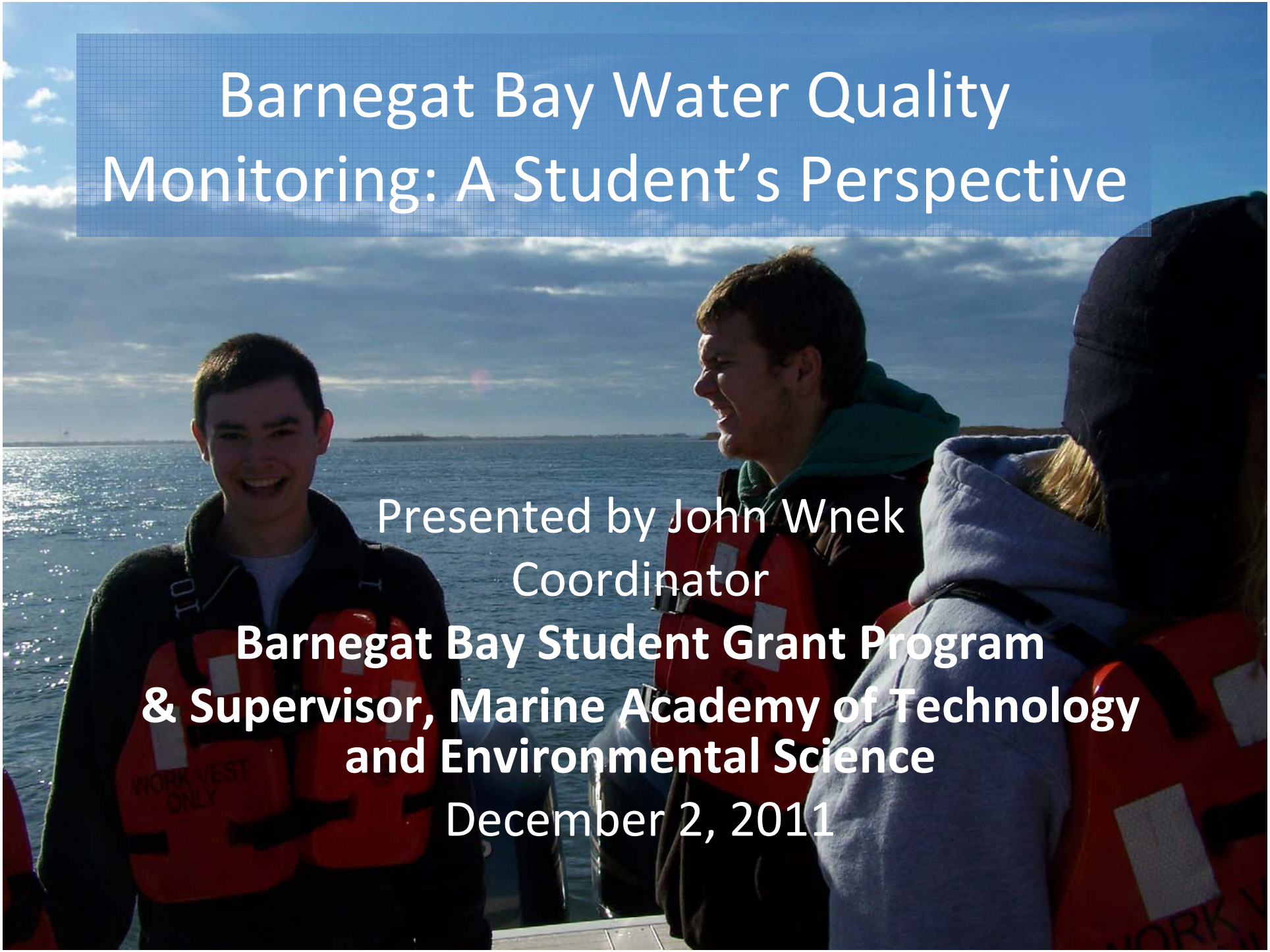


Barnegat Bay Water Quality Monitoring: A Student's Perspective

Presented by John Wnek
Coordinator
Barnegat Bay Student Grant Program
& Supervisor, Marine Academy of Technology and Environmental Science

December 2, 2011

Barnegat Bay Student Grant Program

"Provides college students with an opportunity to conduct an independent research project or participate in a team water quality monitoring program"

Water Quality Monitoring Project

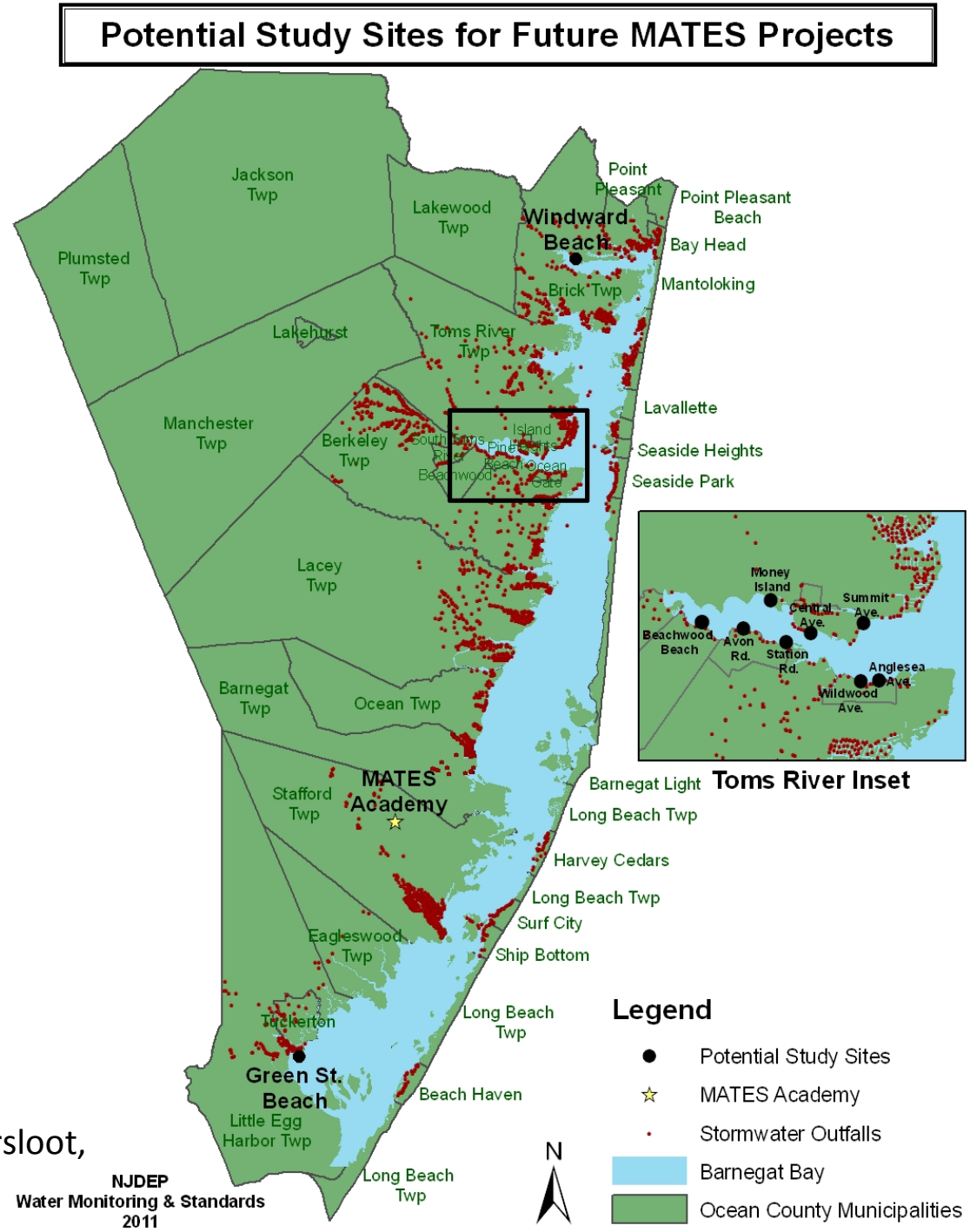
Supports the Governor's Barnegat Bay 10 Point Action Plan

