

**Water Year 2008
Bacteria Sampling Report
for the
Klamath River Estuary**



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I. Introduction

Since time immemorial the Klamath River has been the source of life and the primary influence and focus of Yurok Culture. Though current reservation boundaries are confined to a strip of land a mile wide on either side of the Lower Klamath River, ancestral territory encompassed land many times this area. Because of the central role the river has always played in their life ways, the health and preservation of the river system has become an essential part of contemporary Yurok culture. Today the Yurok people continue to use local waters for ceremonial and subsistence activities that can be impacted by poor water quality. This report summarizes the bacteria sampling performed in the Lower Klamath River Estuary in the Water Year 2008.

E. coli and Enterococci

Escherichia coli (*E. coli*) and enterococci are two types of fecal coliform bacteria. They reside in and originate from the intestinal tracts of warm-blooded animals with primary sources being human and livestock excrement. Contact with high levels of these bacteria can lead to a variety of health complications ranging from mild cramps to severe gastrointestinal distress and death in extreme, untreated cases. Primary sources of contamination on the Klamath River Estuary include human activity, failing septic systems and livestock that have free access to waterways within the watershed. In compliance with the Yurok Tribe Coastal Monitoring Program Sampling and Analysis Plan, if the level of *E. coli* exceeds 235 Most Probable Number (MPN), or 61 MPN for enterococci, per 100 ml sample, immediate retesting is to be performed.

Total Coliforms

Coliform is a family of bacteria common to soils, plants and animals. It encompasses numerous genera, only some of which are a threat to human health. As fecal coliforms are a sub-group of total coliforms, the presence and concentration of total coliforms is used as a relative indicator of fecal coliform levels. Primary sources of total coliforms on the Klamath River Estuary include the degradation and decomposition of organic plant and animal matter in the surrounding environment. Normal bioprocessing occurring in local soils provides for the reproduction of non-fecal coliform bacteria, and thus an increase of total coliforms in the summer months is seen during this season of increased biological activity. The California Water Quality Control Board's California Ocean Plan establishes a single sample retesting limit of 10,000 MPN per 100ml sample for total coliform.

II. Methods

At each sampling site 100 milliliter (ml) grab samples were collected in sterile, sealed sample bottles provided by Humboldt County Department of Public Health Lab. While wearing sterile Nitrile gloves, the seal and lid were removed from the bottle ensuring that the inside of the lid and no portion of the threaded opening of the bottle came into contact with any surface other than the water being sampled. The sample bottle was then submerged one foot below the surface while angled 45 degrees upstream. At one foot below the surface the bottle was rotated vertical and brought to the surface. The cap was replaced and the sample was placed on ice for same day transportation to the lab.

Sample location, sampling time, and bottle number were recorded for lab records. Sampling location, name of sampler, number of bathers present at sampling location, runoff quantity, amount and type of debris present in the water, tide information, length of beach, time and any additional pertinent information were recorded for departmental records. Samples were delivered the same day to the Humboldt County Department of Public Health laboratory in Eureka, CA following appropriate and documented chain of custody procedures.

III. Site Selection

YTEP collected water samples for bacterial analysis at the following locations:

- **Klamath River Estuary (KE)**
- **Klamath River Above KCSD Waste Water Treatment Plant (KR>WTP)**
- **Klamath River Below KCSD Waste Water Treatment Plant (KR<WTP)**

