OPERATION CLEARWATER BACTERIA MONITORING PROGRAM

Capt. Diana Muller, South RIVERKEEPER®

History of Operation Clearwater and Today's Operation Clearwater

- Started by the Severn River Association in 1970, concerned about health and bacteria
- Collaborated at the time with the USNA to perform the analysis
- Taken over by Dr. Sally Hornor, microbiologist, Anne Arundel Community College
- Today the South River Federation, West/Rhode Riverkeeper Inc, Magothy River Association and Severn River Association are the participants in Operation Clearwater
- Groups provide their own trained field samplers
- Every Wednesday- no matter what the weather; we all monitor for bacteria
- Why: Because we know that people recreate in the water during the summer
- All bacteria samples are taken to Dr. Hornor's lab for analysis
- Results are provided to us by Thursday afternoon
- Communicated to residents via email, website or phone call on Thursday afternoon
- Emergency samples are analyzed by Capt Muller in Dr. Muller's lab

South River Watershed and Storm Vulerability
Septic, Sewer and Stormwater (S^3)

Stormwater:

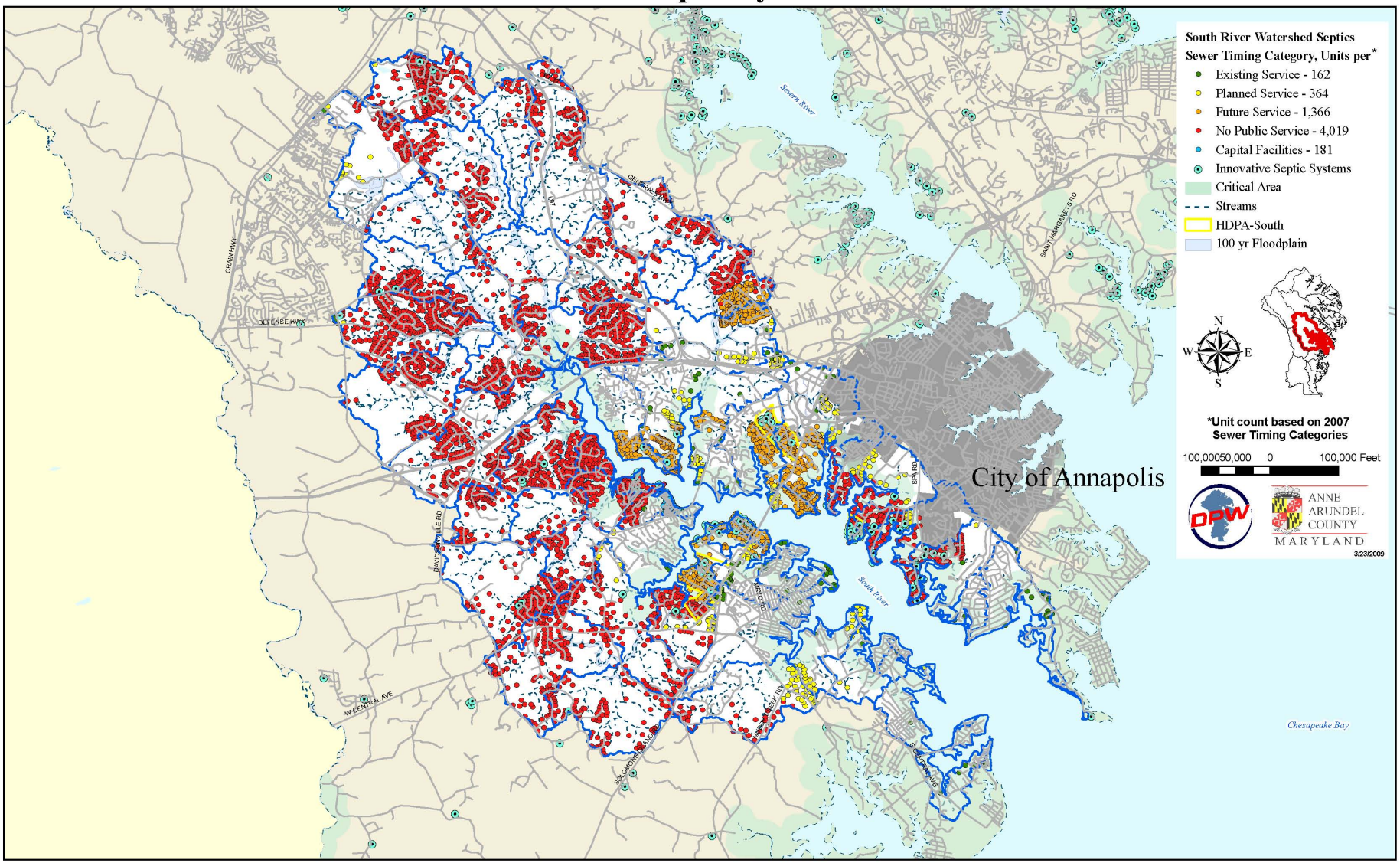
Pet Waste

Selby Bay and Duvall Bay have TMDL's for bacteria

On average, most these communities have 2 dogs each.

In Selby-on-the-Bay: 800 homes 1600 pets (dogs, chickens)

South River Watershed Septic Systems - Environmental



ANTIQUATED SEWER PIPES

Conservationists: 'How many other similar breaks are there?'
By E.B. FURGURSON III, Staff Writer

Published 04/23/10, Capital Gazette

Local conservationists praise quick action by the county to repair a broken sewer line fouling a recently restored creek bed, but worry similar infrastructure damage could be contributing more pollution than suspected in local waterways.

