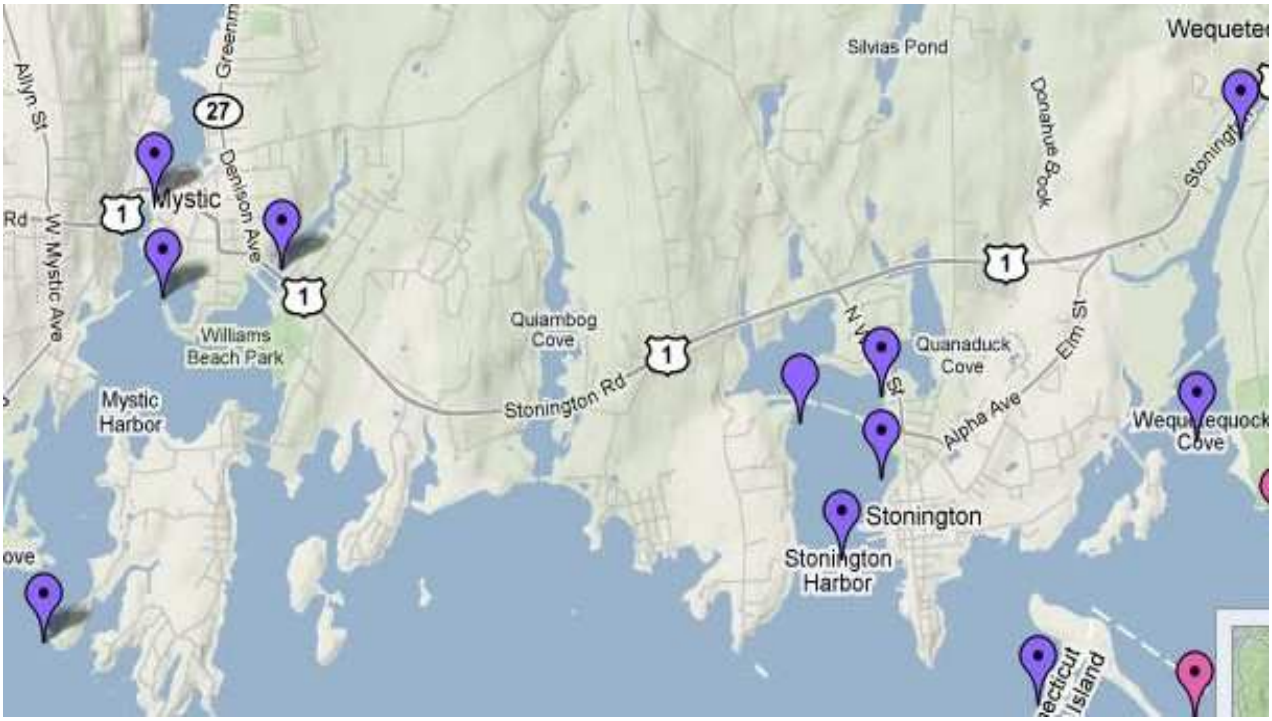
2009 CUSH Water Quality Monitoring

2008 Recap:

- The season, our first, ran from early July through mid-October
- Weather was warmer than average in June and July and dryer than average from May through August, with a wet September. All sampling days occurred during dry weather. Monthly collection days were scheduled to catch ebb tides.
- Results: Dissolved oxygen (DO), chlorophyll (algae), and nutrients were all at levels supporting aquatic life.
    - The average monthly DO at all sites was 5.0 parts per million (ppm) or more, meeting the State limit of not less than 4.8 ppm.
    - Chlorophyll seasonal averages ranged from 2 ppb (very good) to 5.8 ppb (less good).
    - Total Nitrogen seasonal averages at all sites ranged from 230 ppb (low) to 450 ppb (moderate).
    - Bacteria were generally at or below established limits for shellfish and swimming.
    - August spikes in chlorophyll (10.3 ppb) and total nitrogen (750 ppb) at Wequetequock Cove Mouth were not approached on other days in 2008 or at any time in 2009 and may have been an anomaly due to high winds on the sampling day. Long-term monitoring is a must!

2009 sampling sites



- Five sites in and around Stonington Harbor: Sandy Point (west side), Mid Harbor, Dodson's Boatyard, Lambert's Cove, and the mouth of Wequetequock Cove at Goat Island.
- Four sites in Mystic: Murphy's Point, Mason's Island, Mystic River Park, and the site of a continuous monitor at Mystic Seaport (check back in May for complete results from the Seaport site).
- Two long coves: the head of Wequetequock Cove at King Cove Marina and Pequotsepos Cove at the Rte 1 bridge.

