

BACTERIOLOGICAL AND CHEMICAL ASPECTS OF WATER QUALITY IN TANKERSLEY CREEK



Amanda Thompson and Daniel Simoneau, Undergraduate Students, Texas A&M University-Texarkana
Mentors: Dr. Nurul Alam and Dr. Mary Hearron



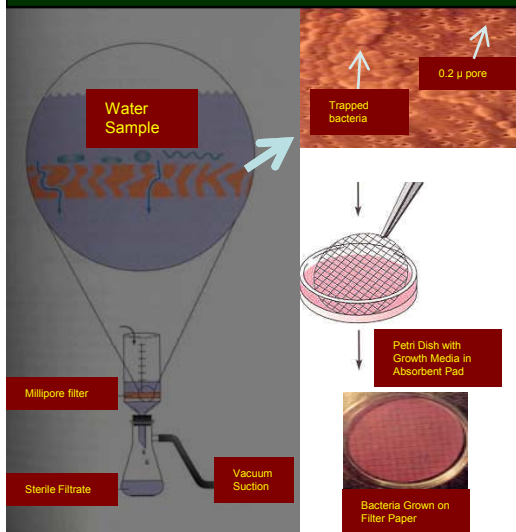
ABSTRACT

Continuous water quality monitoring is very important for compliance with government standards and in the interest of the public. Water samples were collected weekly from Tankersley creek during the recreational season of June and July in 2007 and analyzed for fecal coliform and selected water chemistry parameters. Our data showed that all 14 samples were positive for fecal coliform and exceeded the USEPA and Texas surface water quality standards. Fecal coliform count ranged from 438 - 1.2×10^3 CFU/100 ml which is 2.19 - 60 times higher than the Texas surface water quality standards. There was no significant impairment of physicochemical parameters in either of the sites. Our results indicated that the bacteriological quality of water in these water bodies has deteriorated drastically.

MATERIALS

- Millipore Filtering unit
- Millipore membrane filter (0.22 micron)
- M-FC (Fecal coliform media, pre-sterilized, ampoule)
- Petri Dish with absorbent pad (47 mm)
- Sampling bottles (glass, screw-cap)
- Incubator (44.5°C)
- Suction pump
- Autoclave
- Forceps (flat surface)
- Pipette (sterile, serological) and Pipette filler

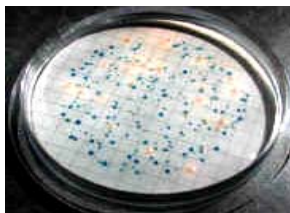
OUTLINE OF MILLIPORE FILTRATION METHOD



INTRODUCTION

Tankersley Creek is a freshwater stream in the Cypress Creek basin that extends 8 miles to the northwest of Mount Pleasant in Titus County, Texas. The city of Mount Pleasant is the largest urban population in Titus County. The landscape is drained by Tankersley and Hart creeks, and the tributaries of Big Cypress Creek. During 2000-2004, Tankersley Creek was placed on the TCEQ's list of waters not meeting their water quality standard. Fecal coliforms are useful indicators of recreational water quality and possess human health risks. *Escherichia coli* (*E. coli*) and Enterococci are the most common 'fecal coliforms' that occur primarily in the intestine of warm-blooded animals. Finding them in aquatic habitat, specially in large number, thus indicates recent and high levels of fecal contamination. Wastewater treatment facility within 500 feet of the creek, chicken farms & processing industries nearby, and human and wildlife activities in the summer generally would increase the risk of 'fecal' contamination in the water.

The objective of this study was to determine the bacteriological and physicochemical water quality at two selected sites on Tankersley Creek



METHODS

Sterilization

Millipore filtering units, sampling bottles, membrane filters, media, and forceps were sterilized by autoclaving at 121°C and 15 p.s.i. for 20 minutes.

Sampling sites

Two sites were selected for weekly sampling of water during the recreational season of June and July in 2007. All these sites were within ten-mile radius of the research lab and had good accessibility for sample collection. Map of the sampling stations is shown below. Station 1 is Tankersley Creek at FM 899 (upstream) and Station 2 is Tankersley Creek at FM 3412 (downstream)

Sample Collection

Sampling bucket was rinsed twice with the water to be tested before collecting test samples. Duplicate samples were collected in 250 ml pre-sterilized glass bottles and stored on ice until analyzed within 2 hours.

