Narrow River – 20 years of River Monitoring!

Veronica M. Berounsky, Ph.D. & Annette DeSilva

A presentation to the Narrow River Preservation Association's Annual Meeting

October 4, 2012

Topics to be covered

- The River Watch volunteer monitoring program –overview
- A review of Twenty Years of Data
- Observations and Trends
- What can we do?
- How has the data been used?
- Partners and Funding
- 2012 Narrow River Volunteers

Photo by Veronica Berounsky

River Watch – Background Information

- 1991 - The Narrow River Stormwater Management Project - As part of this project, funds were allocated for citizen water quality monitoring.
- 1992 - “River Watch” officially begins with 10 monitoring locations and is part of the URI Watershed Watch Program
- 2011 – Completed 20 years of volunteer monitoring of the Narrow River! – 14 sites

Watershed Watch & River Watch Goals:

- To promote active citizen participation in water quality protection.
- To educate the public about water quality issues.
- To obtain multi-year surface water quality information in order to ascertain current conditions and to detect trends.
- To encourage sound management programs based upon water quality information.

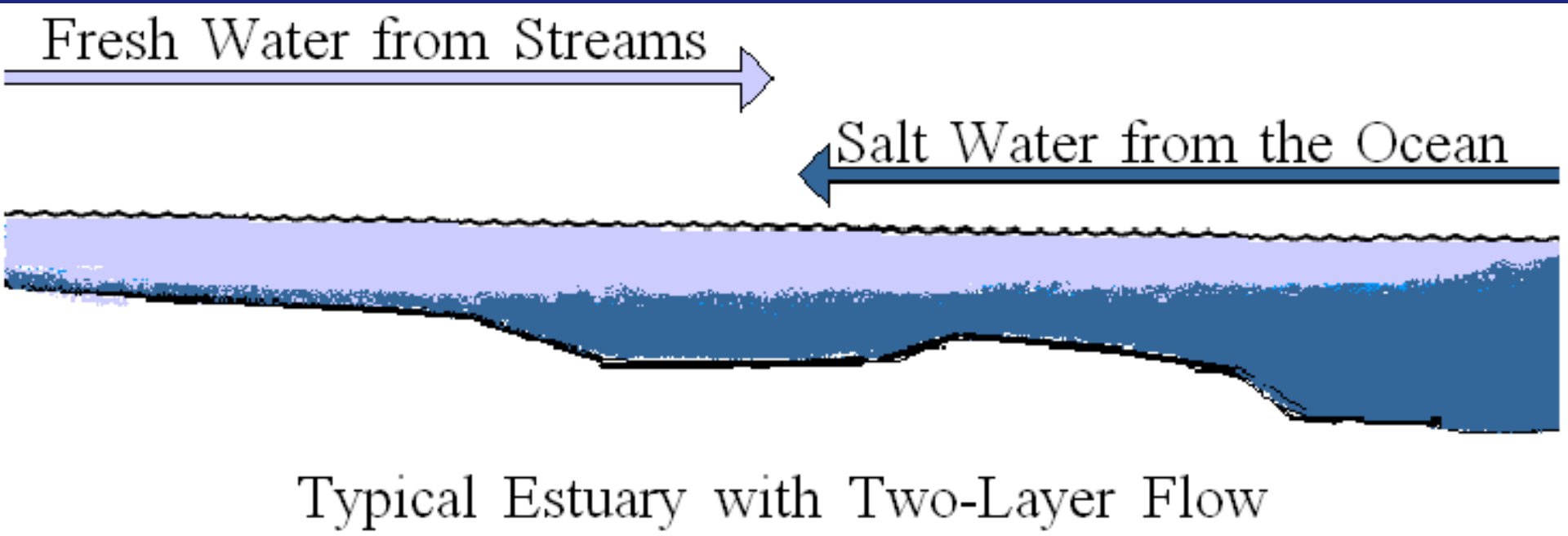
Satellite view of Narrow River and its Watershed

- Watershed boundary is approximately Rt. 1 and Rt. 1A
- Watershed area is 8,700 acres or 14.4 sq. miles or 35.5 sq. km
- Length is 7 miles or 9 km long
- Located in North Kingstown, South Kingstown & Narragansett

Land use is primarily residential

(Photo from Google Earth)

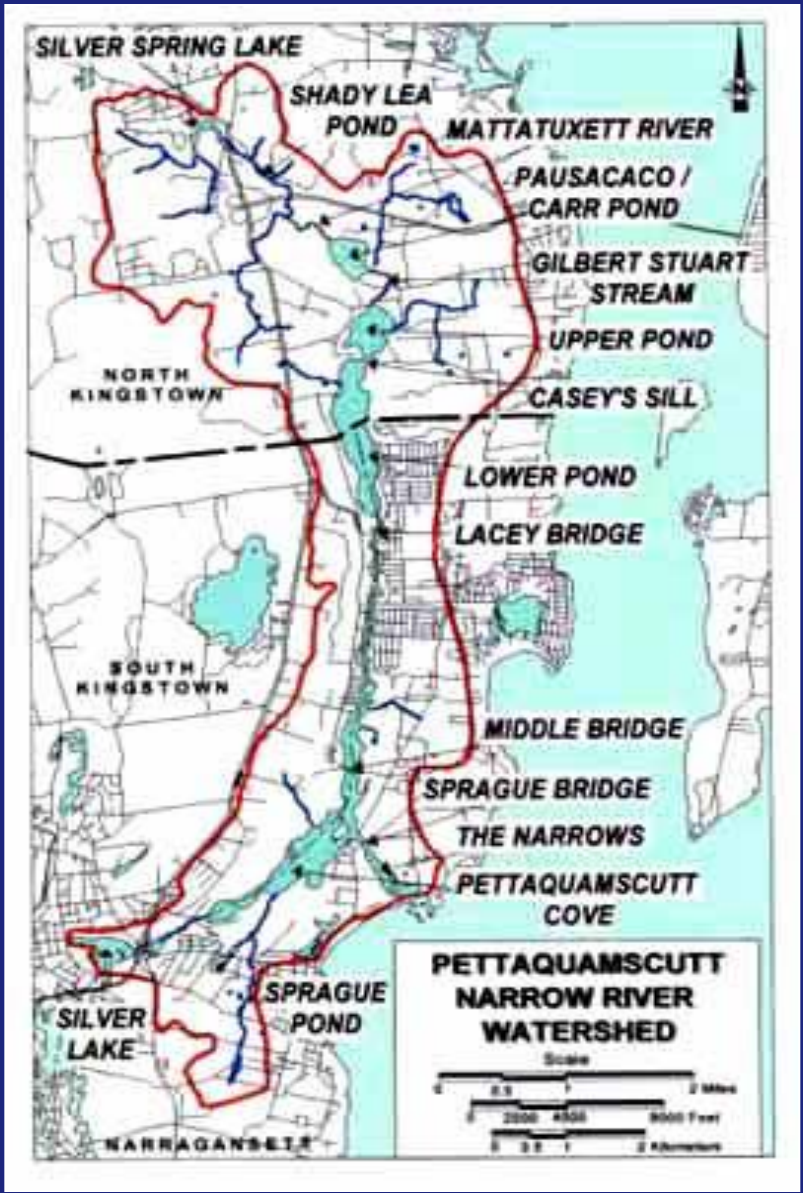
The Narrow River is actually an estuary, not just a river, and has flows of both freshwater and salt water. Salt water from RI Sound reaches into Gilbert Stuart Stream at high tide.



Typical Estuary with Two-Layer Flow

Diagram by David Smith (2008)

Narrow River - Monitoring Locations



- NR1 - Gilbert Stuart Stream
- NR2 - Upper Pond
- NR3 - Lower Pond A
- NR4 - Lower Pond B
- NR5 - Lacey Bridge
- NR6 - Mettatuxet Beach
- NR7 - End of the Narrows
- NR8 - Middlebridge
- NR9 - Pettaquamscutt Cove
- NR10 - Sprague Bridge
- NR11 - Mettatuxet Brook (1996)
- NR12 - Mumford Brook (2000)
- NR13 – Near Lakeside Rd (2004)
- NR14 – Lakeside Outfall (2004)

What is monitored?

- Monitoring Season: May – Oct
- Temperature
- Salinity
- Dissolved Oxygen
- Chlorophyll
- Bacteria
- Nutrients

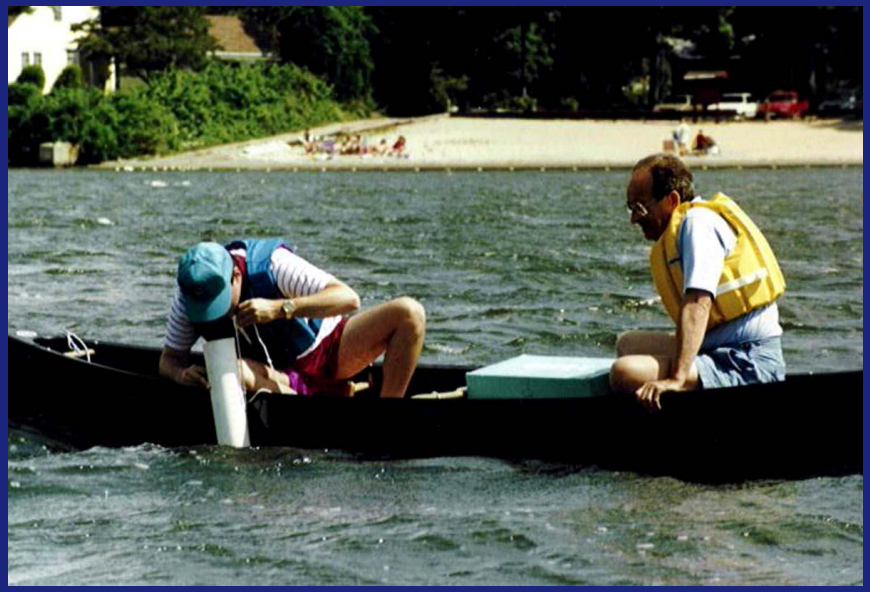


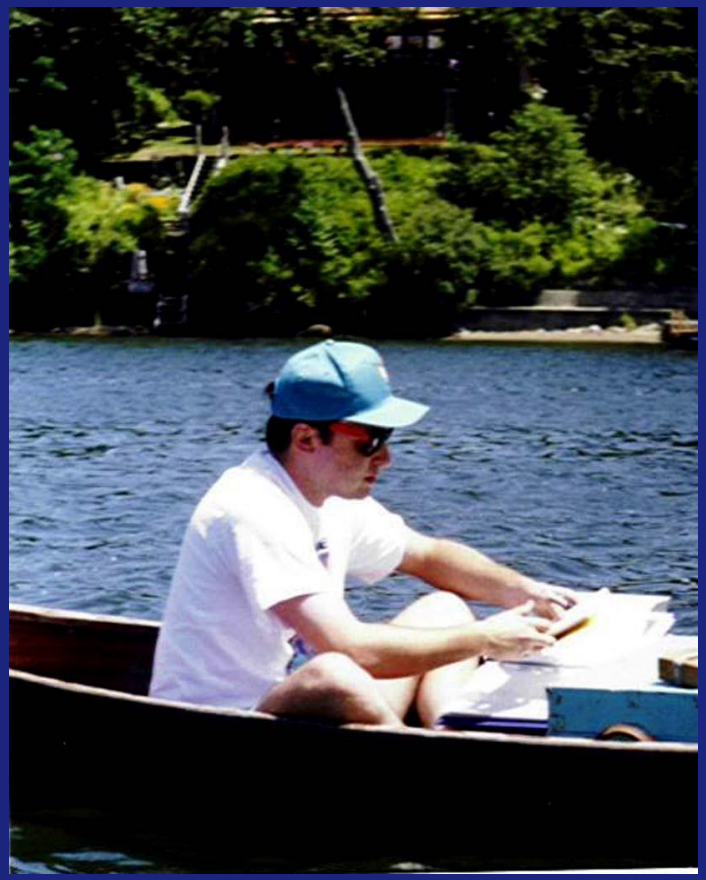
Photo by Annette DeSilva

Twenty Years in Review

- 170 volunteers have participated in the Narrow River Watch Program!
- # of monitoring days = 2576 (= 130/year)
- Total Field Measurements = ~ 30,534
- Total Lab Analyses = ~10,400
- Volunteer Hours = 4,200+ hours

River Watch Data

~ a brief summary ~



Monitor Robert Schelleng 1992
(Photo by Annette DeSilva)

Bacteria Data and Trends

Photo by Annette DeSilva

Bacteria – Why are we concerned?

- Bacteria analyses screen for suitability for recreational water uses (swimming) and shellfishing, and may indicate sewage contamination.

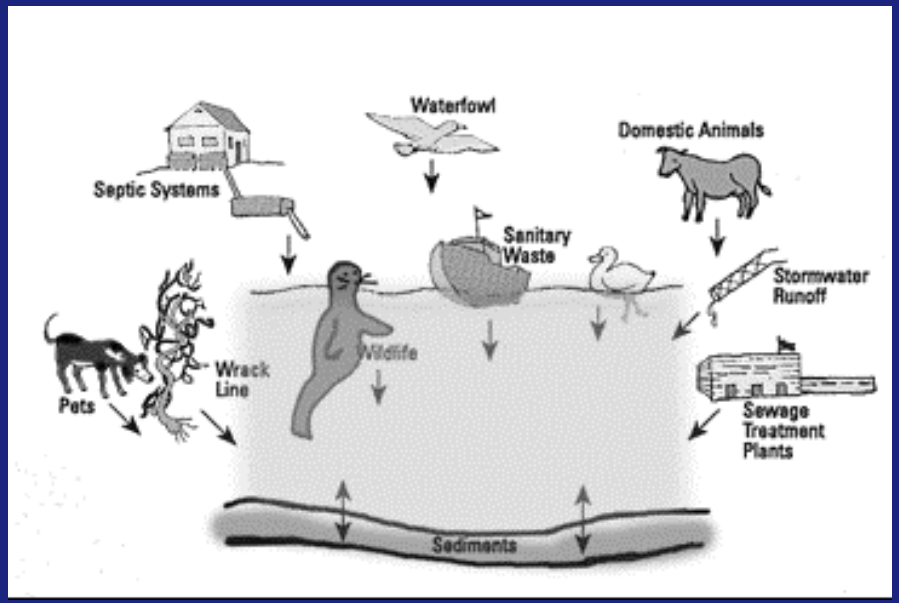


Figure 1: Potential sources of bacteria to a waterway (from Ely, 1997).

Marine standards:

- Recreation (safe swimming) = 50 fecal coliform/100 ml
- Shellfishing = 14 fecal coliform/100 ml

Fresh Water Standard:

- Recreation = 200 fecal coliform/100 ml

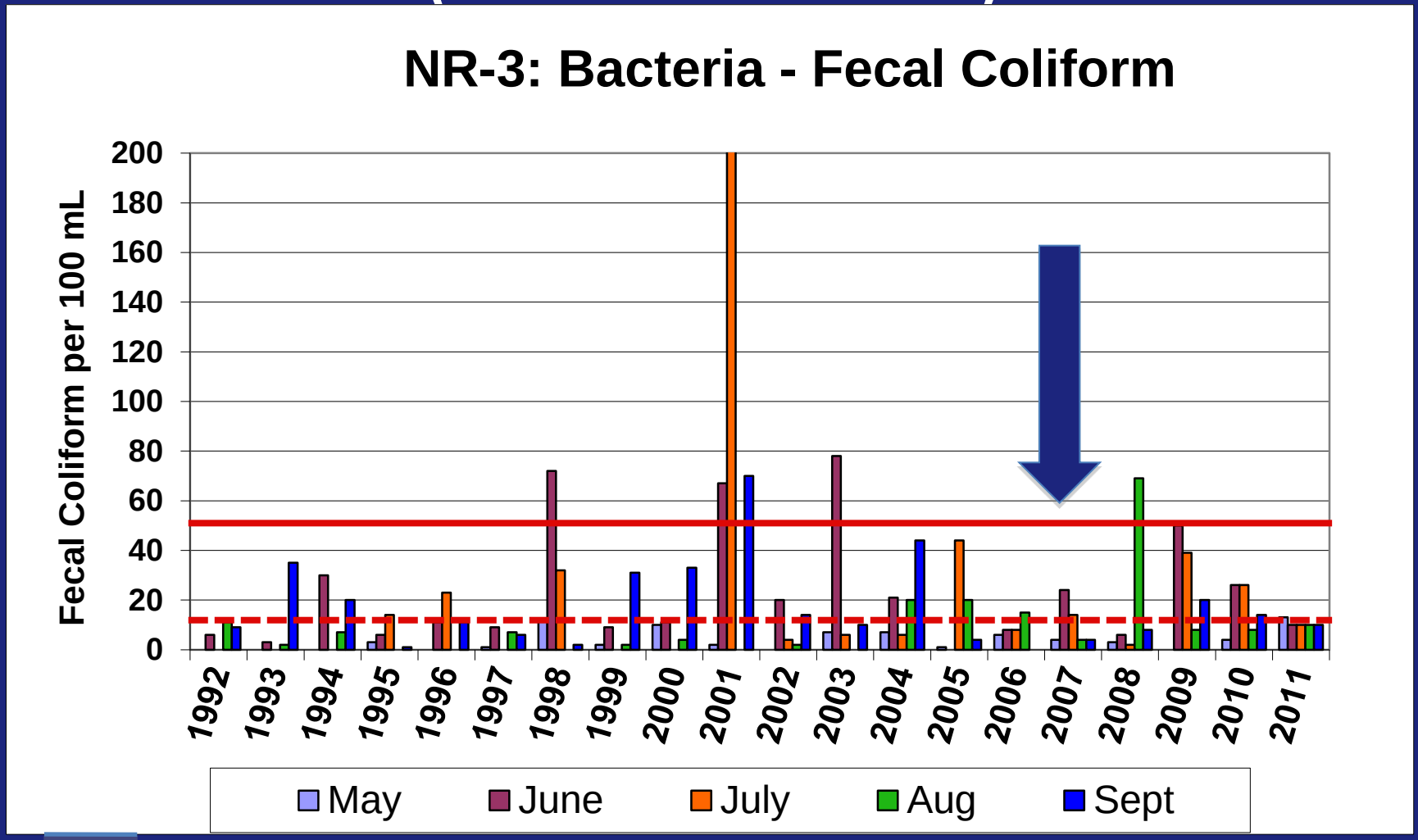
Sites and Bacteria Trends

- The next slides will include a photograph of a selected River Watch site followed by a graph of the 20 years of bacteria values at that site.
- Graphs of nutrient trends will follow.

NR 3 - Lower Pond
Is home to the URI Crew Teams and the annual Narrow River Turnaround Swim

Photo above by Veronica Berounsky
Photo right by John McNamara

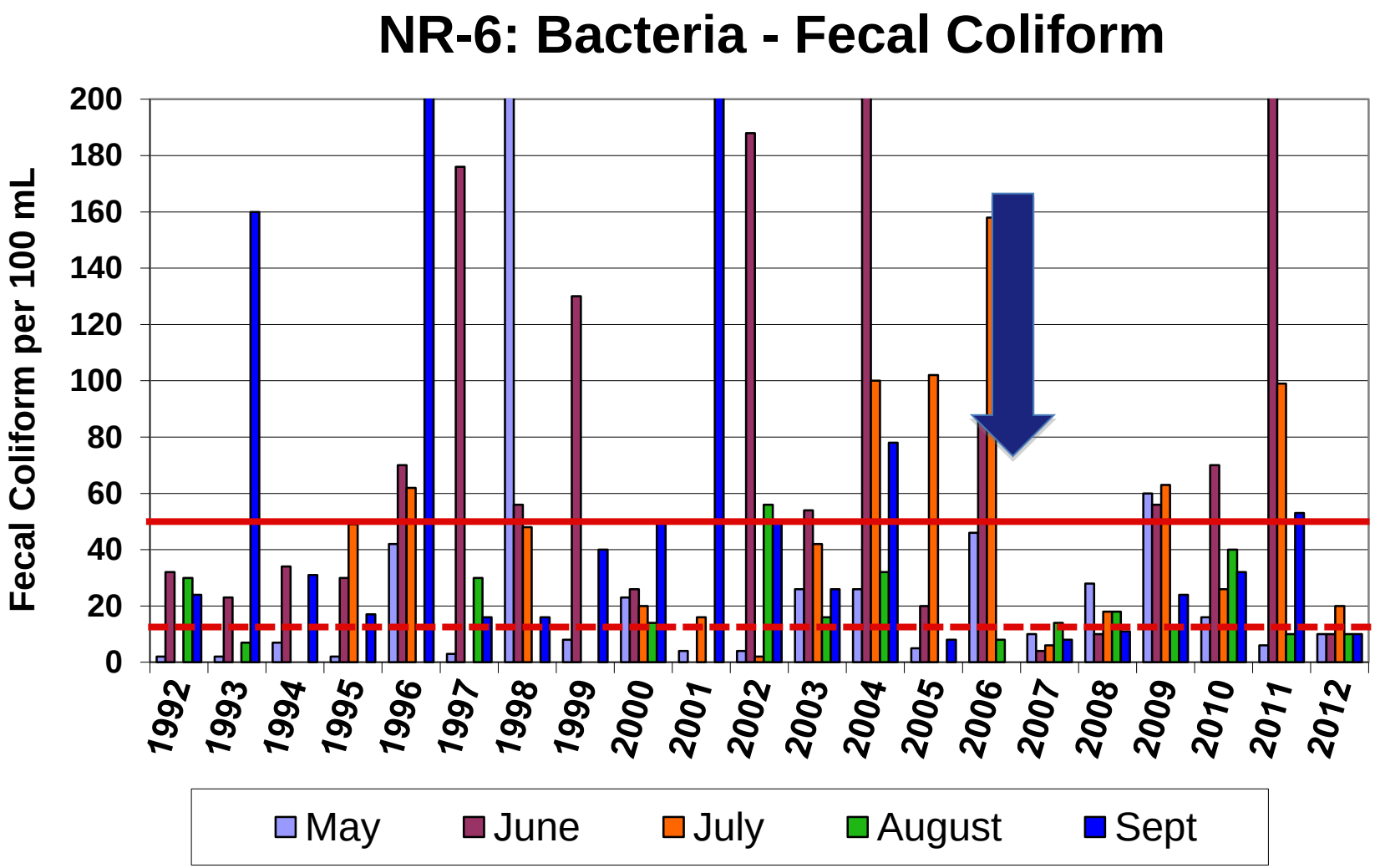
NR-3: Lower Pond (marine water)



NR 6 - Mettatuxet Beach Detention Pond outfall

Photo by Veronica Berounsky

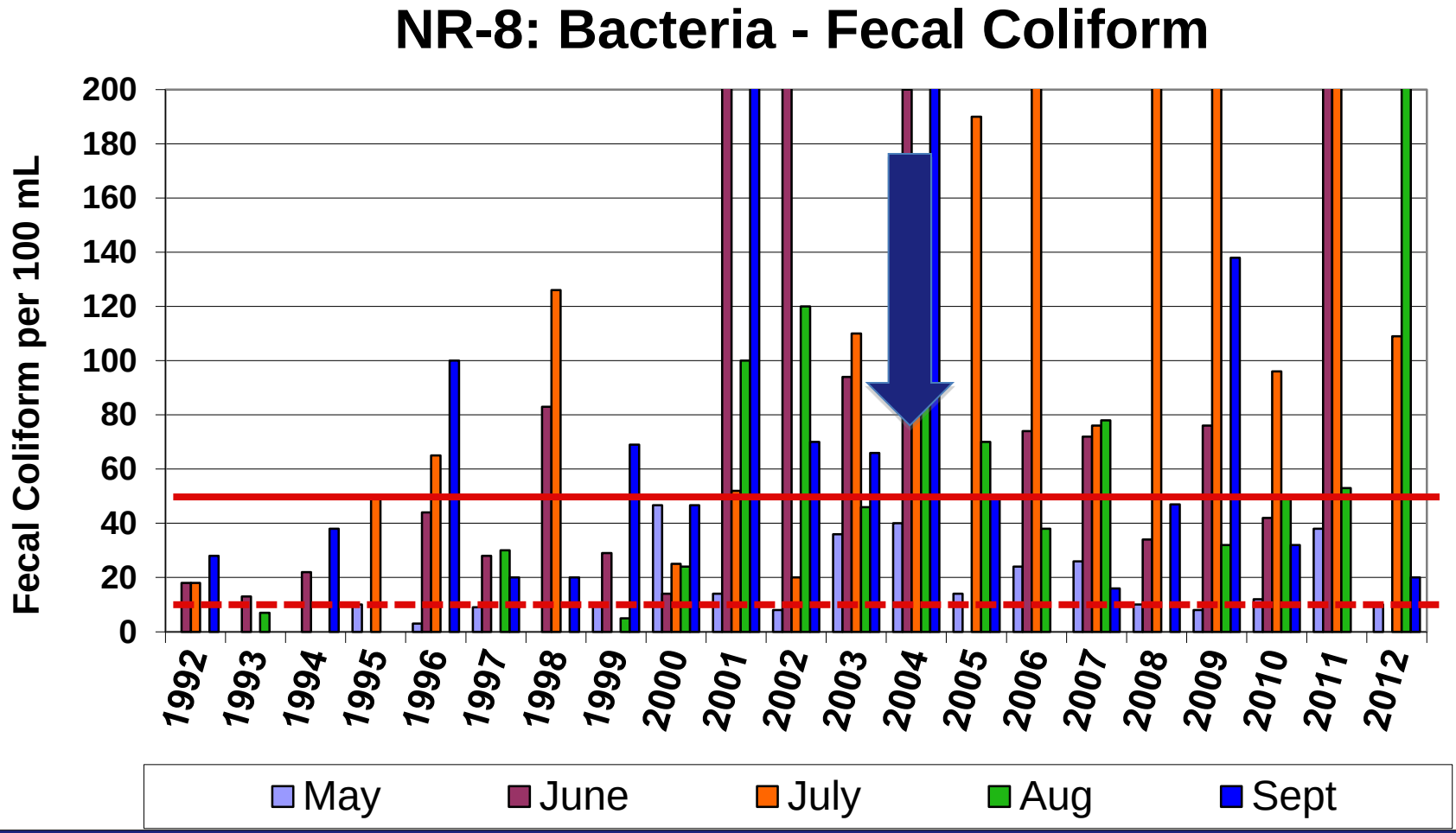
NR-6: Mettatuxett Beach



NR 8 = Middlebridge Bridge

Photo by Veronica Berounsky

NR-8: Middlebridge



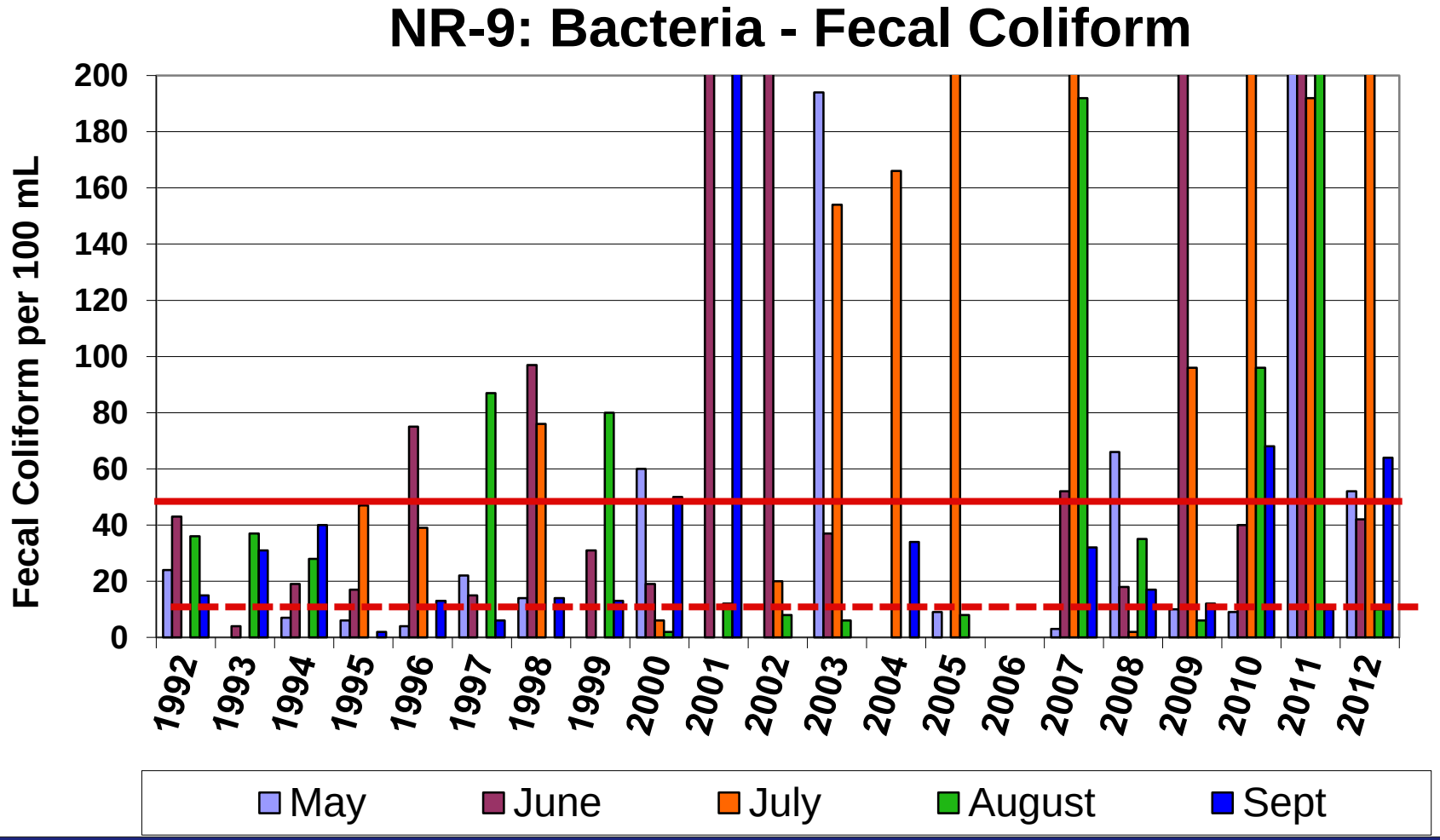
Safe Swimming = 50 FC/100 mL

Shellfishing = 14 FC/100 mL

NR 9 – Pettaquamscutt Cove

Kayakers near Gooseberry Island - Photo by Jason Considine

NR-9 Pettaquamscutt Cove



Safe Swimming = 50 FC/100 mL

Shellfishing = 14 FC/100 mL

Now we will look at monitoring trends at sites where waters enter Narrow River….

NR-13: Near Lakeside Drive

photo by Veronica Berounsky

NR-14: OLD Edgewater outfall pipe

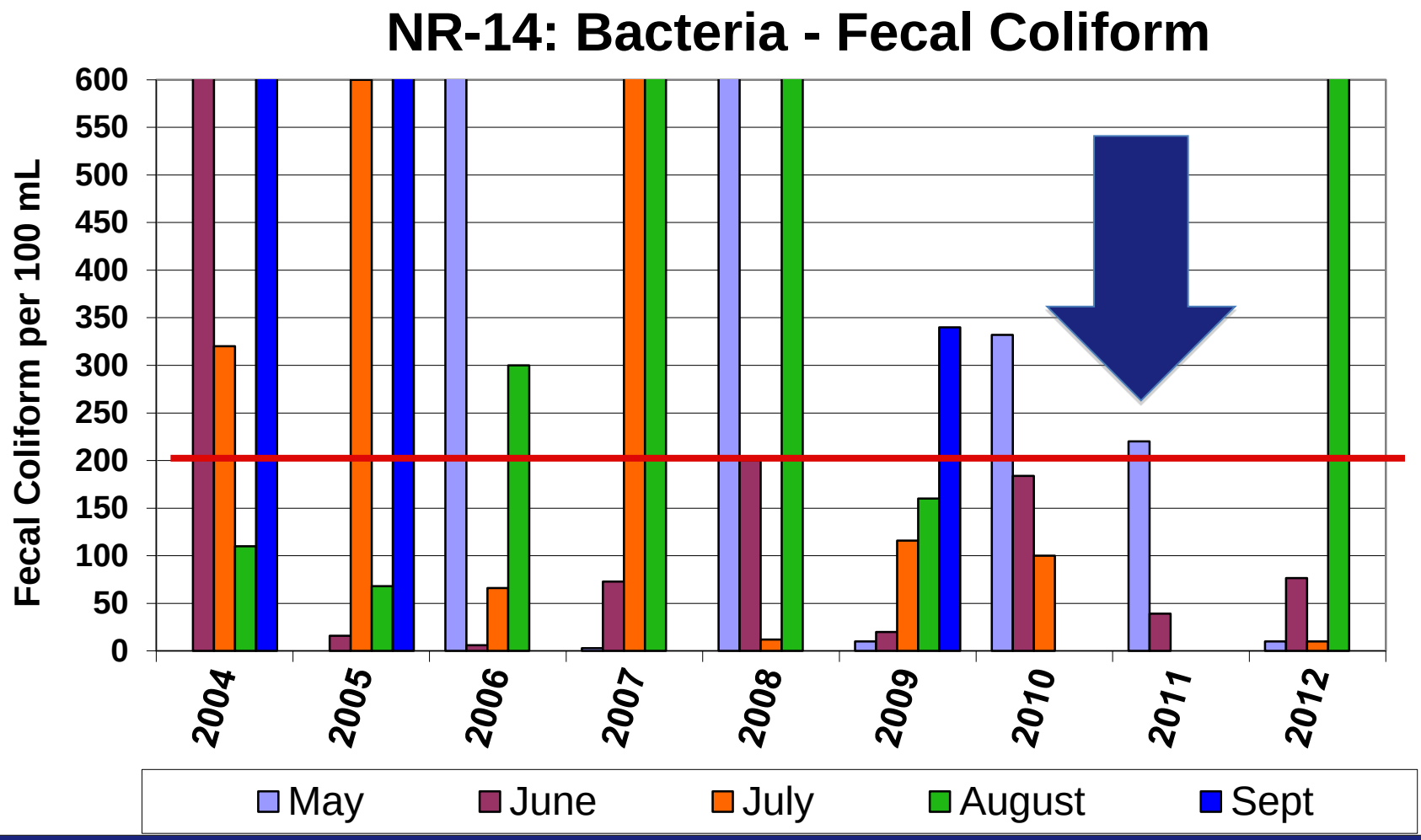
photo by Veronica. Berounsky

The NEW Edgewater BMP system: sand filter and outfall

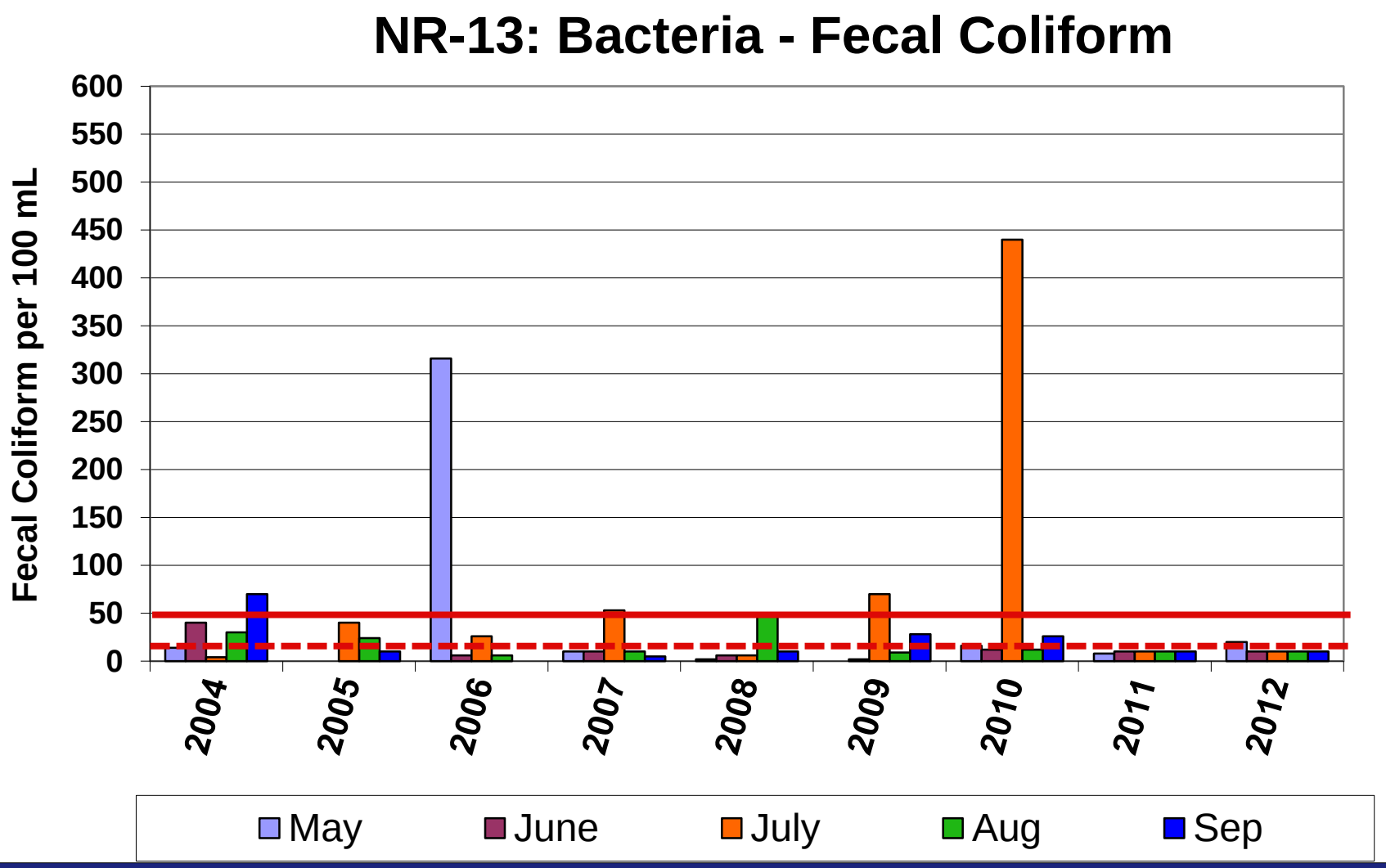
The sand filter slows down the flow of stormwater, keeps it in the sunlight, and filters it to reduce the amount of bacteria and nitrogen

Photos by Veronica Berounsky

NR-14: Lakeside Outfall



NR-13: Near Lakeside Drive



Safe Swimming = 50 FC/100 mL

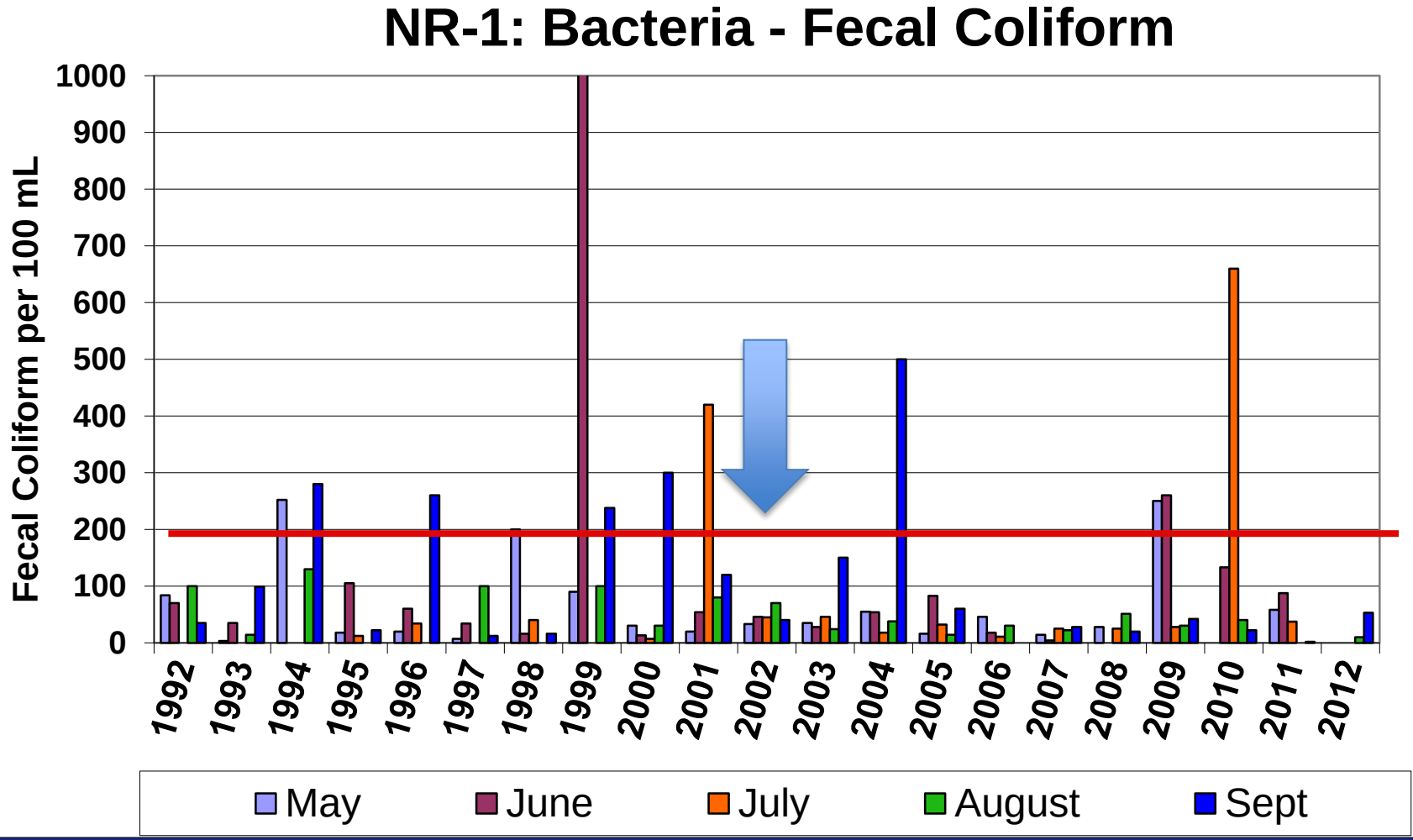
Shellfishing = 14 FC/100 mL

NR-1: Gilbert Stuart Stream entering Narrow River

Station NR 1 is just north of here

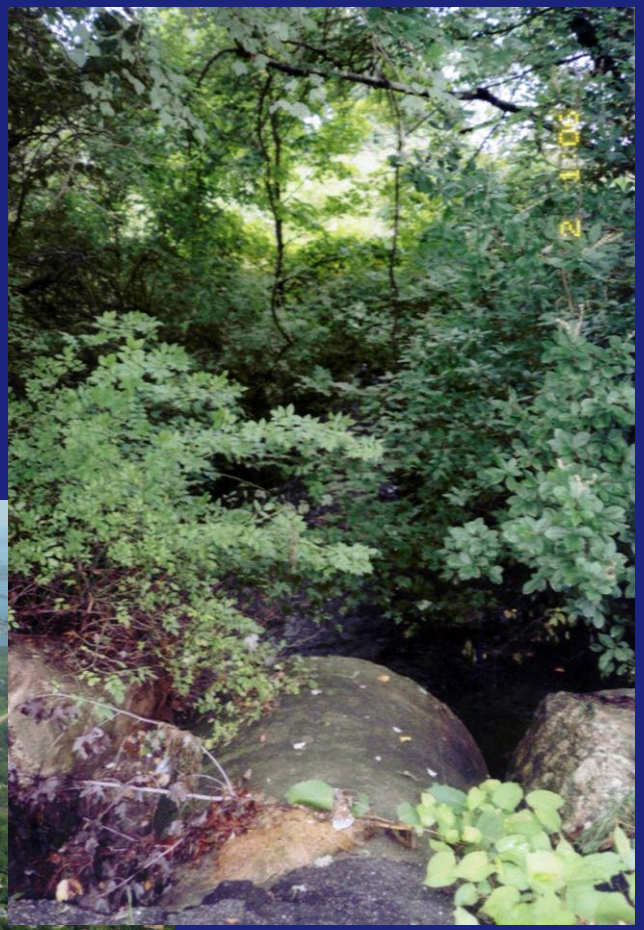
Photo by Richard Benjamin 2007

NR-1: Gilbert Stuart Stream (fresh water)



Safe Swimming = 200 FC/100 mL

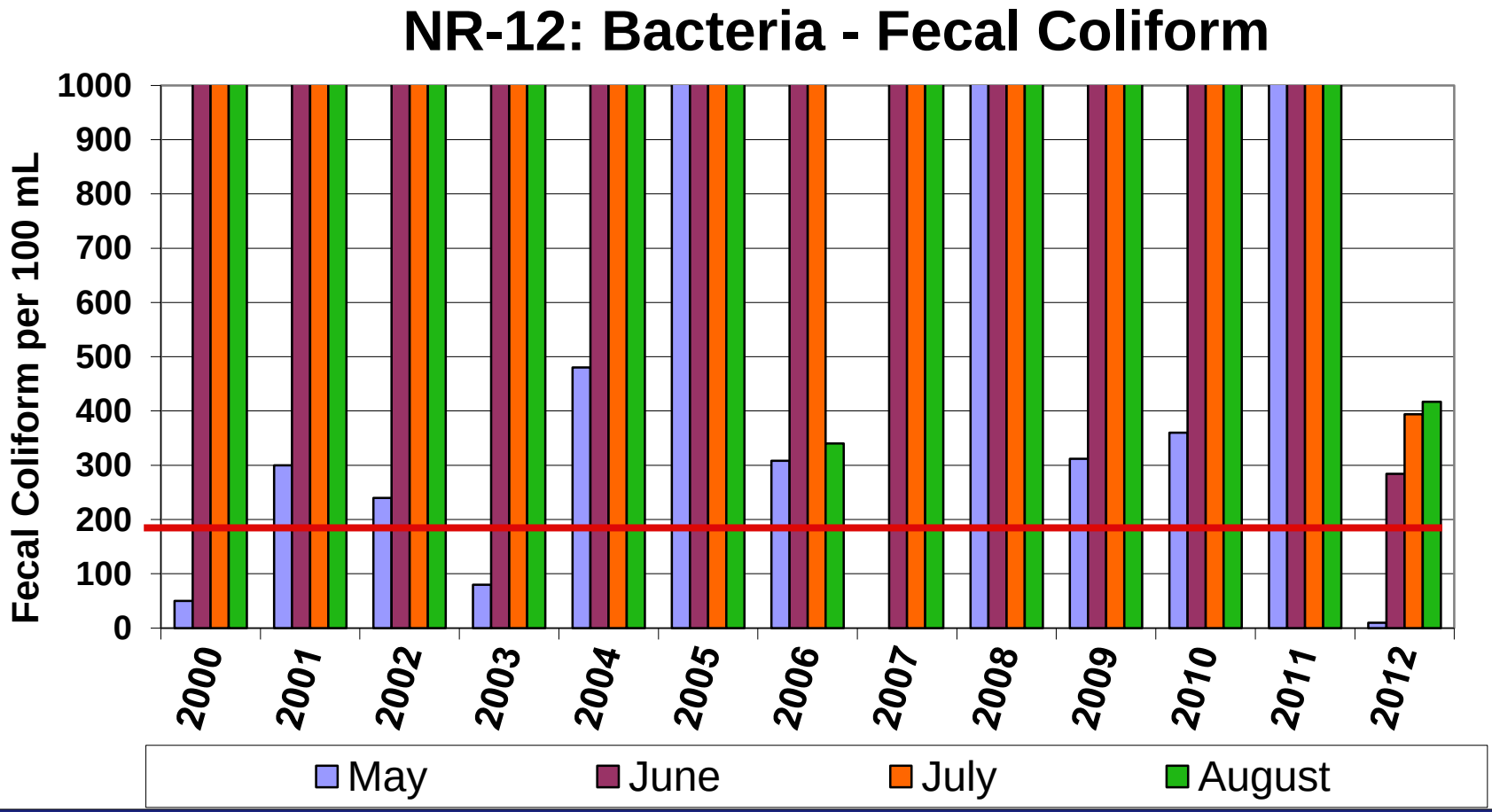
NR-12 = Mumford Brook = fresh water stream entering Pettaquamscutt Cove



Culvert carrying Mumford Brook under Mumford Rd.

Photo above by John McNamara
Photo right by Annette DeSilva

NR-12- Mumford Brook (fresh water)



Safe Swimming = 200 FC/100 mL

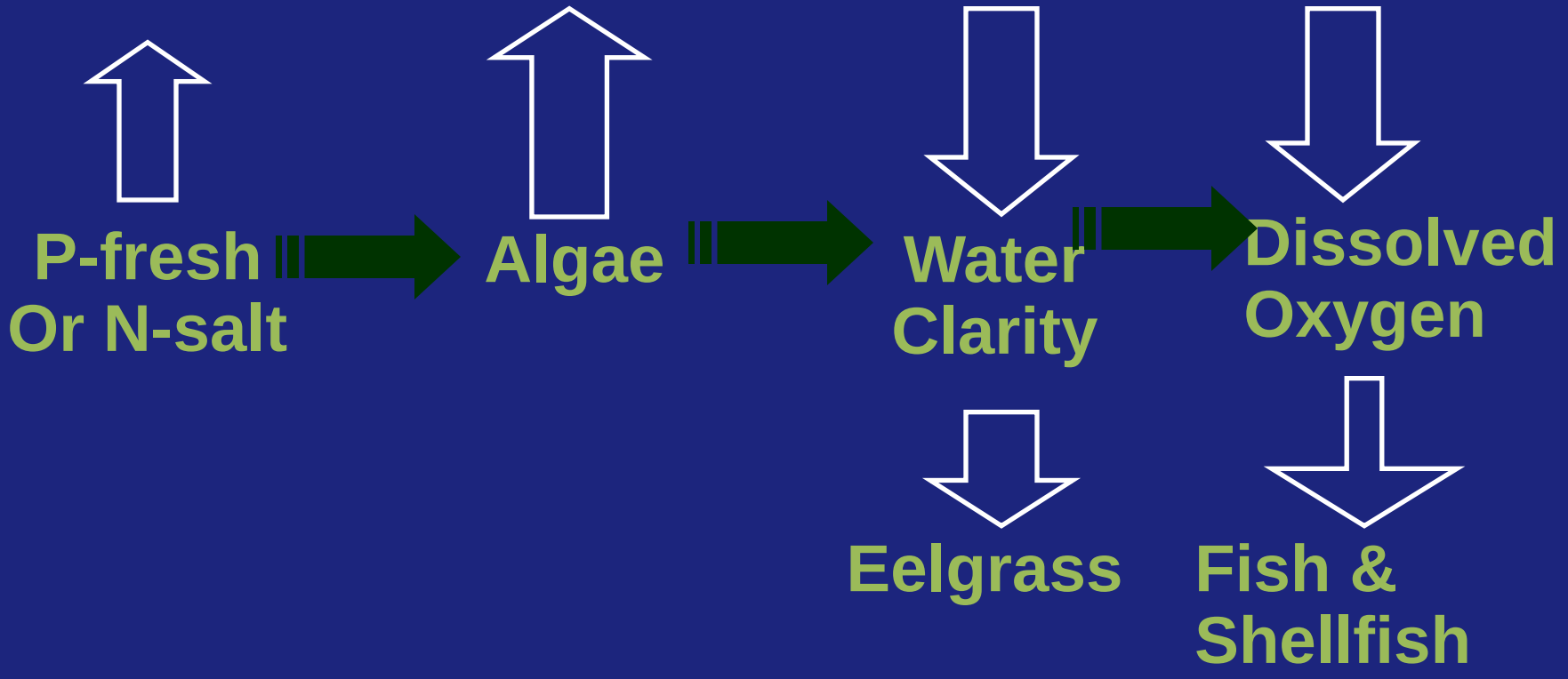
Nitrogen Data and Observations

Why do we worry about Nitrogen?

- Excess fertilizer use leads to runoff of excess nitrogen to the River
- Stormwater runoff is often high in nitrogen and fecal coliform bacteria
- Nitrogen leads to algal blooms that decrease sunlight and harm eelgrass beds
- Decaying algae depletes dissolved oxygen forming hypoxic (low oxygen) conditions and harming fish and shellfish.

Too many nutrients

= eutrophication = enriched waters

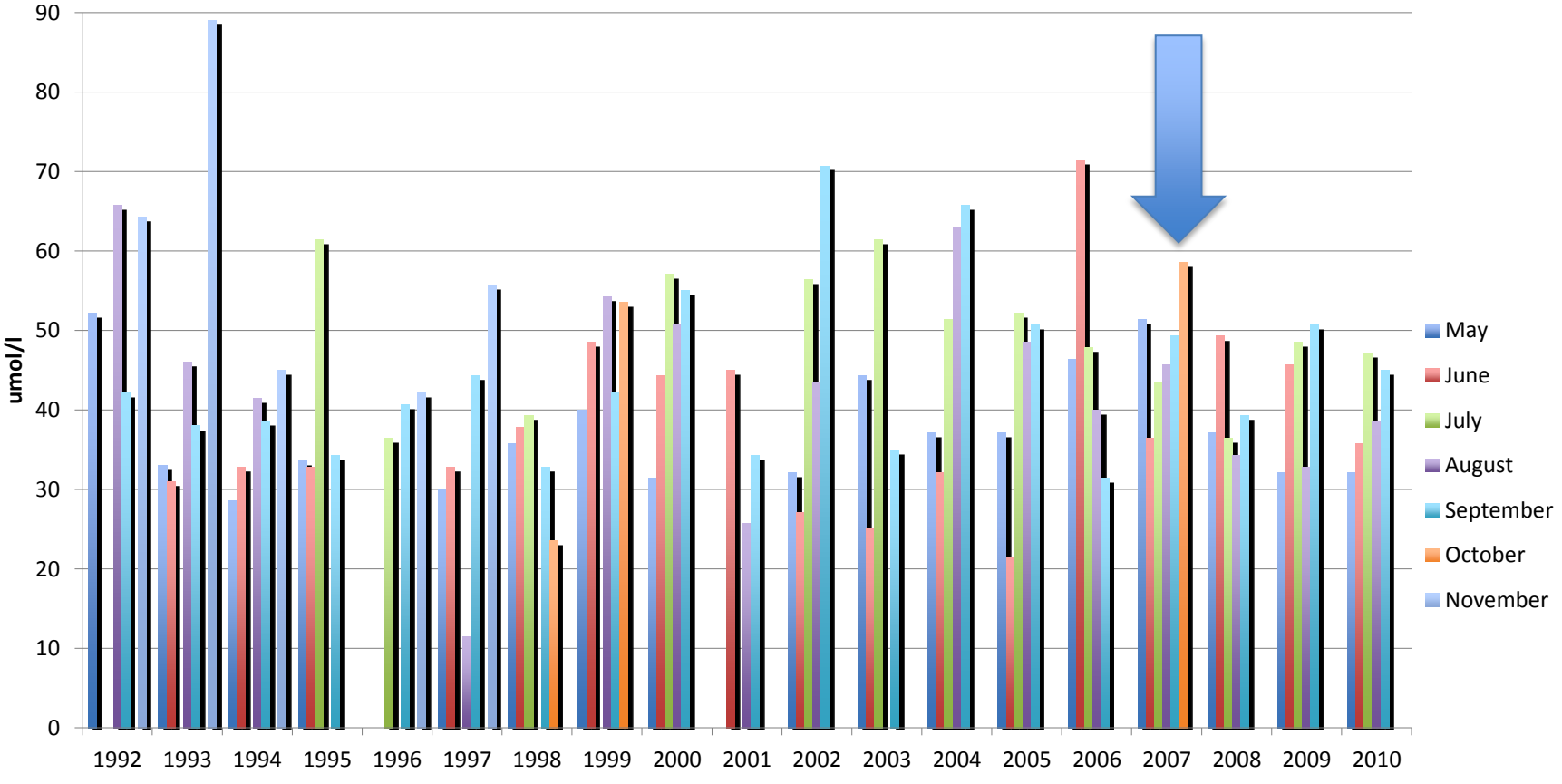


Adapted from URI WW graphic

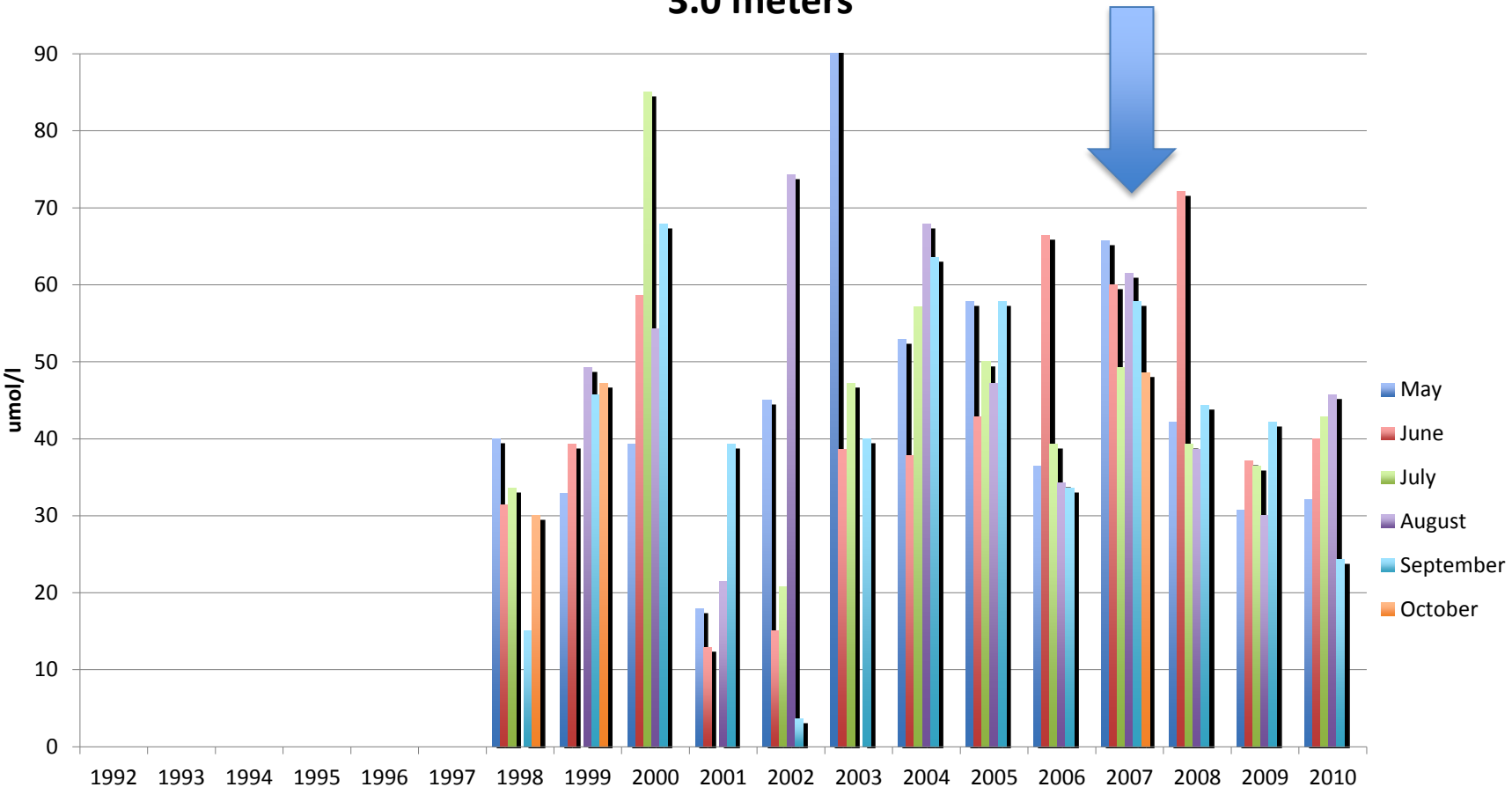
Observations and Trends looked at today:

- 5 stations along the River:
  NR3 = Lower Pond (at surface & at 3m deep)
  NR 6 = Mettatuxet Beach
  NR 8 = Middlebridge
  NR 9 = Pettaquamscutt Cove
  NR 10 = Sprague Bridge

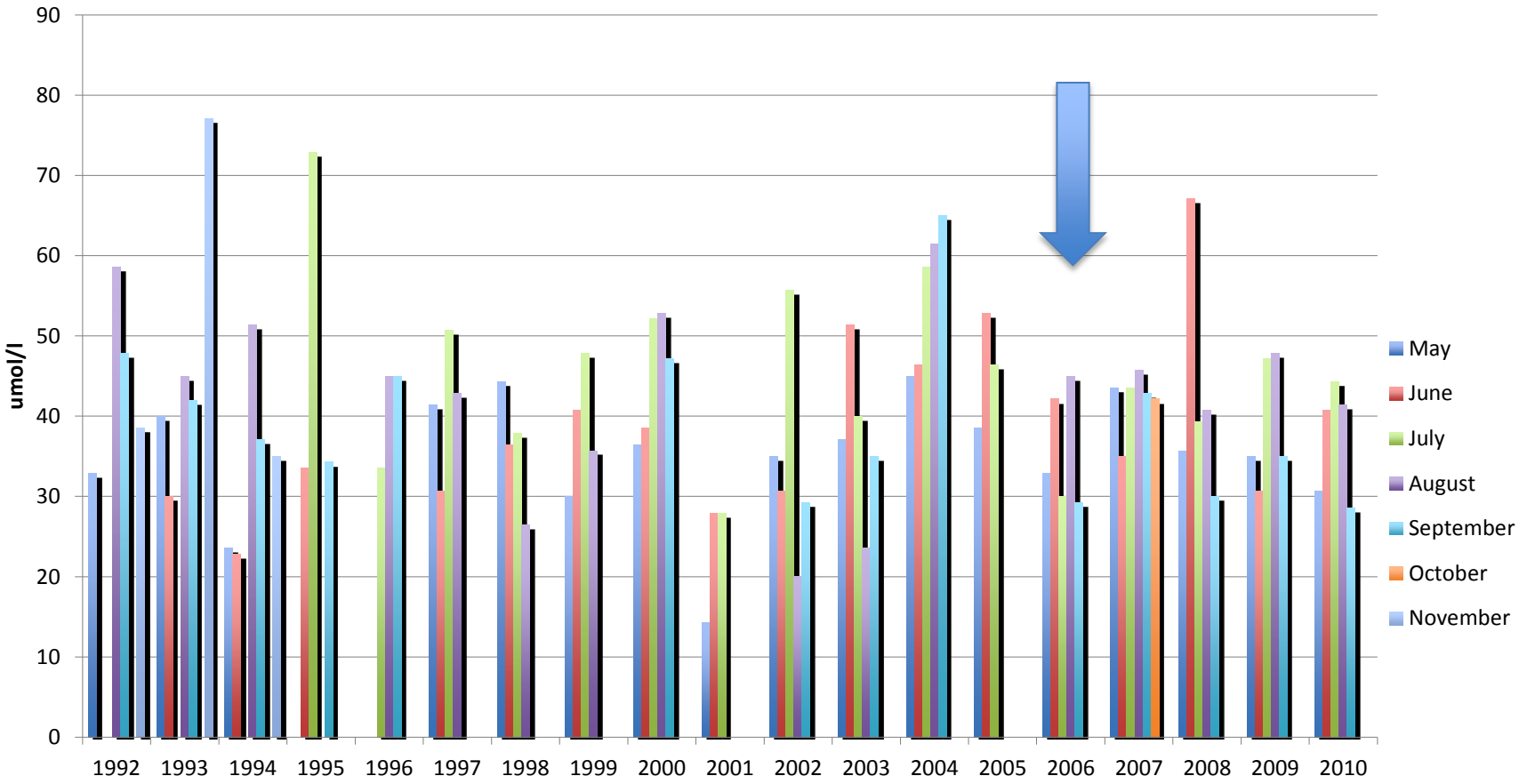
Total Nitrogen
River Watch Season
Lower Pond (NR 3)
Surface



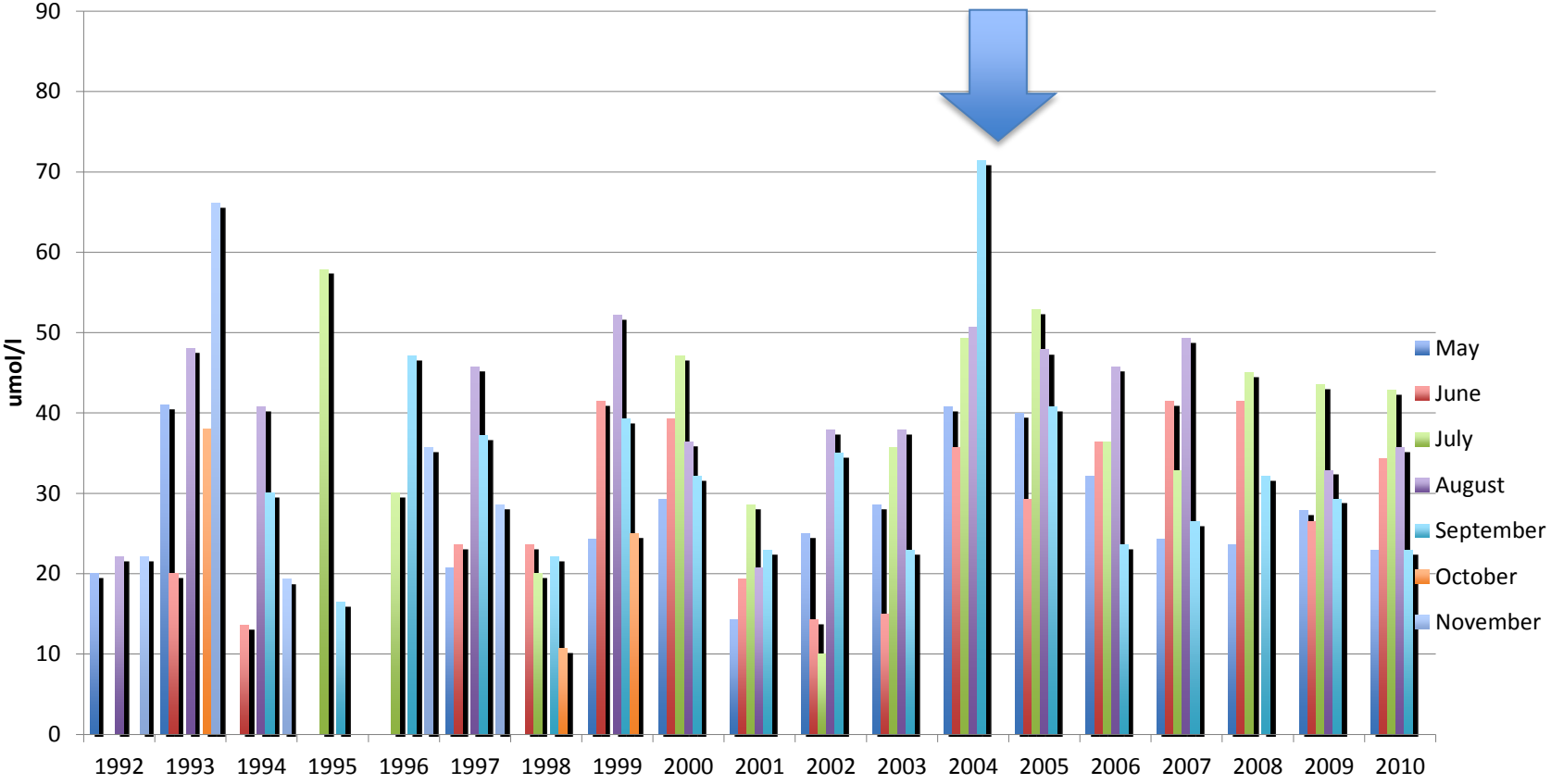
Total Nitrogen
River Watch Season
Lower Pond (NR 3)
3.0 meters



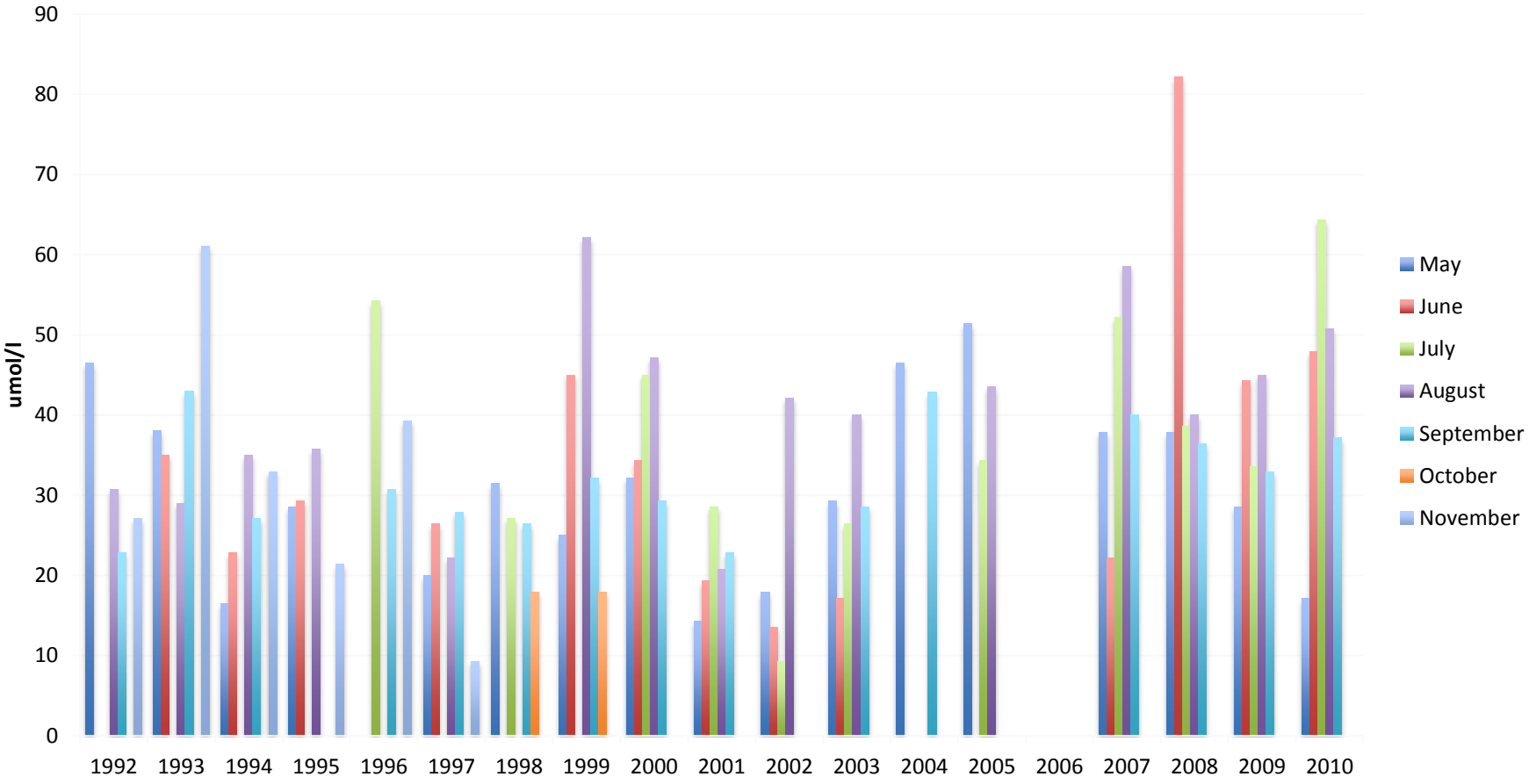
Total Nitrogen
River Watch Season
Mettatuxet Beach (NR 6)
Surface



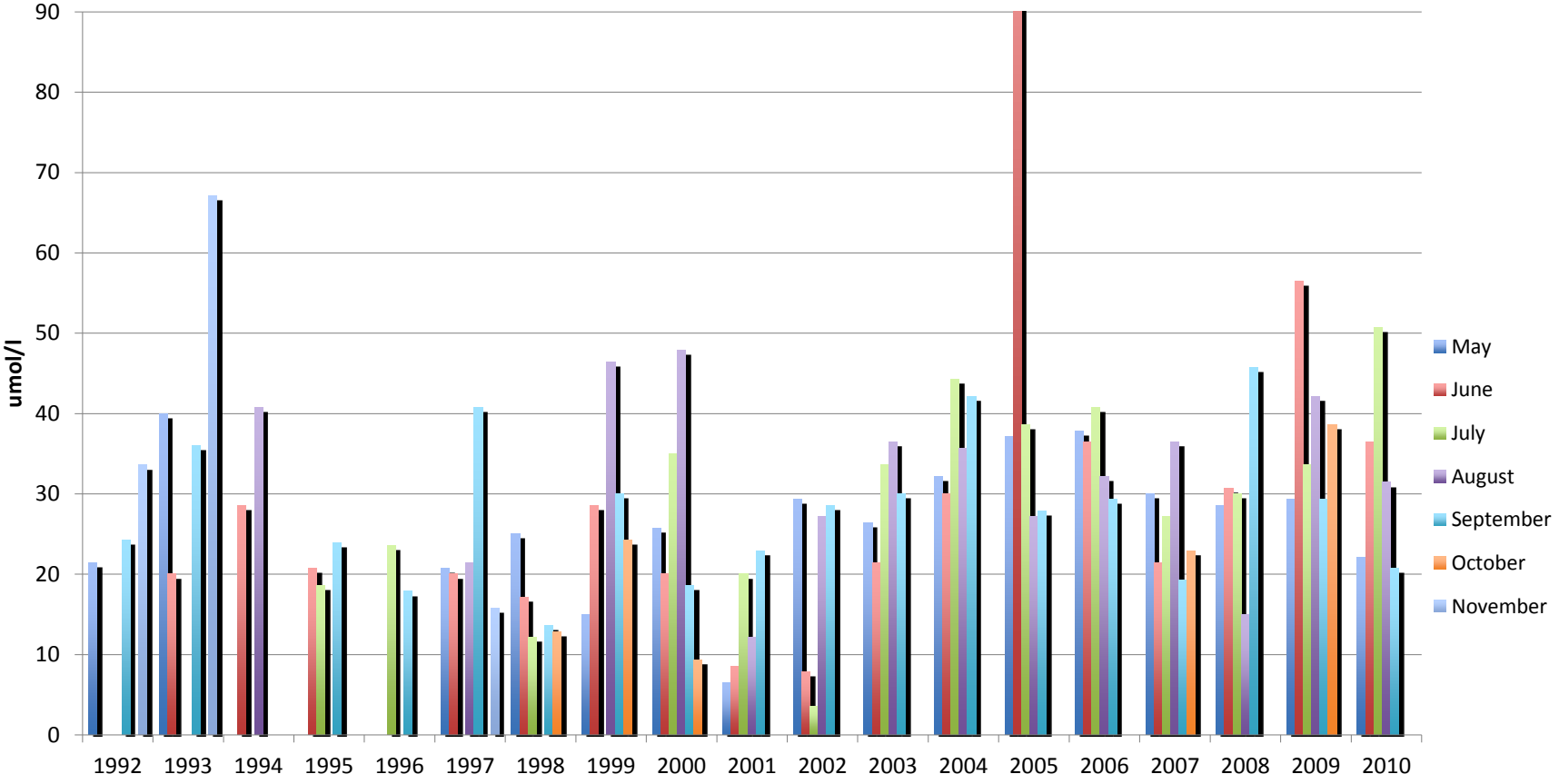
Total Nitrogen
River Watch Season
Middlebridge (NR 8)
Surface



Total Nitrogen
River Watch Season
Pettaquamscutt Cove (NR 9)
Surface



Total Nitrogen
River Watch Season
Sprague Bridge (NR 10)
Surface



Water Quality Trends :

What we have learned from
20 years of River Watch data…..

Conclusions for bacteria and nitrogen

- Streams and the outfall have highest levels of bacteria and nitrogen- these are inputs
- After major rain events, see elevated levels of bacteria and nutrients -so stormwater is a source
- Pond sites have lower bacteria levels than other sites – more land area for filtering?
- Sites close to the mouth have lower nitrogen – because less nitrogen offshore
- Fewer spikes in nitrogen after about 2004 in Middlebridge and Mettatuxet – due to BMP and bridge span increase?

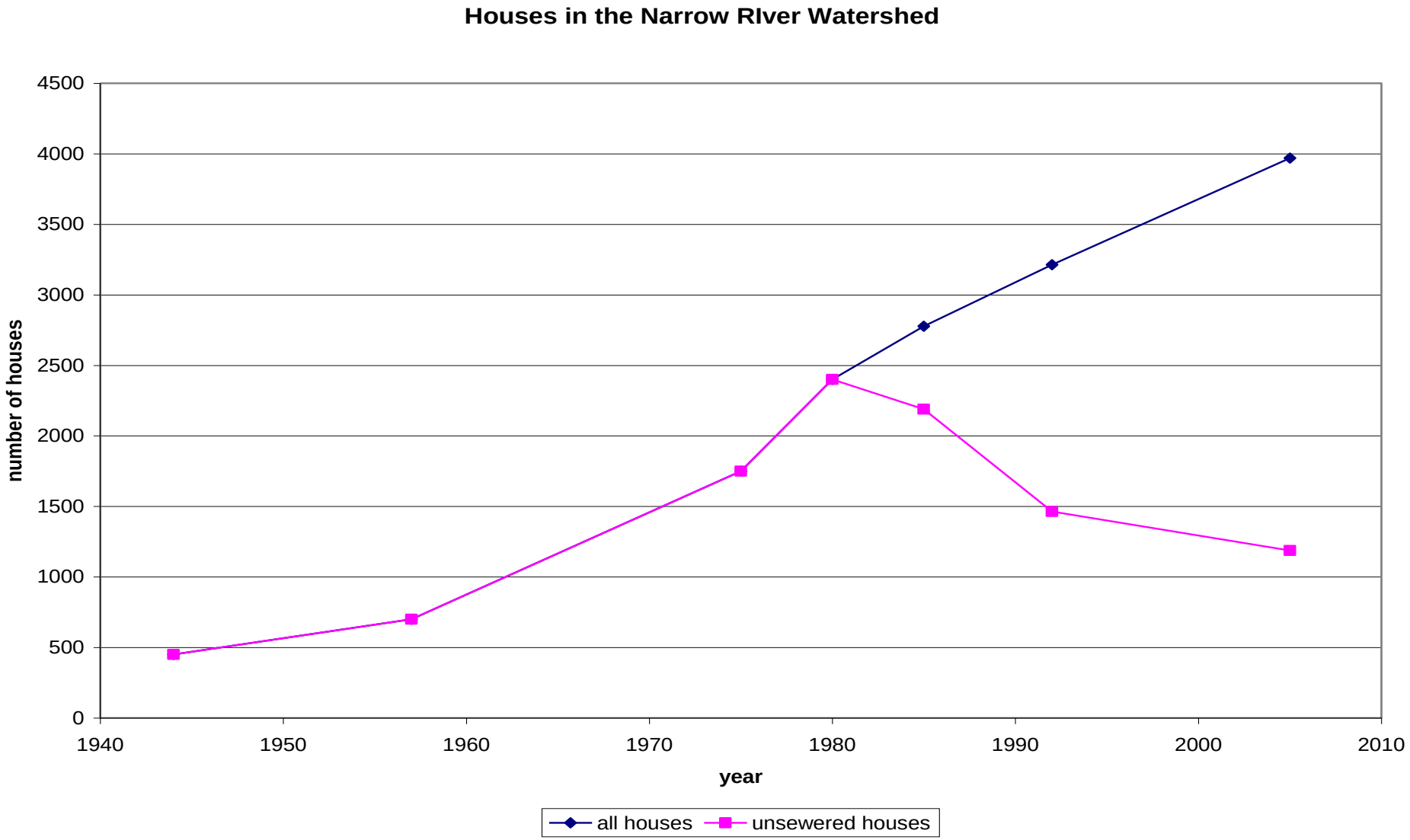
Also, we haven't yet seen a consistent reduction in levels of nitrogen and sewers were supposed to help…

- Why don't we see a decrease in nitrogen right after the sewers went in?
- Information from other watersheds shows a 5-10 year lag after sewers are put in and before any improvements are seen. It's a long term investment.
- Sewers make "unbuildable" lots buildable, so there are more houses with more pavement
- See upcoming graphs…..

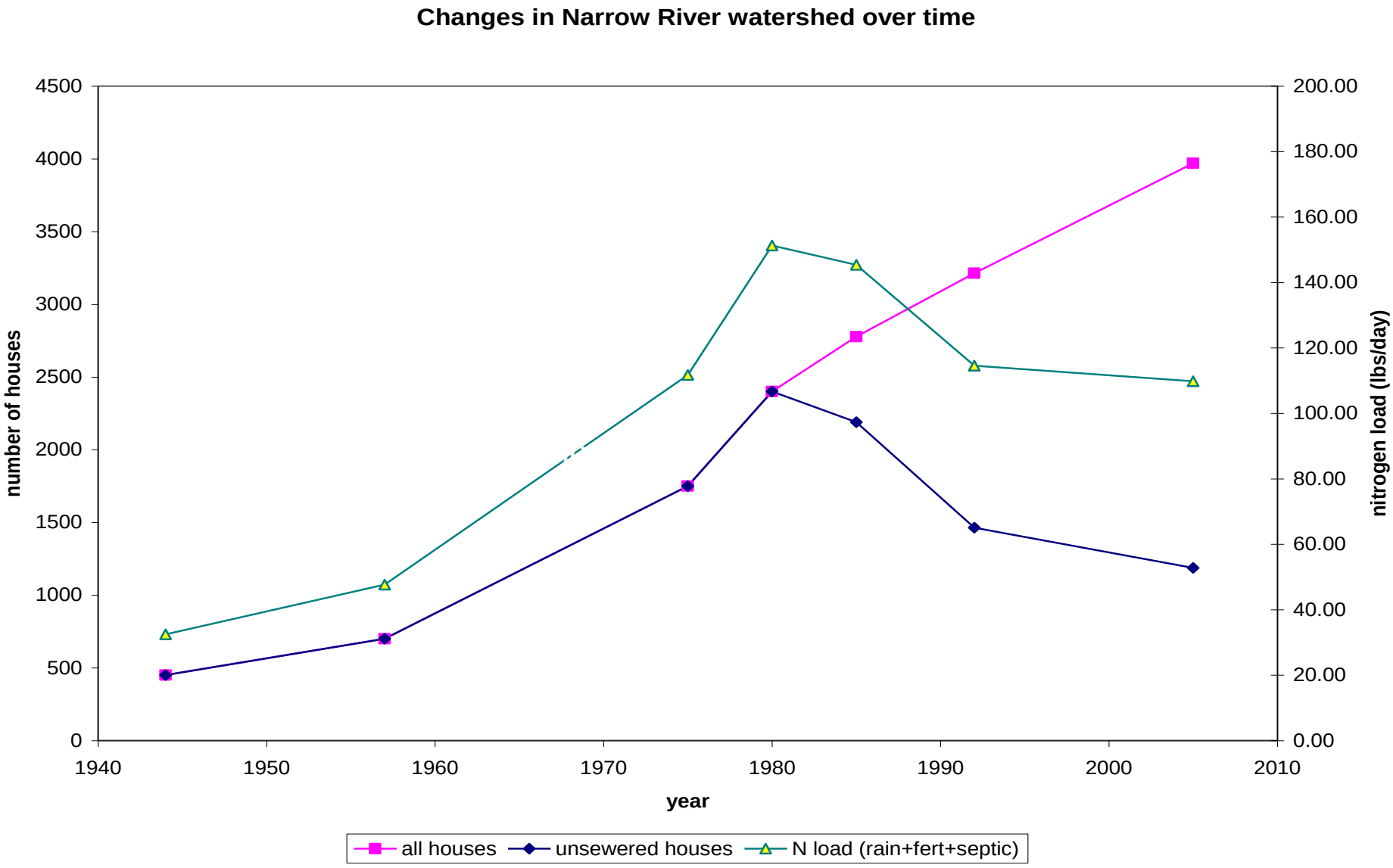
Important Issue for Narrow River: Increase in residential development

Why is this a problem?

- more people = more paved surfaces (roads and driveways and sidewalks) = more stormwater runoff volume
- More people = more fertilizer and pets = more nitrogen in the runoff



Numbers of houses (both as total and as those not connected to a sewer system) in the Narrow River watershed for 1944, 1957, 1975, 1985, 1992, and 2005.
From Berounsky and Nixon 2007.

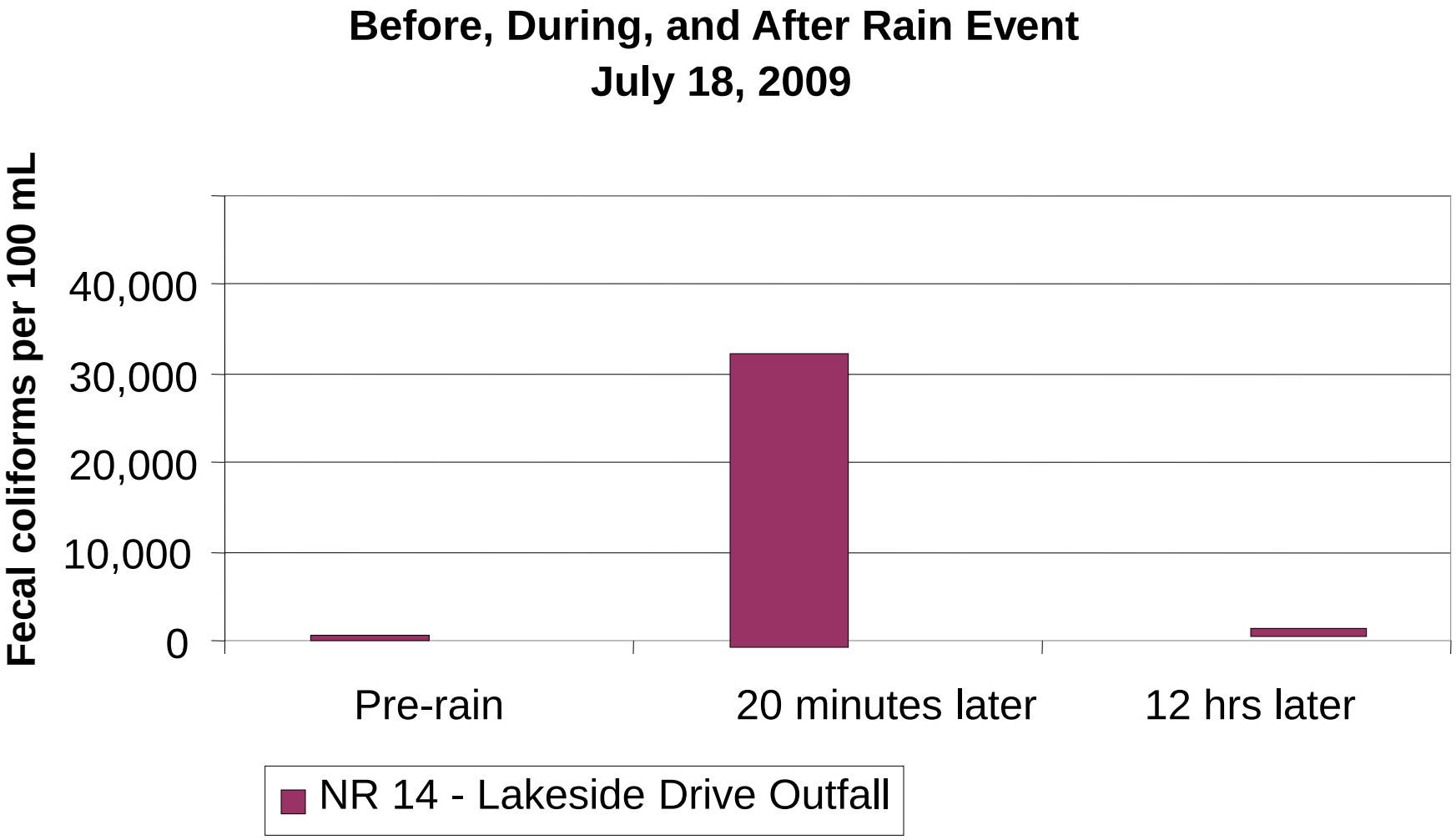


Includes the calculated nitrogen load (SAIC 1994) from three sources: from rain that falls on the watershed and is not taken up by vegetation; from lawn fertilizer; and from septic systems.

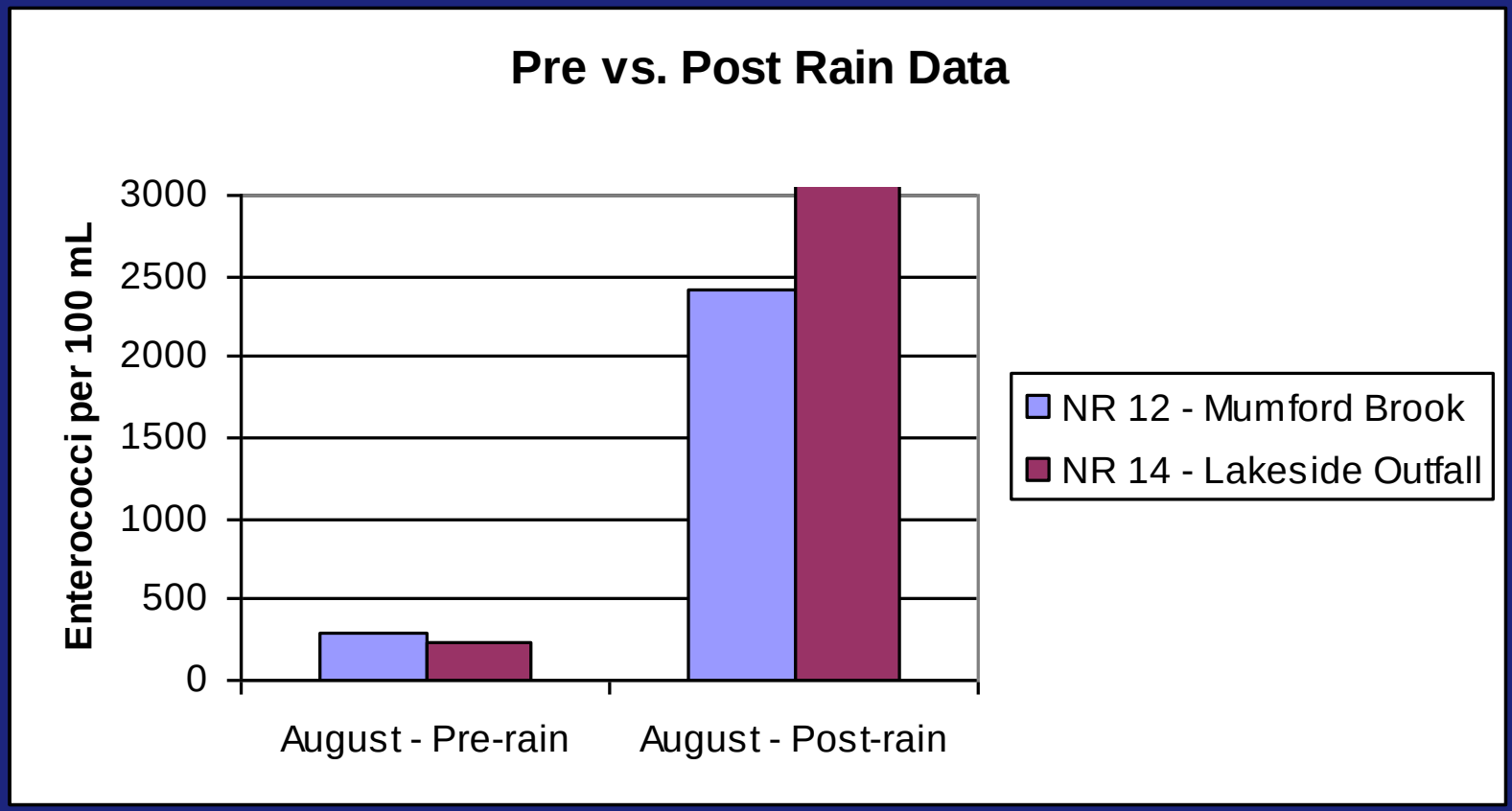
Important Issue for Narrow River: Stormwater

- Stormwater brings both bacteria and nitrogen to the River
- Highest levels are in “first flush” of rain that pushes most material down the streets
- The town of Narragansett has been pro-active in seeking funds to design and implement “best management practices” structures to replace outfall pipes

The stormwater is often high in bacteria and nitrogen….



Outfalls and streams have the same pattern in storm events.



Important Issue: Shellfishing Ban due to high bacteria levels

The problem:

- **"Since 1959, the Narrow River has failed to meet state standards for total coliform bacteria levels"**
- **"In 1979, parts of the Narrow River were closed to shellfishing"**
- **"Beginning in 1994, the entire expanse of the Narrow River was closed to shellfishing and remains closed today due to high coliform bacteria levels."**

from The Narrow River Special Area Management Plan, CRMC, April 1999

The actions:

This has brought about reports, actions, and funds from the town of Narragansett, the state of Rhode Island, the Coastal Resources Management Council, and the Army Corps of Engineers

The Good News:

- The Narrow River has no commercial or industrial enterprises on its banks.

- But this means that most contamination and pollution to the River is from human and wildlife sources

- And the good news is that we can help by our actions

What can we do about nitrogen and bacteria entering the River?

- Support and encourage municipal stormwater BMPs (go to town meetings)
- Develop other ways to keep pollutants away such as raingardens (public and private)
- Don’t feed the birds and do educate others.
- Keep trash and waste away from the River.
- Don’t dump down stormdrains.
- Help determine levels in the River as a volunteer monitor.

Support BMPs (Detention Ponds, etc.)

Purpose:

- Temporarily store excess stormwater runoff
- Filter this water by nutrient uptake from aquatic plants
- Sunlight also kills bacteria
- Trap sediment and trash for later removal

Photo by V. Berounsky

Raingardens allow nitrogen to stay in the soil and vegetation and not flow to the River

Example of a rain garden at North Kingstown Town Hall

DON’T feed the birds, they add nitrogen and bacteria to the River

Photo by Veronica Berounsky

Don’t dump trash, waste or even lawn clippings into the River. They can add bacteria and nitrogen

Do your part and pick up!

Photos by Rosemary Smith

Do Keep Pet Waste Away From the River

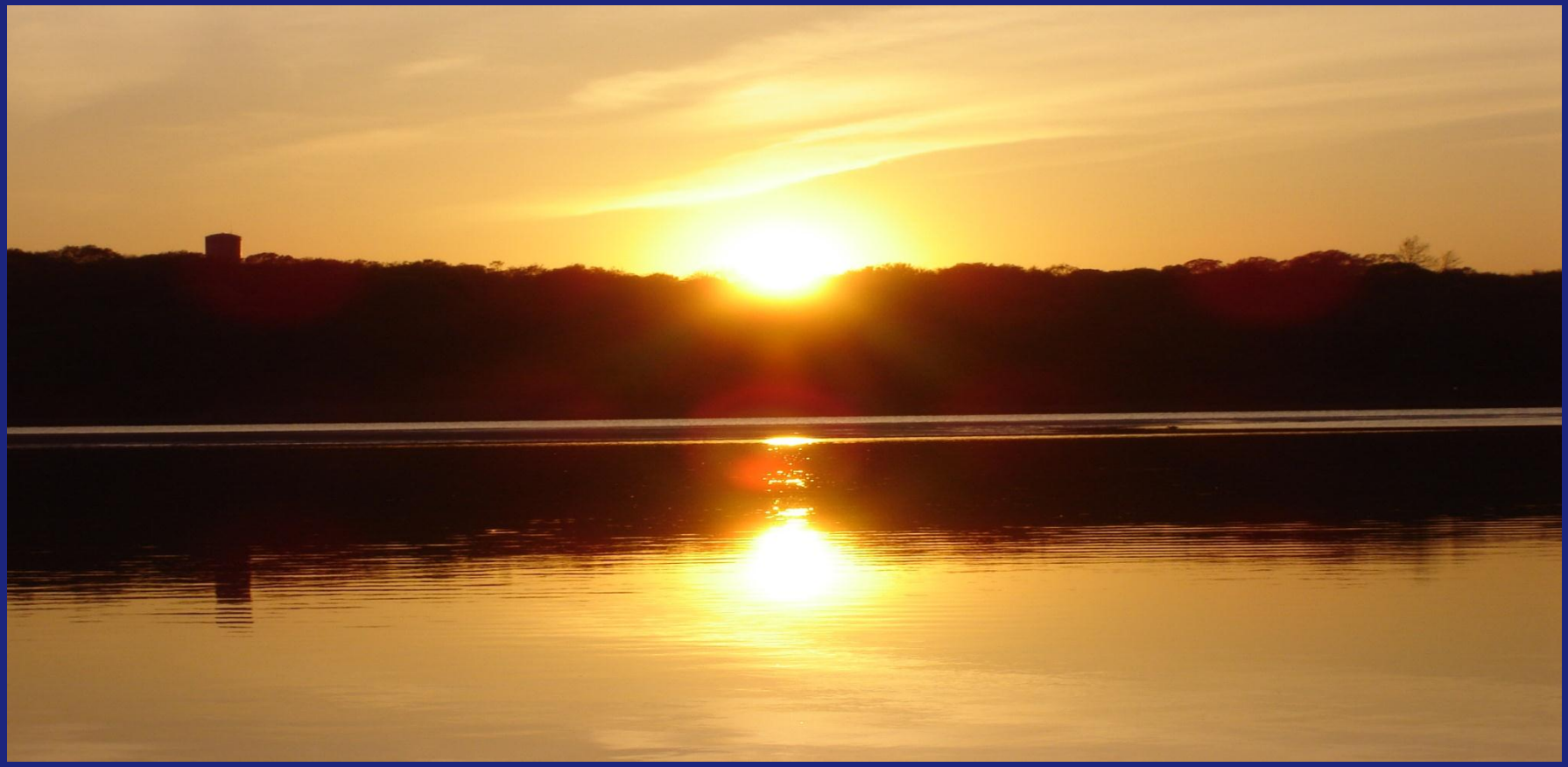
Photos by Rosemary Smith

Photo by Veronica Berounsky

River watch testing of the Water: sign up today!

Photos by Rosemary Smith and Veronica Berounsky

The future of the communities of life in the Narrow River Watershed depends on you !



Sunset over Pettaquamscutt Cove

Photo by Jason Considine

Who has used the River Watch data?

- Tri-town Stormwater Study
- URI Researchers and Students
- Army Corps of Engineers
- Department of Environmental Management
- Save the Bay
- Bryant College
- Environmental Protection Agency
- The Nature Conservancy
- And others

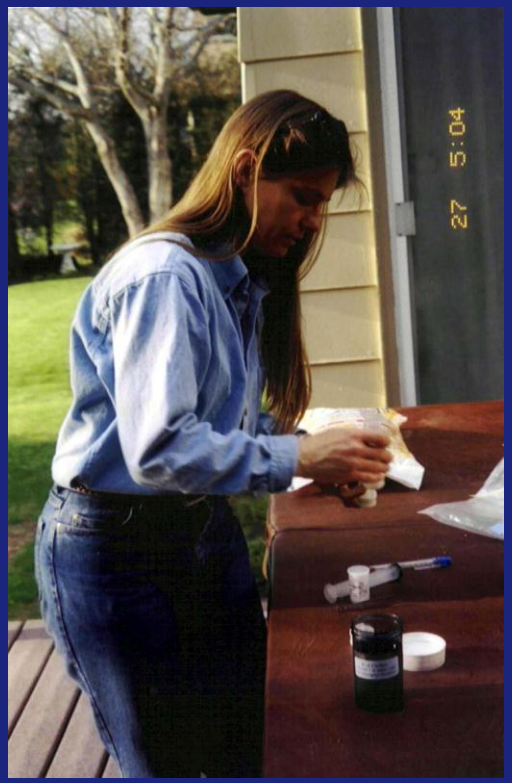
NRPA's Partners and Funding

- RIDEM's Aqua Fund – funded first 3 years of River Watch.
- Towns of Narragansett, North Kingstown, South Kingstown
- EPA equipment grant
- 2007 – The Washington Trust Co.
- US Fish & Wildlife (funds for Mumford Brook Study)
- URI Watershed Watch Office
- Rhode Island River's Council – Funding supported the creation of this 20-year database

NRPA greatly appreciates the support provided for River Watch

Linda Green and Elizabeth Herron

URI Watershed Watch Office



Thank you to Rahat Sharif – for all of her help populating and Q/A of the River Watch database

Thank You!

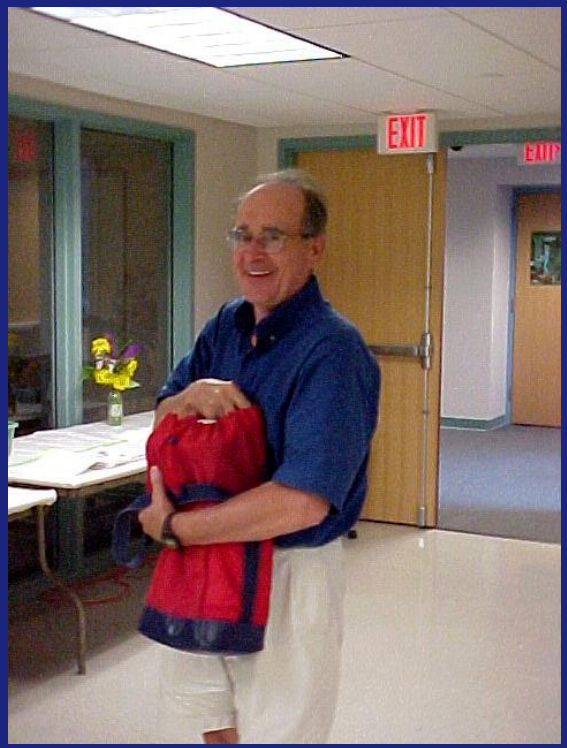
We could not do this without our 2012 Volunteer Monitors

- Lynne Finnegan & Daughter – 1 year
- Lynn Wolslegel – 2 years
- Laura and Howard Reed – 2 years
- Elizabeth Castro – 3 years
- Annie and Susan Hall – 3 years
- Liz Hill – 3 years
- Abby & Perry Moylan - 3 years
- Craig Wood – 3 years
- Omar Zaki – 3 years

2012 Volunteer Monitors (continued)

- Will Cummer – 6 years
- Rosemary Smith – 6 years
- Dave Adelman – 7 years
- The Sarubbi Family – 7 years
- Bette Carey - 8 years
- The Kaprielian Family – 8 years
- Marc Lamson – 8 years
- Dorothy & Dudley Mann – 8 years
- Veronica Berounsky – 9 years

And 2012 Volunteer Monitors who have been with us for over 10 years:



Sue Van Ness – 11 years

Jennifer Carey – 15 years

Robert Schelleng – 20+ years (in photo in 2012)

Annette DeSilva – 21 years

Thank you all! We would not have this data without you!