#8 Educate the Public (including education about Barnegat Bay)

#9 Filling in gaps in research

Getting students involved in a project that addresses water quality at locations on Barnegat Bay, especially areas along the Bay that are closed (more frequently) for swimming as a result of poor water quality (especially after rainfall events).

RUTGERS
New Jersey Agricultural Experiment Station



Slide Courtesy of
Ms. Danielle Donkersloot,
NJDEP

Getting the Students Involved…

- Have students develop a methodology
- Have students work within a Quality Assurance and Quality Control Plan
- Apply Scientific Concepts to solving the problem

Training

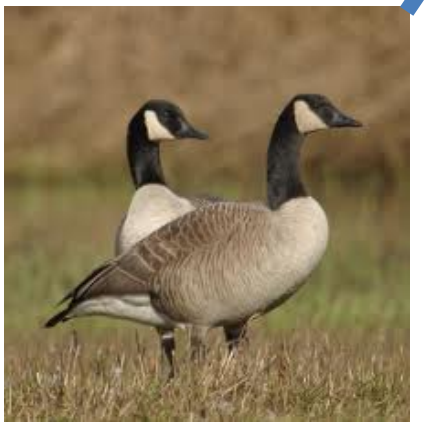
- Students toured the NJDEP Bureau of Marine Water Monitoring Laboratories
- They were given several training sessions with Ms. Danielle Donkersloot and Ms. Cara Muscio
- They reviewed other volunteer water quality monitoring protocols
- Students met with me regularly to discuss logistics and proper sampling techniques (e-mail contact was important)

Site Selection

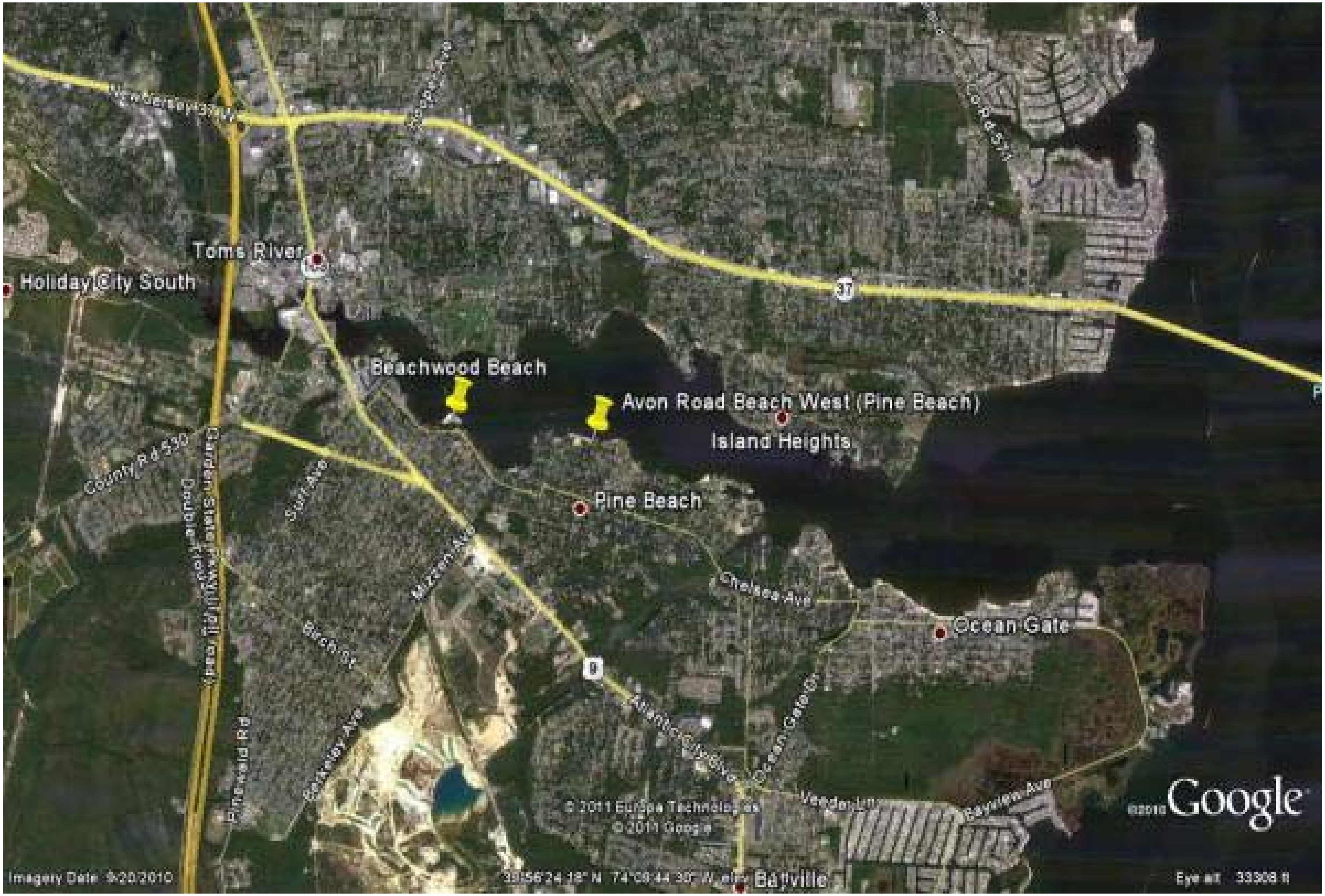
- Beachwood Beach 2010 and 2011
- Rated as one of the “most closed” swimming beaches numerous consecutive years by the NRDC and made the Beach Bum List several consecutive years
- Pine Beach was added in 2011 as it is close proximity to Beachwood Beach

