

# *E. Coli* and qPCR Results North Branch Chippewa River



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# Why We Monitor

- Protect the community
- Identify issues to improve human health
- Tribal programs are equal to the State through US EPA



# What We Monitor

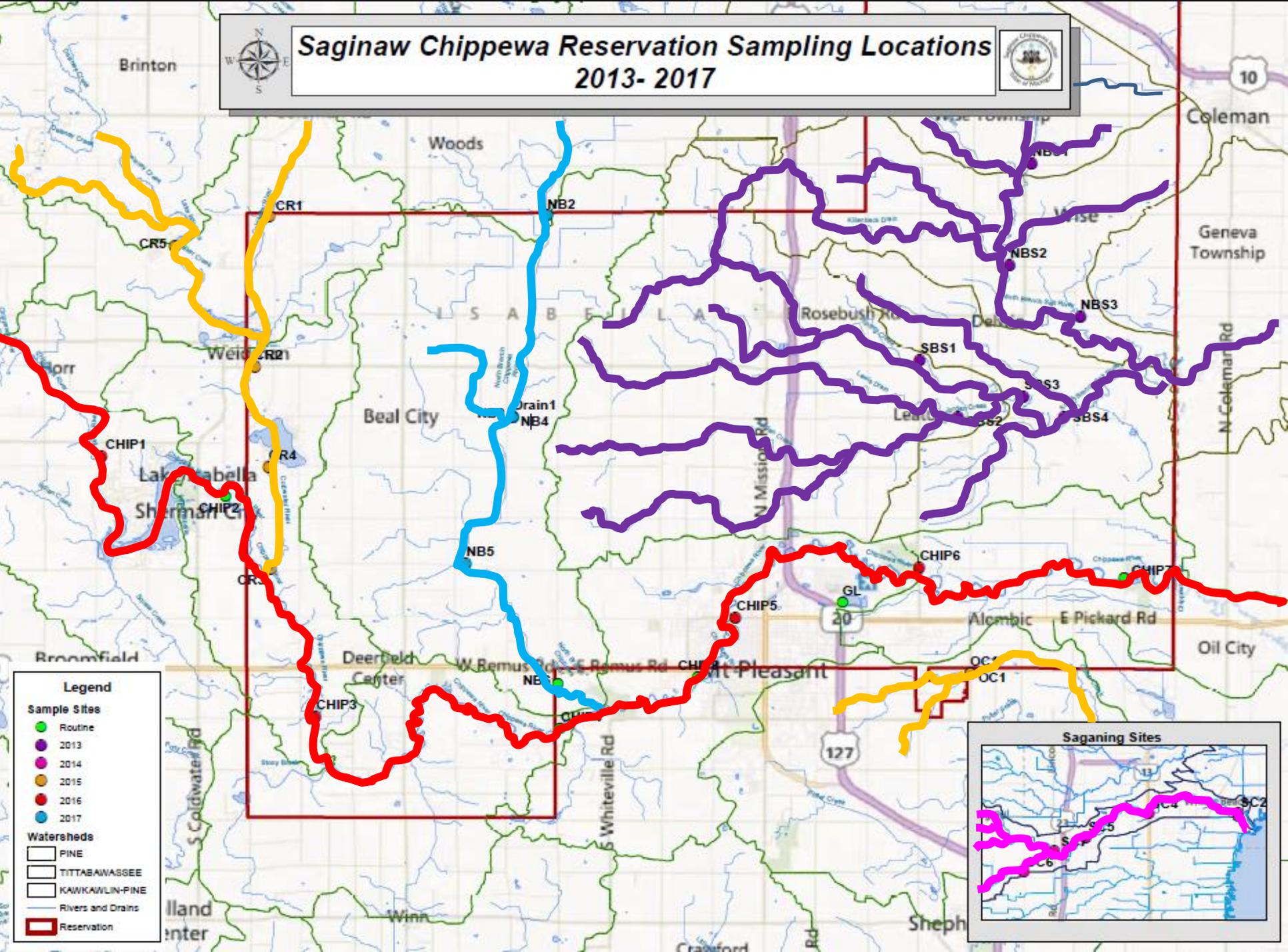
- Physical Parameters
- Nutrients
- BioAssessment
- Aquatic Insects
- Velocity
- Pathogen presence  
quantity