For a few weeks South River Federation staff, keeping an eye on the restoration of a streambed feeding Gingerville Creek, noticed a foul odor at the project area off Riva Road. Then they saw seepage coming through the bank of the creek bed.

In January, South Riverkeeper Diana Muller took samples from the stream just below that spot. The results caused concern.

"The test showed high nitrogen and bacteria counts that can be associated with sewage problems," said Erik Michelsen, the federation's executive director.

The levels were very elevated, total nitrogen readings were .93 milligrams per liter and total coliform was 2,490 coliform forming units per milliliter.

"That was well above what we should have found," Muller said. The nitrogen was about twice the Environmental Protection Agency standard, but the coliform was nearly 25 times the EPA limit of 104 milligrams per liter.

Concerned, they notified the Anne Arundel County Department of Public Works.

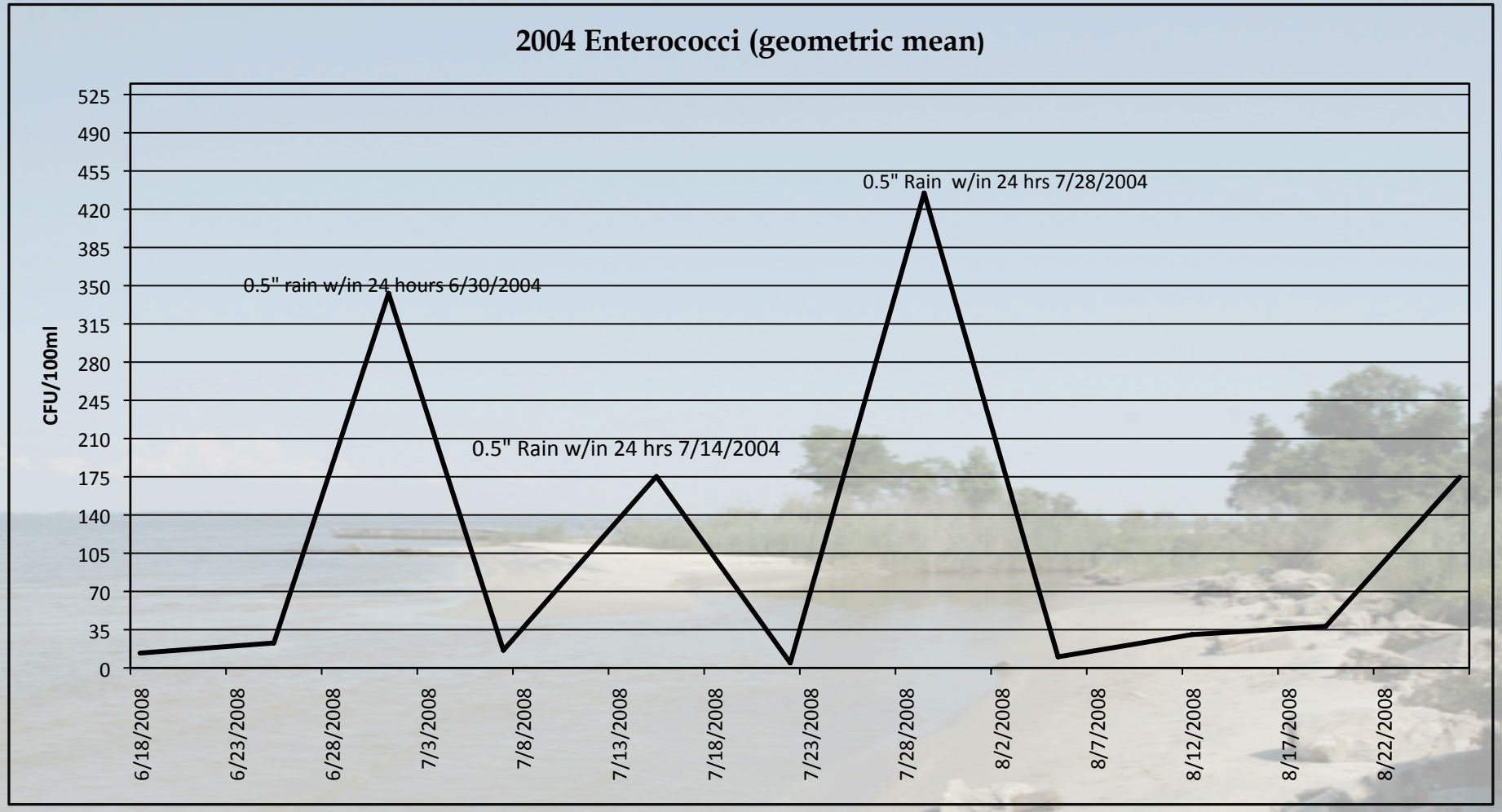
Within a couple of weeks the county checked area sewer lines. Crews using a small television camera that can snake down pipes found a sizable crack in a clay pipe.

