

California Regional Water Quality Control Board
North Coast Region

Russian River Pathogen TMDL

2011-2012 Monitoring Report

May 2012

INTRODUCTION

The North Coast Regional Water Board staff are developing the Russian River Total Maximum Daily Loads (TMDLs) for pathogen indicators to identify and control contamination. Potential pathogen contamination has been identified in three areas of the lower and middle Russian River watershed (Hydrologic Units 114.10 and 114.20). Identification of the contamination led to the placement of waters within these areas on the federal Clean Water Act Section 303(d) list of impaired waters. The contamination identified has been linked to impairment of the contact recreation (REC-1) and non-contact recreation (REC-2) designated beneficial uses. Health advisories have been published and/or posted by Sonoma County and the City of Santa Rosa authorities.

To support the development of the Russian River Pathogen TMDL, water quality samples of fecal indicator bacteria and other measurements were collected by the North Coast Regional Water Quality Control Board staff. The monitoring study focused on microbiological source identification in the middle and lower Russian River watershed that included both dry and wet weather water sample collection and laboratory analyses. A pilot study was conducted in collaboration with UC Davis Aquatic Ecosystems Analysis Laboratory (Shilling et al. 2009; Viers et al. 2009). The study made several recommendations for monitoring in support of TMDL development. The purpose of this report is to simply document the water quality data collected for this study during 2011-2012. This report does not assess the data to address the identified management questions. Data analysis for these assessments will be presented as technical memorandum to the Russian River Pathogen TMDL administrative file.

The monitoring study was guided by two Quality Assurance Project Plans (QAPP). The *Russian River Pathogen Indicator Bacteria TMDL Quality Assurance Project Plan* (Fadness and Butkus, 2011) detailed the methods applied for water sample collection and analysis of fecal indicator bacteria *E. coli*, *Enterococcus*, and total coliform concentrations. These analyses were conducted by the North Coast Regional Water Board Microbiology Laboratory. The *Russian River Pathogen Indicator Bacteria TMDL – Supplemental Sampling Plan - Quality Assurance Project Plan* (Butkus 2011) detailed the methods applied for collection and analysis of additional water quality samples. The additional water samples were collected in conjunction with the fecal indicator bacteria TMDL samples. The additional water samples were analyzed for *Bacteroides* bacteria and stable isotope analyses of nitrate for relative source differences in oxygen ($\delta^{18}\text{O}$) and nitrogen ($\delta^{15}\text{N}$).

MONITORING QUESTIONS

Monitoring tasks were identified to help address the following eight management questions:

1. Are Basin Plan Water Quality Objectives for pathogenic indicator bacteria being met in the middle and lower Russian River watershed?
2. What is the sampling variability of pathogenic indicator bacteria?
3. What is the analytical laboratory variability of pathogenic indicator bacteria?
4. What is the spatial variability of pathogenic indicator bacteria?
5. What is the temporal variability of pathogenic indicator bacteria?
6. What are the most significant sources of pathogenic indicator bacteria?
7. What is the background or natural levels of pathogenic indicator bacteria?
8. Do beach areas pose a higher risk to REC-1 than non-beach reaches?

Water sampling efforts were conducted with four (4) monitoring tasks. Tasks 1 and 2 are designed to assess indicator bacteria variability, while tasks 3 and 4, respectively, are designed to evaluate the influence of land use and recreational beach use on pathogen indicator concentrations.

Task 1 was designed to assess the sampling variability. The Russian River Pathogens Pilot Study (Shilling et al. 2009; Viers et al. 2009) identified the need to conduct a more robust assessment of the variability of indicator bacteria measurements. Prior to 2011, beach monitoring collected a single grab sample to assess indicator bacteria concentrations at the sample site. This task was conducted to collect grab samples in triplicate to assess the variability of a sample estimate. Sample variability between monitoring sites was assessed by collecting samples at Healdsburg Veteran's Memorial Beach, Monte Rio Beach, and Santa Rosa Creek.

Task 2 was designed to assess the spatial variability along the Russian River and within the watershed. The Russian River Pathogens Pilot Study (Shilling et al. 2009; Viers et al. 2009) identified the need to expand current indicator bacteria monitoring over a range of climatic conditions and to sites other than public beaches. The pilot study also recommended that a minimum of weekly sampling should be conducted throughout the summer recreational use period. Dry season samples were collected weekly at sixteen (16) different locations along the Russian River and from listed tributaries in the watershed (Table 1). Wet season samples were collected at the same locations during storm events.

Task 3 was designed to assess variability between different types of land uses. The Russian River Pathogens Pilot Study (Shilling et al. 2009; Viers et al. 2009) determined that different land uses exhibited different pathogenic indicator bacteria loads. This task was conducted to assess the relative magnitude and variability of indicator bacteria in waters draining from each of

the major land uses found in the Russian River watershed. Based on the land cover spatial data acreage within the study area (USGS, 2006) and Urban Service Areas (SPRMD, 2010), five land cover categories were chosen for this assessment (Table 2):

1. Forest Land
2. Rangeland
3. Agriculture
4. Urban & Residential Sewered areas
5. Residential Non-sewered areas.

Task 4 was designed to assess the relative magnitude and variability of indicator bacteria levels that may be associated with increased human recreation use on weekends. Water samples were collected and analyzed to assess the local impact of recreational activities on indicator bacteria levels at public beaches. Waters samples were collected at two beaches on the Russian River with large public use: Johnson's Beach in Guerneville and Monte Rio Beach in Monte Rio. Samples were collected each day for 8 days to assess daily variability. Sample collection dates bracketed the Russian River Jazz & Blues Festival and the Russian River Cleanup to capture the variability in indicator bacteria concentrations due to the elevated recreational use.

RESULTS

The purpose of this report is to document the water quality data collected for this study during 2011-2012. The water quality data are presented by monitoring task in the following series of tables and figures. Measurement results that were reported as below the analytical detection limit are shown in the figures as ½ the detection limit. Whiskers on box plots showing data represent the 10th and 90th percentile values. Fecal indicator bacteria concentrations are compared in several figures to the California Department of Public Health criteria for posting beaches for fecal contamination (CDHS, 2006). Stable isotope analyses figures are compared to thresholds associated with runoff and sewage. Samples with $\delta^{18}\text{O}$ values above 15‰ are considered to originate largely from runoff. Samples with $\delta^{15}\text{N}$ values below 5‰ are typically ammonium from *in situ* processes such as wastewater treatment, and samples with $\delta^{15}\text{N}$ values above 5‰ are manure and septic waste (Shilling et al. 2009; Viers et al. 2009).

Task 1 – Sampling Site Variability

- Fecal indicator bacteria concentrations (i.e., *E. coli*, *Enterococcus*, and Total Coliform) are presented in Tables 3-11 (pages 7–1) and in Figures 1–9 (pages 56–60).

Task 2 – Watershed Spatial and Temporal Variability

- Fecal indicator bacteria concentrations are presented in Tables 12–28 (pages 12–41) and in Figures 10–15 (pages 61–63).
- *Bacteroides* bacteria concentrations are presented in Tables 29–30 (pages 42–43) and in Figures 16–22 (pages 64–67).
- Stable isotope analyses of nitrate are presented in Table 31 (page 44) and in Figure 23 (page 68).

Task 3 – Land Cover Variability

- Fecal indicator bacteria concentrations are presented in Tables 32–36 (pages 45–49) and in Figures 24–29 (pages 69–71).
- *Bacteroides* bacteria concentrations are presented in Table 37-38 (pages 50–51) and in Figures 30–32 (pages 72–73).
- Stable isotope analyses of nitrate are presented in Table 39 (page 52) and in Figures 33–37 (pages 74–76).

Task 4 – Recreational Beach Variability

- Fecal indicator bacteria concentrations are presented in Tables 40–42 (page 53) and in Figures 38–39 (page 77).
- *Bacteroides* bacteria concentrations are presented in Table 43 (pages 54) and in Figures 40–42 (pages 78–79).
- Stable isotope analyses of nitrate are presented in Table 44 (page 55) and in Figure 43 (page 79).

CITATIONS

Butkus, S. 2011. Russian River Pathogen Indicator Bacteria TMDL – Supplemental Sampling Plan - Quality Assurance Project Plan. Dated November 16, 2011. North Coast Regional Water Quality Control Board, Santa Rosa, CA.

CDHS, 2006. Draft Guidance for Fresh Water Beaches. California Department of Health Services. Dated May 8, 2006.

Fadness, R. and S. Butkus. 2011. Russian River Pathogen Indicator Bacteria TMDL – Quality Assurance Project Plan. Dated May 19, 2011. North Coast Regional Water Quality Control Board, Santa Rosa, CA.

Shilling, F.M., Viers, J.H. and M.L. Johnson. 2009. Russian River Pathogen TMDL Monitoring Design: A Technical Report to the North Coast Regional Water Quality Control Board. Project Report 06-428-110 dated September 2009. Aquatic Ecosystems Analysis Laboratory, U.C. Davis.

SPRMD, 2010. Urban Service Area spatial data. Sonoma County Permit and Resource Management Department. Data downloaded May 2010 from <http://www.sonoma-county.org/prmd/gisdata/index.htm>

USGS, 2006. Enhanced Historical Land-Use and Land-Cover Data Sets of the U.S. Geological Survey. Data Series 240. U.S. Geological Survey. <http://pubs.usgs.gov/ds/2006/240/>.

Viers, J.H., Shilling, F.M., Johnson, M.L., Bowen, L. Hutchinson, R.A., Calanchini, H., Wehrman, A. and H. Schott. 2009. Russian River Pathogen TMDL Monitoring Design: A Summary Report to the North Coast Regional Water Quality Control Board. Project Report 06-428-110 dated September 2009. Aquatic Ecosystems Analysis Laboratory, U.C. Davis.

TABLES

Table 1. Sampling Location for Task 2

Station Name	Location	Latitude	Longitude
Alexander Valley Campground	Alexander Valley Road	38.658672	-121.170433
Camp Rose	Camp Rose Road	38.613511	-121.167928
Memorial Beach	Old Redwood Hwy	38.604650	-121.122922
Steelhead Beach	Old River Road	38.500311	-121.100561
Forestville Access Beach	River Drive	38.510331	-121.078803
Johnson's Beach	Church Street	38.499389	-121.001972
Monte Rio Beach	Bohemian Hwy	38.466258	-122.990628
Commisky Station	Hwy 101	38.882508	-122.944231
Cloverdale River Park	Crocker Road	38.823144	-123.009458
Geyserville Bridge	Highway 128	38.712922	-121.104519
Dutch Bill Creek	Fir Road	38.463314	-122.990083
Jenner	Jenner Boat Ramp	38.449431	-123.115608
Santa Rosa Creek	Los Alamos Road	38.458314	-121.368450
Santa Rosa Creek	Railroad Street	38.434813	-122.719683
Laguna de Santa Rosa	Sebastopol Community Center	38.407926	-122.818068
Green Valley Creek	Martinelli Road	38.480444	-121.091008

Table 2. Sampling Locations for Task 3

Land Use Category	Stream	Location	Latitude	Longitude
Forest Land	Palmer Creek	Palmer Creek Road	38.574354	-122.954499
	Mays Creek	Neeley Road	38.498416	-122.995001
	van Buren Creek	St. Helena Road	38.512635	-122.637307
Shrubland	Crane Creek	Snyder Lane	38.355143	-122.685734
	Gossage Creek	Gilmore Ave	38.337063	-122.734803
	Blucher Creek	Lone Pine Road	38.365517	-122.786515
Agriculture	Woolsey Creek	River Road	38.489806	-122.802845
	Abramson Creek	Willowside Road Levy	38.445692	-122.803044
	Lambert Creek	Lambert Bridge Road	38.653973	-122.927398
Developed Onsite Septic	Irwin Creek	Sanford Road	38.430035	-122.825181
	Limerick Creek	Old Redwood Highway	38.588091	-122.849275
	Turner Creek	Daywalt Road	38.352362	-122.767381
Developed Sewered	Piner Creek	Fulton Road	38.448439	-122.769552
	Copeland Creek	Commerce Drive	38.343216	-122.712096
	Foss Creek	Matheson Street	38.610756	-122.871743

Table 3. *E. coli* Bacteria concentrations measured at Healdsburg Veteran's Memorial Beach on August 30, 2011.

Site Location	<i>E. coli</i>		
	MPN/100mL		
	Replicate 1	Replicate 2	Replicate 3
Upstream Transect - Right Bank	10	<10	<10
Upstream Transect - Center Channel	10	10	<10
Upstream Transect - Left Bank	<10	<10	10
Middle Transect - Right Bank	10	10	<10
Middle Transect - Center Channel	<10	20	10
Middle Transect - Left Bank	<10	20	<10
Downstream Transect - Right Bank	<10	<10	<10
Downstream Transect - Center Channel	<10	<10	10
Downstream Transect - Left Bank	<10	<10	<10

Table 4. *Enterococcus* Bacteria concentrations measured at Healdsburg Veteran's Memorial Beach on August 30, 2011.

Site Location	Enterococcus		
	MPN/100mL		
	Replicate 1	Replicate 2	Replicate 3
Upstream Transect - Right Bank	<10	<10	<10
Upstream Transect - Center Channel	<10	<10	<10
Upstream Transect - Left Bank	<10	<10	<10
Middle Transect - Right Bank	<10	10	<10
Middle Transect - Center Channel	<10	<10	<10
Middle Transect - Left Bank	<10	<10	<10
Downstream Transect - Right Bank	<10	<10	<10
Downstream Transect - Center Channel	10	<10	<10
Downstream Transect - Left Bank	10	10	10

Table 5. Total Coliform Bacteria concentrations measured at Healdsburg Veteran's Memorial Beach on August 30, 2011.

Site Location	Total coliform		
	MPN/100mL		
	Replicate 1	Replicate 2	Replicate 3
Upstream Transect - Right Bank	1,607	1,211	1,439
Upstream Transect - Center Channel	1,455	1,785	1,291
Upstream Transect - Left Bank	1,935	2,755	1,664
Middle Transect - Right Bank	1,396	1,658	1,211
Middle Transect - Center Channel	2,382	2,046	1,658
Middle Transect - Left Bank	1,396	1,467	1,274
Downstream Transect - Right Bank	905	749	1,187
Downstream Transect - Center Channel	1,354	1,081	1,274
Downstream Transect - Left Bank	1,483	884	860

Table 6. E. coli Bacteria concentrations measured at Monte Rio Beach on August 31, 2011.

Site Location	<i>E. coli</i>		
	MPN/100mL		
	Replicate 1	Replicate 2	Replicate 3
Upstream Transect - Right Bank	41	63	72
Upstream Transect - Center Channel	20	20	10
Upstream Transect - Left Bank	41	<10	10
Middle Transect - Right Bank	<10	<10	41
Middle Transect - Center Channel	20	<10	30
Middle Transect - Left Bank	<10	10	10
Downstream Transect - Right Bank	<10	10	41
Downstream Transect - Center Channel	<10	10	30
Downstream Transect - Left Bank	<10	10	20

Table 7. *Enterococcus* Bacteria concentrations measured at Monte Rio Beach on August 31, 2011.

Site Location	Enterococcus		
	MPN/100mL		
	Replicate 1	Replicate 2	Replicate 3
Upstream Transect - Right Bank	<10	<10	<10
Upstream Transect - Center Channel	<10	<10	<10
Upstream Transect - Left Bank	<10	<10	<10
Middle Transect - Right Bank	<10	<10	10
Middle Transect - Center Channel	<10	<10	<10
Middle Transect - Left Bank	<10	<10	<10
Downstream Transect - Right Bank	<10	<10	<10
Downstream Transect - Center Channel	<10	<10	<10
Downstream Transect - Left Bank	<10	<10	10

Table 8. Total Coliform Bacteria concentrations measured at Monte Rio Beach on August 31, 2011.

Site Location	Total coliform		
	MPN/100mL		
	Replicate 1	Replicate 2	Replicate 3
Upstream Transect - Right Bank	1,467	1,178	1,334
Upstream Transect - Center Channel	1,439	1,333	1,198
Upstream Transect - Left Bank	1,860	1,664	2,143
Middle Transect - Right Bank	1,112	1,723	1,334
Middle Transect - Center Channel	1,274	1,317	1,291
Middle Transect - Left Bank	1,785	1,722	1,198
Downstream Transect - Right Bank	1,439	959	1,780
Downstream Transect - Center Channel	1,421	1,291	909
Downstream Transect - Left Bank	1,515	1,597	1,664

Table 9. *E. coli* Bacteria concentrations measured at Santa Rosa Creek near Railroad Street on September 1, 2011.

Site Location	<i>E. coli</i>		
	MPN/100mL		
	Replicate 1	Replicate 2	Replicate 3
Upstream Transect - Right Bank	309	301	185
Upstream Transect - Center Channel	573	211	187
Upstream Transect - Left Bank	337	211	336
Middle Transect - Right Bank	269	199	197
Middle Transect - Center Channel	324	243	342
Middle Transect - Left Bank	355	187	199
Downstream Transect - Right Bank	238	315	269
Downstream Transect - Center Channel	256	288	211
Downstream Transect - Left Bank	187	231	218

Table 10. *Enterococcus* Bacteria concentrations measured at Santa Rosa Creek near Railroad Street on September 1, 2011.

Site Location	Enterococcus		
	MPN/100mL		
	Replicate 1	Replicate 2	Replicate 3
Upstream Transect - Right Bank	10	10	<10
Upstream Transect - Center Channel	<10	52	10
Upstream Transect - Left Bank	<10	52	41
Middle Transect - Right Bank	20	20	10
Middle Transect - Center Channel	<10	<10	<10
Middle Transect - Left Bank	20	<10	10
Downstream Transect - Right Bank	<10	<10	<10
Downstream Transect - Center Channel	<10	10	<10
Downstream Transect - Left Bank	<10	10	<10

Table 11. Total Coliform Bacteria concentrations measured at Santa Rosa Creek near Railroad Street on September 1, 2011.