Chippewa River at Meridian Park



# Saginaw Chippewa Reservation Sampling Locations 2013- 2017



**Legend**

**Sample Sites**

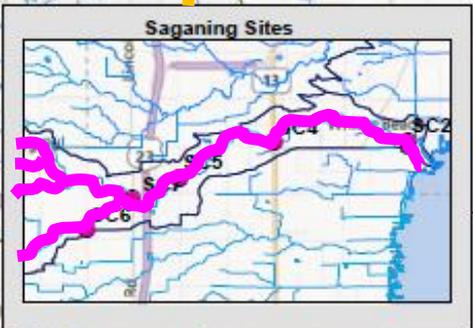
- Routine (Green)
- 2013 (Purple)
- 2014 (Pink)
- 2015 (Yellow)
- 2016 (Red)
- 2017 (Blue)

**Watersheds**

- PINE (White)
- TITABAWASSEE (Light Green)
- KAWKAWLIN-PINE (Light Blue)

**Rivers and Drains** (Blue lines)

**Reservation** (Red outline)



# What is *E. coli*?

- *Escherichia coli* (*E. Coli*) is an indicator of fecal contamination (animal digestive bacteria)
- Fecal contamination contains harmful pathogens



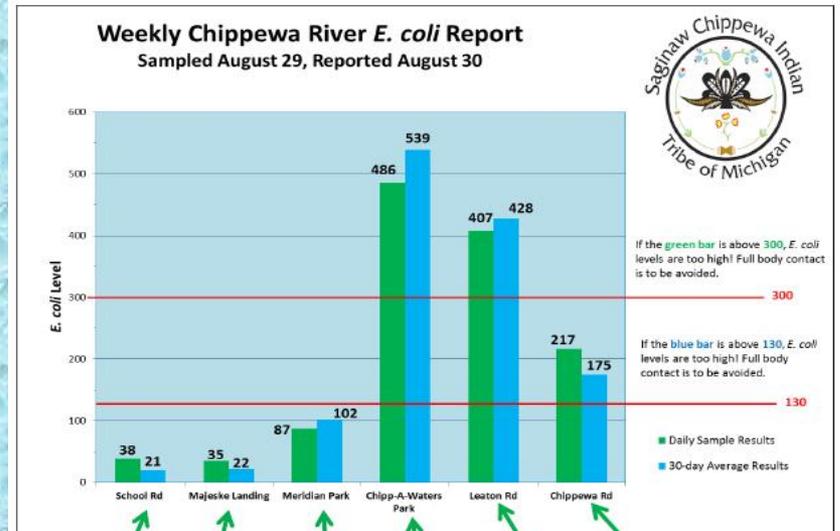
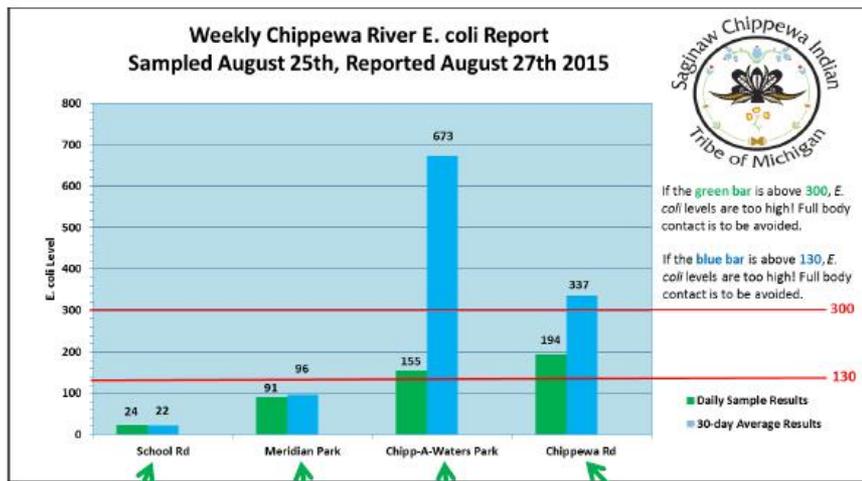
# What are the health effects of exposure to harmful fecal pathogens?

