

Waquoit Bay (WQB) National Estuarine Research Reserve, Waquoit, MA
(August 1998-December 1998)
Latest Update: August 1, 2002

I. Data set and Research Descriptors

1. Principal investigator and contact person

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2. Entry verification:

The data are uploaded in three file formats (each to separate files identified with the same file name but with unique extensions) from the YSI 6000 data logger to a PC with the YSI 6000 data transfer software (Kermit). Two of these (PC6000 and ASCII text formats) are kept on file in the WBNERR archive. The comma delimited format data file is imported to the EXCEL spreadsheet program (version 5.0) where it is processed according to standard NERRS CDMO protocol using the CDMO Excel 5.0 macros. File size of one complete month of data each has been achieved by concatenating (and truncating if necessary) shorter files of interrupted data segments. File contents are examined for anomalies (e.g., sensor malfunction, battery failure, spurious values, etc.) by visualization of data with the program GRAPHER (ver. 1.3). Data requiring editing are noted and copies of the graphs of raw data are saved at WBNERR. Data editing to CDMO protocol is conducted in EXCEL. Missing data (data logger malfunction or maintenance periods) are represented by periods ("."). Outliers (data values not within the design range of the respective sensors except for turbidity and depth) are changed to periods. Data values recorded during deployment or retrieval (i.e., when the instrument was out of the water or in the laboratory) are also changed to periods. A record of changes is documented in the Data Anomalies section of the metadata file. The monthly files are sent electronically by FTP to CDMO. Copies of all files are retained at the reserve. The Research Coordinator, Rick Crawford, performs all data management.

3. Research Objectives:

The primary issue of concern for the Waquoit Bay ecosystem is the influence of anthropogenic induced alterations by nitrogen enrichment. Waquoit Bay receives nitrogen from several sources, such as septic systems (their leachate percolates into groundwater which then enters the bay), run off from roads, run off containing domestic and agricultural fertilizer and animal waste, and atmospheric sources. This elevated nitrogen loading to the bay has resulted in eutrophic conditions that have contributed to alterations of habitats in the bay. For example, thick mats of seaweeds now cover the bottom where eelgrass meadows thrived in the 1970's. Unfortunately, there are few definitive records of bay conditions during that period, which makes it difficult to evaluate the rates of change. To facilitate future evaluation, long-term records from data loggers are being compiled to track several parameters that describe conditions in this eutrophic system. Of particular interest are measurements of dissolved oxygen and turbidity. These long-term records will facilitate evaluation of changes which may come about from a continuation of watershed alteration that result from "traditional" development (i.e., non-sewered residential areas served by private septic systems typically consisting of septic tanks and leach fields) as well as non-industrial commercial development, such as golf courses, cranberry bogs, and "mini shopping malls". The records will be useful for evaluating the efficacy of remediation efforts intended to reduce the nitrogen loading from these sources to Waquoit Bay.

One site, in central Waquoit Bay and considered the "baseline" location, was at latitude 41° 33.927' N, longitude 70° 31.267' W. A logger was operated at this location throughout the August -December 1998 reporting period. (Instruments were not operated prior to this due to personnel shortages.) Logger sensors were 0.75 m above the bottom to ensure they were above the dense macroalgal mat that covers broad expanses of the bottom of Waquoit Bay. The site has depths that typically range between 1.8 m to 2.5 m during a tide. The original sampling design of the monitoring program deemed that data from this

unit were to be considered as representative of ambient environmental conditions within the bay at the time of a sample. Although the site is well flushed by tidal currents, exposed to all points of the wind (i.e., only minimally influenced by shoreline features), and is adequately removed from the navigation channel to be minimally affected by boating activities, staff at WBNERR were concerned about possible effects of residual lateral mixing. This is a typical characteristic of well-mixed estuaries whereby water quality varies very little with depth but varies considerably across the water body (e.g., laterally) due to the more-or-less regular track of water currents. The central basin data logger was originally sited without consideration of the horizontal circulation pattern in the bay. Research was conducted in 1998 to elucidate this pattern and consider its possible influence on data logger output. Part of this work involved placing an additional logger elsewhere in the bay. A summary of the findings of this work is at the end of Section 5. Specific details on ancillary placements can be found in Section 5.