Site Location	Total coliform		
	MPN/100mL		
	Replicate 1	Replicate 2	Replicate 3
Upstream Transect - Right Bank	1,860	2,595	1,785
Upstream Transect - Center Channel	3,873	1,552	1,850
Upstream Transect - Left Bank	2,987	2,481	3,448
Middle Transect - Right Bank	2,723	2,415	1,281
Middle Transect - Center Channel	2,098	2,098	1,935
Middle Transect - Left Bank	2,755	2,359	1,850
Downstream Transect - Right Bank	673	3,076	2,382
Downstream Transect - Center Channel	2,755	3,076	2,310
Downstream Transect - Left Bank	2,046	1,935	1,553

Table 12. Fecal Indicator Bacteria Concentrations measured in the Russian River at Commisky Station Road.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/26/2011	Wet	63	52	2,489
6/2/2011	Wet	63	122	2,481
6/9/2011	Dry	75	31	1,515
6/16/2011	Dry	41	<10	1,497
6/23/2011	Dry	63	85	2,909
6/30/2011	Wet	63	20	2,035
7/7/2011	Dry	30	20	2,851
7/14/2011	Dry	41	31	2,247
7/21/2011	Dry	31	85	2,382
7/28/2011	Dry	41	31	1,178
		63	52	1,918
8/4/2011	Dry	<10	31	1,723
8/11/2011	Dry	52	20	1,539
		98	52	2,187
8/18/2011	Dry	10	52	1,789
8/25/2011	Dry	41	52	1,145
9/1/2011	Dry	10	<10	1,333
9/8/2011	Dry	41	<10	464
9/15/2011	Dry	30	<10	1,106
9/22/2011	Dry	20	105	959
		41	111	1,119
9/29/2011	Dry	85	35	884
10/6/2011	Wet	767	959	>24,196
1/20/2012	Wet	63	31	3,441
		86	30	6,488
3/1/2012	Wet	226	474	6,488
3/15/2012	Wet	278	197	5,748
		187	197	9,804

Table 13. Fecal Indicator Bacteria Concentrations measured in the Russian River at Cloverdale River Park.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
6/16/2011	Dry	31	<10	1,553
		52	30	1,314
6/23/2011	Dry	52	41	3,654
6/30/2011	Wet	31	41	1,553
7/7/2011	Dry	<10	20	2,481
		41	20	4,884
7/14/2011	Dry	10	31	1,017
		20	31	1,467
7/21/2011	Dry	52	20	1,850
7/28/2011	Dry	<10	31	2,603
		<10	31	2,613
8/4/2011	Dry	10	20	3,255
		10	41	3,255
8/11/2011	Dry	<10	10	1,850
		<10	10	2,481
8/18/2011	Dry	10	41	3,076
8/25/2011	Dry	31	10	3,255
9/1/2011	Dry	<10	<10	1,119
9/8/2011	Dry	<10	<10	798
9/15/2011	Dry	10	10	2,046
		10	<10	2,851
9/22/2011	Dry	158	18	2,014
9/29/2011	Dry	31	44	1,153
10/6/2011	Wet	213	98	2,224
		295	122	5,794
1/20/2012	Wet	<10	52	1,918
3/1/2012	Wet	288	256	3,255
3/15/2012	Wet	313	292	10,462

Table 14. Fecal Indicator Bacteria Concentrations measured in the Russian River at the Highway 128 Bridge near Geyserville.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/26/2011	Wet	86	10	5,475
6/2/2011	Wet	63	30	4,884
6/9/2011	Dry	31	30	8,664
6/16/2011	Dry	52	<10	2,603
6/23/2011	Dry	20	<10	4,352
6/30/2011	Wet	20	10	1,576
7/7/2011	Dry	20	<10	1,439
7/14/2011	Dry	10	20	743
7/21/2011	Dry	31	10	2,359
7/28/2011	Dry	<10	20	1,439
8/4/2011	Dry	<10	10	754
8/11/2011	Dry	41	<10	2,909
8/18/2011	Dry	10	10	1,607
		<10	10	1,658
8/25/2011	Dry	<10	10	1,483
		<10	20	3,448
9/1/2011	Dry	<10	10	1,017
9/8/2011	Dry	<10	<10	771
		<10	<10	888
9/15/2011	Dry	<10	<10	1,106
9/22/2011	Dry	20	46	1,396
9/29/2011	Dry	20	<10	816
		30	20	839
		41	22	934
10/6/2011	Wet	52	52	2,143
		148	98	3,076
		173	173	4,106
1/20/2012	Wet	110	153	1,782
3/1/2012	Wet	169	74	1,951
3/15/2012	Wet	556	181	12,997
		422	368	12,033

Table 15. Fecal Indicator Bacteria Concentrations measured in the Russian River at the Alexander Valley Road Bridge.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/24/2011	Dry	<10	10	6,448
		<10	10	7,701
		20	<10	9,208
5/31/2011	Wet	<10	10	7,270
		20	<10	8,164
		31	<10	9,804
6/7/2011	Wet	52	30	6,131
		75	31	8,664
		97	52	9,208
		131	85	9,280
6/14/2011	Dry	10	10	2,595
		<10	10	3,654
		20	41	4,352
6/21/2011	Dry	10	<10	2,247
		20	10	2,481
		31	31	3,255
6/28/2011	Wet	10	20	1,607
		10	30	1,616
		<10	31	1,670
		20	41	1,989
7/5/2011	Dry	10	<10	1,153
		20	<10	1,236
		41	20	1,259
7/12/2011	Dry	<10	10	880
		<10	<10	1,076
		20	31	1,112

Table 15. Fecal Indicator Bacteria Concentrations measured in the Russian River at the Alexander Valley Road Bridge. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
7/19/2011	Dry	<10	10	657
		10	<10	749
		20	<10	794
7/26/2011	Dry	<10	10	1,178
		10	<10	1,178
		20	10	1,607
		20	20	1,723
8/2/2011	Dry	<10	10	1,076
		20	<10	1,187
		20	10	1,263
8/9/2011	Dry	<10	<10	1,334
		10	<10	1,785
		<10	20	1,789
8/16/2011	Dry	<10	20	2,064
		<10	31	2,495
		10	31	2,755
		10	52	2,909
8/23/2011	Dry	<10	10	1,670
		<10	51	1,918
		<10	74	1,956
8/30/2011	Dry	<10	<10	1,722
		<10	<10	1,989
		20	10	2,603
9/6/2011	Dry	10	<10	1,081
		<10	<10	1,497
		10	10	1,904

Table 15. Fecal Indicator Bacteria Concentrations measured in the Russian River at the Alexander Valley Road Bridge. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
9/13/2011	Dry	10	<10	328
		10	<10	602
		20	<10	717
9/20/2011	Dry	10	<10	738
		<10	50	884
		<10	69	958
		20	86	1,259
9/27/2011	Dry	<10	20	909
		<10	27	1,036
		31	27	1,106
10/4/2011	Wet	10	10	1,071
		74	20	1,259
		74	31	1,391
1/20/2012	Wet	171	91	3,282
3/1/2012	Wet	120	110	3,873
		135	63	2,489
3/15/2012	Wet	754	411	17,329

Table 16. Fecal Indicator Bacteria Concentrations measured in the Russian River at Camp Rose.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/24/2011	Dry	<10	<10	3,609
		20	<10	4,106
		20	<10	8,164
5/31/2011	Wet	<10	10	5,172
		<10	<10	5,475
		20	<10	6,867
6/7/2011	Wet	30	20	5,475
		63	31	5,794
		85	41	8,664
6/14/2011	Dry	10	<10	1,515
		20	<10	1,725
		31	20	1,956
6/21/2011	Dry	<10	10	1,616
		<10	<10	1,793
		31	<10	2,098
6/28/2011	Wet	<10	20	1,401
		10	31	1,850
		31	31	2,247
7/5/2011	Dry	10	10	1,553
		<10	<10	1,664
		10	<10	1,670
		10	31	2,098
7/12/2011	Dry	10	<10	1,354
		10	<10	1,607
		31	<10	1,789
7/19/2011	Dry	<10	<10	1,236
		<10	<10	2,014
		20	20	2,187
7/26/2011	Dry	<10	10	1,793
		10	<10	1,935
		20	<10	2,064
		31	31	3,255

Table 16. Fecal Indicator Bacteria Concentrations measured in the Russian River at Camp Rose.
Continued.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
8/2/2011	Dry	<10	<10	1,198
		10	<10	1,467
		10	20	1,664
8/9/2011	Dry	<10	<10	2,046
		<10	<10	1,314
		<10	10	1,989
		<10	31	2,359
8/16/2011	Dry	<10	10	1,782
		<10	20	1,850
		30	20	2,187
		31	41	2,489
8/23/2011	Dry	<10	<10	1,439
		<10	31	1,670
		10	41	1,860
		10	52	2,046
8/30/2011	Dry	<10	<10	1,539
		<10	10	2,046
		<10	<10	2,187
9/6/2011	Dry	<10	<10	19,863
		<10	<10	>24,196
		10	<10	24,196
9/13/2011	Dry	<10	<10	275
		<10	<10	905
		31	<10	933
		31	<10	1,720
9/20/2011	Dry	<10	<10	839
		<10	44	1,925
		10	51	1,935
		<10	51	2,187

Table 16. Fecal Indicator Bacteria Concentrations measured in the Russian River at Camp Rose.
Continued.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
9/27/2011	Dry	<10	<10	908
		<10	31	1,246
		<10	32	1,401
		20	43	2,282
10/4/2011	Wet	30	20	1,050
		63	20	1,100
		63	31	1,119
1/20/2012	Wet	10	10	3,255
3/1/2012	Wet	109	20	3,654
		11	109	1,968
3/15/2012	Wet	364	368	15,531

Table 17. Fecal Indicator Bacteria Concentrations measured in the Russian River at Healdsburg Veteran's Memorial Beach.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/24/2011	Dry	10	<10	3,654
		<10	<10	3,654
		<10	10	4,352
5/31/2011	Wet	20	10	3,076
		20	20	3,448
		30	20	4,106
6/7/2011	Wet	52	20	4,106
		83	30	5,794
		86	31	5,794
6/14/2011	Dry	10	10	1,333
		20	10	1,483
		30	<10	1,723
		31	<10	2,014
6/21/2011	Dry	20	<10	1,112
		30	20	1,553
		41	20	2,098
6/28/2011	Wet	74	86	1,935
		119	98	2,382
		158	122	2,613
7/5/2011	Dry	20	<10	884
		31	10	959
		31	31	959
7/12/2011	Dry	20	10	857
		20	10	857
		30	10	880
		31	<10	960
7/19/2011	Dry	<10	10	933
		10	<10	934
		<10	10	1,112
		20	20	1,553

Table 17. Fecal Indicator Bacteria Concentrations measured in the Russian River at Healdsburg Veteran's Memorial Beach. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
7/26/2011	Dry	<10	10	650
		31	<10	744
		52	10	744
		74	10	1,050
8/2/2011	Dry	10	<10	435
		20	10	613
		31	10	677
8/9/2011	Dry	10	<10	1,162
		10	<10	1,178
		20	10	1,483
		41	10	1,658
8/16/2011	Dry	10	<10	2,909
		<10	<10	3,076
		20	10	4,611
8/23/2011	Dry	10	<10	1,317
		<10	10	1,515
		31	10	2,014
8/30/2011	Dry	10	<10	991
		<10	<10	1,162
		10	<10	1,515
9/6/2011	Dry	<10	<10	1,376
		20	<10	1,607
		20	20	1,860
9/13/2011	Dry	<10	<10	959
		<10	<10	1,178
		20	<10	1,450
		41	<10	2,143
9/20/2011	Dry	10	<10	1,236
		10	38	1,333
		<10	38	1,565
		20	39	1,956

Table 17. Fecal Indicator Bacteria Concentrations measured in the Russian River at Healdsburg Veteran's Memorial Beach. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
9/27/2011	Dry	20	13	1,354
		30	20	1,354
		63	26	1,354
10/4/2011	Wet	355	75	4,106
		435	108	4,106
		459	110	4,352
		480	132	5,794
1/20/2012	Wet	145	10	2,755
3/1/2012	Wet	120	52	2,987
		135	61	3,076
3/15/2012	Wet	583	294	17,329
		420	272	4,721

Table 18. Fecal Indicator Bacteria Concentrations measured in the Russian River at Steelhead Beach near Forestville.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/24/2011	Dry	10	<10	1,674
		10	10	2,382
		31	<10	4,611
5/31/2011	Wet	20	10	1,935
		30	10	2,310
		31	31	2,613
6/7/2011	Wet	98	41	3,654
		146	41	4,106
		228	52	4,611
6/14/2011	Dry	10	<10	959
		30	10	1,036
		31	10	1,112
6/21/2011	Dry	10	<10	987
		10	<10	1,076
		10	<10	1,126
		31	<10	1,223
6/28/2011	Wet	10	<10	1,376
		20	10	1,421
		30	20	1,450
		41	20	1,553
7/5/2011	Dry	10	<10	1,354
		31	10	1,376
		31	20	1,565
7/12/2011	Dry	<10	10	576
		10	<10	663
		<10	10	676
		<10	<10	906
7/19/2011	Dry	10	<10	565
		<10	10	703
		10	<10	754
		<10	20	789

Table 18. Fecal Indicator Bacteria Concentrations measured in the Russian River at Steelhead Beach near Forestville. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
7/26/2011	Dry	<10	<10	794
		<10	10	798
		20	20	816
8/2/2011	Dry	<10	20	833
		20	30	855
		31	31	959
8/9/2011	Dry	10	31	798
		41	41	908
		41	41	1,609
8/16/2011	Dry	<10	20	538
		<10	20	691
		<10	52	703
		<10	63	7,270
8/23/2011	Dry	<10	31	487
		20	51	884
		63	52	1,354
8/30/2011	Dry	10	<10	327
		<10	<10	379
		20	<10	471
9/6/2011	Dry	<10	<10	495
		10	<10	529
		20	10	670
9/13/2011	Dry	<10	<10	183
		<10	<10	228
		10	<10	256
9/20/2011	Dry	10	19	218
		<10	27	243
		20	34	295

Table 18. Fecal Indicator Bacteria Concentrations measured in the Russian River at Steelhead Beach near Forestville. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
9/27/2011	Dry	<10	<10	233
		10	11	275
		10	16	305
		10	20	441
10/4/2011	Wet	20	10	988
		20	20	1,246
		52	31	1,250
		63	52	1,396
1/23/2012	Wet	2,110	3,230	104,620
		2,495	3,654	>24,196
3/2/2012	Wet	201	119	2,603
		110	40	2,359

Table 19. Fecal Indicator Bacteria Concentrations measured in the Russian River at Access Beach near Forestville.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/24/2011	Dry	10	<10	1,850
		10	<10	1,989
		20	<10	2,098
5/31/2011	Wet	10	<10	1,789
		<10	10	2,247
		10	20	2,755
6/7/2011	Wet	97	20	2,851
		146	20	3,448
		161	30	4,106
6/14/2011	Dry	10	<10	1,374
		20	<10	1,401
		31	10	1,497
6/21/2011	Dry	<10	<10	1,014
		<10	<10	1,236
		<10	<10	1,376
6/28/2011	Wet	20	<10	1,723
		31	10	1,850
		31	20	1,918
7/5/2011	Dry	10	<10	1,439
		20	<10	1,464
		20	10	1,553
		63	10	2,187
7/12/2011	Dry	10	<10	813
		<10	<10	960
		20	<10	1,043
7/19/2011	Dry	10	10	670
		<10	<10	771
		10	<10	855
7/26/2011	Dry	<10	10	1,112
		<10	<10	1,137
		31	<10	1,723

Table 19. Fecal Indicator Bacteria Concentrations measured in the Russian River at Access Beach near Forestville. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
8/2/2011	Dry	10	10	959
		31	10	959
		41	20	1,223
8/9/2011	Dry	10	10	816
		10	<10	882
		10	41	1,039
		20	63	1,145
8/16/2011	Dry	<10	31	677
		10	41	878
		10	41	1,106
8/23/2011	Dry	<10	10	749
		<10	52	754
		10	63	906
8/30/2011	Dry	<10	<10	712
		<10	<10	813
		10	<10	908
9/6/2011	Dry	<10	10	813
		10	<10	862
		<10	10	933
		31	52	1,106
9/13/2011	Dry	<10	<10	301
		<10	<10	399
		<10	<10	478
9/20/2011	Dry	<10	23	305
		10	24	355
		10	25	393
9/27/2011	Dry	10	15	455
		<10	21	487
		<10	35	547
10/4/2011	Wet	203	10	1,187
		231	20	1,223
		313	31	1,396

Table 19. Fecal Indicator Bacteria Concentrations measured in the Russian River at Access Beach near Forestville. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
1/23/2012	Wet	2,320	2,280	98,040
3/2/2012	Wet	146	97	2,254
		97	86	1,624

Table 20. Fecal Indicator Bacteria Concentrations measured in the Russian River at Johnson's Beach near Guerneville.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/24/2011	Dry	<10	10	1,553
		<10	<10	1,918
		20	<10	2,098
5/31/2011	Wet	10	10	1,439
		20	20	1,725
		31	31	2,359
6/7/2011	Wet	74	20	2,143
		75	30	3,076
		171	41	3,255
6/14/2011	Dry	<10	10	620
		<10	10	620
		10	<10	880
6/21/2011	Dry	20	31	1,500
		20	41	1,515
		20	41	1,785
6/28/2011	Wet	20	20	1,850
		52	20	2,359
		74	41	2,359
7/5/2011	Dry	10	<10	1,354
		20	10	1,376
		20	<10	1,658
		31	20	1,904
7/12/2011	Dry	10	<10	1,314
		<10	<10	2,187
		20	<10	2,487
7/19/2011	Dry	31	<10	891
		31	10	1,178
		41	<10	1,376
		41	31	2,098
7/26/2011	Dry	<10	10	1,296
		20	10	1,553
		20	20	1,674

Table 20. Fecal Indicator Bacteria Concentrations measured in the Russian River at Johnson's Beach near Guerneville. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
8/2/2011	Dry	10	10	650
		10	<10	712
		10	20	860
8/9/2011	Dry	<10	10	645
		20	20	767
		108	20	839
8/16/2011	Dry	<10	<10	743
		<10	<10	991
		<10	52	1,076
8/23/2011	Dry	<10	10	820
		20	10	860
		30	10	1,054
		41	41	1,153
8/30/2011	Dry	<10	<10	1,076
		<10	<10	1,354
		10	<10	1,664
9/6/2011	Dry	10	<10	1,081
		<10	<10	1,119
		20	<10	1,126
		31	31	1,169
9/13/2011	Dry	<10	<10	677
		<10	<10	785
		20	<10	789
		31	<10	880
9/20/2011	Dry	<10	21	620
		<10	31	695
		<10	48	706
9/27/2011	Dry	10	<10	712
		<10	12	908
		<10	15	990
		<10	23	1,137

Table 20. Fecal Indicator Bacteria Concentrations measured in the Russian River at Johnson's Beach near Guerneville. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
10/4/2011	Wet	20	10	1,050
		63	<10	1,071
		86	10	1,439
1/23/2012	Wet	630	410	6,450
3/2/2012	Wet	175	41	1,483

Table 21. Fecal Indicator Bacteria Concentrations measured in the Russian River at Monte Rio Beach.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/24/2011	Dry	<10	<10	1,785
		10	<10	3,448
		10	<10	7,270
5/31/2011	Wet	10	<10	1,333
		10	10	1,483
		20	20	1,553
		31	20	2,489
6/7/2011	Wet	63	20	2,014
		85	31	3,448
		109	52	4,884
6/14/2011	Dry	10	10	602
		<10	<10	638
		41	<10	1,935
6/21/2011	Dry	<10	<10	2,481
		20	<10	2,613
		20	<10	2,909
6/28/2011	Wet	<10	10	2,046
		31	20	2,489
		41	41	3,448
7/5/2011	Dry	10	10	2,187
		20	<10	2,613
		31	10	8,664
7/12/2011	Dry	10	10	933
		10	10	1,211
		10	<10	2,143
		31	31	2,282
7/19/2011	Dry	<10	10	1,723
		<10	<10	2,755
		<10	10	2,755
7/26/2011	Dry	<10	10	4,106
		<10	<10	4,352
		<10	20	5,172

Table 21. Fecal Indicator Bacteria Concentrations measured in the Russian River at Monte Rio Beach. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
8/2/2011	Dry	20	<10	1,296
		31	<10	1,314
		31	<10	1,529
8/9/2011	Dry	<10	10	862
		10	<10	1,046
		<10	<10	1,145
8/16/2011	Dry	<10	<10	1,050
		<10	<10	1,439
		<10	10	1,935
8/23/2011	Dry	10	52	2,481
		10	119	2,723
		20	146	2,755
		31	250	3,255
8/30/2011	Dry	<10	<10	1,211
		<10	<10	1,376
		10	<10	2,382
9/6/2011	Dry	10	<10	959
		10	<10	1,092
		30	10	1,607
9/13/2011	Dry	<10	<10	813
		10	<10	862
		20	10	884
9/20/2011	Dry	10	4	345
		10	11	404
		20	11	691
9/27/2011	Dry	52	57	882
		52	81	1,017
		52	86	1,467
10/4/2011	Wet	30	<10	1,223
		75	10	1,467
		86	10	1,616

Table 21. Fecal Indicator Bacteria Concentrations measured in the Russian River at Monte Rio Beach. *Continued.*