Site Characteristics:

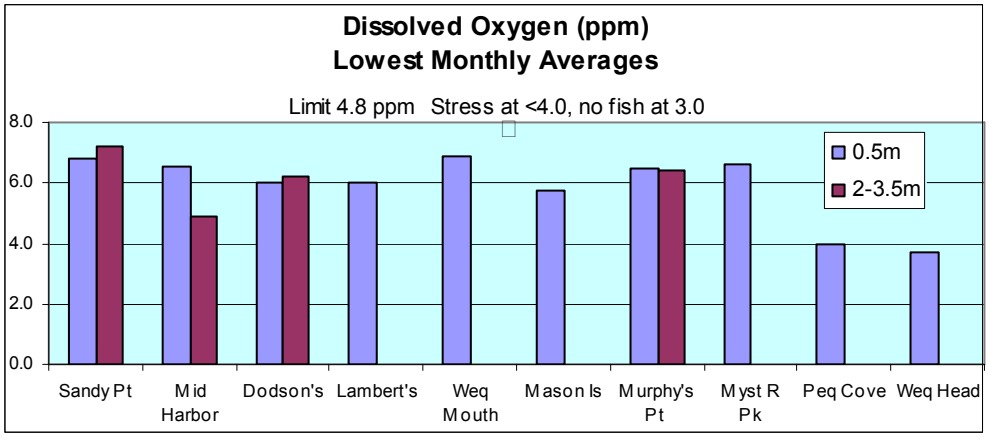
Mid Harbor (Stonington) and Murphy's Pt (Mystic) are near or at sewage treatment plant outfalls. Murphy's Pt, Dodson's, Wequetequock Head, and Lambert's Cove are located at marinas. Pequotsepos Cove is notable for highly restricted flow under the narrow RR bridge. Wequetequock Head is notable for its abundant waterfowl population.

Sample Analysis:

- Beginning on May 13, samples were collected biweekly for temperature, dissolved oxygen (DO), and chlorophyll (an indicator of algae).
- Monthly samples were collected and transported to a state-certified laboratory for measurement of pH, bacteria, and nutrients: Total Nitrogen, Ammonia-N, Nitrate-N, and Total Phosphorus.
- Dissolved Inorganic Nitrogen (DIN) was calculated by adding together the values for Ammonia-N and Nitrate-N. DIN is used as part of the National Estuary Program Coastal Assessment.
- Monthly samples were tested for salinity from mid-July through mid-September at most sites.

Results are grouped by location in the following tables. The reference/control site, Sandy Point, is included in all groups for comparison.

The following chart is a good snapshot of the water quality throughout our sampling area:



For this chart, dissolved oxygen measurements in individual water samples were averaged for each site and each month of the sampling season. Each bar in the chart represents the lowest average monthly value for that site. The chart shows that all but 2 of the sampling sites had adequate dissolved oxygen to support aquatic life. Only Pequotsepos Cove and the head of Wequetequock Cove experienced stressful levels of dissolved oxygen (see below). Note also that average DO values in Mid Harbor deep samples (purple bars) were significantly lower than in the shallow samples, though never falling to 4.0 ppm.

Summary:

The best overall water quality was at Sandy Point West, our reference site; poorest was in the long coves.

- **Dissolved oxygen** (DO): During August and September, the 2 long coves reached DO stress levels at or below 4 parts per million (ppm) in 6 individual samples in Wequetequock Head and 3 samples in Pequotsepos Cove. DO in Mid Harbor at 3.5 meters was below the nearshore State limit of 4.8 ppm in August.

- **Chlorophyll (algae)**: Seasonal averages were good--less than 5 parts per billion (ppb)--at most sites, and fair (5-20 ppb) at Murphy's Point, Mystic River Park, and the coves, except during and just after the July 1 storm (see Weather). In September, Chlorophyll measured 96 ppb in dry weather at Wequetequock Head.

- **Bacteria**:
  - Fecal coliform (an indicator of fecal contamination including wildlife and pets) exceeded the shellfish limit of 14 consistently in the two long coves and occasionally at other sites.
  - Enterococci (a predictor of human gastrointestinal illness) exceeded the swimming limit of 104 in both long coves in August and at Mid Harbor in September.

