Maryland's Final 2012 Integrated Report of Surface Water Quality

Submitted in Accordance with Sections 303(d), 305(b), and 314 of the Clean Water Act

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Finally, EASP would like to thank all those who provided data for this report. To view a full list of individuals and organizations that provided data during the data solicitation period please see Table 3.

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EXECUTIVE SUMMARY

Maryland's 2012 Integrated Report (IR) is submitted in compliance with sections 303(d), 305(b) and 314 of the federal Clean Water Act (CWA). This biennial report describes ongoing efforts to monitor, assess, track and restore the chemical, physical and biological integrity of Maryland waters. This report presents the current status of water quality in Maryland by placing all waters of the State into one of five categories.[1] In addition, the report provides information about the progress on addressing impaired waters (Categories 4 & 5) by documenting:

- Completed Total Maximum Daily Loads (TMDLs), which re-categorize impairments from Category 5 (impaired and needs a TMDL: the "list of impaired waters") to Category 4a (TMDL completed, but still impaired).
- Analyses of new water quality data that shows previously impaired areas are attaining standards. This can result from remediation, changes in water quality standards, or improved monitoring and/or data analysis.
- Assessment methodologies and watershed segmentation that enhance the use of available data and provide consistency with management and implementation strategies. Two examples for 2012 include the assessment methodology for bacteria, and the addition of several rules to Maryland's biological assessment methodology.
- Statewide water quality statistics for Maryland's surface waters.

The 2012 IR incorporates several changes this year which include: the increased use of volunteer data, implementation of revised assessment methodologies for bacteria and biology, and most notably, Maryland's first submission of IR information in a geographic information system (GIS) format. Included in this GIS submittal will be coverages for streams, impoundments, and estuarine waters that depict assessment information at the appropriate scale. These changes are part of an on-going effort to improve Maryland's reporting and assessment activities required under the CWA. Further, Maryland continues to work closely with EPA's Chesapeake Bay Program (CBP) and other state partners (VA, PA, D.C., NY, and DE) on the assessment process for the Chesapeake Bay water quality criteria. Maryland has adopted an assessment process that was created and agreed to by the partner states and the CBP. This agreement has resulted in 53 Chesapeake Bay segments based on a change in assessment methodology. The current Chesapeake Bay assessments will continue to evolve as new assessment methodologies are developed and as additional data are collected. More details on the Chesapeake Bay assessments can be found at: http://www.chesapeakebay.net/about/programs/monitoring.

There are 37 additions to the list of Category 5 waters in 2012. Twenty-four of these new Category 5 waterbody-pollutant combinations (also referred to as listings) resulted from MDE's Biological Stressor Identification Analyses. The purpose of these analyses, as discussed in the Biological Assessment Methodology for Non-tidal Streams, is to identify the primary pollutants that are responsible for impairing watershed biological integrity. Of these 24 new 'biostressor' listings, nine are for total

[1] The Integrated Report places all waters of the State into one of five "categories": Category 1 indicates that a water body is meeting all standards, Category 2 means it is meeting some but not all standards, Category 3 indicates that there is insufficient data to determine whether standards are being met, Category 4a means that water quality standards are not being met but a TMDL is not needed, either because it has already been completed, other more immediate fixes are available, or the impairment is not load related, and finally, Category 5 indicates that a water body is impaired and a TMDL is needed.

suspended solids, seven are for chlorides, seven are for sulfates, and one is listed for total phosphorus. In addition, there are nine new fecal coliform listings in shellfish harvesting waters, two Chesapeake Bay segment listings as a result of updated bioassessments, and two new PCB listings for fish tissue.

Table 1: Category 5 Listing Status from 2010 to 2012

IR Year/Status	Category 5 Listings
2010 Total Category 5 Listings	**359**
2012 New Category 5 Listings	37
2012 New Delistings (Category 5 to Category 2 or 3) *(See Table 2)*	-34
Category 5 Listings removed due to spatial aggregation	-2
Category 5 Listings Addressed due to Approval of the Chesapeake Bay TMDLs (Category 5 - 4a)	-139
Other Category 5 Listings Addressed by Approved TMDLs (not part of Chesapeake Bay TMDL)	-26*
2012 Grand Total Category 5 Listings	**195**

*Other TMDLs may have been approved during this time but they did not address waters on Category 5.

Thirty-four waterbody-pollutant combinations were removed or revised from the list of impaired waters ("delistings") in 2012. Twenty one biological listings without a specified impairing substance have been replaced by specific pollutant listings enumerated by the Biological Stressor Identification analyses (BSID).[2] Another two have been delisted as a result of PCB levels that are now supporting the fishing designated use. Two others have been delisted for fecal coliform as they now support the shellfish harvesting designated use. The remaining nine delistings are a combination of waters that meet aquatic life standards for total phosphorus (four delistings), biological evaluations (2 delistings), sediment-related parameters (two delistings), and ammonia (one delisting). Since early listings were based on limited data (especially from 1996 and 1998), in many cases, it is not possible to attribute these waters now meeting standards to a particular restoration action. It is possible that the extensive restoration practices that have been applied statewide might be playing a contributory role but it may also be true that these listings were made based upon insufficient data. Table 2 shows the general water body-pollutant combinations that have been delisted from Category 5.

In addition, one[3] Category 4b assessment for mercury, in the tidal portion of the Patapsco River (PATMH), has been removed from the IR. This assessment, referencing a specific industrial point source (Erachem Comilog, Inc), was erroneously transferred from Maryland's 304(l) list in the late

[2] During the public comment period several BSID analyses were refined. This refinement led to the removal of four assessments that were on the Draft 2012 IR. It also caused the addition of four more assessments to the Draft IR. As a result, the summary numbers provided in the Executive Summary and other sections of the IR have been updated to reflect these changes. In addition, a new section (Section F.8) was added to the IR to provide further detail concerning these changes.

[3] In the Draft 2012 IR, Maryland proposed removing three other Category 4b assessments. Following discussions with EPA during the public comment period, only one assessment (mercury) was ultimately removed. The other three Category 4b listings (for copper, cyanide, and nickel) will remain on the IR and be addressed at a later date.

1980's. Currently, this facility does not use mercury in any of its industrial processes. Recent discharge monitoring report (DMR) data has also shown that effluent from this facility does not contain measureable quantities of mercury. For these reasons, this listing has been removed from the IR.

Table 2: 2012 Delistings (water body-pollutant combinations removed from Category 5 (impaired status)

Type of Impairment Listing	Number of Listings Removed from Category 5
Generic Biological Listings – specific pollutant now specified	21
Total Phosphorus – Meeting standards	4
Biological Listings - now meeting aquatic life designated use	2
PCB listings - Fish Tissue Concentrations now meeting fishing designated use	2
Bacteria - Meeting standards	2
Sediments – Meeting standards	2
Ammonia - Meeting standards	1
2012 Total Number of Delistings	**34**

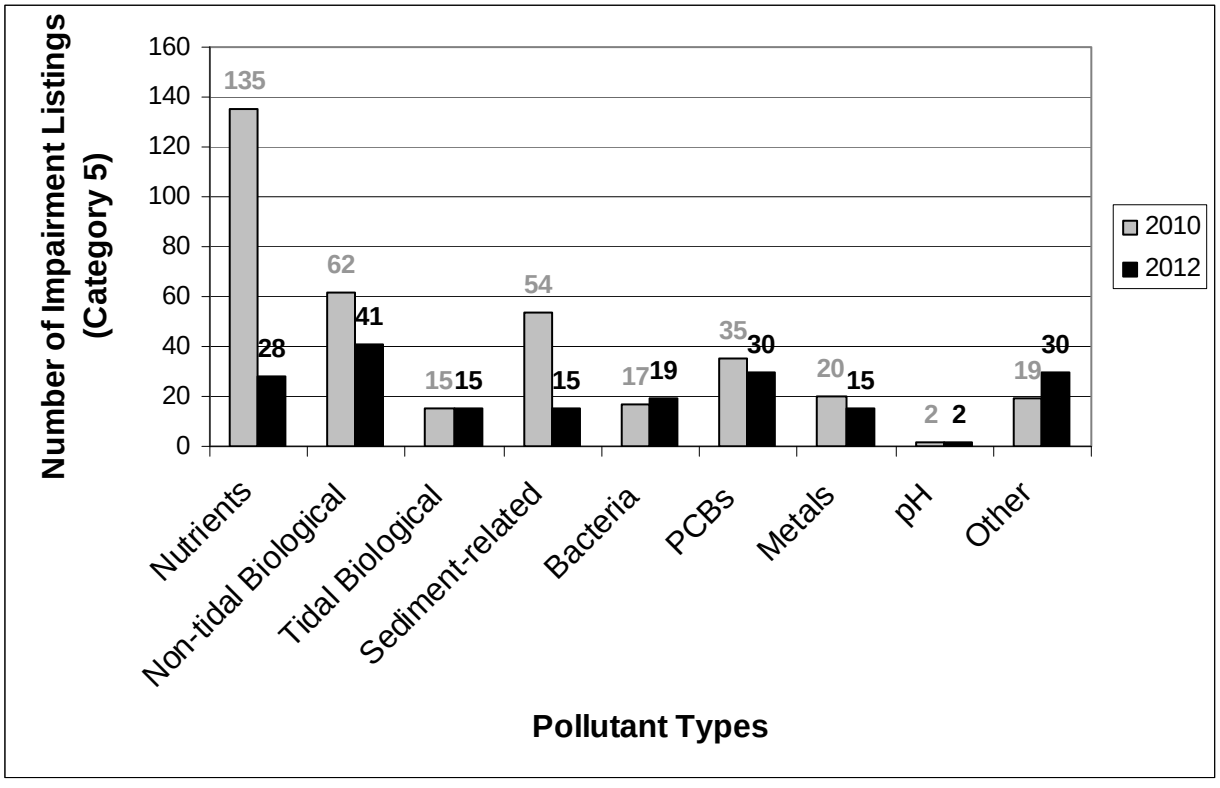

Figure 1: Comparison of the Number of Category 5 (impaired, TMDL not yet complete) Listings Between the 2010 and 2012 Integrated Reporting Cycles per Pollutant Group.

There have been some notable developments in Maryland's water programs since the last IR reporting cycle in 2010. Maryland completed a total of 31 TMDLs and Water Quality Analyses in 2010 and 2011. Twenty-four of the 31 meet specific requirements of the memorandum of understanding (MOU) with EPA that sets TMDL production schedules for Maryland. In addition, in December 2010, the Environmental Protection Agency (EPA), in cooperation with the Bay states, completed the Chesapeake Bay Total Maximum Daily Load, establishing a pollution diet (for nutrients and sediments) for the watershed and effectively addressing 139 of Maryland's impairment listings causing them to be moved from Category 5 (impaired, TMDL may be needed) to Category 4a (impaired but with a TMDL completed). In some cases, the Bay TMDL addresses tidal waters that already had previously approved nutrient TMDLs. For these situations, MDE is developing a separate decision rationale document that will describe the differences and application of the previously developed TMDLs and the Chesapeake Bay TMDL. This document will have its own public review period outside of the IR review period. (Please see Section F.4 for more information).

Other notable new actions taken by the State include:

- Completion of the Phase I Chesapeake Bay Watershed Implementation Plan (WIP) which proposed broad strategies for meeting nutrient and sediment load reductions to meet the Chesapeake Bay TMDL.
- The development of the Phase II Chesapeake Bay WIP that proposes more localized loading reductions and strategies for meeting the water quality goals of the Chesapeake Bay TMDL.
- Improved coordination of NPDES permits and wetlands and waterways permits to avoid potential impacts to Tier II high quality waters under state antidegradation law.
- The establishment of the Marcellus Shale Safe Drilling Initiative to provide recommendations for dealing with environmental liability issues as well as best practices for all aspects of gas drilling so as to protect surface and ground-water quality.
- Promulgation of Maryland's new soil erosion and sediment control regulations that provide enhanced practices to better retain sediment and improve the overall quality of construction site runoff.

In addition to targeted efforts to improve water quality throughout the state, in December of 2011 Governor O'Malley accepted Plan Maryland, a long term development planning document developed by the Maryland Department of Planning designed to foster more sustainable growth patterns within Maryland's borders. This plan serves as an executive policy to improve coordination of state agencies with the overall goal of promoting smart growth. This plan should help to maintain existing habitats and good water quality, which in combination with our restoration efforts will continue to improve water quality and enhance Maryland's natural resources.

PREFACE

Maryland's Integrated Report, when approved by the US Environmental Protection Agency, will satisfy Sections 303(d), 305(b) and 314 of the federal Clean Water Act (CWA). The following lists the requirements of these sections.

Clean Water Act §303(d) (Impaired waters) Requirements

- A list of water quality-limited (impaired) waters still requiring TMDL(s), pollutants causing the impairment and priority ranking for TMDL development (including waters targeted for TMDL development within the next two years).
- A description of the listing methodologies used to develop the list.
- A description of the data and information used to identify waters, including a description of the existing and readily available data and information used.
- A rationale for any decision to not use any existing and readily available data and information.
- Other reasonable information such as demonstrating good cause for not including waters on the list.

Clean Water Act §305(b) (Water quality inventory) Requirements

- A description of the quality of all waters in the State and the extent to which the quality of waters provides for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allows recreational activities in and on the water.
- An estimate of the extent to which control programs have or will improve water quality, and recommendations for future actions necessary and identification of waters needing action.
- An estimate of the environmental, economic and social costs and benefits needed to achieve the objectives of the CWA and an estimate of the date of such achievement.
- A description of the nature and extent of nonpoint source pollution and recommendations of programs needed to control each category of nonpoint sources, including an estimate of implementation costs.
- An assessment of water quality of all publicly owned lakes as specified in §314(a)(1).

Clean Water Act §314 (Clean Lakes) Requirements

- An identification and classification according to eutrophic condition of all publicly owned lakes.
- A description of procedures, processes, and methods (including land use requirements), to control sources of pollution of such lakes.
- A description of methods and procedures, in conjunction with appropriate federal agencies, to restore the quality of such lakes.
- Methods and procedures to mitigate the harmful effects of high acidity, including innovative methods of neutralizing and restoring buffering capacity of lakes and methods of removing from lakes toxic metals and other toxic substances mobilized by high acidity.
- A list and description of those publicly owned lakes for which uses are known to be impaired and those in which water quality has deteriorated as a result of high acidity that may be due to acid deposition.
- An assessment of the status and trends of water quality in lakes, including but not limited to, the nature and extent of pollution loading from point and nonpoint sources and the extent to which the use of lakes is impaired as a result of such pollution, particularly with respect to toxic pollution

PART A: INTRODUCTION

In Maryland, the Departments of Natural Resources (DNR) and the Environment (MDE) are the two principal agencies responsible for water resources monitoring, assessment and protection. DNR is the primary agency responsible for ambient water monitoring and assessment. MDE sets water quality standards, regulates discharges to Maryland waters through multiple permits, enforcement and compliance activities, and develops Total Maximum Daily Loads (TMDLs) for impaired waters. Historically, water quality monitoring results were submitted in two separate reports, the annual §305(b) reports and the biennial §303(d) List (list of impaired waters). Since 2002 and in compliance with Environmental Protection Agency guidance on 303(d) listing and 305(b) reporting, these formerly independent responsibilities have evolved into a combined reporting structure called the Integrated Report (IR).

The IR utilizes five reporting categories that not only include impaired waters requiring TMDLs, but also waters that are clean or need additional monitoring data to make an assessment. These categories are:

Category 1: water bodies that meet all water quality standards and no use is threatened;

Category 2: water bodies meeting some water quality standards but with insufficient data and information to determine if other water quality standards are being met;

Category 3: Insufficient data and information are available to determine if any water quality standard is being attained. This can be related to having an insufficient quantity of data and/or an insufficient quality of data to properly evaluate a water body's attainment status.

Category 4: one or more water quality standards are impaired or threatened but a TMDL is not required or has already been established. The following subcategories are included in Category 4:

Subcategory 4a: TMDL already approved or established by EPA;
Subcategory 4b: Other pollution control requirements (i.e., permits, consent decrees, etc.) are expected to attain water quality standards; and,
Subcategory 4c: Water body impairment is not caused by a pollutant.

Category 5: Water body is impaired, does not attain the water quality standard, and a TMDL or other acceptable pollution abatement initiative is required. This is the part of the List historically known as the 303(d) List.

A.1 Data Sources and Minimum Requirements

Section 130.7(B)(5) of the Clean Water Act requires that states "assemble and evaluate all existing and readily available water quality-related data and information" when compiling their Integrated Report. This includes but is not limited to the following:

(i) Waters identified by the State in its most recent Section 305(b) Report as "partially meeting" or "not meeting" designated uses;

(ii) Waters for which dilution calculations or predictive models indicate non-attainment of applicable water quality standards;

(iii) Waters for which water quality problems have been reported by local, state, or federal agencies; members of the public or academic institutions; and,

(iv) Waters identified by the State as impaired in a nonpoint source assessment submitted to EPA under section 319 of the CWA or in any updates of the assessment.

With the integration of sections 305(b) and 303(d) of the Clean Water Act and the adoption of a multi-category reporting structure, Maryland has developed a two-tiered approach to data quality. Tier 1 data are used to determine impaired waters (e.g., Category 5 waters or the traditional 303(d) List) and are subject to the highest data quality standards. Maryland waters identified as impaired using Tier 1 data may require a TMDL or other regulatory actions. These data should be accompanied by a Quality Assurance Project Plan (QAPP) consistent with EPA data guidance specified in Guidance for Quality Assurance Project Plans. Dec 2002. EPA /240/R-02/009 available at http://www.epa.gov/quality/qs-docs/g5-final.pdf. Tier 1 data analysis must also be consistent with Maryland's Listing Methodologies (see section C.2).

Tier 2 data are used to assess the general condition of surface waters in Maryland and may include volunteer monitoring, land use data, visual observations of water quality condition, or data not consistent with Maryland's Listing Methodologies. Such data may not have a QAPP or may have one that is not consistent with EPA guidance. Waters with this level of data may be placed in Categories 2 or 3 of the List, denoting that water quality is generally good or that there are insufficient data to make an assessment, respectively. However, Tier 2 data alone are not used to make impairment decisions (i.e., Category 5 listings requiring a TMDL) because the data are of insufficient quantity and/or quality for regulatory decision-making. Table 3 below identifies the organizations and/or programs that submitted data to MDE for the 2012 IR.

Table 3: Organizations/Programs that submitted water quality data for consideration in the 2012 IR.

Data Provider	Data Description	Parameter Measured	Data Tier	Notes
Community College of Baltimore County	Stream Waders type data collected from 7 locations using Virginia IBI system	Biological index scores	2	Data Not Used - Full MBSS protocols are needed to be consistent with current biological assessment methodology
Havre de Grace Water Filtration Plant	Data collected from ambient water quality station upstream of WWTP	pH, Fecal Coliform, turbidity, other	2	Data Not Used - Data were not ambient, taken from intake pipe, not representative of water body
Severn Riverkeeper Monitoring Program	Depth profiles with water quality sonde	DO, pH, salinity, temperature, etc	N/A	Data Not Used - Efforts underway to integrate data into Bay Program Assessments for future Integrated Report.

Data Provider	Data Description	Parameter Measured	Data Tier	Notes
Magothy Riverkeeper Monitoring Program	Magothy Report Card, raw data not yet available	N/A	N/A	Data Not Used - Efforts underway to integrate data into Bay Program Assessments for future Integrated Report.
MD Coastal Bays Program	Nutrients, DO, pH, other physical parameters in both the tidal Coastal Bays and nontidal streams	Nutrient species, DO, pH, salinity	1	Data Used - Supports existing impairment listings. Provided to TMDL Development staff.
Nanticoke River Watershed Alliance	Nutrient Data	Nutrients, DO, other physical parameters collected	N/A	Data Not Used - Efforts underway to integrate data into Bay Program Assessments for future Integrated Report.
Baltimore County Dept. of Environmental Protection and Sustainability	Non-tidal benthic monitoring data	Biological index scores	N/A	Data Not Used - Efforts are underway to integrate this data with MBSS biological assessment.
Frederick County	Non-tidal biological monitoring data	Biological index scores	N/A	Data Not Used - Efforts are underway to integrate this data with MBSS biological assessment.
Port Tobacco River Conservancy	Bacteria sampling	Enterococcus levels	1	Data Used - Updated existing impairments
Center for Biological Diversity	Information on Ocean Acidification	Scientific literature provided. One paper relevant to Maryland waters.	2	Data Reviewed - No water quality standards were violated.
Anne Arundel County Dept. Public Works	Physical water quality data and biological data	Metals, DO, biological index scores	1	Data Used - Several segment specific assessments were entered into the IR.
Montgomery County Dept. of Environmental Protection	Biological Data	Biological index scores	N/A	Data Not Used - Efforts are underway to integrate this data with MBSS biological assessment.
NOAA Water Quality Study	Data on Copper Toxicity in the Choptank River	Water column metals levels	2	Data Used - Additional follow-up monitoring required to confirm impairment.
Chesapeake Bay Program	Chesapeake Bay Benthic Data	Biological index scores	1	Data Used - Updated biological assessments for tidal tributaries of the Chesapeake Bay.
MDE – Shellfish Certification Program	Bacteria data for stations in the Tidal areas of the Chesapeake Bay and Coastal Bays in MD	Fecal coliform levels	1	Data Used - Updated bacteria assessments for shellfish harvesting areas.
MDE – Fish Tissue Monitoring Program	PCBs and Mercury Fish Tissue data	PCBs, Hg, chlordane levels	1	Data Used - Updated fish consumption-related assessments.

Data Provider	Data Description	Parameter Measured	Data Tier	Notes
MDE – BEACH Certification Program	Bacteria data collected at designated bathing beaches by County HDs.	Enterococcus levels	1	Data Used - Updated beach assessments.
Chester RiverKeeper	Physical water quality data for one segment	DO, nutrients, pH, turbidity	1	Data Used - Data determined to be from tidal waters, included with assessment for CHSTF.
MD DNR and Chesapeake Bay Program	Results of Water Quality Interpolator Model, based on measured DO levels in Chesapeake Bay	Percent exceedance of CFD curves	1	Data Used -Updated Chesapeake Bay Assessments.
MD DNR and Chesapeake Bay Program	Assesments of Sediment levels in the Chesapeake Bay through the use of the SAV indicator	SAV coverage and water clarity acres	1	Data Used - Updated the sediment assessments for Chesapeake Bay.
MDE - CSO and SSO Data	CSO and SSO information	Gallons of discharge, frequency, etc	1	Data Used - Updated CSO and SSO tables according to methodology.

MDE supports the use of computer models and other innovative approaches to water quality monitoring and assessment. Maryland and the Bay partners have also relied heavily on the Chesapeake Bay model to develop loading allocations, assess the effectiveness of best management practices, and guide implementation efforts. Several different modeling approaches have also been used in TMDL development. With the growing number of biological impairments in Category 5 of the List, Maryland will be relying more heavily on land use analyses, GIS modeling, data mining, and other innovative approaches to identify stressors, define ecological processes, and develop TMDLs.

Maryland has increased its efforts to make Integrated Reporting data available to the public in a real-time, user-friendly environment. To accomplish this goal, Maryland created a searchable IR database and clickable map to make it easier to find water quality assessments for a particular geographic area. This application is available online at http://www.mde.maryland.gov/programs/water/tmdl/integrated303dreports/pages/303d.aspx.

A.1.1 Quality Control of Water Quality Datasets

Data quality in Maryland's water monitoring programs is defined through implementation of the agency's quality control program (e.g., DNR's and MDE's Quality Management Plan), Quality Assurance Project Plan (QAPP) for each monitoring program, and field and laboratory Standard Operating Procedures (SOP). Water monitoring programs conducted under contract to the US Environmental Protection Agency (EPA) must have QAPPs approved by the EPA Regional or Chesapeake Bay Program QA Officer prior to initiating monitoring activities.

Details in each program's QAPP define data quality indicators by establishing quality control and measurement performance criteria as part of the program's planning and development. Such measures help ensure there is a well-defined system in place to assess and ensure the data quality.

Water monitoring programs conducted by a local agency, educational institution, consultant or citizen group may not have a QAPP. Unless there are contractual requirements, water monitoring QAPPs for these groups are not reviewed or approved by the State. While it is recommended that a QAPP or equivalent planning document be developed, some water quality monitoring programs may have no QAPP or documentation on quality control. For State analysts to review these contributed data with any confidence the quantitative aspects of these data need to be defined.

Some of the data quality aspects that need to be considered include:

Precision - How reproducible are the data? Are sample collection, handling and analytical work done consistently each time samples are collected and processed?

Accuracy/Bias - How well do the measurements reflect what is actually in the sample? How far away are results from the "true" value, and are the measures consistently above or below this value?

Representativeness - How well do the sample data characterize ambient environmental conditions?

Comparability – How similar are results from other studies or from similar locations of the same study, or from different times of the year, etc.? Are similar sampling and analytical methods followed to ensure comparability? Do observations of field conditions support or explain poor comparability?

Completeness – Is the quality and amount of data collected sufficient to assess water quality conditions or can these data be appended to other, existing data collected at the same site or nearby to provide enough information to make an assessment decision?

Sensitivity - Are the field and/or laboratory methods sensitive enough to quantify parameters at or below the regulatory standards and at what threshold can an analytical measure maintain confidence in results?

QAPPs will likely not address all of these issues and there are often no quantitative tests or insufficient QC data available to do so. In these instances, best professional judgement may be required as these aspects can be difficult to address, even if there is a monitoring QAPP. For some issues, there is no quantitative test and often little, if any, quality assurance data are provided with contributed data. In most instances, an analyst's review of available monitoring program documentation and data are subjective. Once data quality is considered acceptable (or at least not objectionable), the dataset review process moves to a more quantitative review stage.

A.1.2 Water Quality Data Review

The designated uses defined in the Code of Maryland Regulations are assessed by relatively few field and analytical measures. Water temperature, dissolved oxygen, pH, turbidity, water clarity (Secchi depth or light extinction), acres of estuarine grasses, ammonium, biological integrity and certain bacteria levels define the principal data used to assess criteria attainment. Various measures of nitrogen and phosphorus as nutrients have not been defined in terms of criteria, although exceedance of oxygen criteria or nuisance levels of algae are attributed to high nutrients levels. Except for special studies or as a discharge permit requirement, metals, inorganic and organic parameters defined as criteria are not

routinely measured due to the high cost of analysis and because few of these substances are found in ambient waters at levels exceeding criteria. Specific toxics known to be directly related to human health (i.e., mercury and PCBs) are assessed through MDE's fish and shellfish monitoring programs.

Water quality datasets reviewed for assessing use support are first examined in terms of QAPP or other reports that define monitoring objectives and quality control. For selected parameters, the data are reviewed for sufficient sample size, data distribution (type and outliers/errors) and spatial and temporal distribution in the field. Censored data and field comments are examined for unusual events that may affect data quality (e.g., storm event). Data are examined for seasonality and known correlations (e.g., conductivity and salinity) are reviewed. Censored data are noted and may be excluded from the analysis.

Not all water quality criteria are assessed using this approach. Some assessments are conducted by other State programs using peer-reviewed or defined methods (e.g., Maryland's listing methodologies) and are not re-evaluated using other approaches. Examples include; assessment of algal samples, the State's statistical non-tidal living resource survey (MD Biological Stream Survey), fish kill and bacterial assessments, bathing and shellfish harvesting restrictions, and toxic contaminants in fish tissue, shellstock and sediments.

Some criteria assessments are conducted externally. In these circumstances, the assessment methods are peer reviewed and results are provided to the State. Criteria assessed in this manner are not re-evaluated. Examples include, for Maryland's Chesapeake Bay and tidal tributaries, benthic community criteria (Versar, Inc. and Old Dominion University), aquatic grass coverage (VA Institute of Marine Science), water clarity (MD DNR), and dissolved oxygen (US Environmental Protection Agency's Chesapeake Bay Program).

PART B: BACKGROUND

B.1 Total Waters

Maryland is fortunate to have an incredible diversity of aquatic resources. The low-lying, coastal plain region in the eastern part of the State includes the oceanic zone as well as the estuarine waters of both the Coastal and Chesapeake Bays. Moving further west and up through the rolling hills of the Piedmont region, the tidal influences give way to flowing streams and the Liberty, Loch Raven and Prettyboy reservoir systems. Along the western borders of the State is the Highland region where resides the State's highest peaks, and which includes three distinct geological provinces (the Blue Ridge, the Ridge and Valley province, and the Appalachian Plateaus). Estimates of Maryland's total surface waters across these regions are given in Table 4.

Table 4: Scope of Maryland's Surface Waters.

