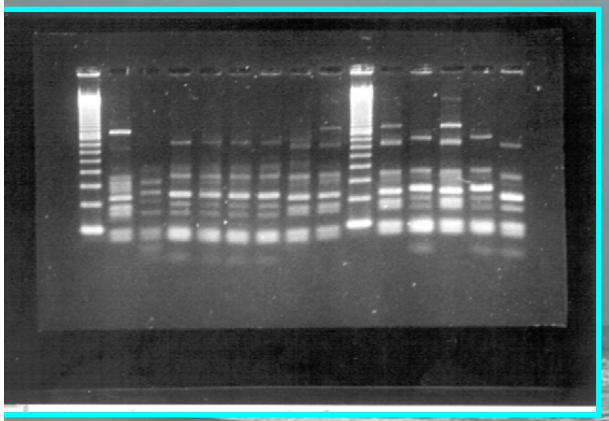
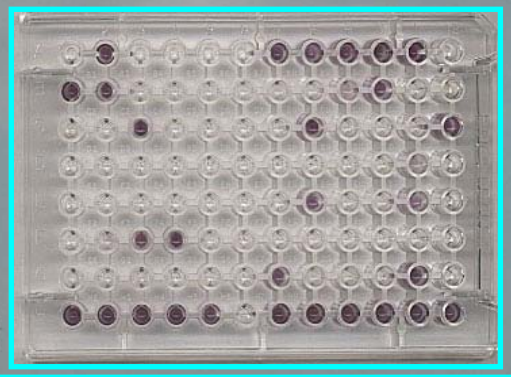
MST Project Examples

Charles Hagedorn





Virginia Tech

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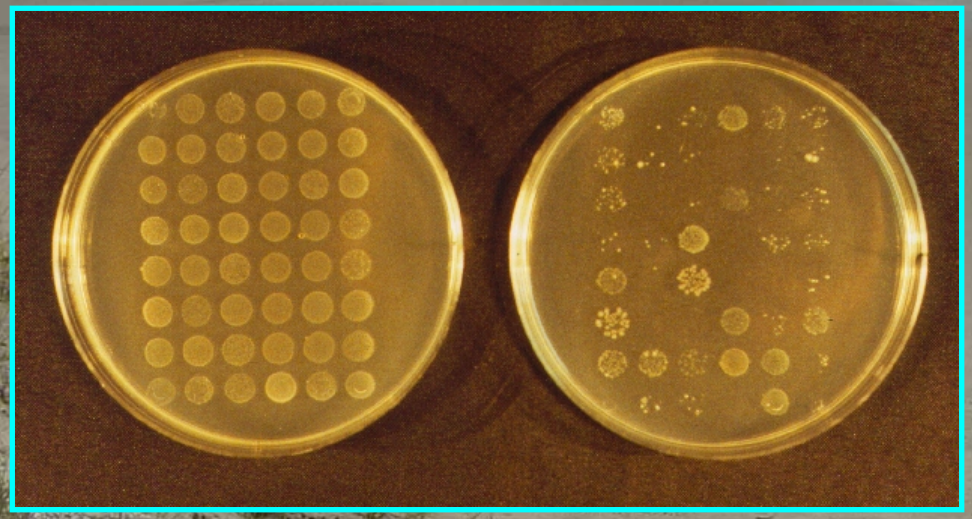
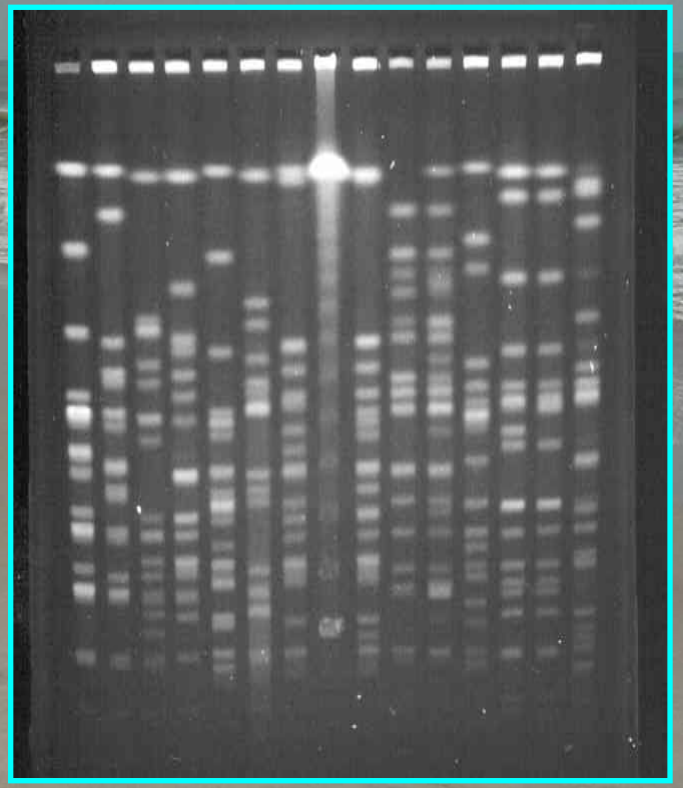