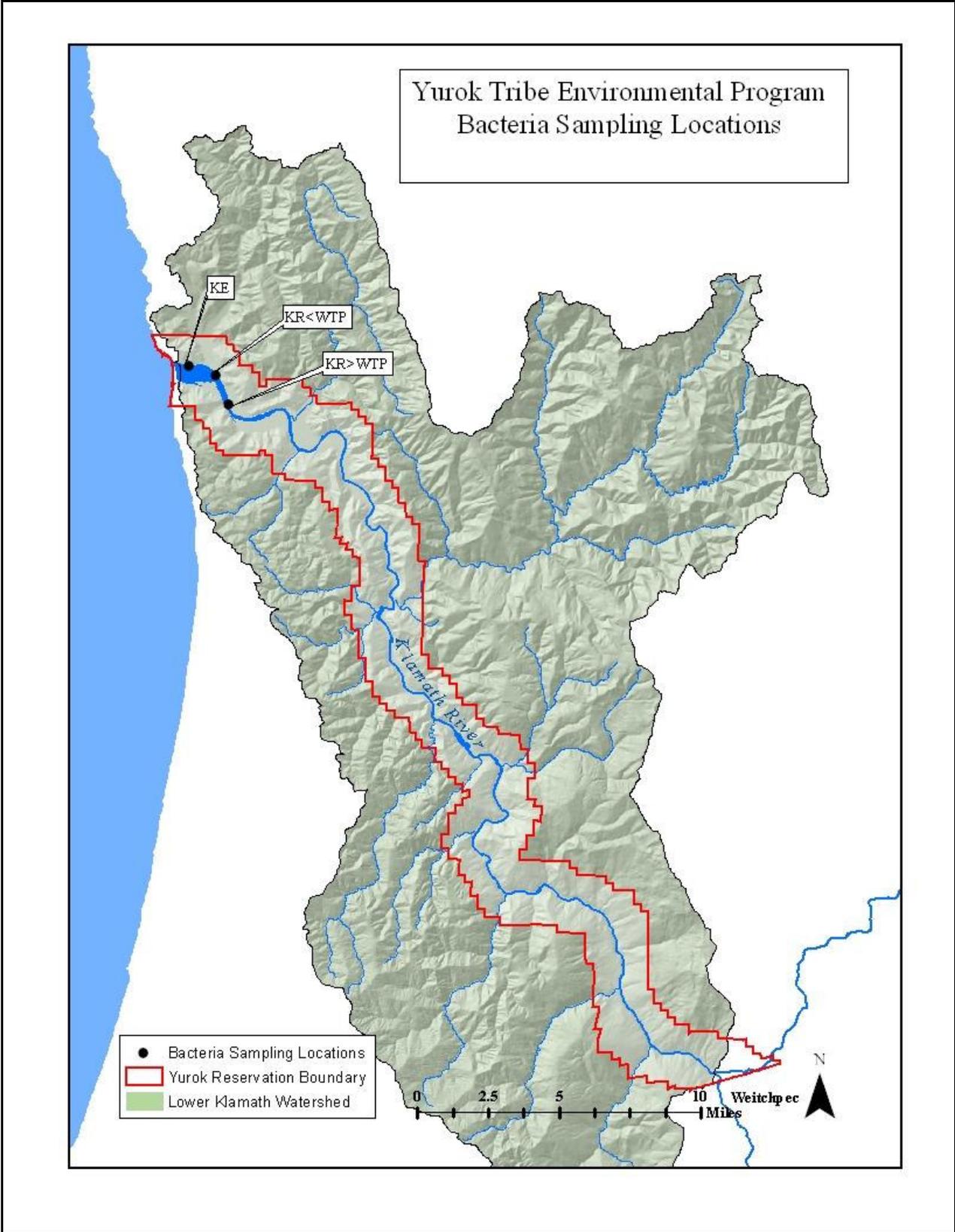


Figure 1. Sampling Site Locations



Figure 2. Klamath River Below Waste Water Treatment Plant sampling site (KR<WTP)



Figure 3. Klamath River Above Waste Water Treatment Plant sampling site (KR>WTP).