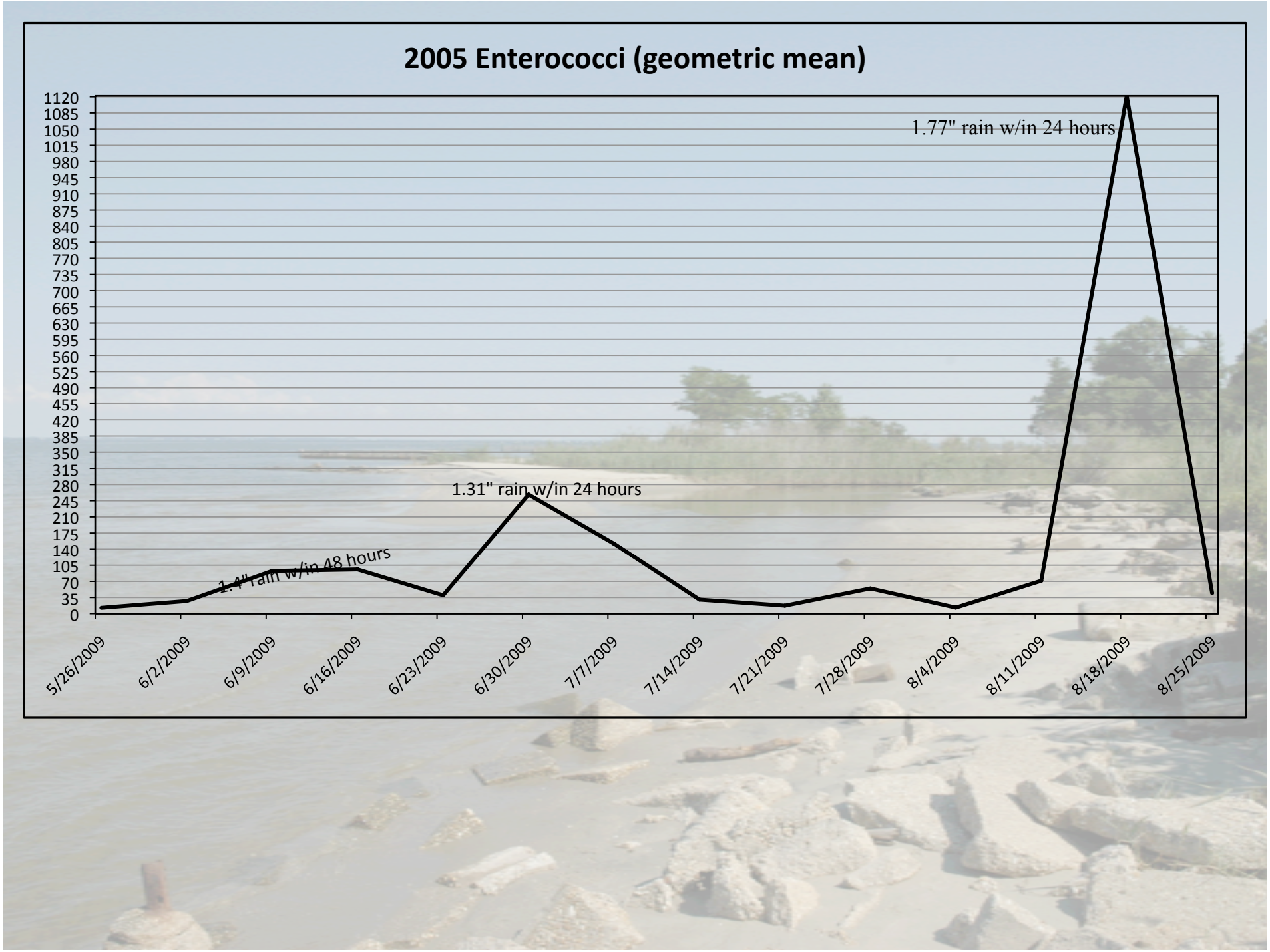
County crews then relined the pipe with liquid plastic last month.

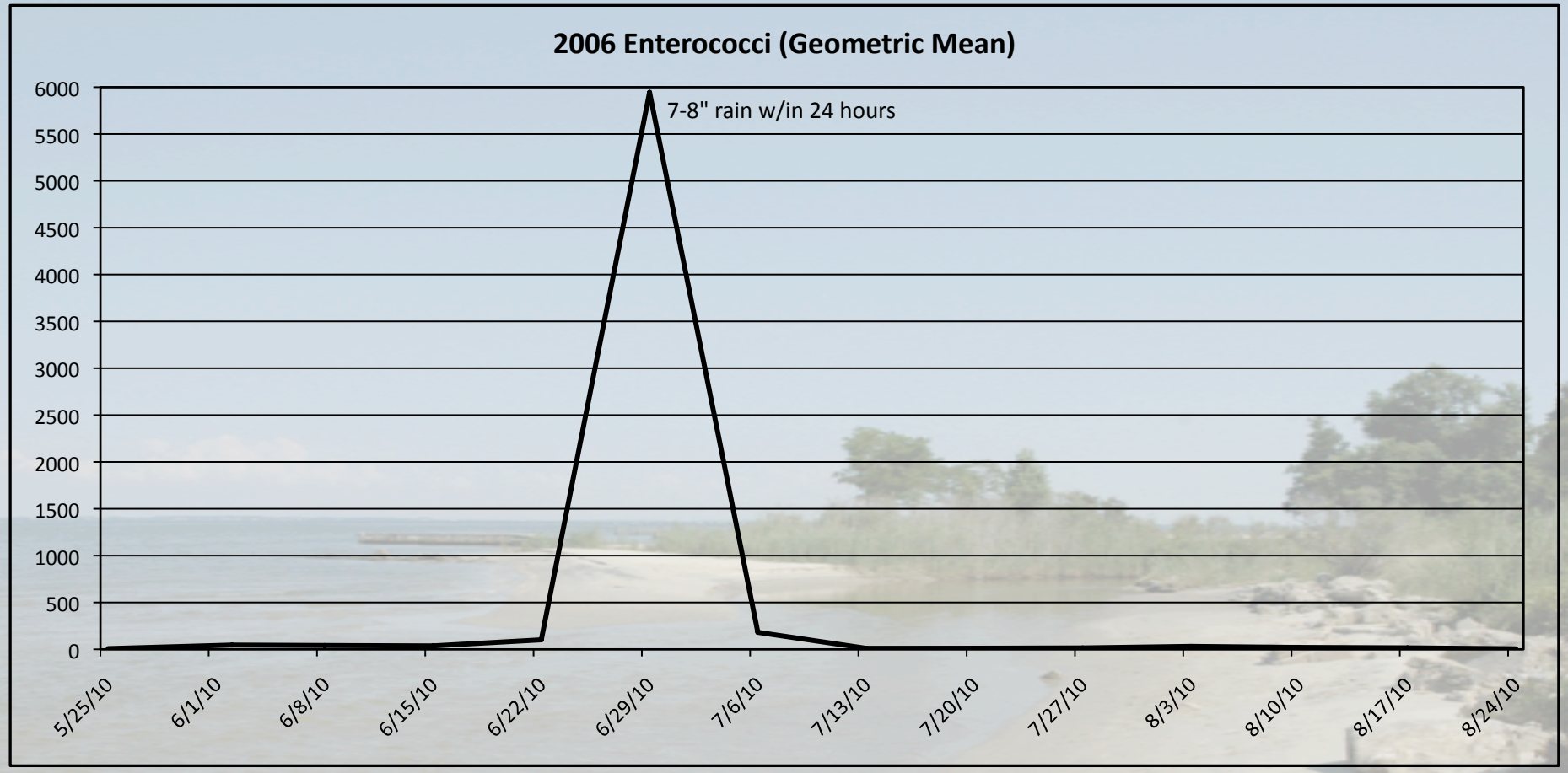
Riverkeeper Muller returned to the site and took new samples following the repair.

