

**Water Year 2005
Bacteria Sampling Report
for the
Lower Klamath River**



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March 2006

Acknowledgements

The Yurok Tribe Environmental Program would like to thank its staff and the AmeriCorps Watershed Steward Project for their help in sample collection, delivery and training. We would also like to thank Humboldt County Department of Public Health lab for the timely processing of samples. I would also like to personally thank Ken Fetcho and Laura Mayo for their oversight and support in compiling this report.

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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 two mile-wide strip of land along 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. This report summarizes the bacteria sampling performed on the Lower Klamath River in the Water Year 2005 as part of a larger, comprehensive and ongoing water quality monitoring program within the basin.

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 Lower Klamath River 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 Lower Klamath include the degradation and decomposition of organic plant and animal matter in the surrounding environment. Normal bioprocessing occurring in local soils provide 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 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 Humboldt County Department of Public Health 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 Above the Trinity River Confluence (WE)
- Trinity River Above the Klamath River Confluence (TR)
- Klamath River Below Weitchpec (KBW)
- Klamath River at USGS Turwar Gage (TG)
- **Klamath River Above KCSD Waste Water Treatment Plant (KR>WTP)**
- **Klamath River Below KCSD Waste Water Treatment Plant (KR<WTP)**
- **Klamath River Estuary (KE)**

The sites in bold indicate those which are sampled on a monthly basis to establish baseline conditions in the Klamath River Estuary, an area of heavy human use. The sites above and below the Klamath Community Service District (KCSD) waste water treatment plant, near the old Klamath town site, were selected to monitor the influence and potential impact of two large septic tanks servicing the current Klamath town site and other adjacent areas. This septic system has been of particular concern due to its proximity to the river and location in the flood plain. During the flood of 1997, the distribution lines supplying these tanks were damaged and there were reports of the river nearby smelling of sewage. The sampling site KR<WTP was selected to accommodate our concern for the integrity of this system and to protect human health.

The one-time sampling of the three up-river sites was performed to correlate bacterial data and establish a snapshot of bacterial conditions during nutrient grab sampling being performed at these sites during the late summer.

Map 1. Lower Klamath River and Yurok Reservation boundaries showing bacteria sampling site locations for the Water Year 2005.

