Maryland Chesapeake Bay Tributary Water Quality Monitoring Program – 2021

Metadata:

Identification_Information:
Citation:
Citation_Information:
Originator: Maryland Department of Natural Resources (MD DNR), Resource Assessment Service
Publication_Date: 20220429
Title: MD DNR Chesapeake Bay Tributary Water Quality Monitoring Program 2021
Geospatial_Data_Presentation_Form: Spatial dataset
Online_Linkage: [https://www.chesapeakebay.net/what/data]

Description:
Abstract:
One of the main goals of the Chesapeake Bay restoration is to reduce the impacts of excess nutrients on the Bay and its tributaries. In accordance with this goal, the Chesapeake Bay Program jurisdictions have agreed to reduce nitrogen, phosphorus and sediment pollution to the Bay. The Maryland Chesapeake Bay Tributary Water Quality Monitoring Program evaluates the physical/chemical component of water quality at sixty-eight tributary stations. By measuring levels of nutrients and closely related habitat characteristics such as dissolved oxygen and water clarity, the monitoring program provides some of the most direct linkages to management actions that are reducing nutrient loads to the Bay.

Samples are collected monthly at each tributary station with the following exceptions:

1) Samples are not routinely collected at stations EE3.3 and XAK7810 in January and February.

2) For logistical reasons, station LE2.3 is routinely sampled as part of the Chesapeake Bay mainstem monitoring project. Thus, station LE2.3 follows the mainstem sampling schedule and is sampled twice monthly during June, July, and August. The second sampling in July at station LE2.3 includes field readings only, no samples are collected for laboratory analyses.

The number of stations sampled by the MD DNR Chesapeake Bay Tributary Water Quality Monitoring Program has fluctuated through the years. Due to changes in funding availability and/or information needs, sampling at some stations has been interrupted or discontinued over the course of the program as follows:

1) Tributary water quality monitoring project sampling ceased in January 2014 at stations BXK0031, CCM0069, MNK0146, XDJ9007, POK0087, XAK7810, TRQ0088, TRQ0146,

TRQ0203, TRQ0224, WIW0141 and XCI4078. Sampling was reinstated at station WIW0141 in July 2014, and resumed at BXK0031, CCM0069, MNK0146, XDJ9007, POK0087, XAK7810, TRQ0088, TRQ0146 and XCI4078 in January 2020.

2) In January 2017, sampling was discontinued at station XHH4742.

Purpose:

The Maryland Department of Natural Resources Chesapeake Bay Water Quality 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 status and trends of nutrient and sediment concentrations in Maryland's Chesapeake Bay mainstem and its tidal tributaries.

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 also 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 four documents listed below. The first three documents may be obtained from The Chesapeake Bay Program Office. The fourth document is available via The Maryland Department of Natural Resources "Eyes on the Bay" web site.

Water Quality Database - Database Design and Data Dictionary, Prepared For: U.S. Environmental Protection Agency, Region III, Chesapeake Bay Program Office, January 2004. [https://archive.chesapeakebay.net/pubs/cbwqdb2004_RB.PDF]. An updated version of the data dictionary is a Chesapeake Bay Program work in progress.

Guide to Using Chesapeake Bay Program Water Quality Monitoring Data, EPA 903-R-12-001, February 2012, CBP/TRS 304-12 [https://www.chesapeakebay.net/documents/3676/wq_data_userguide_10feb12_mod.pdf].

Methods and Quality Assurance for Chesapeake Bay Water Quality Monitoring Programs. Chesapeake Bay Program, May 2017, CBP/TRS-319-17 [https://www.chesapeakebay.net/documents/CBPMethodsManualMay2017.pdf].

The Quality Assurance Project Plan for the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties Component for the period July 1, 2021 - June 30, 2022

[https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/MDDNR_QAPP_MainstemTrib_2021_2022_wApp.pdf].

Time_Period_of_Content:

Time_Period_Information:

Range_of_Dates/Times:

Beginning_Date: 20200106

Ending_Date: 20201221

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: Global Change Master Directory (GCMD). 2022. GCMD Keywords, Version 13.2. Greenbelt, MD: Earth Science Data and Information System, Earth Science Projects Division, Goddard Space Flight Center (GSFC) National Aeronautics and Space Administration (NASA). URL (GCMD Keyword Forum Page): [https://forum.earthdata.nasa.gov/app.php/tag/GCMD+Keywords].

