

**Water Year 2006
Bacteria Sampling Report
for the
Lower Klamath River**



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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 2006 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 Below Weitchpec (KBW)
- Klamath River at USGS Turwar Gage (TG)
- Trinity River Above the Klamath River Confluence (TR)
- Klamath River Above the Trinity River Confluence (WE)
- **Klamath River Estuary (KE)**
- **Klamath River Above KCSD Waste Water Treatment Plant (KR>WTP)**
- **Klamath River Below KCSD Waste Water Treatment Plant (KR<WTP)**
- Muddy Creek above Weitchpec School (MC)

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. The one-time sampling of the Trinity River site was performed to differentiate the contributions of the Trinity and main stem Klamath Rivers to bacterial conditions downstream of the confluence. The one-time sampling of Muddy Creek was performed in response to concerns about septic waste spilling into Muddy Creek following the large storms from 12/26/05 through 12/31/05.

Map 1. Lower Klamath River and Yurok Reservation boundaries showing bacteria sampling site locations for the Water Year 2006.

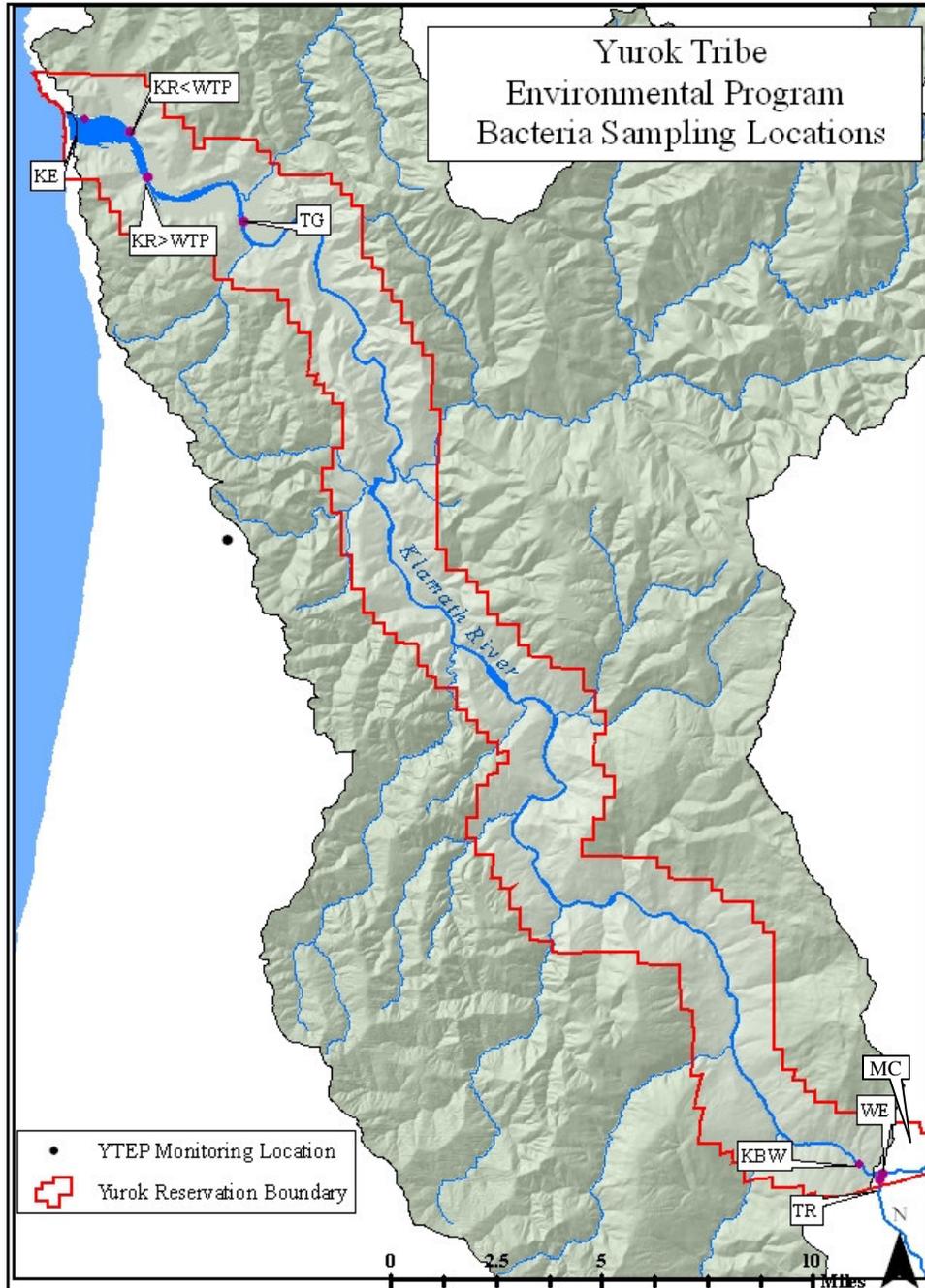




Figure 1. Confluence of Trinity and Klamath Rivers, with the sand bar to the left of the image dividing the two rivers. The Trinity River Above Klamath River Confluence sampling site (TR) is along the sand bar on the upper tributary, while the Klamath River Above Trinity River Confluence (WE) is along the sand bar in the foreground.



Figure 2. Klamath River Below Weitchpec sampling site (KBW).



Figure 3. Klamath River at USGS Turwar Gage sampling site (TG).



Figure 4. Klamath River Above Waste Water Treatment Plant sampling site (KR>WTP).



Figure 5. Klamath River Below Waste Water Treatment Plant sampling site (KR<WTP).



Figure 6. Klamath River Estuary sampling site (KE).