The results? Nitrogen was .01 mg/l and coliform was down to 16 cfu/l.

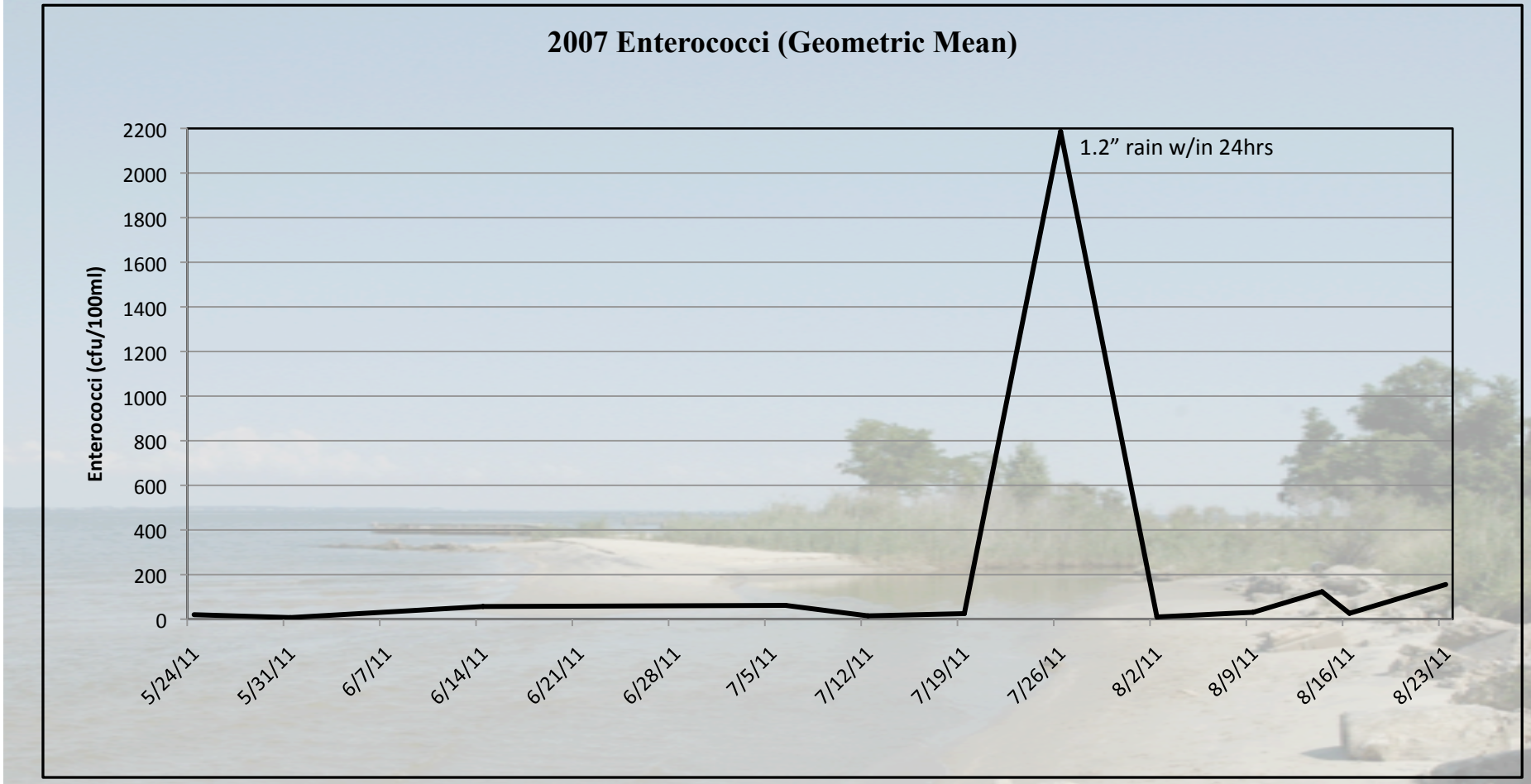
"It is good to see this kind of cooperation from the county, working with a nonprofit to address a problem," Michelsen said. "It helps the county government to have these groups on the ground to identify issues and the county working to correct them. It's a good model."