4. Research methods

The data logger in the central portion of the bay is considered to provide baseline measurements of "ambient" conditions. It records measurements of temperature, specific conductivity, salinity, dissolved oxygen, turbidity, water level, and pH at 15 minute intervals during deployment periods of roughly two weeks. The sampling season is generally from March to December. However, this is dependent on weather, the amount of ice on the bay, the operational availability of the boat that serves as tender for the loggers, and whether there is sufficient staff on hand to satisfactorily operate, calibrate, and maintain the equipment.

Data logger deployment is achieved with a mooring set up that consists of 75 pound anchor (cinder blocks) to which two lines are attached. One line is for a surface float that marks the location. The other is shorter and terminates at a smaller float; line length is such that the float remains submerged throughout tidal changes. The data logger is attached to this line in a vertical manner so

that the sensors (pointing downward) are suspended 75 cm from the bottom. This system was chosen because local regulations prohibit installation of a more permanent structure (e.g., a piling) and to minimize opportunities for vandalism. Unfortunately, because the boat used to tend the data logger(s) is small, handling the weight of the mooring can exceed the limits of safety for data logger deployment/retrieval operations on windy days. As such, data logger field operations are limited to "fair weather". This contingency may result in interruptions in data collection that exceed those required for routine maintenance and calibration schedules.

During colder months, continuous operations are limited to about two weeks due to limited battery life. In the warmer months, particularly June - September, biofouling of the sensors also limits continuous operation to about two weeks even though battery performance during this period would allow longer deployments.

After a deployment, each logger is brought back to the laboratory for post calibration check, data downloading, instrument and sensor cleaning, and calibration. These procedures are carried out according to the methods described in the YSI Operating Manual. Salinity sensors were calibrated with reference seawater that had been previously analyzed with a Guildline salinometer at the Woods Hole Oceanographic Institution. Oxygen calibration was performed with the aid of a laboratory grade barometer. pH sensors were calibrated with 7.0 and 10.0 pH standard solutions (2-point calibrations). Turbidity standard solutions were prepared from formazin dilutions that were checked with a LaMotte Model 600 turbidity meter (calibrated with a 2-point calibration using LaMotte turbidity standards). Temperature sensors were not calibrated.

Oxygen sensor membranes were inspected after each deployment. Performance was also evaluated during the post-retrieval check in the laboratory test tank prior to post-calibration. If sensor performance had deteriorated and was not satisfactory, the membrane was replaced. If performance was satisfactory, the membrane was carefully cleaned with a gentle water spray (a Water Pick dental

instrument), the sensor was recalibrated and then the unit was redeployed. During colder months, when biofouling is less of a concern, membranes were often re-used for two deployments. If a membrane was replaced, calibration was not done until the membrane had been in place for at least 24 hours. Final calibration was done immediately prior to instrument deployment.

5. Site location and character:

The Waquoit Bay National Estuarine Research Reserve (WBNERR) is located in the northeastern United States on the southern shore of Cape Cod, Massachusetts. About 8,000 people maintain permanent residency in Waquoit Bay's drainage area, which covers parts of the towns of Falmouth, Mashpee, and Sandwich. During summer months, the population swells 2-3 fold.

WBNERR is representative of shallow coastal lagoons that occur from Cape Cod to Sandy Hook, New Jersey. WBNERR is within the Virginian biogeographic province, on the transitional border (Cape Cod) between the Virginian and the more northern Acadian biogeographic province.

Like many embayments located on glacial outwash plains, Waquoit Bay is shallow, fronted by prominent barrier beaches (i.e., those of South Cape Beach State Park and Washburn Island), and is backed by salt marshes and upland forests. Two narrow, navigable inlets, reinforced with granite jetties, have been constructed through two barrier beaches to connect Waquoit Bay with Nantucket Sound to the south. A third shallow and generally unnavigable inlet opened through the Washburn Island barrier beach during Hurricane Bob in August 1991. It has not been reinforced and its fate remains uncertain.

The eastern shore of uninhabited Washburn Island, with its low, steep bluffs and forested uplands, forms the western boundary of the reserve. However, tidal waters enter and leave the bay proper (and the Reserve) via the so-called Seapit and Eel rivers, which funnel tidal flows along the western shore of Washburn Island, through Eel Pond and ultimately to Nantucket Sound.