Figure 4. Klamath River Estuary sampling site (KE)

Results: IV

Table 1. Bacteria Sampling Results

Bacteria Sampling Results Table												
<i>E. Coli</i>												
Coliform forming units Report Limit: 10												
YTWQCP: <i>E. coli</i> single sample maximum 235 CFU/100ml												
Site	10/15/07	11/28/07	12/26/07	01/24/08	02/28/08	03/27/08	04/24/08	05/28/08	06/25/08	07/23/08	08/21/08	
Klamath Estuary	31	20	10	ND	ND	ND	ND	ND	ND	10	31	
K.R. below WTP	ND	ND	10	ND								
K.R. above WTP	20	ND	20	ND	ND	20	ND	20	SL	ND	41	
<i>Strep. Faecalis (enterococci)</i>												
Coliform forming units Report Limit: 10												
YTWQCP: <i>Strep. faecalis</i> single sample maximum 61 CFU/100ml												
Site	10/15/07	11/28/07	12/26/07	01/24/08	02/28/08	03/27/08	04/24/08	05/28/08	06/25/08	07/23/08	08/21/08	
Klamath Estuary	ND	ND	ND	ND	10	ND	ND	10	ND	ND	ND	
K.R. below WTP	ND	ND	ND	ND	ND	10	ND	ND	ND	ND	ND	
K.R. above WTP	41	ND	SL	ND	10							
Total Coliform												
Coliform forming units Report Limit: 10												
Site	10/15/07	11/28/07	12/26/07	01/24/08	02/28/08	03/27/08	04/24/08	05/28/08	06/25/08	07/23/08	08/21/08	
Klamath Estuary	794	315	189	95	41	171	262	397	1183	1674	2247	
K.R. below WTP	1112	161	309	107	63	231	161	712	443	1722	1723	
K.R. above WTP	1081	323	1467	73	108	213	160	520	SL	4352	4884	

*Note that 6/25/08 sample from above the W.T.P. was not analyzed by lab due to a crack in the bottle and possible contamination as seen by SL for Sample Loss

