Watershed: **American River – Upper American River**

Years Sampled: **2007-2008, 2010-2014**

Study Objectives:

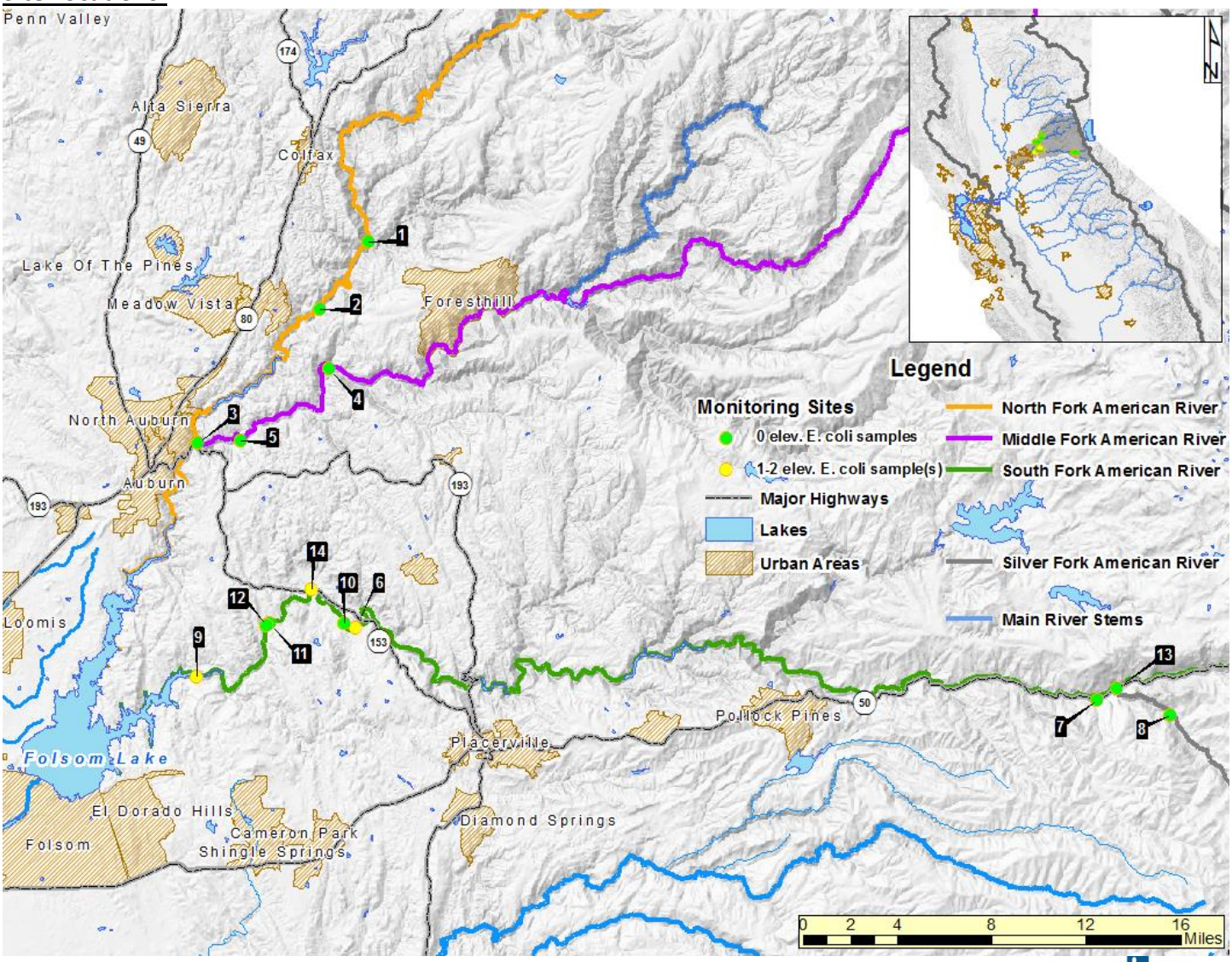
1. Is there any evidence that beneficial uses are being impacted, and if so, what are potential contributors?
2. Are there any noticeable regional, seasonal or trends observed in the water quality data?
3. What are pathogen concentrations at selected monitoring sites?