Total Coliform in Lower Klamath River

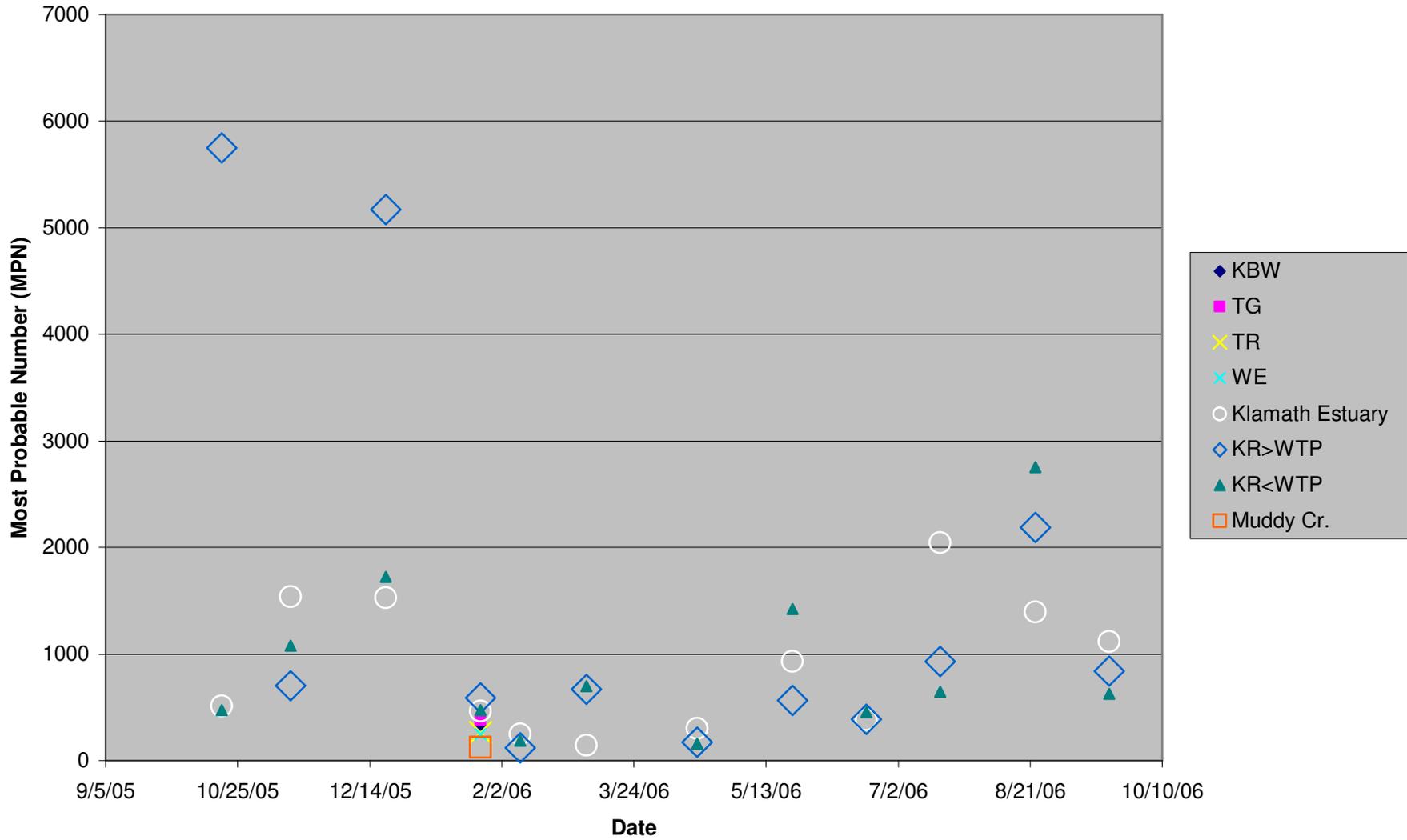


Figure 8: Total Coliform results from water collected within the Yurok Reservation in the Water Year 2006.