- Digestion of contaminated water
  - Intestinal illness
  - Cramps
  - Fever
  - Nausea
  - Diarrhea
- Contact with contaminated water
  - Infections of skin
  - Infection of ears
  - Respiratory illness
  - Eye infection
  - Neurologic impacts
  - Infection of wounds

# Results Creating Concern

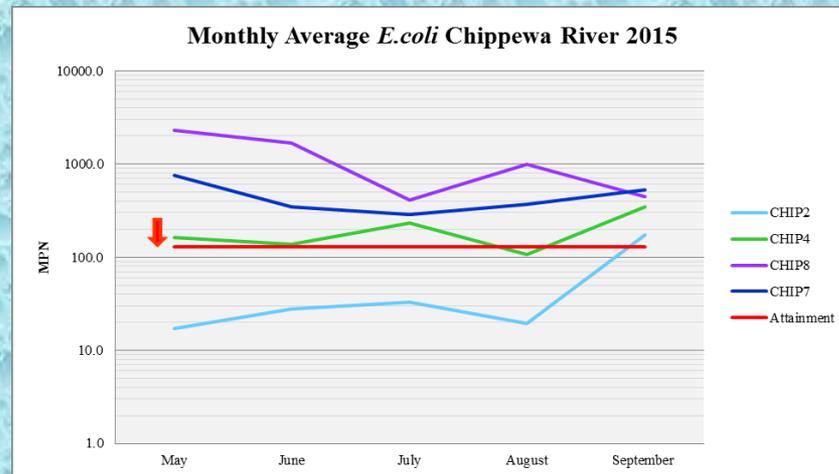
2015

2016



# Need for Source Identification

- *The Problem:*
  - Consistent exceedance of Human Health, Water Quality Standards set by the State of Michigan
  - Human Health concerns over multiple years



Chippewa River sites largely exceed the State of Michigan reference standard of below 130 MPN/100ml, the threshold for the *E. coli* Daily Geometric Mean (monthly average) for full body contact in warm water streams.

- **Identification of the source to determine solution(s)**

# How can fecal contamination get into our waterways?

- Animal fecal matter, including wildlife
- Runoff from agricultural fields
- Direct sewage discharges