Dense housing developments cover the two peninsulas that form the western shore of the two rivers. Although the developments are outside of the Reserve boundaries, nitrogen in discharges from their septic systems (which flows

ultimately into the bay via groundwater) and in fertilizer run-off from their lawns has significant effects on the functioning of the Waquoit Bay ecosystem complex. The impacts of these effects have been a subject of study at the Reserve since its designation (1988). An outcome of this research has been the delineation of subwatersheds within the overall drainage area for Waquoit Bay, of which WBNERR is a small part. This knowledge allows robust experimental designs (e.g., substitution of space for time) which augment results from work done within and near to the Reserve.

At the northern end of the Bay, an area comprising a separate subwatershed, coastal bluffs of glacial till rise 30 feet above sea level, the highest land within the Reserve. Adjacent to the bluffs, the northern basin of the bay is its deepest area (2.3 m mean low water), albeit much of the remainder of the bay is only slightly shallower (roughly 1.6 m). The NB data logger is located within this basin. Bourne, Bog, and Caleb ponds are freshwater kettle hole ponds on the northern-most shore of the bay. As components of the same subwatershed, they have a common albeit minor freshwater outflow into the bay's northern basin via a narrow channel through a brackish marsh. Although this flow is small, over the centuries it has created a significant delta of coarse sand that overlies much finer sediments found at comparable offshore distances elsewhere. The source of this sand is the sandy beach through which this fresh water discharge must travel.

To the east and south, land in other subwatersheds surrounds several salt and freshwater ponds, including Hamblin and Jehu Ponds, brackish salt ponds that are connected to the Bay by the tidal waters of Little and Great rivers, respectively. The shorelines of the ponds are developed with residences that are occupied both seasonally and year round. Hamblin Pond and Little River are components of one subwatershed, and Jehu Pond and Great River are elements of a separate subwatershed. Further south lies Sage Lot Pond. It is in the least developed subwatershed which also contains the barrier beach and salt marsh

ecosystem of the reserve's South Cape Beach State Park. To the east of Sage Lot Pond and within the same subwatershed, lies the highly brackish Flat Pond. It receives minimal tidal flows of salt water from Sage Lot Pond through a narrow, excavated channel. The preponderance of the input to Flat Pond is groundwater and run off, both of which are likely affected (e.g., nutrients, pesticides, bacteria) by an adjacent golf course and near-by upper-scale residential development.

The largest source of freshwater to Waquoit Bay is the Quashnet/Moonakis River. (Although named "river", this and the reserve's Childs River are more appropriately described as "rivulets".) A component of yet another subwatershed, it originates in Johns Pond situated north of the bay and traverses forests, cranberry bogs, residential areas, and the Quashnet Valley Golf Course before entering the bay near the southern "boundary" of the northern basin. ("Quashnet" applies to that portion of the river within the town of Mashpee, and "Moonakis" refers to the brackish estuary at the river's mouth, lying in the town of Falmouth. Quashnet will be used hereafter to refer to the entire river.) Although the "baseline " data logger is roughly in the middle of the bay, it is also in the course of the discharge plume of the river. The plume is only detectable by the CB data logger during high water flows. The Quashnet River is the only component of the Waquoit Bay estuary system that has sufficient numbers of coliform bacteria to cause it to be closed to shellfishing. The source(s) of this bacteria is unknown. The Quashnet River delivers significantly less nitrogen to Waquoit Bay than does the Childs River, which lies to the west and originates in Johns Pond.

The Childs River is the second largest input of freshwater to the Bay. A component of another subwatershed, it runs through densely developed residential areas. The Childs River subwatershed receives the highest nitrogen loading and is the largest nitrogen contributor to the Waquoit Bay system of all the subwatersheds.

Another, albeit smaller, source of freshwater is the discharge of Red Brook

through brackish marshlands into Hamblin Pond. Additional freshwater enters the bay elsewhere through groundwater seepage, precipitation and the flows of small brooks. A significant groundwater flow enters the eastern end of the mooring basin at the head of the bay. There is relatively little surface water runoff entering directly into the bay due to the high percolation rates of Cape Cod's coarse, sandy soils.