- **Dissolved Inorganic Nitrogen** (DIN; ammonia + nitrate, "fertilizer N"): Seasonal averages were fair--less than 200 ppb--except at Murphy's Point in August and October. DIN peaked at almost all sites in October, probably due to seasonal die-off of algae.

- **Total Nitrogen:** Seasonal averages were good (350 ppb or less) at the Stonington Harbor sites and Mason Island. TN was moderate (less than 600-700 ppb) at the Mystic sites and Wequetequock Mouth, and poor at Wequetequock Head (903 ppb).

- **Total Phosphorus** was at recommended levels of 100 ppb or less except for Wequetequock Head in September (473 ppb). However, the **Nitrogen-Phosphorus ratio** at all sites sometimes exceeded 10% of Total Nitrogen, a level at which it could have contributed to the growth of algae.

- **Copper and zinc** levels in samples from the marinas were unremarkable.

- **Tides**: The schedule aimed for sampling at low or ebb tides, although some spring and fall samples were collected during flood tides.

- **Weather**:
  - Nearly 15 inches of rain fell in July, about 10 inches above normal, including 7 inches on July 1-2 and around 3 inches on July 7-8 and July 23-25. August and September were dry.
  - Water temperatures peaked in August at all sites.
  - The only samples obtained during or just after the July 1-2 storm were from Dodson's and Pequotsepos Cove. Chlorophyll samples tested at 48 ppb (Dodson's) and 36 ppb (Pequotsepos), accompanied by mild decreases in dissolved oxygen and increases in temperature.
  - Although salinity data are limited for the 2009 season, values on July 15 (July 2 at Dodson's) were at seasonal lows at all sites. July salinity was especially low in the coves and the Mystic River, reflecting the continued influx of groundwater.
  - Rain within 48 hours of sampling on June 10, July 25 and October 7-8 had no obvious effect on any parameter.

- **Plans for 2010**:
  - Continue monitoring with special emphasis on the long coves
  - Expand salinity data to cover all sites and the entire season
  - Explore tidal cycles in the river and the coves to help distinguish overland flow from ocean contributions.

Stonington Harbor Sites:

Bolded values are a site's highest recorded value for the season (lowest value for DO and % saturation).
Values that exceed established limits are also bolded.

Sampled Monthly	13-May	17-Jun	15-Jul	12-Aug	9-Sep	14-Oct	Seasonal Mean
		←←←←Sampling Dates←←←←					
Total Nitrogen (ppb)	**<350 good; 350-600 moderate, >600-700 enriched**						
Sandy Pt 0.5m	190	230	180	230	**450**	230	252
Sandy Pt 3m	280	180	210	230	360	**470**	288
Mid Harbor 0.5m	-	290	410	**520**	450	240	382
Mid Harbor 3.5m	-	250	180	**510**	480	240	332
Dodson's 0.5m	220	290	320	-	-	380	303
Dodson's 2m	-	-	**480**	1050*	-	370	425
Lambert's Cove	**370**	330	320	-	290	340	330
Weq. Mouth	430	340	350	**470**	410	320	387
				*Outlier; value not included in seasonal mean.			
Ammonia (ppb)							
Sandy Pt 0.5m	<20	<20	< 30	< 20	40	**80**	28
Sandy Pt 3m	<20	<20	30	< 20	40	**130**	38
Mid Harbor 0.5m	-	<20	50	60	40	**80**	48
Mid Harbor 3.5m	-	<20	< 30	40	40	**80**	37
Dodson's 0.5m	<20	30	60	< 20	-	**140**	50
Dodson's 2m	-	-	80	200*	-	**110**	95
Lambert's Cove	-	<20	< 30	-	40	**120**	46
Weq. Mouth	<20	<20	< 30	< 20	< 20	**60**	19
				*Outlier; value not included in seasonal mean.			
Nitrate-Nitrite (ppb)							
Sandy Pt 0.5m	< 20	< 10	10	20	30	**40**	19
Sandy Pt 3m	< 20	< 10	10	10	30	**40**	18
Mid Harbor 0.5m	-	< 10	10	20	20	20	15
Mid Harbor 3.5m	-	< 10	10	10	**30**	20	15
Dodson's 0.5m	< 20	**40**	30	20	-	**40**	28
Dodson's 2m	-	-	20	20	-	**30**	23
Lambert's Cove	< 20	< 10	10	-	20	**30**	15
Weq. Mouth	**30**	< 10	10	20	20	20	18
Dissolved Inorganic N (ppb), ammonium + nitrate			**<100 good, 100 – 500 fair, > 500 poor**				
Sand Pt 0.5	20	15	25	30	70	**120**	47
Sand Pt 3m	20	15	40	20	70	**170**	56
Mid Harbr 0.5	-	15	60	80	60	**100**	63
Mid Harbr 3.5	-	15	25	50	70	**100**	52
Dodson 0.5	20	70	90	30	-	**180**	78
Dodson 2m	-	-	100	220*	-	**140**	120
Lambert's Cove	10	15	25	-	60	**150**	52
Weq Mouth	40	15	25	30	30	**80**	37
				*Value not used in calc. seasonal mean.			