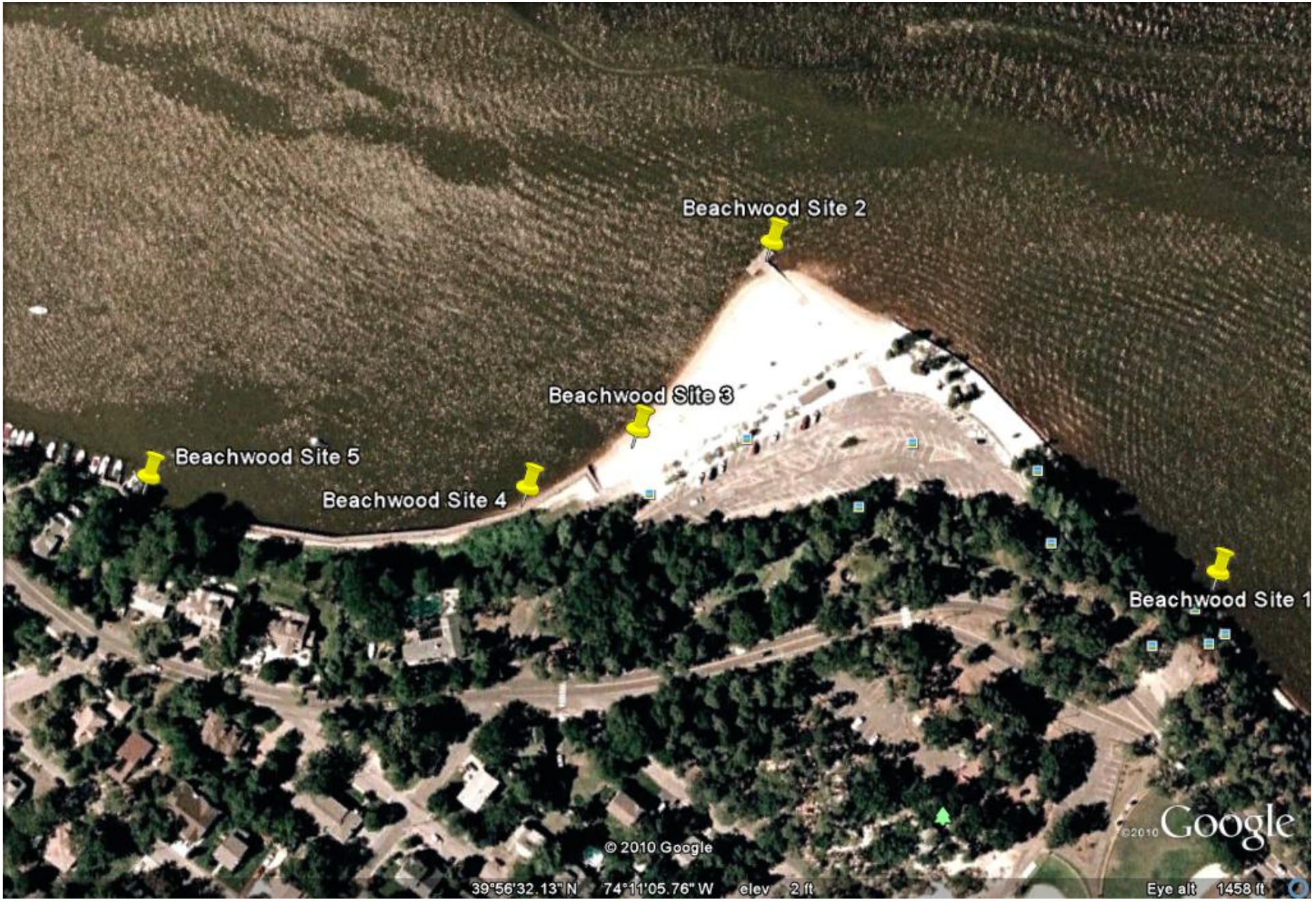
Storm Drains

Human Sources of Wastewater

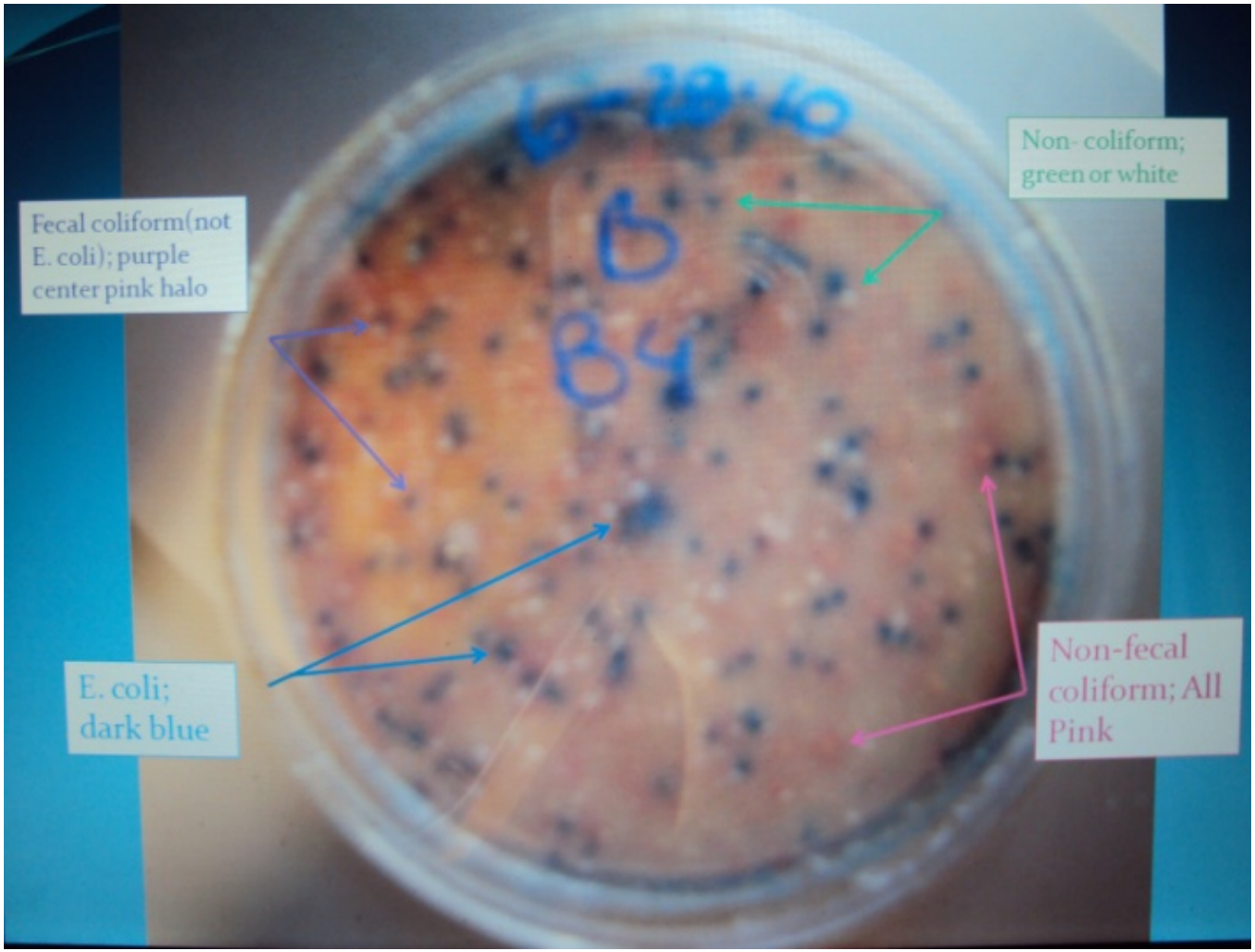


Waterfowl


New Jersey 37 W
Toms River
Holiday City South
Beachwood Beach
Avon Road Beach West (Pine Beach)
Island Heights
County Rd 530
Pine Beach
Chelsea Ave
Ocean Gate
Mizzen Ave
Surf Ave
Birch St
Berkeley Ave
Pinewald Rd
Atlantic City Blvd
Ocean Gate Dr
Veeder Ln
Bayview Ave
Co Rd 571
Hooper Ave
Garden State Pkwy
Double Trouble Road
37
9
© 2011 Europa Technologies
© 2011 Google
©2010 Google
Imagery Date 9/20/2010
Eye alt 33308 ft
Bayville


Beachwood Site 2
Beachwood Site 3
Beachwood Site 5
Beachwood Site 4
Beachwood Site 1
© 2010 Google
©2010 Google
39°56'32.13" N 74°11'05.76" W elev 2 ft
Eye alt 1458 ft

Used Coliscan Easygel® bacterial detection 2010



As a result of the baseline readings being in brackish water this methodology became a comparative approach used in storm drain water collection in 2011