Sometimes a source is obvious…

Sometimes you suspect a source…

Sometimes little is obvious…

VT Source Tracking Program

30+ water quality projects in VA with state (DEQ, DCR, VDH) and federal (USDA, USGS, NSF, EPA) support, plus projects in 14 other states.

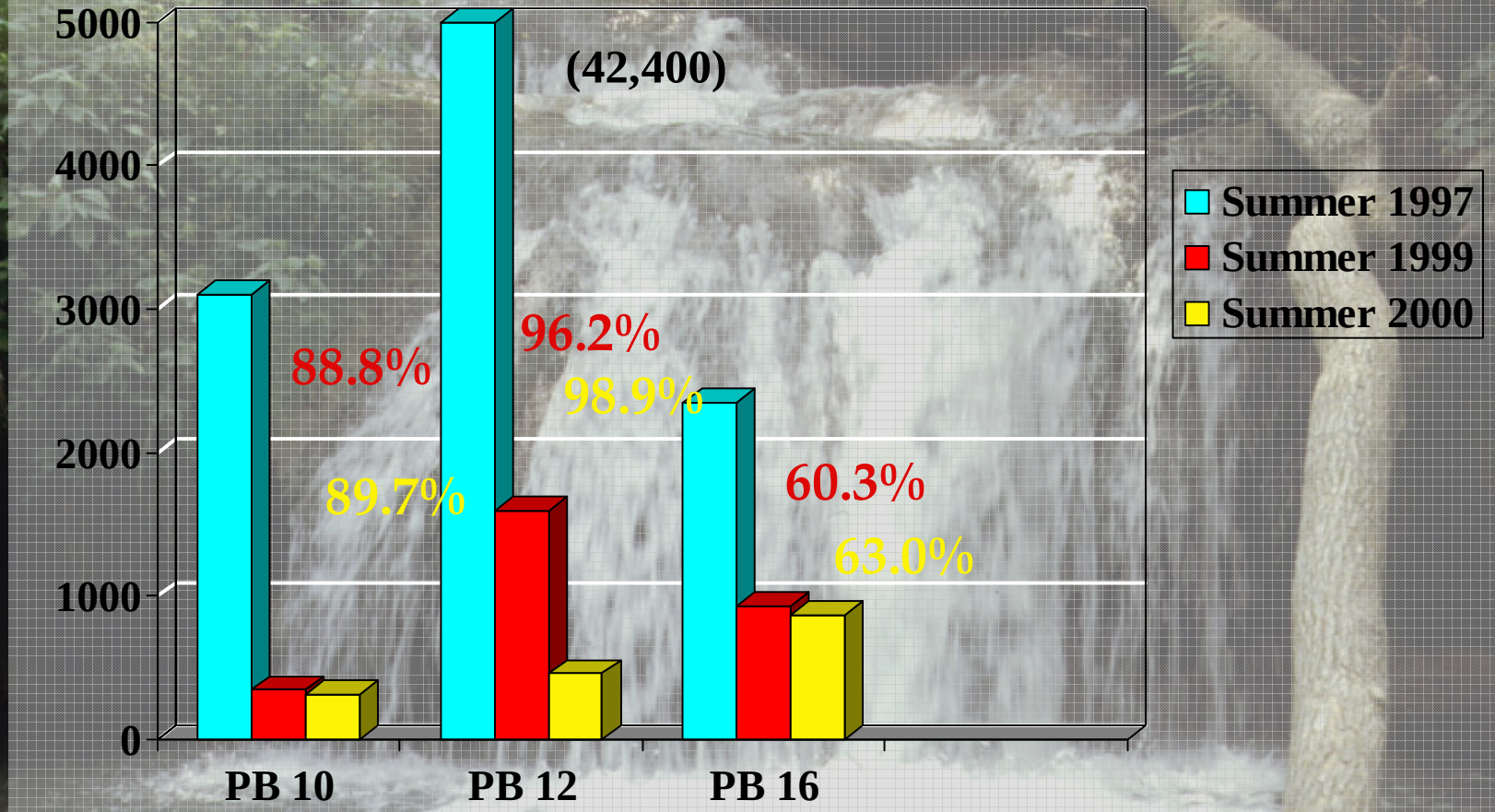
Method Development (USDA, NOAA, USGS, SCCWRP-EPA, DEQ). PFGE, ARA, Biolog + Targeted Sampling & Ribotyping, PCR-custom primers.