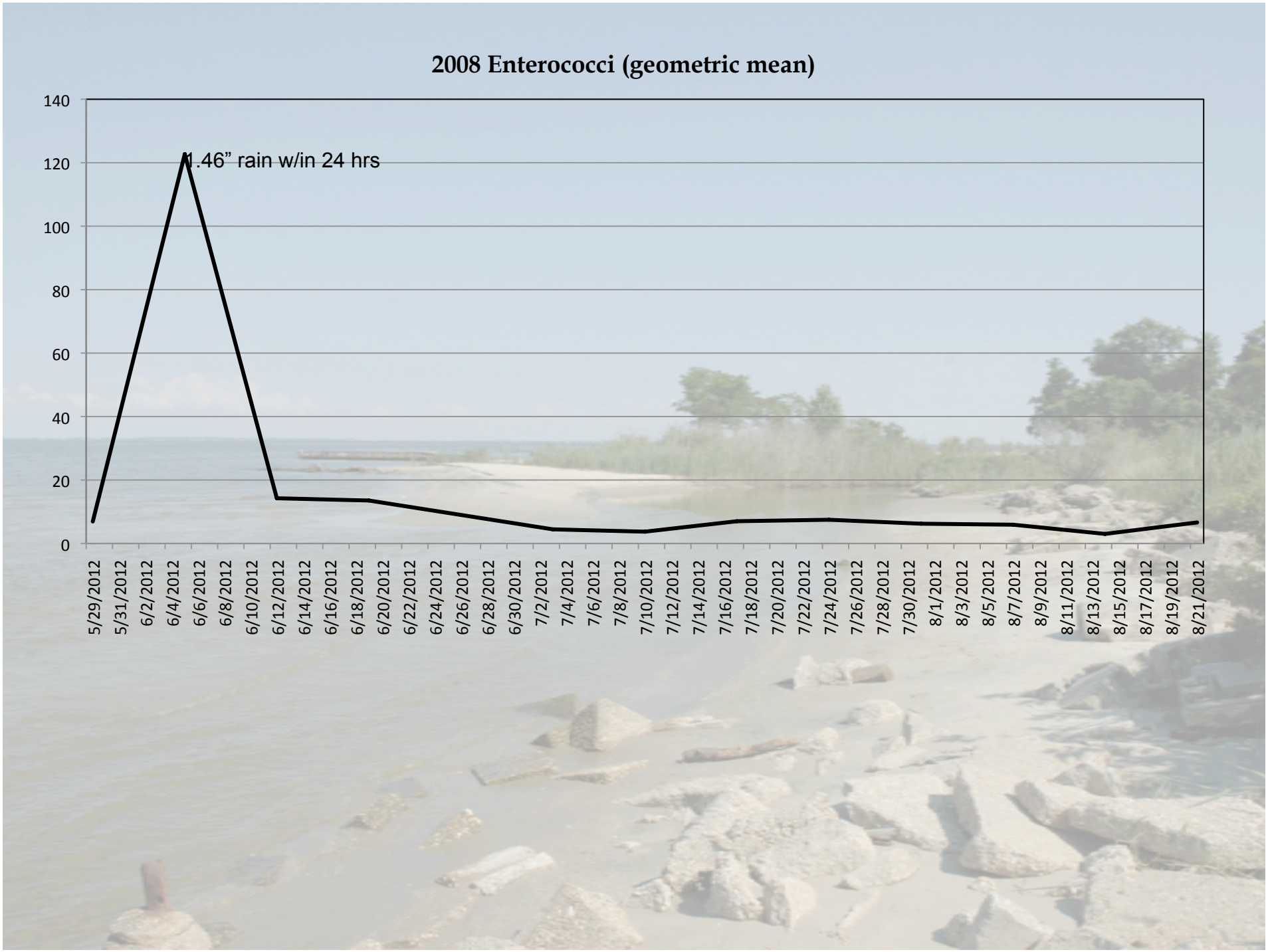

2004 Enterococci (geometric mean)
CFU/100ml
525
490
455
420
385
350
315
280
245
210
175
140
105
70
35
0
0.5" rain w/in 24 hours 6/30/2004
0.5" Rain w/in 24 hrs 7/14/2004
0.5" Rain w/in 24 hrs 7/28/2004
6/18/2008
6/23/2008
6/28/2008
7/3/2008
7/8/2008
7/13/2008
7/18/2008
7/23/2008
7/28/2008
8/2/2008
8/7/2008
8/12/2008
8/17/2008
8/22/2008


2005 Enterococci (geometric mean)
1120
1085
1050
1015
980
945
910
875
840
805
770
735
700
665
630
595
560
525
490
455
420
385
350
315
280
245
210
175
140
105
70
35
0
1.77" rain w/in 24 hours
1.31" rain w/in 24 hours
1.4" rain w/in 48 hours
5/26/2009
6/2/2009
6/9/2009
6/16/2009
6/23/2009
6/30/2009
7/7/2009
7/14/2009
7/21/2009
7/28/2009
8/4/2009
8/11/2009
8/18/2009
8/25/2009