Theme_Keyword: EARTH SCIENCE>BIOSPHERE>ECOSYSTEMS>MARINE ECOSYSTEMS>ESTUARY

Theme_Keyword: EARTH SCIENCE>BIOSPHERE>ECOLOGICAL DYNAMICS>ECOSYSTEM FUNCTIONS>NUTRIENT CYCLING

Theme_Keyword: EARTH SCIENCE>BIOSPHERE>ECOLOGICAL DYNAMICS>ECOSYSTEM FUNCTIONS>PRIMARY PRODUCTION

Theme_Keyword: EARTH SCIENCE>OCEANS>SALINITY/DENSITY>PYCNOCLINE

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>SURFACE WATER>SURFACE WATER FEATURES>RIVERS/STREAMS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>SURFACE WATER>SURFACE WATER PROCESSES/MEASUREMENTS>WATER DEPTH

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>ALKALINITY

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>BIOCHEMICAL OXYGEN DEMAND (BOD)

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>CHLOROPHYLL CONCENTRATIONS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>CONDUCTIVITY

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>GASES>DISSOLVED OXYGEN
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Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>NUTRIENTS>NITROGEN
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>NUTRIENTS>NITROGEN COMPOUNDS
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Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>pH
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>NUTRIENTS>PHOSPHOROUS
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Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>SOLIDS>SUSPENDED SOLIDS
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>SOLIDS>TOTAL DISSOLVED SOLIDS
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>TURBIDITY
Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>WATER TEMPERATURE

Place:
Place_Keyword_Thesaurus: Producer Defined
Place_Keyword: Chesapeake Bay
Place_Keyword: Maryland
Place_Keyword: Monitoring Segment
Place_Keyword: Tidal Tributaries
Place_Keyword: Back River
Place_Keyword: Big Annemessex River
Place_Keyword: Bohemia River
Place_Keyword: Bush River
Place_Keyword: C&D Canal
Place_Keyword: Chester River
Place_Keyword: Choptank River
Place_Keyword: Eastern Bay

Place_Keyword: Elk River
Place_Keyword: Fishing Bay
Place_Keyword: Gunpowder River
Place_Keyword: Little Choptank River
Place_Keyword: Magothy River
Place_Keyword: Middle River
Place_Keyword: Manokin River
Place_Keyword: Nanticoke River
Place_Keyword: Northeast River
Place_Keyword: Patapsco River
Place_Keyword: Patuxent River
Place_Keyword: Pocomoke River
Place_Keyword: Pocomoke Sound
Place_Keyword: Potomac River
Place_Keyword: Rhode River
Place_Keyword: Sassafras River
Place_Keyword: Severn River
Place_Keyword: South River
Place_Keyword: Susquehanna River
Place_Keyword: Tangier Sound
Place_Keyword: West River
Place_Keyword: Wicomico River
Temporal:
Temporal_Keyword_Thesaurus: USGS Thesaurus
Temporal_Keyword: autumn
Temporal_Keyword: spring (season)
Temporal_Keyword: summer
Temporal_Keyword: winter

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. Please use the following citation: Maryland Department of Natural Resources, Resource Assessment Service. Eyes on the Bay. URL: [http://www.eyesonthebay.net/].
Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Renee Karrh
Contact_Position: Program Manager
Contact_Address:
Address_Type: mailing and physical
Address: 580 Taylor Avenue, C2
City: Annapolis
State_or_Province: Maryland
Postal_Code: 21401
Country: USA

Contact_Voice_Telephone: 410.260.8630
Contact_Electronic_Mail_Address: renee.karrh_nospam_@maryland.gov[Remove _nospam_ for valid email address]

Browse_Graphic:
Browse_Graphic_File_Name: MDDNR Tributaries Monitoring Project 2021 Station Map [https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/metadata/MdDNR_TribsStns2021.pdf].
Browse_Graphic_File_Description: Map of sixty-eight, year 2021, Maryland Chesapeake Bay Tributary Water Quality Monitoring Sites.
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. The Nutrient Analytical Services Laboratory (NASL) at the University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory analyzed chlorophyll, nutrient and suspended solids samples. The Maryland Department of Health (MDH) analyzed biological oxygen demand, turbidity and alkalinity samples for Potomac River sites.

The project was made possible with funding provided by The State of Maryland.