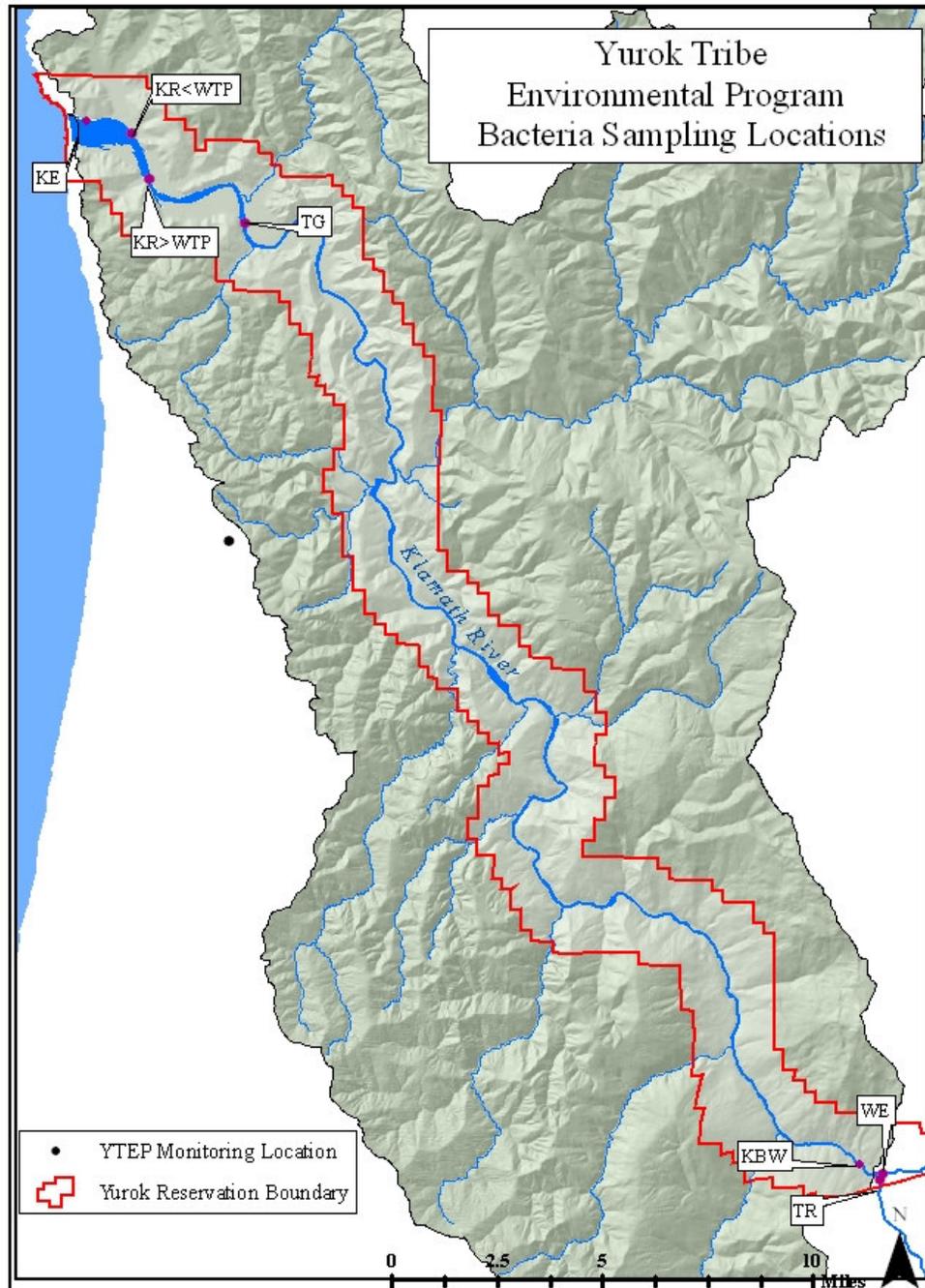




Figure 6. Confluence of Trinity and Klamath Rivers, with the sand bar to the left of the image dividing the two rivers. The Trinity River Above Klamath River Confluence sampling site (TR) is along the sand bar on the upper tributary, while the Klamath River Above Trinity River Confluence (WE) is along the sand bar in the foreground.



Figure 5. Klamath River Below Weitchpec sampling site (KBW).



Figure 4. Klamath River at USGS Turwar Gage sampling site (TG).



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



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



Figure 1. Klamath River Estuary sampling site (KE).

IV. Results

Table 1. *E. coli*, Enterococci, and Total Coliform sampling results for water samples collected within the Yurok Indian Reservation during Water Year 2005 ordered from up-river to down-river.

<i>E. Coli</i> Coliform forming units Report Limit: 10 YTWQCP: <i>E. coli</i> single sample maximum 235 MPN/100ml	Site	10/27/04	11/30/2004	12/1/2004	1/31/05	2/24/05	3/1/05	4/7/05	5/13/05	6/21/05	7/27/05	8/24/05	9/21/05	
	WE												<10	
	TR												<10	
	KBW												20	
	TG												31	
	K.R. >WTP	52	10		<10	<10		10	10	31	10	31	<10	
	K.R. < WTP	20	<10		<10	31		10	31	<10	10	<10	<10	
	Klamath Estuary (KE)	52	20		<10	<10		<10	<10	41	<10	10	20	
	Enterococci													
	Coliform forming units Report Limit: 10 YTWQCP: <i>Strep. faecalis</i> single sample maximum 61 MPN/100ml	Site	10/27/04	11/30/04	12/1/2004	1/31/05	2/24/05	3/1/05	4/7/05	5/13/05	6/21/05	7/27/2005	8/24/05	9/21/05
WE													<10	
TR													<10	
KBW													31	
TG													<10	
K.R. >WTP		31	10		<10	<10		10	<10	<10	<10	<10	<10	
K.R. < WTP		30	<10		<10	<10		<10	<10	<10	<10	10	<10	
Klamath Estuary (KE)		10	<10		<10	<10		<10	<10	10	<10	<10	<10	
Total Coliform														
Coliform forming units Report Limit: 10 CA Water Quality Control Plan: total coliform single sample maximum 10,000 MPN/100ml		Site	10/27/04	11/30/04	12/1/2004	1/31/05	2/24/05	3/1/05	4/7/05	5/13/05	6/21/05	7/27/05	8/24/05	9/21/05
	WE												1565	
	TR												789	
	KBW												1674	
	TG												1379	
	K.R. >WTP	1296	473		134	135		379	776	355	1,376	1616	712	
	K.R. < WTP	2863	275		86	41		384	512	309	4,106	2359	556	
Klamath Estuary (KE)	991	160		120	72		373	598	650	1,650	1935	657		