Total precipitation in June 9.8", this was "back to back" storms


2007 Enterococci (Geometric Mean)
Enterococci (cfu/100ml)
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1.2” rain w/in 24hrs
5/24/11
5/31/11
6/7/11
6/14/11
6/21/11
6/28/11
7/5/11
7/12/11
7/19/11
7/26/11
8/2/11
8/9/11
8/16/11
8/23/11


2008 Enterococci (geometric mean)
1.46" rain w/in 24 hrs
140
120
100
80
60
40
20
0
5/29/2012
5/31/2012
6/2/2012
6/4/2012
6/6/2012
6/8/2012
6/10/2012
6/12/2012
6/14/2012
6/16/2012
6/18/2012
6/20/2012
6/22/2012
6/24/2012
6/26/2012
6/28/2012
6/30/2012
7/2/2012
7/4/2012
7/6/2012
7/8/2012
7/10/2012
7/12/2012
7/14/2012
7/16/2012
7/18/2012
7/20/2012
7/22/2012
7/24/2012
7/26/2012
7/28/2012
7/30/2012
8/1/2012
8/3/2012
8/5/2012
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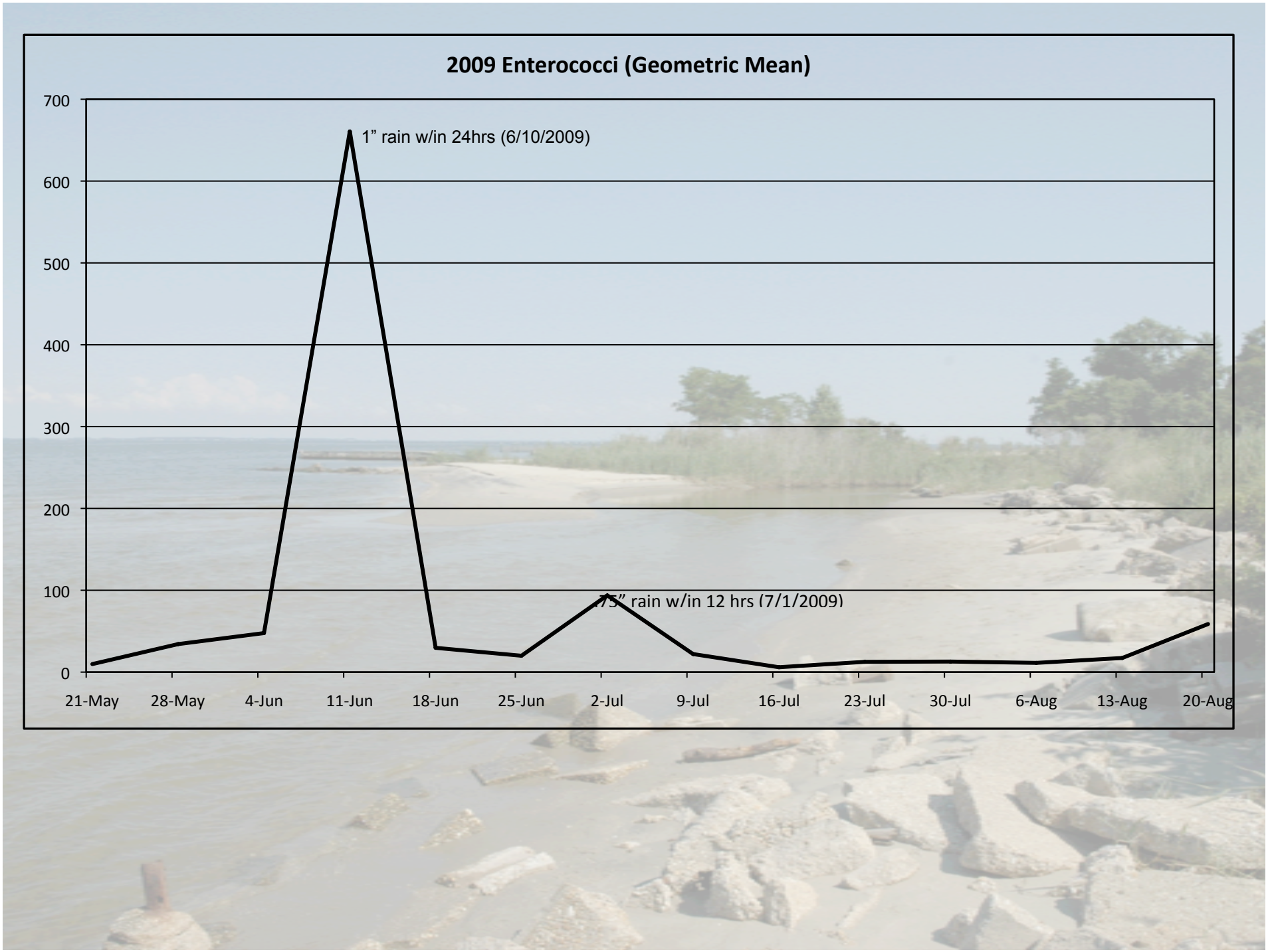
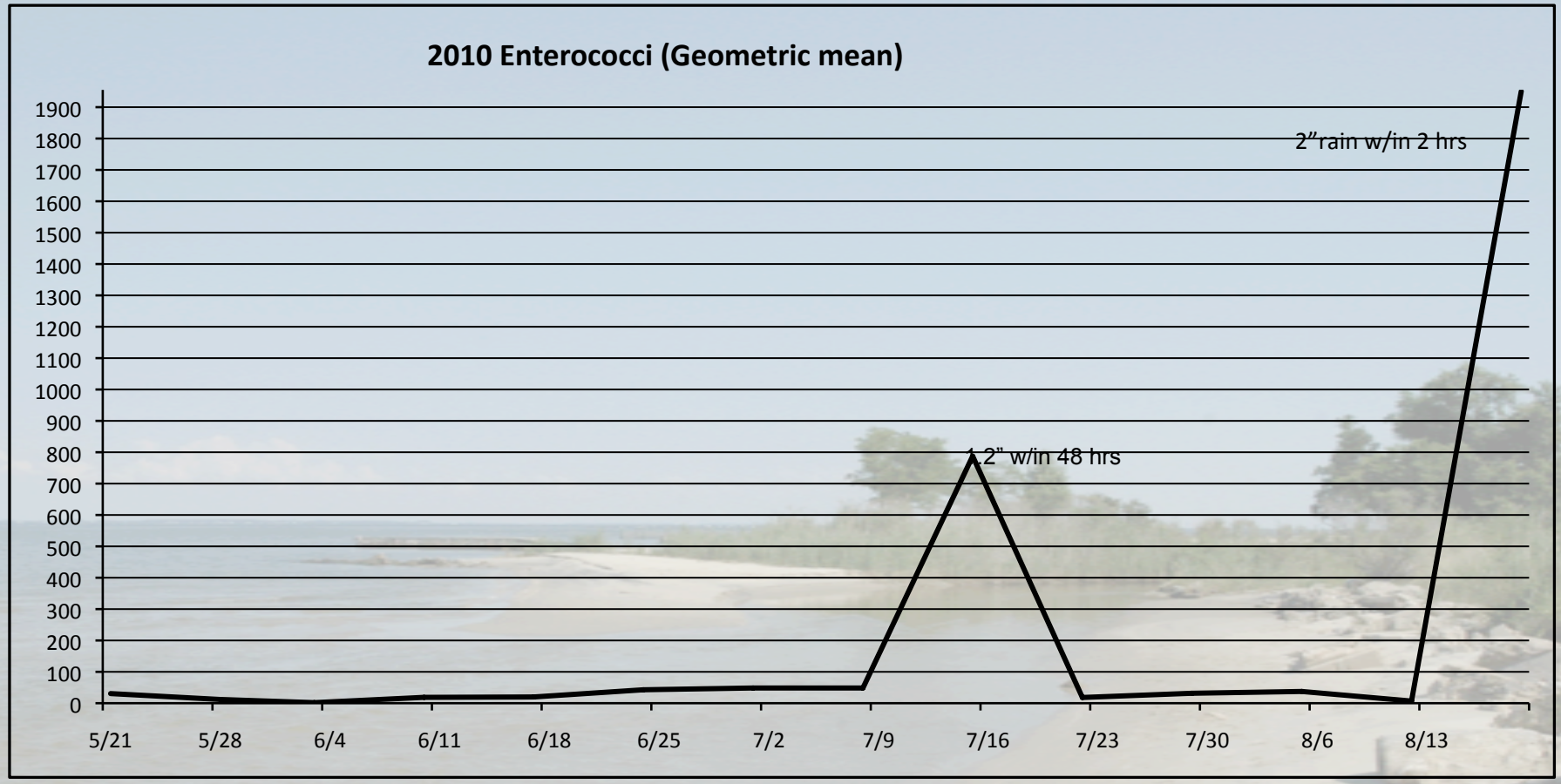
8/13/2012
8/15/2012
8/17/2012
8/19/2012
8/21/2012