Data_Quality_Information:
Attribute_Accuracy:
Attribute_Accuracy_Report:
QUALITY ASSURANCE/QUALITY CONTROL
Maryland Department of Natural Resources followed specific procedures to ensure that the Tributary component of the Chesapeake Bay Water Quality Monitoring Program 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 proper use, calibration and maintenance of both field and laboratory equipment for the measurement of physical and chemical parameters.

The procedures used to control and assure the accuracy of field measurements involved the calibration of field instruments, the verification of calibrations, and equipment maintenance. Most of the details of how data acquired with YSI sondes and Hydrolab sondes were quality assured and quality controlled are described in the process description elements in the Lineage portion of this metadata record.

Daily quality control checks which included 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) 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 methods changes to resolve discrepancies.

ADDITIONAL COMMENTS

In September 2021, the Baltimore Gas and Electric company began work rebuilding a transmission line that runs across the Bush River in Harford County, Maryland. The project involves the replacement of three double circuit steel lattice towers (one on each shore and one located within Bush River) and four single circuit wood H-frames (two on each side of the river) with nine steel galvanized monopoles. MD DNR tributary monitoring station WT1.1 is located on the Bush River within 1000ft downstream of the project, and water quality at that station may be impacted by the ongoing construction activities.

January 2021: A pycnocline was not detected at stations EE2.1, EE3.1, EE3.2, and ET5.2. Above pycnocline and below pycnocline samples at these stations were collected at 1/3 and 2/3 depths, respectively. The Secchi disk depth measurement at station TF1.3 was greater than the total depth. Fog was noted during sampling at stations RET2.1, RET2.2, RET2.4, TF2.1, TF2.4, and XFB1986. During sampling at station TRQ0146, skim ice was present upstream. The boat ramp at station XDJ9007 was under construction. An EXO meter was used to collect readings at station LE2.3.

February 2021: Samples at stations EE1.1, EE3.1, EE3.2, ET4.2, and LE2.3 were collected at 1/3 and 2/3 depths due to the absence of a pycnocline. It rained the night before sampling at stations TF1.0, TF1.2, TF1.3, TF1.4, and WXT0001, and the meter used at these stations post-calibrated out of range (high) for specific conductance and pH. The surface and above pycnocline samples at station RET2.4 were collected at the same depth. A barge went down river just prior to sampling at station WIW0141. An EXO meter was used to collect readings at station LE2.3.

March 2021: Due to the absence of pycnoclines at stations EE2.1, EE3.1, EE3.2, and LE2.3, above and below pycnocline samples were collected from 1/3 and 2/3 of total station water column depths. Station ET4.1 was sampled during an extreme low tide. Rain drizzle occurred the morning before sampling at station LE2.3. An EXO meter was used to collect readings at station LE2.3.

April 2021: Stations EE2.1, EE3.1, EE3.2, ET5.2, LE2.3, and RET2.4 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. It rained the night before sampling at station ET10.1. Oily spots were observed on the water surface at station PIS0033. The Secchi disk depth measurement at station TF1.3 was greater than the total depth. An EXO meter was used to collect readings at station LE2.3.

May 2021: At station EE1.1, the bottom and below pycnocline samples were collected at the same depth. A pycnocline was not detected at stations EE2.1, EE3.1, EE3.2, ET4.2, and ET5.2. Above pycnocline and below pycnocline samples at these stations were collected at 1/3 and 2/3 depths, respectively. A fisherman was present at the end of the pier during sampling at station ET6.1. Samples for station ET7.1 were collected while following a barge. Bridge work was noted at station TRQ0088. Station WIW0141 was sampled after a tow boat and barge had passed. An EXO meter was used to collect readings at station LE2.3.

June 2021: Stations EE1.1, EE2.1, EE3.2, ET4.2, LE2.3, and WT5.1 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. Station RET2.4 had a weak pycnocline. A thin layer of green clumps was observed on the water surface at station ET3.1. A strong ebb tide and a milky film on the water surface were noted at station ET4.1.

July 2021: Due to the absence of a pycnocline, samples were collected at 1/3 and 2/3 depths at the following stations: EE1.1, EE2.1, EE3.1, EE3.2, ET4.2, ET5.2, and RET2.4. Hazy conditions were noted at stations EE2.2, LE1.2, LE1.3, LE1.4, LE2.3, RET1.1, TF1.5, TF1.6, and TF1.7. A strong ebb current was present during sampling at station ET10.1. The Secchi disk depth measurement at station TF1.3 was greater than the total depth.

