

# Hurricane Irene

Bureau of Marine Water Monitoring  
Water Monitoring and Standards  
New Jersey Department of Environmental  
Protection

Presented by Bob Schuster  
NJ Water Monitoring Council Meeting  
May 30, 2012



# Hurricane Irene – August 28, 2011

- Statewide closure all shellfish harvesting on August 27, 2011
- Predicted precipitation 6"-12"
- Hurricane force winds
- 9' storm surge
- Flooding, power outages, sewage bypasses, and sanitary sewer overflows
- Degraded water quality
- Protect public health and viability of shellfish industry
- Followed by Tropical Storm Lee



# What made Hurricane Irene different?

- Large rainfall totals compounded by Tropical Storm Lee resulted in record precipitation.

	August	September
total precipitation	16.89"	7.0"
historical mean	4.54"	3.78"
historical normal	4.56"	4.15"
record	11.44"	9.78"
year	1955	1938



- Severe flooding and resulting bacteria contamination from sewage overflows and pump station failures in Trenton area took weeks to flush from Delaware Bay
- As a result the large influx of freshwater salinity levels in Upper Delaware Bay ranged 0.38 – 4.80 psu. Outside normal tolerance range for oysters.



# National Weather Service Advanced Hydrologic Prediction Service



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City, St  Go

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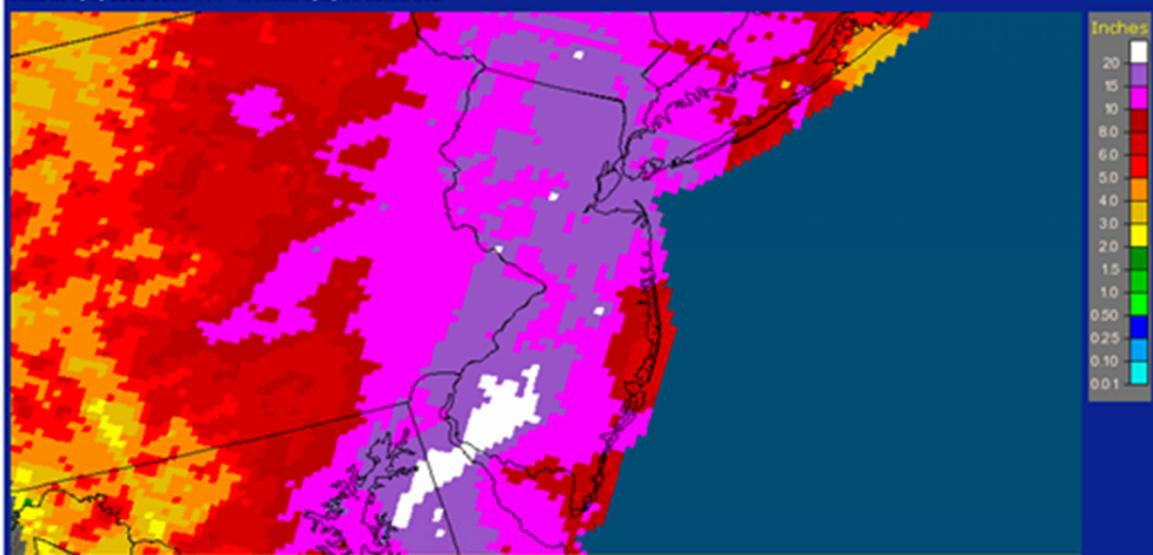
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New Jersey: August, 2011 Monthly Observed Precipitation  
Valid at 9/1/2011 1200 UTC - Created 9/3/11 21:38 UTC



Topo  Pcpn Amount  Counties  Rivers  States  Highway/City  RFC Boundary

**1. Timeframe**    **2. Product**    **3. Location**    **4. Units**

Current Data     Observed     States     English

Archive: Month/Year     Normal     NWS RFC/Regions     Metric

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Year:

Local forecast by "City, St"

