

Volunteer Monitoring for Bacteria in San Francisco Bay Area Creeks

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U.S. EPA Region 9 Lab



EPA Region 9 Volunteer Monitoring Support

- Technical assistance
- Field sampling equipment loans
- Limited laboratory analyses

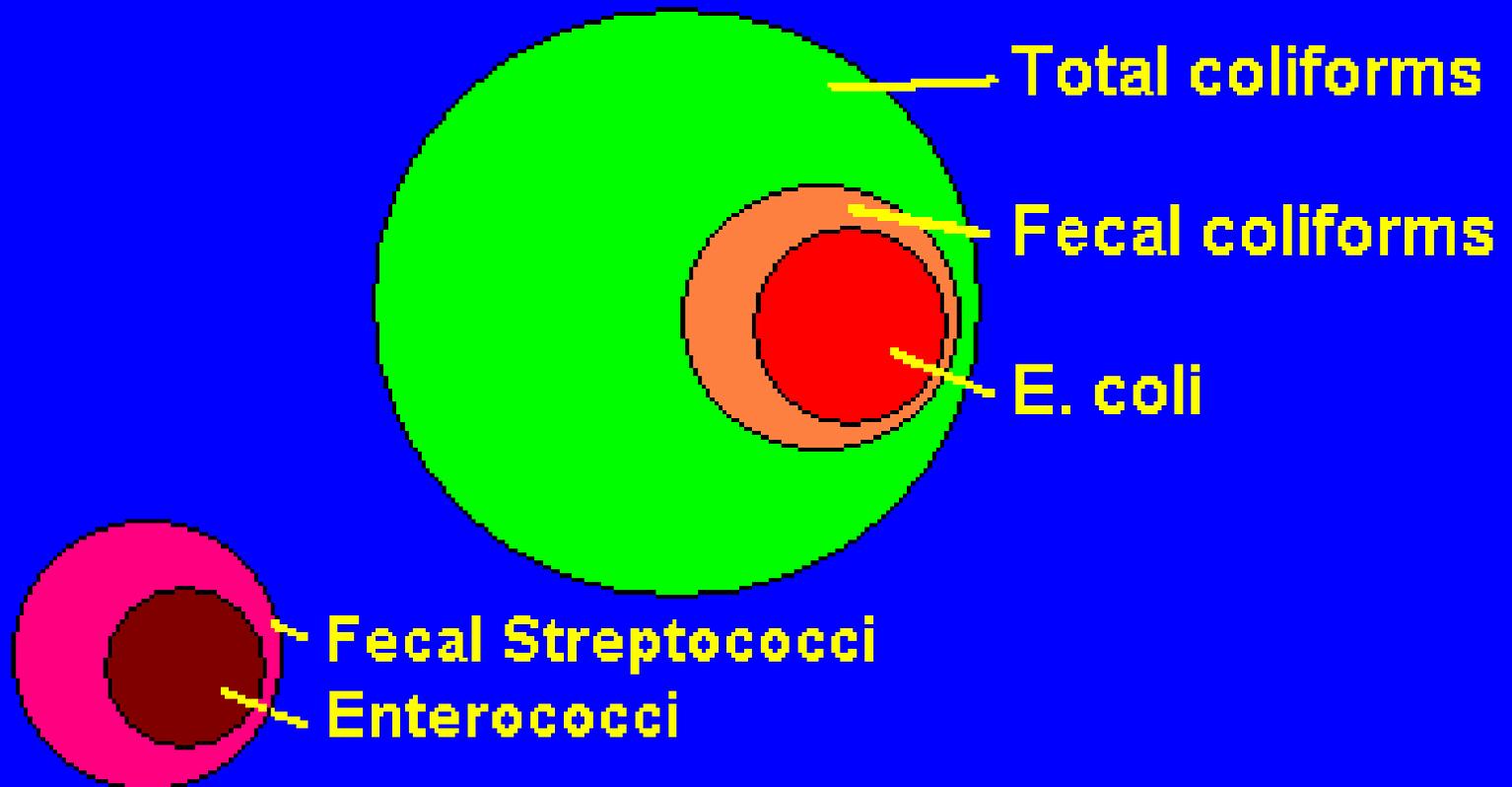
Outline of Presentation

- Field sampling and analysis of bacteria
- Bacterial results from four creeks
- Citizen monitoring action taken