Stonington Harbor sites, continued

Sampled Monthly	13-May	17-Jun	15-Jul	12-Aug	9-Sep	14-Oct	Seasonal Mean
	←←←←Sampling Dates←←←←						
Total Phosphorus (ppb)	**<100 good; should also be 10% or less of Total Nitrogen**						
Sand Pt 0.5	19	34	31	30	40	**41**	33
Sand Pt 3m	9	34	32	36	39	**44**	32
Mid Harbor	-	43	39	**72**	49	46	50
Mid Harbor	-	21	38	43	**51**	45	40
Dodson 0.5	22	49	45	-	-	**57**	43
Dodson 2m	-	-	49	35	-	**58**	47
Lambert's Cove	32	27	38	-	46	**54**	39
Weq Mouth	22	43	34	**46**	40	45	38
Salinity (ppt)							
Sand Pt 0.5	-	34	**28**	33	33	-	
Sand Pt 3m	-	34	**30**	32	36	-	
Mid Harbor	-	34	**31**	32	32	-	
Mid Harbor	-	33	32	32	32	-	
Dodson 0.5	-	35	**24**	32	-	-	
Dodson 2m	-	-	**26**	32	-	-	
Lambert's Cove	-	-	**26**	-	32	-	
Weq Mouth	-	-	**24**	26	30	-	

Bacteria:

ENTEROCOCCI (MPN/100ml)	**Swimming limit = 104, or 35 seasonal average**						**Geometric Mean**
Sandy Pt 0.5m	<10	<10	< 10	< 10	< 10	< 10	<10
Mid Harbor 0.5m	-	<10	< 10	10	**150**	< 10	4.3
Dodson's 0.5m	<10	<10	31	< 10	-	< 10	<10
Lambert's Cove	<10	<10	20	-	< 10	< 10	<10
Weq. Mouth	10	<10	20	64	< 10	< 10	4.8

MPN = Most Probable Number

FECAL COLIFORM (CFU/100ml)	**Shellfish limit = 14**						**Geometric Mean**
Sandy Pt 0.5m	2	**29**	2	1	1	< 1	2
Mid Harbor 0.5m	-	5	6	2	4	< 1	2
Dodson's 0.5m	**101**	< 1	4	2	-	< 1	2
Lambert's Cove	4	8	11	-	4	1	4
Weq. Mouth	9	**18**	11	**19**	6	< 1	5

