

Watershed: Sacramento River

Years Sampled: 2008, 2010-2012

Study Objectives:

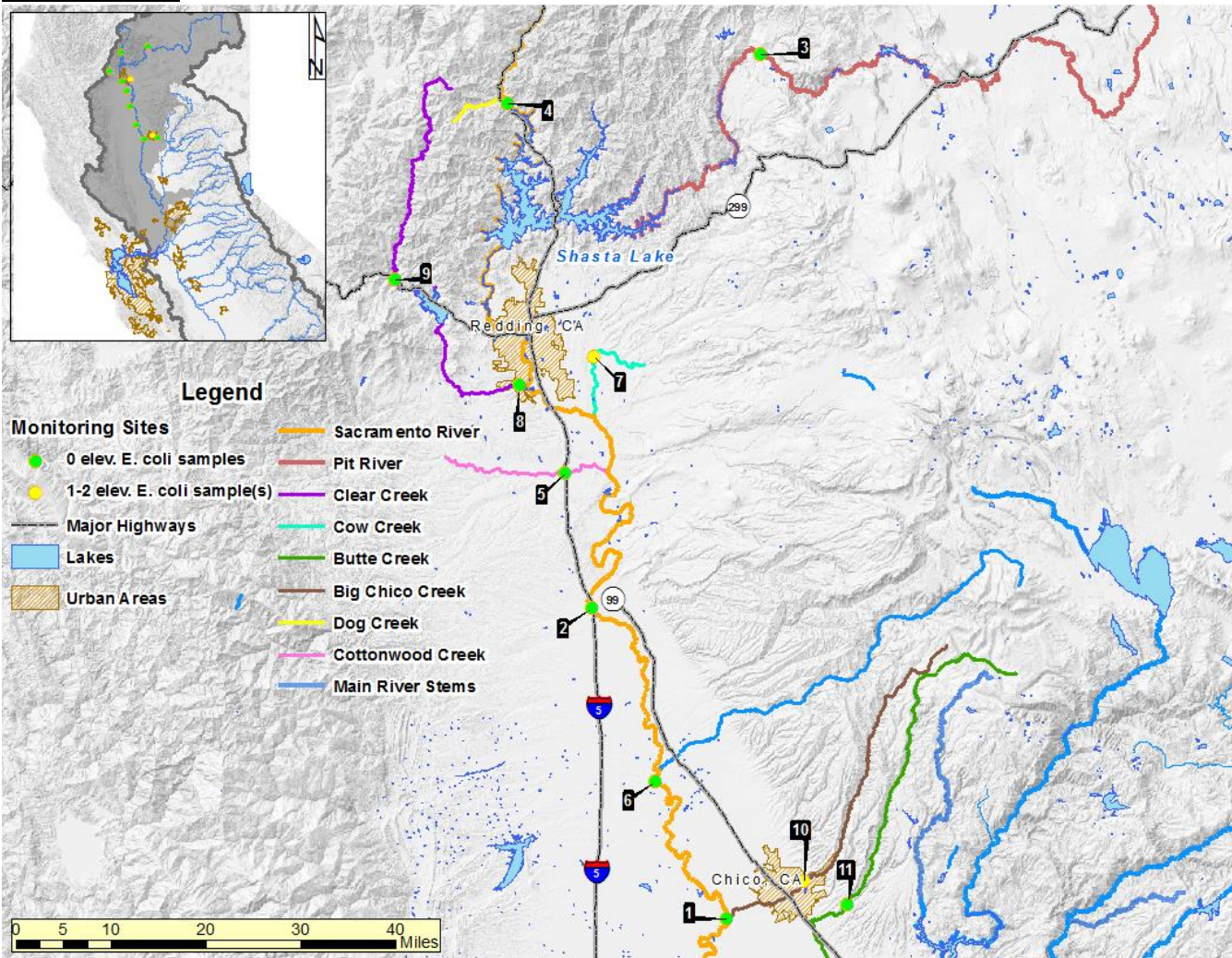
1. Is there any evidence that beneficial uses are being impacted, and if so, what are potential contributors?
2. Are there any noticeable regional, seasonal or trends observed in the water quality data?
3. What are pathogen concentrations at selected monitoring sites?