		Value	Scale	Source
State population		5,773,552	N/A	U.S. Census Bureau, 2010
Surface Area	Total (square miles)	12,193	Unknown	MD DNR 2001
	Land (square miles)	9,844		
Rivers and streams (miles)		19,127	1:24,000 NHD Coverage	MDE, 2012
Impoundments	All Lakes/Reservoirs (number/acres)	947 lakes / 77,965	1:100,000 (RF3)	US EPA, 1991
	Significant Publicly-owned (number/acres)	60 lakes / 21,876	1:24,000 NHD Coverage	USGS, MDE, 2012
Estuaries/Bays (square miles)		2,451	1:24,000	Chesapeake Bay Program, MDE, 2012
Ocean coast (square miles)		107	1:24,000	MDE, 2012
Wetlands	Freshwater (acres)	346,135	Unknown	Tiner and Burke, 1995
	Tidal (acres)	252,273	Unknown	Tiner and Burke, 1995

*Many of these numbers changed based on new mapping coverages at the 1:24,000 scale.

B.1.1 Water Quality Standards

A water body is considered "impaired" when it does not support its designated uses [see Code of Maryland Regulations §26.08.02 at http://www.dsd.state.md.us/comar/subtitle_chapters/26_Chapters.aspx#Subtitle08]. Maryland's Water Quality Standards (WQS) assign one of eight designated use classes to each body of water. The following is a generalized list of these designated use classes.

Use I waters: Water contact recreation, and protection of nontidal warmwater aquatic life;
Use II waters: Support of estuarine and marine aquatic life and shellfish harvesting;
Use III waters: Nontidal cold water; and,
Use IV waters: Recreational trout waters.

Each designated use class then has an appropriate subset of specific designated uses. Water bodies assigned a use class are expected to support the entire subset of designated uses for that class. Table 5 illustrates the specific designated uses that apply to each use class. This table shows all possible use classes in the column headings.

Table 5: Specific Designated Uses that apply to each Use Class.

	Designated Use Classes							
Specific Designated Uses	**I**	**I-P**	**II**	**II-P**	**III**	**III-P**	**IV**	**IV-P**
Water Contact Sports	✓	✓	✓	✓	✓	✓	✓	✓
Leisure activities involving direct contact with surface water	✓	✓	✓	✓	✓	✓	✓	✓
Fishing	✓	✓	✓	✓	✓	✓	✓	✓
Growth and Propagation of fish (not trout), other aquatic life and wildlife	✓	✓	✓	✓	✓	✓	✓	✓
Agricultural Water Supply	✓	✓	✓	✓	✓	✓	✓	✓
Industrial Water Supply	✓	✓	✓	✓	✓	✓	✓	✓
Propagation and Harvesting of Shellfish			✓	✓				
Seasonal Migratory Fish Spawning and Nursery Use*			✓	✓				
Seasonal Shallow-Water Submerged Aquatic Vegetation Use*			✓	✓				
Open-Water Fish and Shellfish Use*			✓	✓				
Seasonal Deep-Water Fish and Shellfish Use*			✓	✓				
Seasonal Deep-Channel Refuge Use*			✓	✓				
Growth and Propagation of Trout					✓	✓		
Capable of Supporting Adult Trout for a Put and Take Fishery							✓	✓
Public Water Supply		✓		✓		✓		✓

*These particular designated uses apply only to the Chesapeake Bay and its tidal tributaries. They are discussed in more detail in Section B.1.1.1.

Each of the designated uses has associated water quality criteria that are then used to determine if the use is being supported. Such criteria can be narrative or numeric. Numeric Water Quality Criteria establish threshold values, usually based upon risk analyses or dose-response curves, for the protection

of human health and aquatic life. These apply to pollutants that can be monitored and quantified to known levels of precision and accuracy, such as toxics concentrations, pH, and nutrients. Narrative criteria are less quantitative in nature but generally prohibit any undesirable water quality conditions that would preclude a water body from supporting a designated use.

The Federal Clean Water Act and its amendments require that States update their water quality standards every three years, subject to review and approval by the US Environmental Protection Agency (http://www.mde.maryland.gov/Programs/WaterPrograms/TMDL/wqstandards/index.asp). Water quality standards are updated through changes to the regulatory language in COMAR and go through a public review process.

B.1.1.1 Water Quality Standards for Chesapeake Bay and its Tidal Tributaries

Maryland has detailed water quality standards for Chesapeake Bay and its tidal tributaries to protect both aquatic resources and to provide for safe consumption of shellfish. The recently revised aquatic resource protection standards are subcategories under Use II waters and establish five designated uses (see Figure 2), including:

Seasonal Migratory Fish Spawning and Nursery Designated Use - includes waters of the Chesapeake Bay and its tidal tributaries that have the potential for or are supporting the survival, growth, and propagation of balanced populations of ecologically, recreationally, and commercially important anadromous, semi-anadromous and tidal-fresh resident fish species from February 1 through May 31.

Seasonal Shallow-Water Submerged Aquatic Vegetation Designated Use –includes tidal fresh, oligohaline and mesohaline waters of the Chesapeake Bay and its tributaries that have the potential for or are supporting the survival, growth, and propagation of rooted, underwater bay grasses in tidally influenced waters between April 1 and October 1.

Open-Water Fish and Shellfish Designated Use - includes waters of the Chesapeake Bay and its tidal tributaries that have the potential for or are supporting the survival, growth, and propagation of balanced, indigenous populations of ecologically, recreationally, and commercially important fish and shellfish species. This subcategory applies to two distinct periods: summer (June 1 to September 30) and October 1 through May 31. In summer, the open-water designated use in tidally influenced waters extends from shoreline to adjacent shoreline, and from the surface to the bottom or, if a pycnocline exists (preventing oxygen replenishment), to the upper measured boundary of the pycnocline. October 1 through May 31, the boundaries of this use include all tidally influenced waters from the shoreline to adjacent shoreline and down to the bottom, except when the migratory spawning and nursery designation (MSN) applies.
NOTE: If a pycnocline exists but other physical circulation patterns, such as the inflow of oxygen-rich oceanic bottom waters, provide oxygen replenishment to the deep waters, this use extends to the bottom. This is mostly prevalent in the Virginia portion of the Bay.

Seasonal Deep-Water Fish and Shellfish Designated Use - includes waters of the Chesapeake Bay and its tidal tributaries that have the potential for or are supporting the survival, growth, and propagation of balanced, indigenous populations of important fish and shellfish species inhabiting deep-water habitats from June 1 through September 30:

NOTE 1: In tidally influenced waters located between the measured depths of the upper and lower boundaries of the pycnocline, where a pycnocline is present and presents a barrier to oxygen replenishment; or
NOTE 2: From the upper boundary of the pycnocline down to the sediment/water interface at the bottom, where a lower boundary of the pycnocline cannot be calculated due to the depth of the water column.
NOTE 3: From October 1 to May 31, criteria for Open Water Fish and Shellfish Subcategory apply.

Seasonal Deep-Channel Refuge Designated Use - includes waters of the Chesapeake Bay and its tidal tributaries that have the potential for or are supporting the survival of balanced, indigenous populations of ecologically important benthic infaunal and epifaunal worms and clams, which provide food for bottom-feeding fish and crabs. This subcategory applies from June 1 through September 30 in tidally influenced waters where a measured pycnocline is present and presents a barrier to oxygen replenishment. Located below the measured lower boundary of the pycnocline to the bottom.
NOTE: From October 1 to May 31, criteria for Open Water Fish and Shellfish Subcategory apply.

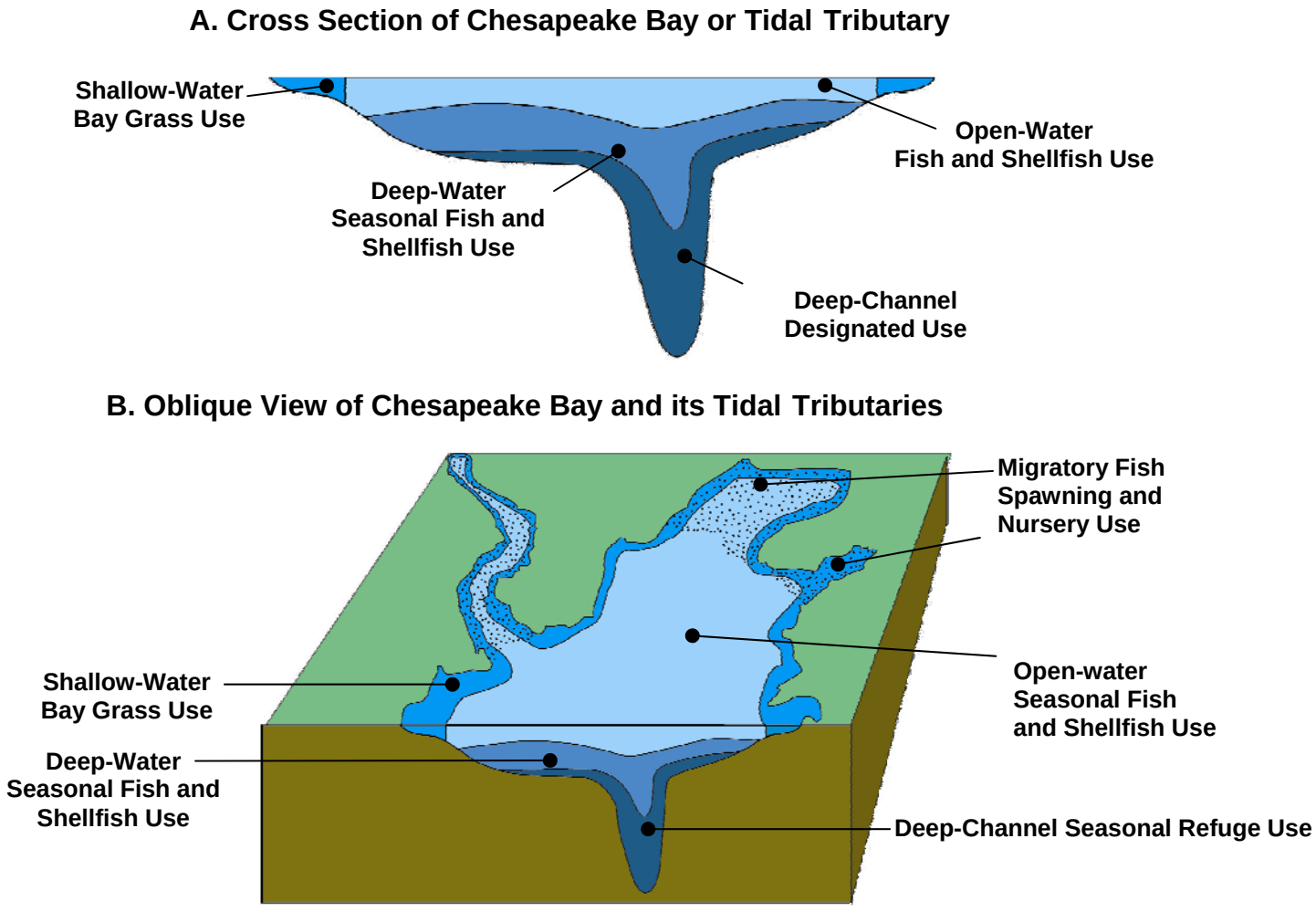

Figure 2: Illustration of the designated uses for Chesapeake Bay (Chesapeake Bay Program, 1998). Uses are both overlapping and three-dimensional.

B.2 Water Pollution Control Programs

Maryland implements a host of water pollution control programs to ensure that water quality standards are attained, many of which are funded by federal dollars under the Clean Water Act. Some programs are administered by different state agencies within Maryland or by local jurisdictions. Some of the programs administered by MDE are briefly cited below and web links are provided for access to more detailed information.

B.2.1 Permits

MDE is responsible for administering several permit programs to reduce the impacts of surface water and groundwater discharges to state waters. More detailed information on the state's water permits is available at http://www.mde.state.md.us/programs/Permits/WaterManagementPermits/Pages/Permits/WaterManagementPermits/index.aspx.

B.2.2 Tier II Waters and Antidegradation

Recently, Maryland implemented antidegradation regulations to better protect state waters where data indicate that water quality is significantly better than required to support the applicable designated uses (COMAR 26.08.02.04). MDE is also developing detailed implementation guidance to help regulated entities better understand and implement these regulations. This important program aims to protect high quality waters by requiring more rigorous permit application reviews and by restricting the amount of buffering capacity (i.e., assimilative capacity) that can be used by a discharger. More information on Tier II can be found at http://www.mde.state.md.us/programs/Water/TMDL/Integrated303dReports/Pages/Antidegradation.aspx.

B.2.3 Grant Programs

A number of financial assistance programs are offered and/or facilitated by the Maryland Department of the Environment. Funding may be in the form of grants, low interest loans, or direct payments for specific projects. More detailed information on the range of programs administered by the Department can be found at http://www.mde.state.md.us/programs/Water/QualityFinancing/Pages/Programs/WaterPrograms/water_quality_finance/index.aspx.

B.2.4 Total Maximum Daily Loads (TMDLs)

Waters listed on Category 5 of this Integrated Report may require a Total Maximum Daily Load or TMDL. A TMDL is an estimate of the amount or load of a particular pollutant that a water body can assimilate and still meet water quality standards. After a total load has been developed, upstream discharges will be further regulated to ensure the prescribed loading amounts are attained. More

information on Maryland's TMDL program can be found at http://www.mde.state.md.us/programs/Water/TMDL/Pages/Programs/WaterPrograms/tmdl/index.aspx.

B.2.5 Drinking Water Supply and Protection

MDE is charged with ensuring that all Marylanders have a safe and adequate supply of drinking water. The Department has programs to oversee both public water supplies, which serve about 84 percent of the population's residential needs, and individual water supply wells, which serve citizens in most rural areas of the State. More information on Maryland's Water Supply Programs can be found at http://www.mde.state.md.us/programs/Water/Water_Supply/Pages/Programs/WaterPrograms/water_supply/index.aspx.

B.2.6 Corsica River Targeted Watershed

The Corsica River Watershed Project is a pilot program designed to demonstrate that a tidal tributary of Chesapeake Bay can be successfully restored. The goal of this targeted watershed restoration is to remove the Corsica River from the Impaired Waters List. For more information, go to http://www.corsicariver.org/.

B.2.7 Program Coordination

State agency staff participate in many work groups, committees, task forces, and other forums to coordinate and communicate state efforts with interested stakeholders. Coordination with the Chesapeake Bay Program and participation by state staff in the associated subcommittees continues to be a nexus for Maryland's water quality restoration activities. The Interagency TMDL Workgroup, chaired by MDE, and which includes the Departments of Natural Resources, Agriculture, Planning and Transportation and the University of Maryland, addresses needs for enhanced coordination between agencies (i.e., Data-sharing, TMDL project selection and review, and TMDL implementation planning, etc.) stemming from the accelerated TMDL production schedule, as well as for federal (Section 319) funding guidance for watershed restoration plans that can be used to develop TMDL implementation plans. State staff also meet regularly with other groups, such as the State Water Quality Advisory Committee and the Maryland Water Monitoring Council, to ensure program coordination with local and federal government agencies, as well as the private sector, academia, and Maryland's citizens.

Recently, in 2009, MDE and DNR completed the latest update to Maryland's Water Monitoring Strategy. During this process both agencies took the opportunity to reevaluate current monitoring goals and objectives to determine if monitoring programs are still meeting state needs. This process also helped to document data gaps that the State hopes to fill before the next updates are made to the strategy.

B.3 Cost/Benefit Assessment

One specific reporting requirement of the Clean Water Act under §305(b), is a cost-benefit analysis of water pollution control efforts to ensure that the benefits of these programs are worth the costs. Economists have defined various ways to measure water quality benefits (e.g., Smith and Desvousges, 1986) and a number of agencies have produced estimates of water quality values based on uses (e.g., flood control value of wetlands – Leschine et al., 1997) or specific activities (e.g., recreational fishing -

US Fish and Wildlife Service, 1998). Data for these efforts often are difficult to obtain, the results are complex or often address only a single use, and comparability between States or regions can be impossible.

B.3.1 Program costs

A substantial level of federal funding for water pollution control efforts comes from some agencies (US Environmental Protection Agency) while funding for aquatic resource protection and restoration may be substantially provided by other federal agencies (e.g., US Fish and Wildlife Service). Funds usually are transferred to States through a variety of appropriations – for example, certain provisions of the federal Water Pollution Control Act and its amendments provide for grants to States, including Sections 104(b) (NPDES), 106 (surface- and ground water monitoring and permitting), 117 (Chesapeake Bay Program), 319 (nonpoint source pollution control), and 604(b) (water quality planning). These funds often provide seed money or low-interest loans that must be matched by State or local funds or documented in-kind efforts used on the project. A summary of federal water quality/aquatic resource-related grants to State agencies is shown in Figure 3.

While some new water programs are occasionally initiated, overall, there has been a general decline of federal funding available to States for various water quality-related programs. The figure below shows a summary of EPA budget data from traditional water grants (Clean Water Act §106, §319, §104b planning, wetlands, targeted watersheds (including Chesapeake Bay), public water supply, beach monitoring and wastewater operator training). The USGS water program summary includes the federal share of joint funding agreements with State/local agencies and other entities.

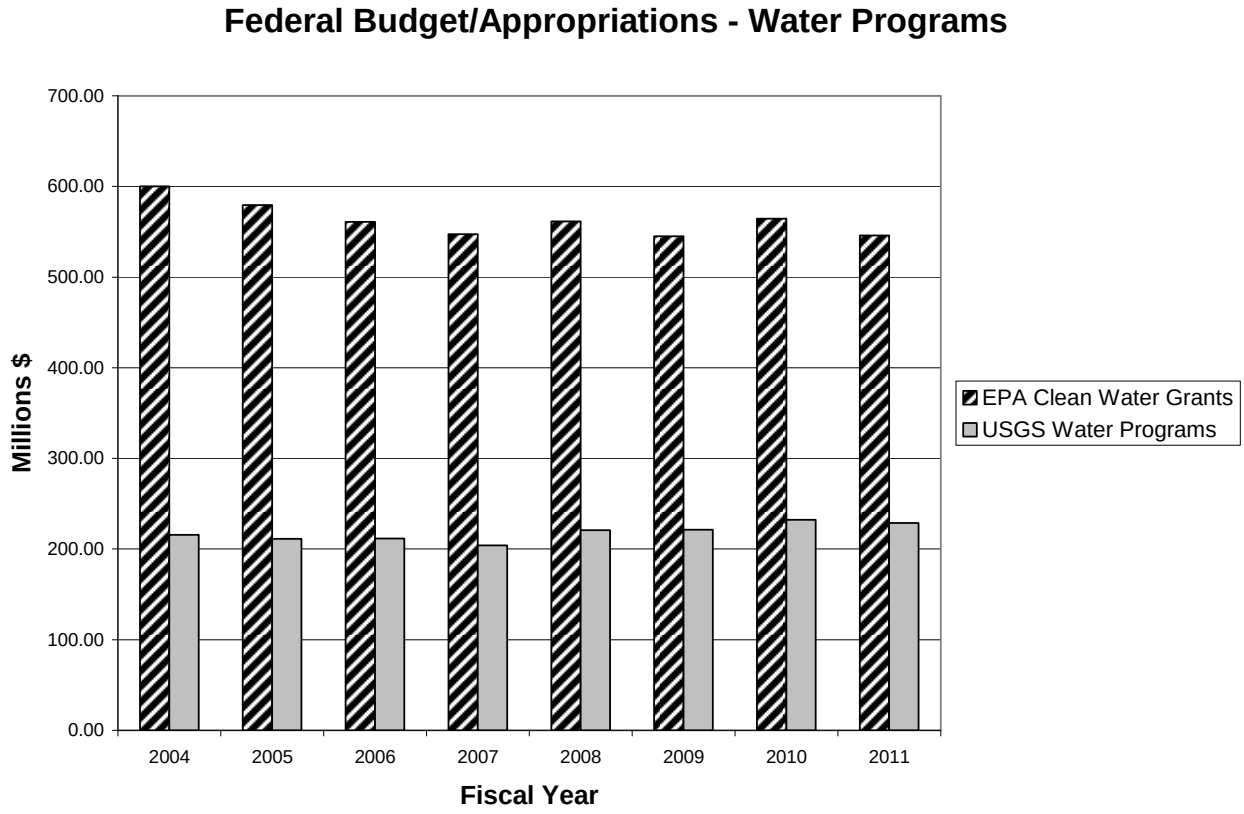

Figure 3: Federal Budget Appropriations to Water Programs (2004-2011). (Source: Association of Clean Water Administrators FY2012 Funding Chart)

Although the changes appear gradual, the loss for State programs is increased when programs that require matching funds are reduced. An example of the impact of national funding variance in §319 funding appropriation and what Maryland received is shown in Figure 4.

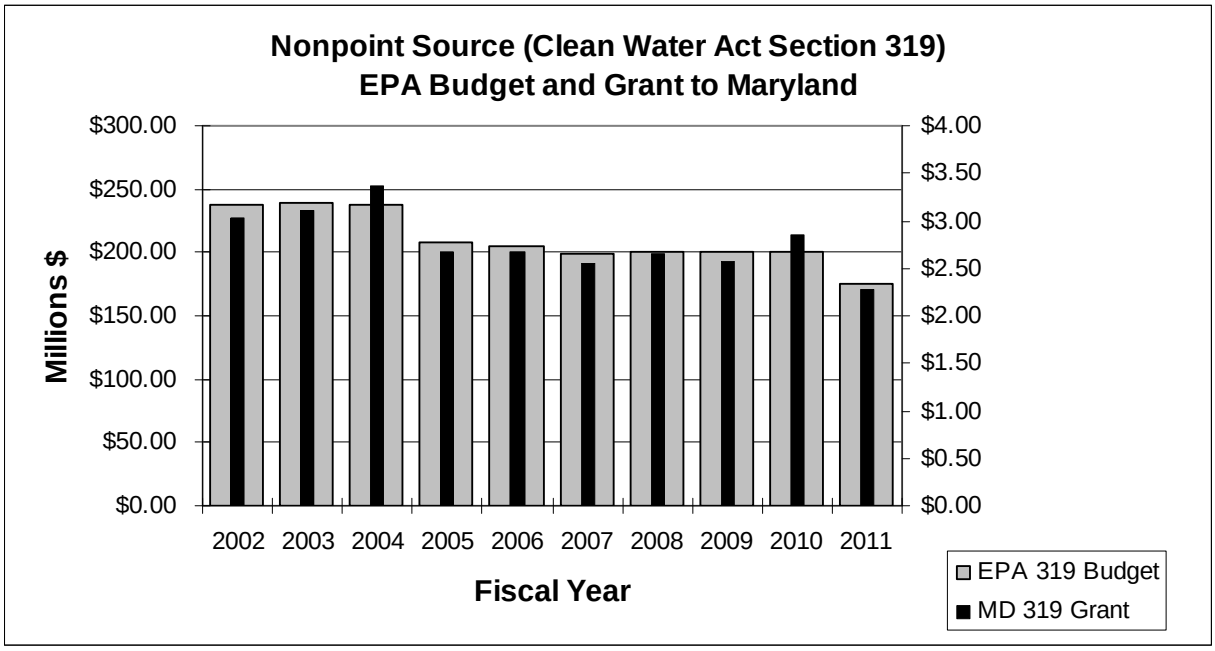

Figure 4: Federal nonpoint source total budget allocation including the Maryland totals. (Sources: Association of Clean Water Administrators FY2012 Report and MDE's 319 Annual Report)

As the federal funding for water programs vary and program costs increase annually, maintenance of nearly every water program activity requires either an increased share from State/local budgets or reductions in program function.

B.3.2 Program Benefits

Clean water offers many valuable uses to individuals and communities as direct and indirect economic benefits. Beautiful beaches, whitewater rivers, and calm, cool lakes add to aesthetic appeal and contribute to a recreation and tourism industry. A plentiful supply and good quality drinking water encourages economic growth and development, increased waterfront property values, and water-based recreational opportunities and commerce. But while environmental quality ranks high in the public's perception of livable communities, an economic valuation of each of these benefits is difficult to develop.

Most often, economic benefits are determined for single uses (e.g., fishing). For example, more than 500,000 Maryland residents are anglers (about one in 10) and residents comprise 70 percent of the State's anglers. In 1996, these anglers spent $475 million in the State on fishing expenses - an average of $664 per angler per year. Most of these expenses (56 percent) were trip-related (food, lodging, transportation, equipment rental). Equipment costs accounted for another large portion (39 percent) and other items (membership dues, magazines, permits, stamps and leases) amounted to $27 million (US Fish and Wildlife Service, 1998).

B.3.3 Summary

Water pollution control efforts are very costly. Much of the federal funds provided to the State and cost-shared with additional State and local funds are used to implement local pollution control and/or restoration programs. On an annual basis, the funds available are but a fraction of the estimated cost.

EPA needs to clearly define meaningful, accessible, available and comparable cost and benefit information that would meet Congress' intent in assessing value of the Clean Water Act's §305(b). A pilot State or regional program or a national study with recognized economists and federal and State participation could help simplify the complexities of this economic analysis.

B.4 Special State Concerns and Recommendations

Chesapeake Bay touches virtually every watershed within Maryland's borders and continues to be the focal point for water quality planning and restoration efforts across the State. On December 29, 2010, EPA finalized the Chesapeake Bay TMDL, effectively identifying the nutrient and sediment reductions necessary to support the water quality goals for the Chesapeake Bay and tidal tributaries. Soon after, the Chesapeake Bay states (MD, VA, PA, NY, DE, DC) submitted their Phase I Watershed Implementation Plans (WIP) for EPA approval. The Phase I WIPs began the process of allocating nutrient and sediment loads to specific jurisdictions and provided broad strategies for achieving pollutant reductions. Currently, Phase II WIPs are being finalized which lay out more detailed nutrient and sediment reduction strategies and also include contingency measures in case the required progress is not made. To help achieve these goals, Maryland committed to two-year milestones that serve as interim goals to help track Maryland's progress in restoring the Bay. Draft results for the 2011 milestones shows Maryland exceeding its goals for cover crop enrollment, nutrient management plans, and soil conservation plans.[4] Still, much works needs to be done as other goals for agriculture, urban areas, and public land restoration have not been met.

In addition to the Chesapeake Bay work, Maryland is increasingly engaged in protecting its high quality waters. Over the past year, MDE has continued its outreach to local governments by identifying high quality waters in their jurisdictions needing special protection (COMAR 26.08.02.04) and raising awareness on the need for antidegradation reviews. Maryland also continues to review wetlands and waterways permits and water and sewer plans to ensure that Tier II waters receive adequate protection to maintain high quality status. Maryland also continues its targeted watershed work utilizing the 319 Nonpoint Source Program and the Chesapeake Bay and Atlantic Coastal Bays Trust Fund. Both funding programs provide grants and assistance to organizations interested in completing water quality restoration projects. Included in Governor O'Malley's 2012 State Budget is a 25% increase in funding for the Chesapeake Bay and Atlantic Coastal Bays Trust Fund which would bring total funding up to $25 million.

Maryland faces many emerging issues in the effort to reduce the amount of pollutants entering the Bay. Due to military Base Re-alignment and Closure (BRAC) initiated by the federal government, more people are expected to move into the Bay watershed with expansion of Aberdeen Proving Grounds and Fort Meade. Proactive planning efforts between the State and local jurisdictions are required to address the infrastructure needs to accommodate BRAC associated population growth. Several successes have

[4] From Maryland BayStat web site at http://www.baystat.maryland.gov/

already been realized in keeping BRAC zones out of Maryland's high quality watersheds. Another emerging issue of state concern is detection of endocrine disrupting chemicals in Maryland waters. These chemicals are being studied for effects on fish reproduction and, in some cases, have been linked to low reproductive success. These substances will be increasingly investigated to determine the magnitude of their effect on fish stocks and whether it is feasible to control them at the source. In addition, Maryland has received several applications to drill for natural gas in the Western Maryland marcellus shale region. In response, the Marcellus Shale Safe Drilling Initiative was created to provide information and recommendations to state policymakers to address the environmental and human health risks associated with drilling in marcellus shale. From this effort, Maryland will be developing regulations and policy to evaluate drilling applications and for determining best practices for this type of activity.

Maryland continues to meet its commitments to EPA and other stakeholders in developing Total Maximum Daily Loads for restoring impaired waters. However, to achieve its water quality goals, Maryland will have to find more effective ways to ramp up both restoration and protection efforts. The limiting factors for making restoration progress continue to be funding constraints, decentralization of water quality programs, and unsustainable growth patterns. The State's efforts to increase environmental funding as well as current efforts to better align monitoring and assessment programs through a coordinated state monitoring strategy will help to address these limiting factors. However, increased funding from the federal side as well as a more coordinated, centralized authority accountable to project successes and failures are necessary for continued progress. Meanwhile, new development in suburban and rural watersheds threatens the progress being made in other areas by creating new pollution sources. PlanMaryland will help to guide future development toward existing urban centers but local governments will need to embrace this vision if growth patterns are to be significantly changed. To protect water quality, the State must continue to implement its antidegradation policy for high quality waters as well as develop clarifying guidance and regulations consistent with both water quality goals and the State's Smart Growth Initiative. To do this effectively, Maryland will have to work more closely with local jurisdictions and the public and be willing to face any associated legal challenges.