CFU = Colony Forming Units

Stonington Harbor sites, continued

Sampled Biweekly	May	Jun	Jul	Aug	Sep	Oct	Seasonal Mean
		←←←←MONTHLY AVERAGES←←←←					
Temperature (ºC)							
Sandy Pt 0.5m	14	16	20	**22**	20	16	18
Sandy Pt 3m	13	15	19	**21**	19	17	17
Mid Harbor 0.5m	15	16	21	**24**	21	18	19
Mid Harbor 3.5m	13	15	21	**22**	20	17	18
Dodson's 0.5m	14	16	20	**21**	20	15	18
Dodson's 2m	-	-	19	20	20	15	18
Lambert's Cove	15	18	22	**24**	20	15	19
Weq. Mouth	14	19	21	**22**	20	11	18
Dissolved Oxygen (ppm)		**Nearshore water limit 4.8, stress at 4.0 or less.**					
Sandy Pt 0.5m	9.0	7.7	**6.8**	7.1	7.4	7.3	7.6
Sandy Pt 3m	9.1	8.1	7.4	**7.2**	7.4	7.6	7.8
Mid Harbor 0.5m	7.8	8.0	6.8	**6.5**	6.8	8.1	7.3
Mid Harbor 3.5m	7.4	6.9	6.3	**4.9**	6.2	8.3	6.7
Dodson's 0.5m*	8.9	7.6	**6.1**	7.3	6.8	7.0	7.3
Dodson's 2m*	-	-	**6.2**	6.7	6.5	7.1	6.6
Lambert's Cove	7.4	7.0	7.0	**6.0**	**6.0**	6.3	6.6
Weq. Mouth	8.5	**6.9**	7.1	7.7	7.1	7.8	7.5
		*Sample obtained after 7" rain on July 2 was not included in average.					
Percent Oxygen Saturation		**% of maximum oxygen at sample temperature and salinity**					
Sandy Pt 0.5m	87	77	**75**	81	81	**75**	79
Sandy Pt 3m	85	80	79	81	80	**78**	81
Mid Harbor 0.5m	76	81	76	77	**75**	85	78
Mid Harbor 3.5m	70	69	70	**55**	68	85	69
Dodson's 0.5m	86	76	**66**	81	75	68	75
Dodson's 2m	-	-	**66**	73	71	70	70
Lambert's Cove	73	73	80	72	66	**62**	71
Weq. Mouth	70	73	79	85	78	**70**	76

Chlorophyll (ppb)	**Good < 5**	**Fair 5 - 20**	**Poor > 20**				
Sandy Pt 0.5m	1.43	2.74	2.63	**3.63**	3.27	3.44	2.86
Mid Harbor 0.5m	2.25	2.61	3.01	3.23	**3.63**	3.61	3.05
Dodson's 0.5m*	1.61	1.32	**-**	4.58	-	2.11	2.40
Lambert's Cove	1.97	3.19	**6.80**	4.29	3.25	2.34	3.64
Weq. Mouth	1.88	4.42	**8.96**	7.51	5.80	3.05	5.27

*48.4 ppb sample obtained after 7" rain on July 2 was not included in average.

CUSH: Stonington Harbor Water Quality Study 2009

Mystic Harbor and River sites:

Bolded values are a site's highest recorded value for the season (lowest value for DO and % saturation).
Values that exceed established limits are also bolded.

Sampled Monthly	13-May	17-Jun	15-Jul	12-Aug	9-Sep	14-Oct	Seasonal Mean
		←←←←Sampling Dates←←←←					
Total Nitrogen (ppb)	**<350 good; 350-600 moderate, >600-700 enriched**						
Sandy Pt 0.5m	190	230	180	230	**450**	230	252
Sandy Pt 3m	280	180	210	230	360	**470**	288
Murph Pt 0.5m	540	600	390	**840**	580	310	543
Murph Pt 2.5m	490	510	560	**1210**	480	880	688
Mason Is.	290	320	260	**320**	290	300	297
Mystic R Pk	**630**	390	430	560	390	340	457
Seaport 1m	300	350	220	360	<500	380	310
Ammonia (ppb)							
Sandy Pt 0.5m	<20	<20	< 30	< 20	40	**80**	28
Sandy Pt 3m	<20	<20	30	< 20	40	**130**	38
Murph Pt 0.5m	<20	50	< 30	80	60	**130**	58
Murph Pt 2.5m	50	60	80	120	70	**220**	100
Mason Is.	<20	30	< 30	< 20	< 20	**120**	33
Mystic R Pk	-	20	< 30	< 20	< 20	**140**	39
Seaport 1m	50	40	110	110	**340**	120	128
Nitrate-Nitrite (ppb)							
Sandy Pt 0.5m	< 20	< 10	10	20	30	**40**	19
Sandy Pt 3m	< 20	< 10	10	10	30	**40**	18
Murph Pt 0.5m	30	60	40	**70**	30	40	45
Murph Pt 2.5m	< 20	< 10	20	**760**	30	90	153
Mason Is.	< 20	< 10	10	20	20	**40**	18
Mystic R Pk	**70**	30	< 10	20	20	40	31
Seaport 1m	<10	<10	<10	<10	<10	<10	<10
Dissolved Inorganic N (ppb), calculated (ammonium + nitrate)				**<100 good, 100 – 500 fair, > 500 poor**			
Sandy Pt 0.5m	20	15	25	30	70	**120**	47
Sandy Pt 3m	20	15	40	20	70	**170**	56
Murph Pt 0.5m	40	110	55	150	90	**170**	103
Murph Pt 2.5m	60	65	100	**880**	100	310	253
Mason Is.	20	35	25	30	30	**160**	50
Mystic R Pk	70	50	20	30	30	**180**	63
Seaport 1m	28	23	58	58	**173**	63	67
Total Phosphorus (ppb)	**<100 good; should also be 10% or less of Total Nitrogen**						
Sandy Pt 0.5m	19	34	31	30	40	**41**	33
Sandy Pt 3m	9	34	32	36	39	**44**	32
Murph Pt 0.5m	28	64	57	74	**78**	36	56
Murph Pt 2.5m	29	48	46	56	**70**	48	50
Mason Is.	19	40	28	41	**53**	47	38
Mystic R Pk	38	30	34	**57**	53	52	44
Seaport 1m	<20	<10	<10	30	60	**100**	35