KEY STATISTICS

Number of sites sampled	11
Sampled by	Water Board Staff (Redding)
Number of sites sampled for pathogens	0
Number of total samples	74
Sampling Frequency	2x/mo. (May-Sept.)
Assessment Threshold	320 MPN/100 mL

Message: Two sites have had one or more samples with elevated *E.coli*. Nine sites never exceeded the assessment threshold.

Site Locations:



Summary of Results:

Table 1: Field Measurements

Station Code	Map #	Station Name	Oxygen, Dissolved (mg/L)		pH		SpConductivity (uS/cm)		Temperature (°C)		Turbidity (NTU)	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
504BUT001	1	Sacramento River upstream of Big Chico Creek Confluence	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
504TEH900	2	Sacramento River at Red Bluff	NR	NR	7.50	7.92	78.5	121.5	14.40	18.40	NR	NR
506SHA950	3	Pit River at Big Bend	NR	NR	7.30	8.30	94.6	149.0	15.30	21.10	NR	NR
506SHA951	4	Sacramento River at Dog Creek Confluence	NR	NR	7.58	8.38	90.3	150.0	15.30	16.90	NR	NR
508SHA900	5	Cottonwood Creek at I-5 bridge	NR	NR	7.12	7.40	127.5	212.1	20.80	21.40	NR	NR
508SHA901	6	Sacramento River at Woodson Bridge Boat Ramp	NR	NR	7.95	8.19	79.7	127.5	16.20	18.50	NR	NR
508SHA902	7	Cow Creek at HWY-44 bridge	NR	NR	7.01	8.36	116.8	211.0	19.50	20.10	NR	NR
508SHA903	8	Clear Creek at HWY-273 bridge	NR	NR	7.82	8.00	92.5	93.0	15.10	19.10	NR	NR
508SHA904	9	Clear Creek at HWY-299 bridge	NR	NR	6.71	8.02	120.8	288.0	17.10	18.30	NR	NR
520BUT900	10	Butte Creek at Honey Run Bridge	NR	NR	8.12	8.50	70.4	113.5	15.00	20.80	NR	NR
520BUT901	11	Big Chico Creek at Bidwell Park	NR	NR	7.40	8.20	140.5	230.6	19.10	23.30	NR	NR