PART C: SURFACE WATER MONITORING AND ASSESSMENT

C.1 Monitoring Program

In December 2009, Maryland completed the last update of its comprehensive water monitoring strategy (http://www.mde.state.md.us/programs/ResearchCenter/EnvironmentalData/Documents/www.mde.state.md.us/assets/document/Maryland_Monitoring_Strategy2009.pdf). Maryland's water quality monitoring programs are designed to support State Water Quality Standards (Code of Maryland Regulations Title 26, Subtitle 08) for the protection of both human health and aquatic life. This strategy identifies the programs, processes and procedures that have been institutionalized to ensure State monitoring activities continue to meet defined programmatic goals and objectives. The strategy also discusses current data management and quality assurance/quality control procedures implemented across the State to preserve data integrity and guarantee that data are of sufficient quality and quantity to meet the intended use. Finally, this document serves as a road map for assigning monitoring priorities and addressing gaps in current monitoring programs. It has proven to be especially useful during the recent recession as declining monitoring budgets have increased the need for greater monitoring efficiency.

C.2 Assessment Methodologies

Starting in 2002, Maryland developed and solicited public review of the assessment methodologies used to document the State's assessment of its water quality standards (WQS) and which establish statistically based approaches for determining water body impairment. These methodologies are designed to provide consistency and transparency in Integrated Reporting so that the public and other interested stakeholders understand why listing decisions are made and can independently verify listing decisions. The assessment methodologies are living documents that can be revised as new statistical approaches, technologies, or other improved methods are identified. When changes are proposed to the methodologies, Maryland allows for public review and comment via the biennial Integrated Report.

For this 2012 reporting cycle, two assessment methodologies (bacteria and biological) have been significantly revised and are open for public review and comment. These revised methodologies and/or language are provided below for stakeholder review and comment. In addition, minor changes were also made to the pH, sediment, toxics, and DO and chlorophyll *a* in Reservoirs assessment methodologies. In all four of these assessment methodologies a section was added that discussed the scale of assessment and how listings would be georeferenced.[5] These changes were not included in the 2012 IR as they do not change the meaning of these methodologies or have any direct impact on the 303(d) List. Regardless, the public is invited to review and provide comments on all assessment methodologies available on MDE's Web site at http://www.mde.maryland.gov/programs/water/tmdl/integrated303dreports/pages/programs/waterprograms/tmdl/maryland%20303%20dlist/ir_listing_methodologies.aspx.

[5] Maryland now georeferences assessments in the IR as part of a new Integrated Reporting requirement. In addition, having these layers mapped facilitates clean water planning efforts and enables more sophisticated data analyses.

C.2.1 Assessment Methodology for Identifying Waters Impaired by Bacteria in Maryland's Integrated Report

Introduction

The rules used by MDE to interpret data and apply the water quality standards are discussed below in three sections. Each of those sections describes the application to a distinct water use: shellfish harvesting; recreational waters; and beaches. Although in each case a bacteriological indicator applies, the criterion and in some cases the indicator itself differs according to the requirements of the National Shellfish Sanitation Program (NSSP), water quality standards, or public health requirements. Data collected and analyzed using approved methods and in accordance with strict QA/QC guidelines may be utilized for decision making with respect to designated use support status. All available data will be considered but may be used for prioritization, additional study, or revised monitoring.

I. Interpretation of Fecal Coliform Data in Use II, Shellfish Harvesting Areas

A. Restricted: Those areas restricted to shellfish harvesting because they do not meet water quality standards for Use II waters are listed in Category 4 or 5 (depending on whether a TMDL was completed or not) of the Integrated Report (IR). MDE uses routine bacteria water quality sampling to determine the presence and extent of shellfish harvesting restrictions. In order to support the shellfish harvesting designated use, the measured level of fecal coliform (expressed as MPN/100 ml) must have a median of less than 14 and a 90th percentile of less than 49, for a minimum of 30 samples.

1. Those areas restricted to shellfish harvesting because they are located in the vicinity of a wastewater treatment plant (WWTP) outfall but where there is no evidence of actual bacteriological impairment are NOT listed as impaired (in Category 4 or 5) in the IR. This restriction is an important application of the principals and practices of public health protection and is required under the NSSP. MDE also evaluates treatment plant performance and its impact to shellfish harvesting waters. These administrative closures are not based on water quality criteria but are designed to be protective buffer areas in case of a system failure. These areas meet the bacteriological portion of the standard.

2. The upper Chesapeake Bay is restricted to shellfish harvesting for administrative reasons and is not listed as impaired (Category 4 or 5 of the IR). This area is designated as Use II waters; however there is insufficient shellfish resource for harvesting due to the fresh water input from the Susquehanna River. Since there are no oysters or clams to harvest and the NSSP requirements for sanitary survey are not met, the area is classified as restricted. In order to protect shellfish waters directly below this area, the shellfish harvesting water designation is a valuable protective measure. Water quality is routinely monitored in this area for fecal coliform and meets the bacteriological portion of the standard. If the collected data shows violations with State standards (notwithstanding the fact that the area is under an administrative closure or restriction) it will be listed appropriately.

B. Conditionally Approved Waters: Before being opened for conditional harvesting, areas need to meet the stringent shellfish bacteriological standards. However, those areas classified as conditionally approved are closed to harvesting for three days following a rainfall event of greater than or equal to one inch in twenty-four hours. This occurs an average of 10 - 15 times per year when it is not completely

certain that bacterial levels are not elevated in response to rain. The rest of the time, these areas meet the water quality standards for Use II waters and are determined to support the designated use. These areas are not listed as impaired (Category 4 or 5) in the IR.

C. Approved Waters: Areas classified as approved for harvesting meet the water quality standards for Use II waters and are placed in Category 1 or 2 (meeting water quality standards) of the IR.

D. Shellfish Waters – Geographic Scale of Assessment
For the purposes of the Integrated Report, MDE will georeference shellfish harvesting impairments as polygonal bodies of water within the larger estuarine waters (i.e. Chesapeake Bay segments, Coastal Bays, etc). The shape of these 'polygonal' chunks of estuarine water will be determined by the spatial arrangement of monitoring stations and by nearby shoreline features.

II. Interpretation of Bacteria Data for Water Contact Recreation Use

A. Maryland has implemented the EPA recommended enterococcus (marine or freshwater and E. coli (freshwater only) standards for all waters except shellfish harvesting waters, where the more stringent FDA standard must be met.

According to EPA's Ambient Water Quality Criteria for Bacteria -1986, the indicators E. coli and enterococcus have been found through epidemiological studies to have the best quantifiable relationship between the density of an indicator in the water and the potential human health risks associated with swimming in sewage contaminated waters. "Indicator organisms are a fundamental monitoring tool used to measure both changes in environmental (water) quality or conditions and the potential presence of hard-to-detect pathogenic organisms. An indicator organism provides evidence of the potential presence or absence of a pathogenic organism that survives under similar physical, chemical, and nutrient conditions. (EPA Beach Guidance, June 2002).

Maryland's bacteria indicator criterion is a conservative measure, which protects the public from the potential risks associated with swimming and other primary contact recreation activities. A few high values of the indicators may or may not be indicative of impairment. Therefore, it is necessary to evaluate the results from indicator organisms from multiple sampling events over time to adequately quantify water quality conditions.

Maryland generally classifies recreational waters into two main divisions; beaches and other recreational waters. Beaches are typically monitored more frequently than other recreational waters due to the frequency of use. Sections II.B. and II.C. further describe the differences between these divisions. However, it is worth noting that, for the purposes of the Integrated Report, both recreational water divisions are assessed using the same protocols detailed in section II.D.

B. Beaches
Beaches are designated as "Beaches" from Memorial Day through Labor Day (Beach Season). During this period, beaches are monitored closely using a tiered approach based on risk to human health since these are places identified as areas where people are likely to swim. High, Medium, and Low priority beaches are monitored weekly, biweekly, and monthly, respectively. Low priority beaches will be re-

evaluated regularly to determine if they should be prioritized higher or removed from the list of beaches. This ensures that all beaches will have the necessary number of sampling events performed to adequately assess them.

MDE has delegated the authority for designating beaches, monitoring beaches, and notifying the public regarding beach water quality conditions to local health departments. Thus, local health departments can make administrative decisions to add or remove beaches based on the level of use. They must submit correspondence (form) to MDE when they elect to administratively add or remove beaches from MDE's list of beaches. When a local health department removes a beach from the list of beaches, it also effectively removes the beach from Category 4 or 5 of the IR, if the beach was previously listed as impaired. This is done to avoid having to monitor a waterbody for contact recreation support when, in reality, the waterbody is not used for such activity.

MDE's role in this process is to assure that beaches state-wide are managed uniformly. MDE maintains a database of all beaches in Maryland including latitude and longitude coordinates of the endpoints identifying the beach segment, sanitary survey information provided by the local health departments, and monitoring results (all beach monitoring samples are submitted to DHMH for laboratory analysis). This data, along with all other available data will be used to determine which areas are to be listed as impaired.

C. Other Waters (Not Beaches)

Other waters, besides designated beaches, may be assessed for the water contact recreation use. Such waters may include non-tidal flowing waters or portions of estuarine waters. The frequency of use as well as the scale of assessment for these waters can vary widely . Some examples of such waters included in the 2012 Integrated Report include the nontidal watersheds Double Pipe Creek and Anacostia River as well as the estuarine segments, Furnace and Marley Creek.

D. Assessing Support of Water Contact Recreation Use

The assessment methodology for water contact recreation use waters applies to both beaches and other recreational waters.

Step 1 - A steady state geometric mean will be calculated with available data from the previous year where there are at least 5 representative sampling events. The data shall be from samples collected during steady state, dry weather conditions and during the beach/swimming season (recognized as Memorial Day through Labor Day) to be representative of the critical condition (highest use). If the resulting steady state geometric mean is greater than 35 cfu/100 ml enterococci in marine/estuarine waters, 33 cfu/100 ml enterococci in freshwater or 126 cfu/100 ml E. coli in freshwater, the water body will be included for further assessment. If fewer than 5 representative sampling events for an area being assessed are available, data from the previous two years will be evaluated.

Step 2 – Once a preliminary list is assembled, a steady state geometric mean will be calculated with available data from the previous two (2) to five (5) years. The data shall be from samples collected during steady state, dry weather conditions and during the beach/swimming season (Memorial Day through Labor Day) to be representative of the critical condition (highest use). If the resulting geometric mean is greater than 35 cfu/100 ml enterococci in marine/estuarine waters, 33 cfu/100 ml enterococci in

freshwater or 126 cfu/100 ml E. coli in freshwater, the water body will be listed on Category 3 (insufficient information) of the IR as requiring more data.

Step 3 - Category 3 of the Integrated Report
Once waters are listed on Category 3 of the IR, a sanitary survey must be conducted to identify potential sources of pathogenic bacteria. If the sanitary survey identifies significant sources of pathogenic bacteria and they are not corrected before the end of the next listing cycle, the waters will be moved to Category 5 of the IR (impaired, TMDL required). If the sanitary survey is conducted and all potential sources of pathogenic bacteria are remedied, the waters will be moved from Category 3 to Category 2 (meeting this particular water quality criterion) of the IR. If a sanitary survey is not conducted before the next listing cycle, the waters will be moved from Category 3 to Category 5.

Step 4 - Category 5 of the Integrated Report (Impaired, TMDL required)
For waters listed under Category 5 of the IR, a sanitary survey must be conducted if it was not conducted before or after the waters were listed on Category 3 of the IR. A water body can be removed from Category 5 of the IR and placed in Category 2 if it meets both of the following conditions:
(a) it meets the steady state geometric mean standard referenced in Step 1 AND,
(b) a sanitary survey is conducted at the water body and there are no sources of pathogenic bacteria found, or if sources of pathogenic bacteria are remedied.

E. Geographic Scale of Assessment

Beaches - For the purposes of the Integrated Report, waters identified and assessed as beaches will be georeferenced as linear stretches of water, having only the dimension of length. As a result, the water body size reported for beaches will be expressed in miles. Since bathing beaches are typically narrow bands of water where water contact recreation occurs, this will help focus the georeferencing process to those areas of shoreline where beach access takes place.

Recreational Waters (not beaches) - Recreational waters, as the term is used here, generally refers to non-tidal flowing waters that may, from time to time, be used for full body contact recreation. For the purposes of the Integrated Report, when a bacterial monitoring station is assessed on non-tidal flowing waters, all upstream waters within the Maryland 8-digit watershed will be georeferenced as having the same assessment result. The only exception to this rule will be when there is an in-stream impoundment that significantly alters flow up and downstream of the dam. Recreational waters can also include tidal waters that may have had special assessments completed outside of the normal beach monitoring program. Waters such as the Baltimore Harbor and Marley Creek are two examples. Assessments for these waters will be based on the spatial arrangement of monitoring stations and any nearby shoreline features. As a result, the geographic depiction of these assessments will show a polygonal body of water.

III. Discussion

It is critical that the sampling be carried out in a way that is representative of conditions in time and space. Per EPA's Ambient Water Quality for Bacteria - 1986, the calculated "densities are for steady state dry weather conditions." A sampling event means samples taken at a beach, or other waterbody to

characterize bacterial concentrations with the number and placement of sampling stations sufficient to characterize conditions in the full extent of the beach area or waterbody. High spatial and temporal variability suggest that infrequent or moderately elevated bacteriological levels alone do not necessarily represent a human health risk or impairment. The bacteriological standard is descriptive and includes numerical criteria. The intent of the criteria is to allow the 'number' to be judged in conjunction with the sanitary survey that identifies probable sources of bacteria and allows regulators to assess the probability of human health risk. The standard recognizes the inherent variability of the bacterial measurement and recognizes the inadequacies of indicator organisms. The Most Probable Number (MPN) or Colonies Forming Units (CFU) test used to determine the level of bacteria is not a direct count but a statistical estimation subject to a high degree of variability.

C.2.2 Biological Assessment Methodology and the Biological Stressor Identification Process

The latest Biological Assessment Methodology is posted at: http://www.mde.maryland.gov/programs/water/tmdl/integrated303dreports/pages/programs/waterprograms/tmdl/maryland%20303%20dlist/ir_listing_methodologies.aspx. To find up-to-date information on Biological Stressor Identification (BSID) analyses please visit: http://www.mde.maryland.gov/programs/Water/TMDL/Pages/Programs/WaterPrograms/tmdl/bsid_studies.aspx. The Biological Assessment Methodology went essentially unchanged between the 2010 and 2012 IR cycles with the exception of adding language that clarifies an existing assessment rule. Specifically, when evaluating eight-digit watersheds, scenarios can occur where watersheds meet the minimum sample size for benthic index of biotic integrity (IBI) scores but not for fish IBI scores (sample size minimum ~8). This can occur due to a number of factors including sampling in headwater streams where benthic communities can thrive but which cannot support an adult fish community. In such cases, an assessment for the 8-digit watershed can be made using the benthic IBIs alone. If the opposite occurs, i.e. there were fewer valid benthic IBI scores and the number of fish IBI scores met the minimum sample size, the watershed would be placed in Category 3. This rule, though never explicitly stated in the biological assessment methodology has, in effect, been practiced since the first assessment methodology in 2002. The use of this rule is supported by studies of the variability of benthic IBIs and fish IBIs. In these studies (Currey et al.) it was shown that the coefficient of variation is generally smaller for benthic IBIs (9%) than for fish IBIs (13%). In other words, fish IBIs tend to be more variable due to factors such as mobility and the seasonal use of habitats while benthos appear to be more representative of localized conditions.

Another important change regarding the Biological Assessment Methodology and BSID analysis, is the use of Category 4C (impaired, pollution not caused by pollutant) for several non-pollutant impairments. In the 2010 IR, MDE implemented the BSID analysis approach to identify the cause of biological community degradation. As BSID analyses were completed, the generic "cause unknown" listings for non-tidal watersheds were replaced by listings for specific impairing pollutants.[6] Common pollutants identified were substances such as chlorides, sulfates, and nutrients. In 2012, several of these analyses, for select watersheds, indicated that at least a portion of the impact to biological communities could be

[6] Some assessments still remain on Category 5 for "cause unknown" due to biological evaluations. These watersheds have not yet undergone BSID analysis to determine the causal pollutants. Eventually, all biological evaluations will be replaced by listings for specific pollutants.

attributed to stream and riparian habitat modifications. More specifically, biological impacts were found to be due to lack of riparian stream buffering (having vegetated buffer areas, 50 meters) and channelization of stream banks (which includes the hardening of banks or even straightening of stream channels). As a result, the 2012 IR has 13 new Category 4c listings for channelization and 5 new Category 4c listings for lack of a riparian buffer. This marks the first time that Maryland has made use of this category. Table 6 shows those watersheds that received new Category 4C listings.

Table 6: New Category 4c (impaired, pollution not caused by a conventional pollutant) Assessments on the 2012 IR.

AU-ID	Basin Name	Category	Cause	Notes
MD-02130510	Upper Chester River	4c	Channelization	The Biostressor (BSID) analysis indicates that stream channelization due to agricultural ditching is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130802	Lower Gunpowder Falls	4c	Channelization	The Biostressor analysis indicates that stream channelization due to urban development is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130404	Upper Choptank River	4c	Channelization	The Biostressor (BSID) analysis indicates that stream channelization due to agricultural ditching is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130905	Gwynns Falls	4c	Channelization	The Biostressor analysis indicates that stream channelization due to urban development is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02140207	Cabin John Creek	4c	Channelization	The Biostressor analysis indicates that stream channelization due to urban development is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130901	Back River	4c	Channelization	The Biostressor analysis indicates that stream channelization due to urban development is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.

AU-ID	Basin Name	Category	Cause	Notes
MD-02141003	Wills Creek	4c	Channelization	The Biostressor analysis indicated that stream channelization due to agricultural ditching is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130906	Patapsco River Lower North Branch	4c	Channelization	The Biostressor analysis indicates that stream channelization due to urban development is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130704	Bynum Run	4c	Channelization	The Biostressor analysis indicates that stream channelization due to urban development is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130904	Jones Falls	4c	Channelization	The Biostressor analysis indicates that stream channelization due to urban development is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130306	Marshyhope Creek	4c	Channelization	The Biostressor analysis indicated that stream channelization due to agricultural ditching is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130203	Upper Pocomoke River	4c	Channelization	The Biostressor analysis indicates that stream channelization due to agricultural ditching is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02140205	Anacostia River	4c	Channelization	The Biostressor analysis indicates that stream channelization due to urban development is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130901	Back River	4c	Lack of Riparian Buffer	The Biostressor analysis indicates that the lack of a riparian buffer is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02140205	Anacostia River	4c	Lack of Riparian Buffer	The Biostressor analysis indicates that the lack of a riparian buffer is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings

AU-ID	Basin Name	Category	Cause	Notes
				(Category 5) for this watershed.
MD-02140302	Lower Monocacy River	4c	Lack of Riparian Buffer	The Biostressor analysis indicates that the lack of a riparian buffer is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02141002	Evitts Creek	4c	Lack of Riparian Buffer	The Biostressor analysis indicates that the lack of a riparian buffer is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.
MD-02130203	Upper Pocomoke River	4c	Lack of Riparian Buffer	The Biostressor analysis indicates that the lack of a riparian buffer is a major stressor affecting biological integrity in this watershed. NOTE: The BSID analysis also identified several other pollutant listings (Category 5) for this watershed.

Though these impairments will not be addressed through a total maximum daily load approach, they will be prioritized for future water quality improvement projects. Maryland has several programs for addressing habitat-related degradation due to inadequate riparian buffers and stream channelization. Both the 319 Nonpoint Source Program and the Chesapeake Bay and Atlantic Coastal Bays Trust Fund provide guidance and grant funding to organizations looking to reduce nonpoint sources of pollution (http://www.mde.maryland.gov/programs/water/319nonpointsource/pages/programs/waterprograms/319nps/index.aspx). In addition, MDE administers the Water Quality Revolving Loan Fund (WQRLF) that provides low interest loans to groups interested in completing stream restoration projects (http://www.mde.maryland.gov/programs/Water/QualityFinancing/DrinkingWaterRevolvingFund/Pages/Programs/WaterPrograms/Water_Quality_Finance/water_quality_fund/index.aspx). Lastly, the Maryland Department of Agriculture oversees several programs designed to help farmers implement conservation practices that improve riparian buffers. The Maryland Agriculture Water Quality Cost-Share (MACS) Program and Conservation Reserve Enhancement Program (CREP) are just two of those programs.

C.3 Assessment Results

There are 37 additions to the list of Category 5 waters in 2012. Twenty-four of these new Category 5 waterbody-pollutant combinations resulted from MDE's Biostressor Analyses. Of these 24 new 'biostressor' listings, nine are for total suspended solids, seven are for chlorides, another seven are for sulfates, and one is listed for total phosphorus. In addition, there are nine new fecal coliform listings in shellfish harvesting waters, two Chesapeake Bay segment listings as a result of updated bioassessments, and two new PCB listings for fish tissue. Table 7 below provides detailed information regarding these new listings.

Table 7: New Category 5 (impaired, may need a TMDL) Listings on the 2012 IR.

AU_ID	Basin_Name	Water_Type_Detail	Designated_Use	Cause
MD-02130306	Marshyhope Creek	1st thru 4th order streams	Aquatic Life and Wildlife	Total Suspended Solids (TSS)
MD-02130308	Transquaking River	1st thru 4th order streams	Aquatic Life and Wildlife	Total Suspended Solids (TSS)
MD-02130403	Lower Choptank River	1st thru 4th order streams	Aquatic Life and Wildlife	Total Suspended Solids (TSS)
MD-02130403	Lower Choptank River	1st thru 4th order streams	Aquatic Life and Wildlife	Phosphorus (Total)
MD-02130404	Upper Choptank River	1st thru 4th order streams	Aquatic Life and Wildlife	Total Suspended Solids (TSS)
MD-02130510	Upper Chester River	1st thru 4th order streams	Aquatic Life and Wildlife	Total Suspended Solids (TSS)
MD-02130802	Lower Gunpowder Falls	1st thru 4th order streams	Aquatic Life and Wildlife	Total Suspended Solids (TSS)
MD-02130802	Lower Gunpowder Falls	1st thru 4th order streams	Aquatic Life and Wildlife	Chlorides
MD-02130802	Lower Gunpowder Falls	1st thru 4th order streams	Aquatic Life and Wildlife	Sulfates
MD-02130901	Back River	1st thru 4th order streams	Aquatic Life and Wildlife	Total Suspended Solids (TSS)
MD-02130901	Back River	1st thru 4th order streams	Aquatic Life and Wildlife	Chlorides
MD-02130901	Back River	1st thru 4th order streams	Aquatic Life and Wildlife	Sulfates
MD-02130903-Stansbury_Pond	Baltimore Harbor Watershed	Impoundments	Fishing	PCB in Fish Tissue
MD-02130907	Liberty Reservoir	1st thru 4th order streams	Aquatic Life and Wildlife	Chlorides
MD-02131004	West River	1st thru 4th order streams	Aquatic Life and Wildlife	Total Suspended Solids (TSS)
MD-02131004	West River	1st thru 4th order streams	Aquatic Life and Wildlife	Sulfates
MD-02131105	Little Patuxent River	1st thru 4th order streams	Aquatic Life and Wildlife	Chlorides
MD-02140202-Wadeable_Streams	Potomac River Montgomery County	1st thru 4th order streams	Aquatic Life and Wildlife	Chlorides
MD-02140202-Wadeable_Streams	Potomac River Montgomery County	1st thru 4th order streams	Aquatic Life and Wildlife	Sulfates
MD-02140205	Anacostia River	1st thru 4th order streams	Aquatic Life and Wildlife	Chlorides
MD-02140205	Anacostia River	1st thru 4th order streams	Aquatic Life and Wildlife	Sulfates
MD-02140501-Dam4-5	Potomac River Washington County	River Mainstem	Fishing	PCB in Fish Tissue

AU_ID	Basin_Name	Water_Type_Detail	Designated_Use	Cause
MD-02140501-Wadeable_Streams	Potomac River Washington County	1st thru 4th order streams	Aquatic Life and Wildlife	Chlorides
MD-02140501-Wadeable_Streams	Potomac River Washington County	1st thru 4th order streams	Aquatic Life and Wildlife	Sulfates
MD-02141005-Wadeable_Streams	Upper North Branch Potomac River	1st thru 4th order streams	Aquatic Life and Wildlife	Sulfates
MD-05020203	Deep Creek Lake	1st thru 4th order streams	Aquatic Life and Wildlife	Total Suspended Solids (TSS)
MD-CHOMH1-Broad_Creek	Lower Choptank River	Tidal Shellfish Area	Shellfishing	Fecal Coliform
MD-CHOMH1-Edge_Creek	Lower Choptank River	Tidal Shellfish Area	Shellfishing	Fecal Coliform
MD-CHOMH1-San_Domingo_Creek_mainstem	Lower Choptank River	Tidal Shellfish Area	Shellfishing	Fecal Coliform
MD-CHOMH2-Jenkins_Creek	Lower Choptank River	Tidal Shellfish Area	Shellfishing	Fecal Coliform
MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Aquatic Life and Wildlife	Cause Unknown
MD-LCHMH-Little_Choptank_River	LCHMH - Little Choptank River Mesohaline	Tidal Shellfish Area	Shellfishing	Fecal Coliform
MD-MAGMH-Deep_Creek	MAGMH - Magothy River Mesohaline	Tidal Shellfish Area	Shellfishing	Fecal Coliform
MD-PAXMH-BUZZARD_ISLAND_CREEK	PAXMH - Lower Patuxent River Mesohaline	Tidal Shellfish Area	Shellfishing	Fecal Coliform
MD-PAXOH-PATUXENT_RIVER	PAXOH - Middle Patuxent River Oligohaline	Tidal Shellfish Area	Shellfishing	Fecal Coliform
MD-TANMH	TANMH - Tangier Sound Mesohaline	Chesapeake Bay segment	Aquatic Life and Wildlife	Cause Unknown
MD-TANMH-Daugherty_Creek	TANMH - Tangier Sound Mesohaline	Tidal Shellfish Area	Shellfishing	Fecal Coliform

Based on Maryland's assessment methodology for combined sewer overflows (CSO) and sanitary sewer overflows (SSO), if any water body segment has received more than two spills greater than 30,000 gallons over a 12-month period that water body will be considered impaired. This is applied only in the absence of bacterial monitoring data; if such monitoring data are available, the decision methodology for bacteria will apply. Table 8 and 9 describe the pertinent overflow events. Though not all of these bacterial impairments are captured in the IR database, these tables serve as record of their impairment.

Table 8: Summary of combined sewer overflows (CSO) that occurred 3 or more times over the past 5 years.

Receiving Waters	NPDES Permit	# Exceedences (≥30,000 gallons) from 2007 thru 2011	City/County	Consent Decree	IR Status for Bacteria
Evitts Creek	MD0021598	18	City of Cumberland/Allegany County	✓	Not listed
North Branch Potomac River	MD0021598	608	City of Cumberland/Allegany County	✓	Not listed
Wills Creek	MD0021598	109	City of Cumberland/Allegany County	✓	Listed and TMDL complete
Choptank River	MD0021636	352	City of Cambridge/Dorchester	✓	Multiple shellfish areas listed with TMDLs complete
Braddock Run	MD0067547	160	La Vale/Allegany	✓	Listed – tributary to Wills Creek
George's Creek	MD0067384	41	Westernport/Allegany	✓	Listed and TMDL complete
George's Creek	MD0067407	125	Dept. Public Works/Allegany	✓	Listed and TMDL complete
George's Creek	MD0067423	79	Frostburg/Allegany	✓	Listed and TMDL complete
Jennings Run	MD0067423	6	Frostburg/Allegany	✓	Listed under Wills Cr. And TMDL complete
Sand Spring Run	MD0067423	14	Frostburg/Allegany	✓	Listed and TMDL complete

Table 9: Summary of sanitary sewer overflows (SSO) that occurred 3 or more times over the past 5 years resulting fromteh same facility or occurring within the same jurisdiction.