Mystic Harbor and River sites, continued

Sampled Biweekly	May	Jun	Jul	Aug	Sep	Oct	Seasonal Mean
		←←←←MONTHLY AVERAGES←←←←					
Temperature (ºC)							
Sandy Pt 0.5m	14	16	20	**22**	20	16	18
Sandy Pt 3m	13	15	19	**21**	19	17	17
Murph Pt 0.5m	15	18	22	**25**	21	16	19
Murph Pt 2.5m	14	16	21	**24**	21	16	18
Mason Is.	13	16	21	**25**	19	15	18
Mystic R Pk	15	18	22	**25**	21	16	19
Dissolved Oxygen (ppm)	**Nearshore water limit 4.8, stress at 4.0 or less**.						
Sandy Pt 0.5m	9.0	7.7	**6.8**	7.1	7.4	7.3	7.6
Sandy Pt 3m	9.1	8.1	7.4	**7.2**	7.4	7.6	7.8
Murph Pt 0.5m	8.8	7.7	7.2	**6.5**	6.7	7.5	7.4
Murph Pt 2.5m	8.5	7.3	**6.4**	7.0	6.5	7.6	7.2
Mason Is.	7.7	6.5	6.3	6.1	**5.8**	7.4	6.6
Mystic R Pk	8.5	7.4	7.1	**6.6**	**6.6**	7.1	7.2
Percent Oxygen Saturation	**% of maximum oxygen at sample temperature and salinity**						
Sandy Pt 0.5m	87	77	75	81	81	**75**	79
Sandy Pt 3m	85	80	79	81	80	**78**	81
Murph Pt 0.5m	86	80	87	78	**75**	**75**	80
Murph Pt 2.5m	82	74	**71**	82	72	76	76
Mason Is.	73	65	70	73	**62**	73	70
Mystic R Pk	83	78	82	79	74	**72**	78
Chlorophyll (ppb)	**Good < 5**	**Fair 5 - 20**	**Poor > 20**				
Sandy Pt 0.5m	1.43	2.74	2.63	**3.63**	3.27	3.44	2.86
Murph Pt 0.5m	6.52	3.55	**11.86**	-	6.29	1.97	6.04
Mason Is.	4.43	2.33	3.42	3.98	**4.77**	2.62	3.59
Mystic R Pk	7.42	3.41	10.30	**10.93**	7.22	1.63	6.82
Salinity (ppt)							
Sandy Pt 0.5m	-	34	**28**	33	33	-	
Murph Pt 0.5m	-	30	**24**	28	30	-	
Mason Is.	-	-	**26**	28	31	-	
Mystic R Pk	-	24	**15**	23	28	-	
ENTEROCOCCI (MPN/100ml)	**Swimming limit = 104, or 35 seasonal average**						**Geometric Mean**
Sandy Pt 0.5m	<10	<10	< 10	< 10	< 10	< 10	<10
Murph Pt 0.5m	<10	20	10	**42**	< 10	20	7.4
Mason Is.	<10	<10	< 10	< 10	< 10	**-**	<10
Mystic R Pk	10	10	**31**	< 10	10	31	9.9
MPN = Most Probable Number							
FECAL COLIFORM (CFU/100ml)	**Shellfish limit = 14**						**Geometric Mean**
Sandy Pt 0.5m	2	**29**	2	1	1	< 1	3
Murph Pt 0.5m	13	14	9	**21**	7	1	8
Mason Is.	1	1	1	4	4	-	2
Mystic R Pk	**15**	**29**	11	**26**	12	10	**16**
CFU = Colony Forming Units							