City, St  Go

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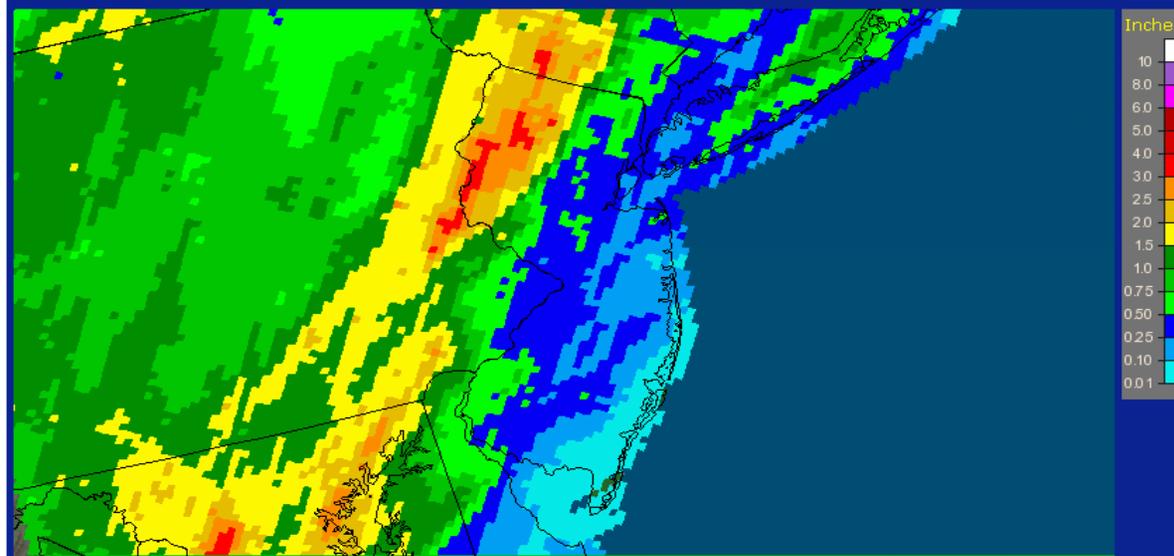
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New Jersey: 9/6/2011 1-Day Observed Precipitation  
Valid at 9/6/2011 1200 UTC - Created 9/8/11 23:30 UTC



- Topo
- Pcpn Amount
- Counties
- Rivers
- States
- Highway/City
- RFC Boundary

1. Timeframe

- Current Data
- Archive: Month/Year
- Archive: Daily

Year:   
 Month:   
 Day:

Update URL for Bookmarking

Print/Save Map

Observed

View Yesterday's Analysis

3. Location

- States
- NWS RFC/Regions
- NWS WFOS

CONUS + Puerto Rico  
 Alabama  
 Arizona  
 Arkansas  
 California

4. Units

- English
- Metric

Missing Data

Zoom Out to CONUS

NOTE: If you would like to bookmark or share your current view, you must first click the "Update URL for Bookmarking" button. The... NOTE: Data for the entire country are usually available by 12:30 pm Eastern Time (0:30 am Pacific Time)

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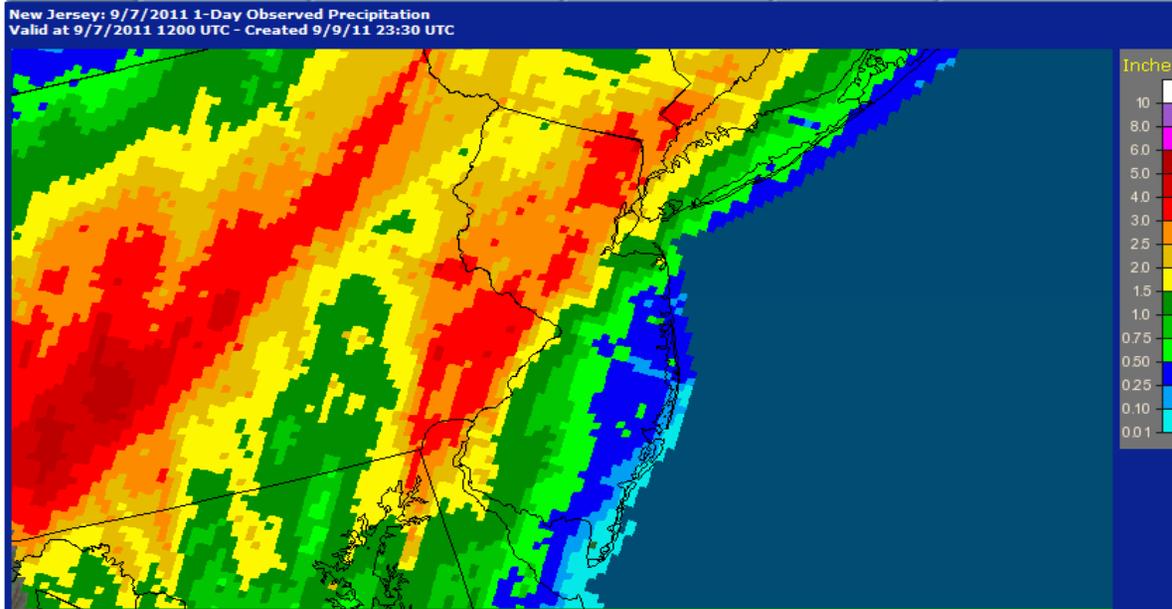
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**1. Timeframe**  
 Current Data  
 Archive: Month/Year  
 Archive: Daily  
 Year: 2011  
 Month: September  
 Day: 7