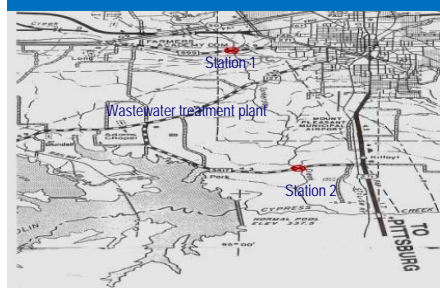
Sample Analysis

Membrane Filtration (MF) method was used for the enumeration of fecal bacteria. Fecal Coliform Test Kit (Millipore) was purchased from Ward's Scientific (Rochester, NY) and used according to the manufacturer's instructions with minor modifications. Typically, 100 ml or 10 ml water sample was filtered through sterile 47 mm 0.22 micron Millipore filter in a filtering flask to trap bacteria. The Membrane filter was then transferred to a Petri dish with an absorbent pad saturated with M-FC media. The dishes were incubated in an inverted position for 24 hours in an incubator at 44.5°C. Following incubation, the dishes were removed from the incubator and performed a colony count of all colonies exhibiting blue color. The number of fecal bacteria per 100 ml was calculated. Duplicate samples were prepared and counted as above. A control was also run during each test day with sterilized water. Diagrammatic representation of MF is shown on the bottom left.

Chemical Parameters

Water chemistry parameters including Temperature, pH, Nitrate, Conductivity, Dissolved Oxygen readings were obtained with a Yellow Springs Instrument (YSI) multi-parameter probe. Phosphate levels were monitored using a LaMotte Total Phosphate Kit.

SAMPLING STATIONS



CONCLUSIONS

- Bacteriological quality of water in the Tankersley Creek has deteriorated drastically.
- Fecal coliform count in the water was alarmingly higher than the USEPA and Texas surface water quality standards.
- Physicochemical parameters did not show any significant impairment
- These results will provide and incorporate new information on fecal coliform and chemical conditions into the existing database for reassessment of water quality in Tankersley Creek.

RESULTS

- ▶ All samples were positive for fecal coliform bacteria
- ▶ Bacterial count ranged from 438 to 12200 CFU (colony forming unit) per 100 ml water (Table)
- ▶ 100% samples exceeded USEPA and Texas surface water standards for contact recreation
- ▶ Chemical parameters, as listed under methods, remained within the acceptable limits set forth by the state of Texas (Table)

RESULTS

DATE (WEEK)	FECAL COLIFORM (CFU/100ML)		WATER TEMP (°C)		DISSOLVED OXYGEN (DO %)		PHOSPHATE (PPM)		NITRATE (PPM)		RAINFALL (CM)
	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2	
6-11-2007 (Week-1)	438	547	28.5	29.35	90.2	57.1	0.1	0	16.0	0	3.8
6-22-2007 (Week-2)	2775	792	27.3	27.11	91.8	96.0	0.1	0.1	2.0	0	21.2
6-27-2007 (Week-3)	1200	2054	24.34	30.2	118.0	115.0	0.1	0	2.0	1.0	31.6
7-5-2007 (Week-4)	3414	1798	24.1	28.2	131.7	109.9	0.1	0	0.1	0	23.7
7-11-2007 (Week-5)	6000	3000	35.0	38.0	39.0	99.1	0.1	0	6.0	0	24.8
7-18-2007 (Week 6)	12200	3550	38.0	42.2	80.9	88.8	0.1	0.1	6.0	1.0	4.7
7-25-2007 (Week 8)	1925	544	33.2	34.2	86.5	45.0	0.1	0.1	16.0	2.0	<1

REFERENCES

1. Texas Commission on Environmental Quality (TCEQ). 2005. Texas Surface Water Quality: What is it, and How is it Measured?
2. United States Environmental Protection Agency (USEPA) <http://www.uspa.gov/safewater/mclic/html>
3. Texas Surface Water Quality Standards. 2006. Revisions to Chapter 307.
4. Tankersley Creek Bacterial Source Tracking, Special Study, Cypress Creek Basin, TCEQ/Northeast Texas Municipal Water District, FY 2004-2005.