# Source Tracking Study

## *Objectives:*

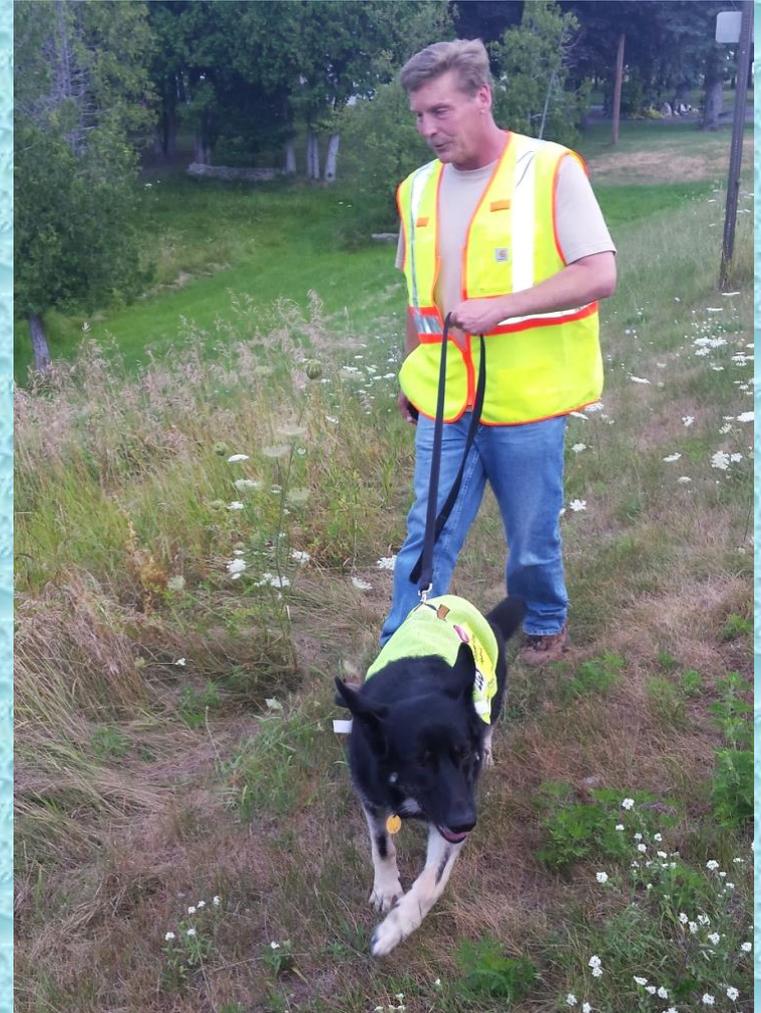
- Pathogen tracking in the North Branch of the Chippewa River Watershed
- Trace high levels of *E. coli*
- Determine whether sources of *E. coli* are human, bovine, or another source
- SVSU – DNA
- Environmental Canine Services (ECS) – sent tracking human waste