E. coli in Lower Klamath River

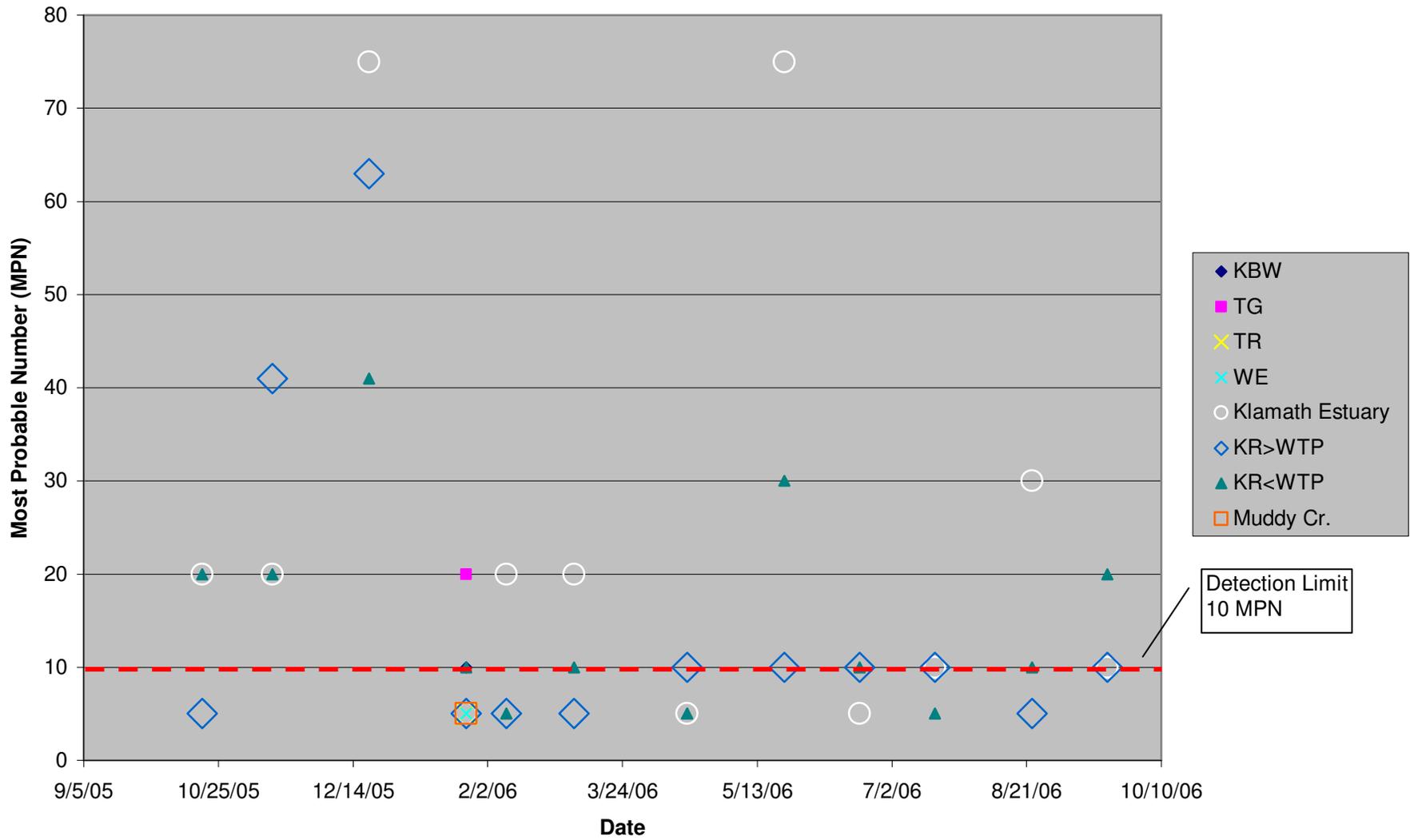


Figure 9: *E. coli* results from water collected within the Yurok Reservation in Water Year 2006*.