Receiving Waters	Owner of Collection System	# Exceedences (≥30,000 gallons) from 2007 thru 2011	City/County	Consent Decree	IR Status for Bacteria
Anacostia River	Washington Suburban Sanitation Commission	3	Prince George's County	✓	Listed and TMDL complete
Broad Creek	Washington Suburban Sanitation Commission	17	Prince George's County	✓	Not listed
C&D Canal	Chesapeake City	4	Cecil County/Chesapeake City		Not listed
Chesapeake Bay	Calvert County DPW	5	Calvert County/Chesapeake Beach		Not listed
Conocheague Creek	Washington County Dept. of Water Quality	3	Washington County/Williamsport		Listed and TMDL complete
Evitts Creek	Allegany County	15	City of Cumberland/Allegany County	✓	Not listed
Falls Creek	Washington County	7	Washington County		Listed and TMDL complete

Receiving Waters	Owner of Collection System	# Exceedences (≥30,000 gallons) from 2007 thru 2011	City/County	Consent Decree	IR Status for Bacteria
George's Creek	Allegany County	19	Allegany County	✓	Listed and TMDL complete
Gwynns Falls	Baltimore City	60	Baltimore City	✓	Listed and TMDL complete
Herring Run	Baltimore City	32	Baltimore City	✓	Listed and TMDL complete
Hunting Creek	Town of Thurmont	5	Thurmont/Frederick County		Listed and TMDL complete
Jennings Run	Allegany County	43	Allegany County	✓	Listed under Wills Cr. and TMDL complete
Jones Falls	Baltimore City	23	Baltimore City	✓	Listed and TMDL complete
Little Patuxent River	Piney Orchard Advance WWTP (MES)	3	Piney Orchard/Anne Arundel Co.		Listed on Category 3
Maiden Choice Creek	Baltimore County	49	Baltimore County	✓	Listed and TMDL Complete
North Branch Potomac River	Allegany County (Cresaptown Pumping Station)	54	Allegany County	✓	Not listed
Northeast Creek	Baltimore County	8	Baltimore County	✓	Not listed
Patapsco (Inner Harbor)	Baltimore City	4	Baltimore City	✓	Listed on Category 5
Patapsco River	Baltimore County DPW	7	Baltimore County	✓	Listed and TMDL Complete
Pea Vine Run	Allegany County (Mill Run Pump Station)	40	City of Cumberland/Allegany County	✓	Not listed
Piscataway Creek	Washington Suburban Sanitation Commission	11	Prince George' County	✓	Listed and TMDL complete
Port Tobacco River	Town of La Plata	4	Town of La Plata/Charles County	✓	Listed on Category 5
Stemmers Run	Baltimore County DPW	6	Baltimore County	✓	Not Listed
Warrior Run	Allegany County	34	Allegany County	✓	Listed in Category 3
Western Branch	Washington Suburban Sanitation Commission	7	Prince George's County	✓	Not listed
Wills Creek	Allegany County	46	Allegany County	✓	Listed and TMDL complete

There were a total of thirty-four waterbody-pollutant combinations removed from Category 5 in 2012, Table 10. Twenty one of these were generic biological listings (cause unknown) that did not specify a particular pollutant or stressor as the cause of impairment. These listings have now been replaced by specific pollutant/stressor listings enumerated by the Biological Stressor Identification analyses, Table 12.

The remaining thirteen delistings resulted from Water Quality Analyses, reassessments using newer data, or a refined assessment scale. Water Quality Analyses (WQA) are completed when State scientists collect detailed information for a listed water body in anticipation of a TMDL and find that the water body is not impaired. New assessments or reassessments are simply a reanalysis of more recent water quality data collected by ongoing monitoring and assessment programs. Three of the remaining thirteen delistings (MD-05020203, MD-05020203-Deep_Creek_Lake, MD-02140501) resulted from recently completed total phosphorus WQAs. Another two listings (MD-EASMH-Miles_River2 and MD-EASMH-Hunting_Creek), for fecal coliform, were delisted because recently collected monitoring data indicated attainment of the shellfish harvesting designated use. Two more listings (MD-CHSMH and MD-CHOMH2) came off Category 5 due to new estuarine bioassessments showing aquatic life use support. The Middle Patuxent River (MD-02131106) and the Chesapeake Bay Oligohaline waters (MD-CB2OH) were delisted for total suspended solids, based on a WQA and on new water clarity data, respectively.

An additional two delistings (MD-02130906 and MD-02140501-Dam3-4) occurred as a result of refining the assessment unit scale used for assessing PCB levels in fish tissue. For both the Patapsco River Lower North Branch (MD-02130906) and the Potomac River Washington County (MD-02140501-Dam3-4), data from multiple sampling locations was disaggregated in order to establish more site-specific assessments. This caused certain portions of the Patapsco Lower North Branch and Potomac River to be delisted while other portions remained on the list. This action improved the geographic specificity of the impaired and non-impaired portions of the rivers and provided a more realistic calculation of the stream miles in Categories 2 and 5. Seneca Creek (MD-02140208) was delisted for ammonia after a more extensive data analysis was completed. This analysis used 338 sample results collected from 41 stations in the Seneca Creek watershed to determine that ammonia levels were not exceeding ammonia water quality criteria. Lastly, in one uncommon scenario, the Atkisson Reservoir total phosphorus impairment was moved to Category 3 (insufficient data to determine impairment) after conducting a comprehensive search of historical data and finding no current conclusive evidence of an impairment. Atkisson Reservoir will be prioritized for future monitoring to properly assess for nutrient enrichment.

Table 10: New Delistings for 2012 (removed from Category 5).

ID	AU_ID	Basin Name	Basin_Code	Water Type	Designated Use	Cause	Summary Rationale for Delisting of Segment-Pollutant Combinations*
2159	MD-02140208	Seneca Creek	02140208	RIVER	Aquatic Life and Wildlife	Ammonia (Total)	1
1474	MD-02130306	Marshyhope Creek	02130306	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
410	MD-02140304	Double Pipe Creek	02140304	RIVER	Aquatic Life and Wildlife	Cause Unknown	5

ID	AU_ID	Basin Name	Basin_Code	Water Type	Designated Use	Cause	Summary Rationale for Delisting of Segment-Pollutant Combinations*
1572	MD-02130907	Liberty Reservoir	02130907	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
521	MD-02140206	Rock Creek	02140206	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
1536	MD-02130510	Upper Chester River	02130510	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
1459	MD-02130203	Upper Pocomoke River	02130203	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
381	MD-02140205	Anacostia River	02140205	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
552	MD-02130404	Upper Choptank River	02130404	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
961	MD-02141005	Upper North Branch Potomac River	02141005	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
333	MD-02140302	Lower Monocacy River	02140302	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
356	MD-02140305	Catoctin Creek	02140305	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
711	MD-02130802	Lower Gunpowder Falls	02130802	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
386	MD-02130901	Back River	02130901	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
1483	MD-02130308	Transquaking River	02130308	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
1586	MD-02131004	West River	02131004	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
1494	MD-02130403	Lower Choptank River	02130403	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
1115	MD-02131105	Little Patuxent River	02131105	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
360	MD-02140501	Potomac River Washington County	02140501	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
1558	MD-02130704	Bynum Run	02130704	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
541	MD-05020203	Deep Creek Lake	05020203	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
1466	MD-02140202	Potomac River Montgomery County	02140202	RIVER	Aquatic Life and Wildlife	Cause Unknown	5
1747	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	02130505, 02130506, 02130507	ESTUARY	Aquatic Life and Wildlife	Cause Unknown	1
1104	MD-CHOMH2	CHOMH2 - Choptank River Mesohaline mouth 2	02130403	ESTUARY	Aquatic Life and Wildlife	Cause Unknown	1

ID	AU_ID	Basin Name	Basin_Code	Water Type	Designated Use	Cause	Summary Rationale for Delisting of Segment-Pollutant Combinations*
1175	MD-EASMH-Hunting_Creek	Miles River	02130502	ESTUARY	Shellfishing	Fecal Coliform	1
1702	MD-EASMH-Miles_River2	Miles River	02130502	ESTUARY	Shellfishing	Fecal Coliform	1
2031	MD-02140501-Dam3-4	Potomac River Washington County	02140501	RIVER	Fishing	PCB in Fish Tissue	1
2028	MD-02130906	Patapsco River Lower North Branch	02130906	RIVER	Fishing	PCB in Fish Tissue	1
286	MD-02140501	Potomac River Washington County	02140501	RIVER	Aquatic Life and Wildlife	Phosphorus (Total)	1
338	MD-05020203-Deep_Creek_Lake	Deep Creek Lake	05020203	IMPOUNDMENT	Aquatic Life and Wildlife	Phosphorus (Total)	1
324	MD-05020203	Deep Creek Lake	05020203	RIVER	Aquatic Life and Wildlife	Phosphorus (Total)	1
129	MD-021307031132-Atkisson_Reservoir	Atkisson Reservoir	02130703	IMPOUNDMENT	Aquatic Life and Wildlife	Phosphorus (Total)	2
222	MD-02131106	Middle Patuxent River	02131106	RIVER	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	1
1222	MD-CB2OH	CB2OH - Northern Chesapeake Bay Oligohaline	02139996, 02139997, 02130611, 02130705, 02130701	ESTUARY	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	1

*Table 10 does not include waterbody-pollutant combinations for which a TMDL was established. This table also does not include those listings in Category 4c (impaired, pollution not caused by a pollutant). The new Category 4c listings are provided in Table 6.

Table 11: Key for the last column in Table 10.

*Summary Rationale for Delisting of Segment/Pollutant Combinations	Explanation
1	State determines water quality standard is being met
2	Flaws in original listing
3	Other point source or nonpoint source controls are expected to meet water quality standards
4	Impairment due to non-pollutant
5	Original listing was based on a bioassessment, specific pollutants are now identified in place of biological listing

Table 12: Watersheds listed previously as biologically impaired that have now had a BSID analysis completed. Some of these were addressed during the 2012 IR.

8-digit Watersheds that Previously were in Category 5 based on impaired biological communities (cause unknown)	Stressors Identified	IR Category	Attributable Risk
Anacostia River	Total Suspended Solids	4a	73%
	Chlorides	5	47%
	Sulfates	5	14%
	Channelization	4c	57%
	Lack of Riparian Buffer	4c	27%
Back River	Total Suspended Solids	5	85%
	Chlorides	5	83%
	Sulfates	5	96%
	Channelization	4c	45%
	Lack of Riparian Buffer	4c	69%
Bynum Run	Total Suspended Solids	4a	37%
	Channelization	4c	41%
Catoctin Creek	Phosphorus (Total)	5	82%
Deep Creek Lake	pH, Low	4a	45%

8-digit Watersheds that Previously were in Category 5 based on impaired biological communities (cause unknown)	Stressors Identified	IR Category	Attributable Risk
	Total Suspended Solids	5	91%
Double Pipe Creek	Total Suspended Solids	4a	75%
	Phosphorus (Total)	5	78%
Liberty Reservoir	Chlorides	5	55%
Little Patuxent River	Total Suspended Solids	4a	84%
	Chlorides	5	39%
Lower Choptank River	Total Suspended Solids	5	79%
	Phosphorus (Total)	5	84%
Lower Gunpowder Falls	Total Suspended Solids	5	61%
	Chlorides	5	45%
	Sulfates	5	46%
	Channelization	4c	39%
Lower Monocacy River	Total Suspended Solids	4a	71%
	Lack of Riparian Buffer	4c	27%
Marshyhope Creek	Total Suspended Solids	5	32%
	Channelization	4c	47%
Potomac River Montgomery County	Total Suspended Solids	5	85%
	Chlorides	5	30%
	Sulfates	5	14%
Potomac River Wash Co	Total Suspended Solids	4a	73%
	Chlorides	5	19%
	Sulfates	5	14%
Potomac Upper North Branch	pH, Low	4a	32%
	Sulfates	5	71%

8-digit Watersheds that Previously were in Category 5 based on impaired biological communities (cause unknown)	Stressors Identified	IR Category	Attributable Risk
Rock Creek	Total Suspended Solids	4a	78%
Transquaking River	Total Suspended Solids	5	59%
Upper Chester River	Total Suspended Solids	5	33%
	Channelization	4c	59%
Upper Choptank River	Total Suspended Solids	5	70%
	Channelization	4c	67%
Upper Pocomoke River	Total Suspended Solids	5	84%
	Phosphorus (Total)	5	94%
	Channelization	4c	46%
	Lack of Riparian Buffer	4c	49%
West River	Total Suspended Solids	5	90%
	Sulfates	5	63%

Also new in 2012, one[7] Category 4b (impaired, no TMDL needed as other pollution control requirements are expected to bring about compliance) listing for the Patapsco River was removed from the IR. This listing was related to a specific industrial source and originated from the 304(l) lists created in the 1980's. This record was then erroneously carried over into the initial 303(d) List for Maryland and persisted thereafter. After reevaluating the historical information for this listing and the associated facility, it was determined that it was inappropriate to maintain this record on Maryland's IR. The rationale behind this decision centers around three major points. First, the facility implicated in this listing, Erachem Comilog, Inc, does not use mercury anywhere in its industrial processes. Secondly, effluent data collected between 1997 and 2003 shows that mercury was rarely even detected in the discharge (and in all cases was below the water quality

[7] In the Draft 2012 IR, Maryland proposed removing three other Category 4b assessments. Following discussions with EPA during the public comment period, only the mercury assessment was removed. The other three Category 4b listings (for copper, cyanide, and nickel) will remain on the IR and be addressed at a later date.

criterion). Thirdly, Department data on fish-tissue concentrations of mercury in the Patapsco River show levels well below the fish consumption criteria. For these reasons, the Department has removed this listing from the IR (Table 13).

Table 13: Category 4b Listings removed from the 2012 IR.

Cycle First Listed	Assessment Unit ID	Basin Name	Basin Code	Water Type	Water Type Detail	Designated Use	Listing Category	Cause	Notes
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	02130903	ESTUARY	Point source discharge	Aquatic Life and Wildlife	4b	Mercury	ICS Listing - Chemetals is currently known as Erachem.

C.3.1 Total Maximum Daily Loads (TMDL)

Maryland continues to make progress completing TMDLs for waters listed as impaired on Category 5 of the IR. Total Maximum Daily Loads determine the sources of pollution for an identified impairment as well as the estimated reductions necessary to bring the water body back into compliance with Water Quality Standards. Once Maryland completes a TMDL for a water body-pollutant combination, it must then be approved by EPA, in order to take force. When this has occurred, the water body-pollutant combination will get moved to Category 4a on the IR.

The completion of EPA's Chesapeake Bay TMDL in December 2010 addressed 53 distinct water body segments (in Maryland) with nutrient and/or sediment impairments.[8] In all, 139 of Maryland's water body-designated use-pollutant combinations were moved from Category 5 to Category 4a. In several cases, these new TMDLs coincided with geographic areas already addressed by previously approved nutrient TMDLs. Some examples of this include the Sassafras River (02130610), Back River (02130901), and Mattawoman Creek (02140111). As a result, Maryland is re-examining these older nutrient TMDLs in comparison to the new Chesapeake Bay nutrient TMDLs to determine which should be used in force. The final decisions will be captured in a rationale document that will undergo its own public review period. Until that time, the previously developed tidal nutrient TMDLs will remain effective. For those tidal segments that did not previously have a TMDL, the Chesapeake Bay TMDL will act in force. Please contact MDE's TMDL Program for more information (Thomas Thornton, tthornton@mde.state.md.us). Table 14 lists the waterbodies with TMDLs completed since the last IR cycle. This list includes waters included in the Chesapeake Bay TMDL.

Table 14: Recently Approved TMDLs in Category 4a of the IR. This list includes Chesapeake Bay segment TMDLs. This list does not include any TMDLs that were captured on the 2010 IR.

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2004	MD-02130510-Millington_Wildlife_Ponds	Upper Chester River	Impoundments	Fishing	Mercury in Fish Tissue	Atmospheric Deposition - Toxics
1996	MD-02130704	Bynum Run	Non-tidal 8-digit watershed	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Unspecified Urban Stormwater
1996	MD-02130904	Jones Falls	Non-tidal 8-digit watershed	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Urban Runoff/Storm Sewers
1996	MD-02130906	Patapsco River Lower North Branch	Non-tidal 8-digit watershed	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Urban Runoff/Storm Sewers

[8] The Chesapeake Bay TMDL actually established multiple TMDLs to address each of the 53 segments in Maryland.

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-02131104	Patuxent River upper	Non-tidal 8-digit watershed	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Urban Runoff/Storm Sewers
2008	MD-02131104	Patuxent River upper	Non-tidal Segment(s)	Water Contact Sports	Escherichia coli	Livestock (Grazing or Feeding Operations)
2004	MD-021311040938-Cash_Lake	Patuxent River upper	Impoundments	Fishing	Mercury in Fish Tissue	Atmospheric Deposition - Toxics
1996	MD-02131105	Little Patuxent River	Non-tidal 8-digit watershed	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Urban Runoff/Storm Sewers
2006	MD-02140205	Anacostia River	Non-tidal 8-digit watershed	Water Contact Sports	Debris/Floatables/Trash	Inappropriate Waste Disposal
2002	MD-02140205-Northeast_Northwest_Branches	Anacostia River	River Mainstem	Fishing	Polychlorinated biphenyls	Urban Runoff/Storm Sewers
1996	MD-02140206	Rock Creek	Non-tidal 8-digit watershed	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Urban Runoff/Storm Sewers
1996	MD-02140207	Cabin John Creek	Non-tidal 8-digit watershed	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Urban Runoff/Storm Sewers
1996	MD-02140208	Seneca Creek	Non-tidal 8-digit watershed	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Urban Runoff/Storm Sewers
1996	MD-02140501	Potomac River Washington County	Non-tidal 8-digit watershed	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Agriculture
2008	MD-021410050039-Laurel_Run	Upper North Branch Potomac River	Subwatershed	Aquatic Life and Wildlife	Iron	Acid Mine Drainage
2012	MD-021410050039-Laurel_Run	Upper North Branch Potomac River	Subwatershed	Aquatic Life and Wildlife	Aluminum	Acid Mine Drainage
2008	MD-021410050048-Three_Forks_Run	Upper North Branch Potomac River	Subwatershed	Aquatic Life and Wildlife	Iron	Acid Mine Drainage
2008	MD-021410050048-Three_Forks_Run	Upper North Branch Potomac River	Subwatershed	Aquatic Life and Wildlife	Aluminum	Acid Mine Drainage
2012	MD-02141005-Mainstem_aboveJR_Lake	Upper North Branch Potomac River	Non-tidal Segment(s)	Aquatic Life and Wildlife	Iron	Acid Mine Drainage

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2006	MD-ANATF	ANATF - Anacostia River Tidal Fresh	Chesapeake Bay segment	Water Contact Sports	Debris/Floatables/Trash	Inappropriate Waste Disposal
1996	MD-BACOH	BACOH - Back River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Municipal Point Source Discharges
1996	MD-BACOH	BACOH - Back River Oligohaline	Chesapeake Bay segment	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Source Unknown
1996	MD-BACOH	BACOH - Back River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Municipal Point Source Discharges
1996	MD-BACOH	BACOH - Back River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Municipal Point Source Discharges
1996	MD-BACOH	BACOH - Back River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Municipal Point Source Discharges
2008	MD-BIGMH	BIGMH - Big Annemessex River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-BOHOH	BOHOH - Bohemia River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Agriculture
1996	MD-BOHOH	BOHOH - Bohemia River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Agriculture
1996	MD-BOHOH	BOHOH - Bohemia River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
2002	MD-BOHOH	BOHOH - Bohemia River Oligohaline	Chesapeake Bay segment	Fishing	PCB in Fish Tissue	Upstream/Downstream Source
1996	MD-BOHOH	BOHOH - Bohemia River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
1996	MD-BSHOH	BSHOH - Bush River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2012	MD-BSHOH	BSHOH - Bush River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-BSHOH	BSHOH - Bush River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-BSHOH	BSHOH - Bush River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
2012	MD-C&DOH	C&DOH - C&D Canal Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-C&DOH	C&DOH - C&D Canal Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-C&DOH	C&DOH - C&D Canal Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-C&DOH	C&DOH - C&D Canal Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-CB1TF	CB1TF - Northern Chesapeake Bay Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-CB1TF	CB1TF - Northern Chesapeake Bay Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-CB1TF	CB1TF - Northern Chesapeake Bay Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2012	MD-CB1TF	CB1TF - Northern Chesapeake Bay Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-CB2OH	CB2OH - Northern Chesapeake Bay Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2012	MD-CB2OH	CB2OH - Northern Chesapeake Bay Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-CB2OH	CB2OH - Northern Chesapeake Bay Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-CB2OH	CB2OH - Northern Chesapeake Bay Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
2012	MD-CB3MH	CB3MH - Upper Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2008	MD-CB3MH	CB3MH - Upper Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-CB3MH	CB3MH - Upper Chesapeake Bay Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-CB3MH	CB3MH - Upper Chesapeake Bay Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-CB3MH	CB3MH - Upper Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-CB3MH	CB3MH - Upper Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Phosphorus (Total)	Source Unknown
2012	MD-CB3MH	CB3MH - Upper Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-CB3MH	CB3MH - Upper Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-CB3MH	CB3MH - Upper Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Nitrogen (Total)	Source Unknown
1996	MD-CB4MH	CB4MH - Middle Chesapeake Bay Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-CB4MH	CB4MH - Middle Chesapeake Bay Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-CB4MH	CB4MH - Middle Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-CB4MH	CB4MH - Middle Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-CB4MH	CB4MH - Middle Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Phosphorus (Total)	Source Unknown
1996	MD-CB4MH	CB4MH - Middle Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Nitrogen (Total)	Source Unknown
1996	MD-CB4MH	CB4MH - Middle Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2008	MD-CB5MH	CB5MH - Lower Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-CB5MH	CB5MH - Lower Chesapeake Bay Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-CB5MH	CB5MH - Lower Chesapeake Bay Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-CB5MH	CB5MH - Lower Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-CB5MH	CB5MH - Lower Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Phosphorus (Total)	Source Unknown
1996	MD-CB5MH	CB5MH - Lower Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Nitrogen (Total)	Source Unknown
1996	MD-CB5MH	CB5MH - Lower Chesapeake Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-CHOMH1	CHOMH1 - Choptank River Mesohaline mouth 1	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-CHOMH1	CHOMH1 - Choptank River Mesohaline mouth 1	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-CHOMH1	CHOMH1 - Choptank River Mesohaline mouth 1	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-CHOMH1	CHOMH1 - Choptank River Mesohaline mouth 1	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-CHOMH1	CHOMH1 - Choptank River Mesohaline mouth 1	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-CHOMH2	CHOMH2 - Choptank River Mesohaline 2	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-CHOMH2	CHOMH2 - Choptank River Mesohaline 2	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-CHOMH2	CHOMH2 - Choptank River Mesohaline 2	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
2012	MD-CHOMH2	CHOMH2 - Choptank River Mesohaline 2	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-CHOMH2	CHOMH2 - Choptank River Mesohaline 2	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-CHOOH	CHOOH - Choptank River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2008	MD-CHOOH	CHOOH - Choptank River Oligohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-CHOOH	CHOOH - Choptank River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-CHOOH	CHOOH - Choptank River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-CHOOH	CHOOH - Choptank River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-CHOTF	CHOTF - Upper Choptank River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-CHOTF	CHOTF - Upper Choptank River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-CHOTF	CHOTF - Upper Choptank River Tidal Fresh	Chesapeake Bay segment	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Source Unknown
2012	MD-CHOTF	CHOTF - Upper Choptank River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-CHOTF	CHOTF - Upper Choptank River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2008	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Phosphorus (Total)	Source Unknown
2012	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-CHSMH	CHSMH - Lower Chester River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Nitrogen (Total)	Source Unknown
2002	MD-CHSMH-02130507	Corsica River	Tidal subsegment	Fishing	PCB in Fish Tissue	Upstream/Downstream Source

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-CHSOH	CHSOH - Middle Chester River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
2010	MD-CHSOH	CHSOH - Middle Chester River Oligohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-CHSOH	CHSOH - Middle Chester River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
1996	MD-CHSTF	CHSTF - Upper Chester River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
1996	MD-CHSTF	CHSTF - Upper Chester River Tidal Fresh	Chesapeake Bay segment	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Source Unknown
1996	MD-CHSTF	CHSTF - Upper Chester River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
1996	MD-CHSTF-Duck_Neck_Beach	Upper Chester River	Public Beach	Water Contact Sports	Enterococcus	Source Unknown
1996	MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2008	MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Phosphorus (Total)	Source Unknown
1996	MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2012	MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Nitrogen (Total)	Source Unknown
2012	MD-EASMH	EASMH - Eastern Bay Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2012	MD-ELKOH	ELKOH - Elk River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-ELKOH	ELKOH - Elk River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-ELKOH	ELKOH - Elk River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-ELKOH	ELKOH - Elk River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-GUNOH	GUNOH - Gunpowder River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2010	MD-GUNOH	GUNOH - Gunpowder River Oligohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
2012	MD-GUNOH	GUNOH - Gunpowder River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-GUNOH	GUNOH - Gunpowder River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2012	MD-GUNOH	GUNOH - Gunpowder River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-HNGMH	HNGMH - Honga River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-HNGMH	HNGMH - Honga River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-HNGMH	HNGMH - Honga River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2008	MD-LCHMH	LCHMH - Little Choptank River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-LCHMH	LCHMH - Little Choptank River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-LCHMH	LCHMH - Little Choptank River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-MAGMH	MAGMH - Magothy River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-MAGMH	MAGMH - Magothy River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-MAGMH	MAGMH - Magothy River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-MAGMH	MAGMH - Magothy River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
2012	MD-MAGMH	MAGMH - Magothy River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-MAGMH	MAGMH - Magothy River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2012	MD-MAGMH	MAGMH - Magothy River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-MANMH	MANMH - Manokin River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
1996	MD-MANMH	MANMH - Manokin River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
2012	MD-MANMH	MANMH - Manokin River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Agriculture
2012	MD-MANMH	MANMH - Manokin River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Agriculture
1996	MD-MANMH	MANMH - Manokin River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
1996	MD-MATTF	MATTF - Mattawoman Creek Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Urban Runoff/Storm Sewers
1996	MD-MATTF	MATTF - Mattawoman Creek Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
1996	MD-MATTF	MATTF - Mattawoman Creek Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
1996	MD-MATTF	MATTF - Mattawoman Creek Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Urban Runoff/Storm Sewers
1996	MD-MIDOH	MIDOH - Middle River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-MIDOH	MIDOH - Middle River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-MIDOH	MIDOH - Middle River Oligohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-MIDOH	MIDOH - Middle River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-MIDOH	MIDOH - Middle River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2008	MD-NANMH	NANMH - Lower Nanticoke River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
2012	MD-NANOH	NANOH - Upper Nanticoke River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-NANOH	NANOH - Upper Nanticoke River Oligohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
2008	MD-NANOH	NANOH - Upper Nanticoke River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2008	MD-NANOH	NANOH - Upper Nanticoke River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-NANOH	NANOH - Upper Nanticoke River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
2012	MD-NANTF	NANTF - Upper Nanticoke River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
2006	MD-NANTF	NANTF - Upper Nanticoke River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2006	MD-NANTF	NANTF - Upper Nanticoke River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-NANTF	NANTF - Upper Nanticoke River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-NORTF	NORTF - North East River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Agriculture
2006	MD-NORTF	NORTF - North East River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
2006	MD-NORTF	NORTF - North East River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Agriculture
2002	MD-NORTF	NORTF - North East River Tidal Fresh	Chesapeake Bay segment	Fishing	PCB in Fish Tissue	Upstream/Downstream Source
1996	MD-NORTF	NORTF - North East River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	Non-navigation Channel Areas	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Municipal Point Source Discharges
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	Non-navigation Channel Areas	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Municipal Point Source Discharges
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	Non-navigation Channel Areas	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Municipal Point Source Discharges
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	Non-navigation Channel Areas	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Municipal Point Source Discharges
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	SAV Grow Zone	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	Non-navigation Channel Areas	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Municipal Point Source Discharges