August 2021: The total depth reading at station BXK0031 was taken at a slight angle due to strong currents. Hydrogen sulfide odor was detected with the bottom and below pycnocline samples at station EE1.1. Stations EE2.1, EE3.1, ET5.2, LE2.2, LE2.3, and RET2.4 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. The meter used at stations ET10.1, MNK0146, and POK0087 post-calibrated high for specific conductance. The dissolved oxygen readings at station ET9.1 were double-checked, and the surface dissolved oxygen reading at RET2.1 was checked with meter Q. Overnight rain was noted at stations LE1.1, RET1.1, TF1.0, TF1.2, TF1.3, TF1.4, TF1.5, TF1.6, TF1.7, WT1.1, WT2.1, WT3.1, WT4.1, and WXT0001.

September 2021: Morning rain fell the day of sampling at stations LE1.1, RET1.1, TF1.5, TF1.6, and TF1.7. A pycnocline was not detected at stations EE1.1, EE3.1, EE3.2, ET4.2, ET5.2, and LE2.3; therefore, samples at these stations were collected at 1/3 and 2/3 depths. Fog and/or haze were reported at stations EE2.1 and EE2.2. EXO meter B was used to collect readings at station LE2.2. Readings at stations MAT0078 and PIS0033 were collected using EXO1 meter A. The surface reading for specific conductance changed during sampling at RET2.4.

October 2021: The bottom and below pycnocline samples at station EE2.1 were collected at the same depth. Stations EE3.1, EE3.2, ET5.2, and RET2.4 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. Morning showers were noted at stations EE1.1 and ET4.2, and the readings at both stations were taken with an EXO1 meter. The meter used at stations CCM0069, ET3.1, ET4.1, ET6.1, TRQ0146, WIW0141, and XDJ9007 did not undergo a post-calibration check after sampling. The Secchi disk depth measurement at station TF1.3 was greater than the total depth.

November 2021: A pycnocline was not detected at stations EE1.1, EE2.1, EE3.1, ET5.2, LE2.3, and RET2.4. Above and below pycnocline samples at these stations were collected at 1/3 and 2/3 depths, respectively. At stations MAT0078 and PIS0033, flow in the creek was described as low.

December 2021: A pycnocline did not exist at stations EE2.1, EE3.1, EE3.2, ET4.2, ET5.2, LE2.2, LE2.3, and RET2.4, and the above pycnocline and below pycnocline samples were collected from 1/3 and 2/3 of total station water column depth. The walkway on the bridge at station ET10.1 was being replaced. At station TF1.3, the Secchi disk depth measurement was greater than the total depth. At station LE1.3, the Secchi disk depth measurement was greater than 3 meters.

Logical_Consistency_Report:

For logistical reasons, station LE2.3, a Potomac River water quality sampling station, is routinely sampled during Chesapeake Bay mainstem sampling cruises.

Tributaries monitoring project boat stations are sampled using small boats for most of the year. The larger mainstem sampling vessel is used when weather and safety are concerns. One or more of the following tributaries project stations may be sampled using the larger vessel during December, January and February surveys: EE1.1, EE2.2, EE2.1, ET4.2 and WT5.1.

Due to the COVID-19 pandemic, enhanced safety protocols and social distancing guidelines required the Potomac River and Patuxent River sampling to be conducted by two separate boat crews beginning with the June 2020 monitoring cruises and continuing through 2021.

ADDITIONAL COMMENTS

January 2021: Station WIW0141 was sampled from the ferry, and the Secchi disk depth reading was taken in the sun.

February 2021: Station WIW0141 was sampled from the ferry. The Secchi disk depth reading at station XDJ9007 was taken in the sun.

March 2021: Shallow water at station TF1.3 prompted sample collection from the bridge.

April 2021: The bottom sample at station LE1.1 should have been collected at 10.0m depth. Station WIW0141 was sampled from the end of the ferry.

May 2021: Station WIW0141 was sampled from the end of the ferry.

June 2021: Samples collected at station ET3.1 were processed at the Toal Recreation Area. At stations ET5.1 and ET5.2, the silicate samples were accidentally frozen. Samples collected at stations WT1.1, WT2.1, WT3.1, and WT4.1 were processed after leaving the station. Samples for stations WT6.1 and WT7.1 were processed at the Sandy Point boat ramp.

August 2021: The road was closed at station TRQ0088, thus sampling was conducted at the upstream retaining wall.

September 2021: Station TRQ0088 was sampled before the bridge because the road was torn up.