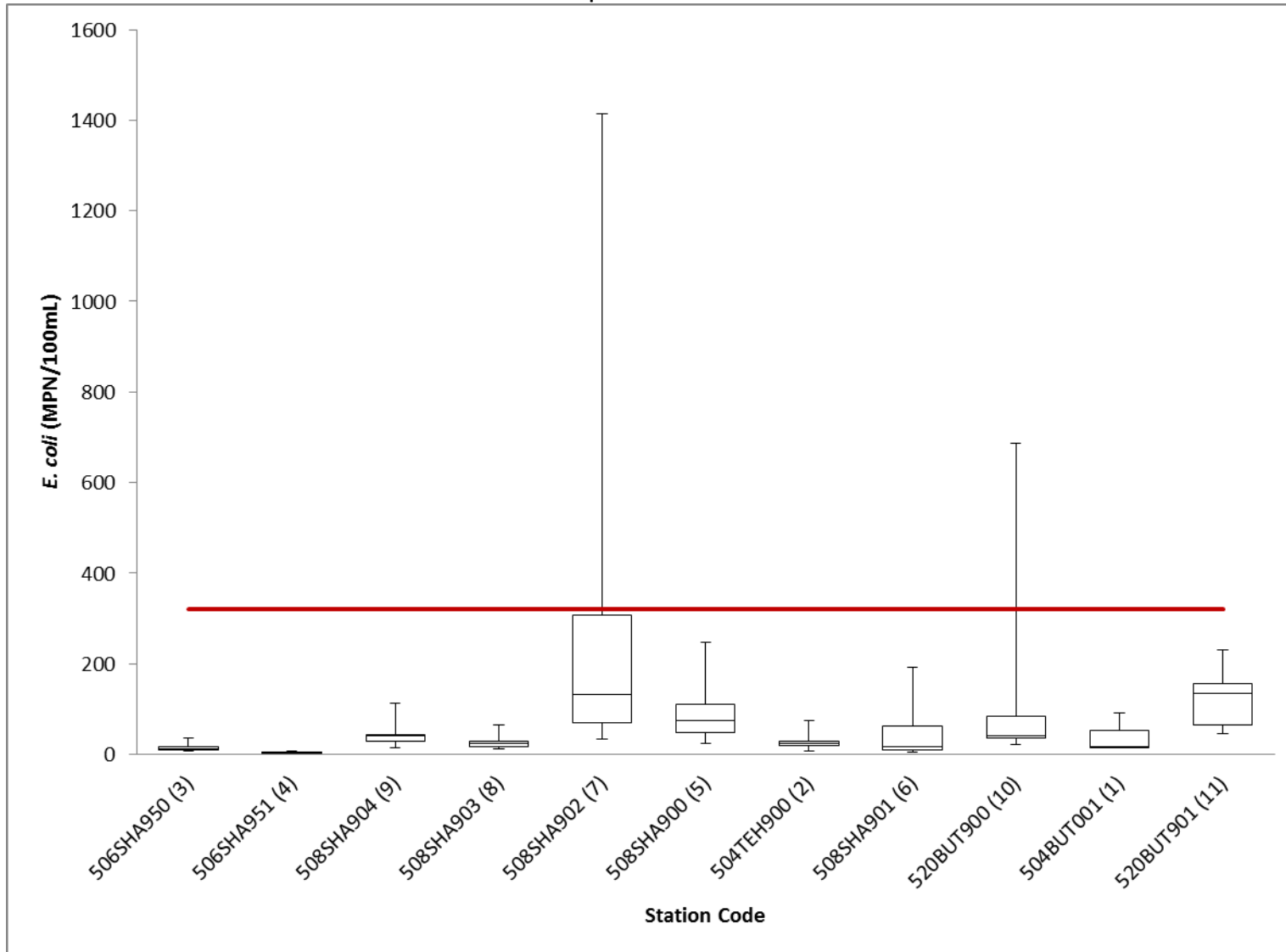
NR: Not Recorded

Table 2: E. coli and Pathogen Results

Map #	<i>E. coli</i> (MPN/100ml)					<i>Cryptosporidium</i> (cysts/L)			<i>Giardia</i> (oocysts/L)			<i>Salmonella</i> (MPN/100mL)			<i>E.Coli</i> O157:H7 (Presence/Absence)		
	Mean	Min	Max	Count	>320	Max Result	Count	(+)	Max Result	Count	(+)	Max Result	Count	(+)	Result	Count	(+)
1	40.0	13.4	90.9	3	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
2	29.9	6.3	75.4	6	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
3	15.8	6.2	35.9	6	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
4	3.2	1.0	7.4	7	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
5	93.0	23.1	248.1	8	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
6	51.0	4.1	191.8	7	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
7	409.1	34.5	1413.6	9	2	NA	0	0	NA	0	0	NA	0	0	NA	0	0
8	27.0	12.0	63.8	7	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
9	44.8	14.6	113.7	7	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
10	141.2	21.3	686.7	7	1	NA	0	0	NA	0	0	NA	0	0	NA	0	0
11	122.2	46.5	231.0	7	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0

E.coli - Highlighted Cells: Exceeds EPA Guideline of 320 MPN/100ml Pathogens- (+): positive result, Highlighted Cells: positive results, NA: Not Applicable

Graph 1: *E. coli* Results



WHAT IS THE MEASURE SHOWING?