KEY STATISTICS

Number of sites sampled	**14**
Sampled by	**Water Board Staff (Sac)**
	American R. Conservancy
Number of sites sampled for pathogens	**0**
Number of total samples	**173**
Sampling Frequency	**2x/mo. (May-Sept.)**
Assessment Threshold	**320 MPN/100 mL**

Message: **Three sites have had one or more samples with elevated *E.coli.* Eleven 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)		Temperatiure (˚C)		Turbidity (NTU)	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
514AMR800	1	AR, N Fork at Yankee Jim's Rd	6.97	10.18	6.54	8.70	49.0	147.0	15.36	26.60	0.21	1.99
514AMR801	2	AR, N Fork at Ponderosa Way	6.83	9.91	6.57	8.84	65.0	184.0	16.43	27.80	0.02	1.06
514AMR802	3	AR, N Fork upstream of Confluence w/ Middle Fork	7.98	11.07	6.55	8.50	43.5	133.0	15.80	25.63	0.22	1.88
514AMR803	4	AR, M Fork at Drivers Flat	8.00	12.08	5.10	8.82	34.6	44.0	11.53	18.42	0.28	2.07
514AMR804	5	AR, M Fork at Mammoth Bar	7.61	11.88	5.41	9.08	34.0	90.0	13.28	20.80	0.25	4.72
514AMR805	6	AR, S Fork at Lotus	8.91	11.01	7.09	8.21	13.0	37.4	14.36	20.84	0.31	5.05
514AMR806	7	AR, S Fork at Kyburz	NR	NR	7.00	8.18	30.0	77.0	12.00	19.77	0.46	1.01
514AMR807	8	AR, Silver Fork at China Flat Campground	NR	NR	7.00	7.99	21.0	85.0	10.00	18.94	0.58	0.94
514AMR808	9	AR, S Fork at Salmon Falls Rd	8.06	10.78	7.25	8.51	18.0	58.0	14.15	26.27	0.28	8.49
514AMR809	10	AR, S Fork at Camp Lotus	NR	NR	8.03	8.03	67.0	67.0	NR	NR	0.65	0.78
514AMR810	11	AR, S Fork at Cronin Ranch Rd	NR	NR	8.41	8.41	23.0	23.0	NR	NR	1.51	1.66
514AMR811	12	AR, S Fork downstream of Cronin Ranch Rd	NR	NR	8.23	8.23	22.0	22.0	NR	NR	0.58	1.33
514ELD006	13	AR, Silver Fork at Wildwood	NR	NR	7.24	8.67	65.5	72.0	13.80	21.60	NR	NR
514GWCH49	14	Greenwood Creek at HWY-49	NR	NR	8.01	8.01	106.0	106.0	NR	NR	0.73	0.90