**2. Product**  
 Observed

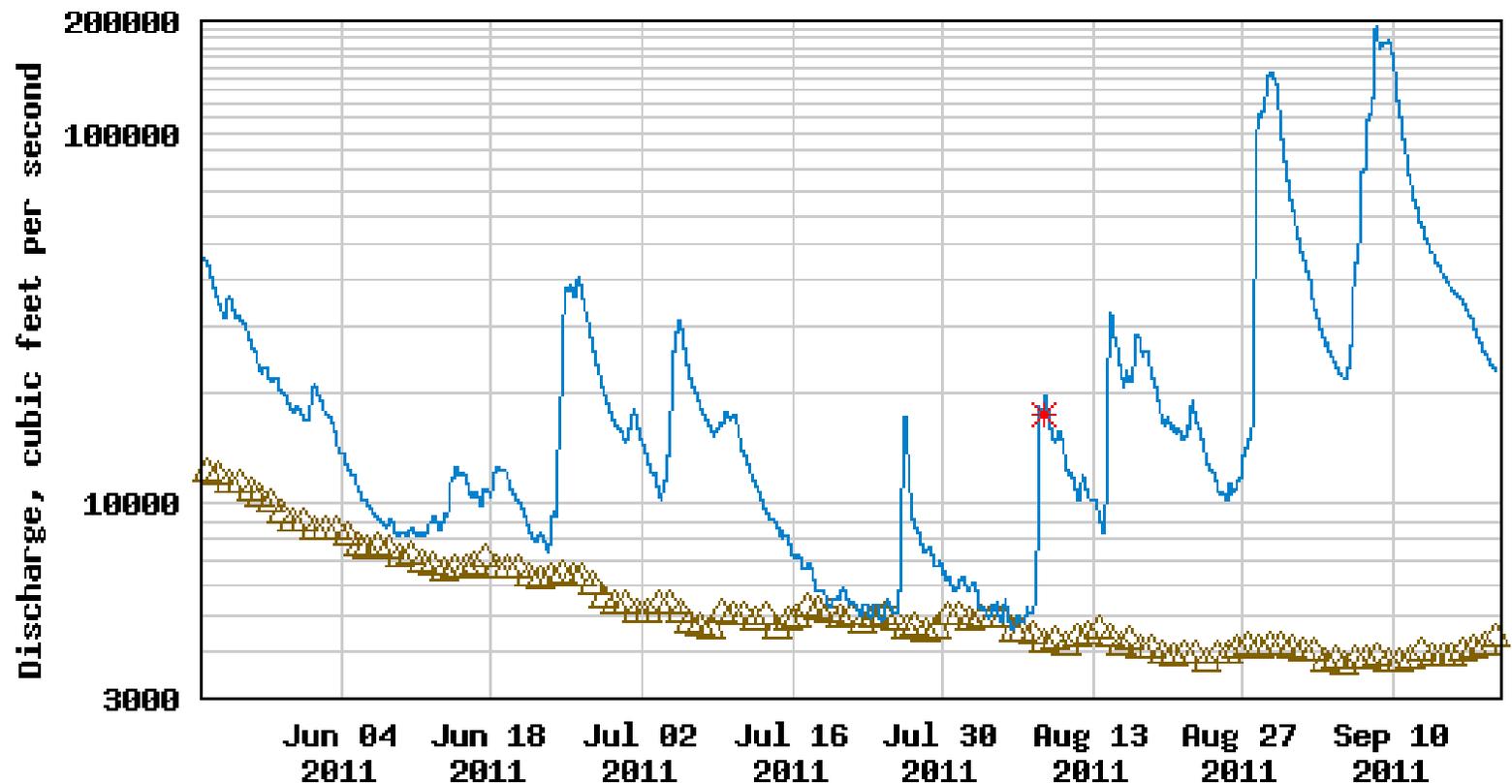
**3. Location**  
 States  
 NWS RFC/Regions  
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**4. Units**  
 English  
 Metric

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### USGS 01463500 Delaware River at Trenton NJ