October 2021: The meter used at stations CCM0069, ET3.1, ET4.1, ET6.1, TRQ0146, WIW0141, and XDJ9007 was not post-calibrated after sampling.

November 2021: Station TRQ0088 was sampled from the boat ramp downstream. Station WIW0141 was sampled from the ferry while in the middle of the channel.

There were no known logical consistency issues during sampling conducted in July and December 2021.

Completeness_Report:

Biological Oxygen Demand, turbidity and alkalinity samples were collected at a subset of Potomac River Tributaries project stations: MAT0016, MAT0078, PIS0033, RET2.4, RET2.2, RET2.1, TF2.4, TF2.3, TF2.2, TF2.1 and XFB1986. When the Monday following Biological Oxygen Demand sample collection was a holiday, samples were not collected.

Tributary samples are not routinely collected at stations EE3.3 and XAK7810 during January and February.

The second sampling in July at station LE2.3 includes readings only; no samples are collected.

ADDITIONAL COMMENTS

January 2021: Total depth could not be determined at station TRQ0088 due to strong currents. Because station WIW0141 was sampled from the ferry, total depth was not measured.

February 2021: The tidal current at station TRQ0088 was too strong to get a total depth reading. Because station WIW0141 was sampled from the ferry, total depth was not measured.

May 2021: Licor readings were not collected at station LE1.4 due to rough seas.

July 2021: Secchi disk depth was not recoded at station LE1.4.

August 2021: Air temperature was not recorded at stations CCM0069, TRQ0088, TRQ0146, WIW0141, and XDJ9007.

October 2021: Station TRQ0088 was not sampled because construction prevented access to the sampling site.

November 2021: Due to rough conditions, Licor readings were not collected at stations LE1.1, LE1.2, LE1.3, and RET1.1.

December 2021: Licor readings were not collected at station LE1.4 due to rough seas. One of the sample vials for station TF1.3 was lost.

There were no known completeness issues in March, April, June and September 2021.

Lineage:
Process_Step:
Process_Description:
SONDE CALIBRATION and POST-CALIBRATION
The Yellow Springs Instrument (YSI) data sondes and HydroLab multi-parameter sondes were maintained and calibrated before and after each cruise in accordance with manufacturer's recommendations. During 2021, YSI series 6820 V2, YSI EXO1, YSI EXO2, Hydrolab series 5 and HL4 sondes were deployed. Field sheet dissolved oxygen method and equipment-set unit number values were used to track sondes used for station water quality measurements.

SONDE PROFILE SAMPLING PROTOCOLS:
A profile of temperature, specific conductance, dissolved oxygen, and pH was obtained from the water column at 0.5 m, 1.0 m, 2.0 m and 3.0 m depth intervals below the surface. Thereafter readings were taken at 2.0 m intervals and at the bottom. Tributary bottom equals total depth minus one meter (not rounded). If the change in dissolved oxygen exceeded 1.0 mg/L or if the change in specific conductance equaled or exceeded 1,000 micromhos/cm over any 2.0 m interval, readings were taken at 1.0 m intervals between these two readings. For total depths less than or equal to 10.0 m, readings were taken at 1.0 m intervals.

GRAB SAMPLING DEPTH PROTOCOLS:
At stations where two depths were sampled, collections were taken at 0.5 m below the surface, and 1.0 m above the bottom. If the station total depth was equal to 1.5 m, the bottom sample was also collected at 0.5 m. Great caution was exercised when taking bottom samples; if the bottom was disturbed and bottom sediments appeared to have been included, the sample was dumped out and collected after the sediments had settled. Alternately, the sample was collected slightly higher in the water column and the new bottom sample depth was noted.

At stations where 4 depths were sampled and a pycnocline existed, collections were taken at 0.5 m below the surface, 1.5 m above the upper boundary of the pycnocline, 1.5 m below the lower boundary of the pycnocline, and 1 m above the bottom.

At stations where 4 depths were sampled and there was no discernable pycnocline, samples were taken at 0.5 m below the surface, at the closest profile depth one third the distance from the surface to the bottom, at the closest profile depth two thirds the distance from the surface to the bottom, and 1 m above the bottom.

Note that six Patuxent River stations, at which samples are also collected from four depths, use a different fixed-depth protocol for sampling mid-water depths. At station TF1.5 and RET1.1, samples are collected at 3 m and 6 m. Mid-water-column samples at stations LE1.1 and LE1.4 are collected at 3 m and 9 m. Samples are collected at 3 m and 12 m depths at stations LE1.2 and LE1.3.