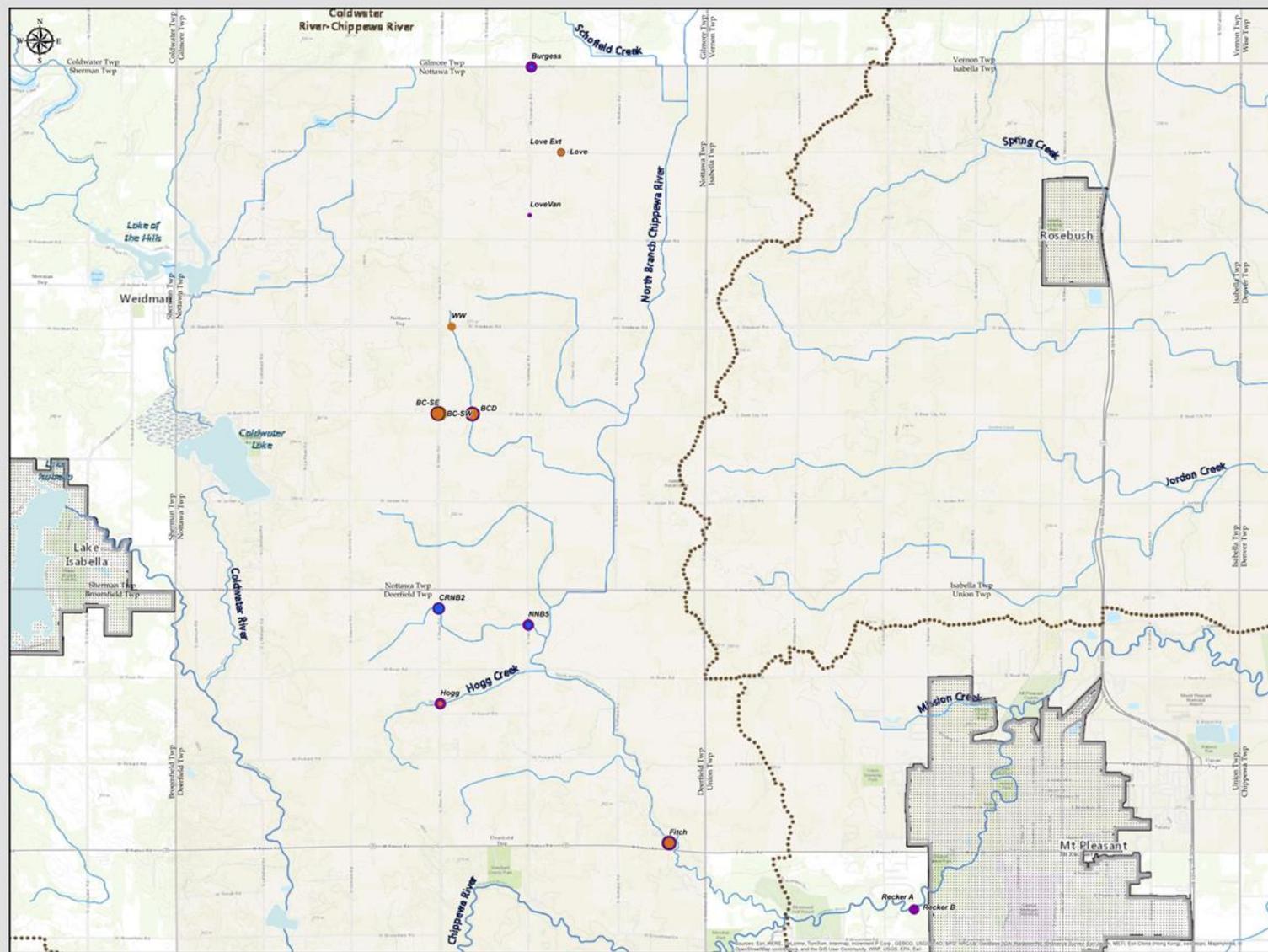
# Source Tracking Study

## *Project Elements:*

- Identified areas of elevated levels of *E.coli*
- Sent water samples for Ship and Sniff study
- Evaluated results of Ship and Sniff
- Conducted field investigations
- Determine the accuracy and reliability of positive canine alerts with *E.coli* and DNA analysis.
- The SCIT processed the *E.coli* samples using the Colilert-18 Method
- SVSU processed the DNA samples



# SCIT Reservation Water Systems Contaminates



## Legend

### SVSU DNA (Tsc/5µL)

#### Bovine

- 27
- 28 - 29
- 30 - 45
- 46 - 51
- 52 - 89
- 90 - 279
- 280 - 7156
- 7157 - 10351
- 10352 - 26622
- 26623 - 265964
- 265965 - 472845

#### Human

- 27
- 28 - 29
- 30 - 45
- 46 - 51
- 52 - 89
- 90 - 279
- 280 - 7156
- 7157 - 10351
- 10352 - 26622
- 26623 - 265964
- 265965 - 472845

### Avg. E.Coli 2015 (MPN)

- 0 - 77
- 78 - 108
- 109 - 119
- 120 - 150
- 151 - 224
- 225 - 276
- 277 - 380
- 381 - 449
- 450 - 1106
- 1107 - 2972
- 2973 - 20050

# Data and Results

- Most sample sites exceeded the Michigan Water Quality Standard of 300 MPN for the Daily Geometric Mean
- E.coli levels were highest at the storm drain sites at the corner of Beal City and Winn Roads(BCD or BC) and Fitch Drive, reaching over 20,050 MPN
- A creek that drained to the North Branch (CRNB2) also had noticeably elevated levels of E.coli.