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

Enterococci in Lower Klamath River

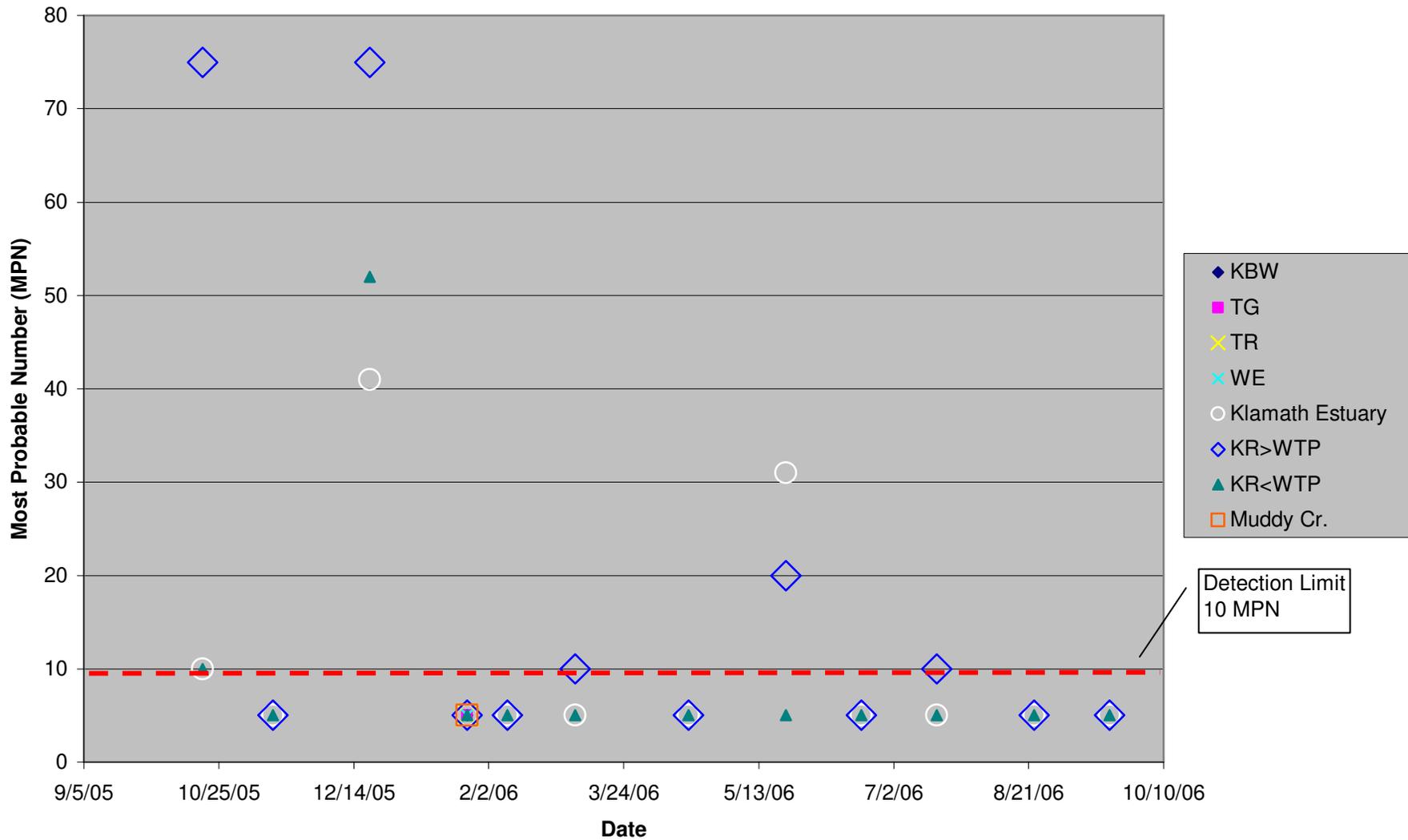


Figure 10: Enterococci results from water collected within the Yurok Reservation in Water Year 2006*.

*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. 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 system during this time. No samples taken in the Water Year 2006 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 highest levels of total coliform were 5748 and 5172 MPN per 100 ml sample measured at the Klamath River above the waste water treatment plant on 10/19/05 and 12/20/05 respectively. The lowest level detected was 120 MPN per 100ml sample on 2/9/06 at Klamath River above the waste water treatment plant.

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. 26 of the 41 samples taken, or 63 percent, tested at or below the minimum detection limit of 10 MPN per 100 ml sample. The highest *E. Coli* levels, 75 MPN per 100 ml sample, were measured in the Klamath Estuary on 12/20/05 and 5/23/06.

Enterococci levels exceeding the retesting limit of 61 MPN per 100ml sample were measured on two occasions at the Klamath River above the waste water treatment plant: 75 MPN per 100ml sample enterococci levels were measured on 10/19/05 and 12/20/05. Resampling was not performed, due to the time lapse between the sampling and the return of the laboratory results and the rapidly changing river conditions during the late fall. These high enterococci levels were concurrent with higher than usual total coliform and *E. coli* levels at the same site and times. Over the course of the year, 35 of the 41 samples taken, or 85 percent, tested 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 *E. coli* levels above the wastewater treatment plant were not significantly higher than levels below the wastewater treatment plant. This indicates that, in Water Year 2006, this was not a source of bacteria pollution in the Klamath River Estuary.

E. Coli and enterococci levels at Muddy Creek above Weitchpec School were below the minimum detection limits of 10 MPN per 100ml sample. Total coliform levels at Muddy Creek were 122 MPN per 100ml sample, far below the California State Water Resources Board limit for recreational use of 10,000 MPN per 100ml sample. Thus, our sampling shows no evidence that spillage of septic waste caused bacteria levels to rise to potentially hazardous levels in Muddy Creek.

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