LIGHT ATTENUATION SENSOR CALIBRATION

Once every two years, per LI-COR® Bioscientific recommendations, the ambient and underwater sensors (used to measure Photosynthetic Active Radiation (PAR)) were factory re-calibrated. Upon return from the factory, updated, sensor specific, correction values were entered into the displays before the equipment was deployed. A LI-COR® equipment tracking maintenance log was used to provide a permanent record of all re-calibrations, battery replacements, lowering-line checks and equipment repairs.

LIGHT ATTENUATION SAMPLING PROTOCOLS

Vertical profiles of light penetration were obtained. An initial reading with the underwater sensor just below the surface of the water (0.1 m) was followed by measurements at either 0.25 m or 0.5 m intervals until a value less than ten percent (10 %) of the surface reading (0.1 m) was attained.

SECCHI DEPTH:

Water transparency was determined, to the nearest 0.1 m using a 20 cm standard Secchi disk lowered into the water column with a calibrated rope. Observations were made on the shady side of the sampling location.

Process_Date: Unknown
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Kristen Heyer
Contact_Position: Manager, Water Quality Monitoring
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: kristen.heyer_nospam_@maryland.gov[Remove _nospam_ for valid email address]

Process_Step:
Process_Description:
LABORATORY ANALYSIS - CBL

University of Maryland Center for Environmental Science (UMCES) Chesapeake Biological Laboratory (CBL), Nutrient Analytical Services Laboratory (NASL) analyzed total dissolved nitrogen, particulate nitrogen, nitrite, nitrite + nitrate, ammonium, total dissolved phosphorus, particulate phosphorus, orthophosphate, dissolved organic carbon, particulate carbon, total suspended solids, and volatile suspended solids.

The NASL began performing chlorophyll analyses in the year 2009. Prior to 2009, chlorophyll analyses were performed by the Maryland Department of Health and Mental Hygiene.

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: Jerry (Jerome) Frank
Contact_Position: Manager, Nutrient Analytical Services Laboratory
Contact_Address:
Address_Type: mailing and physical
Address: University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory, 146 Williams Street, 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: frank _nospam_@umces.edu[Remove _nospam_ for valid email address]

Process_Step:
Process_Description:
VERIFICATION AND DATA MANAGEMENT:
Each month DNR Tawes Office and Field Office personnel conducted data QA/QC procedures. All of the water quality calibration "grab" sample data were plotted. Outliers and anomalous values were thoroughly researched. Staff compared unusual values to historic values from the site and values from nearby sites. Weather events were considered, event logs were reviewed and CBL analytical laboratory staff and DNR field staff members were consulted regarding possible legitimate causes for outlying values. In cases where values were not considered to be legitimate, they were masked from the published dataset with the approval of the field staff and the Quality Assurance Officer.

Process_Date: Unknown
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Diana Domotor
Contact_Position: Data Analyst
Contact_Address:
Address_Type: mailing and physical
Address: 580 Taylor Ave., D2
City: Annapolis
State_or_Province: MD
Postal_Code: 21401

Contact_Voice_Telephone: 410.260.8630
Contact_Electronic_Mail_Address: diana.domotor_nospam_@maryland.gov[Remove _nospam_ for valid email address]

Process_Step:
Process_Description:
MDH DES ECL LABORATORY ANALYSIS
Maryland Department of Health, Division of Environmental Sciences, Environmental Chemistry Laboratory, Baltimore, MD, analyzed biological oxygen demand, total alkalinity and turbidity for Potomac River stations.
Process_Date: Unknown
Process_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Cynthia Stevenson
Contact_Position: Supervisor, Inorganics/Air Quality Laboratories
Contact_Address:
Address_Type: mailing and physical
Address: 1770 Ashland Ave.
City: Baltimore
State_or_Province: Maryland
Postal_Code: 21205
Country: USA
Contact_Voice_Telephone: 433.681.3851
Contact_Electronic_Mail_Address: cynthia.stevenson_nospam_@maryland.gov[Remove _nospam_ for valid email address]

Spatial_Data_Organization_Information:
Indirect_Spatial_Reference: Back River, Big Annemessex River, Bohemia River, Bush River, C&D Canal, Chesapeake Bay, Chester River, Choptank River, Corsica River, Eastern Bay, Elk River, Fishing Bay, Gunpowder River, Little Choptank River, Magothy River, Manokin River, Middle River, Nanticoke River, Northeast River, Patapsco River, Potomac River, Patuxent River, Pocomoke River, Pocomoke Sound, Rhode River, Sassafras River, Severn River, South River, Tangier Sound, West River and Wicomico River.
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 the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties Component Database for the Maryland Chesapeake Bay Tributaries. Project data are an aggregation of data collected at sixty-eight Maryland tributaries stations during 2021.

