

2006 Parameter Data: Salinity; Greenwich Bay and Other Estuarine or Brackish Sites

The distribution and stability of an estuarine ecosystem, such as Greenwich and Little Narragansett Bay, depend on three important physical characteristics of the water: salinity, temperature and circulation. Each affects and is affected by the others. Salinity is a key factor influencing the physical make-up of estuarine systems. Salinity is the number of grams of dissolved salts present in 1,000 grams of water, so it is usually expressed in parts per thousand (ppt). Freshwater contains few salts (less than 0.5 ppt) which makes it less dense than full ocean strength seawater, which averages 25 to 30 ppt. This difference in density causes salinity to increase with depth, with freshwater remaining at the surface. Water with a salinity of greater than 0.5 ppt but less than 25 ppt is called brackish, meaning a combination of saltwater and freshwater.

Together, salinity, temperature and circulation dictate the physical characteristics of water. The warmer, lighter freshwater flows seaward over a layer of saltier and denser water flowing upstream. The opposing movement of these two flows forms saltwater fronts or gradients that move up and down an embayment in response to the input of freshwater. These fronts are characterized by intensive mixing. A layer separating water of different densities, known as a pycnocline, is formed. This stratification varies within any season depending on rainfall. Stratification is usually highest in the spring as the amount of freshwater in our bays or ponds increases due to melting snow and frequent rain. Stratification is maintained throughout summer due to the warming of surface waters.

In autumn, fresher surface waters cool faster than deeper waters and sink. Vertical mixing of the two water layers occurs rapidly, usually overnight. This mixing moves nutrients up from the bottom, making them available to phytoplankton and other organisms inhabiting upper water levels. This turnover also distributes much-needed dissolved oxygen to deeper waters. During the winter, water temperature and salinity are relatively constant from surface to bottom. (Adapted from the Chesapeake Bay Program website <http://www.chesapeakebay.net/ecoint3a.htm>.)

The results reported here are from samples collected during the monthly water collections, and then analyzed in the URI Watershed Watch laboratory. URI Watershed Watch staff used both LaMotte salinity kits and two refractometers, with the average value reported. Additional salinity data may be available for Narrow River and some other estuarine sites, as monitored by the volunteers in the field using LaMotte kits.

Watershed code	LOCATION	Sample Depth (m)	Sample							MEAN
			MAY	JUNE	JULY	AUG.	SEPT.	OCT.		
			-- (g/l or ppt) --							
NA	Greenwich Bay #1 - Middle Ground Buoy	1	28.8	25.1	26.5	26.7	30.7	26.7	27.4	
NA	Greenwich Bay #1 - Middle Ground Buoy	DEEP	28.9	27.6	27.5	26.3	32.7	28.0	28.5	
NA	Greenwich Bay #2 - Sally Rock	1	25.9	24.9	26.3	27.1	30.7	32.0	27.8	
NA	Greenwich Bay #2 - Sally Rock	DEEP	29.0	28.9	27.4	25.7	32.0	28.0	28.5	
NA	Greenwich Bay #3 - The Brothers	1	28.5	24.9	28.3	27.6	29.3	30.0	28.1	
NA	Greenwich Bay #3 - The Brothers	DEEP	29.3	29.1	28.5	28.7	32.7	28.7	29.5	
NA	Greenwich Bay #4 - Greenwich Bay Marina	0.5	26.7	23.1	-	36.7	30.0	29.6	29.2	
NA	Greenwich Bay #4 - Greenwich Bay Marina	DEEP	27.5	26.0	-	29.3	30.7	30.1	28.7	
NA	Greenwich Bay #6 - Ponaug Marina	0.5	13.9	23.1	25.0	28.0	31.0	29.0	25.0	
NA	Greenwich Bay #8 - Little Rhody Boat Club	0.5	25.2	23.3	26.7	-	29.3	28.7	26.6	
NA	Greenwich Bay #9 - Warwick Cove Marina	0.5	25.6	25.1	27.4	30.0	28.7	28.0	27.5	
NA	Greenwich Bay #10 - Greenwich Bay North Marina	0.5	-	-	26.6	30.0	28.0	30.7	28.8	

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			-- (g/l or ppt) --							
NA	Greenwich Bay #11 - Mouth of Greenwich Cove	0.5	27.3	25.2	28.7	30.0	29.3	29.3	28.3	
NA	Greenwich Bay #11 - Mouth of Greenwich Cove	DEEP	-	27.8	27.8	25.3	30.0	30.7	28.3	
NA	Greenwich Bay #12 - Harborside	0.5	27.8	23.4	26.4	25.0	29.3	25.4	26.2	
NA	Greenwich Bay #13 - EG Town Dock	0.5	28.3	23.7	26.9	24.3	27.0	25.1	25.9	
NA	Greenwich Bay #15 - Brushneck Cove	0.5	-	22.5	28.2	-	-	-	25.3	
NA	Buckeye Brook #4 - Mill Cove	0.5	-	-	-	-	-	10.9	-	
NA	Nanaquaket Pond	1	-	-	-	-	-	29.6	-	
WD	Pawcatuck @ Avondale	0.5	-	-	-	-	-	25.6	-	
WD	Pawcatuck @ Avondale	3	-	-	-	-	-	30.0	-	
NA	Prince's Pond	0.5	-	-	-	-	-	11.3	-	
NA	Prince's Pond	3	-	-	-	-	-	13.7	-	
NA	Wesquage Pond	0.5	-	-	-	-	-	0.7	-	
NA	Wickford Cove	1	-	-	26.8	-	33.3	-	30.1	

Limit of Detection = 0.4 ppt