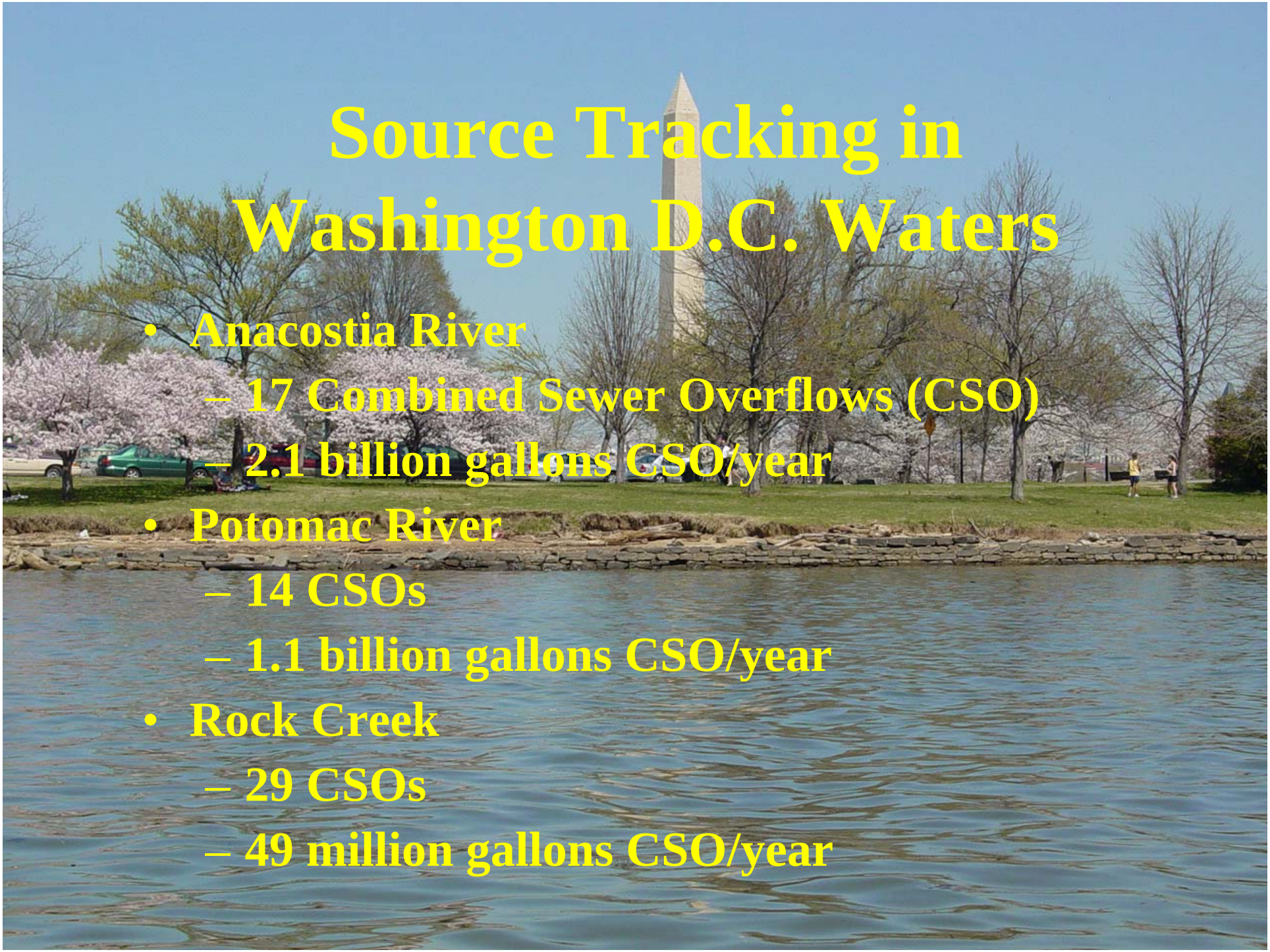
Concentrate on locations where remediation efforts are underway.

