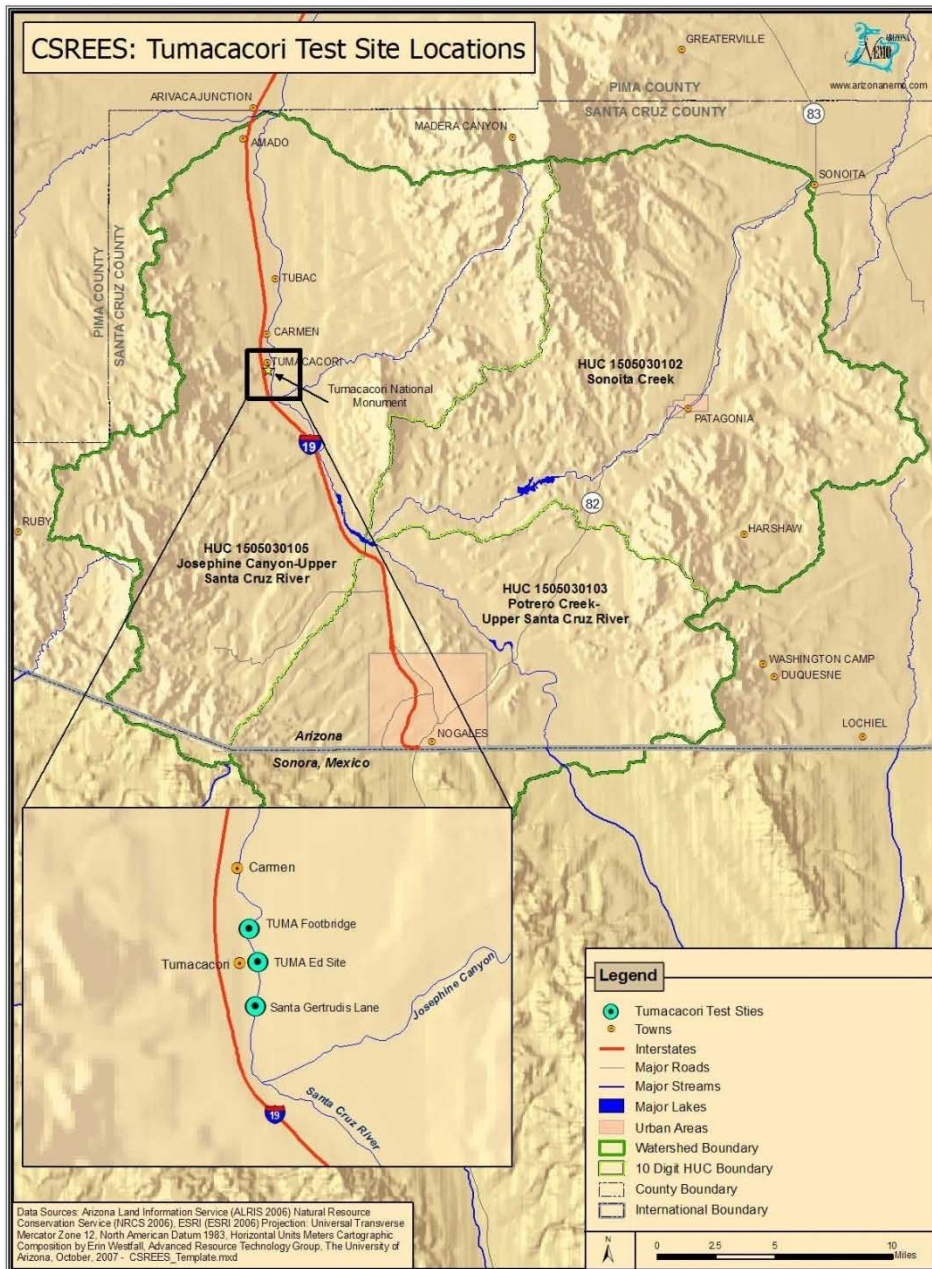


E. Coli Monitoring at Tumacacori