2009 Enterococci (Geometric Mean)
700
600
500
400
300
200
100
0
1" rain w/in 24hrs (6/10/2009)
.75" rain w/in 12 hrs (7/1/2009)
21-May
28-May
4-Jun
11-Jun
18-Jun
25-Jun
2-Jul
9-Jul
16-Jul
23-Jul
30-Jul
6-Aug
13-Aug
20-Aug


2010 Enterococci (Geometric mean)
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
2”rain w/in 2 hrs
1.2” w/in 48 hrs
5/21
5/28
6/4
6/11
6/18
6/25
7/2
7/9
7/16
7/23
7/30
8/6
8/13

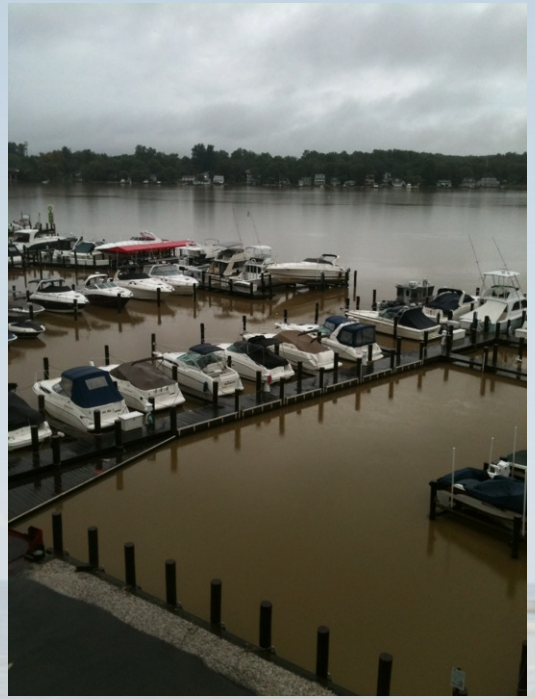
2011 Enterococci (Geometric Mean)