Goals

- Use the most pertinent scientific methodology
- Testing in the interest of public safety & health
- Further water quality understanding of the Toms River

Courtesy of the Monitoring Team 2011

Testing Information

- *Escherichia coli*
- *Enterococcus sp.*
- Optical Brighteners
- Water Quality Parameters

Courtesy of the Monitoring Team 2011

Pictures courtesy of Google© images

Optical Brighteners

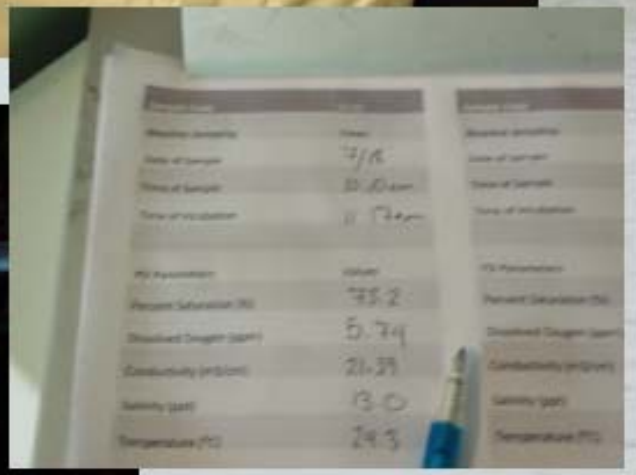
- Fluorescent Whitening Agents
- Found in products such as laundry detergent, toilet paper
- Have no sources other than humans
- Can end up in storm water runoff, eventually flowing into lakes and other bodies of water

IDEXX Laminator

IDEXX Quanti-Trays under black light

Quality Assurance

- DEP quality assurance measures
  - Tier B
- Recognition of research
- Accuracy of data



