

Narragansett Bay Commission 2019 Monitoring Season Update

Environmental Monitoring Collaborative Meeting, January 30th, 2020



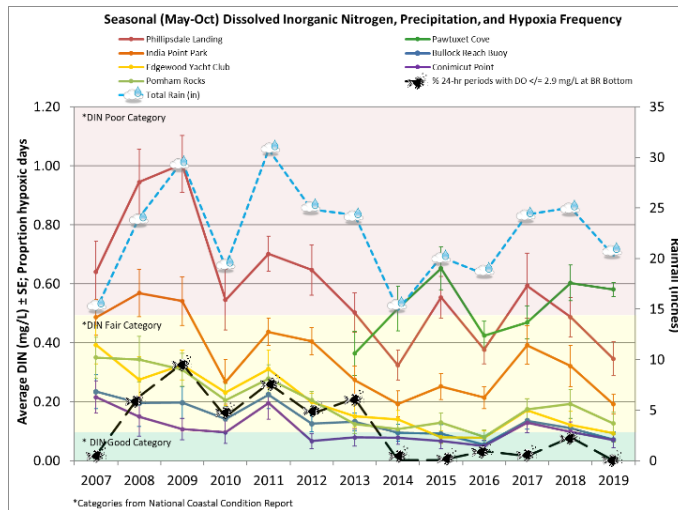
Seasonal Nitrogen Loading to Upper Narragansett Bay

- Field's Point and Bucklin Point remained in compliance with seasonal total nitrogen (TN) permit limits (5 mg/L) in 2019:
 - Avg. May – Oct 2019
 - Field's Point = 2.7 mg/L
 - Bucklin Point = 3.3 mg/L
- NBC seasonal 2019 N loadings were 83% below 2003 loadings.
- The table at right compares seasonal N loading from all major sources to upper Bay pre- (2006 - 2013) and post-nitrogen treatment upgrades (2014 - 2019) at NBC facilities. Overall, N loadings are down ~43% compared to the pre-upgrade period.

	2006 - 2013 Average	% of Total Loading	2014 - 2019 Average	% of Total loading
	lbs/day	%	lbs/day	%
Bucklin Point	1,143	5.8%	556	5.0%
Field's Point	4,039	20.5%	1,099	9.8%
Blackstone River*	4,426	22.5%	2,338	20.8%
Moshassuck River*	174	0.9%	116	1.0%
Woonasquatucket River*	425	2.2%	152	1.4%
Pawtuxet River*	2,156	11.0%	1,183	10.5%
Ten Mile River**	812		202	
East Providence WWTP*	517	2.6%	237	2.1%
Taunton River*	2,692	13.7%	1,334	11.9%
Fall River WWTP	3,227	16.4%	3,415	30.4%
Other Sources TOTAL***	844	4.4%	797	7.1%
Total Contribution	19,668		11,227	

*River data is Total Dissolved Nitrogen only
 **Ten Mile River loading data unavailable for 2018-2019. Historical numbers shown for reference, but excluded from annual totals at this time.
 ***"Other Sources" includes East Greenwich, Bristol, and Warren WWTP.

Dissolved Inorganic Nitrogen in the Providence and Seekonk River Estuaries



EPA National Coastal Conditions Report Dissolved Inorganic Nitrogen (DIN)

Thresholds:

POOR	> 0.5 ppm
FAIR	0.1-0.5 ppm
GOOD	< 0.1 ppm

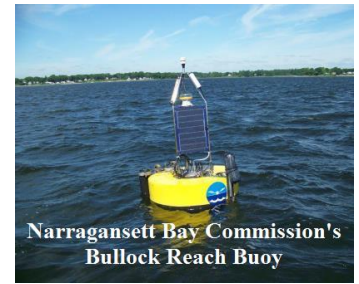
Seasonal (May – Oct) Average:

Bay Sampling Location	Average DIN (ppm)	
	2018	2019
Phillipsdale Landing	0.47	0.35
India Point Park	0.27	0.19
Pomham Rocks	0.23	0.13
Edgewood Yacht Club	0.12	0.09
Pawtuxet Cove	0.60	0.58
Bullock Reach Buoy	0.12	0.07
Conimicut Point	0.11	0.07

- Most stations in "fair" EPA National Coastal Conditions DIN category; three sites in the "good" category.
- Pawtuxet Cove had the highest seasonal average DIN in 2018 and 2019, with DIN results in the "poor" category.