NHP, 2007-2008

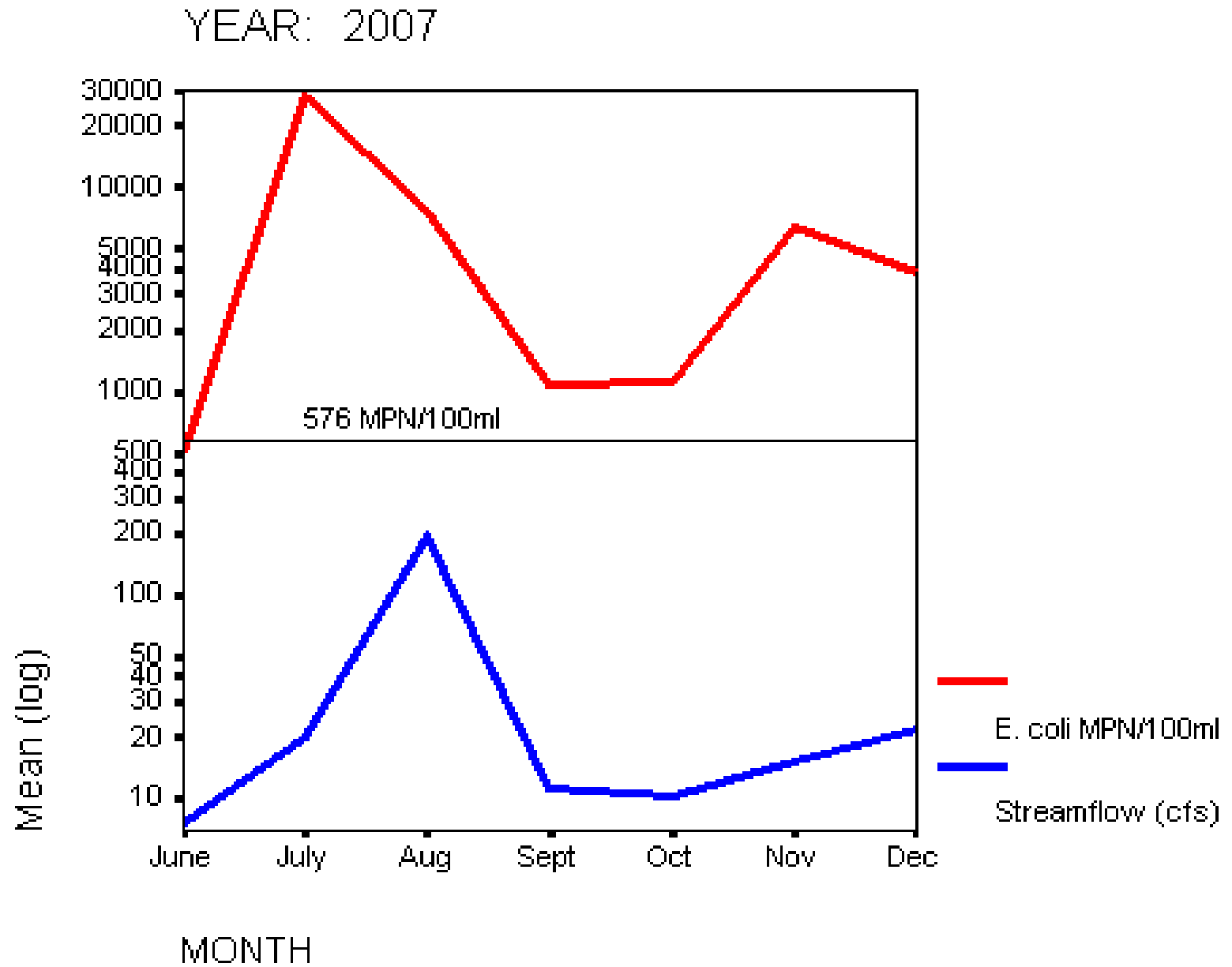


***E. coli* Sampling at Tumacacori**

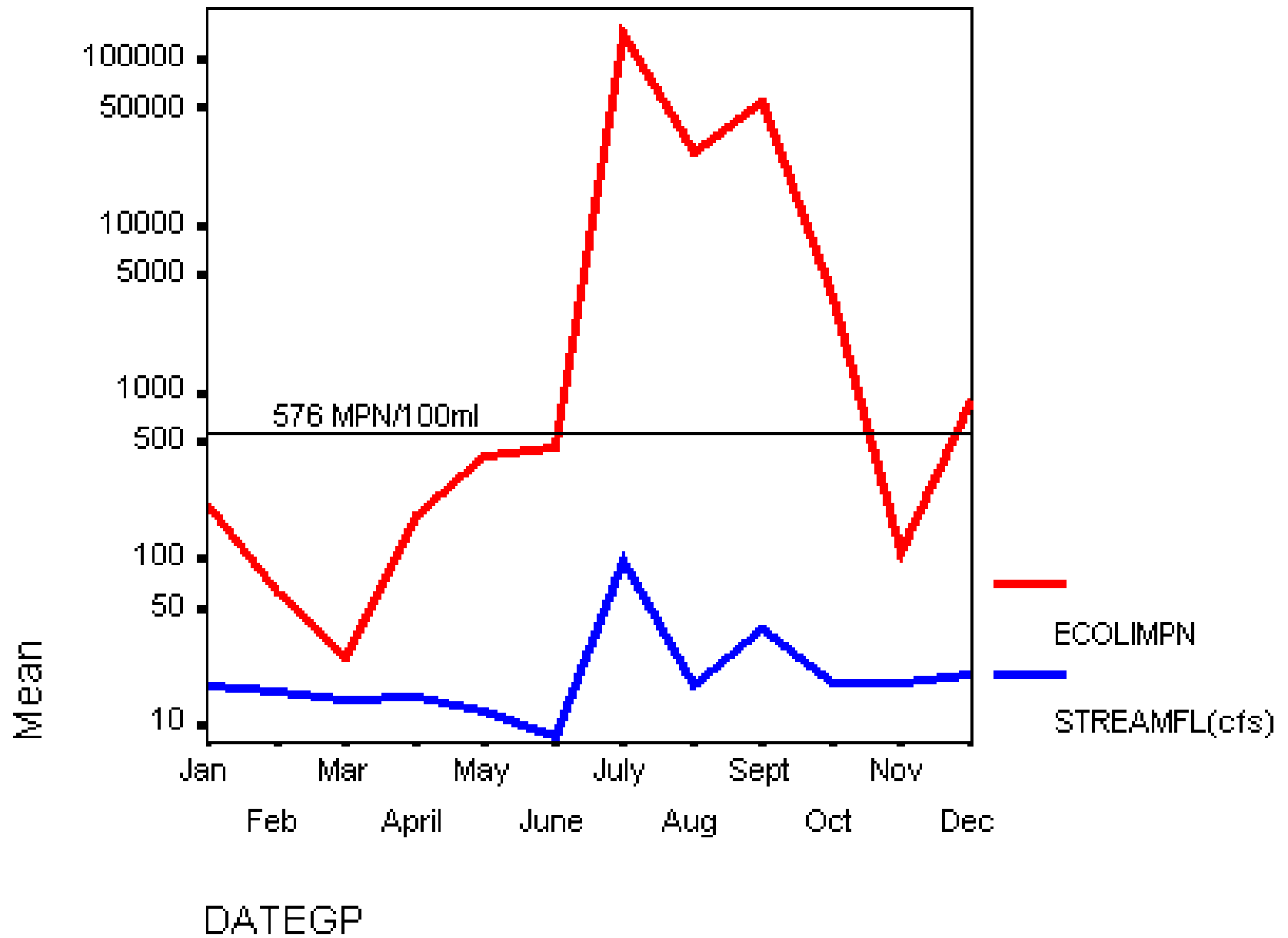
Goals:

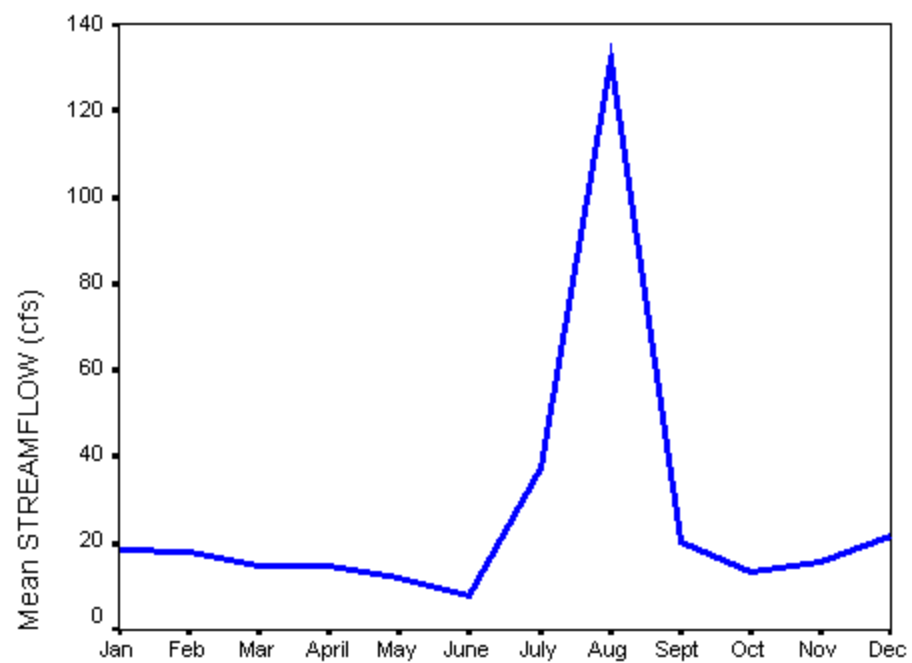
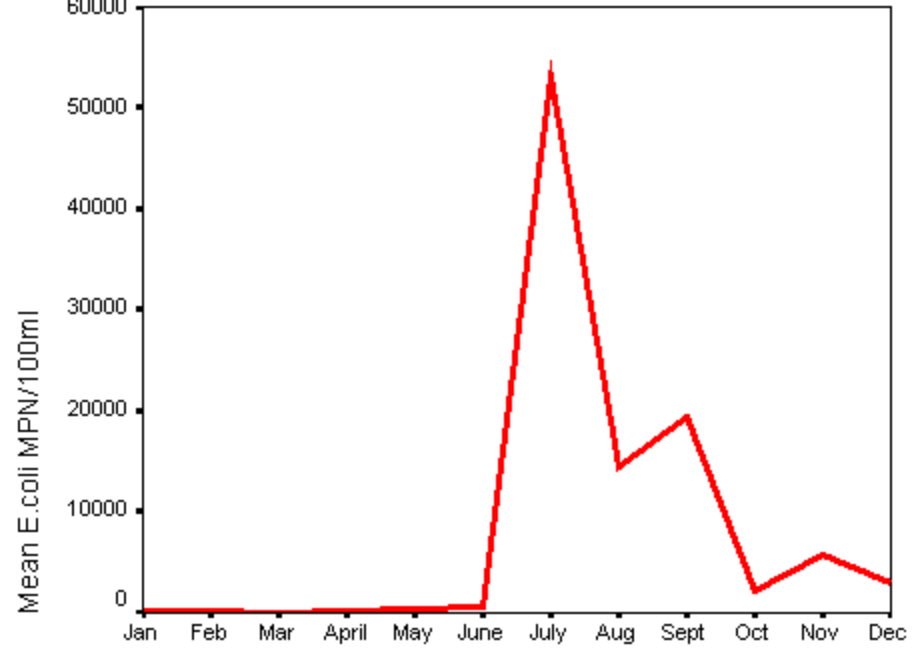
- Monitor *E. coli* levels for public health/safety and park management.
- Test the relationship between streamflow and *E. coli* count.
- Sample at three locations within the park.
- Get additional data to analyze relationship between rainfall, streamflow, and *E. coli* count.

E. coli count and Streamflow, 2007-2008



YEAR: 2008

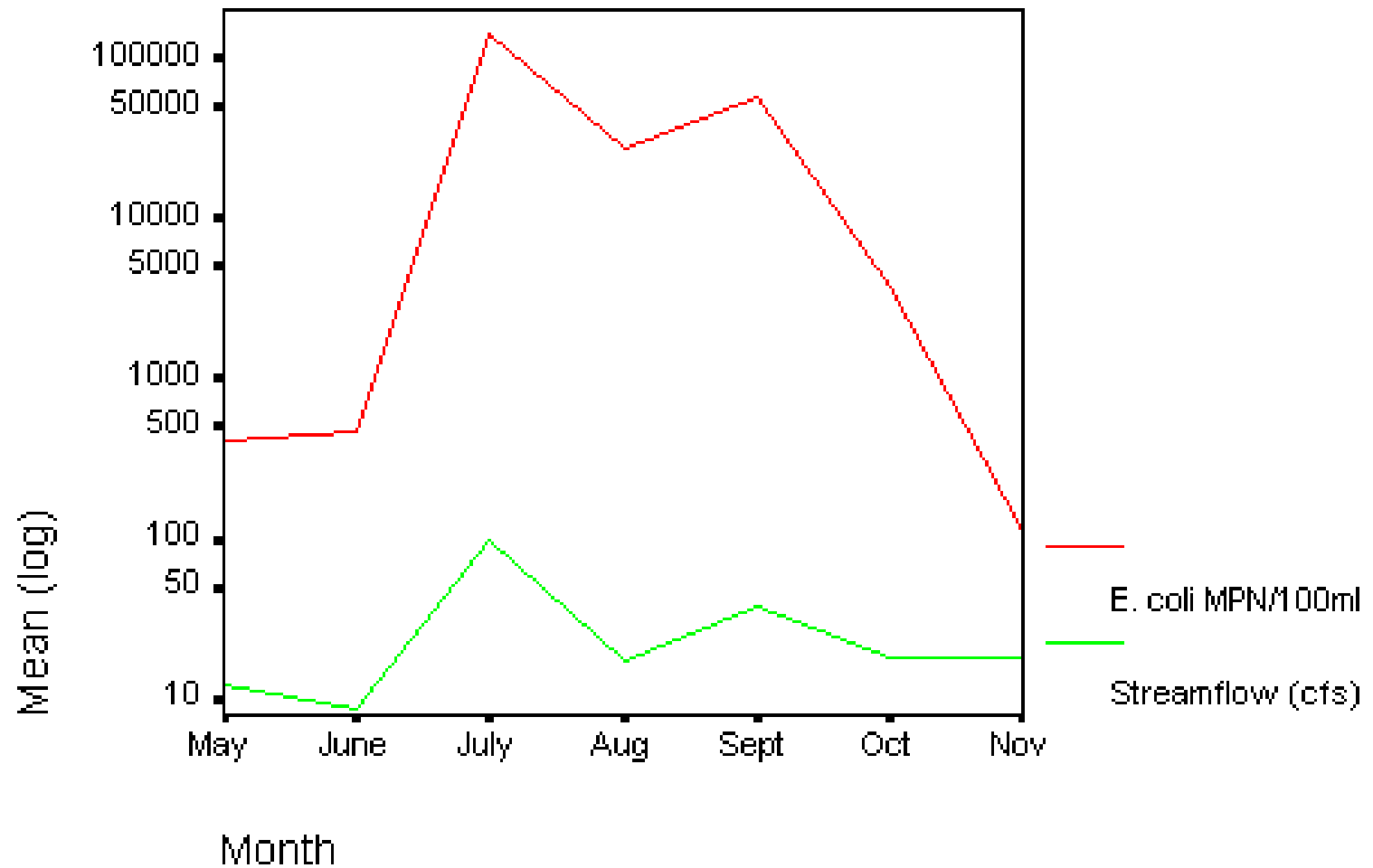




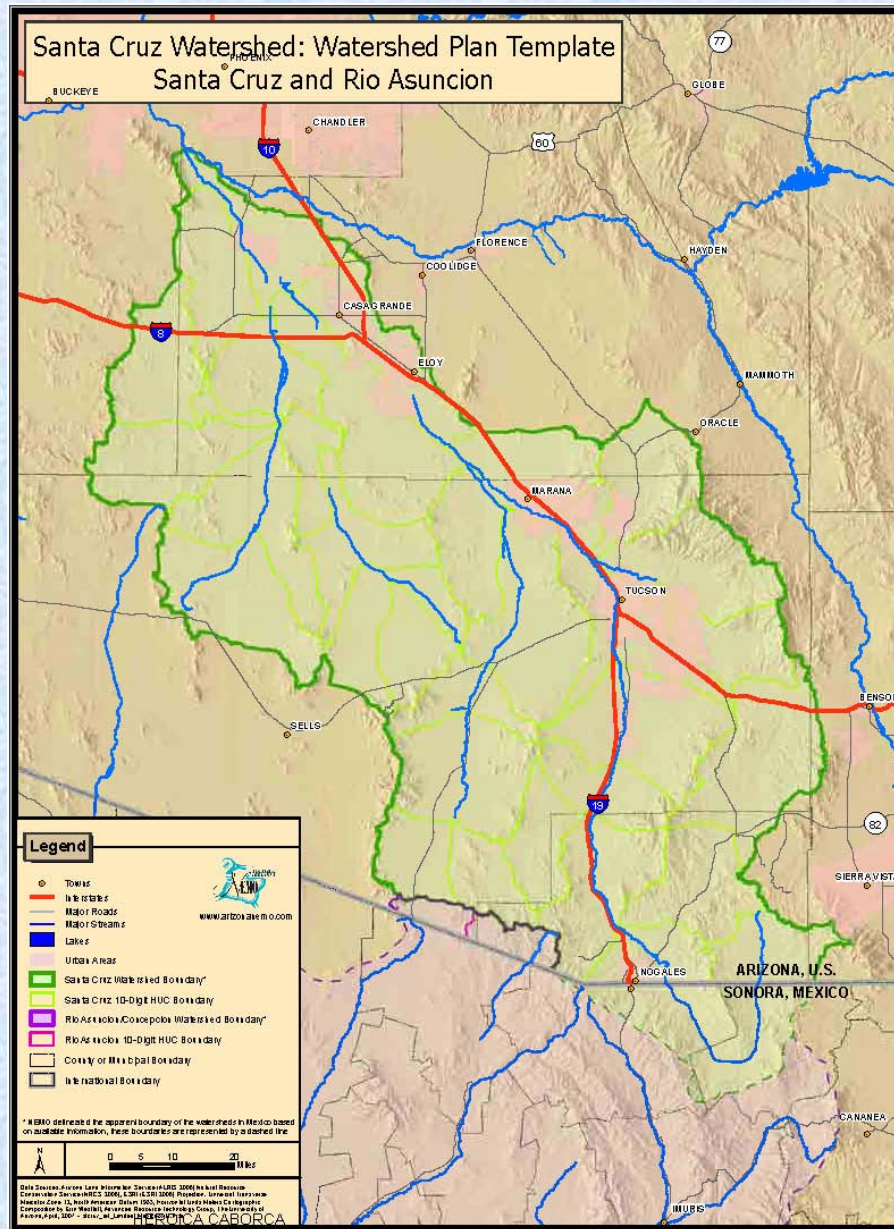
Month (2007-2009)

Monsoon Season

E. coli and Streamflow



Sources of Excessive *E. coli*?



Environmental Impact

- The presence of fecal coliform bacteria in aquatic environments indicates that the water has been contaminated with the **fecal material** of man or other animals.
- Source water may have been contaminated by **pathogens** or disease producing bacteria or viruses which can also exist in fecal material.
- The presence of fecal contamination is an indicator that a potential **health risk** exists for individuals exposed to this water.