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	Non-navigation Channel Areas	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Municipal Point Source Discharges
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	Navigation Channel	Seasonal Deep-Channel Refuge Use	Nitrogen (Total)	Source Unknown
1996	MD-PATMH	PATMH - Patapsco River Mesohaline	Navigation Channel	Seasonal Deep-Channel Refuge Use	Phosphorus (Total)	Source Unknown
1998	MD-PATMH-FURNACE_CREEK	PATMH - Patapsco River Mesohaline	Subwatershed	Water Contact Sports	Enterococcus	Wildlife Other than Waterfowl
1998	MD-PATMH-MARLEY_CREEK	PATMH - Patapsco River Mesohaline	Subwatershed	Water Contact Sports	Enterococcus	Wastes from Pets
1996	MD-PAXMH	PAXMH - Lower Patuxent River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-PAXMH	PAXMH - Lower Patuxent River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-PAXMH	PAXMH - Lower Patuxent River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-PAXMH	PAXMH - Lower Patuxent River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-PAXMH	PAXMH - Lower Patuxent River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-PAXMH	PAXMH - Lower Patuxent River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-PAXMH	PAXMH - Lower Patuxent River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2012	MD-PAXOH	PAXOH - Middle Patuxent River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2010	MD-PAXOH	PAXOH - Middle Patuxent River Oligohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-PAXOH	PAXOH - Middle Patuxent River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-PAXOH	PAXOH - Middle Patuxent River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-PAXOH	PAXOH - Middle Patuxent River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
2012	MD-PAXTF	PAXTF - Upper Patuxent River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
2010	MD-PAXTF	PAXTF - Upper Patuxent River Tidal Fresh	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-PAXTF	PAXTF - Upper Patuxent River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-PAXTF	PAXTF - Upper Patuxent River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-PAXTF	PAXTF - Upper Patuxent River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-PISTF	PISTF - Piscataway Creek tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-PISTF	PISTF - Piscataway Creek tidal Fresh	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-PISTF	PISTF - Piscataway Creek tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-PISTF	PISTF - Piscataway Creek tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-PISTF	PISTF - Piscataway Creek tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2008	MD-POCMH	POCMH - Lower Pocomoke River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
2012	MD-POCOH	POCOH - Middle Pocomoke River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-POCOH	POCOH - Middle Pocomoke River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-POCOH	POCOH - Middle Pocomoke River Oligohaline	Chesapeake Bay segment	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Source Unknown
2012	MD-POCOH	POCOH - Middle Pocomoke River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-POCOH	POCOH - Middle Pocomoke River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-POCTF	POCTF - Upper Pocomoke River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-POCTF	POCTF - Upper Pocomoke River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2012	MD-POCTF	POCTF - Upper Pocomoke River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-POCTF	POCTF - Upper Pocomoke River Tidal Fresh	Chesapeake Bay segment	Aquatic Life and Wildlife	Total Suspended Solids (TSS)	Source Unknown
1996	MD-POCTF	POCTF - Upper Pocomoke River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2008	MD-POTMH	POTMH - Lower Potomac River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-POTMH	POTMH - Lower Potomac River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Agriculture
1996	MD-POTMH	POTMH - Lower Potomac River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
1996	MD-POTMH	POTMH - Lower Potomac River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Agriculture
1996	MD-POTMH	POTMH - Lower Potomac River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Phosphorus (Total)	Agriculture
2012	MD-POTMH	POTMH - Lower Potomac River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
2012	MD-POTMH	POTMH - Lower Potomac River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Agriculture
1996	MD-POTMH	POTMH - Lower Potomac River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Channel Refuge Use	Nitrogen (Total)	Agriculture

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-POTMH	POTMH - Lower Potomac River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
1996	MD-POTOH1	POTOH1 - Lower Potomac River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Agriculture
2012	MD-POTOH1	POTOH1 - Lower Potomac River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Agriculture
2012	MD-POTOH1	POTOH1 - Lower Potomac River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
1996	MD-POTOH1	POTOH1 - Lower Potomac River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
1996	MD-POTOH2	POTOH2 - Port Tobacco River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Agriculture
1996	MD-POTOH2	POTOH2 - Port Tobacco River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Agriculture
1996	MD-POTOH2	POTOH2 - Port Tobacco River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
1996	MD-POTOH2	POTOH2 - Port Tobacco River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
1996	MD-POTOH2	POTOH2 - Port Tobacco River Oligohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-POTOH3	POTOH3 - Nanjemoy Creek	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2012	MD-POTOH3	POTOH3 - Nanjemoy Creek	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2012	MD-POTOH3	POTOH3 - Nanjemoy Creek	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-POTOH3	POTOH3 - Nanjemoy Creek	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-POTOH3	POTOH3 - Nanjemoy Creek	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-POTTF	POTTF - Upper Potomac River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-POTTF	POTTF - Upper Potomac River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-POTTF	POTTF - Upper Potomac River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-POTTF	POTTF - Upper Potomac River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-RHDMH	RHDMH - Rhode River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-RHDMH	RHDMH - Rhode River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2012	MD-RHDMH	RHDMH - Rhode River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-RHDMH	RHDMH - Rhode River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-SASOH	SASOH - Sassafras River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Agriculture
2010	MD-SASOH	SASOH - Sassafras River Oligohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
2002	MD-SASOH	SASOH - Sassafras River Oligohaline	Chesapeake Bay segment	Fishing	PCB in Fish Tissue	Contaminated Sediments
2012	MD-SASOH	SASOH - Sassafras River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Agriculture
2012	MD-SASOH	SASOH - Sassafras River Oligohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Agriculture
1996	MD-SASOH	SASOH - Sassafras River Oligohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Agriculture
1996	MD-SEVMH	SEVMH - Severn River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
2012	MD-SEVMH	SEVMH - Severn River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2010	MD-SEVMH	SEVMH - Severn River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-SEVMH	SEVMH - Severn River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-SEVMH	SEVMH - Severn River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
2012	MD-SEVMH	SEVMH - Severn River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-SEVMH	SEVMH - Severn River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
2012	MD-SOUMH	SOUMH - South River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-SOUMH	SOUMH - South River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-SOUMH	SOUMH - South River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-SOUMH	SOUMH - South River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
2012	MD-SOUMH	SOUMH - South River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-SOUMH	SOUMH - South River Mesohaline	Chesapeake Bay segment	Seasonal Deep-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-SOUMH	SOUMH - South River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-TANMH	TANMH - Tangier Sound Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
1996	MD-TANMH	TANMH - Tangier Sound Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-TANMH	TANMH - Tangier Sound Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown
1996	MD-WBRTF	WBRTF - Western Branch Patuxent River Tidal Fresh	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-WBRTF	WBRTF - Western Branch Patuxent River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	
1996	MD-WBRTF	WBRTF - Western Branch Patuxent River Tidal Fresh	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	

Cycle First Listed	Assessment Unit ID	Basin Name	Water Type Detail	Designated Use	Cause	Sources
1996	MD-WBRTF	WBRTF - Western Branch Patuxent River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	
1996	MD-WBRTF	WBRTF - Western Branch Patuxent River Tidal Fresh	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	
2012	MD-WICMH	WICMH - Wicomico River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Agriculture
1996	MD-WICMH	WICMH - Wicomico River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Agriculture
2012	MD-WICMH	WICMH - Wicomico River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Urban Runoff/Storm Sewers
1996	MD-WICMH	WICMH - Wicomico River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Urban Runoff/Storm Sewers
2006	MD-WICMH-02130302	WICMH - Wicomico River Mesohaline	Tidal Shellfish Area	Shellfishing	Fecal Coliform	Sewage Discharges in Unsewered Areas
2012	MD-WSTMH	WSTMH - West River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Phosphorus (Total)	Source Unknown
1996	MD-WSTMH	WSTMH - West River Mesohaline	Chesapeake Bay segment	Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory	Total Suspended Solids (TSS)	Source Unknown
1996	MD-WSTMH	WSTMH - West River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Phosphorus (Total)	Source Unknown
2012	MD-WSTMH	WSTMH - West River Mesohaline	Chesapeake Bay segment	Seasonal Migratory Fish Spawning and Nursery Subcategory.	Nitrogen (Total)	Source Unknown
1996	MD-WSTMH	WSTMH - West River Mesohaline	Chesapeake Bay segment	Open-Water Fish and Shellfish Subcategory	Nitrogen (Total)	Source Unknown

Table 15 and 16 lists those waters for which TMDLs will likely be initiated over the next two years.

Table 15: Anticipated Submissions to Address Category 5 Integrated Report Listings in FFY 2012.

Listing Year	Listed Waterbody	Impairing Substance	1998 MOU Count	2010 303(d) List Count
1996	Assawoman Bay	Nutrients	1	2
1996	Assawoman Bay, Greys Creek	Nutrients		2
1996	Isle of Wight Bay (open water)	Nutrients	1	2
1996	Isle of Wight Bay, Manklin Creek	Nutrients		2
1996	Sinepuxent Bay	Nutrients	1	2
1996	Newport Bay, Marshall Creek	Nutrients		2
1996	Chincoteague Bay	Nutrients	1	2
1996	Lower Monocacy River	Nutrients	1	1
1996	Upper Monocacy River	Nutrients	1	1
1996	Double Pipe Creek	Nutrients	1	1
1996	Antietam Creek	Nutrients	1	1
1996	Catoctin Creek	Nutrients	1	1
1996 2002 2004	Liberty Reservoir	Nutrients, Sediments, Mercury & Biological*	2	4
1996	Rock Creek	Nutrients	1	1
2008	Baltimore Harbor	Trash/debris		1
2006	Catoctin Creek	Biological*		1
2006	Lower Monocacy River	Biological*		1
2002	Rock Creek	Biological*		1
2006	Potomac River Montgomery County	Biological*		1
2006	Little Patuxent River, Hammond Branch	Biological*		1
2002	West River	Biological*		1
2006	Potomac River/Washington County	Biological*		1
2002	Middle Chester River	Biological*		1
2002	Transquaking River	Biological*		1
2002	Baltimore Harbor	Biological*		1
2002	Double Pipe Creek	Biological*		1
2004	Upper North Branch Potomac River	Biological*		1
2006	Lower Gunpowder Falls	Biological*		1
2002	Deep Creek Lake	Biological*		1
Total for 1998 MOU			**12**	
Total Listings Addressed from 2010 303(d) List (1996/1998/2002/2004/2006/2008/2010)				**39**

*These biological listings (cause unknown) will be addressed by the BSID analysis to identify the specific stressors causing biological community degradation.

Table 16: Anticipated Submissions to Address Category 5 Integrated Report Listings in FFY 2013.

Listing Year	Listed Waterbody	Impairing Substance	1998 MOU Count	2010 303(d) List Count
2006	West River	PCBs		1
2002	South River MH	PCBs		1
2006	Severn River MH	PCBs		1
2006	Magothy River	PCBs		1
2002	Anacostia River	Heptachlor epoxide		1
2008	Upper North Branch Potomac River (4 listings)	Manganese		1
2002	Impoundment, Lake Roland	PCBs		1
2002	Lower Susquehanna River	PCBs		1
2002	Upper and Lower Elk River	PCBs		1
2002	Back Creek/C&D Canal Oligohaline	PCBs		1
2010	Rocky Gorge Reservoir, Impoundment	Mercury		1
2010	Youghiogheny River Lake, Impoundment	Mercury		1
Total for 1998 MOU			**0**	
Total Listings Addressed from 2010 303(d) List (1996/1998/2002/2004/2006/2008/2010)				**12**

C.3.2 Assessment Summary

The summary tables provided in this section are submitted for consistency with EPA guidance and to help EPA fulfill its mandate to provide nationwide assessment results. The reader is cautioned against using these numbers to track statewide progress with respect to water quality. Beginning with this report (2012), Maryland used the 1:24,000 scale National Hydrography Dataset (NHD) to calculate waterbody sizes.[9] In contrast, the waterbody sizes used for the 2008 and 2010 IR cycles were calculated using the 1:100,000 scale NHD coverage. This, by itself, causes discrepancies in the total stream miles, estuarine square mileage, and impoundment acreage represented. In addition, in some cases, the water body size reported in Category 1 or 2 (unimpaired status) can increase or decrease cycle to cycle simply because assessments were corrected or made with better data and instrumentation. Other useful water quality tracking information can be found at Maryland's BayStat Program website (http://www.baystat.maryland.gov/) which provides information not only for water quality tracking but also information and progress related to water quality implementation.

Table 17: Size of Surface Water Assigned to Reporting Categories.

Waterbody Type	Category							Total in State	Total Assessed
	1	2	3	4a	4b	4c	5		
River/stream miles	0	5956.3393	2744.21	1977.9015	0	0	8448.6792	19,127.13	16,382.92
Lake/pond acres	0	2089.83	534.03	9998.53	0	0	7426.43	21,876.08	19,514.79
Estuarine square miles	0	0.34	42.39	865.39	0	0	1,543.10	2,451.22	2,408.82
Ocean square miles	0	0.00	107.39	0	0	0	0	107.39	0.00
Freshwater wetland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tidal wetland acres	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Maryland utilizes a multi-category report structure for the IR which can potential report a single water body in multiple listing categories. For the purposes of this table, water body sizes were not double-counted. If a water body was listed in Category 5 for one pollutant and Category 2 for another, the water body size was assigned to Category 5 to represent a worst-case scenario.

C.3.3 Split and Aggregated Water Body Segments

The State has split or aggregated water bodies/assessment units where data and information are supportive. For example, a listing originally may have been made for a large watershed and more detailed information is now available demonstrating that the watershed is comprised of smaller, hydrologically distinct subwatersheds. In these cases, the State will split this watershed into several subwatershed scale listings that better align with TMDL development. A summary of the assessment units that were split during the 2012 cycle is included in Table 18. For similar reasons, the State has aggregated assessment units when certain waters are hydrologically non-distinct or loading analyses dictate a more holistic approach to modeling water quality. Table 19 shows those listings that were aggregated during the 2012 cycle.

[9] Although converting to the 1:24,000 scale NHD made it harder to track progress between IR cycles, the benefits of a higher resolution stream scale enable greater mapping capabilities and increased geographic precision.

Table 18: Summary of Newly Split Assessment Units in the 2012 IR.

Former AU ID (2010 AU-ID)	Water Body Names	Pollutant(s)	New (2012) Split AU IDs	Rationale
MD-POTOH	Lower Potomac River Oligohaline	Total Suspended Solids (TSS)	MD-POTOH1	This listing was split out to match the assessment units used for nutrient assessments. Splitting out the POTOH segment also allows for better measuring progress towards the SAV restoration goals.
	Port Tobacco River		MD-POTOH2	
	Nanjemoy Creek		MD-POTOH3	

Table 19: Summary of Newly Aggregated Assessment Units in the 2012 IR.

Former AU IDs (2010 AU-ID)	Separate Waterbody Names	Pollutant(s)	New (2012) Aggregated AU ID	Rationale
MD-PATMH-Bodkin_Creek	Bodkin Creek	Nitrogen (Total)	MD-PATMH	Segments were combined to match the scale of the Chesapeake Bay nutrient and Sediment TMDLs. Bodkin Creek is assessed as part of the larger Patapsco River Mesohaline segment.
MD-PATMH	Patapsco River	Nitrogen (Total)		
MD-PATMH-Bodkin_Creek	Bodkin Creek	Phosphorus (Total)	MD-PATMH	Segments were combined to match the scale of the Chesapeake Bay nutrient and Sediment TMDLs. Bodkin Creek is assessed as part of the larger Patapsco River Mesohaline segment.
MD-PATMH	Patapsco River	Phosphorus (Total)		

C.3.4 Estuarine Assessments

This section provides assessment results and water quality summaries for Maryland's estuarine systems that include both the Chesapeake and Coastal Bays. The Chesapeake Bay assessments continue to evolve as new criteria and assessment methodologies are implemented and as Maryland utilizes the newer salinity-based segmentation. Comparatively, the Coastal Bays fall behind the Chesapeake in terms of public awareness and resource allocation for monitoring and assessment activities. For additional details on Chesapeake Bay assessments, please see http://www.mde.maryland.gov/assets/document/2008%20Ambient%20Water%20Criteria.pdf.

Table 20 and 21 show the size of estuarine waters assigned to each category for each pollutant. For the 2012 cycle, these numbers were calculated in the same fashion as they were for the 2010 cycle. For nutrient listings, the entire size of a Chesapeake Bay segment was assigned to one category, defaulting to the least desirable category (in this order, 5, 4A, 3, 2, 1). In other words, regardless of the magnitude of impairment for that segment, a segment's whole size will be reported in Category 5 for nutrients (TP or TN) if any percentage of the segment fails to meet the applicable water quality criterion.

Table 20: Size of Estuarine Waters per Category According to Pollutant.

Size of Estuarine Area (sq. miles) per Category according to Pollutant Type							
	Category on the Integrated List						
Cause	**Cat. 1**	**Cat. 2**	**Cat. 3**	**Cat. 4a**	**Cat. 4b**	**Cat. 4c**	**Cat. 5**
Arsenic		0.96					
BOD, Biochemical oxygen demand				0.086			
Cadmium		51.21					
Chlordane				36.99			
Chlorpyrifos		48.73					
Chromium		41.63					2.90
Copper		59.33	34.47		Point**		1.03
Cyanide					Point**		
Debris/Floatables/Trash				0.09			
Estuarine Bioassessments		897.2398	165.35				1,278.12
Enteroccoccus				0.69			4.27
Fecal coliform		122.54		58.73			29.89
Lead		53.12					1.30
Mercury in Fish Tissue		312.58	96.47				
Nickel		4.32			Point**		
Nitrogen (Total)			82.3	2271.555			97.36
Oil spill - PAHs					0.33		
PCBs		137.84	86.52	384.34			344.29
Phosphorus (Total)			82.30	2264.285			97.36
Selenium		0.03					
Silver		0.96					
Total Suspended Solids (TSS)**		258.7252	22.44	401.79			
Toxics							2.00
Zinc		13.42					7.40

Point* - These listings are remnants of the 304(L) list and were originally listed due to the presence of point sources. Thus these listings have no associated sizes.

**The total size of areas assessed for TSS do not total the area assessed for the Shallow Water designated use (DU) due to TSS listings for the aquatic life DU.

Table 21: Size of Estuarine Waters in Linear Distance per Category According to Pollutant.

Size of Estuarine Linear Distance (shoreline distance in miles) per Category according to Pollutant Type							
	Category on the Integrated List						
Cause	**Cat. 1**	**Cat. 2**	**Cat. 3**	**Cat. 4a**	**Cat. 4b**	**Cat. 4c**	**Cat. 5**
Debris/Floatables/Trash							9.5
Enterococcus		1.28	0.20	0.22			
Fecal coliform		0.01					

Table 22 depicts the status of estuarine waters with respect to different designated uses. Similar to Table 17, the numbers provided for the open water, deep water, and deep channel designated uses are calculated using a binary method. Instead of calculating the percent-area-impaired using data supplied

with the dissolved oxygen assessments, Maryland used the 'impaired or not' approach to determine the column in which a water-segment's size should be placed. This approach simplifies the calculations and improves general understanding of the geographic scope of impairment.

Table 22: Designated Use Support Summary for Maryland's Estuarine Waters.

Designated Use		Size of Estuarine Waters (square miles)				
		State Total	Total Assessed	Supporting - Attaining WQ Standards	Not Supporting - Not Attaining WQ Standards	Insufficient Data and Information
Aquatic Life and Wildlife		2,451.2	2,314.6	896.6	1,418.0	135.0
Fishing		2,451.2	866.5	137.84	728.625	86.52
Water Contact Recreation	General Recreational Waters	2,451.2	6.4	1.4	4.963	2,444.8
	Public Beaches*	162	162	161	1	0
Shellfish Harvesting		2,136.2	2,136.2	2,047.6	88.6	0
Migratory Spawning and Nursery**		1,338.8	1,256.5	0.0	1,256.5	82.3
Shallow Water SAV**		667.6	645.2	258.7	386.5	22.4
Open Water**		2,342.3	2,260.0	0	2,260.0	82.3
Deep Water***		1,402.1	1,402.1	0	1,402.1	0.0
Deep Channel**		1,298.0	1,298.0		1,298.0	

*Public Beach results are reported as the number of beaches, not as surface area or linear extent of water affected.
**Chesapeake Bay specific uses. Note: Areas are based on total segment surface area. Surface area sizes for each specific designated use have not been defined.
***As a result of updates to the Chesapeake Bay water quality model and changes to Maryland's water quality standards (COMAR 26.08.02.08), there are now several more estuarine assessment units that contain the deep water designated use.

Table 23: Size of Estuarine Waters Impaired by Various Sources.

Waterbody Type - Estuary	
Sources	Water Size in Square Miles
Agriculture	479.00
Channel Erosion/Incision from Upstream Hydromodifications	0.09
Contaminated Sediments	325.76
Discharges from Municipal Separate Storm Sewer Systems (MS4)	0.09
Innappropriate Waste Disposal	9.59

Waterbody Type - Estuary	
Sources	**Water Size in Square Miles**
Industrial Point Source Discharge	2.90
Livestock (Grazing or Feeding Operations)	17.87
Manure Runoff	17.49
Municipal Point Source Discharges	42.40
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	6.90
Pipeline Breaks	0.33
Source Unknown	2,234.99
Upstream Source	358.72
Upstream/Downstream Source	12.84
Urban Runoff/Storm Sewers	16.38
Wastes from Pets	16.95
Wildlife Other than Waterfowl	0.43

Table 24: Attainment Results for the Chesapeake Bay Calculated Using a Probabilistic Monitoring Design.

Project Name	Chesapeake Bay Benthic Assessment
Owner of Data	Chesapeake Bay Program and Versar Inc.
Target Population	Tidal waters of the Chesapeake Bay (reporting only the MD portion)
Type of Waterbody	Chesapeake Bay Estuary
Size of Target Population	2342.3 (only the MD portion)
Units of Measurement	Square Miles
Designated use	Aquatic Life
Percent Attaining	38.3%
Percent Not-Attaining	54.6%
Percent Nonresponse	7.1%
Indicator	Biology - Estuarine Benthic macroinvertebrate IBI
Assessment Date	4/1/2012
Precision	unknown

C.3.4.1 The Coastal Bays

Maryland's Coastal Bays, the shallow lagoons nestled behind Ocean City and Assateague Island, comprise a complex ecosystem. Like many estuaries, Maryland's Coastal Bays display differences in water quality ranging from generally degraded conditions within or close to tributaries to better conditions in the more open, well-flushed bay regions. Showing the strain of nutrient enrichment, the Coastal Bays exhibit high nitrate levels in the freshwater reaches of streams, excess algae, chronic brown tide blooms, macroalgae blooms, and incidents of low dissolved oxygen. Although seagrass coverage has leveled off in recent years, large increases in seagrass area have taken place since the 1980s.

Like water quality, the status of Coastal Bays living resources is mixed. While the Bays still support diverse and abundant populations of fish and shellfish, human activities are affecting their numbers. Forage fish, the major prey item for gamefish, have been in steady decline since the 1980s and reports of fish kills, usually the result of low oxygen levels, are increasing. Hard clam densities are lower than historic levels but have been generally stable over the past 10 years. Blue crab populations are fluctuating but do not appear to be in decline, despite a relatively new parasite causing summer mortality in some areas. Oysters, which were historically abundant in the Coastal Bays, remain only as small, relict populations. Bay scallops have recently returned after being absent for many decades and are now found throughout the Bays, although numbers are low.

In terms of overall water quality, living resources, and habitat conditions, the Bays were given the following ranking from best to worst: Sinepuxent Bay, Chincoteague Bay, Assawoman Bay, Isle of Wight Bay, Newport Bay, and St. Martin River. For more information, refer to the 2010 Coastal Bays Report Card (http://www.mdcoastalbays.org/pdf/final-2010.pdf). The Department of the Environment is scheduled to submit nutrient TMDLs for the Coastal Bays to EPA by the end of federal fiscal year 2012.

C.3.4.2 2007 National Estuary Program Coastal Condition Report

In spring of 2007, the US Environmental Protection Agency (EPA) released its third in a series of coastal environmental assessments which focused on conditions in the 28 National Estuary Program (NEP) estuaries (online at: http://water.epa.gov/type/oceb/nep/index.cfm). In this Coastal Condition Report (CCR), four estuarine condition indicators were rated for individual estuaries:

- water quality (e.g., dissolved inorganic nitrogen, dissolved inorganic phosphorus, chlorophyll a, water clarity, and dissolved oxygen);
- sediment quality (e.g., sediment toxicity, sediment contaminants, and sediment total organic carbon);
- benthic index and;
- fish tissue contaminants index

For each of these four key indicators, a score of good, fair, or poor was assigned to each estuary which were then averaged to create overall regional and national scores. Based on these calculations, the overall condition of the nation's NEP estuaries was generally fair. Estuaries in the Northeast Coast region where Maryland's two NEP estuaries are located (Coastal Bays; Chesapeake Bay), the water quality index was rated as fair; sediment quality, benthic, and fish tissue contaminants indices were poor

and overall condition estuaries were rated poor. Altogether, NEP estuaries showed the same or better estuarine condition than US coastal waters overall.

The report describes a number of major environmental concerns that affect some or all of the nation's 28 NEP estuaries. The goal of this report is to provide a benchmark for analyzing the progress and changing conditions of the NEPs over time. The top three issues, which also affect Maryland's estuaries include:

- Habitat loss and alteration (including dredging and dredge-disposal activities; construction of groins, seawalls, and other hardened structures; and hydrologic modifications);
- Declines in fish and wildlife populations (associated with habitat loss, fragmentation or alteration, water pollution from toxic chemicals and nutrients, overexploitation of natural resources, and introduction of invasive species); and
- Excessive nutrients (nitrogen and phosphorus runoff from agriculturally and residentially applied fertilizers and animal wastes, discharges from wastewater treatment plants, leaching from malfunctioning septic systems, and discharges of sanitary wastes from recreational boats).

C.3.5 Lakes Assessment - Clean Water Act §314 (Clean Lakes) Report

In the federal Clean Water Act (CWA), §314 addresses the Clean Lakes program, which was designed to identify publicly owned lakes, assess their water quality condition, implement in-lake and watershed restoration activities and develop programs to protect restored conditions. This section also requires regular reporting of State efforts and results.

In Maryland, all significant (> 5 acres surface area), publicly-owned lakes are man-made impoundments. A number of specific assessment, planning and restoration activities in Maryland were funded by §314 as early as 1980 until Congress rescinded Clean Lakes funding in 1994. Section 314 has since been reauthorized (2000) under the Estuaries and Clean Water Act of 2000 but no funds have yet been appropriated to states. The US Environmental Protection Agency currently encourages States to use funds in the §319 (Nonpoint Source Program) to address Clean Lakes priorities; however, no Clean Lake projects have been funded in Maryland through this program because of limited funding and higher priorities (e.g., Chesapeake Bay restoration, Total Maximum Daily Loads).

C.3.5.1 Trophic status

One measure of lake water quality is through classification by overall level of productivity ("trophic condition"). This measure often is based on relative nutrient levels which can affect not only biological community structure, but also certain physical characteristics of lakes:

- **oligotrophic lakes** - usually deep, with low levels of nutrients, plankton and low production rates - often serve well as drinking water sources or as lakes for boating or swimming, but having limited gamefish populations.
- **eutrophic lakes** - generally shallow, with high plankton levels and production rates - often supporting sportfishing for some species, but oxygen may be depleted below the thermocline and during periods of ice cover and may result in fish kills. Diurnal oxygen and pH levels may vary widely. Sportfishing for some fish species may be excellent, but water clarity will be reduced.
- **mesotrophic lakes** - have moderate productivity levels between the above two classifications and serve well as recreational lakes for fishing, boating and swimming activities.

Two other lake trophic classes not found in Maryland include: dystrophic or "bog" lakes characterized as having low nutrient levels, but very high color from humic materials and often acidified, and hypereutrophic lakes characterized by extremely high nutrient/productivity levels.

The most recent Statewide trophic survey of Maryland's significant, publicly-owned lakes was conducted in 1991 and 1993. For this survey, 58 lakes were identified as meeting the definition of significant, publicly-owned lakes. Since then, two other lakes have been added to this listing:

1. Big Piney Reservoir (Allegany Co.; Casselman River segment) - 110 ac. Frostburg water supply reservoir that was being rebuilt during this survey when public access was restricted, and
2. Lake Artemesia (Prince George's Co.; Anacostia River segment) - a recreational lake created from Metro construction.

In addition to publicly-owned lakes, water quality issues at a number of privately-owned lakes have been evaluated and water quality determined to be impaired and either needing a TMDL or just having had a TMDL completed and approved. These include: LaTrappe Pond, Lake Linganore, Lake Lariat, Atkisson Reservoir, and Millington Wildlife Ponds. Trophic condition has not been determined for these lakes.

The State's 60 significant, publicly-owned lakes, surface area, owners and trophic status, and a summary of the trophic status of publicly owned lakes are provided in Tables 25 and 26, respectively.

Table 25: Trophic status of Maryland's significant, publicly-owned lakes.