Unknown Stream Isolates from Page Brook, 5/97-10/97

Sampling Site	Source Identification (%)				
	Cow	Deer	Human	Geese	?
PB10	81	11	0	4	4
PB12	86	6	0	5	3
PB16	78	5	0	8	9

Percent Fecal Coliform Reductions in Page Brook





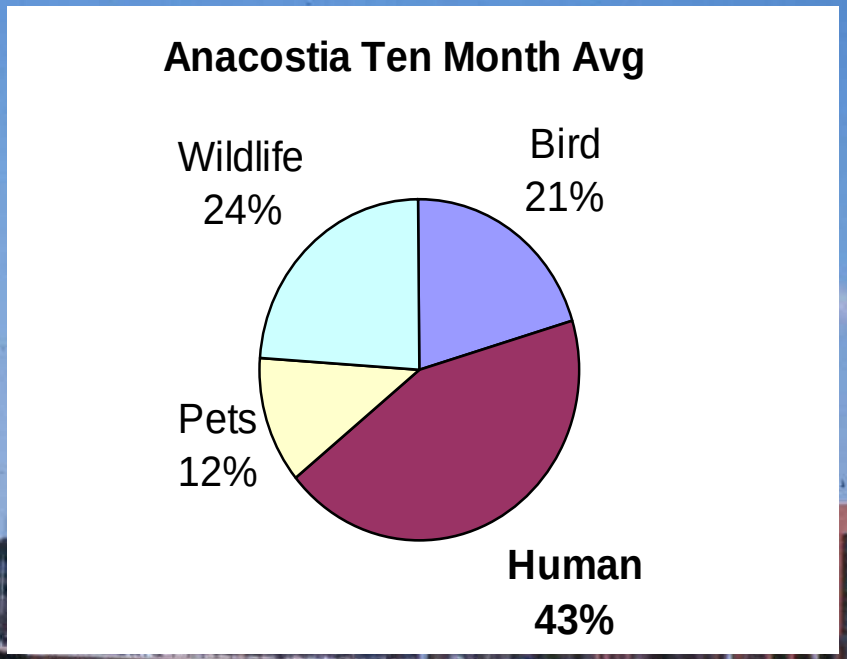
Source Tracking in Washington D.C. Waters

- Anacostia River
  - 17 Combined Sewer Overflows (CSO)
  - 2.1 billion gallons CSO/year
- Potomac River
  - 14 CSOs
  - 1.1 billion gallons CSO/year
- Rock Creek
  - 29 CSOs
  - 49 million gallons CSO/year

Results for the Anacostia River

1,483 enterococci isolates from 6 sites were analyzed from July 2002 to April 2003

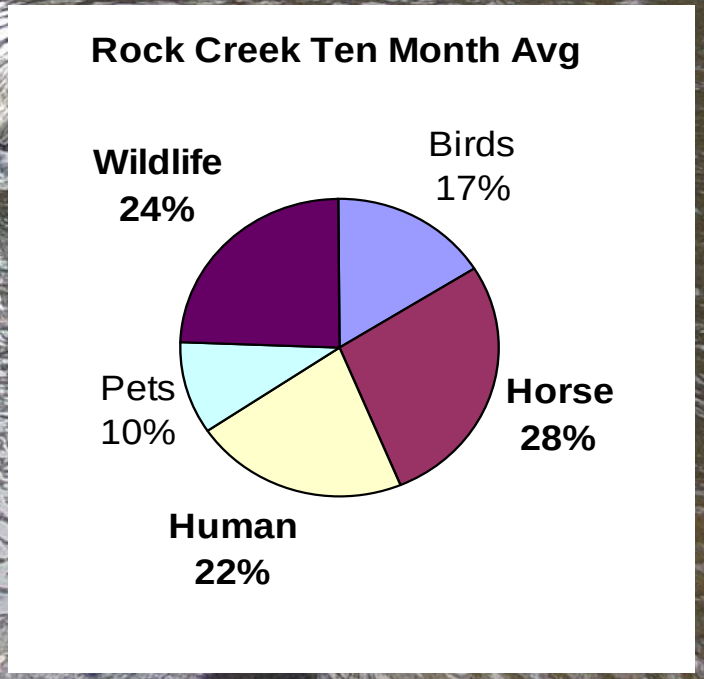
Source	Percent
Human	43 A
Wildlife	24 B
Bird	21 B
Pets	12 C