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
1/23/2012	Wet	1,560	1,870	61,310
3/2/2012	Wet	216	31	3,255

Table 22. Fecal Indicator Bacteria Concentrations measured in the Russian River near Villa Grande.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
8/30/2011	Dry	<10	<10	1,467
9/13/2011	Dry	30	<10	1,145
9/20/2011	Dry	30	37	933
9/27/2011	Dry	201	113	1,210
10/4/2011	Wet	122	20	1,497

Table 23. Fecal Indicator Bacteria Concentrations measured in the Russian River Estuary at the Boat Launch Ramp near Jenner.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/24/2011	Dry	10	<10	426
5/31/2011	Wet	122	<10	5,172
6/2/2011	Wet	122	<10	5,172
6/7/2011	Wet	134	31	5,794
6/14/2011	Dry	20	<10	11,199
6/21/2011	Dry	10	<10	7,270
6/28/2011	Wet	122	75	>24,196
7/5/2011	Dry	<10	<10	>24,196
7/12/2011	Dry	<10	<10	7,701
7/19/2011	Dry	10	<10	2,755
7/26/2011	Dry	10	<10	1,956
8/2/2011	Dry	<10	<10	5,475
8/9/2011	Dry	10	<10	9,804
8/16/2011	Dry	<10	<10	6,867
8/23/2011	Dry	<10	<10	4,106
8/30/2011	Dry	<10	<10	3,654
9/6/2011	Dry	<10	<10	241
		<10	<10	241
9/8/2011	Dry	<10	<10	161
9/13/2011	Dry	10	<10	2,247
9/20/2011	Dry	10	2	712
9/27/2011	Dry	135	111	880
10/4/2011	Wet	96	<10	3,784
		146	30	5,172
1/23/2012	Wet	4,480	1,850	92,080
3/2/2012	Wet	173	20	2,064

Table 24. Fecal Indicator Bacteria Concentrations measured in Santa Rosa Creek at the Highway 12 Bridge.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/26/2011	Wet	189	41	933
6/2/2011	Wet	187	52	882
6/9/2011	Dry	213	31	1,529
6/16/2011	Dry	173	31	3,255
6/23/2011	Dry	216	110	1,785
6/30/2011	Wet	259	86	1,789
		262	109	2,613
7/7/2011	Dry	84	52	3,282
7/14/2011	Dry	108	74	2,035
7/21/2011	Dry	63	173	1,664
		86	199	1,725
7/28/2011	Dry	63	146	3,076
8/4/2011	Dry	63	84	1,396
8/11/2011	Dry	63	119	1,414
8/18/2011	Dry	171	323	2,613
		213	435	3,076
8/25/2011	Dry	84	771	1,664
		97	933	2,481
9/1/2011	Dry	520	<10	1,317
9/8/2011	Dry	197	<10	805
9/15/2011	Dry	63	20	1,046
9/22/2011	Dry	249	1,046	1,414
9/29/2011	Dry	97	980	2,282
10/6/2011	Wet	1,455	504	10,462
1/21/2012	Wet	1,198	728	>24,196
		1,081	749	>24,196
2/7/2012	Wet	100	630	1,580
2/29/2012	Wet	246	134	1,576
		71	86	3,448

Table 25. Fecal Indicator Bacteria Concentrations measured in Santa Rosa Creek near the Railroad Street Bridge.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/26/2011	Wet	860	355	8,167
6/2/2011	Wet	487	195	5,172
6/9/2011	Dry	156	85	4,160
6/16/2011	Dry	211	98	2,700
6/23/2011	Dry	364	98	3,448
		435	160	3,873
6/30/2011	Wet	309	135	4,352
7/7/2011	Dry	443	295	6,488
7/14/2011	Dry	146	187	3,255
		256	231	5,172
7/21/2011	Dry	288	63	2,014
		299	122	2,909
7/28/2011	Dry	624	189	2,359
8/4/2011	Dry	369	52	2,481
8/11/2011	Dry	345	109	3,448
8/18/2011	Dry	246	97	4,611
8/25/2011	Dry	279	97	2,359
9/1/2011	Dry	175	20	1,081
9/8/2011	Dry	63	20	481
9/15/2011	Dry	84	<10	1,723
9/22/2011	Dry	10	10	504
		20	<10	697
		31	63	886
9/29/2011	Dry	31	58	620
10/6/2011	Wet	2,014	812	>24,196
1/21/2012	Wet	4,106	7,270	>24,196
2/7/2012	Wet	624	5,880	3,448
2/29/2012	Wet	5,475	7,701	22,240

Table 26. Fecal Indicator Bacteria Concentrations measured in Dutch Bill Creek near Monte Rio.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/24/2011	Dry	10	41	341
5/31/2011	Wet	20	10	228
6/2/2011	Wet	20	10	228
6/7/2011	Wet	62	30	350
6/14/2011	Dry	10	10	226
6/21/2011	Dry	20	10	512
6/28/2011	Wet	96	195	3,130
7/5/2011	Dry	<10	86	14,136
7/12/2011	Dry	20	10	650
7/19/2011	Dry	<10	10	537
7/26/2011	Dry	30	41	682
8/2/2011	Dry	10	10	712
8/9/2011	Dry	<10	10	638
8/16/2011	Dry	<10	<10	341
8/23/2011	Dry	52	74	1,046
8/30/2011	Dry	<10	<10	171
9/6/2011	Dry	<10	<10	144
		<10	<10	144
9/13/2011	Dry	<10	<10	221
9/20/2011	Dry	<10	55	175
9/27/2011	Dry	10	<1	594
10/4/2011	Wet	10	31	4,352
1/23/2012	Wet	1,460	310	14,300
3/2/2012	Wet	74	63	657

Table 27. Fecal Indicator Bacteria Concentrations measured in Green Valley Creek at Martinelli Road.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
5/26/2011	Wet	369	253	6,131
		432	345	7,270
6/2/2011	Wet	158	199	2,382
6/9/2011	Dry	63	10	1,782
6/16/2011	Dry	135	<10	1,223
6/23/2011	Dry	41	20	1,187
6/30/2011	Wet	75	31	2,382
7/7/2011	Dry	31	52	3,654
		97	120	5,475
7/14/2011	Dry	41	52	1,086
7/21/2011	Dry	31	10	1,050
7/28/2011	Dry	31	63	985
8/4/2011	Dry	10	20	839
		10	20	987
8/11/2011	Dry	41	110	1,112
8/18/2011	Dry	31	187	1,086
8/25/2011	Dry	63	199	1,723
9/1/2011	Dry	31	31	1,607
9/8/2011	Dry	20	<10	185
		161	15,531	2,613
9/15/2011	Dry	120	20	8,164
		121	31	15,531
9/22/2011	Dry	1,119	866	4,611
9/29/2011	Dry	73	1,203	4,884
10/6/2011	Wet	1,918	987	24,196
1/23/2012	Wet	4,352	4,352	23,550
		3,654	2,723	>24,196
3/2/2012	Wet	85	203	3,255
		158	216	3,130

Table 28. Fecal Indicator Bacteria Concentrations measured in the Laguna de Santa Rosa at the Sebastopol Community Center.

Date	Period	E. coli	Enterococcus	Total Coliform
		MPN/100mL	MPN/100mL	MPN/100mL
1/21/2012	Wet	17,329	12,997	>24,196
		12,997	6,586	>24,196
2/7/2012	Wet	9,050	9,090	38,730
2/29/2012	Wet	9,880	13,540	34,480
		17,329	17,329	>24,196
5/26/2011	Wet	538	1,904	12,997
6/2/2011	Wet	121	63	2,764
		145	107	5,794
6/9/2011	Dry	52	<10	5,172
		75	63	7,270
6/16/2011	Dry	148	113	6,131
6/23/2011	Dry	20	30	3,130
		404	85	4,884
6/30/2011	Wet	2,873	1,723	24,169
		3,076	1,918	>24,196
7/7/2011	Dry	52	233	5,172
7/14/2011	Dry	41	63	5,172
7/21/2011	Dry	341	30	>24,196
7/28/2011	Dry	148	52	17,329
8/4/2011	Dry	31	150	3,255
8/11/2011	Dry	10	93	1,483
8/18/2011	Dry	74	52	1,500
8/25/2011	Dry	187	134	1,723
9/1/2011	Dry	20	<10	987
		31	10	1,086
9/8/2011	Dry	41	<10	548
9/15/2011	Dry	<10	52	959
9/22/2011	Dry	20	89	833
9/29/2011	Dry	10	101	1,500
10/6/2011	Wet	15,531	5,794	>24,196

Table 29. Dry Period *Bacteroides* Bacteria Sample Results for Task 2

Collection Date	Location	<i>Bacteroides</i> 16SrRNA genes per 100mL		
		All	Human-specific	Bovine-specific
8/18/2011	Commisky Station Road	2,143,740	4,156	10,328
8/18/2011	Cloverdale River Park	2,550,520	1,039	284
8/18/2011	Geyserville Bridge	1,556,200	1,116	230
8/16/2011	Alex. Valley Campground	1,977,040	44,922	112
8/16/2011	Camp Rose	1,370,570	32,958	385
8/16/2011	Memorial Beach	391,436	8,053	597
8/16/2011	Steelhead Beach	448,957	77,848	77
8/16/2011	Forestville River Access	370,872	105,064	129
8/16/2011	Johnson's Beach	105,785	2,179	85
8/16/2011	Monte Rio Beach	106,738	11,242	3,885
8/16/2011	Jenner Boat Ramp	1,353,680	3,781	4,168
8/16/2011	Dutch Bill Creek	428	<60	<30
8/18/2011	Green Valley Creek	532,697	27,738	39
8/18/2011	Laguna de Santa Rosa	122,713	888	<30
8/18/2011	Santa Rosa Creek at Los Alamos Road	20,364	938	177
8/18/2011	Santa Rosa Creek at Railroad Street	1,419,610	5,526	3,102

Table 30. Wet Period *Bacteroides* Bacteria Sample Results for Task 2

Collection Date	Location	<i>Bacteroides</i> 16SrRNA genes per 100mL		
		All	Human-specific	Bovine-specific
10/6/2011	Commisky Station Road	496,430	1,307	497
10/6/2011	Cloverdale River Park	642,543	1,135	1,136
10/6/2011	Geyserville Bridge	638,238	25,886	243
10/6/2011	Alex. Valley Campground	934,240	29,182	120
10/6/2011	Camp Rose	1,273,610	29,153	188
10/6/2011	Memorial Beach	1,041,660	15,290	165
10/6/2011	Steelhead Beach	1,021,610	19,121	47,291
10/6/2011	Forestville River Access	745,079	10,043	29,292
10/6/2011	Johnson's Beach	177,907	9,404	361
10/6/2011	Monte Rio Beach	135,997	39,456	137
10/6/2011	Jenner Boat Ramp	393,019	5,893	1196
10/6/2011	Dutch Bill Creek	8,685	416	<30
10/5/2011	Green Valley Creek	968,914	6,294	106
10/5/2011	Laguna de Santa Rosa	322,812	14,051	514
10/5/2011	Santa Rosa Creek at Los Alamos Road	59,973	4,517	186
10/5/2011	Santa Rosa Creek at Railroad Street	716,845	60,292	12,429

Table 31. Stable Isotopes of Nitrate Sample Results for Task 2

Period	Location	Date	$\delta^{15}\text{N}$	$\delta^{18}\text{O}$
Dry	Commisky Station Road	9/7/2011	18.1	-2.9
	Cloverdale River Park	9/7/2011	21.4	-2.8
	Geyserville Bridge	9/7/2011	2.6	-6.6
	Alex. Valley Campground	9/7/2011	18.4	2.3
	Camp Rose	9/7/2011	< MDL	< MDL
	Memorial Beach	9/7/2011	3.8	-96.8
	Steelhead Beach	9/7/2011	-1.3	-31.1
	Forestville River Access	9/7/2011	10.5	-341.5
	Johnson's Beach	9/7/2011	10.3	-77.8
	Monte Rio Beach	9/7/2011	21.9	-76.1
	Jenner Boat Ramp	9/7/2011	8.6	-4.9
	Laguna de Santa Rosa	9/7/2011	24.5	3.4
	Green Valley Creek	9/7/2011	4.7	-7.5
	Dutch Bill Creek	9/7/2011	15.7	-8.2
	Santa Rosa Creek at Los Alamos Road	9/7/2011	19.8	-3.0
	Santa Rosa Creek @ Railroad Street	9/7/2011	26.7	0.1
Wet	Commisky Station Road	10/6/2011	8.1	4.2
	Cloverdale River Park	10/6/2011	10.1	3.5
	Geyserville Bridge	10/6/2011	7.0	3.6
	Alex. Valley Campground	10/6/2011	7.9	5.3
	Camp Rose	10/6/2011	11.1	11.7
	Memorial Beach	10/6/2011	< MDL	< MDL
	Steelhead Beach	10/6/2011	5.1	7.7
	Forestville River Access	10/6/2011	5.8	7.2
	Johnson's Beach	10/6/2011	5.6	10.8
	Monte Rio Beach	10/6/2011	7.0	12.8
	Jenner Boat Ramp	10/6/2011	5.5	5.3
	Laguna de Santa Rosa	10/5/2011	7.2	11.4
	Green Valley Creek	10/5/2011	14.3	12.4
	Dutch Bill Creek	10/6/2011	7.5	2.6
	Santa Rosa Creek at Los Alamos Road	10/5/2011	6.1	10.3
	Santa Rosa Creek @ Railroad Street	10/5/2011	5.7	9.8

Table 32. Fecal Indicator Bacteria Concentrations measured from Forested Land Cover Locations.

Period	Stream	Date	<i>E. coli</i>	<i>Enterococcus</i>	Total Coliform
			MPN/100mL	MPN/100mL	MPN/100mL
Dry	Palmer Creek	1/17/2012	10	<10	131
		4/19/2012	<10	10	318
	Mays Creek	1/17/2012	10	<10	350
			30	10	474
		3/5/2012	31	10	435
			134	10	617
	4/19/2012	74	63	528	
		203	30	633	
	van Buren Creek	12/9/2011	<10	10	285
			<10	<10	130
		1/17/2012	31	<10	164
			10	<10	298
4/18/2012	20	<10	644		
	41	10	512		
Wet	Palmer Creek	1/20/2012	420	272	4,884
		2/29/2012	256	428	17,329
		3/14/2012	62	83	1,267
	Mays Creek	1/23/2012	616	602	10,462
			602	573	11,199
		3/2/2012	175	20	1,259
			73	10	1,515
		3/14/2012	246	565	19,863
	328		341	24,196	
	van Buren Creek	1/21/2012	613	733	>24196
		2/7/2012	134	74	1,785
			100	<100	1,210
2/29/2012		86	97	1,725	
	95	107	1,497		

Table 33. Fecal Indicator Bacteria Concentrations measured from Shrubland Land Cover Locations.

Period	Stream	Date	<i>E. coli</i>	<i>Enterococcus</i>	Total Coliform
			MPN/100mL	MPN/100mL	MPN/100mL
Dry	Blucher Creek	12/9/2011	20	41	1,624
		1/17/2012	201	41	2,382
		4/18/2012	1,198	201	12,997
	Crane Creek	3/5/2012	<10	30	820
			10	41	959
		3/22/2012	228	243	8,664
			369	231	6,488
	4/18/2012	169	175	8,164	
	Gossage Creek	12/9/2011	309	85	1,785
		1/17/2012	30	20	2,310
4/18/2012		98	20	5,475	
Wet	Blucher Creek	1/21/2012	12,033	12,033	>24,196
		2/7/2012	2,382	512	24,196
		2/29/2012	6,867	1,274	86,640
	Crane Creek	1/21/2012	10,462	6,131	>24196
		1/21/2012	5,475	7,701	>24196
		2/7/2012	435	275	17,329
		2/29/2012	31	404	6,488
			41	209	6,488
	Gossage Creek	1/21/2012	17,329	>24,196	>2,4196
		2/7/2012	216	727	24,196
		2/29/2012	644	1,351	16,160
		1/23/2012	4,352	4,352	23,550
			3,654	2,723	>24196
		3/2/2012	85	203	3,255
	158		216	3,130	

Table 34. Fecal Indicator Bacteria Concentrations measured from Agricultural Land Cover Locations.

Period	Stream	Date	<i>E. coli</i>	<i>Enterococcus</i>	Total Coliform
			MPN/100mL	MPN/100mL	MPN/100mL
Dry	Lambert Creek	3/5/2012	30	41	9,850
			10	20	15,531
		3/22/2012	<10	173	15,531
		4/19/2012	74	41	6,131
	Woolsey Creek	3/5/2012	10	10	2,382
			<10	10	1,850
		3/22/2012	31	63	4,884
		4/18/2012	10	30	5,475
			41	97	4,884
	Abramson Creek	12/9/2011	298	85	120,330
		1/17/2012	41	52	862
			63	20	1,043
4/18/2012	173	20	6,488		
Wet	Lambert Creek	1/21/2012	5,172	1,178	>24,196
			6,488	1,246	>24,196
		2/29/2012	86	1,081	36,540
		3/14/2012	743	3,654	61,310
	833		2,481	>24,196	
	Woolsey Creek	1/21/2012	>24196	24,196	>24,196
		2/7/2012	63	2,105	>241,690
		2/29/2012	218	428	62,940
	279		497	>24,196	
	Abramson Creek	1/21/2012	>24196	>24196	>24,196
		2/7/2012	228	345	12,033
		2/29/2012	235	155	4,541

Table 35. Fecal Indicator Bacteria Concentrations measured from Developed Land Cover Locations with Onsite Septic Systems.

Period	Stream	Date	<i>E. coli</i>	<i>Enterococcus</i>	Total Coliform
			MPN/100mL	MPN/100mL	MPN/100mL
Dry	Limerick Creek	3/5/2012	158	<10	19,680
		3/22/2012	836	1,162	24,196
		4/19/2012	156	145	155,310
			241	203	>24196
	Irwin Creek	3/5/2012	63	41	985
		3/22/2012	373	121	4,352
			327	109	4,568
	4/18/2012	135	31	8,664	
	Turner Creek	12/9/2011	594	109	5,172
			435	86	8,164
		1/17/2012	9,208	216	14,136
		4/18/2012	435	181	19,863
Wet	Limerick Creek	1/21/2012	6,488	17,329	>24,196
		2/29/2012	15,531	24,196	>241,960
			24,196	19,863	>24,196
		3/14/2012	1,664	2,098	81,640
	41		2,613	12,033	
	Irwin Creek	1/21/2012	17,329	12,997	>24,196
		2/7/2012	213	256	24,196
		2/29/2012	358	314	2,046
		3/14/2012	24,810	19,863	>241,960
	Turner Creek	1/21/2012	>24196	>24196	>24,196
		2/7/2012	3,076	461	46,110
			3,410	2,790	54,750
2/29/2012		5,172	4,352	43,520	
	3,448	2,310	24,196		

Table 36. Fecal Indicator Bacteria Concentrations measured from Developed and Sewered Land Cover Locations.

Period	Stream	Date	<i>E. coli</i>	<i>Enterococcus</i>	Total Coliform
			MPN/100mL	MPN/100mL	MPN/100mL
Dry	Copeland Creek	12/9/2011	31	<10	723
		1/17/2012	10	20	473
		4/18/2012	341	145	9,208
			272	246	5,172
	Foss Creek	12/9/2011	97	31	776
			98	<10	759
		1/17/2012	341	85	1,354
		4/19/2012	323	75	6,294
	Piner Creek	12/9/2011	228	52	1,314
		1/17/2012	187	10	605
		4/18/2012	275	103	4,106
	Wet	Copeland Creek	1/21/2012	4,352	9,208
2/7/2012			7,270	24,196	41,060
			9,590	23,590	68,670
2/29/2012			15,531	3,654	77,010
Foss Creek		1/20/2012	6,131	2,046	>24,196
		2/29/2012	5,172	4,352	129,970
			2,909	5,794	>24,196
		3/14/2012	789	1,500	>241,960
Piner Creek		1/21/2012	5,475	6,488	>24,196
		2/7/2012	5,493	14,136	10,112
		2/29/2012	8,164	12,997	38,730
			6,867	6,131	>24,196

Table 37. *Bacteroides* Sample Results for Task 3.