AR: American River, N/M/S: North/Middle/South, NR: Not Recorded

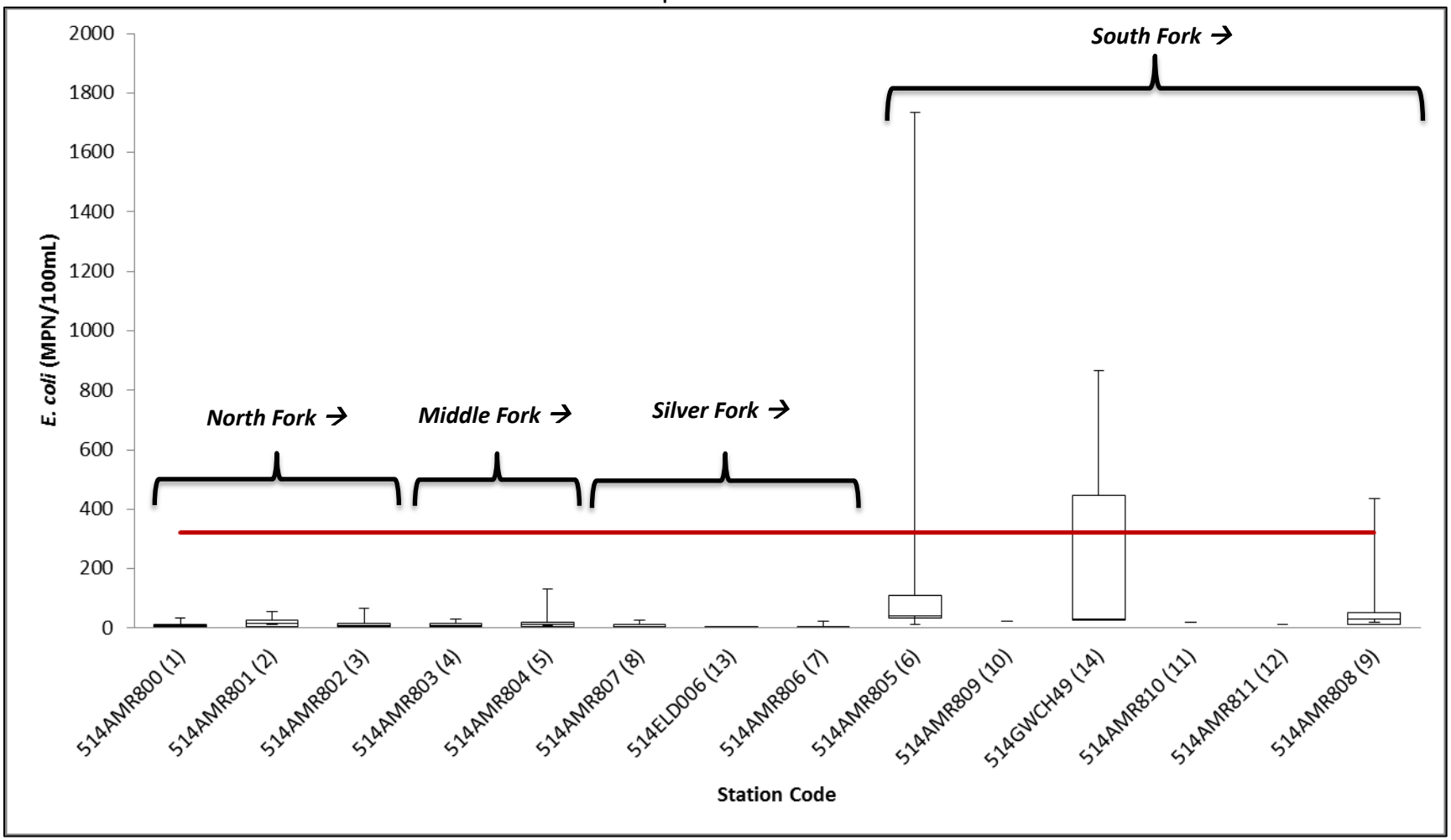
Table 2: *E. coli* and Pathogen Results

Map #	*E. coli* (MPN/100ml)					*Cryptosporidium* (cysts/L)			*Giardia* (oocysts/L)			*Salmonella* (MPN/100mL)			*E.Coli* O157:H7 (Presence/Absence)		
	Mean	Min	Max	Count	>320	Max Result	Count	(+)	Max Result	Count	(+)	Max Result	Count	(+)	Result	Count	(+)
1	8.8	<1.0	35.5	12	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
2	18.3	<1.0	55.7	21	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
3	13.5	<1.0	66.3	22	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
4	11.7	2.0	29.2	12	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
5	19.3	1.0	131.4	22	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
6	150.7	6.3	1732.9	21	2	NA	0	0	NA	0	0	NA	0	0	NA	0	0
7	4.3	<1.0	22.8	14	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
8	7.4	<1.0	27.9	14	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
9	58.8	1.0	435.2	24	1	NA	0	0	NA	0	0	NA	0	0	NA	0	0
10	24.3	24.3	24.3	1	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
11	18.7	18.7	18.7	1	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
12	11.0	11.0	11.0	1	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
13	2.7	<1.0	6.3	5	0	NA	0	0	NA	0	0	NA	0	0	NA	0	0
14	306.1	23.0	866.4	3	1	NA	0	0	NA	0	0	NA	0	0	NA	0	0

E.coli - Highlighted Cells: Exceeds EPA Guidline of 320 MPN/100ml

Pathogens - (+): positive result, Highlighted Cells: positive results, NA: Not Applicable

Graph 1: *E.coli* Results



1,2,3 = progressive DS flow along North Fork; 4,5 = progressive DS flow along Middle Fork;
8,13,7 = progressive DS flow along Silver Fork; 6,10,14,11,12,9 = progressive DS flow along South Fork

WHAT IS THE MEASURE SHOWING?

The Upper American River consists of a North, Middle, South, and Silver Fork that originate from the west-facing crest of the Sierra Nevada near Lake Tahoe. With the exception of the Silver Fork (which drains into the South Fork), all of the forks merge together at Folsom Lake, where water is impounded for municipal use. Field measurements for each site are shown in Table 1.

Results show that 3 of the 14 sites exhibited elevated levels of *E. coli* in the Upper American sub-watershed on one or more occasions (shown in Table 2). There were 4 samples with elevated levels out of 173 samples, or 2.3%. The highest concentration (1732.9 MPN/100 mL) occurred at Lotus along the South Fork (6). While there were detections along the South Fork (shown in Graph 1), their occurrences were few relative to the sample count for these sites [with the exception of Greenwood Creek (14), which has an unrepresentative sample size of 3]. There were no detections along the North, Middle, or Silver Forks.

The sub watershed is primarily forest (Jin et al., 2013). It is heavily utilized for recreational activities, and is home to numerous waterfowl throughout the year as well. In addition, the increasing drought may be a contributing factor for contamination as the waters become more concentrated.

No sites in the Upper American River sub 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_ambient_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

Upper American River [Map]. 1:300000. 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