Results for Rock Creek

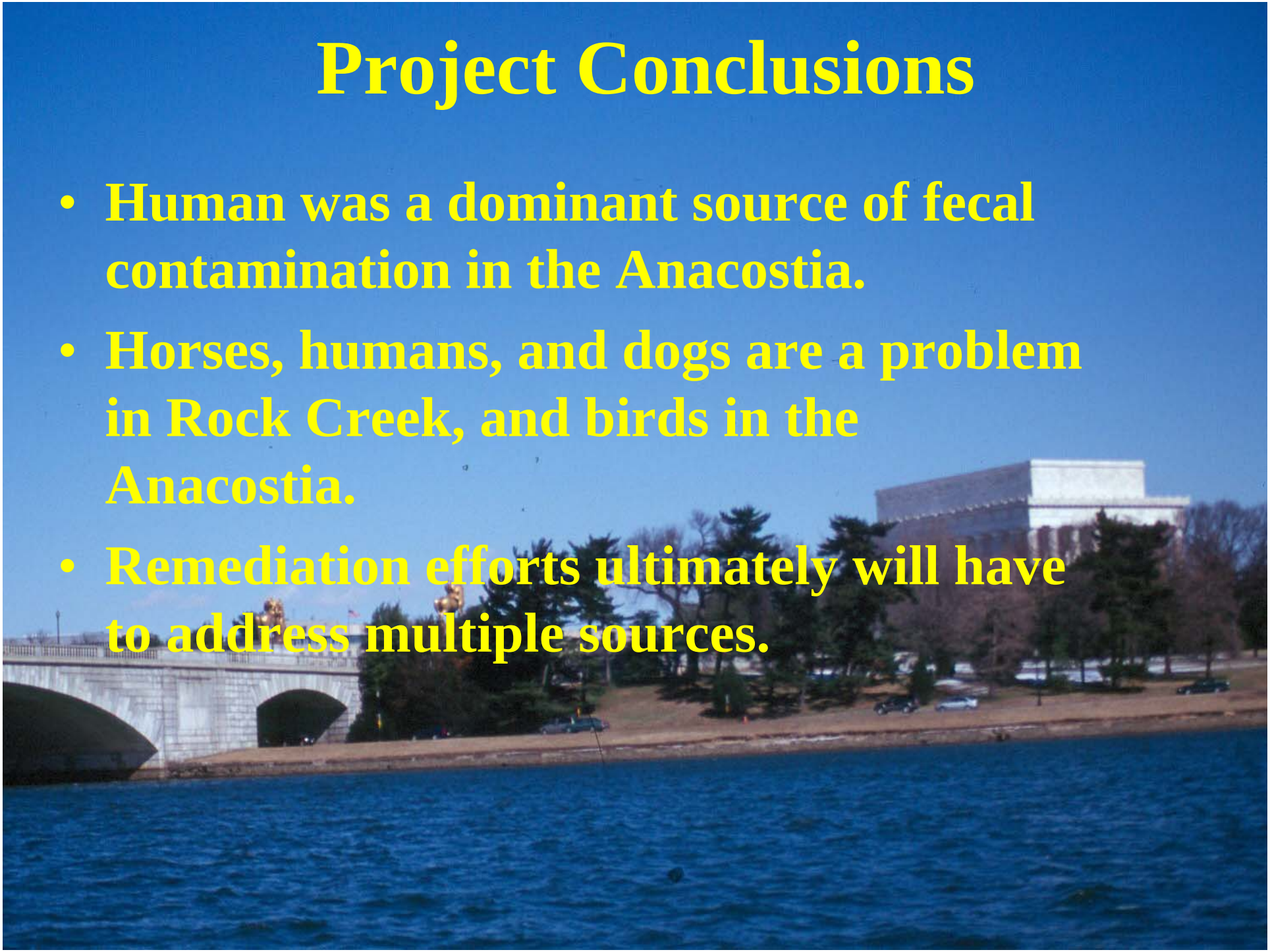
1,568 isolates from 6 sites were analyzed from July 2002 to April 2003

