Maryland Shallow Water Monitoring Program – 2009 Continuous Monitoring

Metadata:

Identification_Information:
Citation:
Citation_Information:
Originator: Maryland Department of Natural Resources, Resource Assessment Service (MD DNR RAS)
Publication_Date: 20100515
Title: MD DNR Continuous Water Quality Monitoring Project 2009
Geospatial_Data_Presentation_Form: Spatial dataset

Description:
Abstract:
Water quality was monitored at forty-four Maryland shallow water sites located in Chesapeake Bay, Chesapeake Bay tributaries and Maryland Coastal Bay tributaries during 2009. YSI (6600 EDS) data loggers sampled seven environmental parameters: water temperature, specific conductance, dissolved oxygen concentration, oxygen percent saturation, pH, turbidity and fluorescence. Water depth was measured at stations where loggers were deployed at fixed depths. Salinity and chlorophyll were derived from specific conductance and fluorescence, respectively. Each parameter was sampled at 15-minute intervals. The number of days that data were collected at individual stations ranged from twenty-nine to three hundred forty.

Data loggers were exchanged bi-weekly. Loggers were deployed simultaneously at two depths at stations XHH4931 and XHH4916.

When data loggers were exchanged, water samples for pigments, nutrients and suspended solids were collected for later analysis. At the same time, Secchi disk depth was measured and a HydroLab (series III or IV) water quality sonde was used to collect discrete water temperature, salinity, dissolved oxygen and pH data. Light attenuation was also measured using a LiCor instrument.

Purpose:
The Maryland Department of Natural Resources Shallow Water Monitoring program is part of a cooperative effort between the Federal government and State and local governments in the Chesapeake Bay watershed to assess the ambient water quality criteria for dissolved oxygen, chlorophyll and water clarity in shallow water habitats.

Shallow water monitoring data describes the 2009 state of forty-four shallow water sites on Chesapeake Bay and Maryland Coastal Bay tributaries using key water quality indicators.

The information is integrated with data from other Bay water quality stations and living resources monitoring projects and used to understand linkages, temporal variation and long-term trends.

Water quality data are used to refine, calibrate and validate Chesapeake Bay ecological models. The models are used to develop and assess water quality criteria with the goal of removing the Chesapeake Bay and its tidal rivers from the list of impaired waters.

Supplemental_Information:
The target audiences for this information include Resource Managers, Technical/Scientific Users, Government, Educators, Students and General Public.

Data users who desire very detailed information about Water Quality Monitoring data-definition, sampling-procedures and data-processing are encouraged to refer to the two documents listed below. The documents may be obtained from the Chesapeake Bay Program Office.

Water Quality Database - Database Design and Data Dictionary Prepared For: U.S. Environmental Protection Agency, Region III, Chesapeake Bay Program Office, January 2004. http://archive.chesapeakebay.net/pubs/cbwqdb2004_RB.PDF

The most current version of the Water Quality Data Dictionary - Online may be found at: [http://archive.chesapeakebay.net/data/data_dict.cfm?DB_CODE=CBP_WQDB].

Quality Assurance Project Plan for the Maryland Department of Natural Resources, Chesapeake Bay Shallow Water Quality Monitoring Program, for the period July 1, 2009 - June 30, 2010. [http://mddnr.chesapeakebay.net/eyesonthebay/documents/SWM_QAPP_2009_2010_Draft1.pdf]

Time_Period_of_Content:
Time_Period_Information:
Range_of_Dates/Times:
Beginning_Date: 20090101
Ending_Date: 20091231
Currentness_Reference: Ground condition
Status:
Progress: Complete
Maintenance_and_Update_Frequency: As needed
Spatial_Domain:
Bounding_Coordinates:
West_Bounding_Coordinate: -79.4938
East_Bounding_Coordinate: -75.0405
North_Bounding_Coordinate: 39.7425
South_Bounding_Coordinate: 37.8713
Keywords:
Theme:
Theme_Keyword_Thesaurus: Olsen, L.M., G. Major, K. Shein, J. Scialdone, R. Vogel, S. Leicester, H. Weir, S. Ritz, T. Stevens, M. Meaux, C.Solomon, R. Bilodeau, M. Holland, T.

Northcutt, R. A. Restrepo, 2007. NASA/Global Change Master Directory (GCMD) Earth Science Keywords. Version 6.0.0.0.0
[online:http://gcmd.nasa.gov/Resources/valids//gcmd_parameters.html]

Theme_Keyword: Biosphere > Aquatic Ecosystems > Estuarine Habitat
Theme_Keyword: Biosphere > Aquatic Ecosystems > Rivers/Stream Habitat
Theme_Keyword: Biosphere > Ecological Dynamics > Ecosystem Functions > Nutrient Cycling
Theme_Keyword: Biosphere > Ecological Dynamics > Ecosystem Functions > Primary Production
Theme_Keyword: Terrestrial Hydrosphere > Surface Water > Rivers/Streams
Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Chlorophyll
Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Conductivity
Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Light Transmission
Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Nitrogen Compounds
Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Oxygen
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Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Phosphorous Compounds
Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Suspended Solids
Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Turbidity
Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > Water Temperature

Place:
Place_Keyword_Thesaurus: Producer Defined
Place_Keyword: United States
Place_Keyword: Maryland
Place_Keyword: Chesapeake Bay Watershed
Place_Keyword: Chesapeake Bay
Place_Keyword: Anne Arundel County
Place_Keyword: Baltimore City
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Place_Keyword: Talbot County
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Place_Keyword: Bush River
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Place_Keyword: Coastal Bays
Place_Keyword: Corsica River
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Place_Keyword: Sassafras River
Place_Keyword: St. Mary's River
Place_Keyword: Susquehanna River
Place_Keyword: Tred Avon River
Place_Keyword: Wicomico River
Access_Constraints: None
Use_Constraints: None
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Mark Trice
Contact_Position: Chief, Water Quality Informatics
Contact_Address:
Address_Type: Mailing Address
Address: Tawes State Office Building, 580 Taylor Avenue, D2
City: Annapolis
State_or_Province: MD
Postal_Code: 21401
Contact_Voice_Telephone: 410 260-8630
Contact_Electronic_Mail_Address: MTRICE_nospam_@dnr.state.md.us[Remove _nospam_ for valid email address]
Browse_Graphic:
Browse_Graphic_File_Name: http://mddnr.chesapeakebay.net/newmontech/contmon/stn_map/Cmon_stns_2009.pdf
Browse_Graphic_File_Description: Map of forty-four 2009 Continuous Monitoring Sites.
Note symbols and coordinates for stations XBE5486 (PRO) and XGE3275 (RHO) are also on the map. Data collected at stations XBE5486 and XGE3275 are not currently submitted to the Chesapeake Bay Program by MD DNR.
Browse_Graphic_File_Type: PDF
Data_Set_Credit:
Maryland Department of Natural Resources (MDDNR) Resource Assessment Service (RAS) staff collected the majority of samples and processed the data. St. Mary's River Project staff

collected a subset of samples. The Nutrient Analytical Services Laboratory (NASL) at the Chesapeake Biological Laboratory (Univ. of MD) analyzed the nutrient, chlorophyll and suspended solids samples.

The project was made possible with funding provided by The State of Maryland, the United States Environmental Protection Agency Chesapeake Bay Program, the National Atmospheric and Oceanic Administration National Estuarine Research Reserve System program, the Oyster Recovery Partnership, Harford County, Maryland and Anne Arundel, County Maryland.

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
Quality Assurance/Quality Control: MD DNR followed specific procedures to ensure that the Shallow Water Quality Monitoring Program project design was properly implemented and managed with sufficient accuracy, precision and detection limits. Accuracy (closeness to the true value) of collected data was controlled and assured by the proper use, calibration and maintenance of both field and laboratory equipment for the measurement of physical and chemical parameters.

The YSI 6600 V2 or 6600 EDS sondes were configured with the following probes: 6560(conductivity/temperature); 6561(flat glass pH) or 6579(tall pH); 6136(turbidity); 6562(rapid pulse dissolved oxygen) or 6150(ROX); 6025(fluorescence/chlorophyll). Sondes at 2 sites were also configured with 6132 (blue-green pe) probes.

Resolution, range and accuracy specifications for the sonde and probes may be obtained from the manufacturer. [https://www.ysi.com/ysi/Support]

Procedures used to control and assure the accuracy of field measurements consisted of calibration of field instruments, verification of calibrations, equipment maintenance, and collection of filter blanks. Details of how data acquired with YSI sondes were quality assured and quality controlled may be found in the process description elements in the Lineage portion of this metadata record.

Water quality laboratory analysis results were used to calibrate and cross-check sonde data for accuracy. Daily quality control checks (including the running of blanks and standards) were used to control and assure laboratory accuracy.

Accuracy of Chesapeake Biological Laboratory, Nutrient Analytical Services Laboratory (CBL NASL) laboratory results was also assessed through DNR's participation in the Chesapeake Bay Coordinated Split Sample Program (CSSP), a split sampling program in which five laboratories involved in Chesapeake Bay monitoring analyze the coordinated split samples. CSSP was established in June 1989 to establish a measure of comparability between sampling and analytical operations for water quality monitoring throughout the Chesapeake Bay and its tributaries. DNR followed the protocols in the Chesapeake Bay Coordinated Split Sample Program Implementation Guidelines (EPA 1991) and its revisions. Split samples were collected quarterly. Results were analyzed by appropriate statistical methods to determine if results differed significantly among

labs. If a difference occurred, discussions began regarding techniques and potential method changes to resolve discrepancies.

Additionally, CBL NASL participated two times per year in the United States Geologic Survey (USGS) reference sample program.

Logical_Consistency_Report:

Two of the attributes in the water quality data set are PARAMETER and VALUE. In cases where PARAMETER value is "SIGMA_T" and the VALUE measurement in the record is a negative number, the number should be considered unreliable. SIGMA_T values are not measured. SIGMA_T values are derived.

During 2009, at all but two stations, water quality monitoring sondes were deployed at a single depth. At two stations: The Sill (XHH4916) and Possum Point (XHH4931), sondes were deployed at two depths: one meter from the surface and 0.3 meters from the bottom.

Values in the 'LAYER' column of sonde data files may be used to determine the depth at which a sonde was deployed. Sonde data from all 2009 sites, except XHH4916 and XHH4931, list a value of 'BS', 'below surface' in the LAYER column. For stations XHH4916 and XHH493, a LAYER column value of 'B' indicates the sonde was deployed 0.3 meters above the bottom. A LAYER column value of 'S' indicates the sonde was deployed 1 meter below the surface.

In the 2009 sonde data there are numerous instances of turbidity measurements with negative values. The turbidity probe accuracy is plus or minus 5 NTU. In cases where turbidity probe post-deployment calibration values were within acceptable limits, negative values greater than or equal to -5.0 NTU are reported.

The sonde at station XKH2949 was moved (16-Apr-2009) approximately 3-4 meters after the sonde tube was damaged by a boat. The sonde at station XIE2581 was moved (16-Jun-2009) approximately 9 meters after the sonde tube was damaged by a boat. The original 2009 location of the sonde at station XIE2581 was about 3-4 meters from where it was located in 2008. The 2009 position of the sonde at station XBF7904 was about 3 meters removed from the 2008 position. The sonde at station XHF6841 was removed 30-Jun-2009 because the tube was broken. The sonde tube was re-installed 16-Jul-2009 about 3 meters away from its original location.

Two different models of dissolved oxygen sensors were used during 2009. When the data sondes were deployed, they were configured with either model 6562 (rapid pulse), or model 6150 (ROX) probes.

The sondes deployed at stations XBF7904 (St. Georges Creek), XCF1440 (St. Mary's College) and XFG0995 (Tred Avon) used rapid pulse probes. All other continuous monitoring sondes used ROX probes in 2009

During 2009, it was not always possible, for logistical reasons, to replace sondes at all sites every two weeks. The sonde at station XCG5495 was not switched on 14-Apr-2009. The sonde at station XKI0256 was not switched on 30-Apr-2009. The sonde at station LMN0028 was not switched on

12-May-2009. The sonde at station XHF6841 was not switched on 19-May-2009. The sonde at station XKH2870 was not switched on 11-Jun-2009. The sonde at station XEA3687 was not switched on 29-Jun-2009. The sonde at station XCG9168 was not switched on 7-Jul-2009.The sonde at station XHG8442 was not switched on 14-Jul-2009. The sonde at station XKI0256 was not switched on 22-Jul-2009. The sonde at station XKH2870 was not switched on 23-Jul-2009. The sonde at station XEA3687 was not switched on 27-Jul-2009. The sonde at station XKH0375 was not switched on 20-Aug-2009. The sonde at station XKH2870 was not switched on 20-Aug-2009. The sonde at station XKH2797 was not switched on 3-Sep-2009. The sonde at station XKH2949 was not switched on 3-Sep-2009. The sonde at station XEA3687 was not switched on 14-Sep-2009. The sonde at station XKH2870 was not switched on 17-Sep-2009. The sonde at station XKH2949 was not switched on 1-Oct-2009. The sonde at station MTI0015 was not switched on 22-Oct-2009.

Comments in the XHH3851 (Sycamore Point) sonde data beginning 28-Dec-2009 indicate that a shift in all parameter data may have been caused by "a bubbler being turned on for ice conditions".

Completeness_Report:

2009 data from forty-four continuous monitoring stations are available on-line.

The 2009 Continuous Monitoring project dataset includes twelve months of sonde records from the continuous monitoring stations: WXT0013 (Iron Pot Landing), PXT0455 (Jug Bay) and XHH3851 (Sycamore Pt.). The sondes at stations: XCF1440 (St. Mary's College), and XIE5748 (Baltimore Harbor) were deployed eleven months. Sonde data were collected for ten months at stations: XDM4486 (Bishopville Prong), MTI0015 (Mataponi), NPC0012 (Newport Creek), XJG7035 (Otter Point Creek), and XBM8828 (Public Landing). Nine month deployments occurred at stations: XDN6921 (Grey's Creek), XGG8359 (Kent Narrows Inside), XGG8458 (Kent Narrows Outside), and XHF0460 (Sandy Pt. - South Beach). Deployments at stations: XCD5599 (Breton Bay (Pawpaw Point)), XKH2797 (Carpenters Point), XKI5022 (Charlestown), XJG7461 (Church Point), XHF9808 (Fort Smallwood), XHG8442 (Gratitude Marina), XKH2949 (Havre de Grace), XCG9168 (House Point), LMN0028 (Little Monie Creek), XHG2318 (Love Point), XEA3687 (Mattawoman), XCG5495 (Muddy Hook Cove), XBF7904 (St Georges Creek) andXKH2870 (Stump Point) lasted eight months. Sondes were deployed seven months at stations: XJH2362 (Betterton), XJI2396 (Budd's Landing), XHF6841 (Down's Park), XIE2581 (Fort Armistead), XIF1735 (Fort Howard), XKI0256 (Hollywood Beach), XKI3890 (Locust Point Marina), XJI8369 (Long Point), XIE4741 (Masonville Cove), XHH4931 (Possum Point - Bottom and Surface), XKH0375 (Susquehanna Flats) and XHH4916 (The Sill Bottom and Surface). Sonde XEB5404 (Indian Head) and sonde XFG0995 (Tred Avon) were deployed five and four months respectively.

Silicate samples were only collected at the four Coastal Bays stations during 2009: XDM4486 (Bishopville Prong), XDN6921 (Grey's Creek), NPC0012 (Newport Creek) and XBM8828 (Public Landing).

The user may discover a few interruptions in sonde datasets. In most cases, these interruptions were related to short-term problems with sonde operation.

Station XJG7035 (Otter Point Creek) was removed from service 14_Dec-2009 due to concerns about ice and low temperatures.

There were gaps in the sonde data for a few stations for the following reasons. The sonde at station XIE2581 (Fort Armistead) was out of service from 3-Jun-2009 to 16-Jun-2009 due to a broken sonde tube. The sondes at stations XHF0460 (Sandy Pt. - South Beach) and XHF6841 (Down's Park) were out of service from 30-Jun-2009 to 16-Jul-2009 due to broken sonde tubes.

A configuration problem resulted in no data collection between 14-Jul-2009 and 30-Jul-2009 by the sonde deployed at station XIE5748 (Baltimore Harbor).

Station XHF6841 is missing data from 1-Aug-2009 to 18-Aug-2009 due to battery failure. Similarly, XHF0460 is missing data from 11-Aug-2009 to 13-Aug-2009 because of battery failure. No data were collected at station XKH2870 (Stump Point) during the period of 11-Jul-2009 through 6-Aug-2009 due to a power failure. Another power failure at station XKH0375 (Susquehanna Flats) resulted in a data gap between 22-Jul-2009 and 6-Aug-2009.

Fouling necessitated the temporary removal of three sondes and tubes for maintenance. The sonde at station XHF0460 was out of service from 27-Aug-2009 to 24-Sep-2009. The sonde at station XHF9808 (Fort Smallwood) was not deployed from 8-Sep-2009 to 11-Sep-2009. The sonde at XIE2581 was removed for maintenance from 7-Oct-2009 to 20-Oct-2009.

On a few occasions, due to extreme low tide conditions, sondes were not submerged. These data are not included in the published dataset.

All other missing sonde attribute values were removed because the data were determined to be unreliable during the quality control process.

Lineage:
Process_Step:
Process_Description:
SONDE CALIBRATION and POST-CALIBRATION

The Yellow Springs Instrument (YSI) 6600 data sondes were maintained and calibrated before and after each deployment in accordance with YSI recommendations.
https://www.ysi.com/ysi/Support

FIELD MEASUREMENTS AND SAMPLING

SONDES:

The continuous monitoring sensors at the sites recorded seven water quality parameters every 15 minutes. Data were uploaded to DNR's web site http://www.eyesonthebay.net shortly after retrieval.

At all sites the seven water quality parameters measured continuously were: water temperature, specific conductance, salinity, dissolved oxygen, turbidity (NTU), fluorescence (used to estimate chlorophyll a) and pH. Sondes deployed at fixed depths also measured water depth.

Each monitoring station was equipped with a YSI 6600 sonde. The sonde logged data onto an internal memory, where it was stored until retrieval. Thirteen stations were equipped with cellular telemetry units, which allowed data to be transmitted hourly to a server computer at DNR. Sondes were deployed inside vertically-oriented four-inch diameter PVC pipes with several two-inch holes drilled along their length to allow for water exchange. Depending on location, sondes were either suspended from a float 1.0-meters below surface or fixed 0.3-meters or 0.5-meters above bottom resting on a stop bolt.

Sondes at the following stations were deployed at a fixed depth of 0.3 meters above the bottom: LMN0028 (Little Monie Creek), MTI0015 (Mataponi), NPC0012 (Newport Creek), PXT0455 (Jug Bay), WXT0013 (Iron Pot Landing), XBM8828 (Public Landing), XCG5495 (Muddy Hook Cove), XCG9168 (House Point), XDM4486 (Bishopville Prong), XDN6921 (Grey's Creek), XEA3687 (Mattawoman), XEB5404 (Indian Head), XGG8359 (Kent Narrows Inside), XGG8458 (Kent Narrows Outside), XHH4916 (The Sill), XHH4931 (Possum Point - Bottom), XJG7035 (Otter Point Creek), XKH0375 (Susquehanna Flats) and XKH2797 (Carpenters Point).

Sondes at the following stations were deployed at a fixed depth of 0.5 meters above the bottom: XBF7904 (St Georges Creek), XCD5599 (Breton Bay (Pawpaw Point)), XCF1440 (St. Mary's College) and XFG0995 (Tred Avon).

All other sondes were deployed suspended from buoys at a depth of 1.0 meters below the surface.

Note that meters were deployed at two depths at stations: XHH4916 and XHH4931.

WATER QUALITY CALIBRATION SAMPLES:

Each time sondes were exchanged at each Continuous Monitoring station, "Grab" water quality samples were collected at meter depth using a horizontal "Alpha" water sampler. At the time the water was collected, a HydroLab sonde measurement was taken at 1.0 meter depth.

Numbered two-quart bottles were triple-rinsed and filled with water for "whole" and "filtered" nutrient and chlorophyll samples.

Nutrient, pigment and suspended-solid water samples were filtered on station or shortly thereafter. Sample waters and filters were placed on ice immediately after filtration.

Particulate samples included: Chlorophyll, Particulate Carbon, Particulate Nitrogen, Particulate Phosphorus (PP), Particulate Inorganic Phosphorous (PIP), Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS).

Filtrate collected from TSS/VSS or PP/PIP filtrations was used for dissolved nutrient samples. Total Dissolved Nitrogen and Total Dissolved Phosphorus, Nitrate, Nitrite, Ammonia, Orthophosphate, Silicate and Dissolved Organic Carbon samples were collected.

Silicate samples were only collected at the four Coastal Bays stations during 2008: XDM4486, XDN6921, XBM8828 and NPC0012.

HYDROLAB PROFILE:

The first reading of the HydroLab water-column profile at each station was recorded at the same time the water quality "grab" sample was collected. After the 1.0-meter depth record was logged, the sonde was lowered to the bottom. A reading was taken at 0.3-meters above the bottom. The sonde was raised and measurements were recorded at 0.5-meter or 1.0-meter increments until it reached the surface. (In cases where station depth was greater then 3-meters, the sonde was raised in 1-meter increments).

SECCHI DEPTH:

Secchi Disk Depth was measured each time sondes were exchanged. Readings with the secchi disk were made in-situ without the aid of sunglasses. The secchi disk was lowered into the water, on the shady side of the boat or pier. The depth at which the disk was no longer visible was recorded. The time at which the reading was taken was noted. This facilitated later matching of secchi depth readings with transmissometer and turbidity data.

PAR MEASUREMENT:

Underwater Photosynthetically Active Radiation (PAR, 400-700nm)

When meters were exchanged at a site, down-welling light penetrating the water column (PAR) was measured underwater at several depths to calculate the light attenuation coefficient, Kd. Simultaneous surface and submersed PAR intensity measurements were taken to account for variability in incident surface irradiance due to changes in cloud cover. Data collected from this procedure were used to estimate the depth of the photic zone.

The equipment used was manufactured by LI-COR, Inc. and consisted of a LI-192SA, flat cosine Underwater Quantum Sensor, a LI-190SA air (deck) reference sensor and a Data Logger (LI-1000 or LI-1400).

Surface and underwater readings were recorded simultaneously. Readings were allowed to stabilize before being recorded. If the station depth was less than 3 meters, readings were taken at 0.1 meter and at 0.25-meter intervals until 10% for the 0.1-meter reading was reached. If the station depth was greater than 3 meters, a reading was taken at 0.1-meter and at 0.5-meter intervals until 10% of the 0.1-meter reading was reached.

SONDE DATA CHECKS

The continuous monitoring sondes were retrieved, calibrated and replaced bi-weekly from January to December. At each deployment, sondes were replaced with clean, recalibrated units and data from the data loggers were downloaded to a computer.

In the field, before an instrument was replaced, field staff allowed both the new (freshly calibrated) sonde and the old (deployed) sonde to log two readings (fifteen minutes apart) side by side at the same depth. In addition, for one of the readings, data were recorded from a discrete instrument -usually a HydroLab sonde. This three-way comparison assured that the "new" and "old" sondes were both reading each parameter within a certain tolerance. The HydroLab reading was used as a "double-check," and since it was a discrete reading, it allowed staff to watch the display and note whether the parameters were fluctuating or stable.

EcoWatch(tm) software (a YSI product) was used to calibrate the instruments as well as to upload and view data collected. Data downloaded from the sonde were subjected to quality assurance/quality control checks to ensure that values outside the range of possibility were not displayed on the DNR web site.

Data were evaluated using both three-way in-situ comparison results and data from sonde calibrations. The comparison tolerances were as follows - for both pre- post- calibration and in-situ comparisons: Temperature (deg C) +- 0.2; Specific Conductance (uM/cm) +- 5%; Dissolved Oxygen (mg/l) +- 0.5 mg/l; pH +- 0.2; Turbidity (NTU) +- 5%; Chlor +- 5%.

Excessive drift between pre- and post- calibration values of sonde probes, variance from in-situ measurements or probe failures caused data to be flagged. When post-calibration drift exceeded the limits stated above in both the post-calibration and the in-situ comparables, the "bad data" were masked within the data set with an error code (see QAPP for list of error codes).

SONDE FILE POST-PROCESSING:

Each "raw" .csv file of sonde data was post-processed using an Excel(tm) Macro. The file was opened and renamed. Rows of data acquired before and after deployment were deleted. Records (if any) were also deleted if instrument error codes indicated "garbage" data. The macro rearranged columns and inserted error-tracking columns and headings. Macro statements flagged negative values, missing values and highlighted values outside each parameter's normal range. The macro also returned a report summarizing range exceedances. Event and instrument information was appended to each record.

Flagged values were evaluated. Common anomalies included spikes in fluorescence and turbidity, dips in specific conductance, and extremely high dissolved oxygen readings. Instrument post-calibration results, in-situ comparisons with HydroLab, LI-COR readings, historical data from near-by locations and survey crew remarks were used to determine whether sensor values were acceptable.

In cases where data were determined to be unreliable, the reason(s) were documented with error codes and comments. Unreliable data were masked. No data were discarded. Only data considered reliable were published in reports.

Field staff and Tawes Office staff reviewed continuous monitoring data weekly. If a problem was identified, a field team member was dispatched to replace the instrument as soon as possible.

VERIFICATION AND DATA MANAGEMENT

At the end of the monitoring season, DNR Tawes Office and Field Office personnel conducted additional data QA/QC procedures. All of the data were plotted and outliers and anomalous values were thoroughly researched. Staff compared unusual values to historic values from the site and values from nearby sites in the Bay. Weather events were considered, event logs were reviewed and field staff members were consulted regarding possible legitimate causes for the values. In cases where values were not considered legitimate, error codes were assigned. All data were retained in the archive data set. After field staff and the Quality Assurance Officer reviewed error flags, the values were masked within the published dataset.

Process_Date: Unknown
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Sally Bowen
Contact_Position: Project Chief, Monitoring Field Office, DNR
Contact_Address:
Address_Type: mailing and physical
Address: 1919 Lincoln Drive
City: Annapolis
State_or_Province: Maryland
Postal_Code: 21401
Country: USA
Contact_Voice_Telephone: 410 263-3369
Contact_Electronic_Mail_Address: SBOWEN_nospam_@dnr.state.md.us[Remove _nospam_ for valid email address]

Process_Step:
Process_Description:
LABORATORY ANALYSIS – CBL

University of Maryland's Chesapeake Biological Laboratory (CBL), Nutrient Analytical Services Laboratory analyzed total dissolved nitrogen, particulate nitrogen, nitrite, nitrite + nitrate, ammonium, total dissolved phosphorus, particulate phosphorus, particulate inorganic phosphorus, orthophosphate, dissolved organic carbon, particulate carbon, total suspended solids, and volatile suspended solids.

Note that beginning in 2008, Shallow Water Monitoring silicate samples were only collected and analyzed for four Maryland Coastal Bays stations: NPC0012, XDM4486, XDN6921 and XBM8828.

Further information about laboratory analytical procedures may be obtained from the "Process_Contact".

Process_Date: Unknown
Process_Contact:
Contact_Information:

Contact_Person_Primary:
Contact_Person: Carl Zimmerman
Contact_Position: Director of Analytical Services/Quality Assurance Officer
Contact_Address:
Address_Type: mailing and physical
Address: Chesapeake Biological Laboratory, Center for Environmental and Estuarine Studies, The University of Maryland System, 1 Williams St; P.O. Box 38
City: Solomons
State_or_Province: Maryland
Postal_Code: 20688
Country: USA
Contact_Voice_Telephone: 410 326-7252
Contact_Electronic_Mail_Address: carlz _nospam_@cbl.umces.edu[Remove _nospam_ for valid email address]

Spatial_Data_Organization_Information:
Indirect_Spatial_Reference: Bohemia River, Bush River, Chesapeake Bay, Chester River, Choptank River, Maryland Coastal Bays, Corsica River, Elk River, Honga River, Mattawoman Creek, Northeast River, Patapsco River, Patuxent River, Potomac River, Sassafras River, Susquehanna River, Tred Avon River, Wicomico River, Maryland, USA
Direct_Spatial_Reference_Method: Point

Spatial_Reference_Information:
Horizontal_Coordinate_System_Definition:
Geographic:
Latitude_Resolution: 0.0001
Longitude_Resolution: 0.0001
Geographic_Coordinate_Units: Decimal degrees
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137
Denominator_of_Flattening_Ratio: 298.257

Entity_and_Attribute_Information:
Overview_Description:
Entity_and_Attribute_Overview:
This metadata record is a description of a continuous monitoring project. Project data are an aggregation of data collected at forty-four Maryland stations during 2009.

The data are contained in five related entities (tables): Station_Information, Monitoring_Event_Data, Water_Quality_Data, Light_Attenuation_Data and CMON_DATA. Each table contains attributes (fields).

The entity Station_Information is comprised of the attributes: STATION, DESCRIPTION, WATER_BODY, CBP_BASIN, TS_BASIN, BASIN, CBSEG_2003,

CBSEG_2003_DESCRIPTION, HUC8, CATALOGING_UNIT_DESCRIPTION, HUC11, WATERSHED, FIPS, STATE, COUNTY/CITY, FALL_LINE, LATITUDE, LONGITUDE, LL_DATUM, UTM_X and UTM_Y

The entity Monitoring_Event_Data is comprised of the attributes: EVENT_ID, SOURCE, AGENCY, PROGRAM, PROJECT, STATION, EVENT_START_DATE, EVENT_START_TIME, CRUISE, TOTAL_DEPTH, UPPER_PYCNOCLINE, LOWER_PYCNOCLINE, AIR_TEMP, WIND_SPEED, WIND_DIRECTION, PRECIP_TYPE, TIDE_STAGE, WAVE_HEIGHT, CLOUD_COVER, GAGE_HEIGHT, PRESSURE, FLOW_STAGE, DETAILS and WATER_BODY.

The entity Water_Quality_Data is comprised of the attributes: EVENT_ID, SOURCE, PROJECT, STATION, SAMPLE_DATE, SAMPLE_TIME, DEPTH, LAYER, SAMPLE_TYPE, SAMPLE_ID, PARAMETER, QUALIFIER, VALUE, UNIT, METHOD, LAB, PROBLEM, DETAILS, TOTAL_DEPTH, UPPER_PYCNOCLINE, LOWER_PYCNOCLINE, LAT, and LONG.

The entity Light_Attenuation_Data is comprised of the attributes: EVENT_ID, SOURCE, PROJECT, STATION, SAMPLE_DATE, SAMPLE_TIME, SAMPLE_REPLICATE_TYPE, DEPTH, EPAR_S, EPARU_Z, EPARD_Z, UNIT, METHOD, DETAILS, WATER_BODY, TOTAL_DEPTH, UPPER_PYCNOCLINE, and LOWER_PYCNOCLINE.

The entity CMON_DATA is comprised of the attributes: DATE, TIME, STATION, SONDE, TOTAL_DEPTH, DISSOLVED OXYGEN, PERCENT OXYGEN SATURATION, SALINITY, TEMPERATURE, PH, TURBIDITY AND CHLOROPHYLL.

Entity_and_Attribute_Detail_Citation:
Water Quality Database - Database Design and Data Dictionary Prepared For: U.S. Environmental Protection Agency, Region III, Chesapeake Bay Program Office, January 2004. http://archive.chesapeakebay.net/pubs/cbwqdb2004_RB.PDF

The most current version of the Water Quality Data Dictionary - Online may be found at: [http://archive.chesapeakebay.net/data/data_dict.cfm?DB_CODE=CBP_WQDB].

Quality Assurance Project Plan for the Maryland Department of Natural Resources, Chesapeake Bay Shallow Water Quality Monitoring Program, for the period July 1, 2009 - June 30, 2010. [http://mddnr.chesapeakebay.net/eyesonthebay/documents/SWM_QAPP_2009_2010_Draft1.pdf]

Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Michael Mallonee
Contact_Position: Water Quality Data Manager
Contact_Address:
Address_Type: mailing

Address: 410 Severn Avenue, Suite 109
City: Annapolis
State_or_Province: Maryland
Postal_Code: 21403
Contact_Voice_Telephone: 800 968-5785
Contact_Electronic_Mail_Address: mmallone@_no_spam_chesapeakebay.net[Remove _nospam_ for valid email address]
Resource_Description: Downloadable data
Distribution_Liability: None of the Chesapeake Bay Program partners or any of their employees, contractors, or subcontractors makes any warranty, expressed or implied, nor assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information or data contained within the web site. Reference to any specific commercial products, processes, or services or the use of any trade, firm, or corporation name is for the information and convenience of the public and does not constitute endorsement, recommendation or favoring by the Chesapeake Bay Program partners.

Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: ASCII file, formatted for text attributes, declared format
Format_Information_Content: Station Information data, Monitoring Event data, Light Attenuation data and Water Quality data
File_Decompression_Technique: No compression applied
Transfer_Size: 2.9
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
http://www.chesapeakebay.net/data/index.cfm?subjectarea=WATER_QUALITY
Access_Instructions: Station Information, Monitoring Event, Light Attenuation and Water Quality data are available though the Chesapeake Bay Programs CIMS data hub. Select Water Quality Database (1984-Present). Access the data by following web site (see network resource name) instructions.
Digital_Form:
Digital_Transfer_Information:
Format_Name: ASCII file, formatted for text attributes, declared format
Format_Information_Content: Continuous monitoring sonde data
File_Decompression_Technique: No compression applied
Transfer_Size: 85
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
http://mddnr.chesapeakebay.net/newmontech/contmon/archived_results2.cfm?year=2009

Access_Instructions: CMON data (sonde data) for 2009 are available through the Continuous Monitoring - Archived Results page of Eyes on the Bay website. Access sonde data by following web site (see network resource name) instructions. Select station and specify dates. Station record set counts range from 6,241 to 35,040. Depending on connection speed, downloads may take a very long time. Downloading partial record sets will proceed more quickly.
Fees: None

Metadata_Reference_Information:
Metadata_Date: 20100616
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Ben Cole
Contact_Address:
Address_Type: Mailing and physical address
Address: Maryland Department of Natural Resources, D-2
City: Annapolis
State_or_Province: MD
Postal_Code: 21401
Contact_Voice_Telephone: (410) 260-8630
Contact_Electronic_Mail_Address: bcole_nospam_@dnr.state.md.us[Remove _nospam_ for valid email address]
Metadata_Standard_Name: Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998