Pequotsepos Cove and Wequetequock Cove Head at King Cove Marina

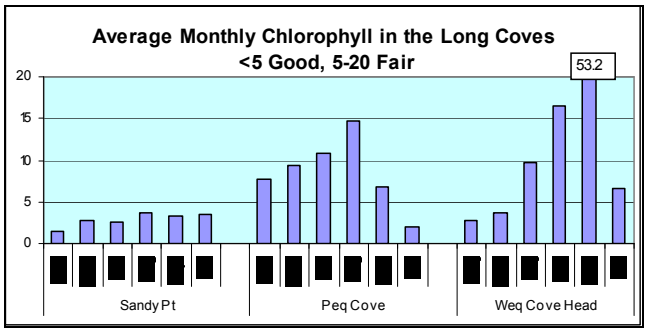
Bolded values are a site's highest recorded value for the season (lowest value for DO and % saturation). Values that exceed established limits are also bolded.

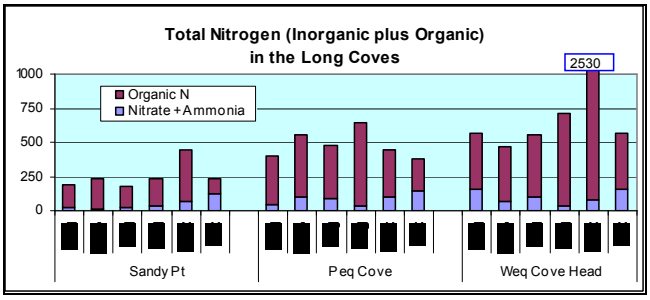
Sampled Monthly	13-May	17-Jun	15-Jul	12-Aug	9-Sep	14-Oct	Seasonal Mean
	←←←←Sampling Dates←←←←						
Total Nitrogen (ppb)	**<350 good; 350-600 moderate, >600-700 enriched**						
Sandy Pt 0.5m	190	230	180	230	**450**	230	252
Peq Cove 0.5m	400	560	480	**640**	440	380	483
Weq Head 0.5m	570	470	560	710	**2530*** *See Chlorophyll table	580	**903**
Ammonia (ppb)							
Sandy Pt 0.5m	<20	<20	< 30	< 20	40	**80**	28
Peq Cove 0.5m	<20	30	< 30	< 20	70	**120**	43
Weq Head 0.5m	<20	60	**70**	< 20	50	60	43
Nitrate-Nitrite (ppb)							
Sandy Pt 0.5m	< 20	< 10	10	20	30	**40**	19
Peq Cove 0.5m	30	**70**	70	20	30	30	42
Weq Head 0.5m	**150**	< 10	30	20	30	20	43
Dissolved Inorganic N (ppb), ammonium + nitrate			**<100 good, 100 – 500 fair, > 500 poor**				
Sand Pt 0.5	20	15	25	30	70	**120**	47
Peq Cove	40	100	85	30	100	**150**	84
Weq Head	**160**	65	100	30	80	80	86
Total Phosphorus							
Sand Pt 0.5	19	34	31	30	40	**41**	33
Peq Cove	29	47	47	**72**	46	52	49
Weq Head	12	25	56	62	**473**	57	**114**
Bacteria:							**Geometric**
ENTEROCOCCI (MPN/100ml)	**Swimming limit = 104, or 35 seasonal average**						**Mean**
Sandy Pt 0.5m	<10	<10	< 10	< 10	< 10	< 10	<10
Peq Cove 0.5m	10	87	53	**624**	30	10	**45.3**
Weq Head 0.5m	20	10	20	**254**	74	10	30.2
							Geometric
FECAL COLIFORM (CFU/100ml)	**Shellfish limit = 14**						**Mean**
Sandy Pt 0.5m	2	**29**	2	1	1	< 1	3
Peq Cove 0.5m	**17**	**95**	**85**	**240**	**16**	5	**37**
Weq Head 0.5m	**116**	**110**	**62**	**85**	**136**	**25**	**78**