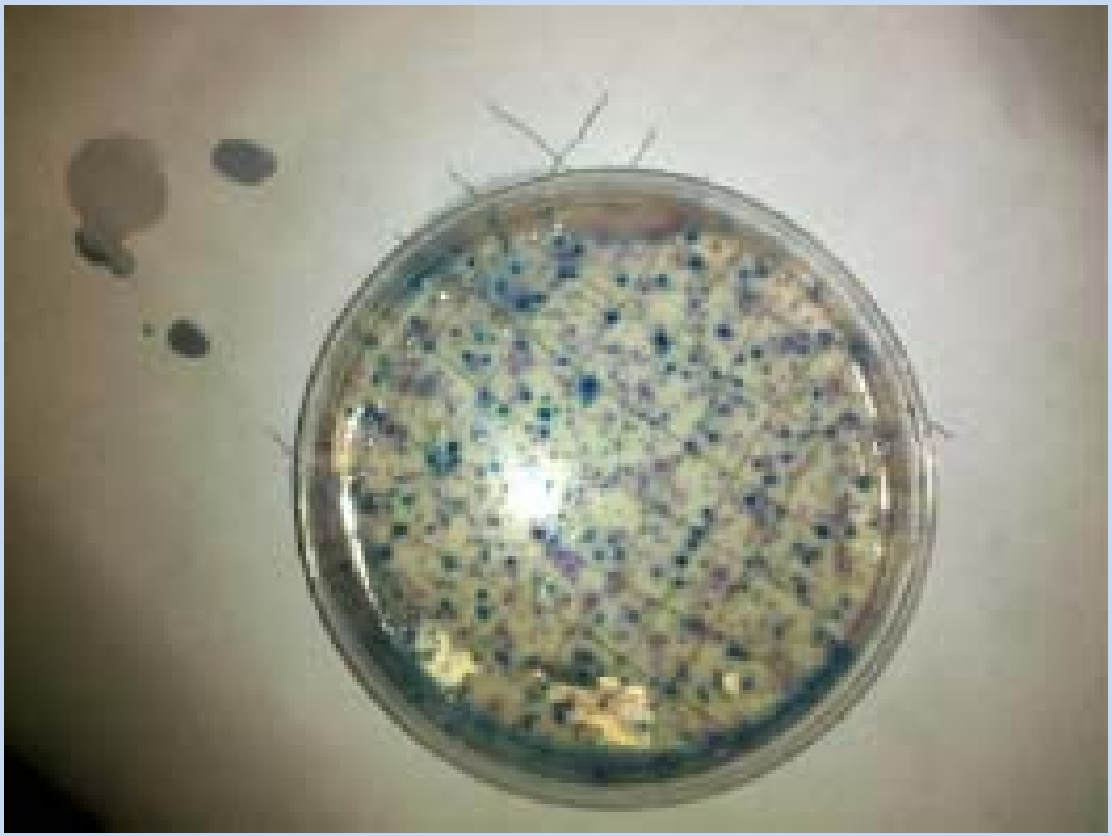
Courtesy of the Monitoring Team 2011

Our Plan

Student Developed Methodology

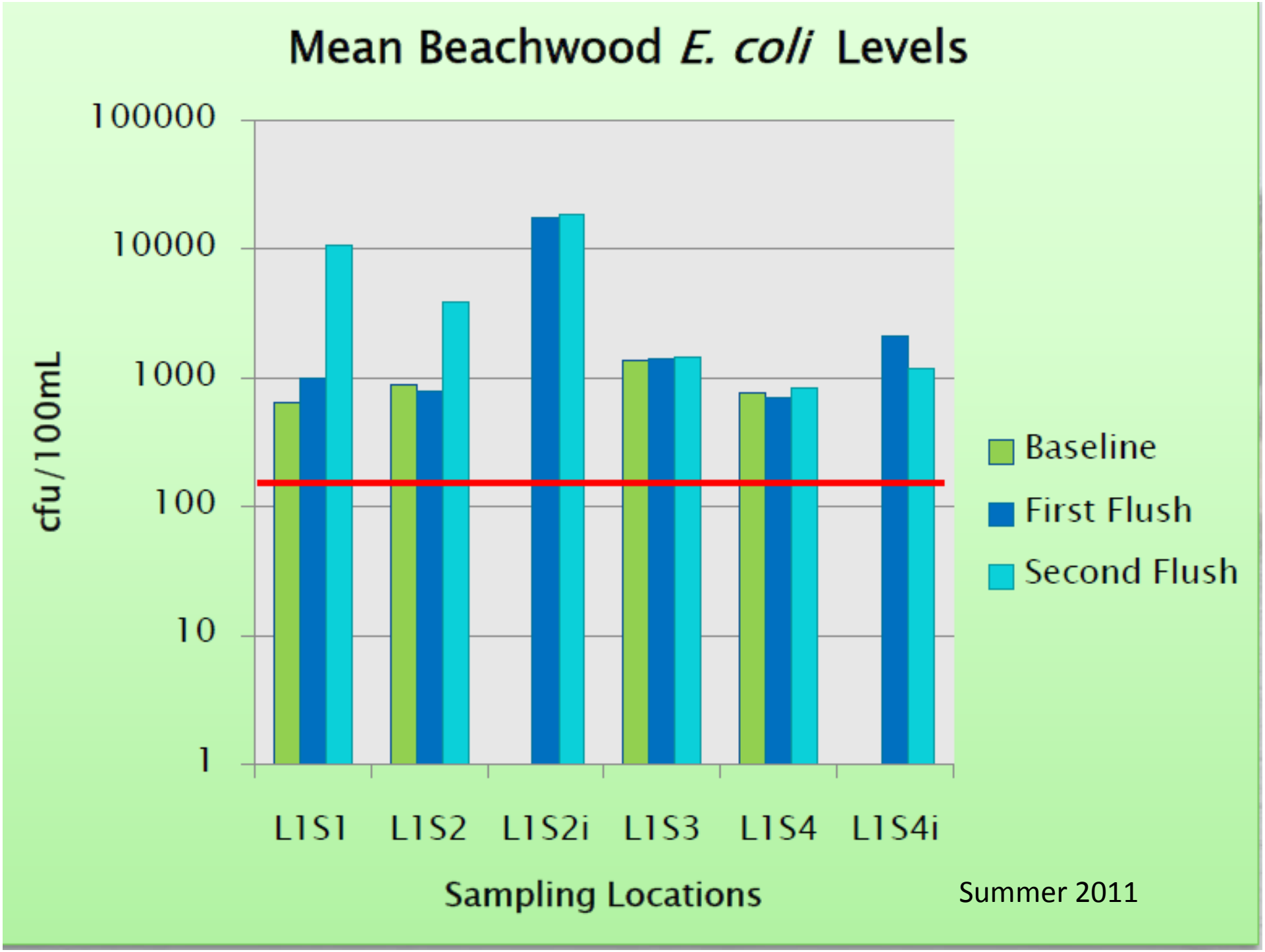
Sampling will occur:

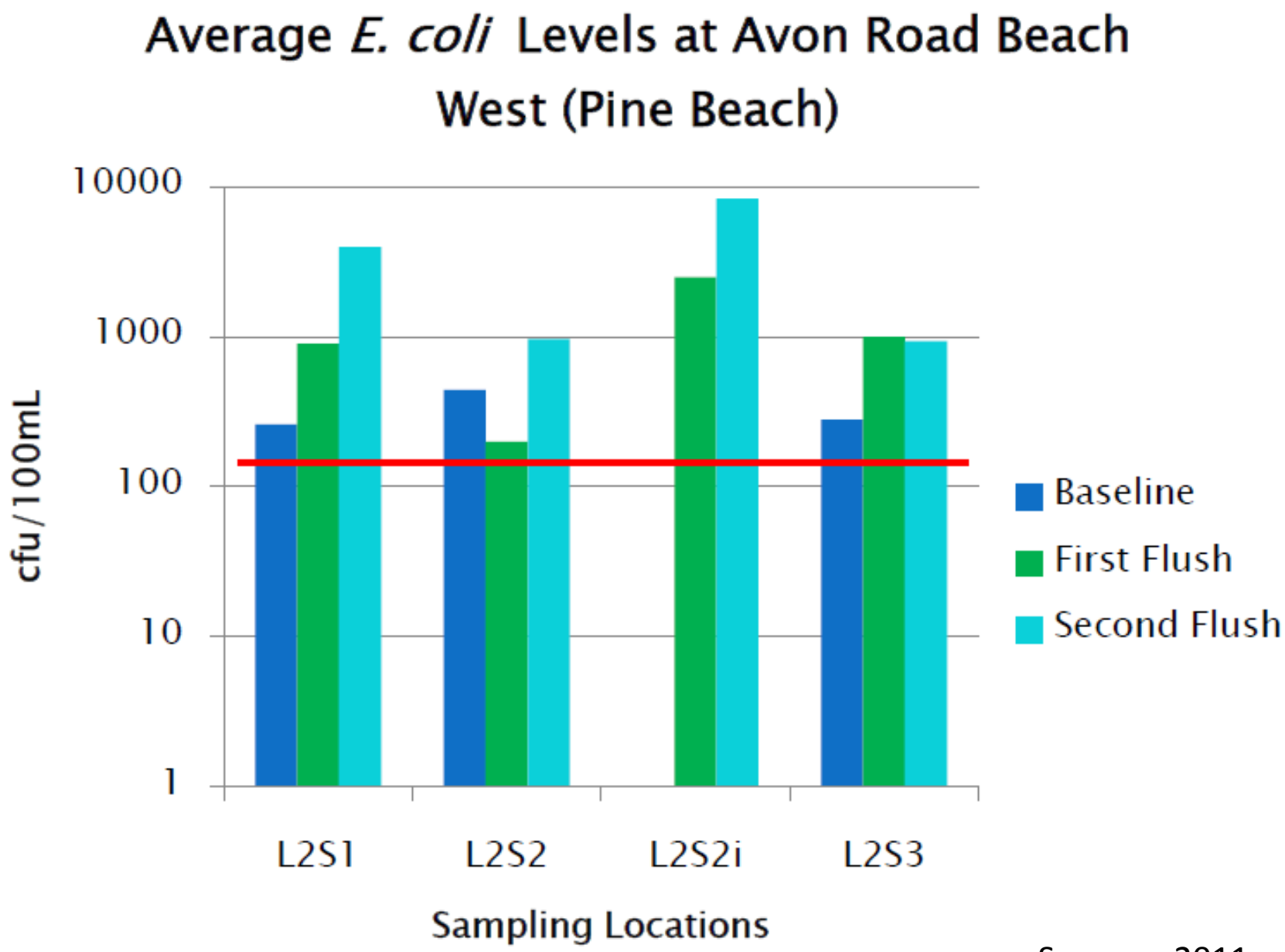
- Within 30 minutes after storm has begun
- Within the second 30 minute period after the storm has begun
- **Base-line sampling will occur on a Bi-Weekly basis on Mondays to compare bacterial data with the Health Department**
- OBs will be tested before the first flush of each storm



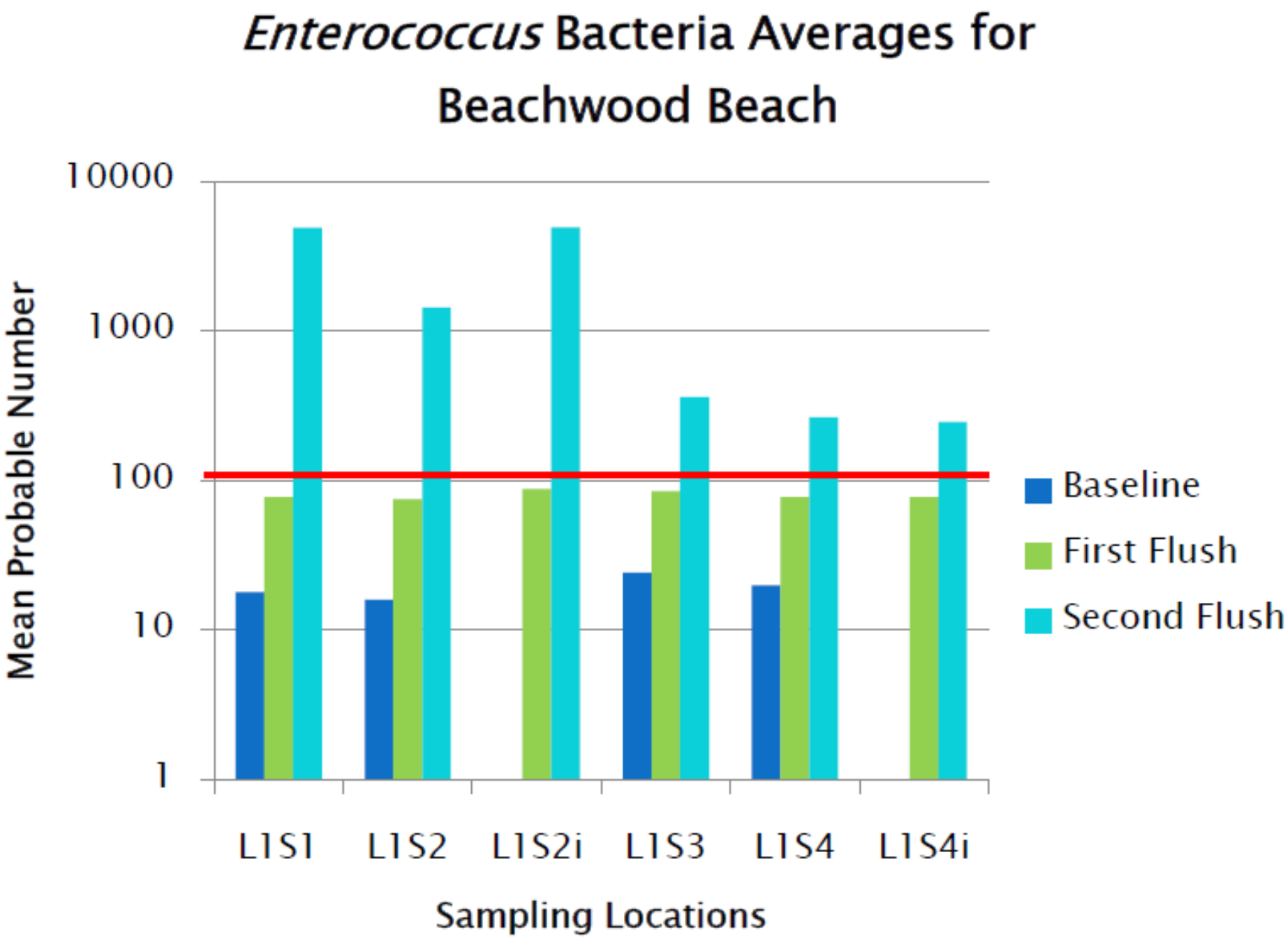
Beachwood Beach Coliscan Easygel®
Fecal Coliform Bacteria Colonies