BASIN	LAKE NAME	SIZE (acres)	OWNER/MANAGER	TROPHIC ASSESSMENT
02120204	Conowingo Pool	2,936.0	Exelon Generation Co.	Meso/Eutrophic
02130103	Bishopville Pond	5.7	Worcester Co.	Eutrophic
02130106	Big Mill Pond	60.2	Worcester Co.	Eutrophic
02130203	Adkins Pond	17.2	MD State Hwy/Wicomico Co.	Eutrophic
02130301	Coulbourn Pond	8.6	Wicomico Co.	Meso/Eutrophic
02130301	Mitchell Pond #2	8.6	City of Salisbury	Eutrophic
02130301	Mitchell Pond #3	5.8	City of Salisbury	Eutrophic
02130301	Schumaker Pond	48.6	City of Salisbury	Meso/Eutrophic
02130301	TonyTank Lake	42.0	Wicomico Co.	Eutrophic
02130301	TonyTank Pond	41.3	MD State Hwy Admin.	Eutrophic
02130303	Allen Pond	35.8	Somerset/Wicomico Co.	Meso/Eutrophic
02130304	Johnson Pond	104.0	City of Salisbury	Eutrophic
02130304	Leonards Mill Pond	45.9	Wicomico Co.	Eutrophic
02130306	Chambers Lake	9.4	Town of Federalsburg	Meso/Eutrophic
02130306	Smithville Lake	40.0	MD DNR	Meso/Eutrophic
02130405	Tuckahoe Lake	86.0	MD DNR	Eutrophic
02130503	Wye Mills Community Lake	61.5	MD DNR	Eutrophic
02130509	Urieville Community Lake	35.0	MD DNR	Meso/Eutrophic
02130510	Unicorn Mill Pond	48.0	MD DNR	Meso/Eutrophic
02130702	Edgewater Village	7.2	Harford Co.	Eutrophic
02130805	Loch Raven Reservoir	2,400.0	Baltimore City	Mesotrophic
02130806	Prettyboy Reservoir	1,500.0	Baltimore City	Mesotrophic
02130904	Lake Roland	100.0	Baltimore City	Eutrophic
02130907	Liberty Reservoir	3,106.0	Baltimore City	Mesotrophic
02130908	Piney Run Reservoir	298.0	Carroll Co.	Meso/Eutrophic
02131001	Lake Waterford	12.0	Anne Arundel Co.	Meso/Eutrophic
02131103	Allen Pond	9.5	City of Bowie	Eutrophic
02131104	Laurel Lake	12.0	City of Laurel	Meso/Eutrophic
02131105	Centennial Lake	50.0	Howard Co.	Eutrophic
02131105	Lake Elkhorn	49.0	Columbia Assn.	Eutrophic

BASIN	LAKE NAME	SIZE (acres)	OWNER/MANAGER	TROPHIC ASSESSMENT
02131105	Lake Kittamaqundi	107.0	Columbia Assn.	Eutrophic
02131105	Wilde Lake	23.0	Columbia Assn.	Eutrophic
02131107	Duckett Reservoir	773.0	Wash. Suburban Sanitary Comm.	Meso/Eutrophic
02131108	Triadelphia Reservoir	800.0	Wash. Suburban Sanitary Comm.	Mesotrophic
02140103	St. Mary's Lake	250.0	MD DNR	Meso/Eutrophic
02140107	Wheatley Lake	59.0	Charles Co.	Mesotrophic
02140111	Myrtle Grove Lake	23.0	MD DNR	Eutrophic
02140203	Cosca Lake	11.0	MD-NCPPC	Eutrophic
02140205	Greenbelt Lake	21.5	City of Greenbelt	Eutrophic
02140205	Pine Lake	5.0	MD-NCPPC	Meso/Eutrophic
02140205	Lake Artemesia	38.0	MD-NCPPC	Unknown
02140206	Lake Bernard Frank	56.0	MD-NCPPC	Eutrophic
02140206	Lake Needwood	74.0	MD-NCPPC	Eutrophic
02140208	Little Seneca Lake	505.0	Wash. Suburban Sanitary Comm.	Mesotrophic
02140208	Clopper Lake	90.0	MD DNR	Mesotrophic
02140303	Hunting Creek Lake	46.0	MD DNR	Mesotrophic
02140501	Big Pool (C&O Canal)	92.4	National Park Service	Meso/Eutrophic
02140502	City Park Lake	5.2	City of Hagerstown	Mesotrophic
02140502	Greenbrier Lake	27.0	MD DNR	Oligo/Mesotrophic
02140508	Blairs Valley Lake	32.2	MD DNR	Meso/Eutrophic
02141002	Lake Habeeb	208.5	MD DNR	Oligo/Mesotrophic
02141005	Wm. Jennings Randolph Reservoir	952.0	Army Corps of Engineers	Oligo/Mesotrophic
02141006	Savage River Reservoir	360.0	Upper Potomac River Assn.	Oligo/Mesotrophic
02141006	New Germany Lake	13.0	MD DNR	Meso/Eutrophic
05020201	Youghiogheny River Lake	593.0	Army Corps of Engineers	Meso/Eutrophic
05020201	Herrington Lake	41.5	MD DNR	Mesotrophic
05020202	Broadford Lake	138.0	Town of Oakland	Meso/Eutrophic
05020203	Deep Creek Lake	4,500.0	MD DNR	Oligo/Mesotrophic
05020204	Cunningham Lake	20.0	Univ. Maryland	Mesotrophic
05020204	Big Piney Reservoir	110.0	City of Frostburg	Unknown

Source: MD Department of the Environment, 1993; 1995

Table 26: Trophic Status Summary of Maryland's significant, publicly-owned lakes.

	Number of lakes	Lake size (acres)
Total lakes	60	21,167.6
Lakes assessed	58	21,009.6
Dystrophic	0	0.0
Oligotrophic	0	0.0
Oligotrophic-Mesotrophic	5	6,047.5
Mesotrophic	11	8,572.7
Mesotrophic-Eutrophic	19	5,380.0
Eutrophic	23	1,009.4
Hypereutrophic	0	0.0
Unknown	2	158.0

Source: MD Department of the Environment, 1993; 1995

C.3.5.2 Pollution control programs

Various existing point and nonpoint source management programs described in this report can be effective in managing pollutant inputs directly to lakes and to lake watersheds. Unlike other water types, lakes have features that complicate the water management process, but also provide more options than other water body types. These factors include “residence time” - the time it takes a water parcel to pass through the lake, seasonal stratification and ability of some lake managers to control water levels or to selectively bypass certain layers or water masses.

Unless the impoundment is a run-of-the-river system, lakes (and estuaries) have a longer residence time than free-flowing streams, allowing organic and inorganic substances in the water more time to interact with the biota (primary producers) and sediments. If the lakes are large enough to develop seasonal

stratification, new water masses develop, in-lake residence time is modified, and water movements altered. The ability to manage water levels and withdrawals provides management options, but adds to the complexity of managing lake waters for the best possible uses.

Most lakes in Maryland do not have comprehensive lake or watershed management plans that address point and nonpoint source pollution, land cover, or management options that would address pollution control in-lake or in the lake watershed. In most instances, pollutant sources are not a result of direct waste discharges to a lake or its immediate watershed, but are in the watershed upstream of the lake. While large water supply systems invest in lake management plans, often their effectiveness in addressing pollution sources in the watershed varies as the watershed areas often are not controlled by the lake owners. Effective lake management plans require a cooperative relationship with land managers (public agencies and private land owners) in upstream watershed areas to develop cooperative agreements addressing land use, pollution control and funding priorities to protect lake resources.

C.3.5.3 Lake Restoration Programs

One aspect of the now un-funded §314 Clean Lakes Program was to provide funding for lake restoration activities. After the Clean Lakes Program was de-authorized in 1994, restoration funding for lakes was added to the §319 Nonpoint Source Program as a fundable activity. Grant requirements, priorities and limited funding in this program, however, do not allow for much needed in-lake reclamation activities (e.g., removal/dredging of excess sediments and nutrients, aquatic vegetation control, aquatic and wildlife habitat enhancement, and shoreline stabilization).

Without a directed management program and federal funding support and with comparatively low priority for accessing State water management funding, current lake restoration activities generally are initiated by lake managers (often the owners). With few lake management plans in place, there is often little planning activity or actual effort to address lake water issues until they become severe (and more difficult and costly to address). Lake managers can take advantage of expert resources available from various State agencies (DNR, MDA, MDE), federal agencies (EPA, US Dept. Agriculture) and non-governmental organizations (e.g, North American Lake Management Society; regional lake management organizations in PA and VA) to assist in developing lake management plans and finding available funding sources.

C.3.5.4 Acidification of lakes

Poorly buffered lakes or lakes in mining areas are subject to acidification due to atmospheric deposition or through acid mine drainage. Although several of Maryland's significant, publicly-owned lakes receive acid mine drainage or naturally acidic drainage through free-flowing tributaries (Deep Creek Lake, Jennings Randolph Reservoir), dilution and natural buffering prevent these lakes from becoming acidified.

The MD Bureau of Mines has worked with the US Department of Interior's Office of Surface Mining Reclamation and Enforcement which has partially funded several projects in Cherry Creek (Garrett Co.), a major tributary to Deep Creek Lake that is impacted by high acidity from acid mine drainage (AMD) from abandoned mines and low-lying wetlands/bogs. Completion of these AMD projects has measurably reduced mineral acidity, though natural organic acidity from the wetlands remain. Studies of the lake have shown that acidic inflow to Deep Creek Lake, even before AMD projects were installed, is

quickly buffered by a natural limestone layer such that water quality of Cherry Creek is not a threat to water quality of the lake.

Wm. Jennings Randolph Reservoir (Garrett Co.; Upper North Branch Potomac River segment) receives acid mine drainage from numerous tributaries directly to the lake and to the upstream river from both Maryland and West Virginia. Constructed primarily to manage flows for downstream water quality, the lake volume varies considerably. Although the lake was designed to manage an expected acidic layer, data show that acidic stratification did not occur. The lowest pH levels in the lake rarely were acidic and water quality below the dam was good enough to support a trout hatchery in the tailwaters of the dam. As AMD is managed upstream of the lake, pH levels, even in the river above the lake rarely are acidic and, with gradually increasing productivity, the lake supports an excellent sportfishery.

Information about acidification in small lakes and privately-owned lakes is not widely known, but water quality impacts can be significant and restoration can be successful. Lake Louise (Garrett Co.; Casselman River segment), a privately-owned, 30-acre lake, had a renowned trout fishery. In the 1970's, sulphide-bearing fill material was used in the construction of Interstate 68 through the upper lake watershed. Acidic leachate from this material entered tributaries to the lake, which suffered severe degradation of the ecosystem and loss of the sport fishery within a two-year period. In the 1990's, the State Highway Administration installed a passive treatment system in the upper lake watershed in an effort to reduce the acidic runoff. In 1999, following restoration of water quality in the lake, an aquatic resource restoration program was implemented
to re-establish the aquatic community and sport fishery (http://www.hpl.umces.edu/ERI/lakes.html).

C.3.5.5 Lake Status and Trends

Maryland agencies do not include lakes in their ambient monitoring programs, although contaminants in selected fish species are tested in some reservoirs on a cyclical basis (MDE). Infrequent sampling is done to address fish kills and algal bloom complaints (DNR, MDE) and some water sampling is done to provide input for pollutant loading models (Total Maximum Daily Loads) (MDE). Some water supply reservoirs have routine water monitoring programs in their lakes (e.g., Baltimore City, Washington Suburban Sanitary Commission reservoirs) and, at times, some local agencies and citizen groups will establish monitoring programs in some lakes. Based on available data a summary of the status of Maryland lakes and reservoirs is given in Table 27.

Table 27: Designated use support summary for Maryland's lakes and reservoirs (acres), 2012.

Designated Use	Size of Impoundments (acres)				
	Total Impoundment Acres	Total Assessed	Supporting - Attaining WQ Standards	Not Supporting - Not Attaining WQ Standards	Insufficient Data and Information
Aquatic Life and Wildlife	21,876.0	8,104.1	4,775.0	8,996.9	13,771.9
Fishing	21,876.0	18,954.1	3,342.2	15,611.8	2,922.0

Designated Use		Size of Impoundments (acres)				
		Total Impoundment Acres	Total Assessed	Supporting - Attaining WQ Standards	Not Supporting - Not Attaining WQ Standards	Insufficient Data and Information
Water Contact Recreation	General Recreational Waters	21,876.0	3,072.4	3,039	33.0	18,803.6
	Public Beaches*	25.0	25.0	25.0	0	0

*Public beaches were reported as the number of beaches in each category rather than providing a size.

C.3.5.5.1 Causes and sources of impairment

Primary causes for why lakes do not fully support their uses include toxic metals - primarily mercury which restricts fish consumption, and low oxygen conditions, which reduces available habitat for aquatic organisms. Low oxygen levels are a result of an accelerated eutrophication process caused by nutrients entering the lake or by nutrients being released from sediments. Other causes include pesticides (chlordane) in fish tissue causing a listing as a consumption advisory of selected species, low pH, excessive siltation and aquatic vegetation.

Table 28: Size of Impoundments per Category According to Pollutant.

Size of Impoundments (acres) per Category according to Pollutant Type							
	Category on the Integrated List						
Cause	Cat. 1	Cat. 2	Cat. 3	Cat. 4a	Cat. 4b	Cat. 4c	Cat. 5
Arsenic		3,708.0					
Cadmium		3,708.0					
Chlordane		98.0					
Chromium (total)		5,113.0					
Chromium, hexavalent		1,508.0					
Copper		3,708.0					
Fecal Coliform		3,039.4					
Lead		6,621.0					
Mercury in Fish Tissue		6,448.3	94.0	8,226.4			4,238.4
Nickel		3,708.0					
Nitrogen (Total)		27.0					
PCB in Fish Tissue		12,785.1	198.4				3,147.0
Phosphorus (Total)		4,775.0	3207.36	6,077.1			2,919.8

Size of Impoundments (acres) per Category according to Pollutant Type							
	Category on the Integrated List						
Cause	Cat. 1	Cat. 2	Cat. 3	Cat. 4a	Cat. 4b	Cat. 4c	Cat. 5
Sedimentation/Siltation		281.0		3,572.3			2,946.0
Selenium		3,708.0					
Zinc		1,508.0					

As lake water quality is reflective of conditions in the watershed, there are numerous sources of pollutants that may keep a lake from meeting its intended use, Table 28. Overall, one of the principal lake problems is due to the accelerated eutrophication process that characterizes most reservoir systems. Nutrients and sediments from various natural and land use activities in the watershed upstream of these impoundments flow into the lake. Nutrients in lake sediments can be recycled into the water column under certain conditions and decomposition of organic material in the sediments can reduce oxygen levels in a stratified lake's deep layer (hypolimnion).

Metals (methylmercury) and PCBs from fish tissue samples in a number of publicly-owned and private lakes are found at levels that could affect human health if enough fish from these systems are consumed. The Department of the Environment establishes fish-consumption advisories that provide the recommended limits of certain fish that should be consumed from lakes with higher levels of mercury, PCB, or pesticide pollution (http://www.mde.state.md.us/programs/Marylander/CitizensInfoCenterHome/Pages/citizensinfocenter/fishandshellfish/index.aspx). Other sources of pollutants include natural conditions (including waterfowl, upstream sources), municipal waste discharges, and urban runoff.

Table 29: The total size of impoundments impaired by various sources, 2012.

Waterbody Type - Impoundment	
Sources	Water Size in Acres
Agriculture	4,535.2
Atmospheric Depositon - Toxics	11,809.8
Contaminated Sediments	3,137.4
Crop Production (Crop Land or Dry Land)	1,449.0
Municipal Point Source Discharges	170.9
Source Unknown	3,617.5
Urban Runoff/Storm Sewers	2,331.0

The Baltimore City water supply reservoirs (Loch Raven, Prettyboy, Liberty Reservoirs), are still in various states of eutrophication and need further improvement and continued protection. Long term tributary and reservoir monitoring data reveal a decrease in nitrate levels between the 1990's and 2003 but has since shown a slight increase. Phosphorus levels do not show any clear long term trend. However, there has been a slight increase in chlorophyll a levels in Loch Raven and Prettyboy Reservoirs since 2001. Sedimentation is monitored periodically to assess the practical storage capacity of these systems - last reported as: Loch Raven Reservoir losing about 11 percent of its original volume followed by Prettyboy Reservoir (losing 7.5 percent), and Liberty Reservoir (losing 3.3 percent) (Reservoir Technical Group, 2004). Finally, of increasing concern are the rising levels of chlorides and conductivity found at lake tributary stations and in the treated water at the Ashburton (Liberty) and

Montebello (Loch Raven) treatment plants. It is believed that road salt is one of the largest contributors to this trend.

C.3.5.5.2 National Lake Survey

As part of a national effort to assess the quality of the nation's waters in a statistically-valid manner, EPA used their water body database and randomly identified lakes in each state (stratified by State, EPA Region and ecological region). In Maryland, 40 lakes were targeted from which only four would be sampled. EPA requested that Maryland collect field water quality, sediment and habitat data from these sites using nationally-consistent sampling/recording protocols. DNR biologists were trained by EPA and the selected lakes were intensively sampled one time during the late summer 2007 (along with one lake sampled by EPA biologists as a reference lake and one additional lake sampled as a replicate for QC purposes). Water, sediment and biological samples were sent to national labs for analysis and field data were submitted to EPA. A second round of lakes sampling is set to commence in 2012. More information on the national survey can be found at http://water.epa.gov/type/lakes/lakessurvey_index.cfm.

C.3.5.5.3 Total Maximum Daily Loads for Lakes

MDE has completed thirty six (36) TMDLs for various lake-pollutant combinations in Maryland through the end of 2011. These TMDLs addressed substances including: methylmercury, phosphorus, chlordane, and sediments (Section F.4). Another nine (9) lake-pollutant combinations are identified as impaired and need TMDLs for pollutants including total phosphorus, sediments, mercury and PCBs. One lake (Edgewater Village Lake) which cannot meet water quality standards even under the most stringent of controls is being considered for a change in designated use (i.e., a Use Attainability Analysis).

C.3.6 Non-tidal Rivers and Streams Assessment

Maryland has two major monitoring programs for assessing non-tidal waters. One is the probabilistic Maryland Biological Stream Survey (MBSS) and the other is the CORE/TREND program for assessing water quality trends at fixed locations. The MBSS program uses fish and aquatic insects as indicators of aquatic health while the CORE/TREND program focuses on conventional water quality parameters (temperature, pH, etc.) as well as nutrient species. The following summaries highlight the results of these programs.

Table 30: Statewide results for the MBSS Program.

Project Name	Maryland Biological Stream Survey
Owner of Data	MD Dept. of Natural Resources (MANTA)
Target Population	All 1st through 4th order nontidal wadeable streams in MD
Type of Waterbody	1st through 4th Order Wadeable Streams
Size of Target Population	19,127.0
Units of Measurement	Miles
Designated use	Aquatic Life
Percent Attaining	19.0%
Percent Not-Attaining	38.0%
Percent Nonresponse	43.0%
Indicator	Biology - freshwater fish and benthic macroinvertebrate IBIs
Assessment Date	4/1/2008

*These results do not incorporate biological monitoring performed by other groups (e.g. Susquehanna River Basin Commission (SRBC)) and used for assessment decisions.

C.3.6.1 Overall Non-tidal River and Stream Assessment Results

Other monitoring projects initiated on an ad-hoc basis have helped to supplement the MBSS and Core Trend Monitoring programs and have helped to assess for other pollutants not captured by these assessments. Tables 31 – 33 provide statewide assessment data for non-tidal rivers and streams.

Table 31: Extent of River/Stream Miles per Category According to Pollutant.

Number of River Miles per Category according to Pollutant Type							
	Category on the Integrated List						
Cause	**Cat. 1**	**Cat. 2**	**Cat. 3**	**Cat. 4a**	**Cat. 4b**	**Cat. 4c**	**Cat. 5**
Aluminum		160.10		26.20			
Ammonia		317.43					
Arsenic		663.70					
BOD, Biochemical oxygen demand		132.17		277.52			
BOD, carbonaceous		339.87		179.35			
BOD, nitrogenous		339.87		179.35			
Cadmium		1235.53					
Cause Unknown/Combination Benthic and Fish Bioassessments		6661.91	2340.02				3181.94
Channelization						1401.82	
Chlordane		48.03					
Chlorides							1617.96

Number of River Miles per Category according to Pollutant Type							
	Category on the Integrated List						
Cause	**Cat. 1**	**Cat. 2**	**Cat. 3**	**Cat. 4a**	**Cat. 4b**	**Cat. 4c**	**Cat. 5**
Chromium (total)		292.42					
Chromium, hexavalent		266.00					
Chromium, trivalent		105.28					
Copper		684.57					
Cyanide		98.39					
Debris/Floatables/Trash				277.52			
Enterococcus		6.78		383.94			67.31
Escherichia coli		489.93	613.33	3451.78			
Fecal coliform		563.23	569.13	231.76			
Heptachlor Epoxide							21.49
Iron		126.14		58.51			
Lack of Riparian Buffer						922.98	
Lead		764.27					
Manganese		150.75					35.55
Mercury		477.40					
Mercury in Fish Tissue		340.76	82.81				
Nickel		663.70					
Nitrogen (Total)		1545.66	243.26	277.52			
PCB in Fish Tissue		128.08	136.21				179.37
PCBs - water				39.22			
pH, High		4.70	19.36				127.46
pH, Low		1193.50		240.52	1.05		1.95
Phosphorus (Total)		3254.09	243.26	316.86			3656.08
Selenium		663.70					
Silver		186.30					
Sulfates							1127.31
Total Suspended Solids (TSS)		529.24		5299.1			2042.09
Zinc		910.11					

Table 32: Designated Use Support Summary for Non-tidal Rivers and Streams.

Designated Use		Size of River/Stream Miles				
		Total River miles	Total Assessed	Supporting - Attaining WQ Standards	Not Supporting - Not Attaining WQ Standards	Insufficient Data and Information
Aquatic Life and Wildlife		19,127.0	16,668.7	6,986.3	9,682.4	2,300.7
Fishing		19,127.0	392.0	173.36	218.6	18,735.1
Water Contact Recreation	General Recreation Waters	19,127.0	5,194.7	1,059.9	4,134.8	13,932.3
	Public Beaches**	6	6	6	0	0
Agricultural Water Use		19,127.0	19,127.0	19,127.0	0	0
Industrial Water Use		19,127.0	19,127.0	19,127.0	0	0
Public Water Supply		8,154.0	8,154.0	8,118.5	35.6	0

*Data on public beaches is measured as a beach count rather than as stream mileage.

Table 33: Summary of Sizes of Riverine Waters Impaired by Various Sources.

Waterbody Type - River	
Sources	Water Size in Miles
Acid Mine Drainage	273.13
Agriculture	3,213.54
Atmospheric Deposition - Acidity	12.98
Atmospheric Deposition - Toxics	21.18
Combined Sewer Overflows	205.66
Contaminated Sediments	156.74
Crop Production (Crop Land or Dry Land)	740.10
Discharges from Municipal Separate Storm Sewer Systems (MS4)	277.52
Inappropriate Waste Disposal	277.52
Livestock (Grazing or Feeding Operations)	2,027.02
Loss of Riparian Habitat	337.02
Manure Runoff	481.08
Municipal (Urbanized High Density Area)	774.55
Municipal Point Source Discharges	72.08
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	71.67
Post-development Erosion and Sedimentation	53.10
Sanitary Sewer Overflows (Collection System Failures)	916.19
Source Unknown	5,451.33
Urban Runoff/Storm Sewers	2,589.77
Wastes from Pets	879.76

C.4 Wetlands Program

MDE received a grant from the U.S. Environmental Protection Agency in 2005 to develop a statewide wetland monitoring and assessment strategy. The Maryland Department of Natural Resources (DNR) was a co-applicant for the grant but resigned from active participation under the grant in 2008. Both agencies participated in discussions and work groups for the Mid-Atlantic work group for wetland monitoring, as well as participated on a national advisory group. There are multiple objectives for Maryland's wetland monitoring and assessment program, which will be related to other regulatory and non-regulatory wetland management programs:

1) Meet 305(b) reporting requirements;
2) Improve existing wetland and waterway regulatory programs;
3) Provide additional information for targeting wetland/waterway restoration and protection efforts;
4) Comply with TMDL requirements, if applicable;
5) Develop use designations and water quality standards for wetlands;
6) Assist in evaluating the effectiveness of compensatory mitigation and voluntary restoration projects;
7) Improve our ability to comprehensively assess landscape and watershed function;
8) Develop the capability to study and assess the status of wetland condition over time; and,
9) Make wetland condition and functional value information available for use in federal, State, local and citizen group-driven natural resource conservation and restoration efforts (examples include Tributary Strategies, TMDL implementation plans, Green Infrastructure Assessment, Strategic Forest Lands Assessment, etc.).

Maryland has made some strides in the development of tools for the assessment of landscapes, including wetlands, for the condition of the habitats these landscapes provide. These tools may have a place in the development of wetland condition monitoring. Several pilot projects have taken place or are underway, including those in the Nanticoke and Patuxent watersheds; tidal wetlands of the Nanticoke watershed; and wetlands in the Piedmont region. A work group of State agency representatives has met several times to discuss goals for the strategy. There is a general consensus to monitor for both wetland condition and function. A draft system for classifying wetlands for monitoring purposes was prepared by MDE and DNR.

A larger work group of State, federal, and local agency representatives; researchers; and other stakeholders began meeting in September 2009 to review and make recommendations for the wetland strategy. The final Maryland Wetland Monitoring Strategy was completed in September of 2010 (http://www.mde.maryland.gov/programs/Water/WetlandsandWaterways/AboutWetlands/Documents/www.mde.state.md.us/assets/document/wetlandswaterways/Final%20Strategy%20Report%20commentsNRCSaddr2.pdf). An analysis of existing wetland methods for applicability in Maryland will continue. More details on Maryland's wetlands strategy can be found on MDE's web site at http://www.mde.maryland.gov/programs/water/wetlandsandwaterways/aboutwetlands/pages/programs/waterprograms/wetlands_waterways/about_wetlands/monitoring.aspx.

C.5 Trend Monitoring

Various statistical approaches are used to define changes in water quality over time to document annual/seasonal variability and how water quality changes in response to water management programs. In the past, EPA has sought to incorporate trend results into the State's assessment methodology; however, an increasing or declining trend in water quality may not signify "improvement" or "degradation". Water quality trend results are not used in the State's water quality assessment or watershed listing process.

Ambient water quality data often do not support the statistical requirements for using parametric statistics. Data transformations (e.g., using statistically significant streamflow-concentration regression residuals) and non-parametric approaches, such as seasonal Kendall's tau (to address seasonality) and LOWESS smoothing (to adjust for serial correlation) may be necessary. Recently, as more data have been collected, some trend results are found to be better explained using a polynomial approach to document reversals in water quality trends (often explaining water quality improvements that are being surpassed by increased watershed development).

Maryland's baseline CORE monitoring program has collected water quality samples from significant non-tidal streams (fourth order and larger) in Maryland each month since the early 1980's. At some sites, samples have been collected regularly since the middle 1970's. Status and trends in water quality condition are determined annually at 54 locations for selected parameters. Trends based on CORE data are determined for a 18-year period (Calendar Year 1986-2004) using the Seasonal Kendall's tau, a statistical test that addresses seasonal variation. These data are not adjusted for streamflow.

The US Geological Survey (USGS) also conducts long-term sampling for nutrient species and sediments at four non-tidal River Input monitoring stations on Susquehanna River (Conowingo Dam), Potomac River (Little Falls), Patuxent River (Governor's Bridge Road) and Choptank River (Red Bridges Road). Regression trends based on USGS data are determined over a nearly similar 22-year period (Water Year 1984-2006). Results presented here are not adjusted for streamflow to provide a level of comparability.

In most instances, there are no statistically significant, long-term trends in water quality conditions. Where they occur, significant trends are summarized below:

- **Temperature** - significant increasing trends observed at four stations (Georges Creek, Susquehanna River, Potomac River at Little Falls, and Upper Patuxent River); significant decreasing trends in temperature were detected on the Lower Patapsco River (US Route 1).
- **pH** - Increasing trends were evident at 37 percent of the sites. Decreasing trends were observed on Catoctin Creek (MD route 464), Gunpowder River between Prettyboy and Loch Raven Reservoirs, and the Choptank River.
- **Conductivity** - Increasing trends were observed in two thirds (67 percent) of the stations; decreasing trends occurred at three sites; two located in the lower free-flowing Potomac River (Point of Rocks and Whites Ferry) and a third site located on the Lower Susquehanna River.
- **Suspended solids** - Decreasing trends observed at four stations (Gwynns and Jones Falls, Upper/Lower Patapsco River, and Upper/Middle/Lower Monocacy River); an increasing trend was observed on the lower Susquehanna River.

- **Turbidity** - Decreasing trends occurred at 65 percent of these stations; four sites in western Maryland (Braddock Run, Casselman River, Cherry Creek, and the Lower Youghiogheny River at Friendsville) were found to have increasing trends.
- **Total nitrogen** – Decreasing trends observed at 79 percent of the stations; with an increase observed on the Choptank River. The USGS analysis of results from the Patuxent River (near Bowie) showed a significant, declining trend.
- **Ammonium** – Decreasing trends were observed at 25 percent of all stations; an increasing trend was observed for the Choptank River - reflecting the increasing Total Nitrogen trend there.
- **Total phosphorus** – Twenty-four sites had decreasing trends - predominantly in the eastern Upper Potomac Basin and the urban/agricultural corridor north of Washington and Baltimore. On the Choptank River, analysis of both MD and USGS datasets showed increasing trends in overlapping, long-term datasets.

C.6 Public Health Issues

C.6.1 Waterborne Disease

In the Surveillance for Waterborne Disease and Outbreaks Associated with Recreational Water - United States, 2003-2004 (US Centers for Disease Control, 2006), data was summarized from the Waterborne Disease and Outbreak Surveillance System, which tracks the occurrences and causes of waterborne disease and outbreaks associated with recreational waters (both natural and artificial (e.g., pool, spa) waters are included). During 2003 and 2004, waterborne disease and outbreaks associated with recreational water were reported by more than half of the States.