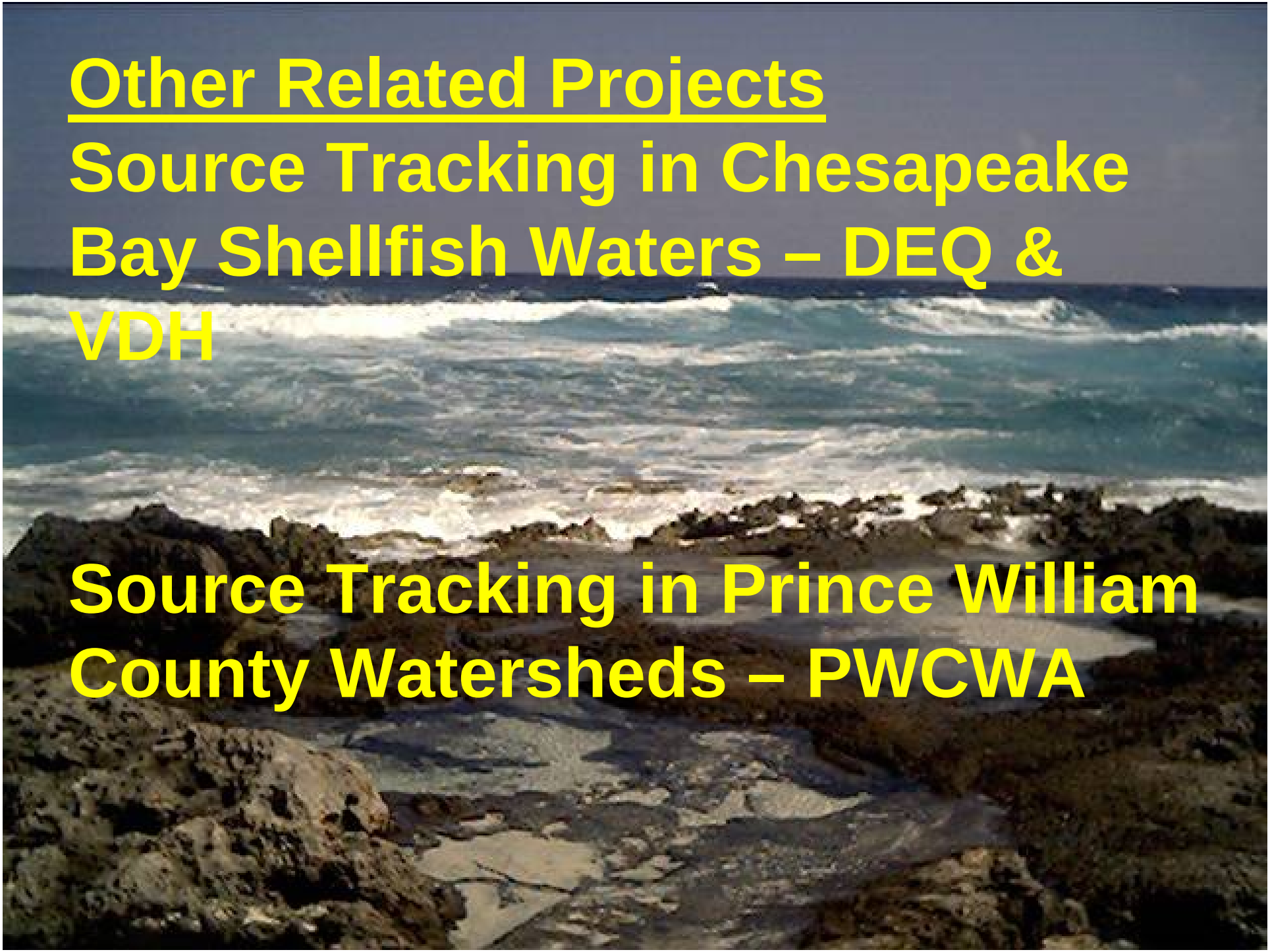
Source	Percent
Horse	28 A
Wildlife	24 A
Human	22 AB
Bird	17 BC
Pets	10 C



Project Conclusions

- Human was a dominant source of fecal contamination in the Anacostia.
- Horses, humans, and dogs are a problem in Rock Creek, and birds in the Anacostia.
- Remediation efforts ultimately will have to address multiple sources.




Other Related Projects
Source Tracking in Chesapeake Bay Shellfish Waters – DEQ & VDH
Source Tracking in Prince William County Watersheds – PWCWA

Bacterial Source Tracking in Virginia's Public Beaches
EPA-VDH-HRSD

Source Tracking Objectives

- Identify ‘problematic’ beaches.
- Perform Bacterial Source Tracking (BST) to identify the origin of fecal contaminants.
- Locate potential methods of transport of fecal contaminants into bathing areas.
- Evaluate the usefulness of the fluorometer for identifying a human signature in water samples.