Summer 2011


Mean Beachwood E. coli Levels
100000
10000
1000
100
10
1
cfu/100mL
L1S1
L1S2
L1S2i
L1S3
L1S4
L1S4i
Sampling Locations
Baseline
First Flush
Second Flush
Summer 2011


Average E. coli Levels at Avon Road Beach West (Pine Beach)
10000
1000
100
10
1
cfu/100mL
L2S1
L2S2
L2S2i
L2S3
Sampling Locations
Baseline
First Flush
Second Flush

Summer 2011


Enterococcus Bacteria Averages for Beachwood Beach
10000
1000
100
10
1
Mean Probable Number
L1S1
L1S2
L1S2i
L1S3
L1S4
L1S4i
Sampling Locations
Baseline
First Flush
Second Flush

Summer 2011

Conclusions

- Our data suggests that during rainfall events, the elevated bacteria levels at Beachwood Beach are a potential hazard for human health and exceed the Ocean County Health Department's standard for safe swimming water
- Our data also suggests that the underwater storm drain at Avon Road Beach West in Pine Beach may potentially pose a problem if the problem is not addressed quickly

Courtesy of the Monitoring Team 2011

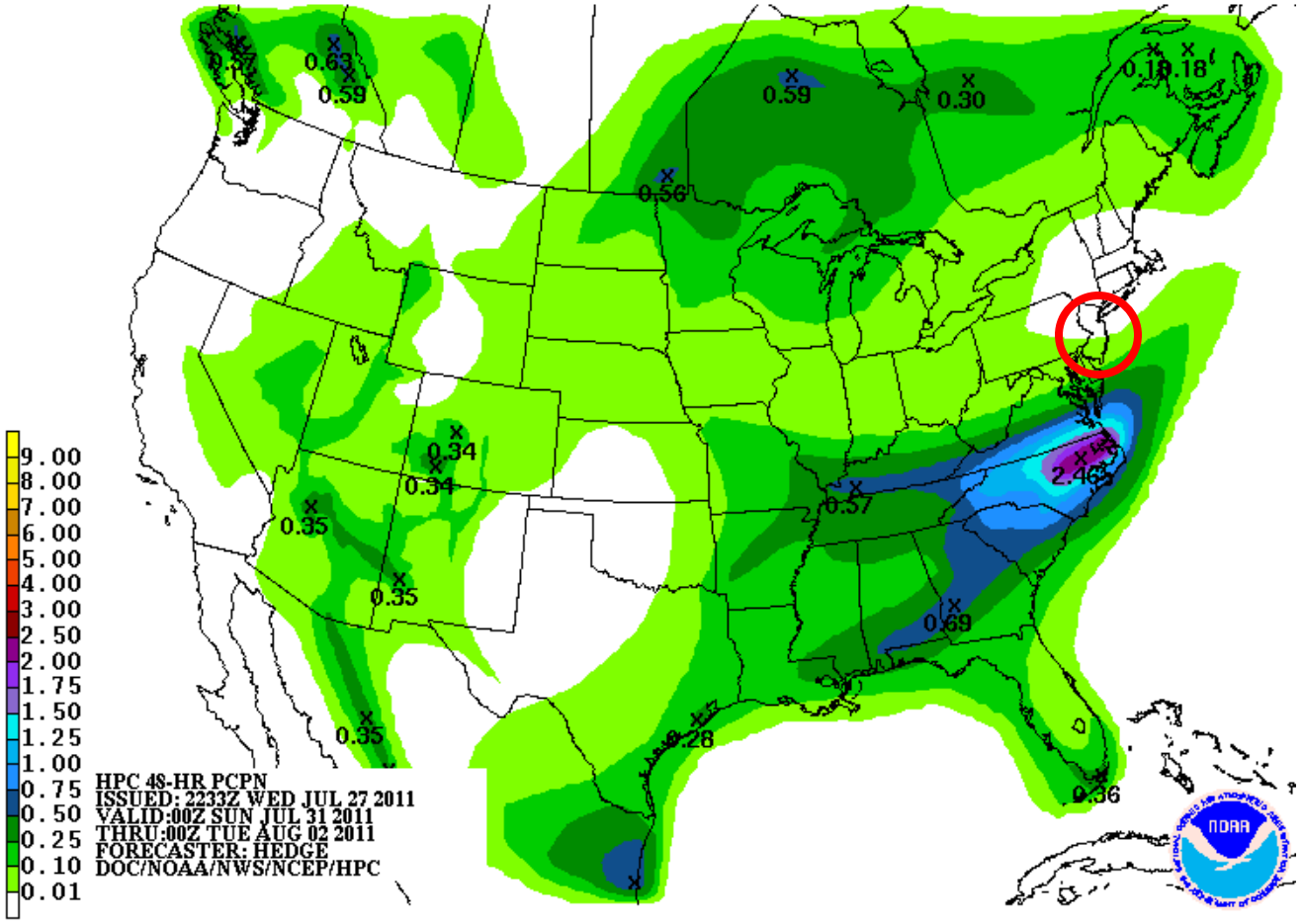
Recommendations

- As per our results, we would recommend a 72 hour beach closing after a storm of 0.10 inches
- Storms over 0.05 inches can provide unhealthy increases in bacteria levels
- To prevent these dangerous conditions, it is recommended to inspect & clean storm drains on a monthly basis
- Inspections can be made by using the Ocean County Health Department's free available storm drain cameras to inspect for debris or infrastructure problems

Courtesy of the Monitoring Team 2011

Some Challenges and Lessons Learned

Weather isn't always cooperative



It helps to have a meteorologist on call. Well, sometimes.

Challenges…

- Background of students varies, but this can be a good thing
- Data collection was also a challenge in heavy precipitation
- Team dynamics and making sure that the team is well trained in each area

Sample of Data Collected

Parameter	6/27/2011	7/7/2011	7/18/2011	7/25/2011	8/1/2011
Sampling Time	12:32:00	17:08:00	10:12:00	10:32:00	9:14:00
Incubation Time	16:00:00	18:16:00	11:17:00	11:45:00	10:25:00
Sampler	Joe	Kevin	Joe	Kevin	Kevin
Percent Saturation (%)	78.1	90.4	78.6	93.0	85.0
Dissolved Oxygen (ppm)	6.09	6.63	6.12	7.87	6.40
Conductivity (mS/cm)	12.85	21.25	20.31	18.18	15.64
Salinity (ppt)	7.3	11.9	12.2	11.9	9.3
Temperature (^{o}C)	25.8	28.4	24.9	20.3	27.1
pH	6.8	7.2			
Optical Brightners		86.63	83.75	122.30	88.66
Turbidity (NTUs)	1.774	4.440	3.205	8.573	4.209
E. Coli (Coliforms/100 mL)	<1	1300	1300	200	1600
Enterococcus (mpn)	< 10	< 10	10	< 10	< 10
Blue Colonies	0	76	145	0	14

Some Problems with the *Enterococcus* data

Date	Beachwood (CFU/100 mL)		Avon (CFU/100 mL)	
	Health Dept.	Ours (Average)	Health Dept.	Ours (Average)
6/27/11	10	11.892	34.641	18.371
7/18/11	10	10	10	10
7/25/11	40	13.269	10	14.581
8/1/11	20	11.892	30	18.566

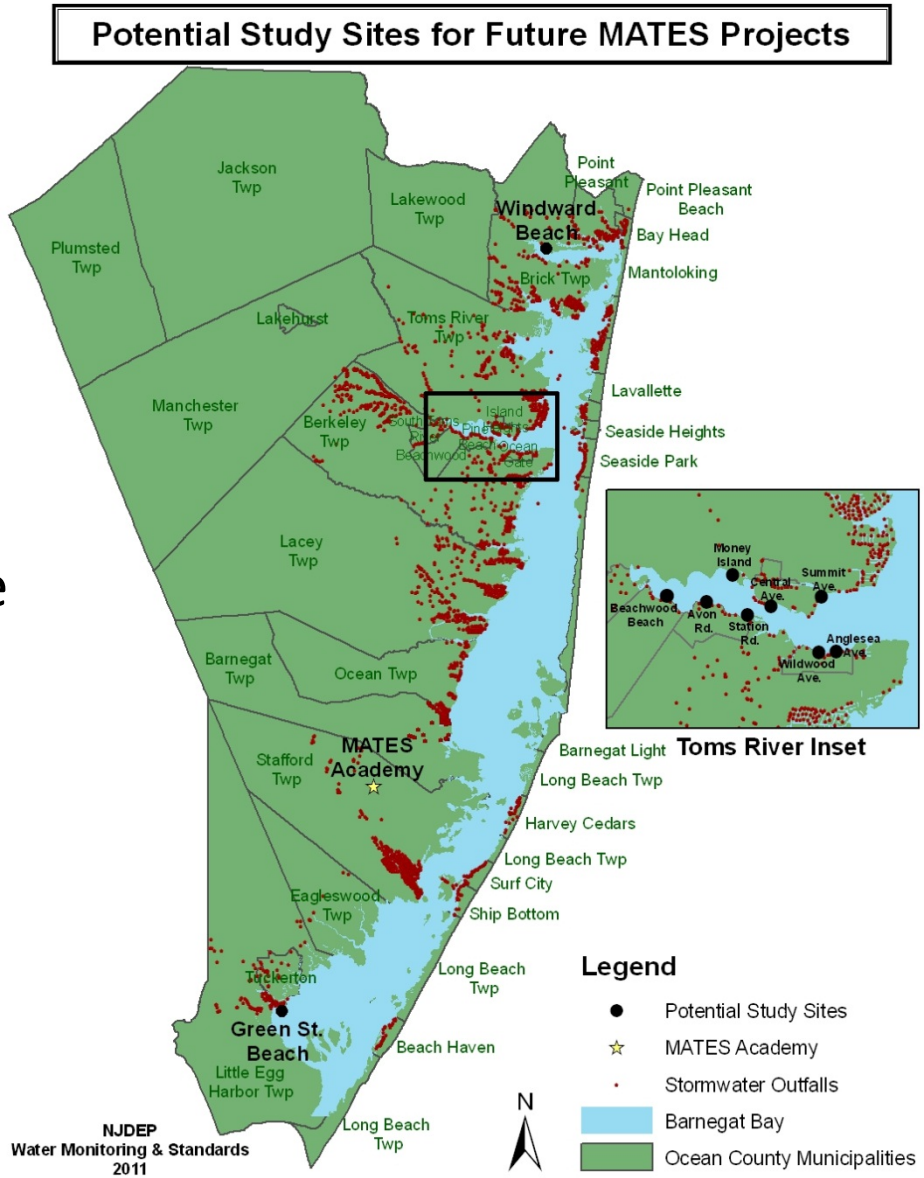
Location	Leed's (CFU/ 100 mL)	Ours (CFU/100 mL)
L1S1	30	10
L1S2	20	10
L1S3	37	10
L1S4	3	20

Positive Outcomes

- Students developed a QA/QC protocol and strengthened their methodology for a Tier-B monitoring program
- The team presented its results at an open presentation in August 2011
- They presented to the Pine Beach town council and sent written reports to Beachwood council members

Building on this…

Possibly Long Swamp on the Toms River, Windward Beach, Tuckerton….



Can this be done with other groups?

- **Our Students demonstrate that this is a workable project and established a foundation for a Tier-B water monitoring project**

- **It could be the initial investigation to determine if more advanced testing may be warranted – “the canary in a coal mine”**

Summer 2011 Water Quality Monitoring Team

Application and Student Sampling Video

savebarnegatbay.org

http://www.youtube.com/watch?v=-Ts58uQs8vE

Acknowledgements

- Save Barnegat Bay
- Ms. Danielle Donkersloot NJDEP
- Dr. Jill Lipoti NJDEP
- Mr. Robert Schuster NJDEP
- Ms. Cara Muscio Rutgers Cooperative Extension
- MATES
- Barnegat Bay Student Grant Program