Bacterial Sample Collection

- **Five consecutive samples over a 30-day period**
- **5-10 stations sampled during wet and dry seasons**
- **One field replicate per week**
- **Samples delivered and analyzed within 24 hours**

Indicator Bacteria



IDEXX Methods

- Total Coliforms and *E. coli*
 - Colilert®
- Enterococci
 - Enterolert®
- Results in 18-24 hours
- 0-2400 MPN/100 mL



Colilert®/Enterolert® Procedure



Map of Sites



Pacific Ocean

San Pedro
Creek

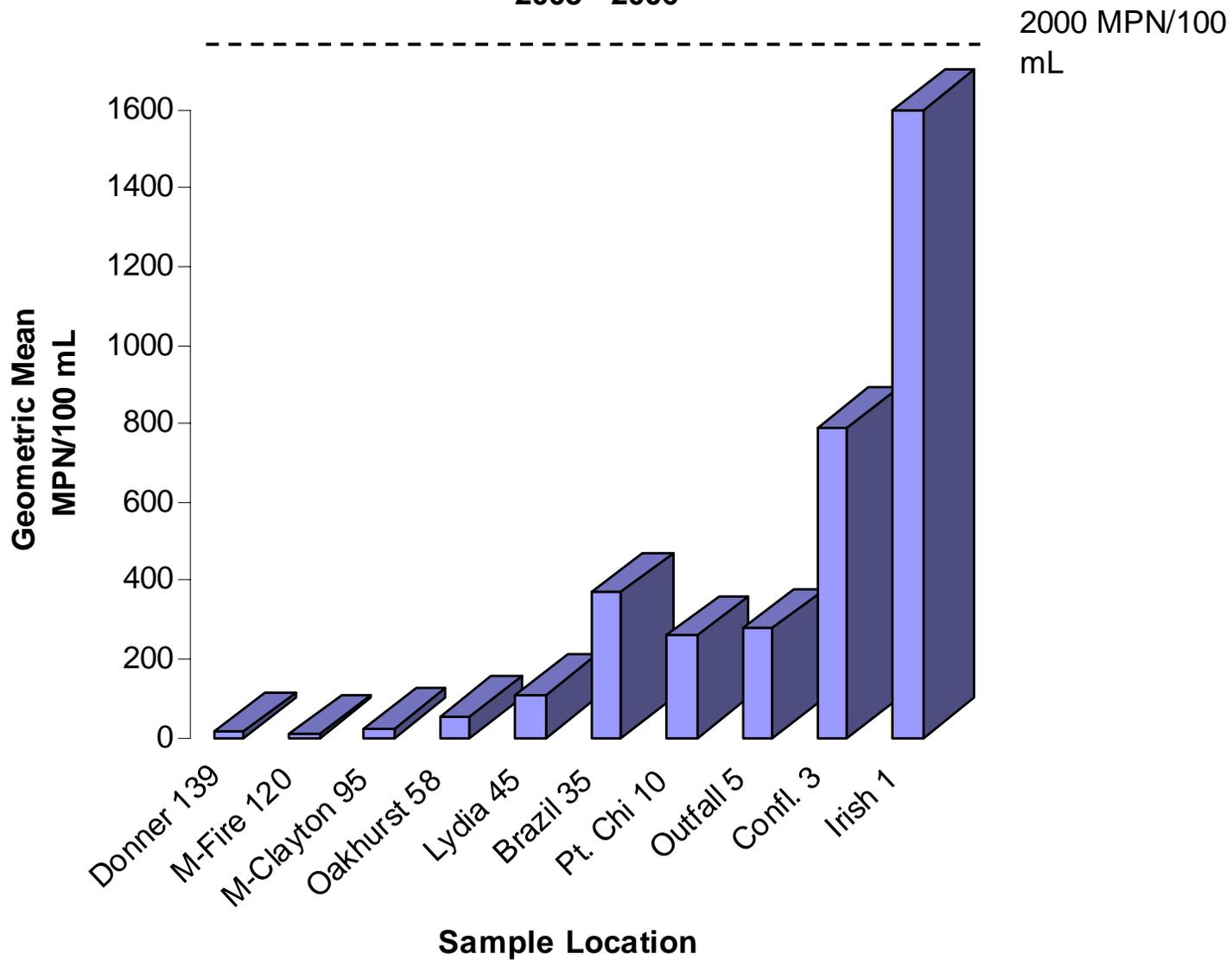
Cerrito Creek

Temescal
Creek

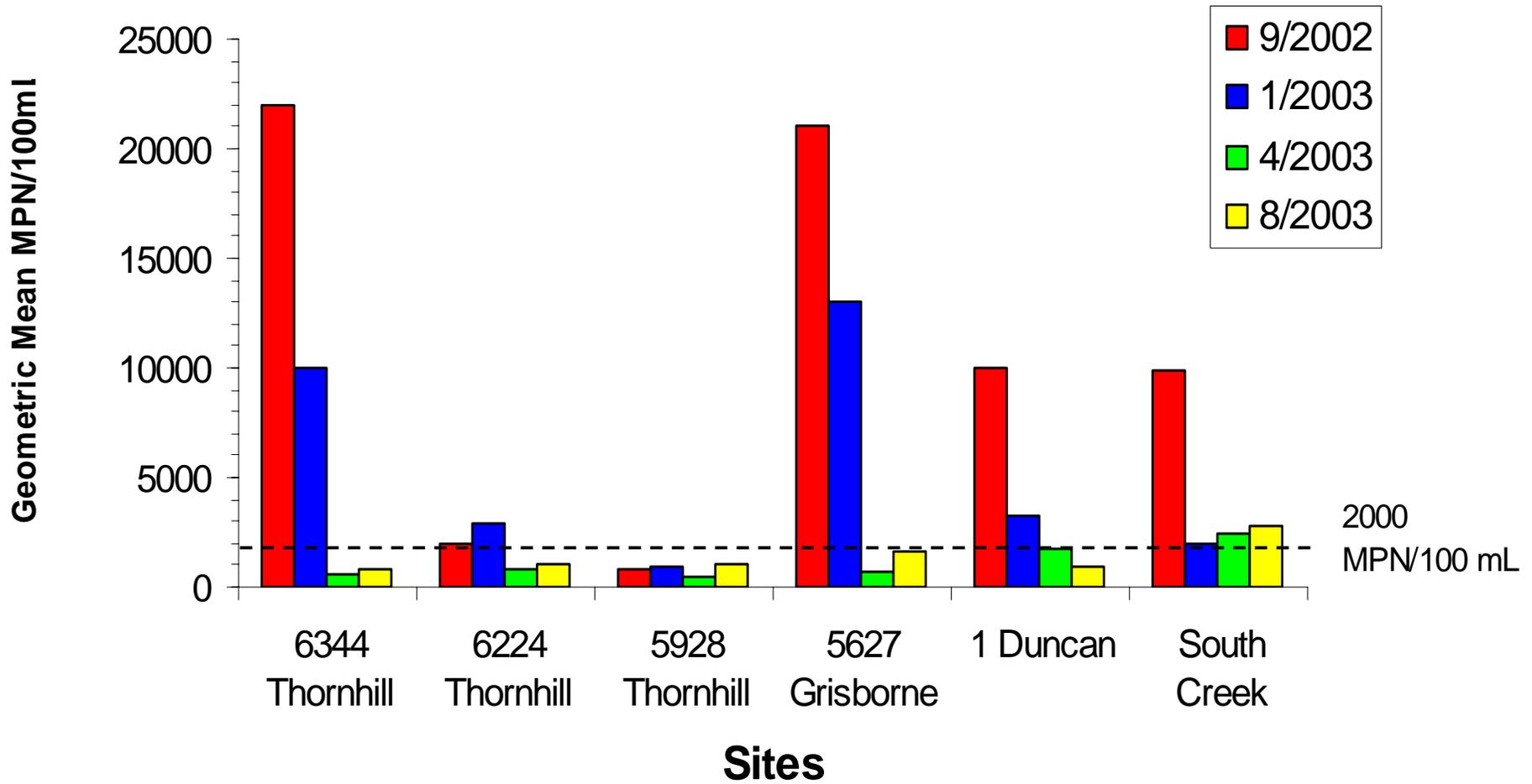
Mt. Diablo
Creek



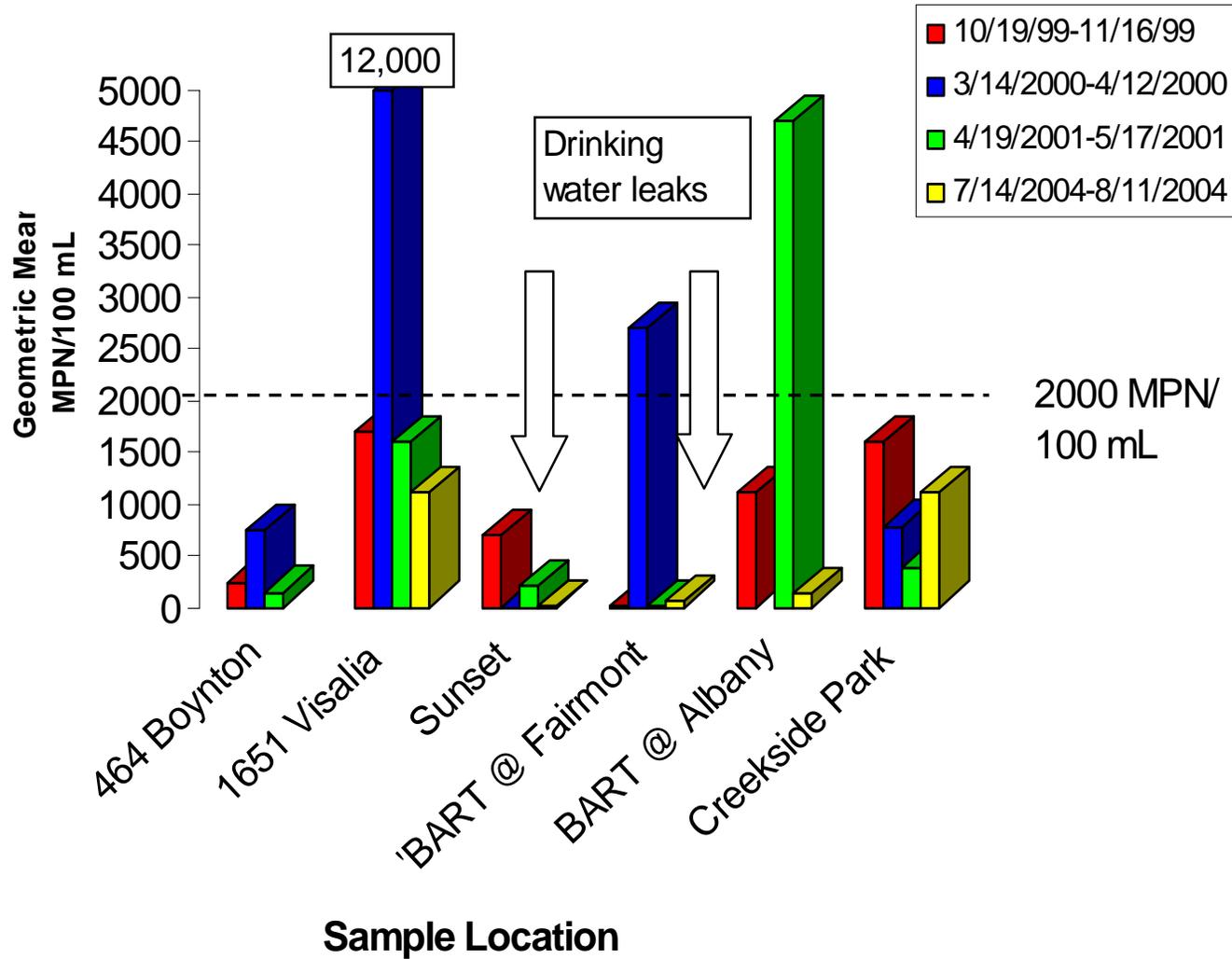
**Mt. Diablo Creek *E. coli*
2005 - 2006**