---- Provisional Data Subject to Revision ----

- △ Median daily statistic (98 years)
- \* Measured discharge
- Discharge

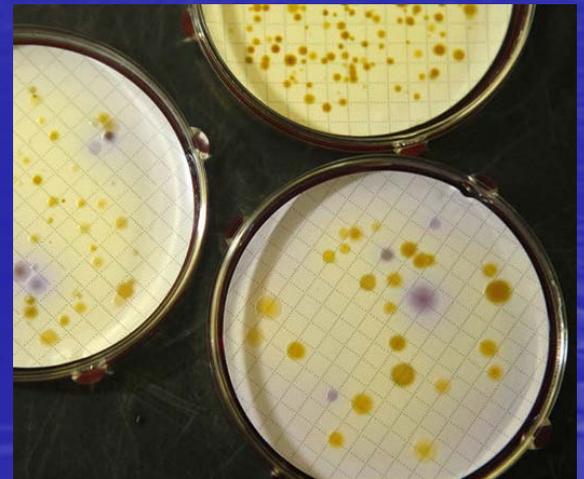
# Procedures for Re-opening Closed Shellfish Beds

- US Food and Drug Admin. National Sanitary Shellfish Program (NSSP) Guide for the Control of Molluscan Shellfish
- Section II, Chapter IV.3.A.(5)(c) to return to open status:
  - The emergency situation or condition has returned to normal and sufficient time has elapsed to allow shellstock pathogens to reduce to acceptable levels; or
  - For emergency closures caused by the occurrence of raw sewage, 7 days must elapse after contamination has ceased (returned to normal levels) and shellfish tissue samples shall not exceed 50 male-specific coliphage per 100 grams of shellfish tissue.

# BMWM's Response to Hurricane Irene

(What we did to reopen as quickly as possible)

- Monitored ambient water quality for fecal coliform from 8/29 - 9/26/11
- 60 man days on the water
- 555 water quality samples collected and analyzed
- 216 animals collected for tissue samples
- 28 salinity samples in Upper Delaware Bay
- Bacteriology lab operated 7 days/wk (including holidays)
- Leveraged resources by working with Atlantic and Delaware Bay Shellfish Councils.



# BMWM's Response to Hurricane Irene

(What we did to reopen as quickly as possible)

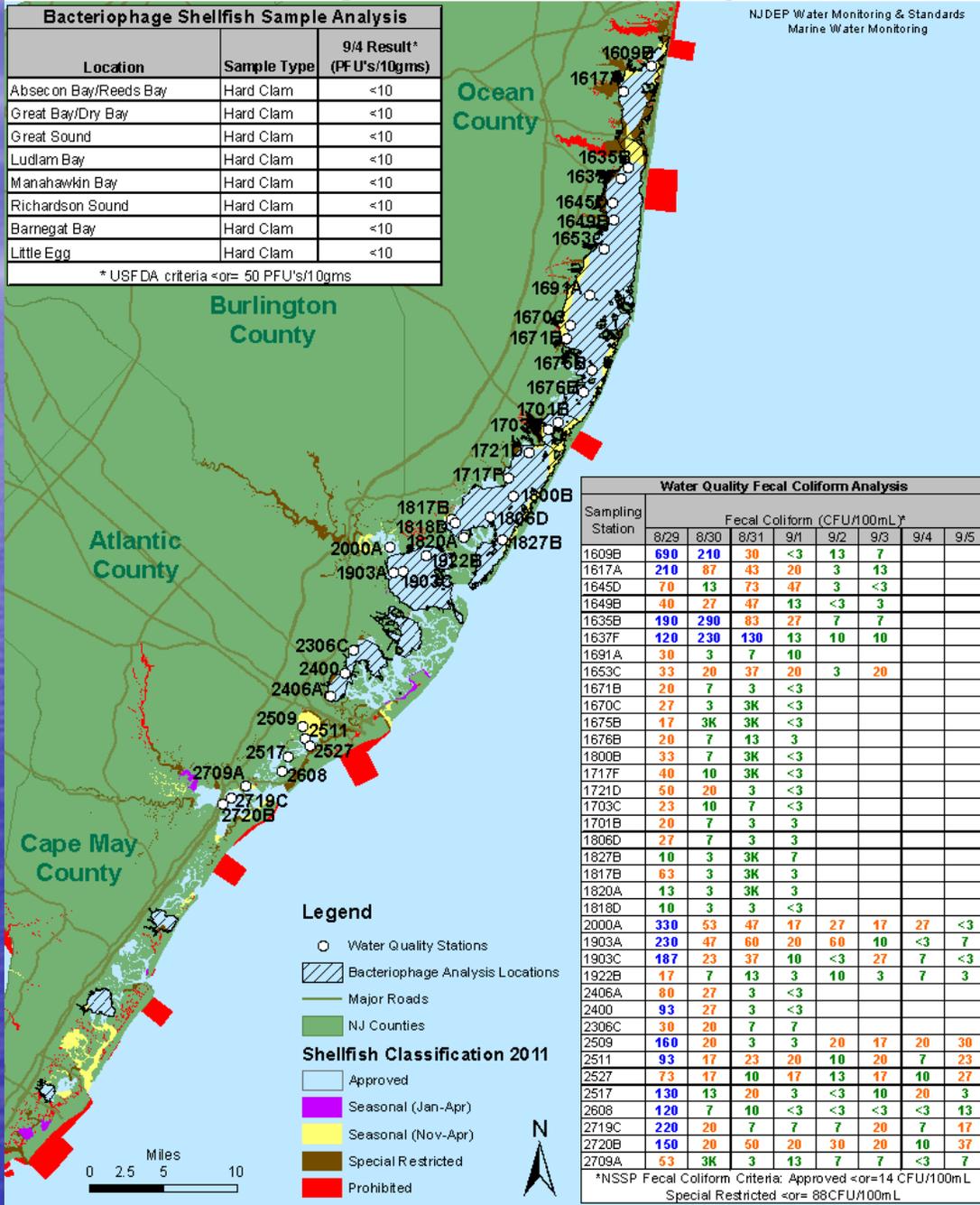
- Partially reopened state water to harvesting as soon as NSSP conditions were met:
  - 9/6/11 (10 days) South of the Metedeconk to Cape May point;
  - 9/7/11 (11 days) Metedeconk north including Raritan and Sandy Hook;
  - 9/8/11 (12 days) Lower Delaware Bay – Beadon Point south;
  - 9/29/11 (33 days) Delaware Bay – Beadon Point north to Ben Davis Point;
  - 10/4/11 (38 days) Upper Delaware Bay (All state waters return to prior classifications)

# Water Quality Stations post Hurricane Irene Ocean, Burlington, Atlantic, & Cape May Counties

Bacteriophage Shellfish Sample Analysis		
Location	Sample Type	9/4 Result* (PFU's/10gms)
Absec on Bay/Reeds Bay	Hard Clam	<10
Great Bay/Dry Bay	Hard Clam	<10
Great Sound	Hard Clam	<10
Ludlam Bay	Hard Clam	<10
Manahawkin Bay	Hard Clam	<10
Richardson Sound	Hard Clam	<10
Barnegat Bay	Hard Clam	<10
Little Egg	Hard Clam	<10

\* USFDA criteria <or= 50 PFU's/10gms

NJDEP Water Monitoring & Standards  
Marine Water Monitoring



Sampling Station	Fecal Coliform (CFU/100mL)*							
	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5
1609B	690	210	30	<3	13	7		
1617A	210	87	43	20	3	13		
1645D	70	13	73	47	3	<3		
1649B	40	27	47	13	<3	3		
1635B	190	290	83	27	7	7		
1637F	120	230	130	13	10	10		
1691A	30	3	7	10				
1653C	33	20	37	20	3	20		
1671B	20	7	3	<3				
1670C	27	3	3K	<3				
1675B	17	3K	3K	<3				
1676B	20	7	13	3				
1800B	33	7	3K	<3				
1717F	40	10	3K	<3				
1721D	50	20	3	<3				
1703C	23	10	7	<3				
1701B	20	7	3	3				
1806D	27	7	3	3				
1827B	10	3	3K	7				
1817B	63	3	3K	3				
1820A	13	3	3K	3				
1818D	10	3	3	<3				
2000A	330	53	47	17	27	17	27	<3
1903A	230	47	60	20	60	10	<3	7
1903C	187	23	37	10	<3	27	7	<3
1922B	17	7	13	3	10	3	7	3
2406A	80	27	3	<3				
2400	93	27	3	<3				
2306C	30	20	7	7				
2509	160	20	3	3	20	17	20	30
2511	93	17	23	20	10	20	7	23
2527	73	17	10	17	13	17	10	27
2517	130	13	20	3	<3	10	20	3
2608	120	7	10	<3	<3	<3	<3	13
2719C	220	20	7	7	7	20	7	17
2720B	150	20	50	20	30	20	10	37
2709A	53	3K	3	13	7	7	<3	7

\*NSSP Fecal Coliform Criteria: Approved <or=14 CFU/100mL  
Special Restricted <or= 88CFU/100mL