The largest stream in California, the Sacramento River flows in a southerly direction for ~500 miles within the Central Valley; its headwaters originate from the Klamath Mountains, and the river eventually empties its accumulated drainage from the Coast Ranges and Sierra Nevada into the Sacramento-San Joaquin River Delta. The Sacramento River is used extensively for irrigation and hydroelectric power. The sites located in the Sacramento watershed are spread throughout the cities of Chico and Redding, along with flowing water bodies surrounding Lake Shasta. Field measurements for each site are shown in Table 1.

Results show that two sites exhibited elevated levels of *E. coli* in the Sacramento watershed on one or more occasions (shown in Table 2). There were 3 samples with elevated levels out of 74 samples, or 4.0%. The highest concentration (1413.6 MPN/100 mL) occurred at Cow Creek near the Highway 44 Bridge (7). Cow Creek also had an average above the recommended EPA guideline (320 MPN/100 mL). While there were detections at two sites (shown in Graph 1), their occurrences were few relative to the sample count. There were no detections along any of the other tributaries.

The watershed is primarily forest (Jin et al., 2013), yet potential non-point and urban sources are abundant. It is heavily utilized for recreational activities, and is also home to numerous waterfowl and other wildlife.

No sites in the Sacramento watershed were sampled for pathogens.

WHY THIS INFORMATION IS IMPORTANT?

In 2012, the USEPA amended recreational water quality guidelines for human health under the Clean Water Act, specifying the standard threshold value (STV) for the indicator bacteria *E. coli* as 320 colony-forming units (CFU) per 100 milliliters (mL). The STV represents the 90% percentile of the water quality distribution, beyond which the water body is not recommended for recreation (Nappier & Tracy, 2012).

E. coli is an indicator of potential fecal contamination and risk of illness for those exposed to water (e.g. when swimming). Since *E. coli* is only an indicator of potential pathogens and does not necessarily identify an immediate health concern, the data collected from this study provide more information on pathogen indicators as well as specific water-borne pathogen concentrations to better assess their impact on the beneficial use of recreation and to identify potential contributors by sub watershed.

WHAT FACTORS INFLUENCE THE MEASURE?

E. coli and specific water-borne pathogens can come from human or animal waste and may be highly mobile and variable in flowing streams. In addition to human recreational use, the presence of pathogens in water may be the result of cattle grazing, wildlife, urban and agricultural runoff, or sewage spills. The physical condition of the watershed may also influence pathogen measurements, however in this study field measurements (temperature, SC, DO, turbidity and pH) were variable between sites and it is unclear if these constituents had an effect on the *E. coli* or pathogen measurements.

TECHNICAL CONSIDERATIONS:

- Data available at: CEDEN
- *E. coli* is only an indicator of potential pathogens and does not necessarily identify an immediate health concern.
- Public reports and fact sheets are available at:
http://www.waterboards.ca.gov/centralvalley/water_issues/water_quality_studies/surface_water_environmental_monitoring/swamp_regionwide_activities/index.shtml

REFERENCES:

California Environmental Data Exchange Network [Internet]. Sacramento, CA. c2010 – [cited January 2015]. Available from:

<http://www.ceden.org>

Sacramento River [Map]. 1:750000. RB5S GIS Data [computer files]. Rancho Cordova, CA. c2014 – [cited January 2015]. Using: ArcGIS [GIS software]. Version 10.2. Redlands, CA: ESRI Inc., 2013.

Jin, S., Yang, L., Danielson, P., Homer, C., Fry, J., and Xian, G. A Comprehensive change detection method for updating the National Land Cover Database to circa 2011. Multi-Resolution Land Characteristics Consortium [Internet]. c2013 – [cited January 2015].

Available from: <http://www.mrlc.gov/nlcd2011.php>

Nappier, Sharon, Tracy Bone. 2012 Recreational Water Quality Criteria. Environmental Protection Agency [Internet]. Sacramento, CA. c2012 – [cited January 2015]. Available from:

<http://water.epa.gov/scitech/swguidance/standards/criteria/health/recreation/upload/factsheet2012.pdf>