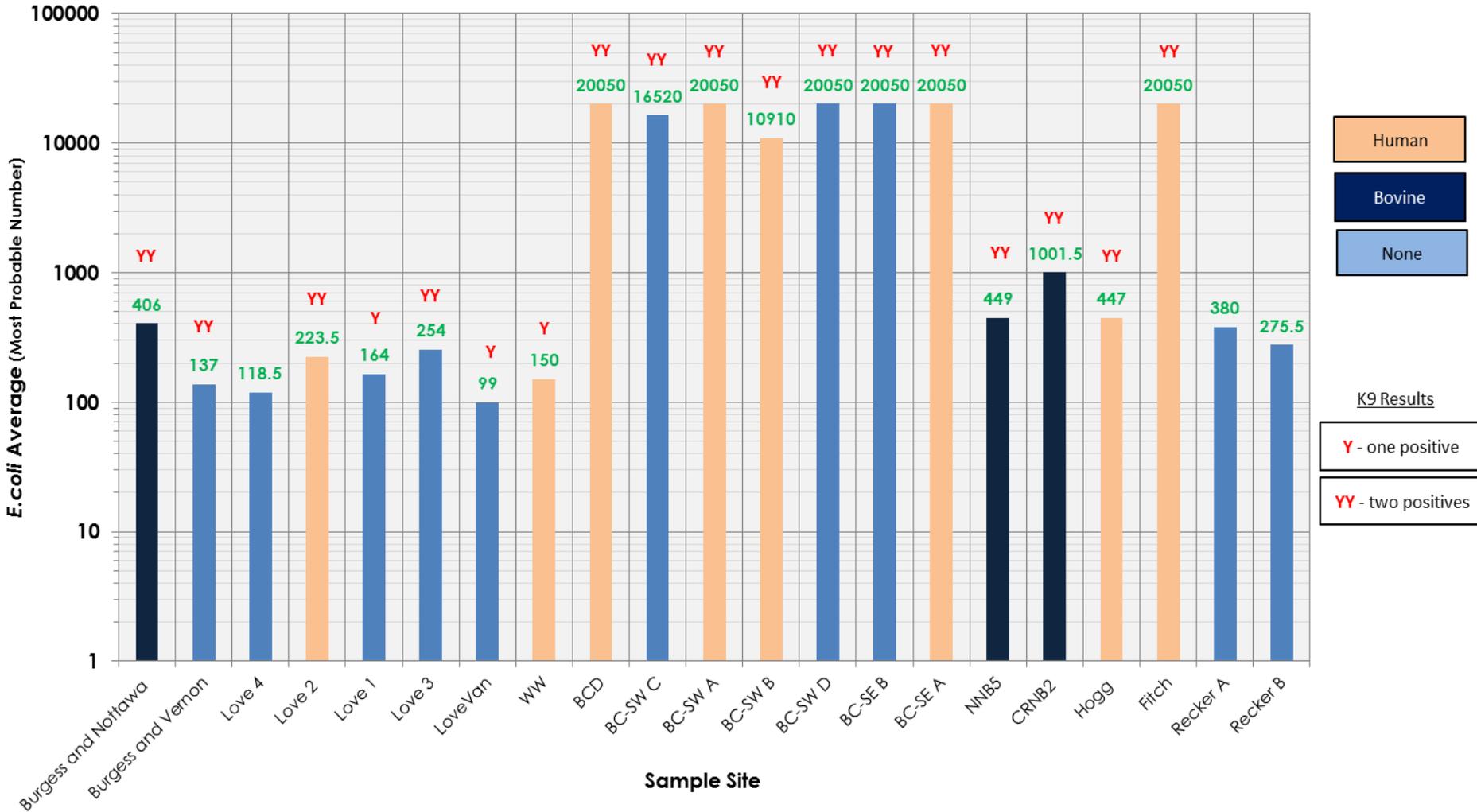
# Data and Results

- Both Fitch Drive and Beal City and Winn Roads storm drains (BCD or BC) tested positive for human waste utilizing canine investigation and qPCR, DNA analysis



- The creek that drained into the North Branch (CRNB2) tested positive for bovine waste.

# SCIT *E.coli* Averages



# Conclusions

- Tribal studies have determined there is a human health threat risk.
- The elevated E. coli readings are primarily a direct result of human waste.
- Waterways impacted
  - North Branch Chippewa River
  - Main Branch of Chippewa River
  - Saginaw Bay