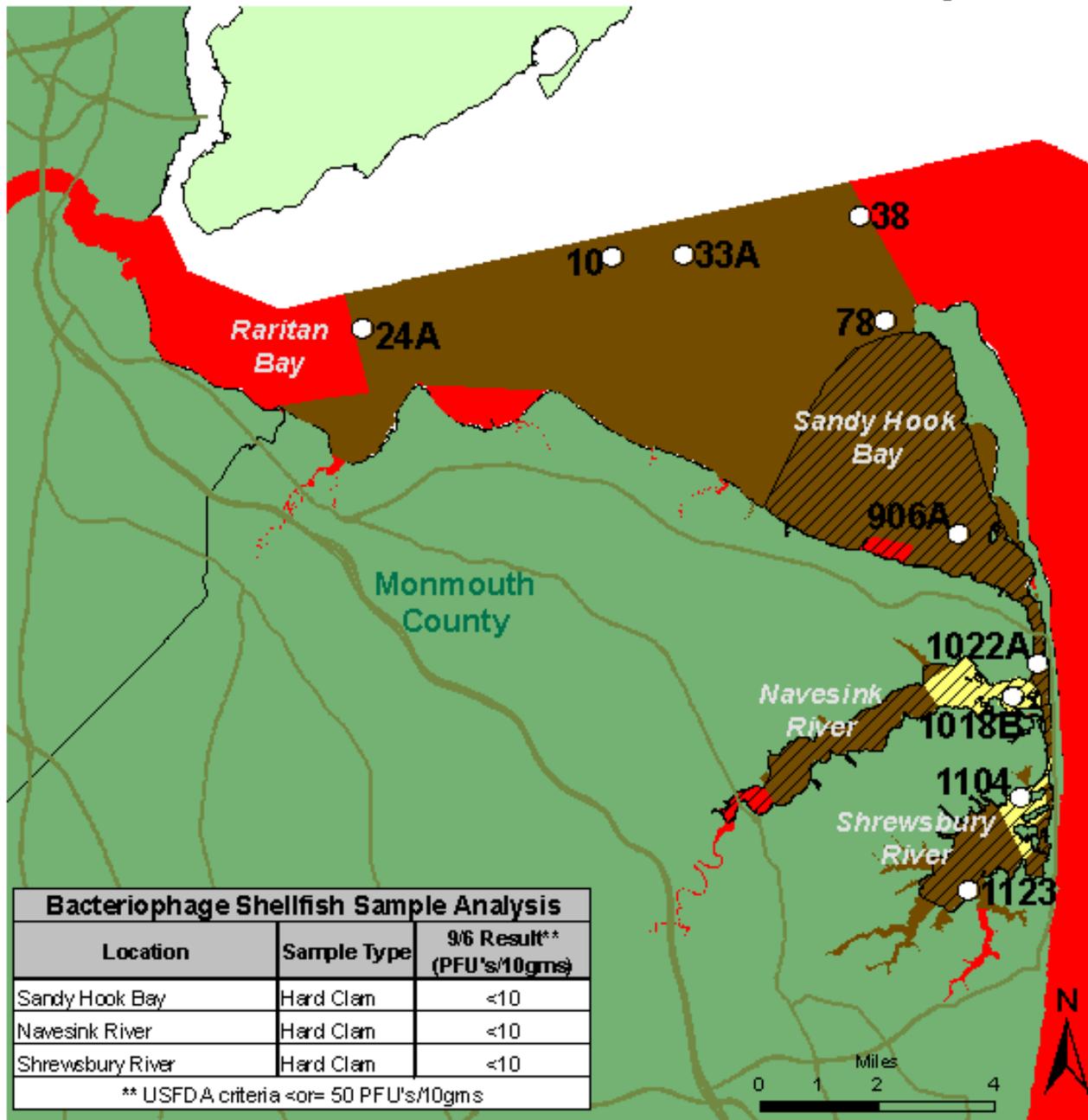
**Legend**

- Water Quality Stations
- ▨ Bacteriophage Analysis Locations
- Major Roads
- NJ Counties

**Shellfish Classification 2011**

- Approved
- Seasonal (Jan-Apr)
- Seasonal (Nov-Apr)
- Special Restricted
- Prohibited

## Water Quality Sampling Stations post Hurricane Irene Monmouth County



Water Quality Fecal Coliform Analysis					
Sampling Station	Fecal Coliform (CFU/100mL)*				
	8/29	8/30	8/31	9/1	9/2
24A	990	1130	63	100	260
10	1100	430	410	60	27
33A	810	360	320	180	100
38	260	190	100	47	37
78	450	390	33	30	40
906A	680	300	230	17	20
1022A	750	430	73	17	40
1018B	1140	440	67	20	40
1104	530	250	57	30	10
1123	900	310	67	20	10

\*NSSP Fecal Coliform Criteria: Approved  $\leq 14$  CFU/100mL. Special Restricted  $\leq 88$  CFU/100mL.

### Legend

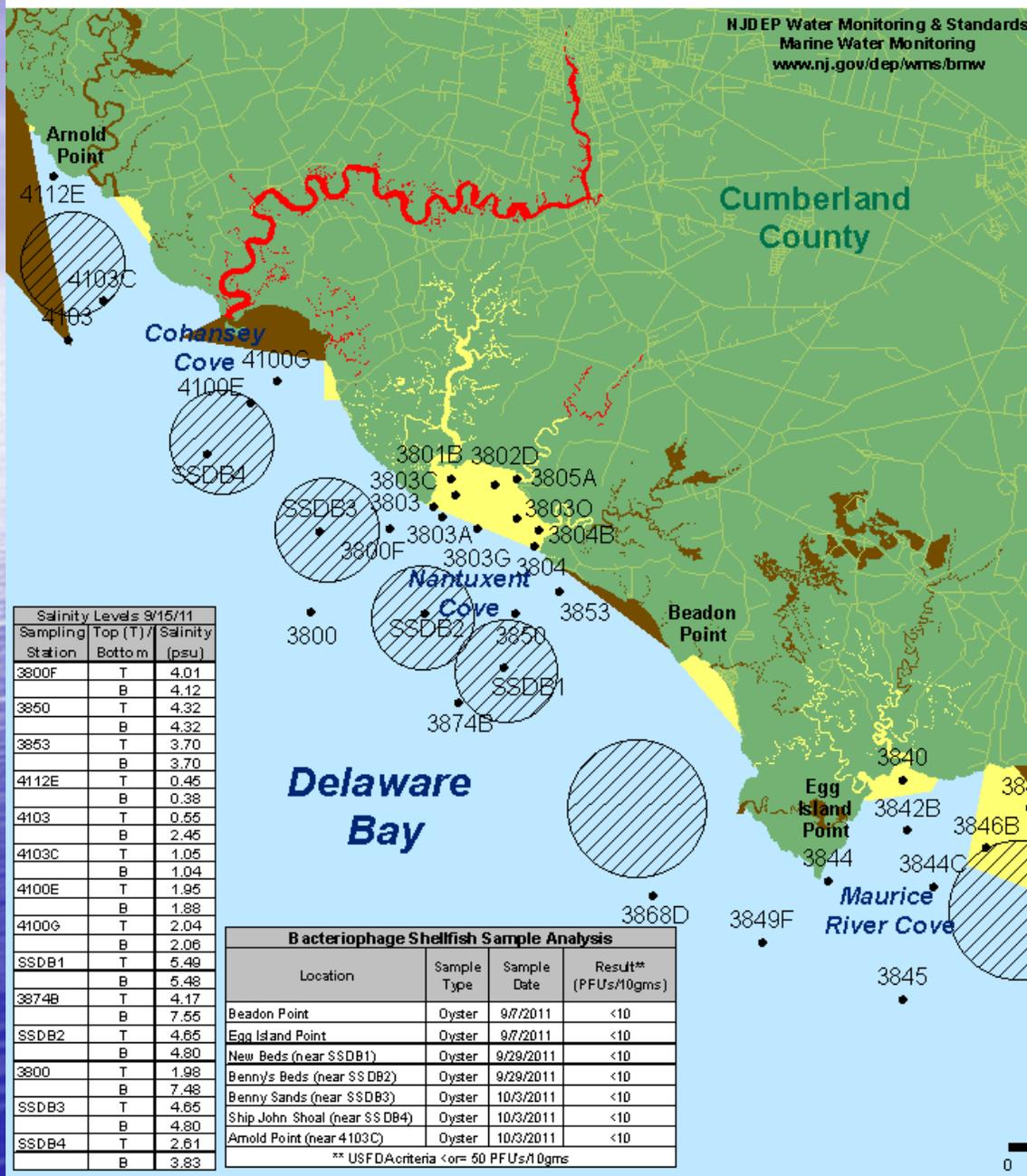
- Water Quality Stations
  - ▨ Bacteriophage Tissue Analysis Locations
  - Major Roads
  - New York
  - NJ Counties
- ### Shellfish Classification 2011
- Approved
  - Seasonal (Jan-Apr)
  - Seasonal (Nov-Apr)
  - Special Restricted
  - Prohibited

Bacteriophage Shellfish Sample Analysis		
Location	Sample Type	9/6 Result** (PFU's/10gms)
Sandy Hook Bay	Hard Clam	<10
Navesink River	Hard Clam	<10
Shrewsbury River	Hard Clam	<10

\*\* USFDA criteria  $\leq 50$  PFU's/10gms

# Water Quality Sampling Stations post Hurricane Irene Delaware Bay

NJDEP Water Monitoring & Standards  
Marine Water Monitoring  
www.nj.gov/dep/wms/bmw



Sampling Station	Water Quality Fecal Coliform Analysis																
	Fecal Coliform (CFU/100mL)*																
	8/28	8/30	8/31	9/1	9/2	9/3	9/4	9/6	9/10	9/12	9/14	9/15	9/17	9/19	9/21	9/23	9/26
3900D	590	400	250	250	210	160											
3947E	83	40	53	87	50	110											
3882	43	17	10	53	7	20											
3945E	3K	20	3	50	57	60											
3945B	3K	10	<3	3	10	20											
3944C	17	3K	<3	<3	3	13											
3944	13	10	<3	7	3	7											
3942B	50	7	3	3	17	20											
3940	60	13	<3	13	7	27											
3947I	60	53	83	120	83	87											
3805A	540	290	23	37	87	100	90	33									
3802D	150	280	37	27	73	60	30	30									
3803G	37	100	17	57	37	30	20	7									
3803A	37	13	27	47	57	40	17	10									
3803C	180	120	30	40	20	47	33	13									
3801B	160	90	73	23	73	60	43	17									
3803	140	60	53	50	23	60	37	13									
3804	140	53	27	57	40	37	40	10									
3803D	170	190	60	57	43	60	47	33									
3804B	170	100	90	70	60	57	53	17									
3845				<3	<3	<3											
3849F				<3	3	<3											
3868D				7	3	<3											
3800F				17	50	47	23	20	30	20	60	33	70	50	13		
3850				33	37	17	17	10	53	30	13	60	20	7	7		
3853				43	40	40	33	<3	37	30	63	43	20	27	23		
4112E							60	20	140		207	200	210	63	80	30	23
4103							140	43	280		230	330	193	97	27	33	<3
4103C							50	87	270		290	160	120	57	23	7	23
4100E							27	130	67	140	120	100	63	97	160	27	3
4100G							20	120	70	30	53	290	70	30	43	13	3
SSDB1							100	63	23	60	110	10	3				
3874B							120	120	27	150	50	90	13				
SSDB2							37	53	10	60	87	20	3				
3800							170	170	110	240	37	50	3				
SSDB3							83	120	70	110	97	87	57	120	<3		
SSDB4							250	170	40	150	93	43	13	63	13		

\*NNSP Fecal Coliform Criteria: Approved <or=14 CFU/100mL. Special Restricted <or= 88 CFU/100mL

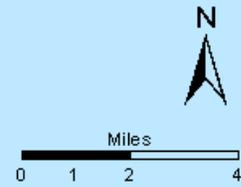
Salinity Levels 9/15/11		
Sampling Station	Top (T) / Bottom	Salinity (psu)
3800F	T	4.01
	B	4.12
3850	T	4.32
	B	4.32
3853	T	3.70
	B	3.70
4112E	T	0.45
	B	0.38
4103	T	0.55
	B	2.45
4103C	T	1.05
	B	1.04
4100E	T	1.95
	B	1.88
4100G	T	2.04
	B	2.06
SSDB1	T	5.49
	B	5.48
3874B	T	4.17
	B	7.55
SSDB2	T	4.65
	B	4.80
3800	T	1.98
	B	7.48
SSDB3	T	4.65
	B	4.80
SSDB4	T	2.61
	B	3.83

Bacteriophage Shellfish Sample Analysis			
Location	Sample Type	Sample Date	Result** (PFUs/10gms)
Beadon Point	Oyster	9/7/2011	<10
Egg Island Point	Oyster	9/7/2011	<10
New Beds (near SSDB1)	Oyster	9/29/2011	<10
Benny's Beds (near SSDB2)	Oyster	9/29/2011	<10
Benny Sands (near SSDB3)	Oyster	10/3/2011	<10
Ship John Shoal (near SSDB4)	Oyster	10/3/2011	<10
Arnold Point (near 4103C)	Oyster	10/3/2011	<10

\*\* USFDA criteria <or= 50 PFUs/10gms

## Legend

- Previously Sampled Stations
  - ▨ Bacteriophage Tissue Analysis Locations
  - Major Roads
  - NJ Counties
- ### Shellfish Classification 2011
- Approved
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  - Special Restricted
  - Prohibited



A blue-tinted photograph of a vast ocean under a cloudy sky. The water is a deep blue with gentle ripples, and the sky is a lighter blue with wispy white clouds. The horizon line is visible in the distance.

Questions?

<http://www.nj.gov/dep/bmw/>