One bacterial outbreak of gastroenteritis in an unnamed lake in Maryland in July 2003 resulted in 65 people reporting an illness. In this case, both Shigella and Plesiomonas was determined to be the cause associated with fecal accidents (5 - 10 diapers were reportedly retrieved from the lake each week) and sewage contamination as the source of the bacterial contamination.

This report also identified illnesses due to the naturally-occurring aquatic bacteria, Vibrio sp. Cases associated with recreational water (no evidence that contact with seafood or marine life might have caused infection) were found in 16 States. Five cases of illness were reported from Vibrio sp. infections with one death in Maryland waters in 2003-2004. These entailed three different Vibrio species isolated from these occurrences, including: Vibrio alginolyticus (2 cases, 1 death); Vibrio parahaemolyticus (1 case), Vibrio vulnificus (2 cases). In this report, nearly all Vibrio patients reported that they were exposed to coastal recreational water mostly during the summer and most frequently during July and August. Activities associated with Vibrio infections included swimming, diving, or wading in water, walking or falling on the shore or rocks and boating, skiing, or surfing.

C.6.1.1 Research Summary

In 2006, US Environmental Protection Agency's (EPA) Office of Research and Development and Office of Water published a series of papers summarizing the research conducted on waterborne disease in the last 10 years. The work includes research supported by EPA and others and is limited to gastrointestinal illness as the health effect of concern. The 1996 Safe Drinking Water Act Amendments mandated that EPA and the US Centers for Disease Control (CDC) and Prevention conduct five waterborne disease

studies and develop a national estimate of waterborne disease. In response, EPA, CDC, and other authors produced a series of papers that reviews the state of the science, methods to make a national estimate of waterborne disease, models that estimate waterborne illness, and recommendations to fill existing data gaps. The papers represent the most comprehensive review conducted in the last 25 years and the first publication of modeling information that estimates waterborne illness on a national level. The papers have been published and are online at: http://www.epa.gov/nheerl/articles/2006/waterborne_disease.html.

C.6.2 Drinking Water

The Maryland Department of the Environment (MDE) is charged with ensuring that all Marylanders have a safe and adequate supply of drinking water. The Department has programs to oversee both public water supplies, which serve about 84 percent of the population's residential needs, and individual water supply wells, which serve citizens in most rural areas of the State. Marylanders use both surface water and ground water sources to obtain their water supplies. Surface water sources such as rivers, streams, and reservoirs serve approximately two-thirds of the State's 5.8 million citizens. The remaining one-third of the State's population obtains their water from underground sources. For more details on the State's drinking water programs, go to http://www.mde.state.md.us/programs/Water/Water_Supply/Pages/Programs/WaterPrograms/water_supply/index.aspx.

C.6.3 Shellfish Harvesting Area Closures

Maryland's Chesapeake Bay waters have long been known for their plentiful shellfish. To protect this valuable resource and safeguard public health the Maryland Department of the Environment is responsible for regulating shellfish harvesting waters.

Shellfish include clams, oysters, and mussels. The term shellfish does not include crabs, lobsters, or shrimp. Shellfish are filter-feeding animals: they strain the surrounding water through their gills which trap and transfer food particles to their digestive tract. If the water is contaminated with disease-causing bacteria, the bacteria are also trapped and consumed as food. If shellfish are harvested from waters which the Department has restricted (closed) and eaten raw or partially cooked, they have the potential to cause illness. Therefore, it is mandatory for oysters and clams to be harvested from approved (open) shellfish waters only.

Shellfish harvesting waters which are open or approved for harvesting are those where harvesting is permitted anytime. Areas which are conditionally approved mean that shellfish harvesting is permitted except for the three days following a rain event of greater than one inch in a twenty-four hour period. Runoff from such a rainfall can carry bacteria into surface waters from adjacent land. Information about which areas have conditional closures is updated daily on the web and via a phone message. Click http://www.mde.state.md.us/programs/Marylander/CitizensInfoCenterHome/Pages/citizensinfocenter/fishandshellfish/harvesting_notices/index.aspx to find out which conditional closures are in effect or call 1-800-541-1210.

The Department of the Environment has also created maps that summarize oyster & clam harvesting waters as of June 1, 2009

(http://www.mde.state.md.us/programs/Marylander/CitizensInfoCenterHome/Pages/citizensinfocenter/fishandshellfish/pop_up/shellfishmaps.aspx). The maps depict the classification of shellfish growing waters of the State as restricted, conditionally approved, or approved.

Also shown in the maps are shellfish areas closed as reserves and sanctuaries by the Department of Natural Resources (DNR). Sanctuaries are areas which are closed to shellfish harvest and often contain oyster restoration projects to help enhance oyster populations for their environmental benefits. These areas are permanent closures. Reserves are areas which are restored, then opened for periodic harvest when certain criteria are met.

C.6.4 Toxic Contaminants Fish Consumption Advisories

The Maryland Department of the Environment (MDE) is responsible for monitoring and evaluating contaminant levels in fish, shellfish and crabs in Maryland waters. The tissues of interest for human health include the edible portions of fish (fillet), crab (crabmeat and "mustard"), and shellfish ("meats"). Such monitoring enables MDE to determine whether the specific contaminant levels in these species are within safe limits for human consumption. Results of such studies are used to issue consumption guidelines for recreationally caught fish, shellfish, and crab species in Maryland (http://www.mde.state.md.us/programs/Marylander/CitizensInfoCenterHome/Pages/citizensinfocenter/fishandshellfish/index.aspx). Additionally, since fish, shellfish, and crabs have the potential to accumulate inorganic and organic chemicals in their tissues (even when these materials are not detected in water), monitoring of these species becomes a valuable indicator of environmental pollution in a given waterbody.

C.6.4.1 Fish Tissue Monitoring

The Maryland Department of the Environment has monitored chemical contaminant levels in Maryland's fish since the early 1970s. The current regional watershed sampling areas divide the State waters into four watersheds:

- Western Maryland watershed,
- Chesapeake Bay tributary watershed,
- Coastal Bays watershed, and
- Baltimore/Washington urban watershed.

Maryland routinely monitors watersheds within these four zones on a 5-year cycle. When routine monitoring indicates potential hazards to the public and environment, additional monitoring of the affected area may be conducted to verify the initial findings and identify the appropriate species and size classes associated with harmful contaminant levels. Findings from such studies (http://www.mde.state.md.us/programs/Marylander/CitizensInfoCenterHome/Pages/citizensinfocenter/fishandshellfish/risk/index.aspx) are the basis for the fish consumption guidelines (find our guidelines at: http://www.mde.state.md.us/programs/Marylander/CitizensInfoCenterHome/Documents/www.mde.state.md.us/assets/document/Maryland%20Fish%20Advisories%202011.pdf).

The types of fish sampled include important predatory game species (such as small mouth bass and striped bass), common recreational panfish species (white perch, bluegill, crappie) as well as bottom

dwelling accumulator species with relatively high fat content (such as carp, catfish and American eel). Also, periodically, MDE conducts intensive surveys of contaminant levels in selected species in specific water bodies. Past targets of intensive surveys conducted in Patapsco River/Baltimore Harbor included: white perch, channel catfish, eel, and striped bass.

C.6.4.2 Shellfish Monitoring

Since the 1960's, the Maryland Department of the Environment has been surveying metal and pesticide levels in oysters and clams from the Chesapeake Bay and its tributaries. Prior to 1990, this effort was conducted every one or two years. In response to low levels of contaminants found and very little change from year to year, the bay-wide monitoring is conducted every three years. This allows MDE to devote its limited resources toward intensive surveys.

During the last monitoring season, MDE collected and tested 500 oysters from 20 locations within the Maryland portion of the Chesapeake Bay. While there were no chemical contaminants at levels of concern in any of the oysters sampled, recreational harvesters should still be aware of possible bacterial contamination and avoid shell-fishing in areas that are closed to commercial shellfish harvesting.

C.6.5 Harmful Algal Blooms

Algae are a natural and critical part of our Chesapeake and Coastal Bays ecosystems. Algae, like land plants, capture the sun's energy and support the larger food web that leads to fish and shellfish. They occur in a size range from tiny microscopic cells floating in the water column (phytoplankton) to large mats of visible "macroalgae" that grow on bottom sediments.

Algae may become harmful if they occur in an unnaturally high abundance or if they produce a toxin. A high abundance of algae can block sunlight to underwater bay grasses, consume oxygen in the water leading to fish kills, produce surface scum and odors, and interfere with the feeding of shellfish and other organisms that filter water to obtain their food. Some algal species can also produce chemicals that are toxic to humans and aquatic life. Fortunately, of the more than 700 species of algae in Chesapeake Bay, less than 2 percent of them are believed to have the ability to produce toxic substances.

Both the Departments of Environment and Natural Resources respond to reports of fish kills and nuisance algae blooms (http://www.dnr.state.md.us/bay/hab/ and http://www.mde.maryland.gov/programs/water/319nonpointsource/pages/mdfishkills.aspx). In the three year period from 2007 to 2009, the State has identified and investigated 12 HAB events where significant risk to human health from contacting or ingesting water existed, 31 fish kills associated with toxic algae, and 33 fish kills associated with oxygen deprivation caused directly by non-toxic algal blooms. An additional 40 fish kills occurred that were attributed to low dissolved oxygen with indirect links to algae and nutrient enrichment. Both MDE and DNR will continue to work with the Bay Program to develop, where appropriate, standards or other measures to protect both human health and aquatic life from harmful algal blooms.

C.6.6 Bathing Beach Closures

The Maryland Department of the Environment works with local health departments to enhance beach water quality monitoring and improve the public notification process regarding beach water quality in Maryland. In October 2000, the U.S. Environmental Protection Agency (EPA) passed the Beaches Environmental Assessment and Coastal Health (BEACH) Act and provided funding to improve beach monitoring in coastal states. Maryland's Beaches Program was established to protect the health of Marylanders at public bathing beaches. The program has evolved further to comply with the requirements of the federal BEACH Act of 2000. This program is administered by MDE; however, the responsibility of monitoring and public notification of beach information is delegated to the local health departments (http://www.mde.maryland.gov/programs/Water/Beaches/Pages/beaches_healthdepts.aspx). To protect the health of citizens visiting beaches across Maryland, MDE's Beaches Program is working to standardize and improve recreational water quality monitoring in the State. In addition, Maryland provides access to real-time beach closure information (http://www.marylandhealthybeaches.org/notification.aspx) to inform the public of beach closures, advisories, and algal blooms before they head to the beach. The following key objectives outline EPA's and Maryland's Beaches Program:

1. Provide better public information regarding beach water quality; and

2. Promote scientific research to better protect the health of beach users.

The BEACH Act allows states to define and designate marine coastal waters (including estuaries) for use for swimming, bathing, surfing, or similar water contact activities. The State of Maryland defines beaches in the Code of Maryland Regulations (COMAR, http://www.dsd.state.md.us/comar/). In COMAR, beaches means, "natural waters, including points of access, used by the public for swimming, surfing, or other similar water contact activities." Beaches are places where people engage in, or are likely to engage in, activities that could result in the accidental ingestion of water. In Maryland, the beach season is designated from Memorial Day to Labor Day.

Maryland's water quality standards and regulations for beaches are published in COMAR 26.08.09 and 26.08.02.03. Some points included are:

1. E. coli and Enterococci are the bacteriological indicators for beach monitoring;
2. Prioritization of monitoring of beaches is based on risk; and
3. All beaches, whether permitted or not, now receive protection.

C.7 Invasive aquatic species

'New' species of viruses, animals, and everything in-between (e.g., amphibians, reptiles, birds, insects, plants, fish, shellfish, even jellyfish) are being introduced at an increasing rate into Maryland. Since colonization, new species have been introduced through a variety of pathways, including ship ballast, in packing materials, and through deliberate import for various uses. While most of these introduced species are beneficial or benign, about 15 percent become invasive - showing a tremendous capacity for

reproduction and distribution throughout its new environment. These invasive species can have a negative impact on environmental, economic, or public welfare priorities.

Many introduced species once thought to be beneficial (e.g., grass carp, mute swans, and nutria) have demonstrated invasive characteristics and are proving difficult to control - out-competing native species (species of plants and animals that have evolved in the State and have developed mutually-sustaining relationships to each other over geologic time) for food, shelter, water or other resources, as well as affecting economic interests and human welfare.

Some of the many aquatic invasive species that have recently consumed a significant level of State and federal agency resources include:

- mute swans (Cygnus olor)
- nutria (Myocaster coypus)
- zebra mussels (Dreissena polymorpha)
- Hydrilla (Hydrilla verticillata)
- water chestnut (Trapa patens)
- phragmites (Phragmites australis)
- purple loosestrife (Lythrum salicaria)
- wavyleaf basketgrass (Oplismenus hirtellus ssp. undulatifolius)
- Chinese mitten crab (Eriocheir sinensis)
- several species of crayfish
- snakehead (Channa argus)
- Didymo (Didymosphenia Geminata)

Information about these and other invasive species are available online from the Department of Natural Resources (http://www.dnr.state.md.us/invasives/), the Smithsonian Research Center, and the US Department of Interior's Fish and Wildlife Service and Geological Survey.

In 2007, the Department of Natural Resources created an Invasive Species Matrix Team to study and direct scientifically-based policy and management responses to the ecological, economic, and public health threats of invasive species in Maryland's native ecosystems (contact Jonathan McKnight at: 410-260-8539; mailto: jmcknight@dnr.state.md.us or Dr. Ron Klauda at: 410-260-8615; mailto: rklauda@dnr.state.md.us). Specific objectives of this intra-agency team are to:

- Provide recommendations to the Secretary of Natural Resources on invasive species policies and regulations.
- Develop a framework for surveillance and monitoring programs designed to detect invasive species introductions and track their dispersal.
- Coordinate rapid response efforts when new invasive species are detected.
- Recommend agency actions and public education programs to prevent new introductions and control the increase/spread of invasive species into non-infested landscapes/waters.
- Develop a list of non-native species introductions into Maryland.
- Share and interpret data, knowledge, and experience on invasive species within Maryland, as well as other state, local, interstate, and federal agencies.

- Develop an Invasive Species Management Plan for Maryland, in cooperation with other organizations, that provides a coordinated, multi-agency strategy to achieve the objectives listed above.

PART D: GROUND WATER MONITORING AND ASSESSMENT

Senate Joint Resolution No. 25 of 1985 requires the Maryland Department of the Environment (MDE) to provide an annual report on the development and implementation of a Comprehensive Ground Water Protection Strategy in the State and on the coordinated efforts by state agencies to protect and manage ground water. The most recent report provides an overview of the Fiscal Year 2011 activities and accomplishments of State programs that are designed to implement Maryland's Comprehensive Ground Water Protection Strategy. ***Please note that this report has not yet been approved. Excerpts provided in Part D (below) may be incomplete or inaccurate. This text is provided for general informational purposes only.***

Since the development of the original strategy, a variety of State programs at MDE, the Maryland Department of Agriculture (MDA) and the Maryland Department of Natural Resources (DNR) have endeavored to achieve this goal. These programs continue to be strengthened by the implementing agencies that contribute toward protecting ground water resources and characterizing the quality and quantity of these resources.

Groundwater is a finite natural resource that sustains Maryland's natural ecosystems in addition to supporting significant and growing human water supply demands. Approximately one third of Maryland's population currently depends on groundwater for drinking water. As the population in Maryland continues to grow, the demand for groundwater for drinking, irrigation, industry, and other uses is increasing, while threats to groundwater quality related to that development increase also. Programs to better understand and manage this critical resource must be strengthened to ensure that an adequate supply of groundwater is available for existing and future generations.

Highlights of groundwater management initiatives coordinated by the State during fiscal year 2011 (July 1, 2010 – June 30, 2011) include:

- In FY 2011 progress continued on the Regional Coastal Plain Assessment of the Maryland Coastal Plain. Phase I of the project is now complete, and work is ongoing for Phase II. Phase I work included revision of the hydrogeologic framework of the Maryland Coastal Plain and development of an Aquifer Information System, which is currently used by MDE staff to access information needed for water appropriation permitting decisions. Phase II includes development of a regional groundwater flow model.
- Work has also continued on the Fractured Rock Water Supply Study, which was initiated in 2009. Initial work focused on the development of a geospatially-referenced data base of stream flow, hydrogeology, water-use, and other appropriate information, and the determination of factors affecting groundwater availability in different hydrogeologic settings. An Aquifer Information System similar to that developed for the Coastal Plain study is also being developed for this region of the State.
- A stakeholder workgroup continued to meet during the year to develop regulations to implement SB 674 (2008), which authorizes the MDE to give priority to public water systems that provide water to a municipal corporation, when allocating groundwater in Carroll, Frederick, or Washington Counties. The group's work is nearing completion, and MDE expects to propose regulations during the next fiscal year.

- MDE continues to implement requirements that developers use environmental site design (ESD) to the maximum extent practicable to provide stormwater management. Counties and municipalities statewide are now implementing modifications to existing stormwater ordinances and plan review procedures to require better site planning, alternative surfaces, and small-scale runoff control practices on new development and redevelopment projects in an effort to replicate the runoff that would be expected from woods. Implementing ESD represents a significant change in the way development runoff is addressed in Maryland and marks another milestone in the evolution of a State program that has existed for nearly 30 years.
- MDE continues efforts to upgrade onsite sewage disposal systems through use of Bay Restoration Funds. Through April of 2011 septic systems serving 2,740 equivalent dwelling units have been upgraded to remove nitrogen with BRF grants.
- The Maryland Commission on Climate Change published its "Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change – Phase II: Building societal, economic, and ecological resilience" in January 2011. This report evaluates vulnerability and recommends adaptation strategies in six important areas, including water resources. MDE will be working in 2012 to implement the recommendations of the report.

Those stakeholders interested in the full groundwater report can send an email request to 303d@mde.state.md.us.

PART E: PUBLIC PARTICIPATION

MDE utilizes a public participation process for Integrated Report (IR) similar to that used for promulgation of new regulations. The Administrative Procedures Act mandates that a minimum of 45 days from the date of publication in the Maryland Register must be allowed for the adoption of new regulations [see Annotated Code of Maryland, State Government Article, § 10-111(a)]. Thirty of those 45 days must be available for public review and comment. Thus, the Department is granting 30 business days for public review of the draft 2012 Integrated Report of Surface Water Quality. The draft Integrated Report is made available in both electronic and hard copy format to the public via the Internet (http://www.mde.state.md.us/programs/Water/TMDL/Integrated303dReports/Pages/2012_IR.aspx) or by special request to Matthew Stover at mstover@mde.state.md.us or 410-537-3611.

During this open comment period for the IR, an informational public meeting is held at MDE's headquarters to facilitate dialogue between MDE and stakeholders concerning the format, structure, and content of the draft IR. MDE also engages interstate river basin commissions, Maryland tributary teams, and watershed councils during the public comment period and gives full presentations on the Maryland Integrated Report as requested.

Comments or questions may be directed in writing to the Department. All comments submitted during the public review period are fully addressed in a comment response document included with the final List submitted for EPA approval. Sufficient time is built into IR development to allow MDE to receive and fully respond to all public comments on the Report.

E.1 Informational Public Meeting Announcement

Informational Public Meeting Announcement:
Maryland's Draft 2012 Integrated Report

The Federal Clean Water Act requires that States assess the quality of their waters every two years and publish a list of waters not meeting the water quality standards set for them. This list of impaired waters is included in the State's biennial Integrated Report (IR). Waters identified in Category 5 of the IR are impaired and may require the development of Total Maximum Daily Loads (TMDLs). The Maryland Department of the Environment (MDE) is announcing the availability of the Draft 2012 IR for public review and comment. The public review period will run from **February 13 to March 26, 2012**. The Draft IR is being posted on MDE's website at http://www.mde.maryland.gov/programs/water/tmdl/integrated303dreports/pages/programs/waterprograms/tmdl/maryland%20303%20dlist/index.aspx. Hard copies of the Draft IR may be requested by calling Mr. Matthew Stover at (410) 537-3611.

The Department is hosting an informational public meeting and conference call in Baltimore at 6pm on March 12, 2012. Any hearing impaired person may request an interpreter to be present at the meeting by giving five (5) working days notice to Matthew Stover at *mstover@mde.state.md.us* or by calling (410) 537- 3611. Anyone wanting to participate in this meeting via conference call should contact Matthew Stover for instructions. Given enough interest, the Department may schedule additional meetings. Comments or questions may be directed in writing to Mr. Matthew Stover MDE, Science Services Administration, 1800 Washington Blvd., Baltimore, Maryland 21230, emailed to 303d@mde.state.md.us, or faxed to the attention of Mr. Matthew Stover at 410-537-3873 on or before **March 26, 2012**. After addressing all comments received during the public review period, a final List will be prepared and submitted to the U.S. Environmental Protection Agency for approval.

Public Meeting Announcement
Date: March 12, 2012
Start Time: 6:00 p.m.
Location: MDE Headquarters
Lobby Conference Rooms (*to the left after entering the front door*)
1800 Washington Blvd.
Baltimore MD, 21230
Parking: Red Lot, Front (south) of building

E.2 Attendance Lists from Informational Public Meetings

MDE

Integrated Report Public Meeting Sign-in Sheet
Baltimore, MD March 12, 2012 at 6 p.m.

Name	Address	Affiliation	email
Jim Ashby	293 Table Rock Rd OAKLAND, MD 21550	Mettiki Coal, LLC	jim.ashby@arlp.com
Karen Coffman	MD SHA 707 N Calvert St. Balt MD 21202	MD State Hwy	kcoffman@sha.state.md.us
Brent Walls	38 Williamsby Ct Bunker Hill, WV 25413	Potomac Riverkeeper	Brent@potomacriverkeeper.org
Kevin Brittingham	105 W. Chesapeake Ave Towson MD 21204	Balt Co Dept EPS	kbrittingham@baltimorecountymd.gov
THEAUX LE GARDEUR	16928 YORK RD MONKTON, MD 21111	Gunpowder Riverkeeper	Keeper@gunpowderriverkeeper.org
Kim Burgess	3001 David Taylor Dr. Baltimore, MD	Baltimore City DPW	kimberly.burgess@baltimorecity.gov
Tom Nasuta	MDE-SSA	MDE	tnasuta@mde.state.md.us
Janice Wiles via conference call	Friends of Frederick County	"	jwiles@friendsoffrederickco.org

In response to questions raised during the public information meeting held on March 12th and in two letters written to the Department, MDE decided to hold an additional informational meeting on April 19, 2012. This meeting consisted of a 45 minute presentation as well as a question and answer session designed to address specific technical questions relating to the Chesapeake Bay TMDL and how it impacted the Draft 2012 Integrated Report of Surface Water Quality. In conjunction with this meeting, the public comment period was extended until April 26, 2012 so as to allow for additional public comment that might result from this meeting. The following is the attendance list from that meeting.

MDE

Chesapeake Bay TMDL: Integrated Report and TMDL Technical Information Meeting

Presented to the Chesapeake Riverkeepers
Baltimore, MD April 19, 2012 from 1-3 p.m.

Sign-in Sheet

Name	Address	Affiliation	email
Larry Merrill	EPA R3 1650 Arch St Phila PA	EPA-R3	merrill.larry@epa.gov
Dennis Genito	105 W. Chesapeake Ave Rm 400 Towson MD 21204	Balt. County DEPS	dgenito@baltimorecountymd.gov
Lee Currey		MDE	Lcurley@mde.state.md.us
John Backus		MDE	jbackus...
Tom Thornton		MDE	tthornton@mdestate.md.us
Matt Stover		MDE	mstover@mde.state.md.us
ED MERRIFIELD			ed@potomac...
Jim Edmonds	Annapolis MD	EPA	edmond.jzane@epa.gov
Mike Fritz	Annapolis	EPA	fritz.mike@epa.gov
Tina Meyer	Baltimore, MD	Baltimore Harbor waterkeeper	tmeyer@blue water baltimore.org
Theresa LeGrande	Manchester MD	Gunpowder Riverkeeper	
DAVID FLORES	BALTIMORE	BALTIMORE WK	info@gunpowder riverkeeper.org
		dflores@bluewaterbaltimore.org	
Tim Rule		MDE	trule@mde.state.md.us

E.3 Comment-Response for the 2012 Integrated Report

Table 34: List of Commentors.

Author	Affiliation	Date Received
James C. Ashby	Mettiki Coal, LLC	March 22, 2012
Kevin Brittingham	Baltimore County Department of Environmental Protection	March 26, 2012
Miyoko Sakashita	Center for Biological Diversity	March 26, 2012
Maria Garcia	Environmental Protection Agency	April 18, 2012
Drew Koslo	Choptank Riverkeeper	April 25, 2012
Theaux Le Gardeur	Gunpowder Riverkeeper on behalf of Chesapeake Riverkeepers	April 26, 2012

METTIKI COAL, LLC, 293 Table Rock Road, Oakland, MD 21550, James C. Ashby, Manager of Environmental Affairs, Jim.Ashby@arlp.com

Mettiki Coal Comment 1: Mettiki is concerned with the process MDE is using to classify manganese as a biological impairing substance. Maryland has not identified manganese as a toxic substance or adopted appropriate numerical criteria for ambient surface waters. The record also reflects that (1) MDE used biological data from only one (1) biological sampling run (spring and fall of 2001) in the extreme headwaters of the North Fork of Sand Run and (2) coupled that analysis with water quality data from a sampling point (UNB-6) in the South Fork mainstem approximately 2.5 miles downstream of the biological assessment station (and below the confluence of the South Fork of Sand Run) taken between 3 and 6 years after the biological monitoring dates to list the "entire length" of Sand run as biologically impaired due to manganese. According to Maryland's own Biological Assessment Methodology, MDE cannot appropriately list Sand Run as biologically impaired based on a one time sampling event.

MDE Response: MDE believes that this comment resulted due to an error in the manganese listing for Sand Run. Upon further review of this listing, it was determined that the specified designated use of "Aquatic Life and Wildlife" was incorrect. MDE agrees with the commenter in that the Department is not currently aware of any conclusive data that demonstrates the harm to aquatic life communities due to manganese. Furthermore, since this listing was based on comparing ambient manganese measurements to the human health (drinking water) threshold (specifically EPA's National Recommended Water Quality Criteria for manganese), MDE has corrected this listing for manganese to show the designated use being assessed as "Public Water Supply" and not "Aquatic Life and Wildlife". To further clarify, biological data was never coupled with the water quality data from station UNB-6 to arrive at this impairment listing. This listing and its geographic coverage were determined solely based on the data collected at station UNB-6, some of which[10] was provided in the "WQA of Metals in the Upper North Branch Potomac, Garrett County, MD". This WQA can be accessed at:

[10] Additional data was collected at station UNB-6 in 2008, after the development of this WQA, that further confirmed high levels (> 50µg/L) of manganese in Sand Run.

(http://www.mde.maryland.gov/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/Programs/WaterPrograms/TMDL/approvedfinaltmdl/wqa_final_unbpotomac_metals.aspx).

In preparation for the 2012 IR, MDE reevaluated the spatial scale of all listings to ensure that they were consistent with the most recent data, including that collected during Total Maximum Daily Load (TMDL) and Water Quality Analysis (WQA) development. As a result of this effort, the manganese listing for MD-021410050040 was refined to specifically identify Sand Run (MD-021410050040-Sand_Run) as having levels of manganese that exceed EPA recommended human health criteria.

The following three paragraphs provide a brief history associated with the Sand Run/North Fork Sand Run biological and manganese listings. Note: The biological and manganese listings originated and were modified independent of one another.

History of the Biological Listing for Subwatershed 021410050040

MDE conducted a search on all previous IRs (1996-2010) for listings relating to subwatershed 021410050040. The earliest listing mentioning subwatershed 021410050040 was a Category 5 (impaired) biological listing from 2004. As noted by the commenter, this listing was based on a single MBSS sampling station on the North Fork of Sand Run (PRUN-109-R-2001). In 2006, this subwatershed biological listing was removed and replaced by a Category 5 biological listing that represented a larger portion of the Upper North Branch Potomac River watershed (more than just subwatershed 021410050040). Next, in 2008, all biological listings for the Upper North Branch Potomac River watershed were consolidated into a single Category 5 biological listing for the entire 8-digit watershed. This was a result of implementing a new Biological Assessment Methodology and the one still in use in today (2012). This Category 5, 8-digit biological listing persisted in the 2010 IR but has now been further refined in the 2012 IR based on the results from MDE's Biological Stressor Identification studies (BSID).[11]

MDE agrees with the commenter that the basis for the original 2004 biological listing for subwatershed 021410050040 was not well supported by the data. In fact, the development of the new biological assessment methodology was prompted by MDE having similar concerns. This assessment methodology maximizes the advantages of a probabilistic monitoring design and therefore no longer lists individual 12-digit subwatersheds, like 02141005004, as biologically impaired. Instead, starting in 2008, this methodology used the randomly sampled MBSS data to estimate the percentage of stream miles impaired throughout an entire 8-digit watershed. The biological assessment for the Upper North Branch Potomac River watershed (02141005), completed in 2008, showed that approximately 62% of the watershed's stream miles had an impaired biological community.