Contamination of surface water with pathogens



Wastewater



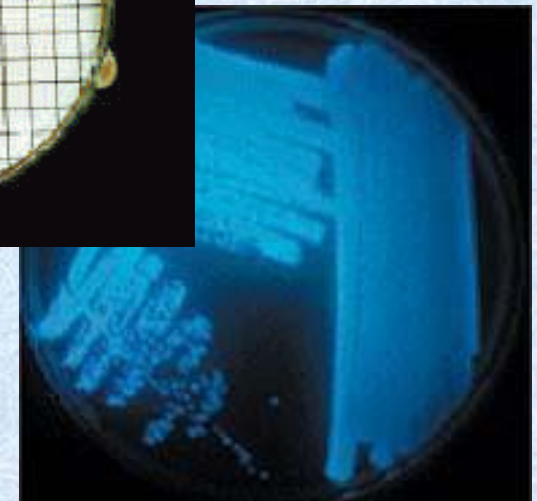
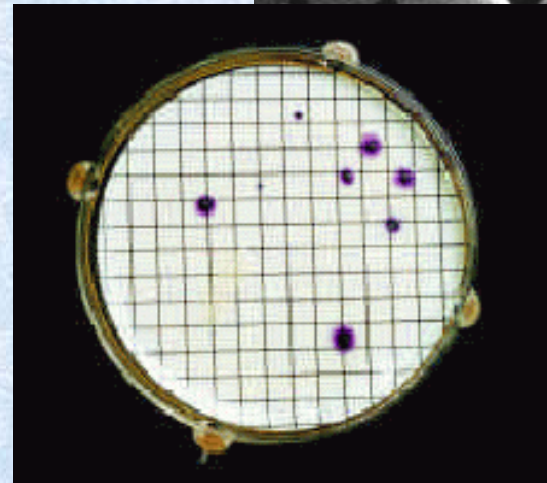
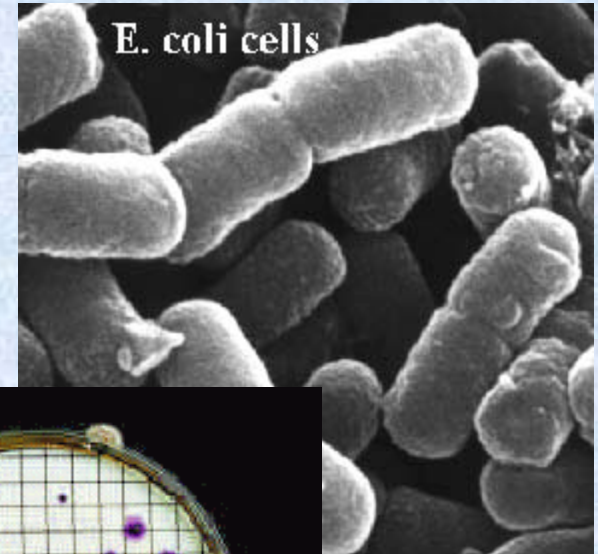
Recreation



Wildlife

What the Heck is *E.coli* ?

- *Escherichia coli* (*E.coli*) is a bacteria naturally found in the intestines and the feces of warm-blooded animals
- Many different types, most harmless, but some may cause illness
- Laboratory tests can distinguish one strain from another
- Commonly used as an indicator of **fecal** pollution of water



There's *E.coli* in the Water, But Where Did it Come From?

- Bacterial Source Tracking (BST) uses laboratory tests to determine if *E.coli* (or other fecal bacteria) in water samples came from animal or human feces
- Most BST methods are **Library Dependent**, need database of reference bacteria from known animal and human sources to identify sources of water isolates
- “Local” watershed libraries of known source *E.coli* isolates currently considered most useful for identifying *E.coli* obtained from ambient water samples

Problems with *E.coli*

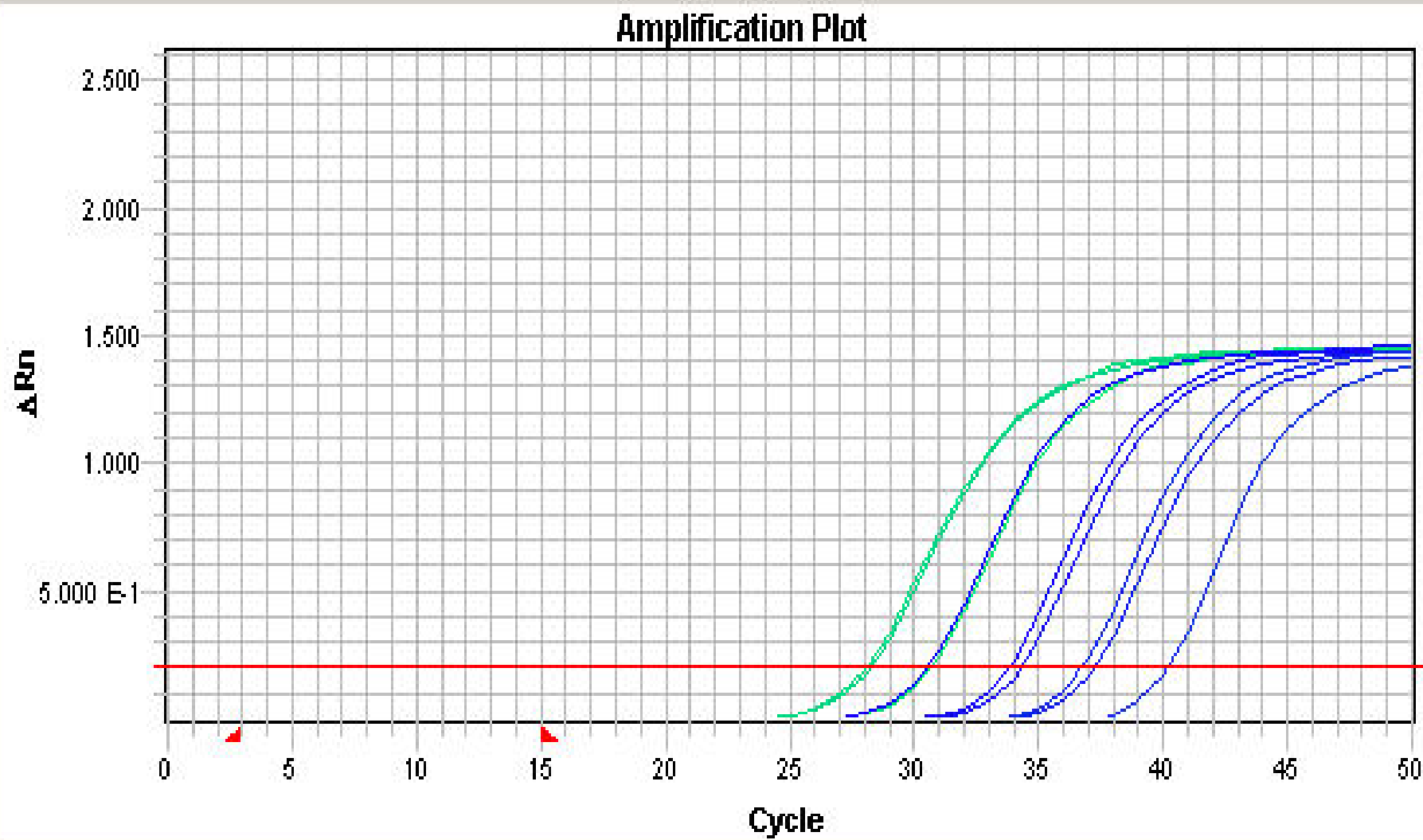


- High degree of genetic diversity not attributed to a specific host animal source
- Potential for *E.coli* to replicate outside of the host
- Geographic and temporal variability

Alternatives to *E.coli*: *Bacteroides*

- Bacteria belonging to the genus *Bacteroides* have been suggested as alternative fecal indicators to *E.coli* or fecal coliforms
- They make up a significant portion of the fecal bacterial population
- Have little potential for re-growth in the environment
- Have a high degree of host specificity that likely reflects differences in host animal digestive systems

Amplification Plot



Probe and Primer Pairs

Assay	Primer/probe name and sequence (5' - 3')	Size (bp) of product	Annealing temp (°C)
AllBac (all <i>Bacteroides</i>)	AllBac296f, 5' -GAGAGGAAGGTCCCCCAC- 3' AllBac412r, 5' -CGCTACTTGGCTGGTTTCAG- 3' AllBac375Bhqr, 5' -(FAM)CCATTGACCAATATTCCTCACTGCTGCCT(BHQ-1)- 3'	106	60
HuBac (human cluster of <i>Bacteroides</i>)	HuBac566f, 5' -GGGTTTAAAGGGAGCGTAGG- 3' HuBac692r, 5' -CTACACCACGAATTCCGCCT- 3' HuBac594Bhqf, 5' -(FAM)TAAGTCAGTTGTGAAAGTTTGCGGCTC(BHQ-1)- 3'	116	60
BoBac (bovine cluster of <i>Bacteroides</i>)	BoBac367f, 5' -GAAGGCTGAACCAGCCAAGTA- 3' BoBac467r, 5' -GCTTATTCATACGGTACATACAAG- 3' BoBac402Bhqf, 5' -(FAM)TGAAGGATGAAGGTTCTATGGATTGTAACTT(BHQ-1)- 3'	100	57



End Goal

- The goal of this project is to use assays that are specific for the host animal regardless of geographic location
- Methods are designed to target specific diagnostic sequences within the *Bacteroides* 16S rRNA gene present in feces from different animals
- Determine the potential human or animal sources of microbial contamination of water to aid development of TMDLs and watershed protection strategies for Tumacacori National Historical Park and the Santa Cruz River