Detection of Optical Brighteners from Human Sources of Fecal Pollution

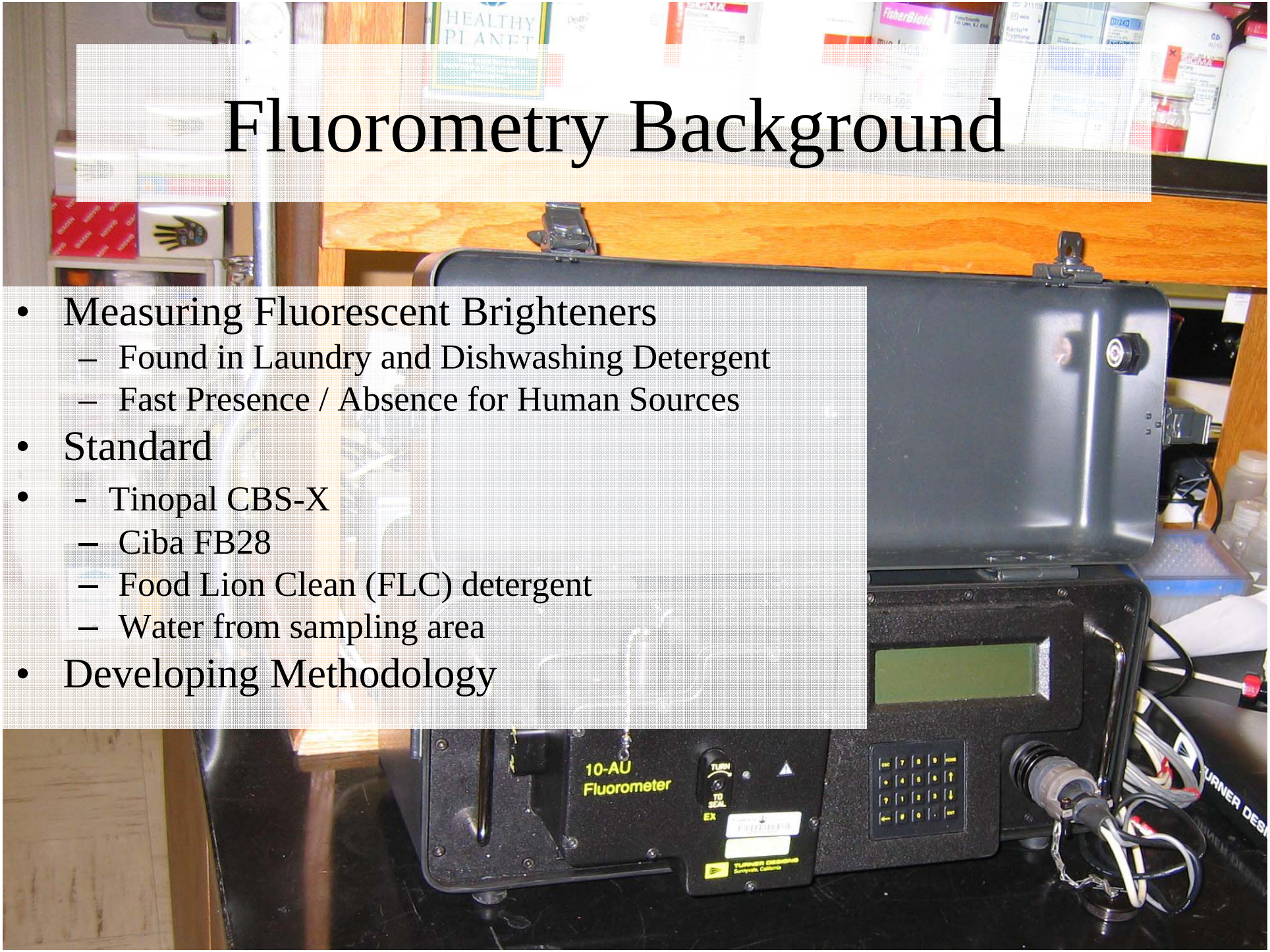
OBs found in laundry detergents, activated at 360nm, fluoresce at 410-430nm.

Sponsored by NOAA and CZM

Turner Designs 10AU Fluorometer

Fluorometry Background

- Measuring Fluorescent Brighteners
  - Found in Laundry and Dishwashing Detergent
  - Fast Presence / Absence for Human Sources
- Standard
- - Tinopal CBS-X
  - Ciba FB28
  - Food Lion Clean (FLC) detergent
  - Water from sampling area
- Developing Methodology




ILLEGAL
Fluorescent plumes could be found and followed to a home…

Fluorometry Results

- Effective in open-ocean, bay, or river waters where concentrated plumes are found.
- Limited potential in water samples and storm outfalls. Some materials can give false positive results (look for the “home run”).
- Emission spectra can be narrowed, should be close to “fool-proof.”
- Cross-validation successful.

Source Tracking in NYC and Long Island Waters

Source Tracking in NYC and Long Island Waters

Quality of water column is quite good.

Problem is organics and metals in the sediments.

Fecal impairments are numerous but localized.

100% of shellfish beds closed.

Source Tracking in Long Island Waters

-Sea Grant project with NOAA.

-*E. coli* and PFGE.

-Human signature found at some locations, opportunity to cross-check with fluorometry.

Source Tracking in NYC and Long Island Waters

Human signatures around older communities.