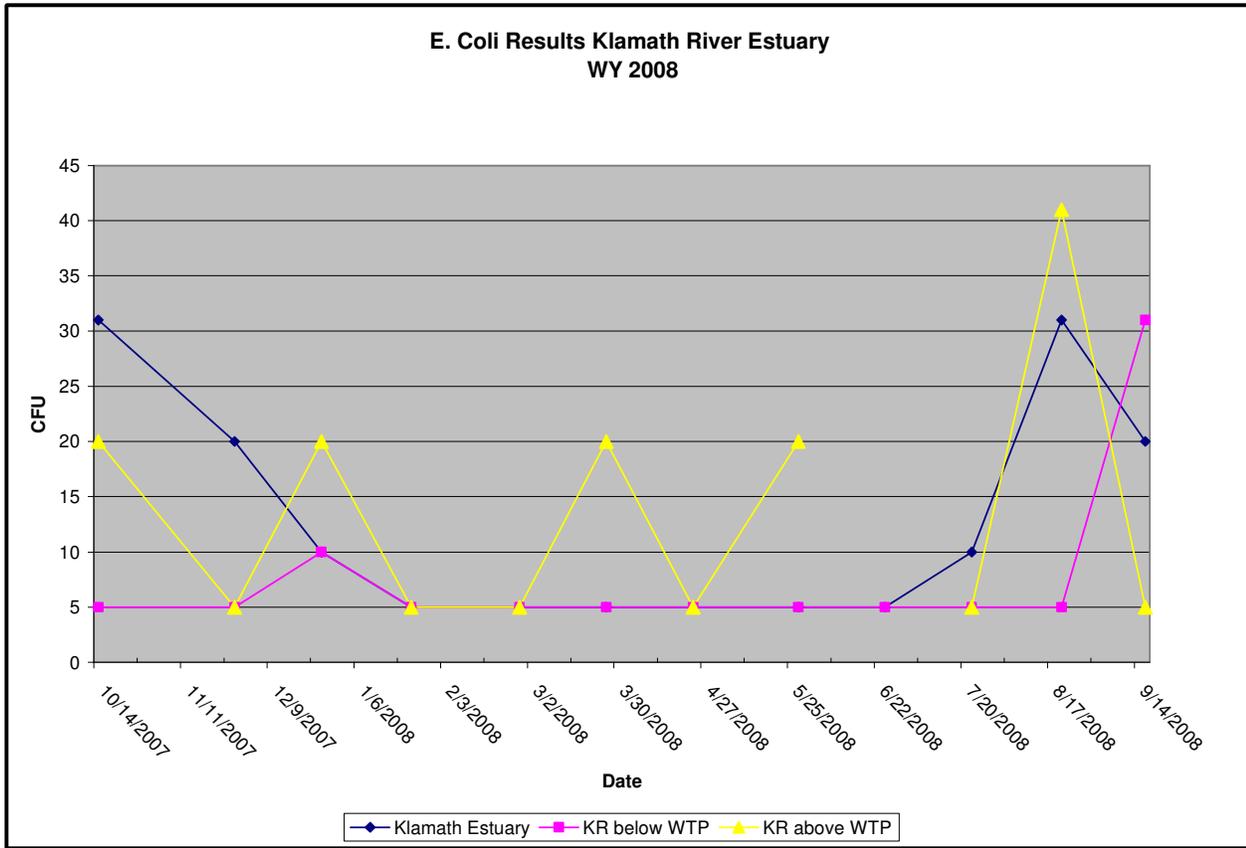


Figure 5. *E. coli* results from water collected within the Klamath River Estuary in Water Year 2008*.

* Note that all results reported below detection limit have been altered to half of the reportable detection limit of 10 mpn for graphing purposes.

* Note that 6/25/08 sample from above the W.T.P. was not analyzed by lab due to a crack in the bottle and possible contamination.

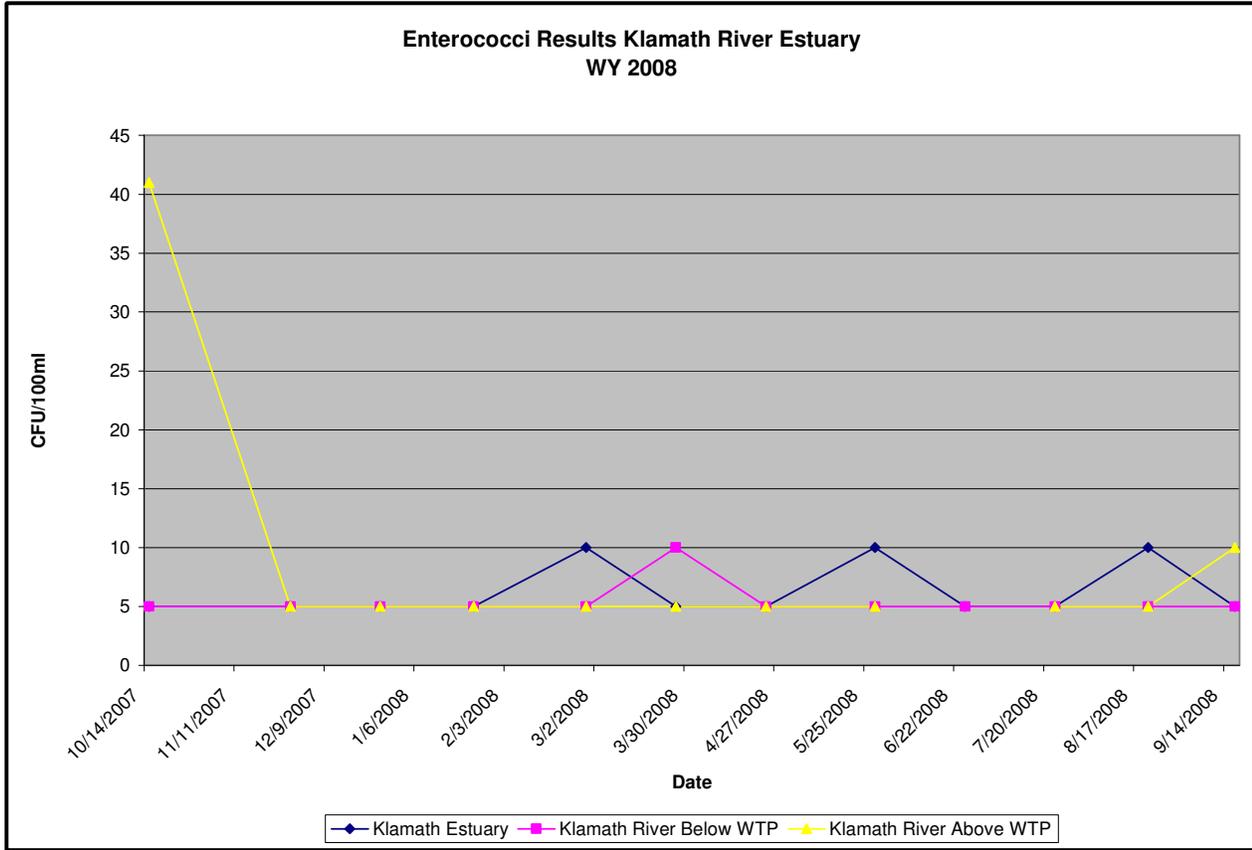


Figure 6. Enterococci results from water collected within the Yurok Reservation in Water Year 2008*.

*Note that all results reported below detection limit have been altered to half of reportable detection limit of 10 mpn for graphing purposes.

*Note that 6/25/08 sample from above the W.T.P. was not analyzed by lab due to a crack in the bottle and possible contamination.

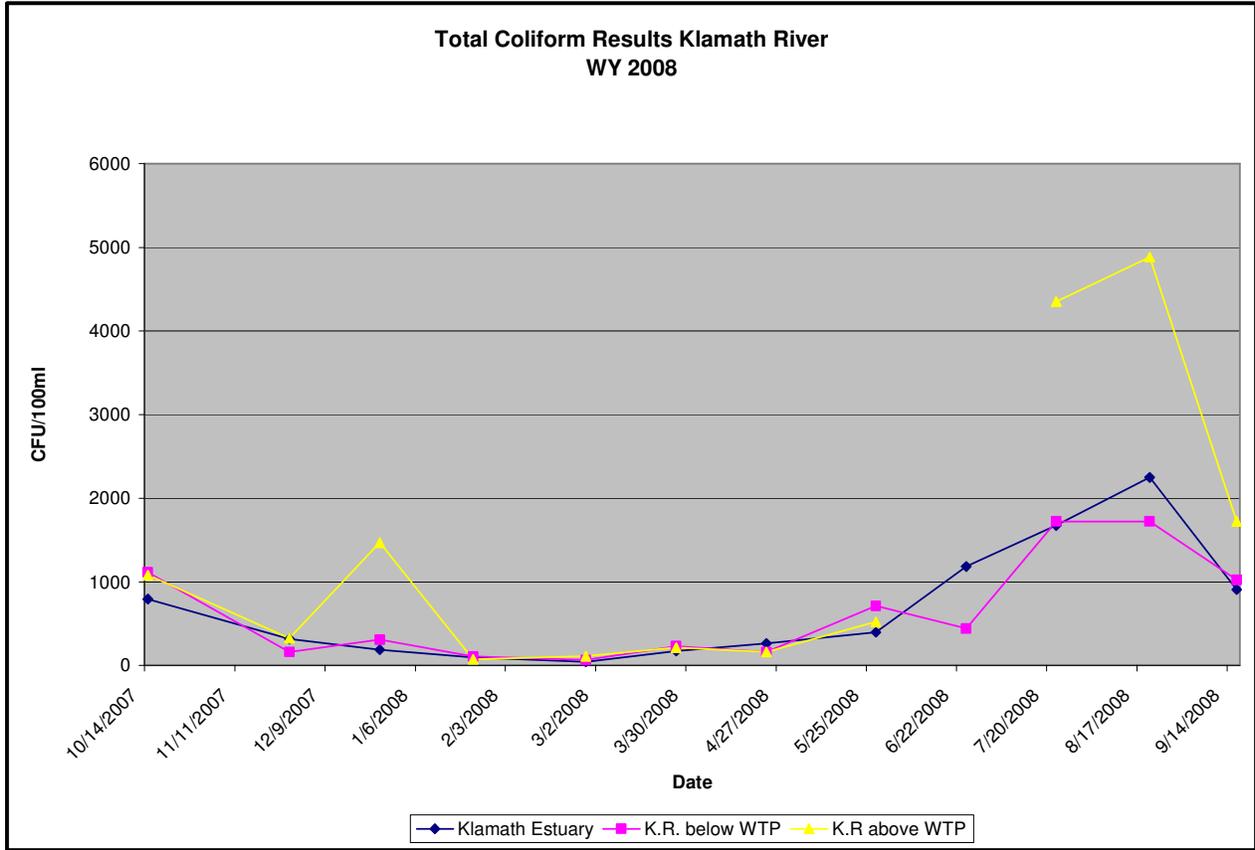


Figure 7. Total Coliform results from water collected within the Yurok Reservation in the Water Year 2008.

* Note that 6/25/08 sample from above the W.T.P. was not analyzed by lab due to a crack in the bottle and possible contamination.

V. Discussion

Total coliform was found present throughout the water year, with levels dropping off during the winter and spring months, and peak numbers occurring during the summer months of July and August. This is expected as the natural flushing mechanism of the river is in full force during these months of high flow causing a dilution in bacteria concentrations. Total coliform levels increase through the summer months as lower flow conditions persist, waters become more stagnant, and plant and animal matter have a greater chance of breaking down and releasing byproducts into the river system. Increased human and animal activity in and near the river in the summer months also contributes to the increase in total coliform present in the river during this time. No sample taken in the Water Year 2008 exceeded the single sample maximum limit of 10,000 MPN/100ml sample for recreational use established by the California State Water Resources Control Board. The highest levels of total coliform were 4352 and 4884 MPN/100 ml, the former occurring above the waste water treatment plant (W.T.P.) on 7/23/08 and the latter also occurring above the W.T.P. on 8/21/08. The lowest level detected was 41 MPN per 100ml sample on 2/28/08 taken at the Klamath River Estuary.

Throughout the water year, all *E. coli* samples collected showed results well below the retesting limit of 235 MPN/100ml sample for recreational use set forth by the Yurok Tribe Coastal Monitoring Program Sampling and Analysis Plan. 24 of the 35 samples taken, or approximately 69 percent, tested at or below the minimum detection limit of 10 MPN/100 ml sample. The highest *E. Coli* level, 41 MPN per 100 ml sample, was measured at the sampling site above the W.T.P. on 8/21/08.

There were no enterococci levels exceeding the retesting limit of 61 MPN per 100ml sample measured during water year 2008. The highest level detected occurred on 10/15/07 above the W.T.P., measured at 41 MPN/100ml. 34 of the 35 samples, or 97 percent, at or below the minimum detection limit of 10 MPN per 100 ml sample.

Enterococci and total coliform levels were on average higher above the wastewater treatment plant than they were below the wastewater treatment plant and the Klamath River Estuary. *E. coli* levels above the wastewater treatment plant were not significantly higher than levels below the wastewater treatment plant and the Klamath River Estuary. Enterococci, *E. coli*, and total coliform levels did not exceed the MPN set forth by the Yurok Tribe Coastal Monitoring Program Sampling and Analysis Plan for a single sample analysis. This indicates that, in Water Year 2008, coliform forming units (C.F.U.), were not a source of bacteria pollution in the Klamath River Estuary.

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