Land Cover	Period	Location	Collection Date	<i>Bacteroides</i> 16SrRNA genes per 100mL		
				All	Human-specific	Bovine-specific
Forest Land	Dry	Mays Creek	03/05/12	3,643	258	456
		Palmer Creek	12/09/11	5,635	<60	<30
		Van Buren	12/09/11	8,881	<60	<30
	Wet	Mays Creek	01/23/12	52,457	2,392	760
		Palmer Creek	01/20/12	83,333	2,781	106
		Van Buren	01/21/12	91,352	2,089	2,265
Shrubland	Dry	Blucher Creek	12/09/11	108,606	1,855	2,959
		Crane Creek	03/05/12	38,795	4,394	352
		Gossage Creek	12/09/11	291,848	11,252	770
	Wet	Blucher Creek	01/21/12	1,759,032	34,189	351,536
		Crane Creek	01/21/12	1,444,232	49,012	46,852
		Gossage Creek	01/21/12	2,243,660	48,551	153,020
Agriculture	Dry	Abramson Creek	12/09/11	88,652,000	17,910,200	14,615
		Lambert Creek	03/05/12	26,049	3,779	<30
		Woolsey Creek	03/05/12	154,093	2,793	865
				50,983	979	286
				126,323	2,724	670
	Wet	Abramson Creek	01/21/12	4,174,163	258,941	515,269
				2,840,300	162,680	335,058
				5,138,440	287,860	632,226
		Lambert Creek	01/21/12	507,104	6,734	453
Woolsey Creek	01/21/12	1,259,863	57,062	153,413		

Table 38. *Bacteroides* Sample Results for Task 3. *Continued.*

Land Cover	Period	Location	Collection Date	<i>Bacteroides</i> 16SrRNA genes per 100mL		
				All		
Developed Onsite Septic	Dry	Irwin Creek	03/05/12	144,554	1,635	483
				137,856	1,517	480
				108,284	1,120	308
		Limerick Creek	03/05/12	135,173	56,951	2,720
				23,353	11,034	369
				66,543	28,965	1,212
	Turner Creek	12/09/11	75,765	4,255	<30	
	Wet	Irwin Creek	01/21/12	2,657,080	69,661	123,193
		Limerick Creek	01/21/12	367,829	5,792	18,121
Turner Creek		01/21/12	5,214,383	71,008	867,503	
Developed Sewered	Dry	Copeland Creek	12/09/11	137,669	2,586	432
		Foss Creek	12/09/11	16,422	1,071	<30
		Piner Creek	12/09/11	82,023	6,826	1,472
	Wet	Copeland Creek	01/21/12	1,488,650	37,270	102,937
		Foss Creek	01/20/12	454,291	73,621	8,668
		Piner Creek	01/21/12	198,187	17,961	5,076

Table 39. Stable Isotopes of Nitrate Sample Results for Task 3

Land Cover	Period	Location	Date	$\delta^{15}\text{N}$	$\delta^{18}\text{O}$
Forest Land	Dry	Mays Creek	3/5/2012	10.3	4.5
		Palmer Creek	12/9/2011	4.5	7.4
		van Buren Creek	12/9/2011	6.0	10.5
	Wet	Mays Creek	1/23/2012	6.2	2.5
		Palmer Creek	1/20/2012	4.5	6.4
		van Buren Creek	1/21/2012	3.3	1.8
Shrubland	Dry	Blucher Creek	12/9/2011	9.9	9.4
		Crane Creek	3/5/2012	< MDL	< MDL
		Gossage Creek	12/9/2011	6.8	6.0
	Wet	Blucher Creek	1/21/2012	6.8	3.6
		Crane Creek	1/21/2012	5.2	4.0
		Gossage Creek	1/21/2012	10.0	2.9
Agriculture	Dry	Abramson Creek	12/9/2011	6.3	18.6
		Lambert Creek	3/5/2012	8.4	5.8
		Woolsey Creek	3/5/2012	< MDL	< MDL
	Wet	Abramson Creek	1/21/2012	8.5	5.8
		Lambert Creek	1/21/2012	8.4	1.7
		Woolsey Creek	1/21/2012	7.0	3.1
Developed Onsite Septic	Dry	Irwin Creek	3/5/2012	7.6	5.4
		Limerick Creek	3/5/2012	8.1	5.8
		Turner Creek	12/9/2011	14.2	11.5
	Wet	Irwin Creek	1/21/2012	7.6	5.4
		Limerick Creek	1/21/2012	5.8	3.2
		Turner Creek	1/21/2012	9.3	3.3
Developed Sewered	Dry	Copeland Creek	12/9/2011	< MDL	< MDL
		Foss Creek	12/9/2011	10.4	7.3
		Piner Creek	12/9/2011	13.9	10.4
	Wet	Copeland Creek	1/21/2012	5.5	4.4
		Foss Creek	1/20/2012	5.1	16.2
		Piner Creek	1/21/2012	6.8	5.0

< MDL = less than the minimum detection limit

Table 40. Daily *E. coli* Bacteria Concentration Sample Results for Task 4

<i>E. coli</i> (MPN/100mL)						
Date	Johnson's Beach			Monte Rio Beach		
	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2	Replicate 3
9/21/2011	82	68.3	90.8	4.1	8.6	8.4
9/22/2011	32.7	19.5	18.5	3.1	8.4	3.1
9/23/2011	21.3	14.4	15.6	6.3	22.3	24.1
9/24/2011	24.1	26.2	22.8	21.8	17.5	24.3
9/25/2011	6.3	8.5	7.4	14.8	13.1	20.1
9/26/2011	22.3	14.5	24.6	25.6	17.1	21.8
9/27/2011	17.3	13.5	3	64.4	38.3	52
9/28/2011	63.1	64.4	56.3	196.8	214.3	218.7

Table 41. Daily *Enterococcus* Bacteria Concentration Sample Results for Task 4

<i>Enterococcus</i> (MPN/100mL)						
Date	Johnson's Beach			Monte Rio Beach		
	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2	Replicate 3
9/21/2011	36.4	51.2	37.9	19.9	6.3	24.9
9/22/2011	58.1	42.8	58.3	9.8	10.9	10.9
9/23/2011	30.9	30.1	27.2	7.5	8.6	9.6
9/24/2011	21.8	54.5	36.9	--	12.1	24.3
9/25/2011	33.6	28.5	29.9	16	18.3	23.1
9/26/2011	58.3	63.1	143.9	21.3	16	24.1
9/27/2011	45.5	49.5	42.2	118.7	307.6	90.6
9/28/2011	98.8	98.5	96	218.7	209.8	248.9

Table 42. Daily Total Coliform Bacteria Concentration Sample Results for Task 4

Total coliform (MPN/100mL)						
Date	Johnson's Beach			Monte Rio Beach		
	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2	Replicate 3
9/21/2011	1299.7	1553.1	1203.3	1299.7	1732.9	1732.9
9/22/2011	920.8	727	980.4	1986.3	1732.9	1732.9
9/23/2011	920.8	1046.2	1299.7	1553.1	1299.7	1046.2
9/24/2011	1046.2	770.1	980.4	1986.3	1413.6	1986.3
9/25/2011	816.4	119.9	1203.3	1299.7	1413.6	1299.7
9/26/2011	1553.1	2419.6	1413.6	1553.1	1046.2	1299..7
9/27/2011	1413.6	920.8	870.4	1413.6	2419.6	2419.6
9/28/2011	1413.6	1413.6	1986.3	2419.6	1732.9	1986.3

Table 43. Daily *Bacteroides* Bacteria Concentration Sample Results

Location	Collection Date	<i>Bacteroides</i> 16SrRNA genes per 100mL		
		All	Human-specific	Bovine-specific
Johnson's Beach	9/21/2011	232,053	1,847	109
	9/22/2011	66,562	661	<30
	9/23/2011	210,080	1,507	58
	9/24/2011	99,681	1,070	47
	9/25/2011	77,709	881	94
	9/26/2011	99,044	875	<30
	9/27/2011	136,205	2,320	<30
	9/28/2011	92,008	2,080	74
Monte Rio Beach	9/21/2011	163,548	9,491	630
	9/22/2011	165,397	6,916	704
	9/23/2011	148,125	8,305	1,125
	9/24/2011	94,103	6,504	635
	9/25/2011	86,306	7,933	1,180
	9/26/2011	46,266	5,154	329
	9/27/2011	84,758	3,406	1,987
	9/28/2011	77,288	4,472	820

Table 44. Stable Isotopes of Nitrate Sample Results for Task 4

Location	Date	$\delta^{15}\text{N}$	$\delta^{18}\text{O}$
Monte Rio Beach	9/21/2011	7.7	-26.9
	9/22/2011	9.6	-13.0
	9/23/2011	5.9	19.1
	9/24/2011	10.7	-56.8
	9/25/2011	9.3	-47.3
	9/26/2011	< MDL	< MDL
	9/27/2011	6.5	-96.5
	9/28/2011	6.8	-56.4
Johnson's Beach	9/21/2011	6.6	-1.4
	9/22/2011	0.6	15.3
	9/23/2011	6.8	-31.6
	9/24/2011	8.0	-66.5
	9/25/2011	7.0	-91.9
	9/26/2011	6.8	-71.2
	9/27/2011	4.3	-122.7
	9/28/2011	11.6	-26.0

< MDL = less than the minimum detection limit

FIGURES

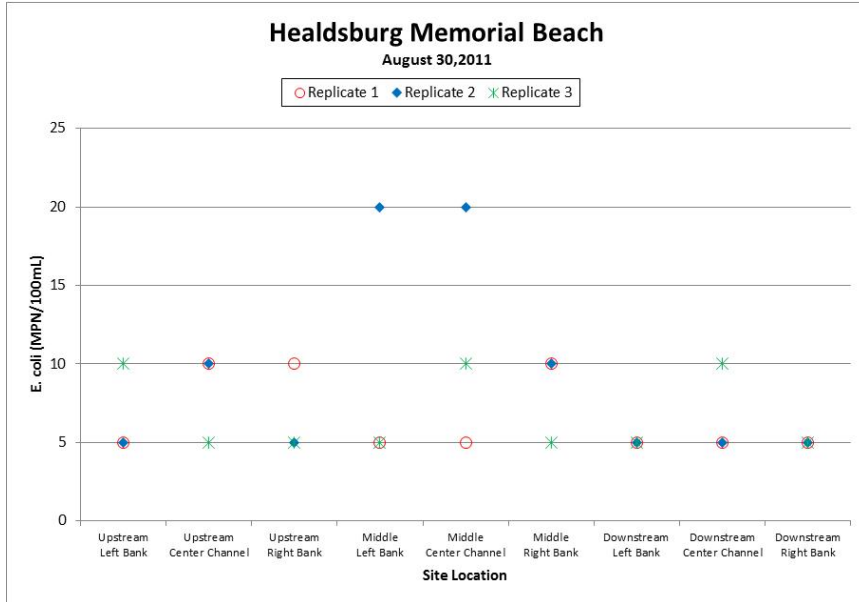


Figure 1. *E. coli* Bacteria concentrations measured at Healdsburg Veteran’s Memorial Beach on August 30, 2012.

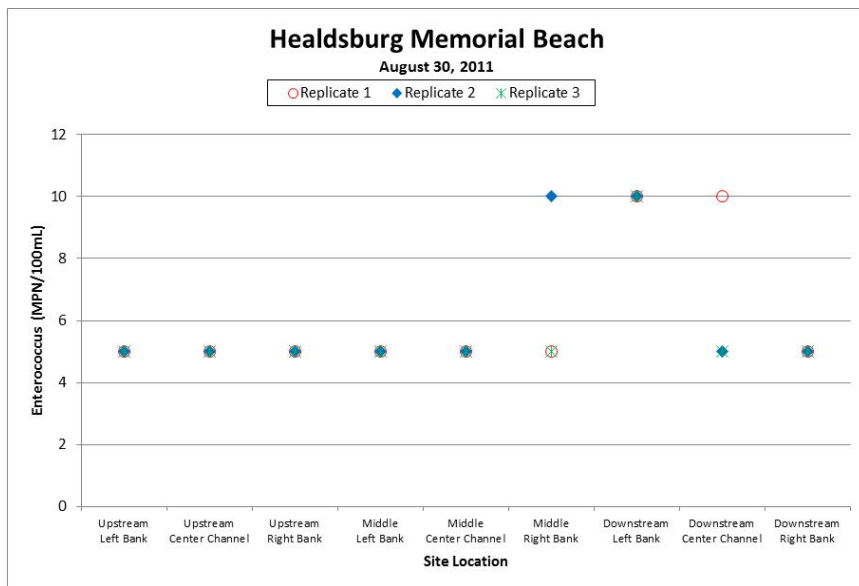


Figure 2. *Enterococcus* Bacteria concentrations measured at Healdsburg Veteran’s Memorial Beach on August 30, 2012.

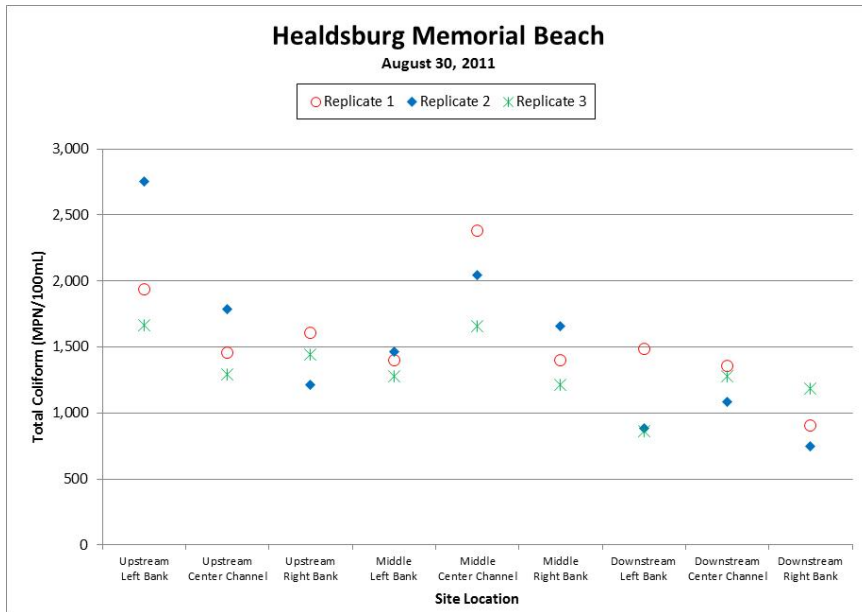


Figure 3. Total Coliform Bacteria concentrations measured at Healdsburg Veteran’s Memorial Beach on August 30, 2012.

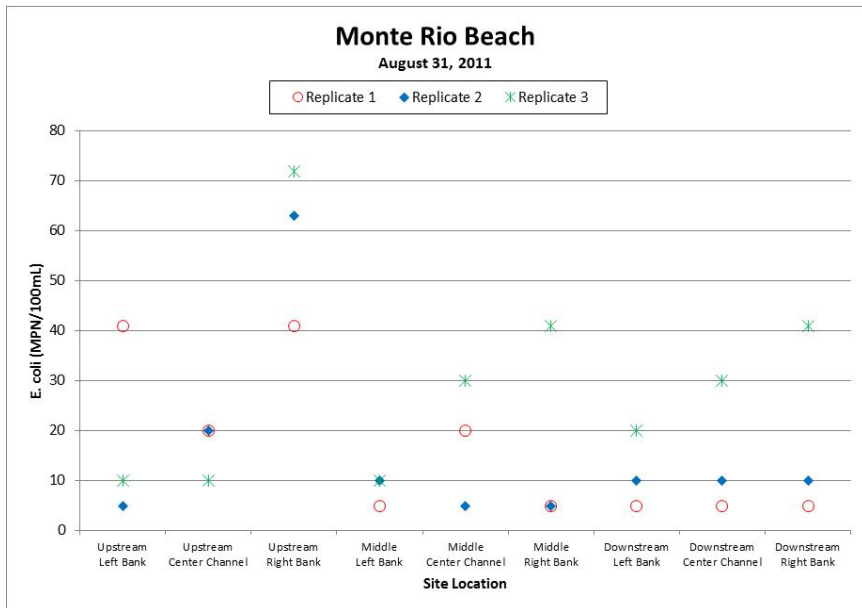


Figure 4. *E. coli* Bacteria concentrations measured at Monte Rio Beach on August 31, 2012.

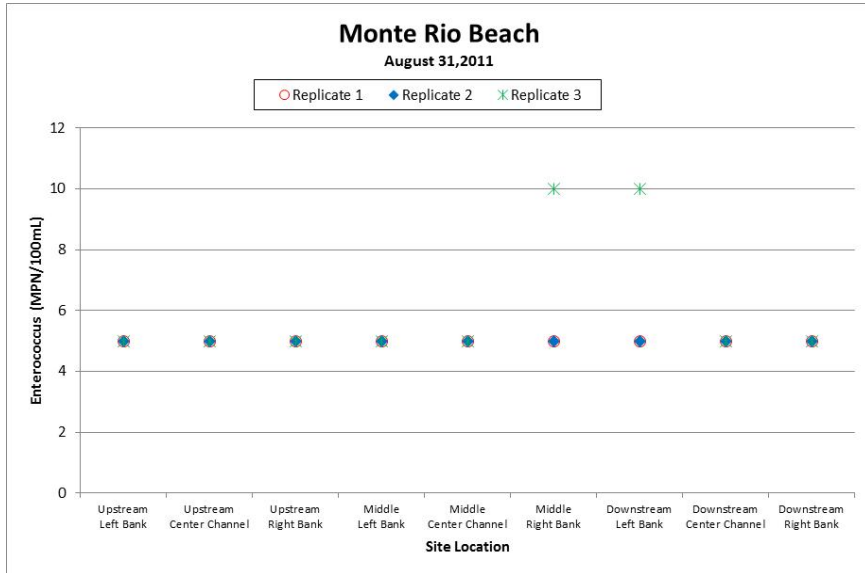


Figure 5. *Enterococcus* Bacteria concentrations measured at Monte Rio Beach on August 31, 2012.

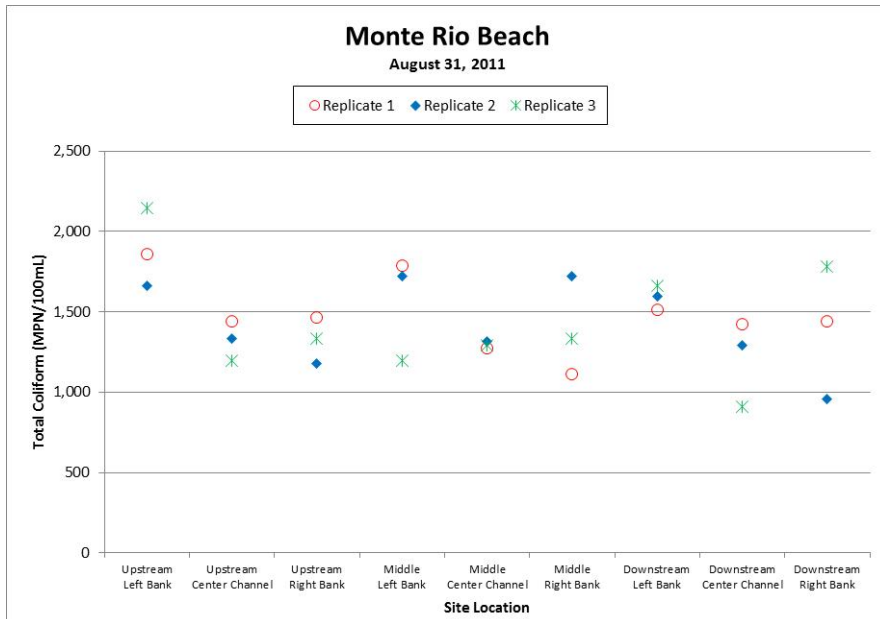


Figure 6. Total Coliform Bacteria concentrations measured at Monte Rio Beach on August 31, 2012.

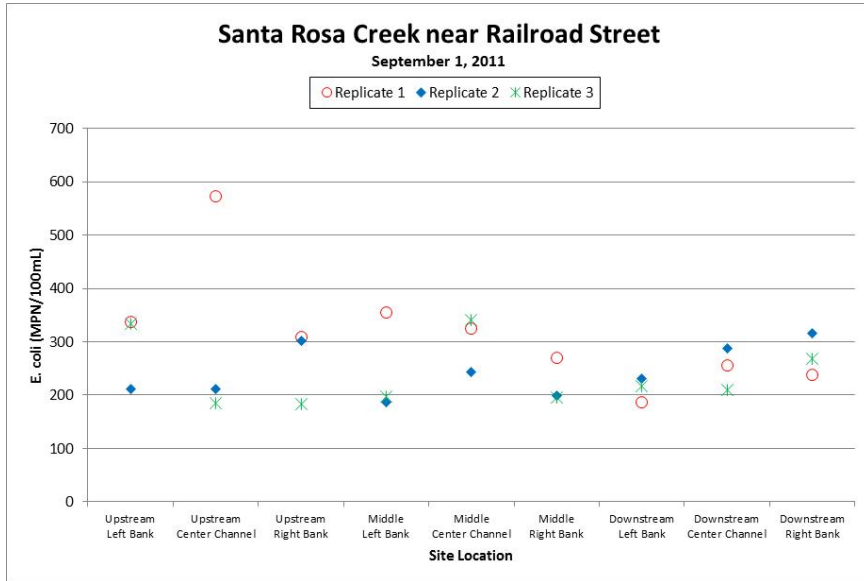


Figure 7. *E. coli* Bacteria concentrations measured at Santa Rosa Creek near Railroad Street on September 1, 2012.

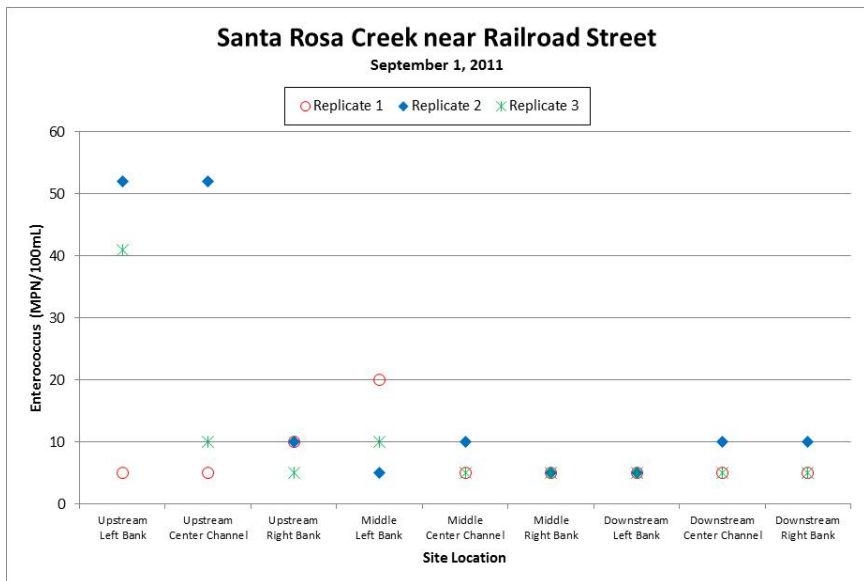


Figure 8. *Enterococcus* Bacteria concentrations measured at Santa Rosa Creek near Railroad Street on September 1, 2012.

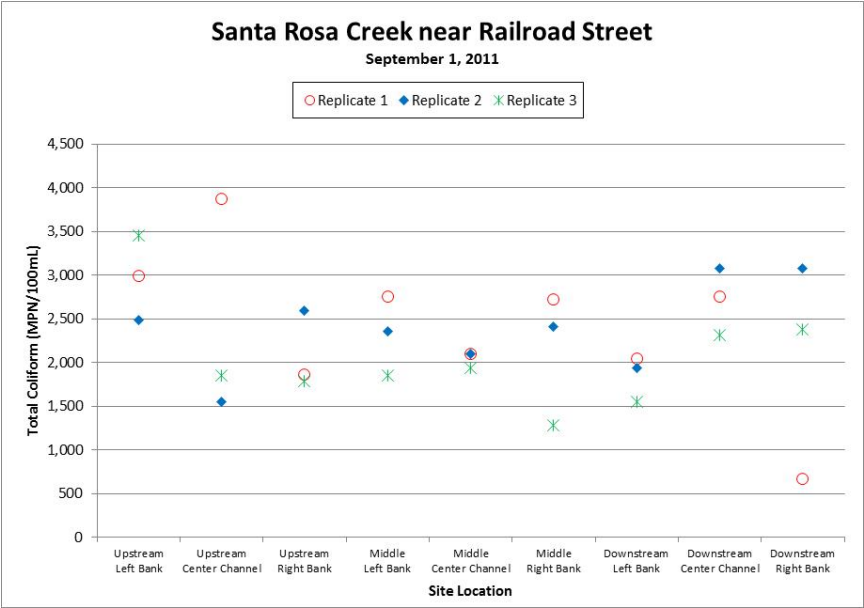


Figure 9. Total Coliform Bacteria concentrations measured at Santa Rosa Creek near Railroad Street on September 1, 2012.

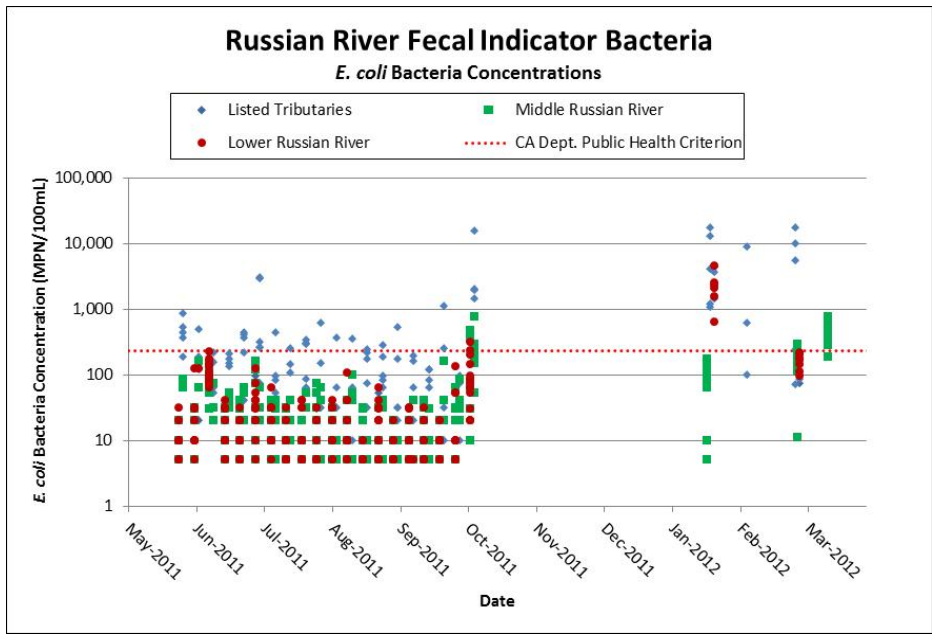


Figure 10. *E. coli* Bacteria Concentrations Measured in the Russian River Watershed Over Time.

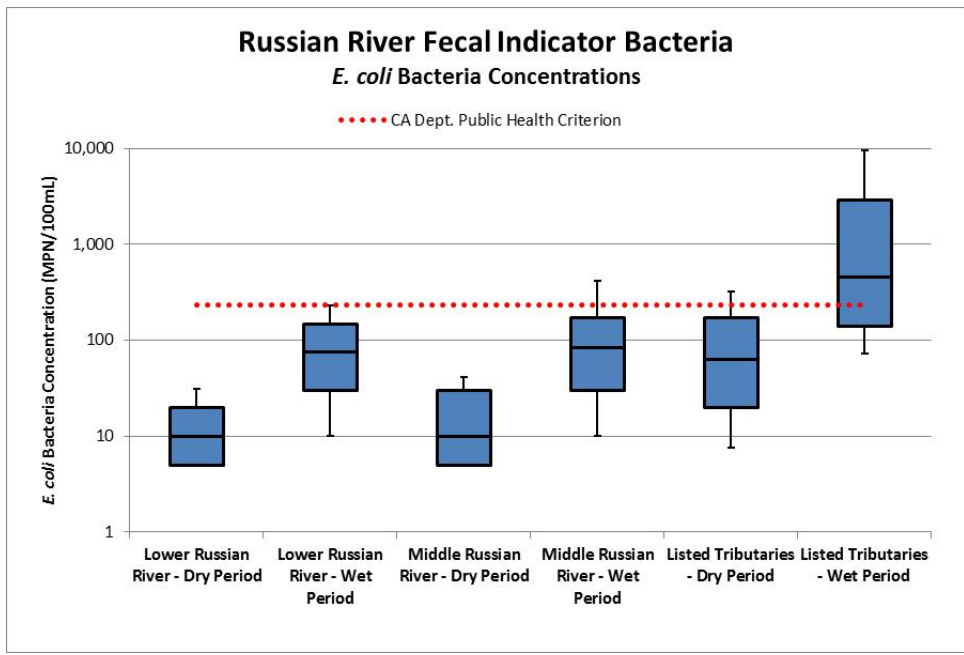


Figure 11. Distribution of *E. coli* Bacteria Concentrations Measured in the Russian River Watershed.

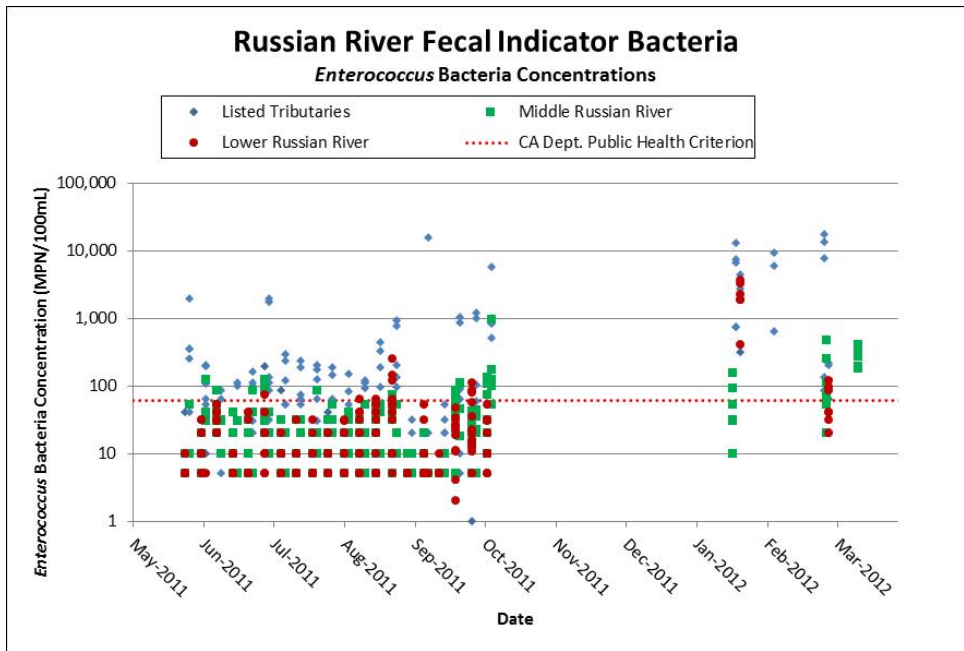


Figure 12. *Enterococcus* Bacteria Concentrations Measured in the Russian River Watershed Over Time.

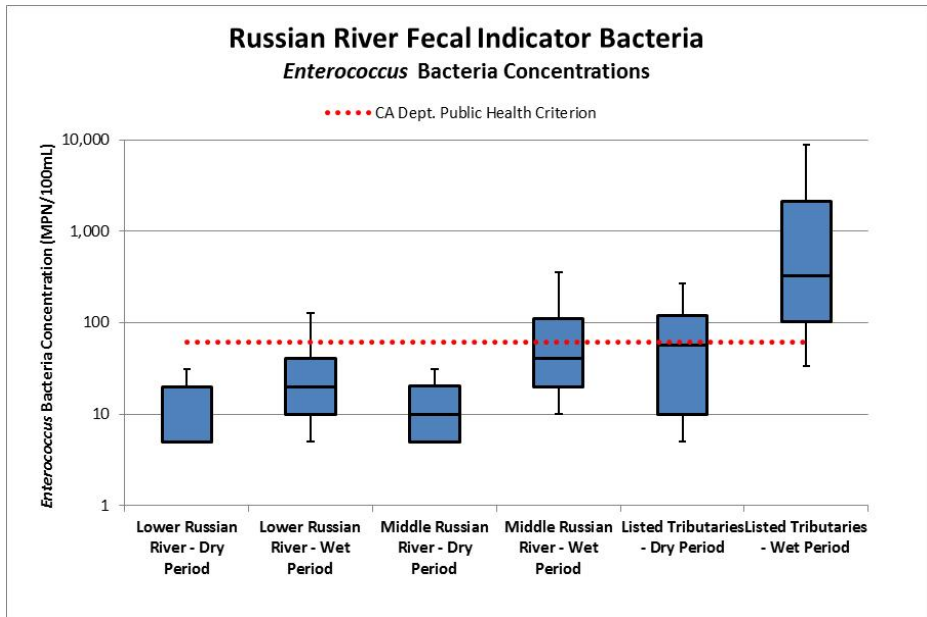


Figure 13. Distribution of *Enterococcus* Bacteria Concentrations Measured in the Russian River Watershed.

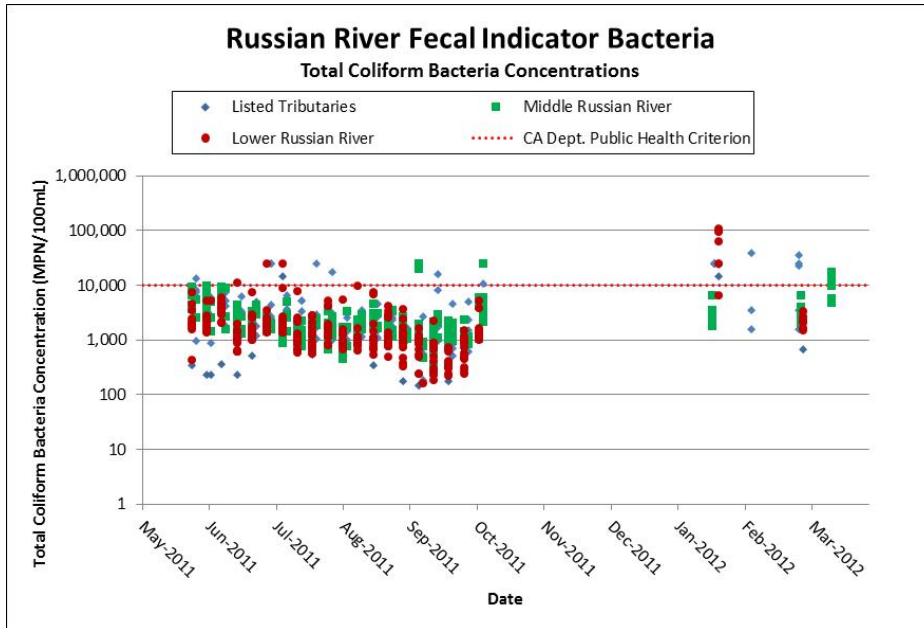


Figure 14. Total Coliform Bacteria Concentrations Measured in the Russian River Watershed Over Time.

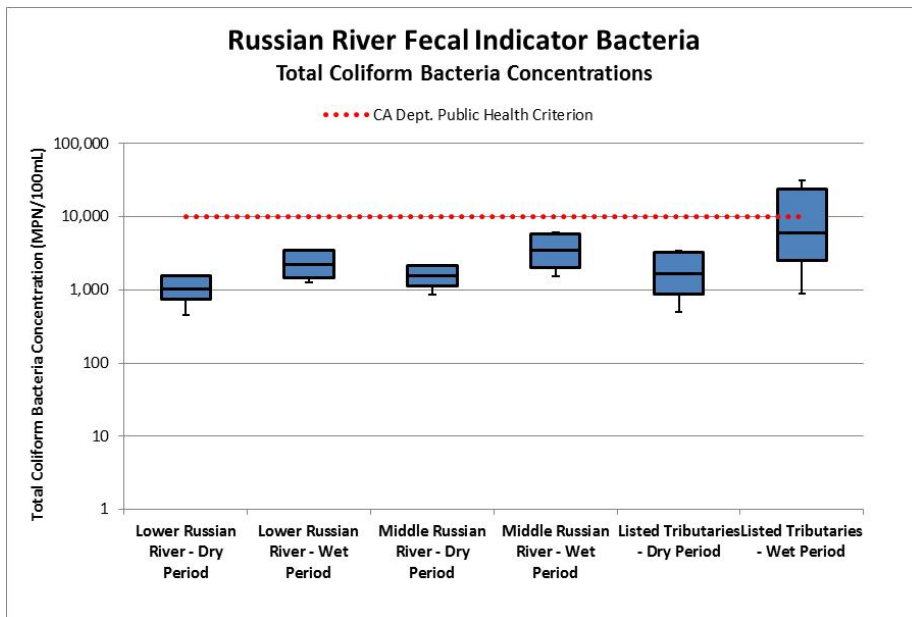


Figure 15. Distribution of Total Coliform Bacteria Concentrations Measured in the Russian River Watershed.

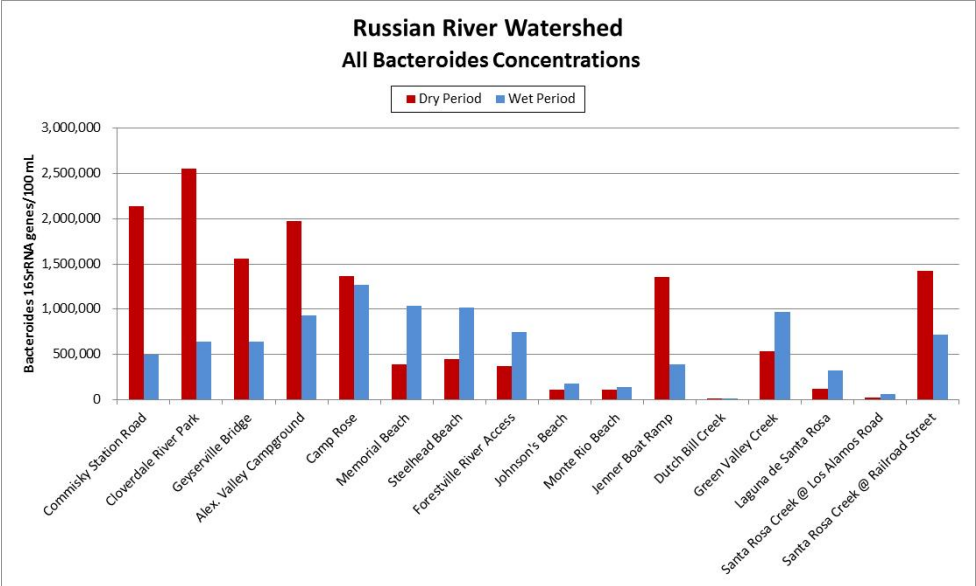


Figure 16. All *Bacteroides* Bacteria Concentration Sample Results for Task 2

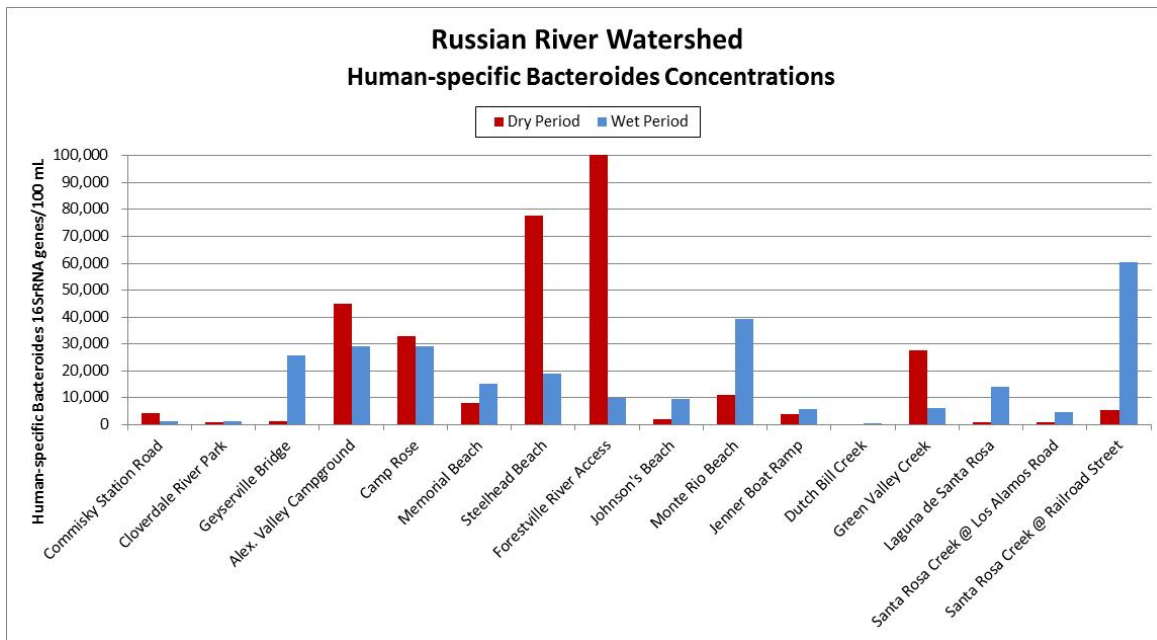


Figure 17. Human-specific *Bacteroides* Bacteria Concentration Sample Results for Task 2

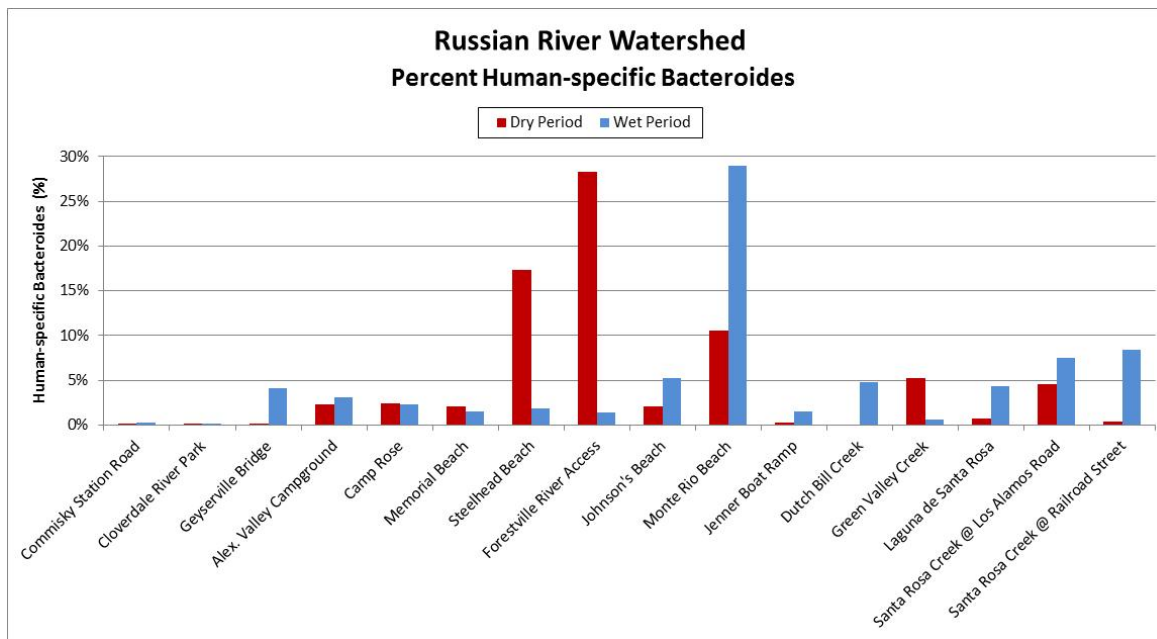


Figure 18. Percent of Human-specific *Bacteroides* Bacteria for Task 2

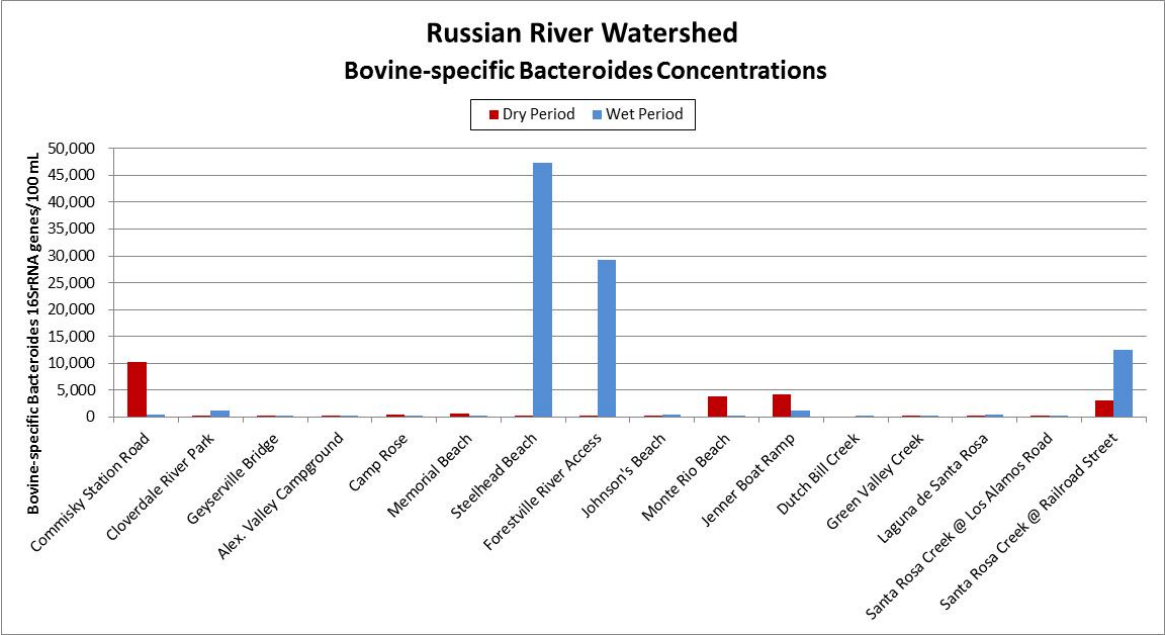


Figure 19. Bovine-specific *Bacteroides* Bacteria Concentration Sample Results for Task 2

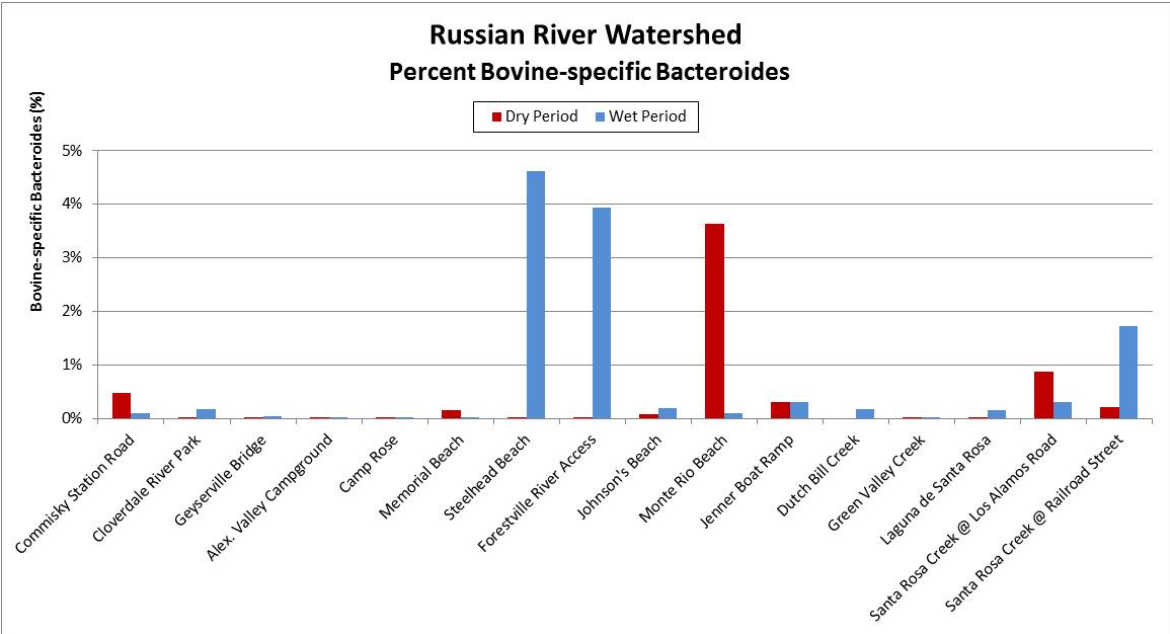


Figure 20. Percent of Bovine-specific *Bacteroides* Bacteria for Task 2

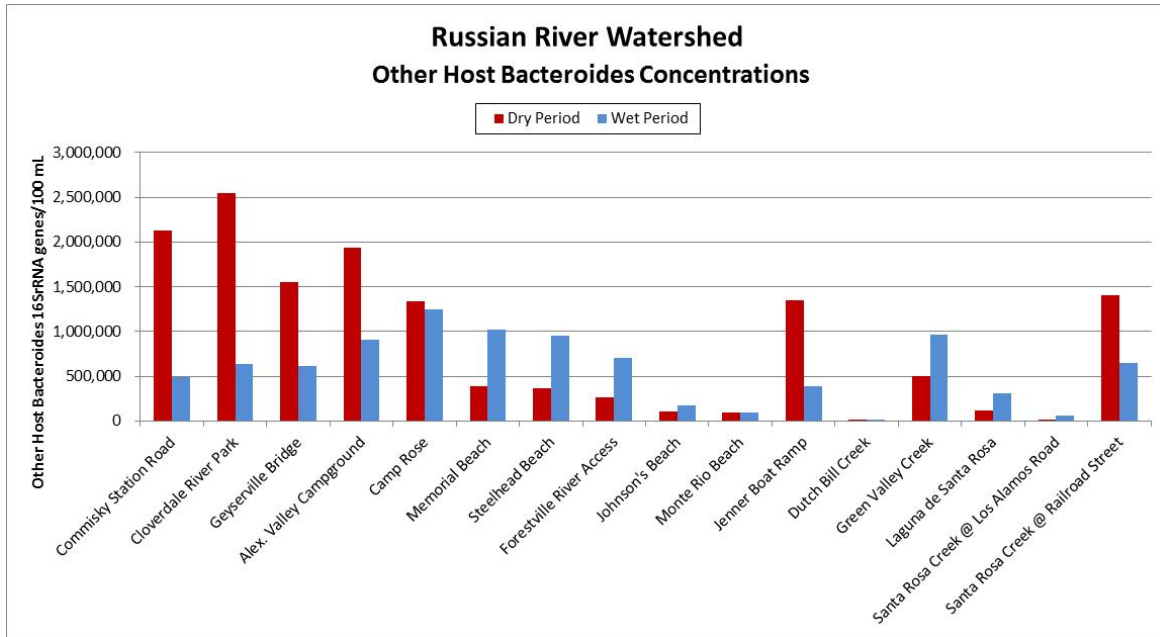


Figure 21. Other *Bacteroides* Bacteria Concentration Sample Results for Task 2

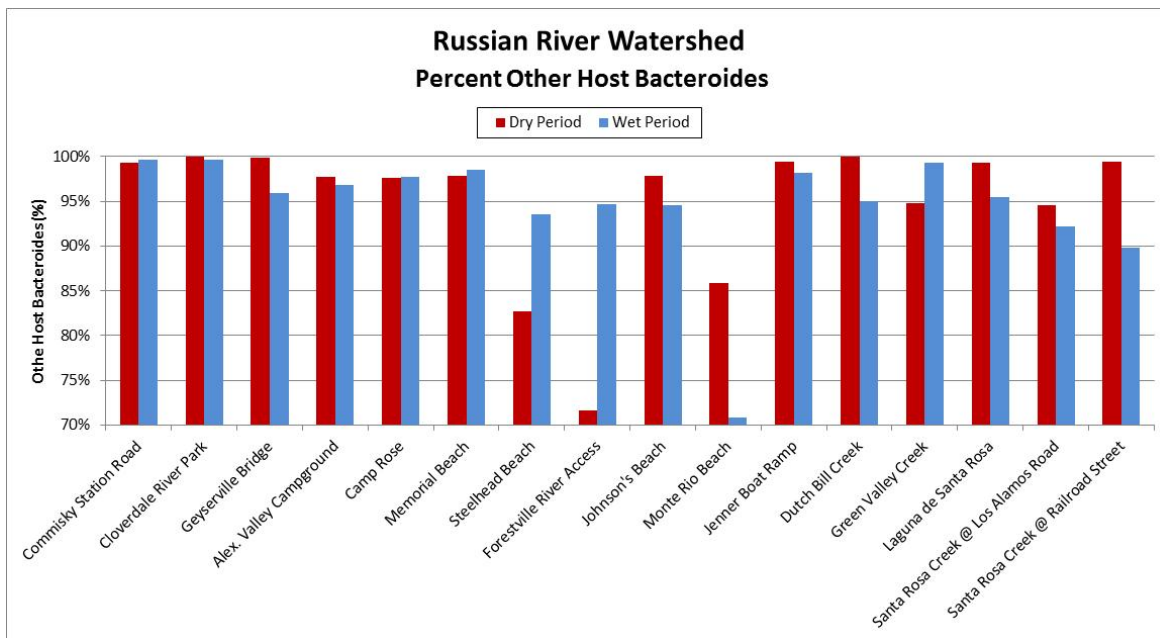


Figure 22. Percent of Other *Bacteroides* Bacteria for Task 2

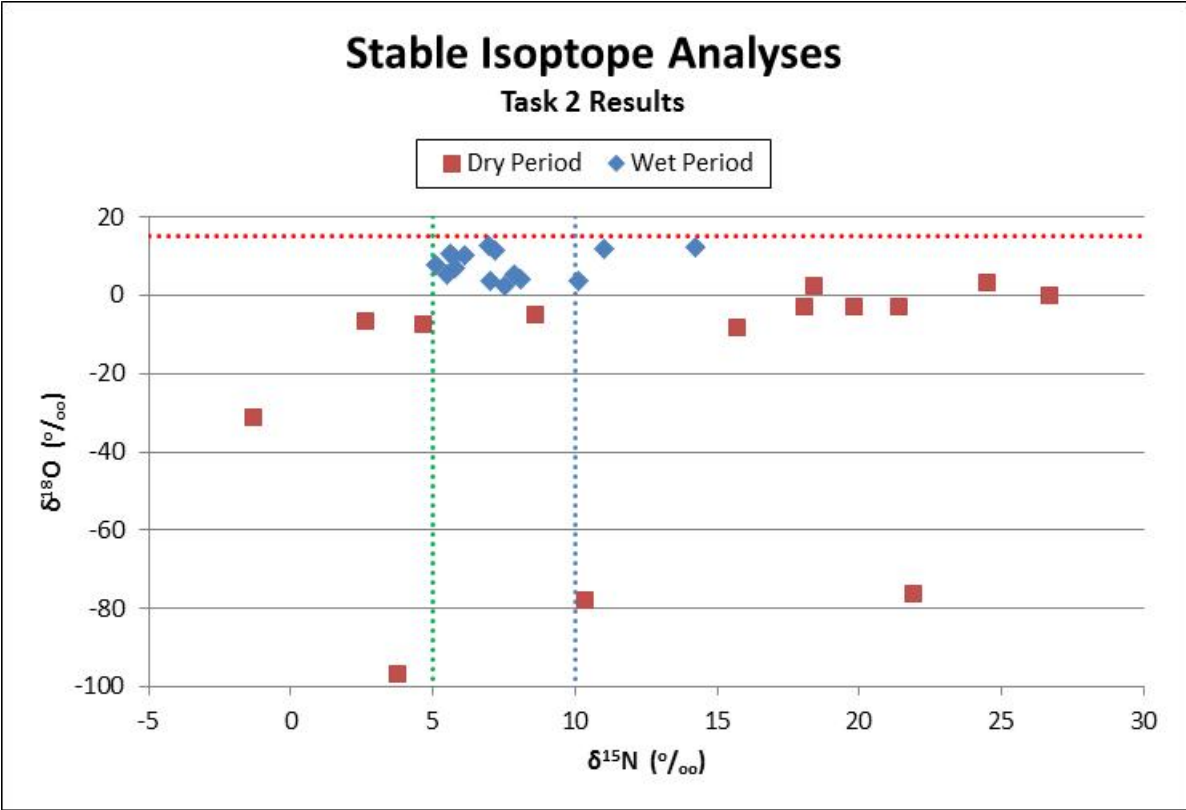


Figure 23. Stable Isotope Analysis Results for Task 2.

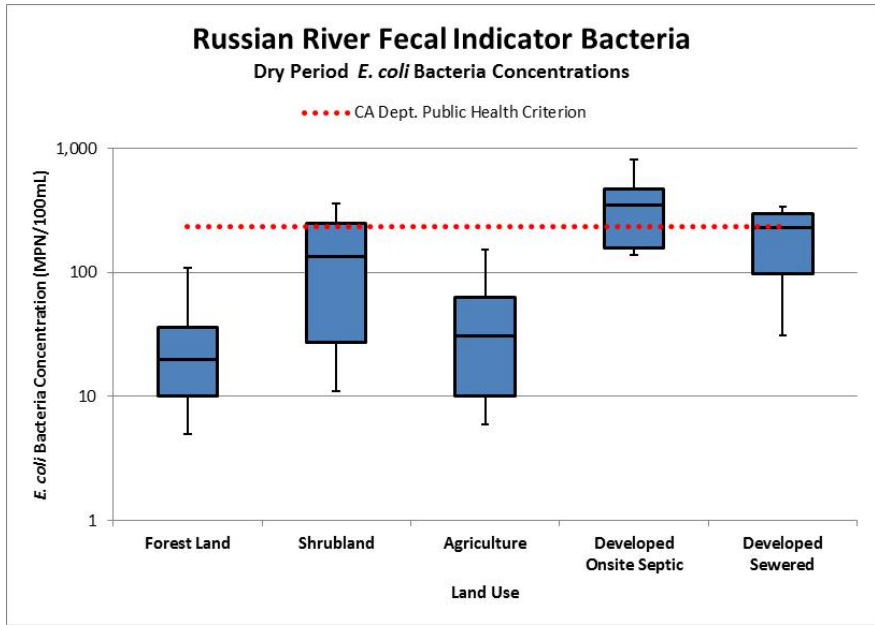


Figure 24. *E. coli* Bacteria Concentrations Measured in the Russian River Watershed during Dry Periods by Land Cover Category.

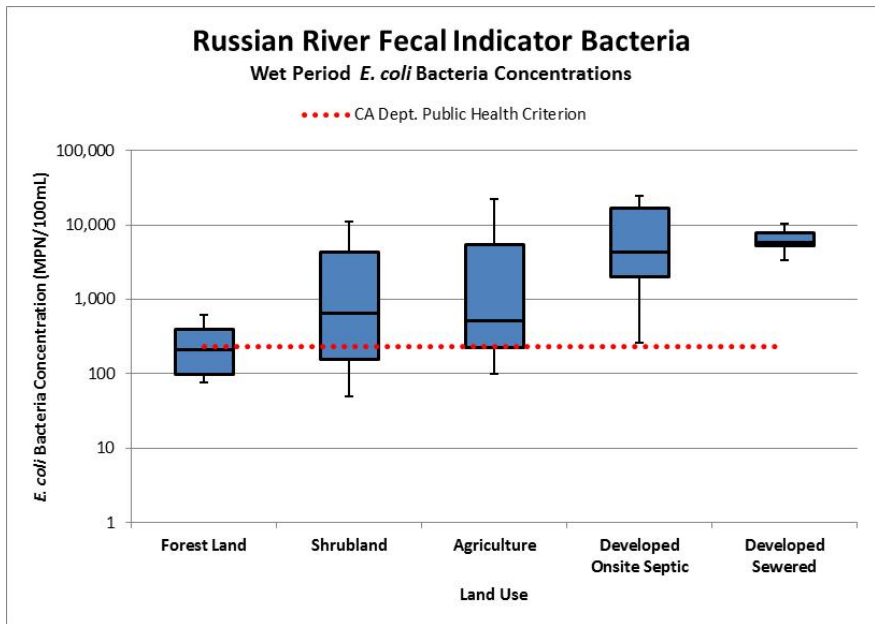


Figure 25. *E. coli* Bacteria Concentrations Measured in the Russian River Watershed during Wet Periods by Land Cover Category.

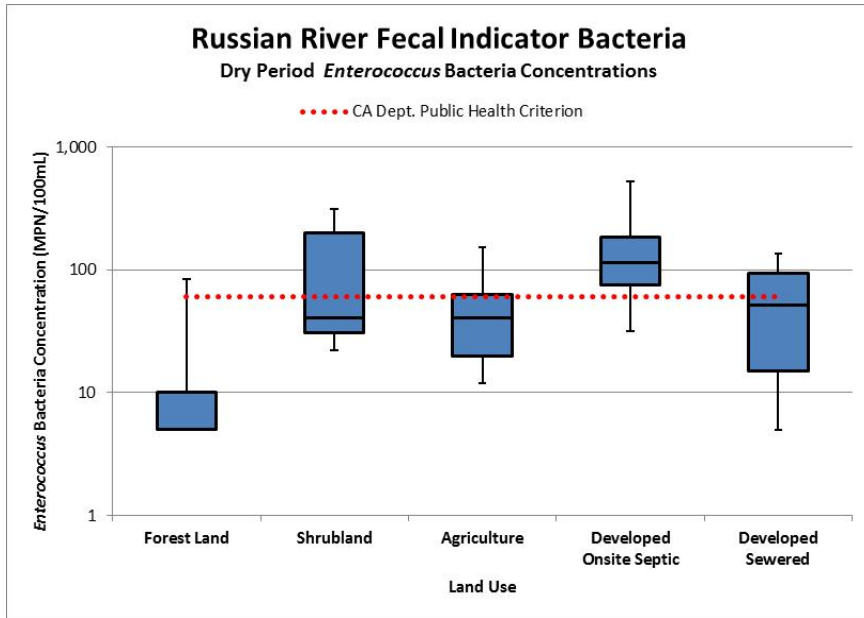


Figure 26. *Enterococcus* Bacteria Concentrations Measured in the Russian River Watershed during Dry Periods by Land Cover Category.

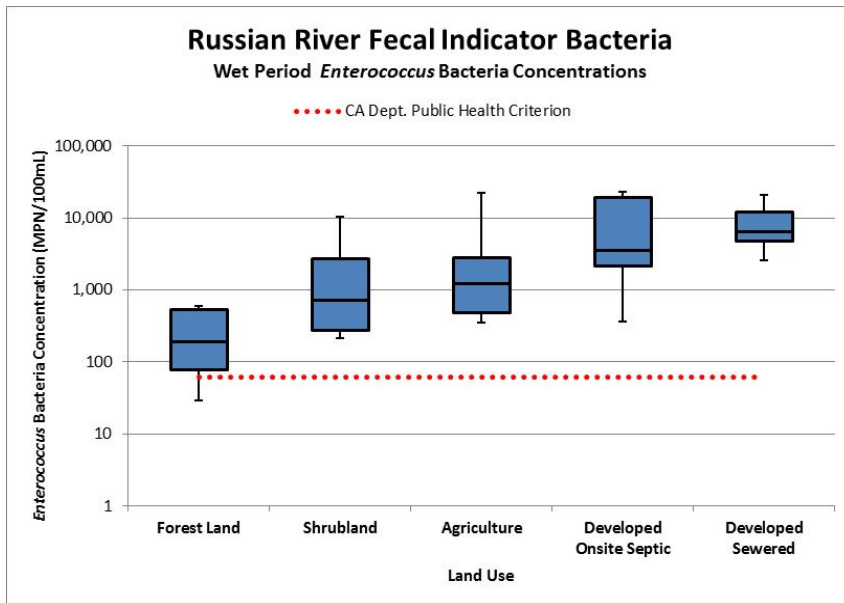


Figure 27. *Enterococcus* Bacteria Concentrations Measured in the Russian River Watershed during Wet Periods by Land Cover Category.

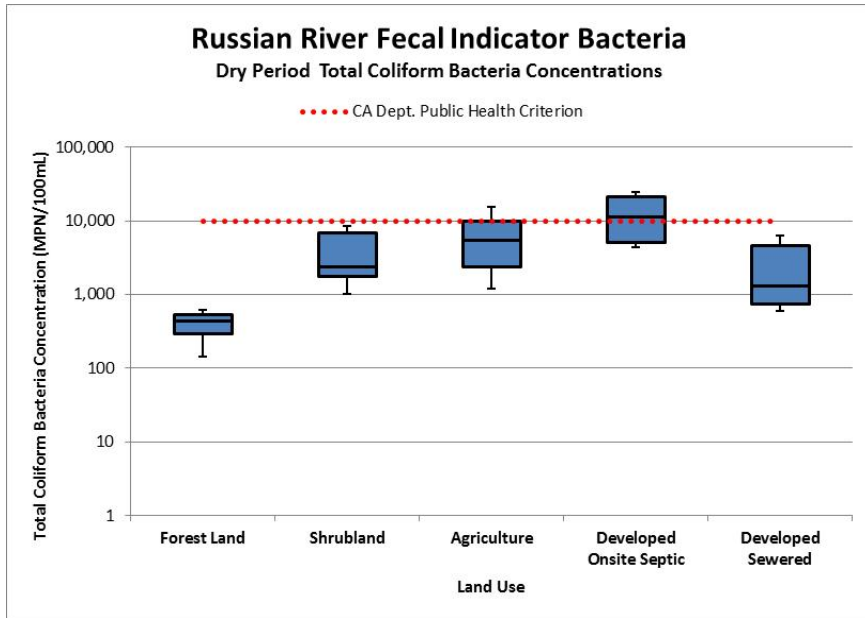


Figure 28. Total Coliform Bacteria Concentrations Measured in the Russian River Watershed during Dry Periods by Land Cover Category.

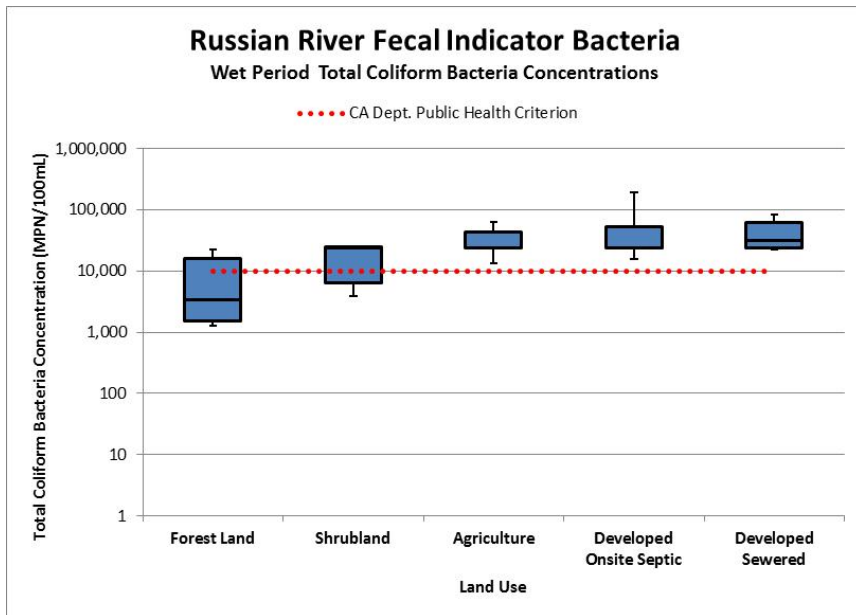


Figure 29. Total Coliform Bacteria Concentrations Measured in the Russian River Watershed during Wet Periods by Land Cover Category

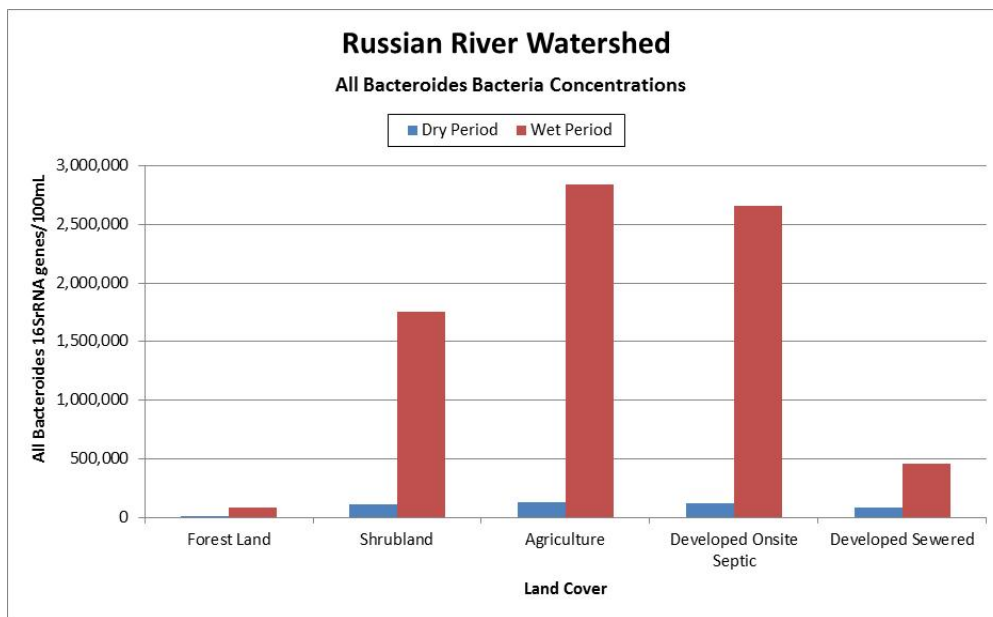


Figure 30. Median *Bacteroides* Bacteria Concentrations Measured in the Russian River Watershed by Land Cover Category.

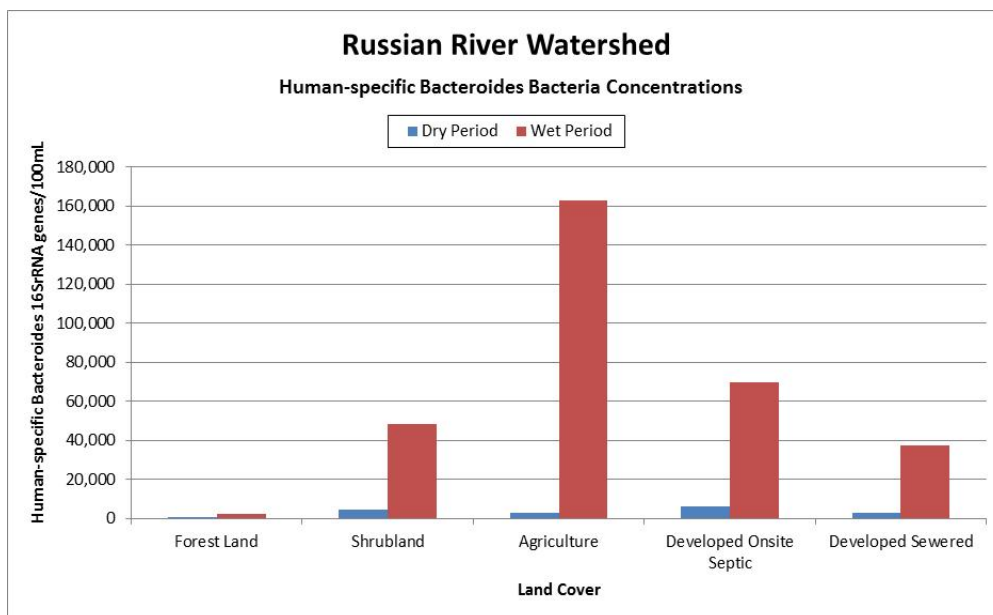


Figure 31. Median Human-specific *Bacteroides* Bacteria Concentrations Measured in the Russian River Watershed by Land Cover Category.

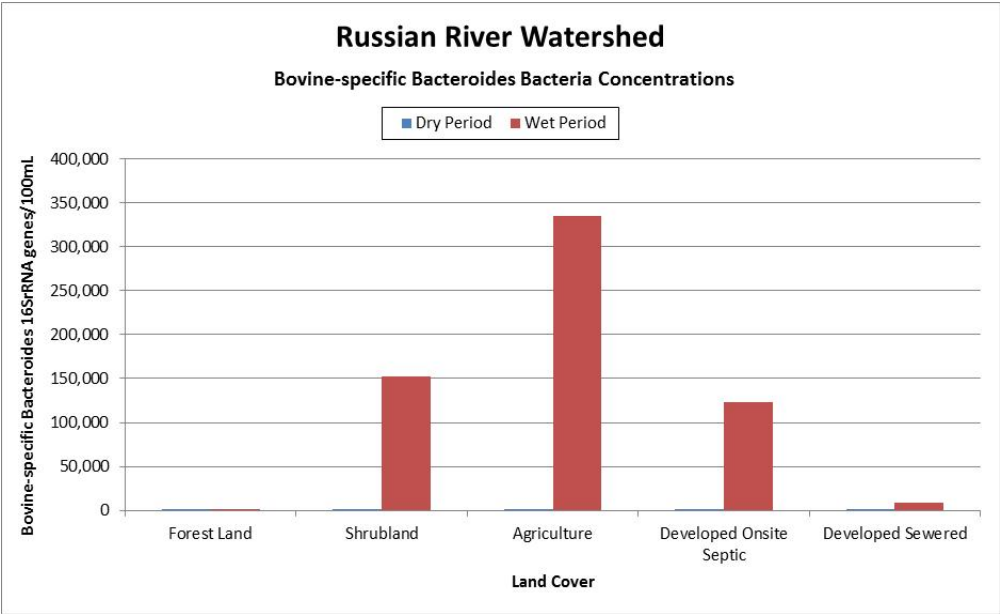


Figure 32. Median Bovine-specific *Bacteroides* Bacteria Concentrations Measured in the Russian River Watershed by Land Cover Category.

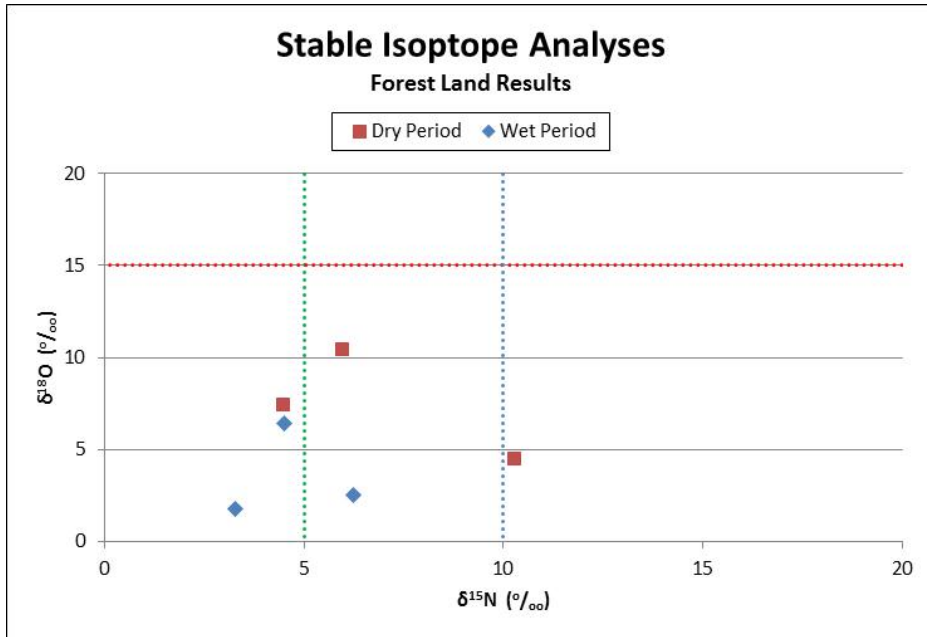


Figure 33. Stable Isotope Analysis Results From Forest Lands.

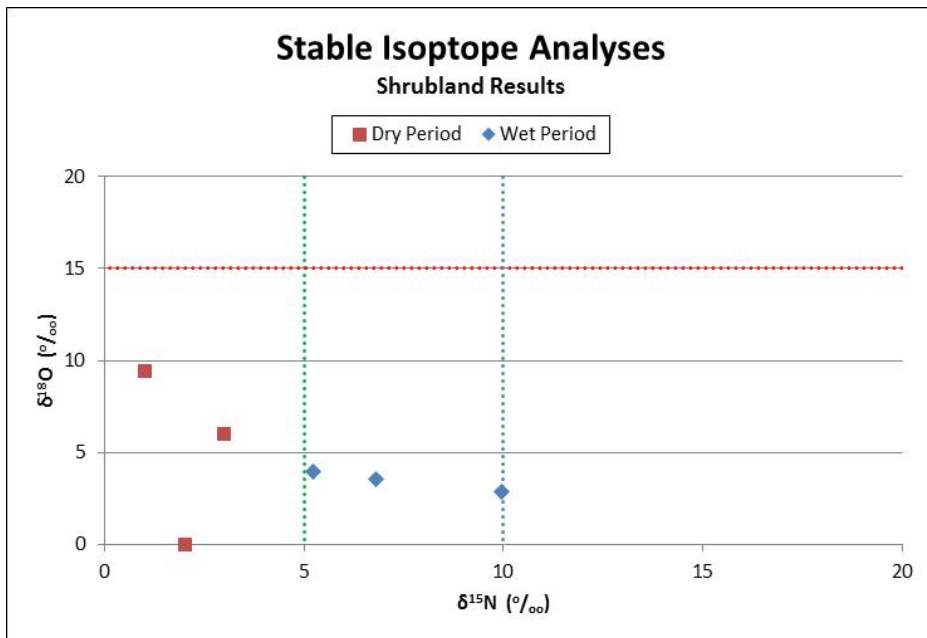


Figure 34. Stable Isotope Analysis Results From Shrubland Areas.

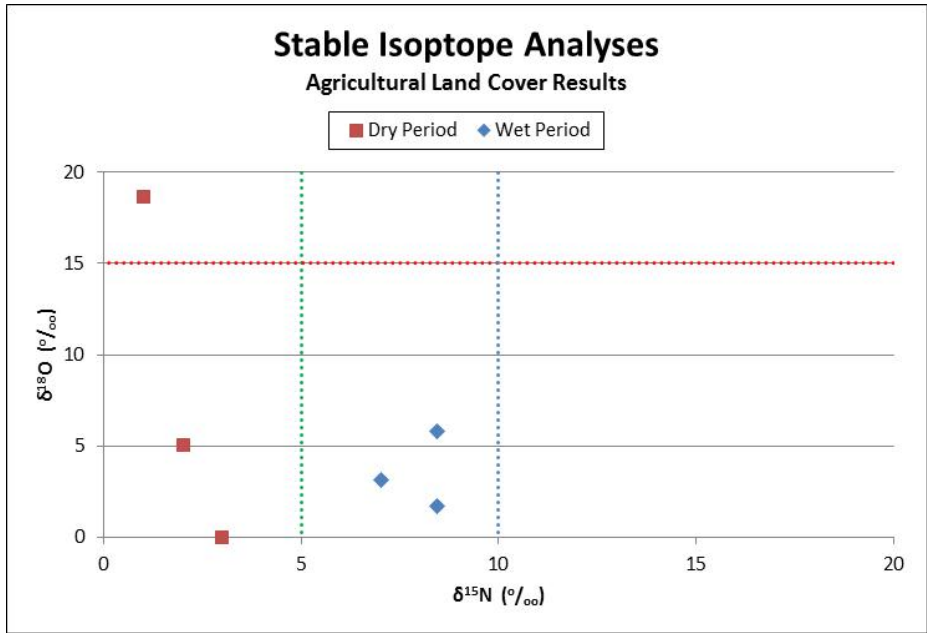


Figure 35. Stable Isotope Analysis Results From Agricultural Lands.

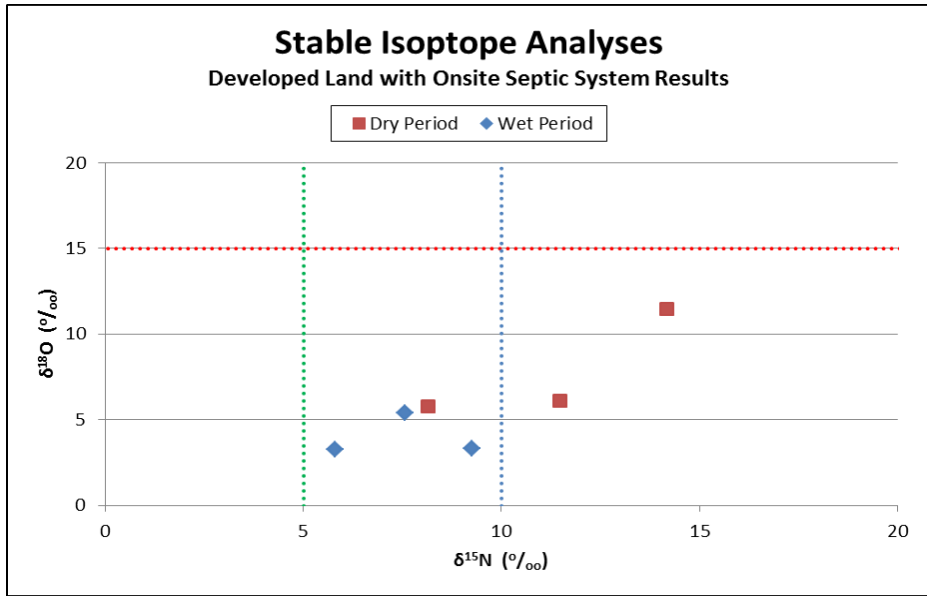


Figure 36. Stable Isotope Analysis Results from Developed lands with Onsite Septic Systems.

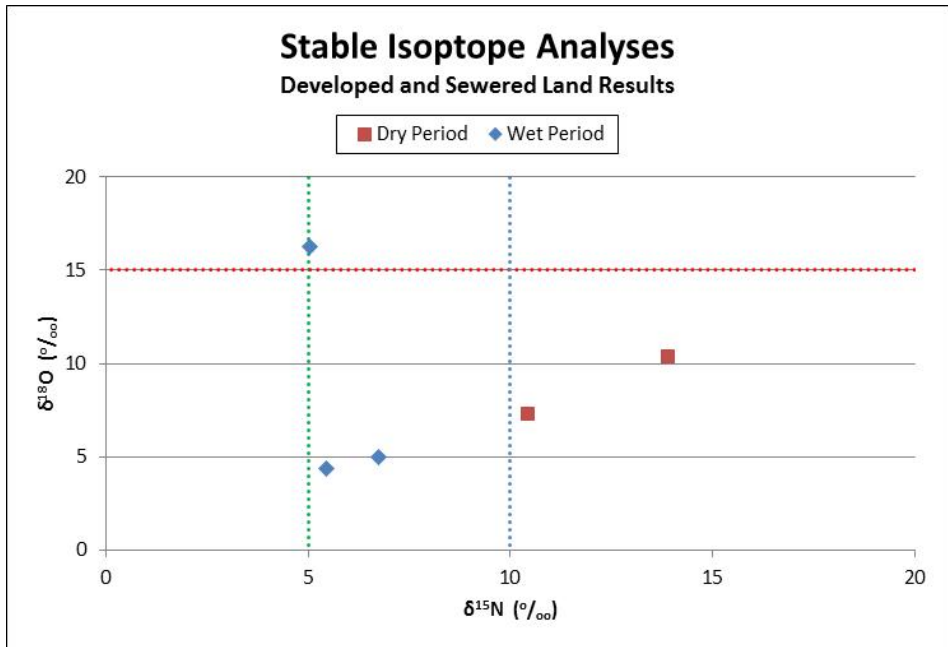


Figure 37. Stable Isotope Analysis Results From Developed lands that are Sewered.

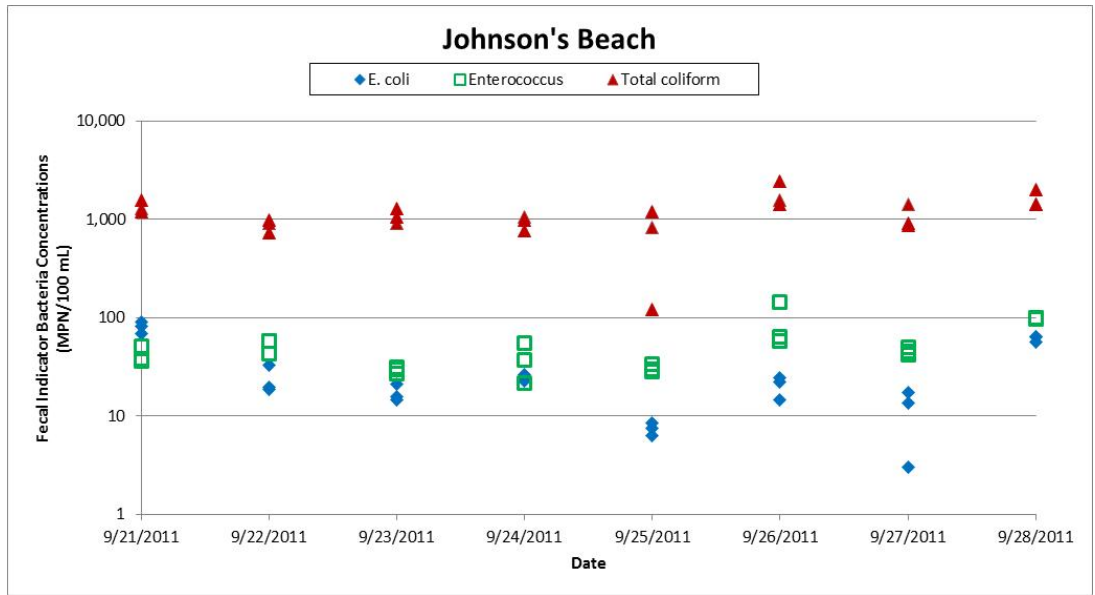


Figure 38. Fecal Indicator Bacteria Measurements from Johnson’s Beach during September 2011.

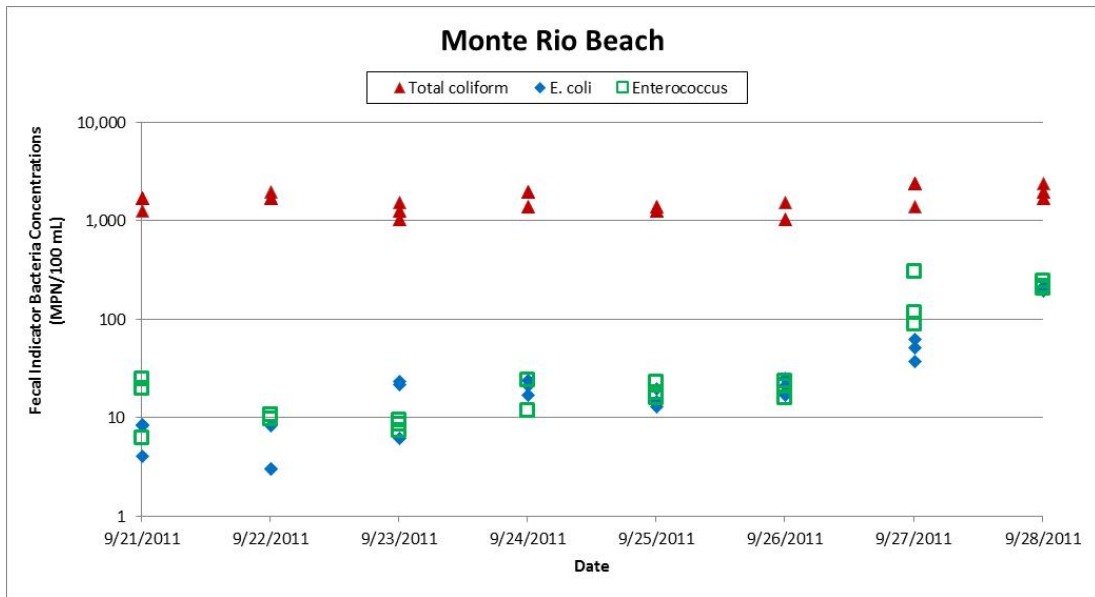


Figure 39. Fecal Indicator Bacteria Measurements from Monte Rio Beach during September 2011.

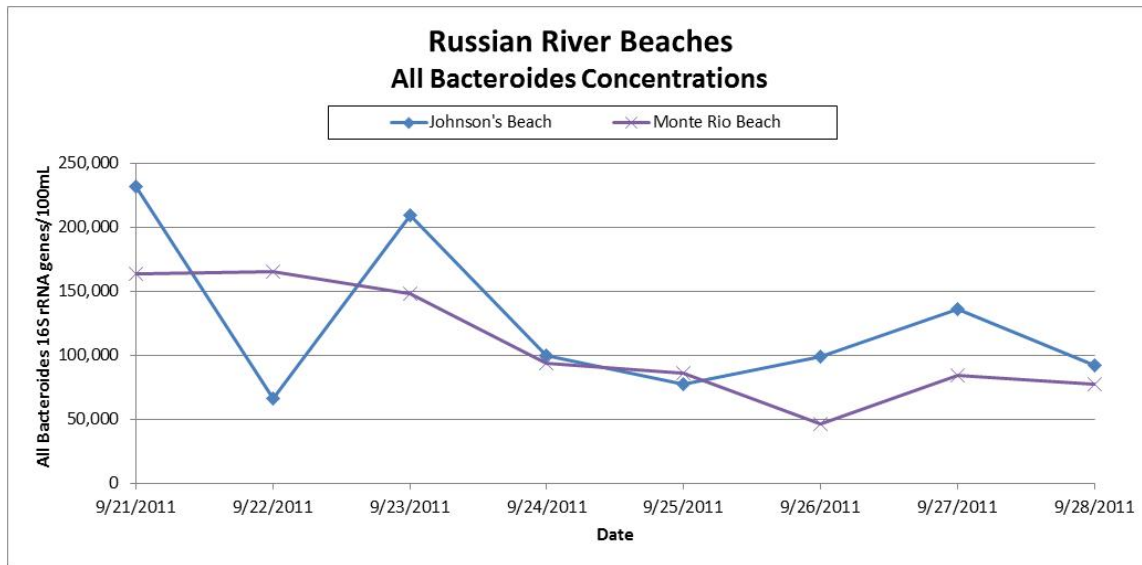


Figure 40. All *Bacteroides* Bacteria Concentration Sample Results

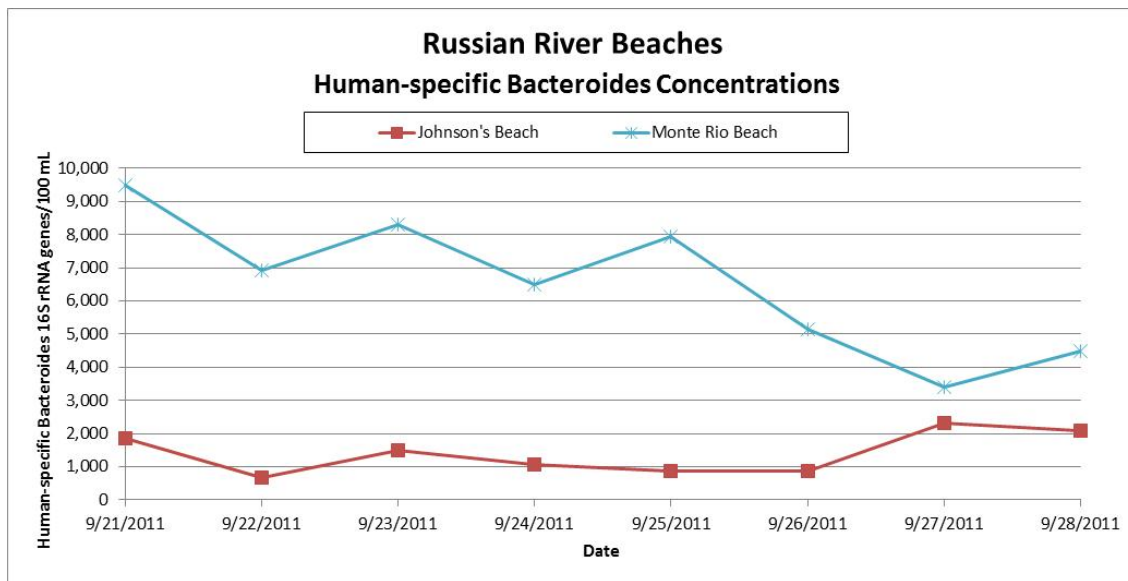


Figure 41. Human-specific *Bacteroides* Bacteria Concentration Sample Results for Task 4

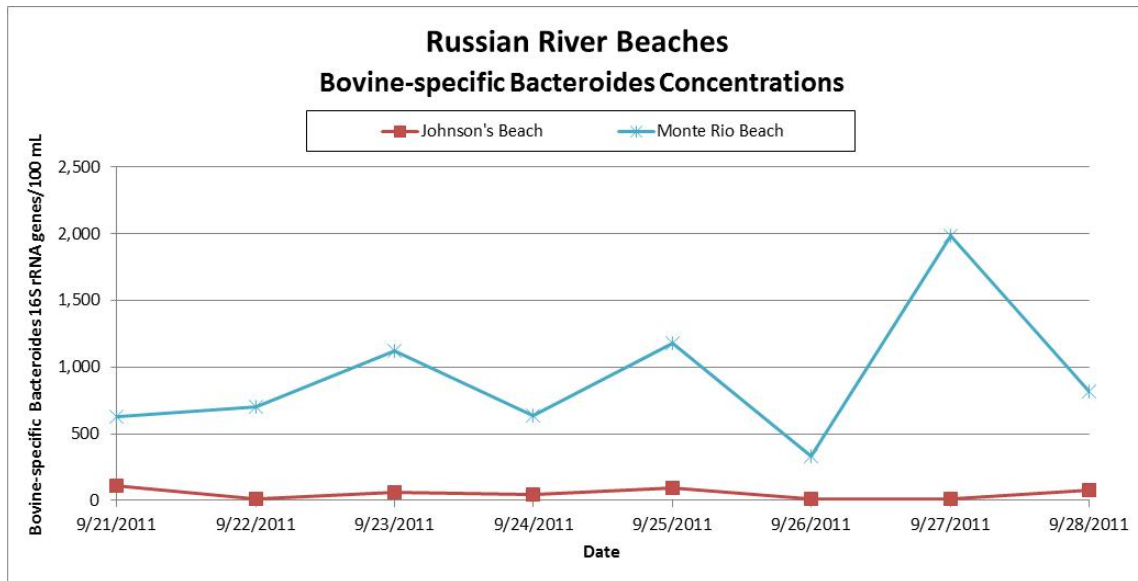


Figure 42. Bovine-specific *Bacteroides* Bacteria Concentration Sample Results for Task 4

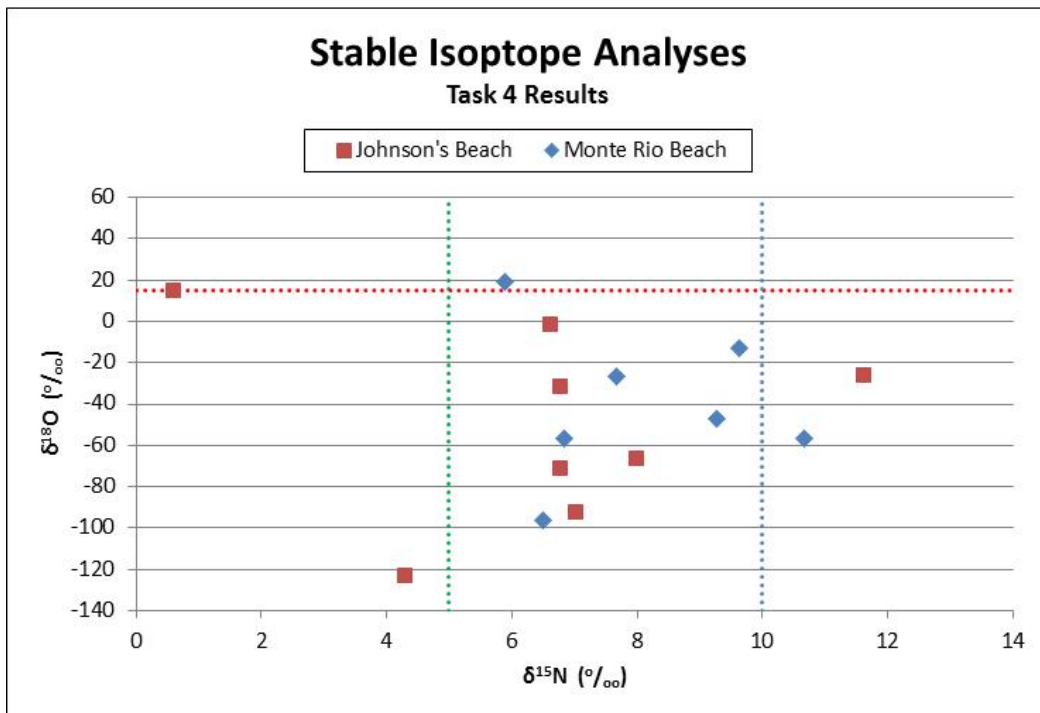


Figure 43. Stable Isotope Analysis Results for Task 4.