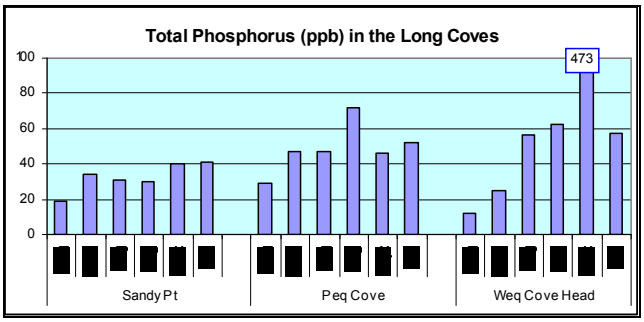
Pequotsepos Cove and the head of Wequetequock Cove, continued

Sampled Biweekly	May	Jun	Jul	Aug	Sep	Oct	Seasonal Mean
		←←←←MONTHLY AVERAGES←←←←					
Temperature (ºC)							
Sandy Pt 0.5m	14	16	20	**22**	20	16	18
Peq Cove 0.5m	15	17	23	**26**	19	14	19
Weq Head 0.5m	16	19	23	**26**	20	16	20
Dissolved Oxygen (ppm)		**Nearshore water limit 4.8, stress at 4.0 or less.**					
Sandy Pt 0.5m	9.0	7.7	**6.8**	7.1	7.4	7.3	7.6
Peq Cove 0.5m	6.7	5.6	4.8	**4.0**	4.2	6.3	5.3
Weq Head 0.5m	7.9	**3.7**	5.4	3.9	4.1	7.3	5.4
Percent Oxygen Saturation		**% of maximum oxygen at sample temperature and salinity**					
Sandy Pt 0.5m	87	77	75	81	81	**75**	79
Peq Cove 0.5m	66	58	58	48	**46**	61	56
Weq Head 0.5m	80	**39**	64	47	45	73	58
Chlorophyll (ppb)			**Good < 5, fair 5-20, poor >20**				
Sandy Pt 0.5m	1.43	2.74	2.63	**3.63**	3.27	3.44	2.86
Peq Cove 0.5m*	7.77	9.29	10.80	**14.65**	6.79	2.09	8.57
Weq Head 0.5m	2.71	3.65	9.77	16.45	**53.20**	6.52	15.38
	*36 ppb sample obtained during storm on July 1 was not included in average.						
Salinity (ppt)							
Sandy Pt 0.5m	-	34	**28**	33	33	-	
Peq Cove	-	-	**14**	25	28	-	
Weq Head	-	-	**20**	25	-	-	

Pequotsepos Cove and the head of Wequetequock Cove, continued

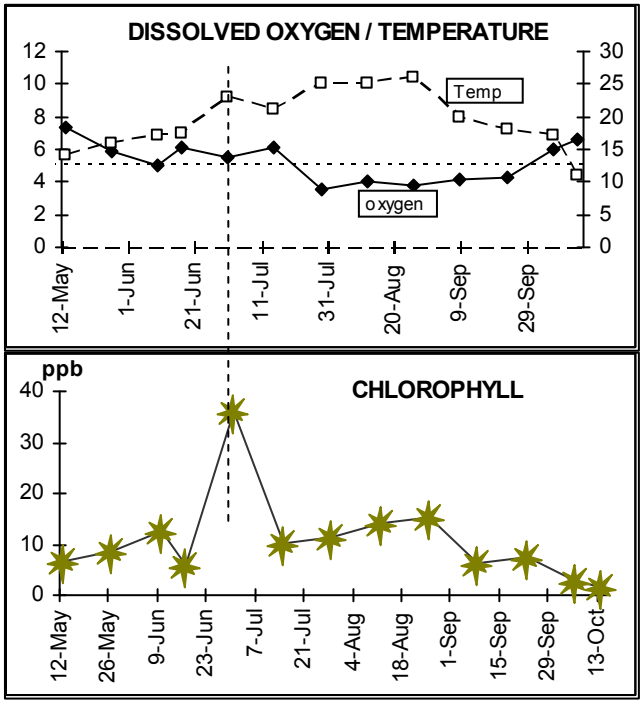






In these coves in 2009, chlorophyll (algae), organic N (includes algae), and phosphorus all peaked in August or September. Nitrate + ammonia-N (fertilizer nitrogen; blue bars in the middle graph) was lowest in August, depleted by algae growth, and rebounded in Oct after the seasonal algae die-off. Note that increased phosphorus in September contributed to the large chlorophyll peak in Wequetequock Cove Head.

Effect of heavy rain: Pequotsepos Cove, sampled July 1 during the storm:



Dodson's Boatyard, sampled July 2 after 7" rain: