

MD DNR Vertical Water Quality Profiler Project 2010

Metadata also available as - [[Parseable text](#)] - [[XML](#)]

Metadata:

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Identification_Information:

Citation:

Citation_Information:

Originator:

Maryland Department of Natural Resources, Resource Assessment Service (MD DNR RAS)

Publication_Date: 20110718

Title: MD DNR Vertical Water Quality Profiler Project 2010

Geospatial_Data_Presentation_Form: Spatial dataset

Description:

Abstract:

Water quality was monitored at a site north of the Chesapeake Bay Bridge and near the center deep trough of the Chesapeake Bay. A vertical profiling system (YSI 6951), equipped with a YSI (6600 EDS) data logger, was used to sample seven environmental parameters: water temperature, specific conductance, dissolved oxygen concentration, oxygen percent saturation, pH, turbidity, and fluorescence. Salinity and chlorophyll were derived from specific conductance and fluorescence, respectively. Profiles were conducted hourly, with measurements recorded at approximate 1 meter depth intervals throughout the entire water column. Total depth at this station was approximately 16 meters (mean low water).

Purpose:

The 2010 Maryland Department of Natural Resources (MD DNR) Vertical Water Quality Profiler Project was a cooperative effort between the MD DNR and the National Oceanic and Atmospheric Administration (NOAA) Chesapeake Bay Office. The NOAA Chesapeake Bay Office (NCBO) deployed a bottom-up profiler farther south in the Chesapeake Bay in the vicinity of long-term fixed station CB4.3C. Along with surface and bottom continuous monitors to be located farther south at the Gooses artificial reef site and University of Maryland Horn Point Laboratory sampling also in the vicinity of CB4.3C, the DNR and NCBO profilers are components of a transect from the northern boundary to the center of the Bay's deep trench.

The DNR profiler will characterize differences in vertical and temporal variability of the measured parameters near the northern boundary of the deep trench. It will also provide data comparable to that collected from the NCBO profiler.

Supplemental_Information:

In addition to hourly profile data, the profiler data logger also collected a surface water (1 meter depth) reading just prior to performing each hourly profile. A second continuous water quality monitor was also deployed at the profiler site. This fixed, bottom-mounted monitor was anchored 1 meter above the bottom and collected data on the same seven parameters every 15 minutes as part of the MD DNR Shallow Water Quality Monitoring Program. The hourly surface readings and the data for the bottom-mounted sonde are presented with the results for the MD DNR Continuous Water Quality Monitoring Project for 2010.

The data logger (sonde) for the profiler was exchanged bi-weekly. When the data sonde was exchanged, water samples were collected for laboratory analysis of chlorophyll 'a' and total suspended solids. 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. Details of the water quality data and laboratory analysis of the grab samples can be found in the documentation for the MD DNR Shallow Water Monitoring Program.

Citation information for the 2010 MD DNR Continuous Water Quality Monitoring Project is provided in the Cross Reference portion of this metadata record. Detailed information on the MD DNR Shallow Water Quality Monitoring Program can be found in the following documentation: MDDNR Continuous Water Quality Monitoring Project Metadata for 2010

[<<http://mddnr.chesapeakebay.net/eyesonthebay/documents/metadata/MdDNR2010CMonProj.html>>] Quality Assurance Project Plan for the Maryland Department of Natural Resources, Chesapeake Bay Shallow Water Quality Monitoring Program, for the period July 1, 2010 - June 30, 2011.

[<http://mddnr.chesapeakebay.net/eyesonthebay/documents/SWM_QAPP_2010_2011_FINALDraft1.pdf>]

Time_Period_of_Content:

Time_Period_Information:

Range_of_Dates/Times:

Beginning_Date: 20100513

Ending_Date: 20101105

Currentness_Reference: Ground condition

Status:

Progress: Complete

Maintenance_and_Update_Frequency: As needed

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -76.35438

East_Bounding_Coordinate: -76.35438

North_Bounding_Coordinate: 39.00585

South_Bounding_Coordinate: 39.00585

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 > Ecological Dynamics > Ecosystem Functions > Primary Production

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 > Oxygen

Theme_Keyword: Terrestrial Hydrosphere > Water Quality/Water Chemistry > pH

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

Place_Keyword: Anne Arundel County

Place_Keyword: Queen Anne's County

Place_Keyword: USA

Place_Keyword: MD

Temporal:

Temporal_Keyword_Thesaurus: None

Temporal_Keyword: 2010

Access_Constraints: None

Use_Constraints:

Acknowledgement of the MD Department of Natural Resources, Resource Assessment Service as a data source would be appreciated in products developed from these data.

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Mark Trice

Contact_Organization:

Maryland Department of Natural Resources, Resource Assessment Service

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_2010.pdf

Browse_Graphic_File_Description:

Map of MD DNR Continuous Monitoring Sites for 2010. The vertical profiler is listed as "PRO - profiler" (Station XHF0488).

Browse_Graphic_File_Type: PDF

Data_Set_Credit:

Maryland Department of Natural Resources Resource Assessment Service staff maintained the profiler and the data

sondes, and processed the data.

The project was made possible with funding provided by The State of Maryland and the National Atmospheric and Oceanic Administration Chesapeake Bay Program Office.

Cross_Reference:

Citation_Information:

Originator:

Maryland Department of Natural Resources, Resource Assessment Service

Publication_Date: 20110515

Title: MD DNR Continuous Water Quality Monitoring Project 2010

Geospatial_Data_Presentation_Form: Spatial dataset

Online_Linkage:

<http://mddnr.chesapeakebay.net/newmontech/contmon/archived_results2.cfm?year=2010>

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

MD DNR followed specific procedures to ensure that the Vertical Water Quality Profiler 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 field equipment for the measurement of physical and chemical parameters.

The YSI 6600 EDS sonde was configured with the following probes: 6560(conductivity/temperature); 6561(flat glass pH) or 6579(tall pH); 6136(turbidity); 6150(ROX dissolved oxygen); 6025(fluorescence/chlorophyll).

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 equipment maintenance, calibration of field instruments, and verification of calibrations. 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.

Logical_Consistency_Report:

The vertical profiler conducted profiles every hour beginning at the top of the hour. Each profile consisted of readings at every 1 meter of depth, beginning at 1 meter below the surface (i.e. 1m, 2m, 3m, etc.) Actual depths varied slightly due to wave action and water currents displacing the sonde in the water column. The profiler moved to a new depth about every 2 mins. A complete profile took approximately 30 minutes to complete.

For the period May 13, 2010 to June 25, 2010, readings were taken to a total depth of 14 meters below the surface. This depth lies approximately 2 meters above the bottom-mounted sonde at this station and was chosen to avoid damage to the equipment. However, the profiler winch and cable system experienced several malfunctions during the early weeks of deployment. DNR staff were concerned that sampling to a depth of 14 meters perhaps required playing out too much cable length, thereby contributing to cable tangles and profiler malfunctions. For this reason, beginning at 9:00am on June 25, the profiler was reprogrammed to take readings to a maximum depth of 13 meters.

On May 26, 2010, a heavier probe guard was added to the data sonde to try and keep the instrument hanging vertically in the water column and minimize drifting in the current. On June 10, 2010, 10 lbs of additional weight were added to the sonde assembly for the same purpose. Finally, on June 25, 2010, an additional 2 lbs. of weight were added, giving the sonde a total weight of about 13.5 lbs. in water.

Due to profiler malfunctions, the equipment would occasionally stop movement through the water column and come to rest at a random depth. When such malfunctions were discovered, DNR staff would electronically signal the profiler to return to the surface and immediately perform a profile. In these instances, profile data did not commence at the top of the hour. After the initial profile following restart, subsequent profiles continued to be conducted hourly at the top of the hour.

In the 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.

Completeness_Report:

The 2010 Vertical Profiler project dataset includes sonde records from May 13, 2010 to November 5, 2010.

On July 8, 2010, two profiles were missed after the 8:00am profile. During routine servicing, the sonde assembly was dropped and ensuing repairs took a couple hours to complete.

During the period May 13, 2010 to July 12, 2010 the profiler operation was interrupted numerous times due to short-term problems with profiler operation. Due to strong currents at the deployment site, the profiler experienced significant tangling in the cables and winch system, causing the system to shut down periodically. Gaps in the time-continuum of data records are due to these mechanical interruptions. On July 12, 2010, the profiler was removed from the water and returned to the manufacturer for repairs. No data records exist for the period July 13, 2010 through October 19, 2010. On October 20, 2010, the profiler was redeployed for 2 weeks until November 5, 2010 which marked the end of the monitoring season.

Dissolved oxygen data are missing from May 26, 2010 to June 10, 2010 due to a missing membrane on the dissolved oxygen probe. All other sonde attribute values that are missing from the dataset were removed during the data quality control process. Analysts examined the data and masked values that were determined to be unreliable.

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>. Ecowatch(tm) software (a YSI product) was used to calibrate the instruments.

FIELD MEASUREMENTS:

The monitoring sonde at the profiler site recorded seven water quality parameters at each 1 meter depth of the vertical profile. Profiles were conducted every hour, with a new depth and parameter reading recorded approximately every 2 minutes. The seven water quality parameters measured were: water depth, water temperature, specific conductance (used to calculate salinity), dissolved oxygen, turbidity (NTU), fluorescence (used to estimate chlorophyll a), and pH.

The vertical profiler was equipped with a YSI 6600 sonde. The YSI 6600 EDS sonde was configured with the following probes: 6560(conductivity/temperature); 6561(flat glass pH) or 6579(tall pH); 6136(turbidity); 6150(ROX dissolved oxygen); 6025(fluorescence/chlorophyll). The sonde logged data onto an internal memory, where it was stored until retrieval. Data were uploaded to DNR's web site <http://www.eyesonthebay.net> shortly after retrieval. The station was also equipped with a cellular telemetry unit, which allowed data to be accessed remotely and transmitted to a server computer at DNR.

SONDE DATA CHECKS:

The monitoring sonde was retrieved, calibrated and replaced bi-weekly from May to November. 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.

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.

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Sally Bowen

Contact_Organization:

Maryland Department of Natural Resources, Resource Assessment Service

Contact_Position: Project Chief, Monitoring Field Office

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:

SONDE DATA FILE POST-PROCESSING:

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.

Loggernet(tm) software (a YSI product) was used to upload the data collected by the profiler. Then, the "raw" .txt file of sonde data was imported into an Access(tm) program. The data were queried to select values that corresponded to a profile measurement (code=105). Data columns were rearranged to achieve a format expected by the Excel(tm) macro, and the resulting data file was saved as a .csv file.

Each .csv file of sonde data was then 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. Profiler data management software provided by YSI was used to view the data. 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 profiler 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 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: Mark Trice

Contact_Organization:

Maryland Department of Natural Resources, Resource Assessment Service

Contact_Position: Chief, Water Quality Informatics

Contact_Address:

Address_Type: mailing
Address: Tawes State Office Building, 580 Taylor Avenue, D2
City: Annapolis
State_or_Province: Maryland
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]

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference: Chesapeake Bay, 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

Vertical_Coordinate_System_Definition:

Depth_System_Definition:

Depth_Datum_Name: No correction
Depth_Distance_Units: meters
Depth_Encoding_Method: Attribute values

Entity_and_Attribute_Information:

Overview_Description:

Entity_and_Attribute_Overview:

This metadata record is a description of a vertical profiler water quality monitoring project for the Chesapeake Bay. Water quality data were collected at 1 meter depth intervals at a single Maryland station (XHF0488) during 2010. The data are comprised of the attributes:
STATION: Station name (text)
DATE: date (month/day/year)
TIME: time, 24 hour format (hour:min)
TEMP: water temperature (degrees Celsius)
SALINITY: salinity (parts per thousand)
DEPTH: depth below water surface (meters)
PH: pH (pH units)
TURBIDITY: turbidity (Nephelometric Turbidity Units)
CHLOROPHYLL: chlorophyll 'a' (micrograms per liter)
DO_PCTSAT: dissolved oxygen percent saturation (percent)
DO: dissolved oxygen (milligrams per liter)

Entity_and_Attribute_Detail_Citation:

The Vertical Water Quality Profiler Project was conducted in a manner consistent with the procedures established for the MD DNR Shallow Water Monitoring Program. Data users who desire very detailed information about data-definition, sampling-procedures, and data-processing are encouraged to refer to the document listed below. Quality Assurance Project Plan for the Maryland Department of Natural Resources, Chesapeake Bay Shallow Water Quality Monitoring Program, for the period July 1, 2010 - June 30, 2011.

<http://mddnr.chesapeakebay.net/eyesonthebay/documents/SWM_QAPP_2010_2011_FINALDraft1.pdf>

Distribution_Information:

Distributor:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Mark Trice

Contact_Organization:

Maryland Department of Natural Resources, Resource Assessment Service

Contact_Position: Chief, Water Quality Informatics

Contact_Address:

Address_Type: mailing

Address: Tawes State Office Building, 580 Taylor Avenue, D2

City: Annapolis

State_or_Province: Maryland

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]

Resource_Description: Downloadable data

Distribution_Liability:

None of the Maryland Department of Natural Resources (MD DNR) 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 MD DNR partners.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Format_Name: ASCII file, formatted for text attributes, declared format

Format_Information_Content: Vertical profiler monitoring sonde data

File-Decompression_Technique: No compression applied

Digital_Transfer_Option:

Online_Option:

Computer_Contact_Information:

Network_Address:

Network_Resource_Name:

<http://mddnr.chesapeakebay.net/newmontech/contmon/profiler/profile_dwnload.cfm>

Access_Instructions:

Vertical profiler data (sonde data) for 2010 are available through the "Continuous Monitoring - Water Column Profiler Data Download" page of the MD DNR "Eyes on the Bay" website. Access sonde data through the link provided under "Network Resource Name" in this metadata record. Select the dates of interest and click on "Download Data". For 2010, individual files range in size from 22 kb to 141 kb. Download times will vary depending on computer connection speed.

Fees: None

Metadata_Reference_Information:

Metadata_Date: 20090718

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Diana Domotor

Contact_Organization:

Maryland Department of Natural Resources, Resource Assessment Service

Contact_Address:

Address_Type: Mailing and physical 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:

ddomotor_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

Generated by [mp](#) version 2.9.12 on Tue Jul 19 16:15:29 2011