Fixed-Site Seasonal Monitoring

- Bullock Reach, May – October 2019: Good water quality
 - Continued to deploy YSI EXO sondes (2018-2019).
 - Bottom dissolved oxygen (DO) averaged 5.2 mg/L, hypoxic conditions (DO \leq 2.9 mg/L) occurred at the bottom <1% of time from May through Oct.
- Phillipsdale Landing, May – October 2019: Fair water quality
 - New YSI EXO sondes in place for 2019 season.
 - Bottom DO averaged 4.7 mg/L and bottom hypoxic conditions (DO \leq 2.9 mg/L) observed approximately 25% of the time from May through October.
- Sondes were also deployed at two temporary locations: near East Providence Yacht Club (June through September 2019) and near Bullock Reach (September through November 2019) to support the Narragansett Bay Regional Ocean Modeling System (ROMS) model development.
- For data: <http://snapshot.narrabay.com/app/Buoys/Export>



Bacteria Monitoring in the Providence, Seekonk River Estuaries and Tributary Freshwater Rivers

Annual Fecal Coliform Geometric Mean (MPN/100 mL)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Division St. Dock	339	395	188	453	228	140	211	304	170	92	270	221	79	96	221	136
Bishop Point	600	324	233	318	306	125	125	233	139	181	281	172	80	87	283	126
Off BP Outfall	819	294	329	499	415	117	166	330	120	217	261	175	79	131	242	156
Phillipsdale Landing	1386	322	226	197	420	144	109	170	138	163	144	143	53	154	277	93
Narragansett Boating Center	718	254	257	165	230	135	122	191	127	240	95	111	73	101	271	121
Crook Point	487	273	293	172	199	147	121	107	169	119	98	114	56	79	169	88
Point St. Bridge	3441	1946	3981	845	785	1022	402	530	562	367	600	504	511	282	699	567
India Point Park	425	318	255	171	182	112	86	214	102	167	74	52	55	77	198	92
Collier Point Park	493	313	296	277	188	201	164	187	188	161	149	106	55	124	197	132
Off FP Outfall	234	210	183	102	120	116	51	119	66	60	36	70	33	47	152	58
Save the Bay		46	61	59	46	38	50	46	35	34	21	36	16	33	57	26
South FP East	117	72	49	65	44	38	43	41	46	33	34	58	16	27	86	36
Edgewood Yacht Club	95	61	98	65	36	34	47	48	40	31	16	44	30	30	43	37
Pawtucket/Providence Junction	98	92	162	116	60	57	79	77	68	43	40	52	36	53	67	37
Gaspee Point	65	63	70	48	40	28	48	37	63	18	15	39	12	26	46	35
Bullock Neck	47	14	31	27	15	18	30	25	46	19	14	11	8	16	17	13
Bullock Reach Buoy	52	34	72	21	16	38	37	28	37	19	14	19	19	18	15	20
North of Nayatt Point		11	20	20	12	17	29	25	23	11	11	8	5	14	16	13
Shawomet		17	43	23	30	22	31	31	31	13	13	14	7	15	19	18
Conimicut Point	31	24	35	11	18	17	26	20	24	11	9	15	6	16	20	13
Annual Rainfall (inches)	45.05	57.37	54.31	42.69	57.09	54.86	53.50	55.49	40.99	45.02	47.19	40.74	38.99	47.74	62.79	51.75

- In 2019, 464 fecal coliform samples, 146 enterococci samples were collected from the Providence and Seekonk Rivers across 22 sample days.
 - 1,483 fecal coliform samples, 547 enterococci samples from freshwater tributary rivers across 97 days.
- Down-bay gradient; average annual fecal coliform counts were lower in 2019 than in 2018.
- A comprehensive study of CSO Phase II impacts on bacteria counts is underway, estimated completion late 2020.

Phytoplankton Monitoring

- Monitor phytoplankton community and obtain phytoplankton counts at the Bullock Reach site.
- Twelve sets of phytoplankton samples collected in 2019.
- Any observations of potentially-harmful plankton taxa are emailed immediately to RI DEM.