A data logger is located in central Waquoit Bay (identified as "Central Basin" or CB) at 41° 33.927' N, longitude 70° 31.267' W. It is the reference site for the WBNERR data logger water quality monitoring program. An instrument will be moored at this site for the long term in order to collect baseline measurement of "ambient" conditions within Waquoit Bay. This information will be considered to represent an integration of the general conditions within the bay. The site is well flushed by tides, is 1.8-2.5 m deep, and is in an area that is minimally disturbed by routine activities on the bay (e.g. boat traffic, shellfishing, etc.). The Central Basin region was once covered by eelgrass (*Zostera marina*). This plant that has all but disappeared from the bay in the last two decades and has been replaced by seaweed, predominantly *Cladophora vagabunda*, *Gracilaria tikvahiae*, and *Enteromorpha* sp.. The CB site is southwest of the mouth of the Quashnet River.

The stream's freshwater discharge into Waquoit Bay is typically 5-10 ft³ /s. The resultant discharge plume at these low flows has an undetectable influence on salinity at the CB site. However, unusually high precipitation events or occasional releases of impounded water at an upstream cranberry bog can significantly increase flow to > 30 ft³ /s. The stream's discharge plume from these events results in slight reductions in salinity at CB. High precipitation is most common in the spring although summer and fall are when rains from tropical disturbances may occur. Discharges from cranberry bogs typically occur in the fall (harvest time) and after the coldest periods of winter; they are likely to be brief events.

Knowledge of the degree of mixing at the two sites was originally derived from measurements made by reserve staff (at the CB site) and from data obtained by the reserve's volunteer water quality monitoring group the Waquoit BayWatchers who have collected depth profiles of Waquoit Bay water quality since 1993. Subsequent research by reserve staff has revealed that lateral mixing has considerable influence because tidal currents follow a general course through the bay. This results in an overall structure to horizontal patterns of water quality characteristics. The pattern it produces is a gyre in the central portion of the bay whereby currents follow a circular pattern in an anticlockwise direction around a central area that exhibits reduced exchange with the remainder of the bay. The flushing rate within the gyre is diminished when compared with other areas of the bay. The location of the gyre meanders slightly, apparently under the influence of tides and wind. Given that the CB location can be either under the influence of the circular current flow or the "older" water nearer the center, as the gyre moves up and down the bay, there is explainable variability in CB data (e.g., salinity values). The MP site is more consistently near the outer regions of the gyre, that is, more frequently in the circular current, and those data are less affected by the meandering of the gyre. (Relocating the logger to the central area of the gyre is impractical because that area is frequented by boat traffic and the logger mooring would be a hazard to navigation.)

In September and October, 1998, a second data logger was situated roughly 100 feet to the southwest of the CB logger. This logger was called CB2. It was fitted with the standard suite of sensors except the pH sensor was an experimental type that was being tested on behalf of engineers at Yellow Springs Instruments, Inc., manufacturers of the data logger units. The CB2 unit was also fitted with an oxidation reduction potential (ORP) sensor.

In November and December, 1998, a data logger was situated at longitude 41 ° 34.131' N, latitude 70 ° 31.294' W, roughly 1200 feet northward of the CB

logger. It was called MP because it was near Metoxit Point. This logger was sited to test this location as an improved alternative to the CB site. The objective was to see whether the MP site was influenced by lateral mixing features to the extent observed at the CB site. The goal was to find a better site for the collection of "baseline" data. (See Section 12.)

In previous years, a data logger was located in the basin at the head of Waquoit Bay. This site was not monitored in 1998.

6. Data collection period

Data collection in the central basin at CB began August 6, 1998 and continued until December 23, 1998. Data collection at CB2 (adjacent to the CB logger) extended from September 2, 1998 to October 5, 1998. Data collection occurred at site MP from November 3, 1998 to December 23, 1998.

7. Associated researchers and projects

None to report.

8. Variable sequence, range of measurements, units, resolution, and accuracy:

YSI 6000 data logger

Variable Name	Range of Measurements(units)	Resolution	Accuracy
Date	1-12, 1-31, 00-99 (Mo,Day,Yr)	1 month, 1 day, 1 year	NA
Time	0-24, 0-60, 0-60 (Hr, Min, Sec)	1 hr, 1 min, 1s	NA
Temp	-5 to 45	0.01 C	+/-0.15C
SpCOND	0-100 (mS/cm)	0.01mS/cm	+/-0.5% of reading +
Salinity	0-70 Parts per thousand (ppt)	0.001 mS/cm	+/-
DO	0-200 (% air Saturation)	0.01ppt	1.0% of reading
DO	200-500 (% air Saturation)	0.01ppt	greater)
DO	0-20 (mg/l)	0.01mg/l	+/-2%
DO	20-50 (mg/l)	0.01mg/l	@air sat.
Depth (shallow)	0-9.1 (m)	0.001m	+/-6%
pH	2-14 units	0.01units	@air sat.
			or 0.1 ppt (whichever is
			0.1% @air saturation
			0.1% @air saturation
			+/-0.2mg/l
			+/-0.6mg/l
			+/-0.018m
			+/-0.2units

Turb 0-1000 NTU 0.1NTU +/-5% of
reading
or 2 NTU (whichever is
greater)

Data columns are separated by tabs.

9. Coded variable code definitions

The file names are labeled according to site identifier code, month, year
(e.g., cb0898).

Identifier codes are:

cb = central basin site in Waquoit Bay and is the so-called reference site;

cb2 = a second
logger was placed

about 100' SW of the cb logger to test new equipment for YSI
Instruments; mp

= a site

about 1200 feet north

of the cb site, chosen to see if this was a better "reference site"
than the
cb location.

10. Data anomalies

August 1998:

CB: DO% and mg/L values from 8/20/98 22:45:00 to 8/24/98
11:30:00

were quite spurious. Saturation values exceeded 600 % and mg/l values
were

negative. At the time of the post-calibration check the DO% was 17.8
(should

have been near 100 %) and there was a slight fold in the DO probe
membrane.

This is the most probable cause for the anomaly and these data were
deleted from

the report. Turbidity data from 8/31/98 16:00:00 to 23:45:00 are missing
because

the probe was malfunctioning and was out of service.

DO data was deleted from 8/31/98 16:00 to 09/04/98 23:45. DO values were
>100%

and up to 250% until the time when the unit failed due to water in the
battery
compartment.

September 1998:

CB: DO data was deleted from 8/31/98 16:00 to 09/04/98 23:45.
DO values were >100%

and up to 250% until the time when the unit failed due to water in the
battery

compartment.

CB2: The data logger was not suspended above the bottom at 0.75
m as

intended because the line supporting the data logger was too long and the float to which it was attached reached the surface at low tide levels. Thus, data logger height above the bottom varied and all data that are sensitive to water level are corrupted. Fortunately, the site is well mixed vertically and any stratification that does occur takes place very near the bottom. Most of the measurements are useful and have been retained. The water level data are corrupted (particularly during low water level periods) but the data record has been retained. Variations within the water level data record suggest that data logger mooring line was also entangled with the line attached to the large marker buoy. As a result there was inconsistency in the depth reached by the data logger during low water periods. Wind blowing against the marker buoy probably played a role in this variation.

October 1998:

CB2: None to report

CB: Turbidity outliers as follows-

10/16/98
03:00:00
-0001

10/16/98
03:15:00
0000

10/16/98
03:30:00
-0001

10/16/98
03:45:00
-0001

10/16/98
04:00:00
-0001

10/16/98
04:15:00

-0001

10/16/98
04:30:00
-0001

10/16/98
04:45:00
-0001

10/16/98
05:00:00
-0001

10/16/98
05:15:00
0000

10/16/98
05:30:00
0000

10/16/98
09:45:00
0000

10/17/98
15:00:00
0000

10/17/98
15:15:00
0000

10/19/98
12:00:00
-0001

10/19/98
12:15:00
-0001

10/22/98

00:00:00
0000

10/24/98
12:00:00
0000

10/26/98
16:30:00
0000

November 1998:

CB: None to report.

MP: During post-calibration of the November deployment (post-cal done 12/04/98), DO % values were slowly increasing rather than slowly decreasing as expected. Inspection of the oxygen sensor membrane revealed a slight fold. Oxygen data for the month (11/03/98 to 11/30/98) are suspect, although they are within the range of expected values.

December 1998:

CB: Post-deployment check delayed until 1/26/98. When checking the turbidity sensor, the turbidity standard of 0 NTU read 6.9 NTU. All other parameters were within range. The turbidity data do not reflect a significant drift as suggested by the post-calibration results. Post-cal numbers were considered anomalous and were ignored.

MP: As noted (above), during post-calibration of the November deployment (post-cal done 12/04/98), DO% values were slowly increasing rather than slowly decreasing as expected. Inspection of the oxygen sensor membrane revealed a slight fold. Data for 12/01/98 and 12/02/98 are suspect although they are within the range of expected values.

11. Missing data

The instruments were not operational at WBNERR until August 6, 1998. The following data are missing:

August 1998:

CB: No data until 08/06/98 16:00:00 when logger was placed in service.

CB: Oxygen data (DO% and mg/l) deleted from 08/20/98 22:45:00 to

08/24/98 11:30:00 (when unit was shut down for servicing) because the values impossibly incorrect. There was a problem with the sensor's membrane.

CB: No data from 08/24/98 11:45:00 to 08/31/98 15:45:00 when logger was out of service for recalibration. No other data loggers were in service during August.

CB: DO data was deleted from 8/31/98 16:00 to 09/04/98 23:45. DO values were >100% and up to 250% until the time when the unit failed due to water in the battery compartment.

September 1998:

CB2 data logger deployment commenced this month.

CB: DO data was deleted from 8/31/98 16:00 to 09/04/98 23:45. DO values were >100% and up to 250% until the time when the unit failed due to water in the battery compartment.

CB: No data from 09/05/98 00:00:00 through 09/15/98 18:00:00. Sonde

(SN#95A27701) was retrieved 09/15/98. Battery compartment was filled with

water. Sonde had ceased recording on 09/05/98 at 00:00:00. Replaced with sonde

SN#96B46179 which was deployed on 9/18/98 at 18:00:00.

CB: No turbidity data recorded for 09/01/98-09/15/98 18:00:00. Turbidity probe out of service.

CB2: No data from 09/01/98 00:00:00 through 09/02/98 14:45:00. Logger not in service.

CB2: No data from 09/15/98 10:30:00 through 09/18/98 16:45:00 for servicing.

CB2: No turbidity data recorded for 09/01/98-09/18/98 16:45:00. Turbidity probe out of service.

CB2: No data from 09/30/98 23:00:00-23:45:00; datalogger set to record in DST instead of EST. When corrected to EST, last hour was lost.

October 1998:

CB: No data from 10/05/98 15:15:00 through 10/13/98 17:45:00 for servicing

CB: No data from 10/28/98 11:00:00 through 10/31/98 23:45:00 for servicing

CB2: No data from 10/05/98 14:15:00 through 10/31/98 23:45:00 for servicing.

CB2: No turbidity data recorded for 10/01/98 to 10/31/98 23:45:00.

Turbidity probe out of service.

CB2 deployment ceased at the end of October.

November 1998:

MP data logger deployment commenced this month.

CB: No data from 11/01/98 00:00:00 through 11/03/98 17:45:00
for
servicing.

CB: No data from 11/28/98 06:00:00 through 11/30/98 23:45:00
due to
battery failure.

MP: No data from 11/01/98 00:00:00-11/03/98 19:45:00 for
servicing

December 1998:

CB: No data from 12/01/98 00:00:00 through 12/07/98 16:45:00
for
servicing.

CB: No data recorded for 12/11/98 10:00:00. Apparent data sonde
malfunction.

CB: No data recorded for 12/17/98 21:45:00. Apparent data sonde
malfunction.

CB: Both loggers were pulled for the winter on 12/23/98 at
11:15:00.
Logging ceased and no data were recorded from 12/23/98 11:30:00 to
12/31/98
23:45:00.

MP: No data from 12/02/98 11:00:00-12/07/98 16:45:00 for
servicing;
datalogger pulled for winter 12/23/98 11:30:00

12. Other remarks/notes

Review of data from the CB and MP loggers suggested that moving the
"reference" site northward would benefit the monitoring program. The CB
site
(latitude 41 o 33.927' N, longitude 70 o 31.267' W) is too close to the
southern
boundary of the gyre that exists in the central part of the bay. As such,
when
the gyre meanders northward, the logger becomes exposed to water more
characteristic of Nantucket Sound conditions rather than the water that
has
estuarine conditions (gyre water). Moving the reference site northward to
MP (41
o 34.131' N, longitude; 70 o 31.294' W latitude) would locate the logger
in
estuarine water. Since this water more directly reveals influences by
anthropogenic influences (e.g., elevated chlorophyll concentrations, as
revealed
by research at WBNERR), the MP site would provide data more apropos to
the goals
of the NERRS System-Wide Monitoring Program. Future "baseline or
reference"
deployments will be at the MP site.