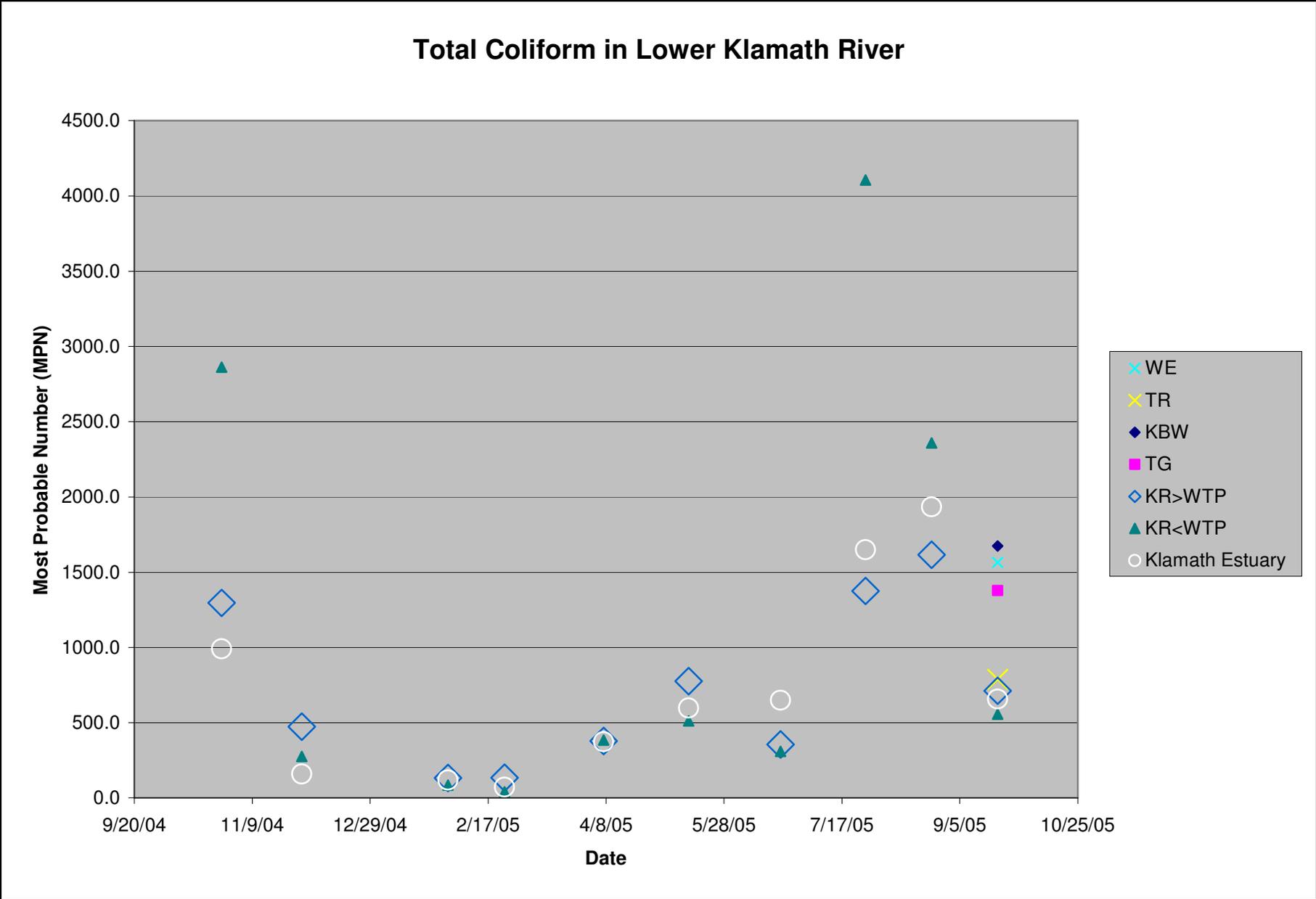


Figure 1: Total Coliform results from water collected within the Yurok Reservation in the Water Year 2005.

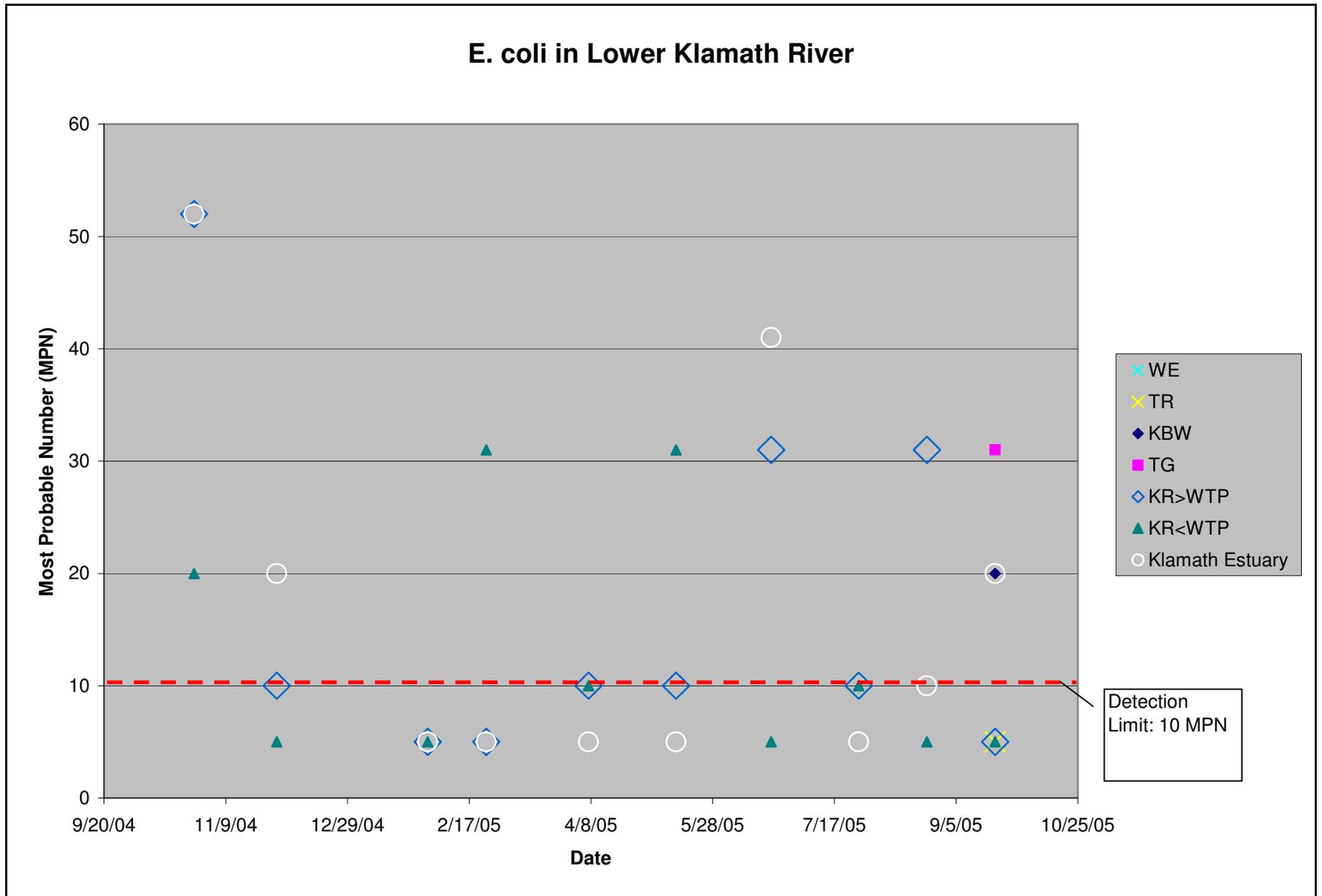


Figure 2: *E. coli* results from water collected within the Yurok Reservation in Water Year 2005*.

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

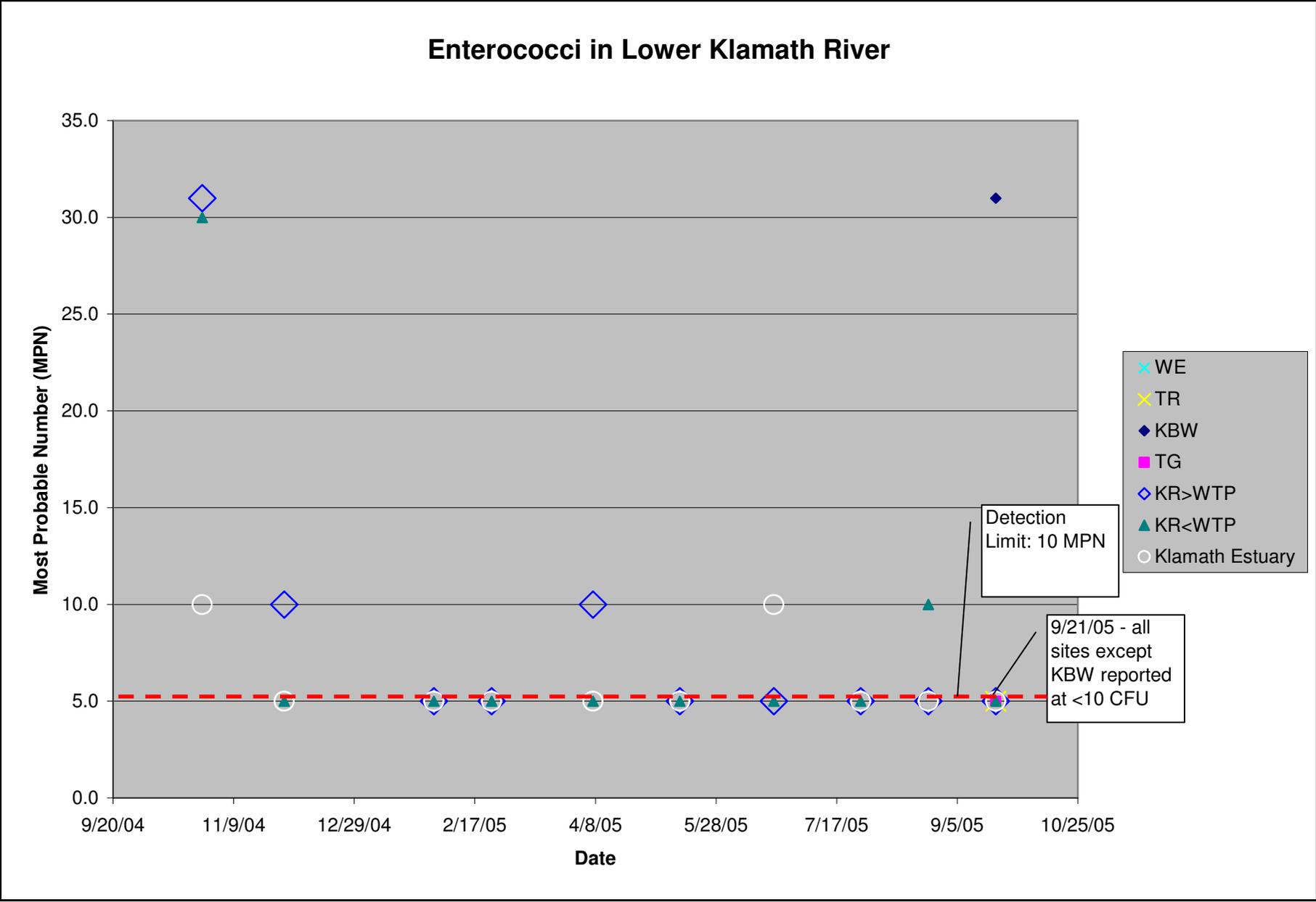


Figure 3: Enterococci results from water collected within the Yurok Reservation in Water Year 2005*.

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

V. Discussion

Total coliform was found present throughout the water year, with levels dropping off during the winter and spring months. 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. Water levels also 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 system during this time. No samples taken in the Water Year 2005 exceeded the single sample maximum limit of 10,000 MPN per 100ml sample for recreational use established by the California State Water Resources Control Board. The lowest level detected was 41 MPN on February 24th at Klamath River Below the Waste Water Treatment Plant, while the highest was 4,106 MPN at the same location on July 27th.

Throughout the water year, all *E. coli* samples collected showed results well below the retesting limit of 235 MPN per 100ml sample for recreational use set forth by the Yurok Tribe Coastal Monitoring Program Sampling and Analysis Plan. Twenty one of 34 samples taken, or 62 percent, tested at or below the minimum detection limit of 10 MPN.

All Enterococci sampling also showed results well below the retesting limit of 61 MPN per 100ml sample for recreational use. 31 of 34 samples taken, or 91 percent, tested at or below the minimum detection limit of 10 MPN for Enterococci. There was no significant difference of either *E. coli* or Enterococci levels above and below the waste water treatment plant detected, indicating that, in Water Year 2005, this was not a source of bacteria pollution in the Klamath River Estuary.

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