200x phase contrast of *Dinophysis* spp



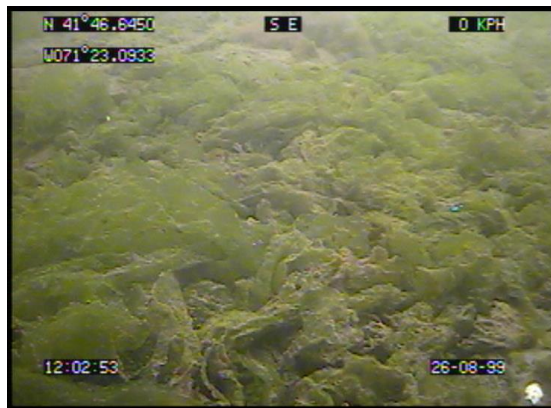
200x phase contrast of *Pseudo-nitzschia* spp

Benthic Video Monitoring

- 11 successful surveys in 2019.
- No extensive amphipod tube mats observed; absence suggests lack of organic enrichment.
- More *Ulva* rafts/beds observed than in 2018 (not statistically evaluated).
- 2020 – RI SeaGrant-Funded collaborative benthic video study with the Nature Conservancy (and others).

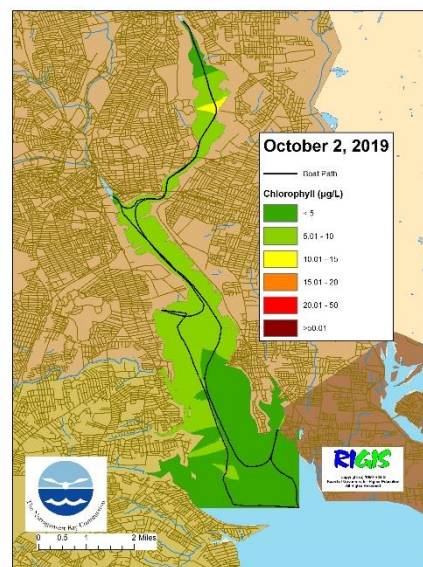
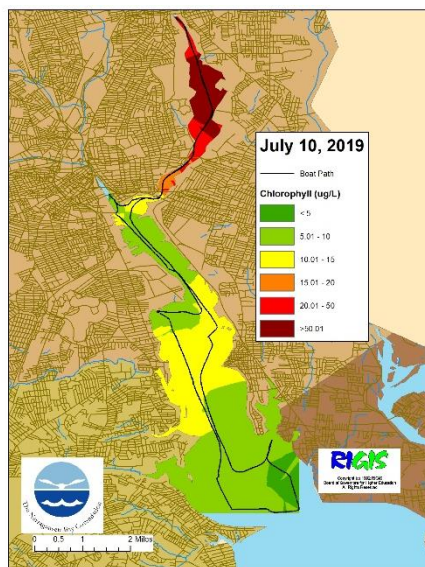
2019 Successful Benthic Video Surveys

	Edgewood	Sabin	Bullock Reach
February	X	X	X
March			
April	X		X
May		X	
June		X	X
July			
August			
September			
October	X	X	X



Estuarine Surface Water Quality Mapping

- Surface water quality is mapped throughout the Seekonk and Providence Rivers as the NBC vessel is underway via pumping water to a sonde, which collects data every four seconds.
- Chlorophyll data is analyzed as a proxy for phytoplankton abundance.
- In 2019, surface water quality was mapped on 29 days; highest surface chlorophyll was observed during July 2019 (below; high surface chlorophyll in the Seekonk River [July], low Upper Bay surface chlorophyll [October]).



Water Column Profiles

- A Seabird instrument is used to collect water quality profiles every two weeks to monthly; 183 profiles were collected in 2019.
- Hypoxic conditions were most prevalent during July and August.

Water Clarity

- In 2019, NBC collected 209 Secchi depth measurements in the Providence and Seekonk Rivers. Photosynthetic Active Radiation (PAR) also collected with water column profiles.

Monitoring Data Available: Snapshot of Upper Narragansett Bay, <http://snapshot.narrabay.com/app/>



NBC Monitoring Stations

- Sampling Type**
- + Historical Sampling Stations
- Nutrients, Bacteria, Secchi**
- Bacteria Only
 - Nutrients Only
 - Bacteria and Secchi
 - Bacteria and Nutrients
 - Nutrients and Secchi
 - Bacteria, Nutrients, Secchi
 - Seabird Vertical Profiles
 - Fixed Site
 - Benthic Video Transects