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

The entity Light_Attenuation_Data is comprised of the attributes: Agency, BiasPC, CBSeg2003, CBSegmentShed2009, Cruise, Depth, Details, EventId, FIPS, HUC8, HUC12, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TierLevel, TotalDepth, Unit and UpperPycnocline.

The entity Monitoring_Event_Data is comprised of the attributes: Agency, CBSeg2003, CBSegmentShed2009, CloudCover, Cruise, Details, EventId, FieldActivityEventType, FieldActivityRemark, FIPS, FlowStage, GaugeHeight, HUC8, HUC12, Latitude, Longitude, LowerPycnocline, MonitoringStation, PrecipType, Pressure, Program, Project, SampleDate, SampleTime, Source, Station, TideStage, TierLevel, TotalDepth, UpperPycnocline, WaveHeight, WindDirection and WindSpeed.

The entity Optical_Density is comprised of the attributes: Agency, BiasPC, CBSeg2003, CBSegmentShed2009, Cruise, Depth, Details, EventId, FIPS, HUC8, HUC12, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TierLevel, TotalDepth, Unit and UpperPycnocline.

The entity Station_Information is comprised of the attributes: CBSeg2003, CBSeg2003Description, CBSegmentShed2009, CBSegmentShed2009Description, CountyCity, FallLine, FIPS, HUC12, HUC8, Latitude, LLDatum, Longitude, State, Station, StationDescription, USGSGage, UTMX and UTMY.

The entity Water_Quality_Data is comprised of the attributes: Agency, BiasPC, CBSeg2003, CBSegmentShed2009, Cruise, Depth, Details, EventId, FIPS, HUC8, HUC12, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TierLevel, TotalDepth, Unit and UpperPycnocline.

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. [https://archive.chesapeakebay.net/pubs/cbwqdb2004_RB.PDF]. An updated version of the data dictionary is a Chesapeake Bay Program work in progress.

The Quality Assurance Project Plan for the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties Component for the period July 1, 2021 - June 30, 2022 [https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/MDDNR_QAPP_MainstemTrib_2021_2022_wApp.pdf].

Methods and Quality Assurance for Chesapeake Bay Water Quality Monitoring Programs. Chesapeake Bay Program, May 2017, CBP/TRS-319-17 [https://www.chesapeakebay.net/documents/CBPMethodsManualMay2017.pdf].

Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Mike Mallonee
Contact_Position: Water Quality Database Manager
Contact_Address:
Address_Type: Mailing and Physical
Address: 1750 Forest Drive, Suite 130
City: Annapolis
State_or_Province: Maryland
Postal_Code: 21401
Country: USA
Contact_Voice_Telephone: 410.267.5785
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 nor any of their employees, contractors, or subcontractors make any warranty, expressed or implied, nor assume 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: Light_Attenuation_Data, Monitoring_Event_Data, Optical_Density_Data, Station_Information and Water_Quality_Data.
File_Decompression_Technique: No compression applied
Transfer_Size: 11.7
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name:
[https://www.chesapeakebay.net/what/downloads/cbp_water_quality_database_1984_present]
Access_Instructions: Data are available through 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.

Fees: None
Metadata_Reference_Information:
Metadata_Date: 20220616
Metadata_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Mark Trice
Contact_Organization: Maryland Department of Natural Resources, Resource Assessment Service
Contact_Position: Program Chief, Water Quality Informatics
Contact_Address:
Address_Type: Mailing and Physical
Address: 580 Taylor Avenue, D2
City: Annapolis
State_or_Province: Maryland
Postal_Code: 21401
Country: USA
Contact_Voice_Telephone: 410.260.8630
Contact_Electronic_Mail_Address: mark.trice_nospam_@maryland.gov[Remove _nospam_ for valid email address]
Metadata_Standard_Name: Content Standards for Digital Geospatial Metadata
Metadata_Standard_Version: FGDC-STD-001-1998