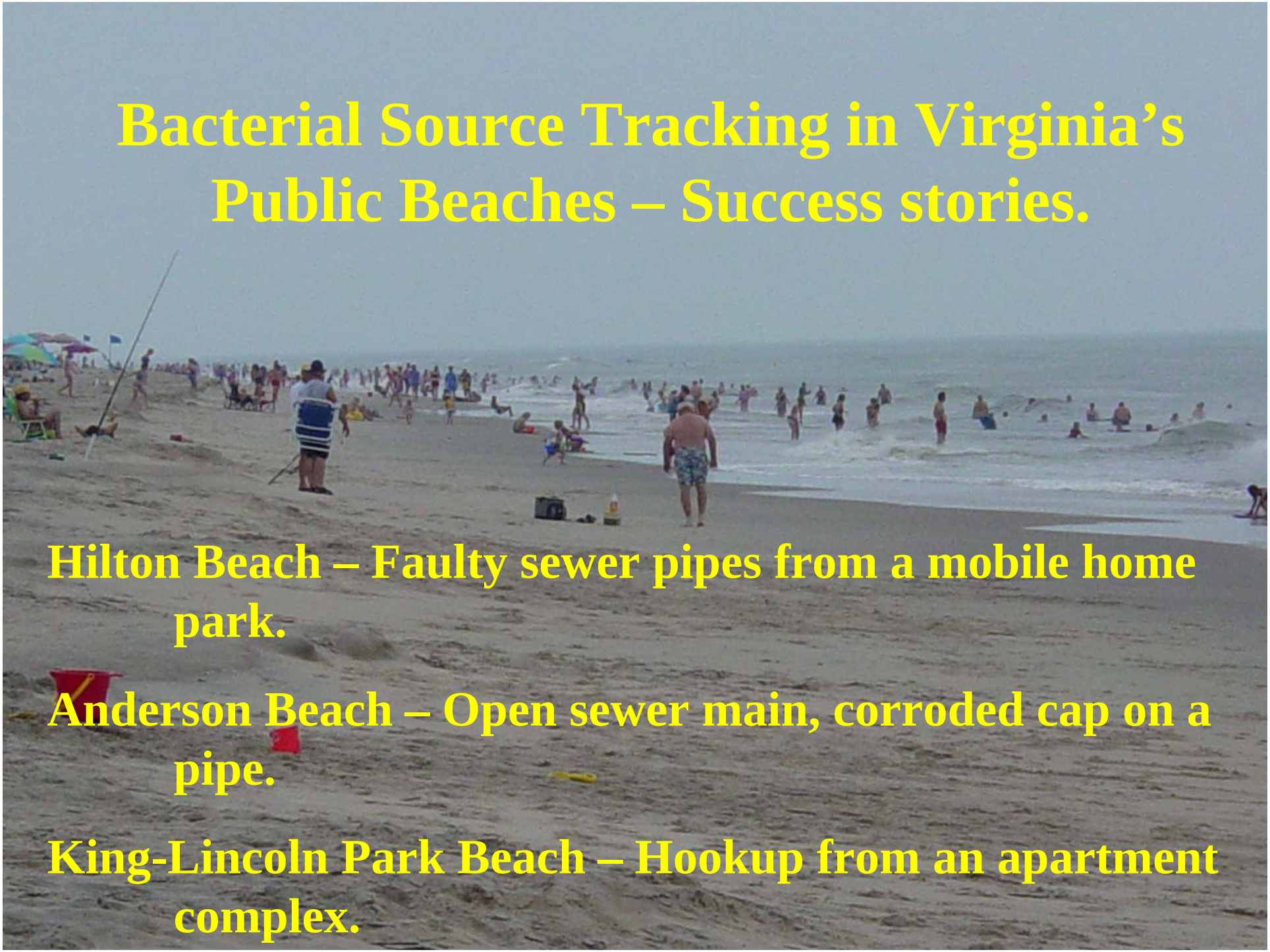
Fluorescent plumes located just as in VA.

Fluorometer could be calibrated away from shore, then near-shore plumes could be readily followed.

Source Tracking in Long Island Waters

-Unexpected opportunity: evaluate marine algae for fluorescence at same wavelengths.

Bacterial Source Tracking in Virginia's Public Beaches – Success stories.



Hilton Beach – Faulty sewer pipes from a mobile home park.

Anderson Beach – Open sewer main, corroded cap on a pipe.

King-Lincoln Park Beach – Hookup from an apartment complex.

Conclusions

MST does work, but one must consider:

Regional Libraries – QA/QC

Multiple Methods – ARA, PFGE, Ent. Species

Alternative Tracer – Fluorometer and OBs

THANK YOU

QUESTIONS?