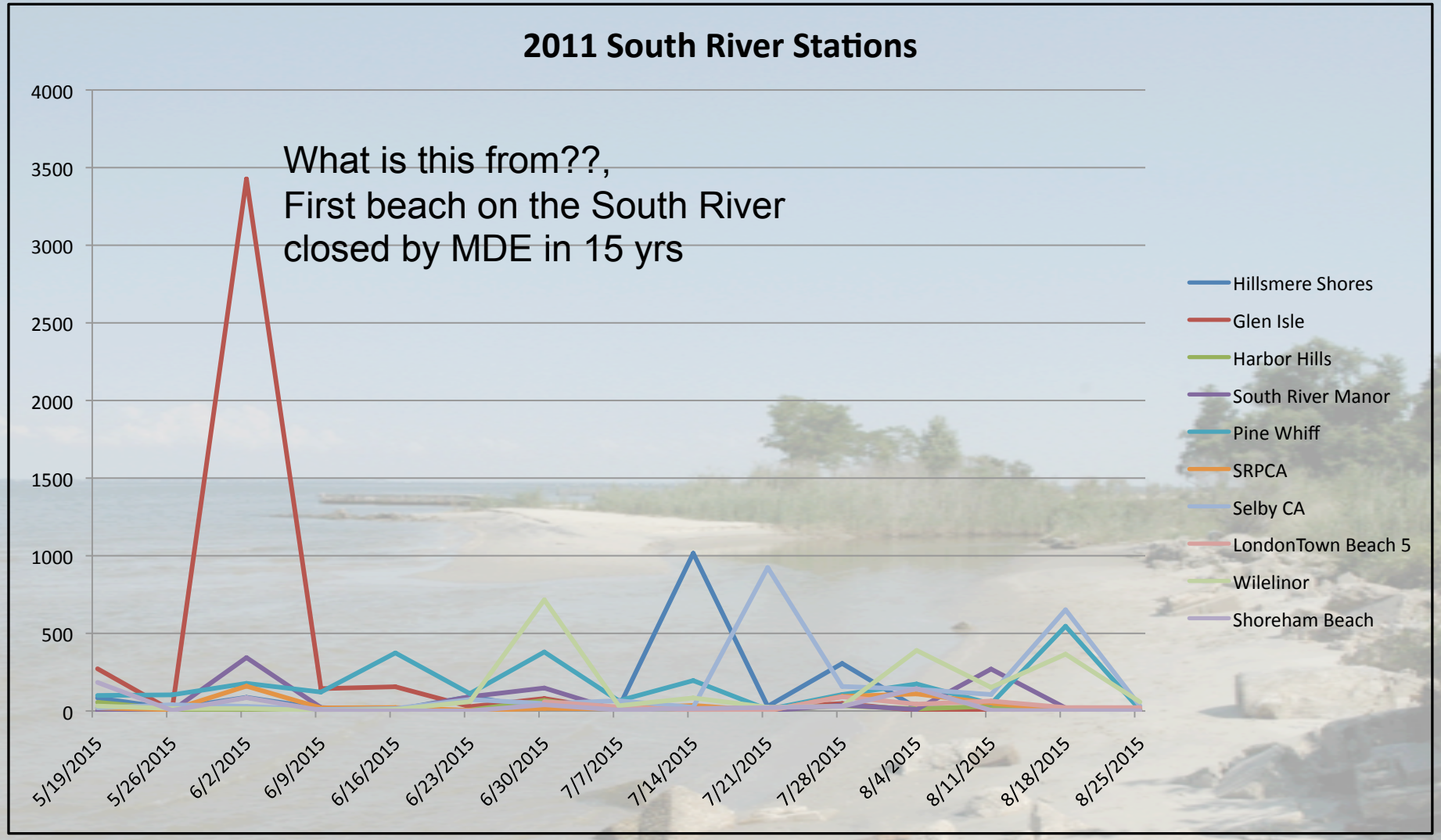
10” rain w/in 48hrs (Tropical Storm Lee)

5” rain w/in 48 hrs

1200
1100
1000
900
800
700
600
500
400
300
200
100
0

5/19/2015
5/24/2015
5/29/2015
6/3/2015
6/8/2015
6/13/2015
6/18/2015
6/23/2015
6/28/2015
7/3/2015
7/8/2015
7/13/2015
7/18/2015
7/23/2015
7/28/2015
8/2/2015
8/7/2015
8/12/2015
8/17/2015
8/22/2015
8/27/2015
9/1/2015
9/6/2015





Ground-Truthing!! Field assessment is crucial.


HEALTH
ADVISORY
AGAINST SWIMMING
AVISO DE SALUD: NO NADAR
AREA GLEN ISLE
DATE POSTED 6/13/2011
ANNE ARUNDEL COUNTY
DEPARTMENT OF HEALTH
www.aahealth.org
410-222-7999

What am I doing next??

Currently trying to identify septic leaks via Optical Brighteners, bacteria and Nutrient Analysis.

Fecal Bacteria	Optical Brightener	Probable Cause
High	High	Sewer pipe leak or failing septic system
High	Low	Other warm blooded mammal source or human waste from other source such as out-house
Low	High	Gray water in storm water system
Low	Low	Background fluorescence or insignificant contamination

THANK YOU