Temescal Creek *E. coli* 2002-2003

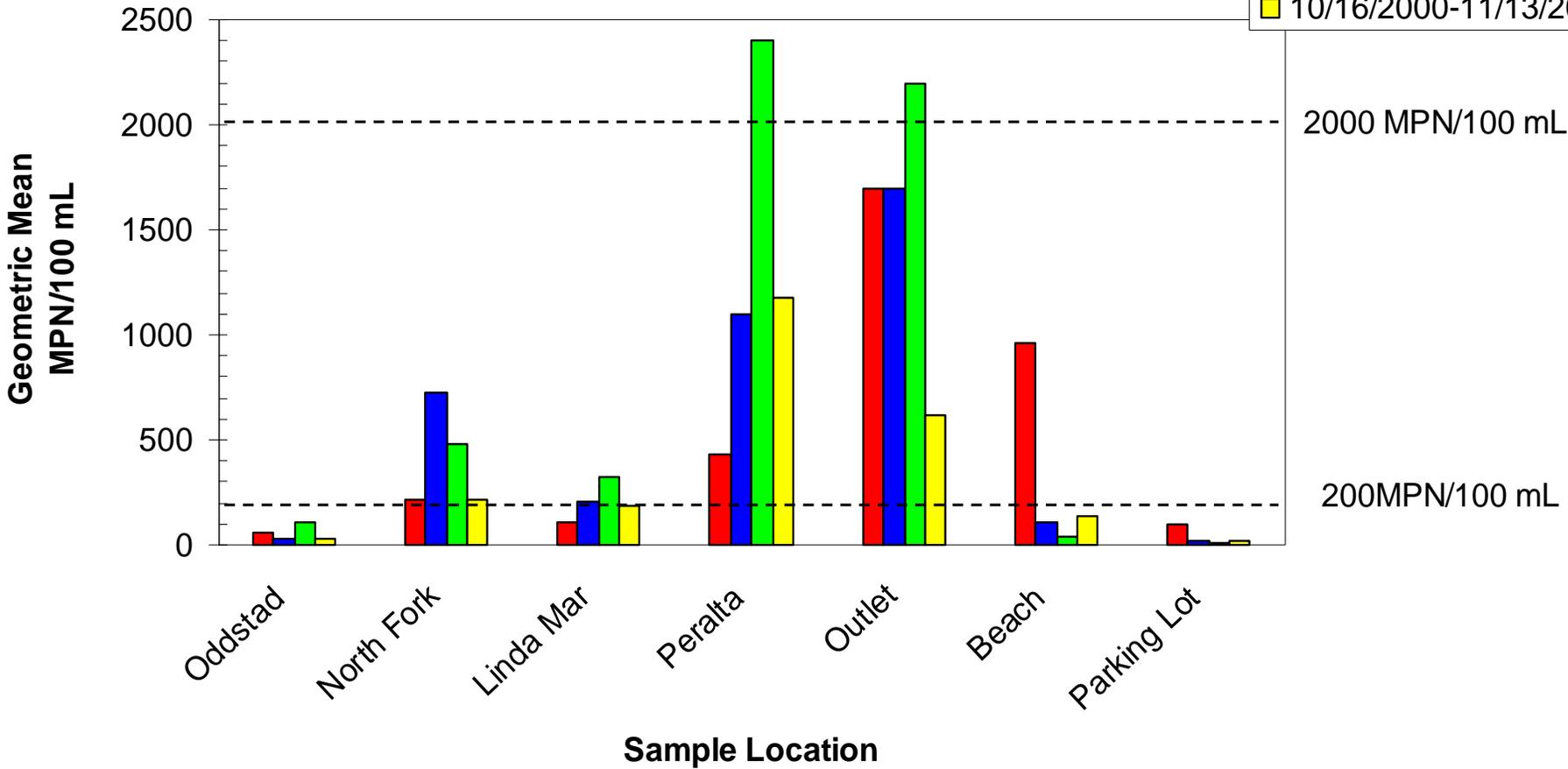


Cerrito Creek *E. coli* 1999- 2004

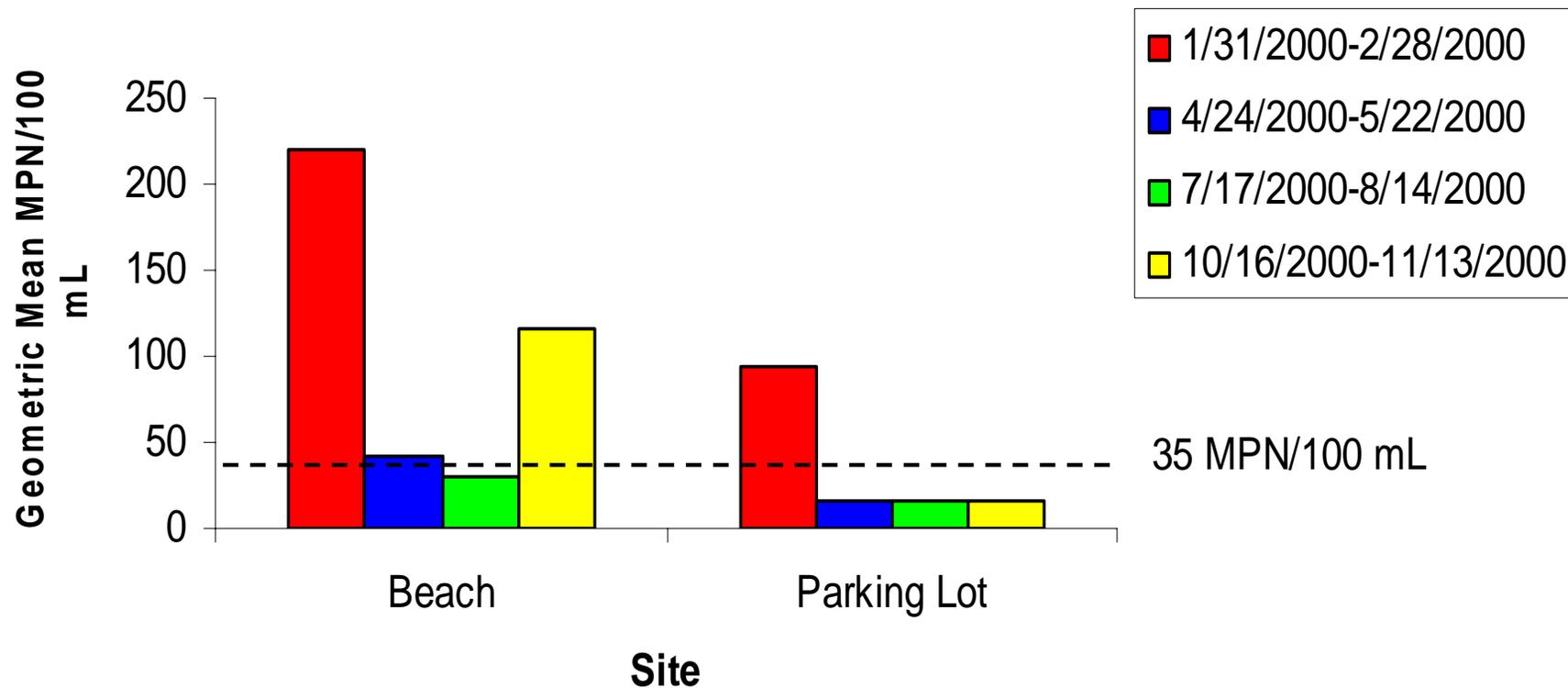


**San Pedro Creek *E. coli*
Winter to Fall, 2000**

- 1/31/2000-2/28/2000
- 4/24/2000-5/22/2000
- 7/17/2000-8/14/2000
- 10/16/2000-11/13/2000



San Pedro Creek *Enterococcus*, Winter to Fall, 2000



San Pedro Creek

- Beach posted when bacterial levels exceed standards
- TMDL to determine bacterial sources
- BMPs for farmers and ranchers

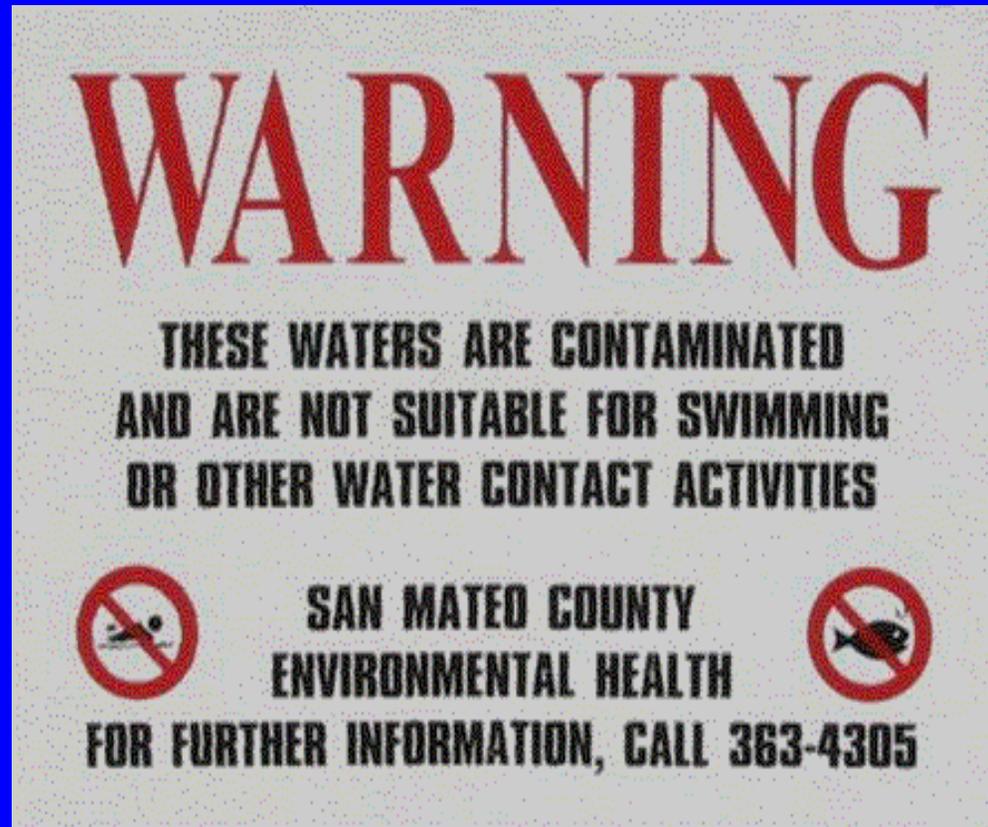


Conclusions

- Sites greatly exceeding the bacterial water quality criterion indicated sewer line leaks
- The absence of bacteria can indicate chlorinated water leaks
- At the beach site, both indicators (*E. coli* and *Enterococcus*) exceeded state standards

Outcomes of Volunteer Monitoring

- Form Partnerships
- Increase stewardship and public information
- Post Beaches
- Reduce bacterial sources



Lessons Learned

- *E. coli* is a very good indicator of sewage
- Urban creeks generally have elevated bacterial levels
- Values typically higher in dry weather
- San Francisco Bay Region Basin Plan Water Quality Objectives for non-contact recreation exceeded at almost all urban creek sites

Field Duplicate Variability

- Results from > 100 field duplicates (sequentially collected) from ambient and wastewater analyzed w/Colilert
- E. coli range: $1 - 34 \times 10^6$
 - RPD mean: 29%; 95% C.F. RPD < 90% (factor of ~2.7)
- Total coliform range 1 -155 x 10⁶
 - RPD mean: 22%; 95 % C.F. RPD <73% (factor of ~2.2)
- No effect of magnitude on RPD
- Similar to expected analytical variability

EPA R.9 Ambient Monitoring Quality Control

- DQO: Five weeks of samples for comparison with bacterial Standards and Criteria.
- Hold time ASAP or up to 24 hrs @ $< 10^{\circ}\text{C}$
- Field duplicate QC: within a factor of 2-3
- 1:10 dilution for Colilert^R quantification from <10 -24,000. No dilution for Enterolert^R except in marine waters.
- 1 media positive/negative control per lot
- Per day or 20 samples:
 - 1 field duplicate, 1 lab duplicate, 1 blank

Bacteria Standards

5 samples spaced over a 30 day period

- **CA Assembly Bill 411: Waters adjacent to public beaches and public water-contact sports areas**
 - Total coliform log mean < 1,000/100 mL
 - Fecal coliform log mean < 200/100 mL
 - Enterococcus log mean < 35/100 mL
- **CA Water Quality Objectives SF Bay Region**
 - Non-contact recreation
 - Fecal coliform mean <2000 / 100mL
 - Water contact recreation
 - Fecal coliform log mean <200 / 100 mL

Bacteria Criteria

- **EPA AWQC for Bathing Waters (Water Contact Recreation)**
 - **Fresh water**
 - *E. coli* geometric mean 126 / 100 mL
 - Enterococcus geometric mean 33 / 100 mL
 - **Salt water**
 - Enterococcus geometric mean 35 / 100 mL

WARNING

THESE WATERS ARE CONTAMINATED
AND ARE NOT SUITABLE FOR SWIMMING
OR OTHER WATER CONTACT ACTIVITIES



SAN MATED COUNTY
ENVIRONMENTAL HEALTH



FOR FURTHER INFORMATION, CALL 363-4305





Pacific Ocean

San Pedro
Creek

Contra
Creek

Temescal
Creek