History of the Manganese Listing for Sand Run (021410050040)

The origins of this listing began in 1996 in what was separately a 305(b) Report and 303(d) List. At that time and up through the 2006 Integrated Report,[12] there was a watershed-wide Category 5 impairment listing for metals. This metals listing did not provide specific waters or streams that were impaired nor

[11] For the 2012 IR, the BSID analyses determined that low pH and sulfates were the predominant stressors in the Upper North Branch Potomac River watershed that were causing biological community impairment. As a result, in the 2012 IR, the biological listing for the Upper North Branch Potomac River has been replaced by listings for low pH and sulfates.

[12] The Integrated Report combined what was once, two separate water quality reports.

did it specify which metals were at levels that exceeded water quality criteria. Following EPA approval of the "WQA of Metals in the Upper North Branch Potomac, Garrett County, MD" in 2006, MDE refined this listing to enumerate specific streams and metals. Thus, in the 2008 IR, a listing was created for MD-021410050040 that showed manganese as the impairing substance. This listing remained unchanged until the 2012 IR when MDE refined the assessment unit name to MD-021410050040-Sand_Run. This was done to better describe the spatial extent of the listing during the process of creating a GIS coverage of all stream impairments. As mentioned previously, the listing of Sand Run for manganese was based solely on water quality data collected at station UNB-6 and not on any biological data.

Mettiki Coal Paraphrased Comment 2: Classifying manganese as an impairing substance based upon EPA's recommended and unenforceable National Recommended Water Quality Criteria (NRWQC) which is recommended solely to minimize objectionable organoleptic effects … is inappropriate especially when surrounding Region III states approach the issue by establishing limits at the intake of public water supplies rather than at upstream outlets.

MDE Response: Many of Maryland's current water quality criteria are based on EPA's national recommended water quality criteria (NRWQC). Although Maryland has not formally adopted EPA's NRWQC for manganese, both the State and public drinking water managers use these values to screen and assess drinking water sources for potential organoleptic effects. MDE is considering potential options for the adoption and implementation of an appropriately protective manganese criterion and/or policy. MDE will keep you apprised during this process.

Mettiki Coal Paraphrased Comment 3: Mettiki has reviewed readily available water quality data submitted to MDE's Water Management Administration on a quarterly basis for the specific stream segment the MBSS sampled in 2001 (North Fork of Sand Run). Quarterly sampling since 1994 (18 years) at the K-1 location shows an average manganese concentration of 0.14 mg/L with only 3 quarterly samples in the past 18 years above 0.40 mg/L and none above the 1.0 mg/L limits of Pennsylvania and West Virginia at the public water intake.

MDE Response: MDE thanks Mettiki for providing the raw data collected at this location (K-1). It should be noted that the WQA for Metals in the Upper North Branch Potomac misquoted EPA's NRWQC for manganese. The correct manganese human health criteria for the consumption of water + organism should have been listed as 0.05 mg/L instead of 0.5 mg/L. As stated previously, MDE is considering options for adopting a manganese criterion and/or policy. After this criterion/policy has been finalized, MDE will either reevaluate available data or collect new data to reassess areas listed as impaired for manganese (including Sand Run). Again, MDE will make sure to keep Mettiki apprized of this process.

Mettiki Coal Comment 4: The use designation of all tributaries to the Upper North Branch and the North Branch of the Potomac itself as III-P (public water supply) seems inappropriate given historical use and historical (pre 1973) quality of the local streams, Sand Run in particular. Mettiki is not

requesting a use attainability analysis, just asking that MDE be pragmatic and reasonable in considering all streams in Maryland to be "public water supply".

MDE Response: Federal Regulations, specifically 40 CFR § 131.10, specify that "In designating uses of a water body and the appropriate criteria for those uses, the State shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters." Consistent with this regulation, Maryland identifies, in its water quality standards (COMAR 26.08.02.08), all waters upstream from public drinking water intakes as having the "-P" or public water supply use designation. However, MDE understands your concern with the implementation of the manganese water quality criterion for this use designation and will take your comment regarding the nearest water intake under advisement when developing a new manganese criterion/policy.

Mettiki Coal Comment 5: As MDE is aware, in the Draft 2004 IR, MDE inadvertently listed the Upper North Branch as being impaired by sulfate but explained in Appendix E of the 2006 IR in response to public comment that "the sulfate impairment category has been changed to pH while the impairing substance has been changed to low pH – acid mine drainage. The Department feels that these changes more accurately characterize the impairment in the basin". Please explain (1) what justification MDE used to reverse their 2006 position (2) why "low pH – acid mine drainage" no longer accurately characterizes the impairment in the basin and (3) why pH is now being replaced with sulfate as the stressor.

MDE Response: The commenter corrected this comment to read "As MDE is aware, in Appendix E of the Final 2002 IR, in response to public comment, MDE wrote that "the sulfate impairment…".

(1) The Upper North Branch Potomac River watershed was initially listed as impaired for sulfates on the 1996 303(d) List. This listing was made on the basis of Department of Natural Resources Core Trend monitoring data that showed high levels of sulfates as compared to other monitoring locations around the state. The listing for sulfates persisted until MDE staff began reviewing listings for the 2002 Integrated Report (303(d) List). At that time, MDE staff felt that the sulfate listing was not well-supported by the previous comparison analysis. For this reason, the sulfate listing was dropped until a more complete monitoring and analysis effort could be completed. At the same time, pH and other acid mine drainage data prompted the state to list the Upper North Branch Potomac River watershed for pH.

(2) and (3) While it may appear that the low pH listings in the Upper North Branch Potomac River watershed have been replaced, they actually still remain, albeit at a more refined geographic scale. In 2010 IR, there were two listings for low pH. In the 2012 IR, these two listings have been split out into nine smaller scale listings that better represent the actual spatial scale of impairment detailed in the "Western Maryland pH TMDLs for the Casselman River, Georges Creek, Savage River, Upper North Branch of the Potomac River, and Wills Creek Watersheds". This TMDL can be accessed at: http://www.mde.maryland.gov/programs/Water/TMDL/Documents/www.mde.state.md.us/assets/document/WesternMD_pH_060210_FRF.pdf. Additionally, recent results from the Biological Stressor Identification Studies (BSID) indicate that low pH is one of the predominant stressors causing biological degradation in the Upper North Branch Potomac River watershed. Table 35 below shows a summary of the nine low pH listings in the Upper North Branch Potomac River watershed.

Table 35: pH Impairments in the Upper North Branch Potomac River Watershed.

Assessment Unit	Basin Name	Water Type	Size	Size Units	Designated Use	Listing Category	Cause	Notes
MD-021410050050-Laurel_Run_north	Upper North Branch Potomac River	RIVER	1.91	Miles	Aquatic Life and Wildlife	4a	pH, Low	The Biostressor analysis indicates that low pH is a major stressor affecting biological integrity in this watershed. The TMDLs for pH address a portion of the biological impairment listing.
MD-021410050049-Elklick_Run	Upper North Branch Potomac River	RIVER	4.06	Miles	Aquatic Life and Wildlife	4a	pH, Low	
MD-021410050047-Wolfden_Run	Upper North Branch Potomac River	RIVER	5.57	Miles	Aquatic Life and Wildlife	4a	pH, Low	
MD-021410050047-Short_Run	Upper North Branch Potomac River	RIVER	3.35	Miles	Aquatic Life and Wildlife	4a	pH, Low	
MD-021410050046-N_Prong_Lostland_Run	Upper North Branch Potomac River	RIVER	5.22	Miles	Aquatic Life and Wildlife	4a	pH, Low	
MD-021410050046-S_Prong_Lostland_Run	Upper North Branch Potomac River	RIVER	3.38	Miles	Aquatic Life and Wildlife	4a	pH, Low	
MD-021410050043-Glade_Run	Upper North Branch Potomac River	RIVER	3.12	Miles	Aquatic Life and Wildlife	4a	pH, Low	
MD-021410050039-Laurel_Run	Upper North Branch Potomac River	RIVER	12.07	Miles	Aquatic Life and Wildlife	4a	pH, Low	
MD-021410050048-Three_Forks_Run_part	Upper North Branch Potomac River	RIVER	9.14	Miles	Aquatic Life and Wildlife	4a	pH, Low	
MD-02141005-Multiple_segments4	Upper North Branch Potomac River	RIVER	138.48	Miles	Aquatic Life and Wildlife	2	pH, Low	Delisted using data collected during TMDL investigation.

Therefore, the new sulfate listing does not replace any low pH listings. Sulfates, in addition to low pH, have been enumerated by the Biological Stressor Identification studies (BSID) as predominant stressors affecting streams in the Upper North Branch Potomac River watershed (02141005). BSID analyses use a case-control, risk-based approach to systematically and objectively determine the predominant cause of reduced biological conditions, which enables the Department to update current Integrated Report assessments. In effect, the BSID process links potential causes/stressors identified by the analysis with general causal scenarios and concludes with a review for ecological plausibility by State scientists. Once the BSID process is completed, one or several stressors (pollutants) may be identified as probable causes of the poor biological conditions within the Maryland 8-digit watershed. MDE then uses identified stressor(s) (e.g., sediments, chlorides, sulfates, and nutrients) to support current pollutant listings, add new pollutant listings, and/or change the category assessment for a pollutant on the Integrated Report. As a result, when stressor(s)/pollutant(s) are identified for a biologically-impaired watershed, the biological listing is removed from category 5 and is replaced by the appropriate pollutant listing(s) (in category 5). For more information on how the BSID studies are conducted and to find watershed specific studies please visit: http://www.mde.state.md.us/programs/Water/TMDL/Pages/Programs/WaterPrograms/tmdl/bsid_studies.aspx.

Mettiki Coal Comment 6: Until MDE goes through the appropriate process to add sulfate to the list of State Water Quality Standards or lays out the factual and scientific foundation that would appropriately support listing sulfate as a stressor, MDE should remove sulfate as an impairing substance in the Upper North Branch and revert to their previously EPA approved "low pH – acid mine drainage" listing.

MDE Response: MDE feels that the BSID studies provide an objective, repeatable, and scientific basis for determining the predominant stressors causing aquatic biological community degradation. This process, adapted from the field of epidemiology, has been reviewed by EPA and accepted as appropriate documentation for adding new pollutant listings to Maryland's IR.

BALTIMORE COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION, 105 W. Chesapeake Avenue, Suite 400, Towson, MD 21204, Kevin D. Brittingham, Ph.D., Supervisor, Watershed Monitoring, kbrittingham@baltimorecountymd.gov

Baltimore Co. DEP Comment 1: The main comment I have is what can we do to get Baltimore County's data (biomonitoring data) used in the report (IR). We put a lot of effort into our monitoring program and would like to get our data out there for use in any application possible. Is there something we can do on our end, or do we need to set up a meeting?

MDE Response: Thank you for your interest in providing data for Maryland's Integrated Report. Maryland did receive Baltimore County's non-tidal benthic monitoring data. However, due to staffing constraints and necessarily stringent timelines, the state was not able to incorporate this data into the 2012 IR assessments. MDE shares the commenter's goal of using this data for the IR and looks forward

to working with Baltimore County on this effort. To that end, MDE is currently working to integrate this data (if possible) with existing Maryland Biological Stream Survey (MBSS) data. Data must first be reviewed to ensure that it meets the state's rigorous requirements for quality assurance/quality control. Once this process is complete, MDE hopes to utilize Baltimore County's data to assess 8-digit watersheds according to the Biological Assessment Methodology (http://www.mde.state.md.us/programs/Water/TMDL/Integrated303dReports/Pages/Programs/WaterPrograms/TMDL/maryland%20303%20dlist/ir_listing_methodologies.aspx). Then, following this assessment, data may be used to enhance the Biological Stressor Identification analyses for these watersheds.

Baltimore Co. DEP Paraphrased Comment 2: As was pointed out in the public meeting on March 12th, the moving of a large number of segments from Category 5 to Category 4a seems to be very quick and on a larger scale than what's real in the field. Just because there's a completed TMDL for that segment, should the status of a water body move from Category 5 to Category 4a?

MDE Response: For clarification, Category 5 represents those water body-designated use-pollutant assessment records that are impaired and require the development of a TMDL. Category 4a is used for those water body-designated use-pollutant assessment records that still show impairment but for which a TMDL has been completed. Thus, it's entirely possible that there has been no change in the water quality for a water body that has been reclassified from Category 5 to 4a. The category change simply denotes the fact that a TMDL has been developed by Maryland and that EPA has approved that TMDL.

CENTER FOR BIOLOGICAL DIVERSITY, 351 California Street, Suite 600, San Francisco, CA 94104, Miyoko Sakashita, Oceans Program Director, miyoko@biologicaldiversity.org

CBD Condensed and Paraphrased Comment 1: CBD urges the Department of the Environment to include Maryland's coastal and Chesapeake Bay waters on the list of threatened or impaired waters due to ocean acidification (OA). As described in Waldbusser et al. 2010, acidification is impacting the Chesapeake Bay even faster than the open ocean. Already, calcification of juvenile oysters is compromised by acidification (G.G. Waldbusser et al. 2010). Although carbon dioxide from atmospheric sources is not the only factor leading to changes in acidity in the Chesapeake Bay, according to the scientists the possibility of a shifting baseline "should not be ignored" and "even gradual decreases in baseline pH could alter estuarine carbonate dynamics in important ways sooner than open ocean environments (Id.). In addition, other studies also confirm the negative consequences of OA on various marine and estuarine fish.

MDE Response: MDE shares the commenter's concerns about the growing body of evidence supporting the relationship between increased levels of atmospheric carbon dioxide and OA. However, with regard to listing Maryland's Coastal and Chesapeake Bay waters as threatened or impaired due to OA, MDE reviewed the articles submitted by CBD and determined that none of them provided sufficient information (e.g. appropriate spatial scale, field studies demonstrating the condition of natural populations in Maryland waters) to determine whether Maryland's coastal waters are failing to attain (or will not be attaining by the next listing cycle) Maryland's water quality standards including marine pH and aquatic life designated uses. MDE reviewed the articles submitted by CBD and determined that none of them provided sufficient information to show that Maryland's waters are failing to attain (or will

not be attaining by the next listing cycle) Maryland's water quality standards. Even the Waldbusser et al. (2010) paper acknowledges that "pH has not significantly changed across mesohaline waters", and "in some tributaries that once supported large oyster populations, pH is increasing." The Waldbusser et al. (2010) paper also acknowledges the difficulties in establishing a causal link between acidification and the plight of the oyster population in the Chesapeake saying the declining oyster stocks "have been decimated by multiple factors, including inadequate fisheries management, habitat decline, and disease (Rothschild et al. 1994; Kennedy et al. 1996; Smith et al. 2005)." MDE will continue to review data for Maryland's waters to determine if the pH criteria are met and if the aquatic life use is supported. If CBD can provide Maryland-specific information in the future, this would be helpful in making water quality impairment determinations.

As one of the conditions of the settlement agreement with the CBD, the United States Environmental Protection Agency (EPA) issued a memorandum on November 15, 2010. This memorandum described how states should move forward where OA information exists to address OA during the 2012 listing cycle using the current 303(d) integrated reporting framework. At the same time, this memo acknowledges that OA information is largely absent or limited (at this point in time) to support the listing of waters for OA in many states. The following EPA webpage includes a copy of the signed memorandum, "Integrated Reporting and Listing Decisions Related to Ocean Acidification": http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/oa_memo_nov2010.cfm.

CBD Paraphrased Comment 2: In addition to the letters presented by the Center for Biological Diversity, Maryland has a duty to examine monitoring data from the Chesapeake Bay as well as its other coastal waters to evaluate them for water quality problems due to ocean acidification.

MDE Response: Maryland reviewed data collected for the Chesapeake Bay and coastal waters. At this time, all data indicates that Maryland's water quality criteria for pH are being attained.

CBD Paraphrased Comment 3: Maryland should incorporate the latest scientific information about ocean acidification into a revision of the marine pH water quality standard and develop additional water quality standards and assessments to address ocean acidification.

MDE Response: If the commenter is interested in proposing new pH criteria and/or assessment methods for marine and/or estuarine waters, please contact Mr. John Backus (jbackus@mde.state.md.us or 410-537-3965) in MDE's Water Quality Standards Program. The Triennial Review process for water quality standards is the best forum to propose standards revisions, and Mr. Backus can provide you with details about that process.

ENVIRONMENTAL PROTECTION AGENCY REGION III, 1650 Arch Street, Philadelphia, PA 19103-2029, Maria Garcia, Office of Standards, Assessment, and TMDL (OSAT), garcia.maria@epa.gov

Section C.2.2 Biological Assessment Methodology and the Biological Stressor Identification Process
EPA Comment 1: The link provided for the Biological Assessment Methodology does not work.

MDE Response: This link has been corrected.

C.3 Section Assessment Results

EPA Comment 2: The narrative states that thirteen listings resulted from Water Quality Analyses or reassessments. Only twelve are listed in table 10.

MDE Response: MDE believes that the commenter may have miscounted the number of delistings in the table. There are a total of 34 delisted records in table 10, with 21 of them have the delisting code of 5 in the right-hand column. The remaining 13 records in the table satisfy the narrative.

EPA Comment 3: Need a discussion on the rationale for the delistings in table 10 that do not have a WQA or were not moved to Category 3 (see list below). Some of them have a note in the Category 2 list, but not all of them. However, even if there is a note in the Category 2 list, recommend to include a discussion in the main report for each of those delistings.

- Seneca Creek (Cause: Ammonia)
- CHSMH- Lower Chester River Mesohaline (Cause: Unknown)
- CHOMH2- Choptank River Mesohaline mouth 2 (Cause Unknown)
- Miles River, Hunting Creek (Cause: Fecal Coliform)
- Miles River, Miles River 2 (Cause: Fecal Coliform).
- Potomac Washington County (Cause: PCB in Fish Tissue)
- Patapsco River Lower North Branch (Cause: PCB in Fish Tissue)
- CB2OH – Northern Chesapeake Bay Oligohaline (Cause: TSS)
- Middle Patuxent River (Cause: TSS)

MDE Response: Additional text explaining the rationale behind these delistings has been added to the report in Section C.3.

EPA Comment 4: Table 10 should also include the listings moved to Category 4c. In fact, the legend includes a key for impairments due to non-pollutant. Alternatively, a note can be added to Table 10 making reference to Table 6.

MDE Response: A note was added under Table 10 indicating that Category 4c listings are shown in Table 6.

EPA Comment 5: Recommend to include a table with a list of the Biological Stressor Identification (BSID) analyses that Maryland conducted in this cycle and the stressors identified in each one. This should also include any BSID analysis conducted where no stressors were identified.

MDE Response: A new table (Table 12) was added to Section C.3 showing those watersheds with generic biological listings (cause unknown) that now have specific stressors identified.

Section F.4 Category 4a Waters

EPA Comment 6: This section discusses the rationale for reevaluating previously approved nutrient TMDLs for tribal tributaries to the Chesapeake Bay. Specifically, this section evaluates whether Maryland's previously approved tidal nutrient TMDLs should be superseded by Chesapeake Bay TMDLs for those segments. Maryland states that if a pre-existing TMDL was developed using standards, models or data that have since been revised, updated or replaced by those used in the Bay TMDL, then the Bay TMDL will replace the previous TMDL. For those pre-existing TMDLs that used water quality standards that were also used by the Bay TMDL, MD evaluated the stringency of Total Nitrogen and Total Phosphorus allocations and the most stringent of the allocations of the pre-existing TMDL or Bay TMDL will apply. While EPA acknowledges that the Bay TMDL is based on a vast collection of data, advanced modeling frameworks, and more updated water quality standards among other things, the final report in the Bay TMDL provides the basis for evaluating whether local TMDLS may be superseded by the Bay TMDL:

"For watersheds and waterbodies where both local TMDLs and Chesapeake Bay TMDLs have already been developed or established for nitrogen, phosphorus, and sediment, the more stringent of the TMDLs will apply. In some cases, the reductions required to meet local conditions shown in existing TMDLs may be more stringent than those needed to meet Bay requirements, and vice versa"

EPA recommends that an assessment of each individual pre-existing TMDL be conducted to compare the reductions required by both the Bay TMDL and the local TMDL. EPA is particularly interested in evaluating the reductions that may be required by permittees based on the individual or aggregated WLAs provided in each TMDL.

MDE Response: The initial draft version of Maryland's 2012 Integrated Report included text that described how the establishment of the Chesapeake Bay TMDL in December 2010 affected previously developed tidal nutrient TMDLs. This text, titled "Reevaluating Previously Developed TMDLs for Maryland Tidal Waters in Light of the Chesapeake Bay TMDL," provided a rationale and criteria for determining whether or not each previously developed TMDL would be superseded by the corresponding Bay TMDL. This text has been removed from Maryland's Final Draft 2012 Integrated Report due to ongoing discussions with EPA and potential refinements of the reevaluation process currently under consideration. Instead, this reevaluation will be conducted outside of the 2012 Integrated Report process, and will undergo a separate public review at a future date. In the meantime, all previously developed tidal nutrient TMDLs for portions of the Chesapeake Bay watershed will remain in force until any change in the prevailing TMDLs is formally determined as a result of the finalized reevaluation. In segments of the Chesapeake Bay and tidal tributaries where no previously developed nutrient TMDLs exist, the corresponding Chesapeake Bay TMDLs for those segments are now in force.

Category 4b List

EPA Comment 7: EPA requests that the Baltimore Harbor/Patapsco River Mesohaline assessment unit that was delisted from category 4B remain on category 4B until ambient water quality monitoring can be completed for at least copper, cyanide, mercury and nickel. If monitoring data show that the waterbody is meeting appropriate water quality standards for those pollutants, a delisting would be appropriate at

that time. If the waterbody is not meeting water quality standards for those pollutants, the waterbody should be added to category 5 and scheduled for a TMDL.

MDE Response: Additional information was provided to EPA regarding these listings. Based on this information, EPA agreed that the Category 4b listing for mercury in the Patapsco River was inappropriate and should be removed from the IR. For the remaining Category 4b listings (copper, cyanide, and nickel), it was deemed that more information was required prior to removing them from the impaired part of the IR. As a result, the Category 4b listings for copper, cyanide, and nickel have been put back on Category 4b of the 2012 Integrated Report and will be prioritized for additional investigation. Additional investigation may include ambient water quality monitoring and/or review of existing permit limits and discharge monitoring data.

Category 5 Waters List

EPA Comment 8: Rock Creek (MD-02140206), Cause Unknown, is in Table 10 as delisted with new specific pollutants now specified. It is not clear which are the new pollutants identified. See also comment #4 above.

MDE Response: A new table (Table 12) was added to Section C.3. to describe what stressors were identified for those 21 generic biological (cause unknown) listings that were removed from Category 5. Specifically, the BSID analysis identified total suspended solids (TSS) as the predominant stressor impacting Rock Creek. Since an impairment listing for TSS already existed for the Rock Creek watershed, a new listing record was not needed. Note: In September of 2011, a TMDL for TSS was completed and approved, causing this listing to move to Category 4a.

Category 2 List

EPA Comment 9: Patuxent River Upper, (MD-02131104), Fecal Coliform, River Mainstem. Note: Rt. 214 to Rocky Gorge. This listing was in the 2010 Category 2 list but not in the 2012 Category 2 list. There is a new listing in the 2012 Category 5 list for this watershed but it is for the Mainstem with the following note: From point at Old Queen Anne's bridge on Old Queen Anne's bridge road to the confluence of the Patuxent River with the Little Patuxent River. Does this one substitute the 2010 listing in Category 2?

MDE Response: On the 2012 IR, there are two E. coli assessment records for the Patuxent River Upper watershed (MD-02131104). One of the assessment records addresses the portion of the Patuxent River Upper watershed that extends from Old Queen Anne’s Bridge Road upstream to the confluence of Patuxent and Little Patuxent River. This water segment, on Category 5 in the 2010 IR, was moved to Category 4a on the 2012 IR having had a TMDL completed and approved in August of 2011. The other E. coli assessment record in the Patuxent River upper watershed addresses the waters extending from the confluence of the Patuxent and Little Patuxent River upstream to the outlet of the Rocky Gorge Dam. These waters, on Category 2 in 2010, have now been placed on Category 3 according to Maryland’s Bacteria Assessment Methodology. In this case, more recently collected data showed that a bacterial impairment may exist in this portion of the watershed. However, more data is needed to confirm the impairment before placing on Category 5.

EPA Comment 10: Upper North Branch Potomac River (MD-02141005), Chromium, trivalent. This listing is in the 2010 Category 2 list but not in the 2012 Category 2 list.

MDE Response: This assessment record was erroneously removed from the Integrated Report due to some confusion surrounding the assessment of chromium in the Upper North Branch Potomac River. After consulting with the lead engineer for the Water Quality Analysis (WQA) written for metals in the Upper North Branch, it was determined that the assessment for chromium did address any potential toxicity that might be due to trivalent chromium. In particular, the assessment completed for this WQA used a conservative comparison of total dissolved chromium levels to hexavalent chromium water quality criteria (hexavalent chromium criteria are lower than trivalent chromium criteria and therefore are more conservative). This comparison showed total dissolved chromium levels below even the speciated chromium (trivalent and hexavalent) criteria.

EPA Comment 11: Sassafras River Oligohaline (MD-SASOH), Cause unknown. This listing was moved from Category 3 to Category 2 but no explanation or note about the rationale for moving this listing.

MDE Response: A note has been added to this assessment record for clarification. For the 2010 IR, MD-SASOH did not have a sufficient benthic macroinvertebrate sample size (N=9) to determine the impairment status. Therefore, this listing was placed in Category 3 for insufficient data. For the 2012 IR assessment, at total of 12 stations were sampled in the Sassafras River Oligohaline area which showed the benthic macroinvertebrate community as healthy. As a result, this assessment record was moved to Category 2.

EPA Comment 12: Jones Falls-Lake Roland, Chlordane. Moved from Category 4a to Category 2 but there was no rationale for moving this listing.

MDE Response: New fish tissue data collected from Lake Roland in 2007 showed levels of chlordane that were well below the fish tissue impairment threshold of 242.8 ppb. See Table 36 below.

Table 36: Concentration of chlordane stereoisomers in fish collected from Lake Roland in 2007.

Fish Species	Number of Individuals in the Composite	Average Length (in)	Average Weight (g)	Chlordane, cis (ppb)	Chlordane, trans (ppb)
Bluegill	5	5.3	40	0.65	0
Carp	5	21.9	2426.8	15.76	5.53
Largemouth Bass	2	9.9	213	0.69	0
Largemouth Bass	2	15.2	847.5	0.43	0.11

EPA Comment 13: Two Category 5 listings for PCBs (Potomac River Montgomery County and Antietam Creek), now have a different Water Type Detail from that specified in the 2010 Category 5 list. It changed from Nontidal 8-digit watershed to River Mainstem. Recommend to make a note on the rationale for this change.

MDE Response: A note was added to Antietam listing. A note already existed for the Potomac River listing. MDE defines the mainstem branch of an 8-digit watershed as the default listing scale for PCB in fish tissue assessments as most sampling occurs in the mainstem. Other spatial areas may be included in an assessment record if data is collected from other portions of a watershed. Please see the Toxics Assessment Methodology for more details on the spatial scale of assessment (http://www.mde.maryland.gov/programs/Water/TMDL/Integrated303dReports/Documents/Assessment_Methodologies/Toxics_AM_2012.pdf).

MIDSHORE RIVERKEEPER CONSERVANCY, 23 N. Harrison Street, Easton, MD 21601, Drew J. Koslow, Choptank Riverkeeper, drew@midshoreriverkeeper.org

For the Choptank there are a couple of proposed delistings that raise some concern.
MRC Paraphrased Comment 1: The MD-CHOTF-Camp_Mardela_Beach listing was for enterococcus in swimming areas. MDE states that testing indicates that bacterial contamination is no longer an issue. MRC is curious as to when samples were collected and how many were taken to support this delisting. Ideally bacteria sampling should be conducted on a regular (weekly) basis (during swimming season) to protect swimmers health.

MDE Response: For the original Category change (Category 3 – insufficient data to Category 2 – water body meets water quality criteria) that occurred to the Camp Mardela Beach assessment on the 2010 Integrated Report; 21 samples were collected during 7 sampling events[13] (2008) which resulted in a geomean of 9 cfu/100ml using enterococcus as the indicator. The steady-state bacterial water quality criterion for enterococcus in freshwater is 33 cfu/100ml (geomean). In addition, a sanitary survey was conducted for this area in 2008 which did not identify any significant sources of pathogenic bacteria.

Caroline County Health Department now uses *E. coli* as the primary bacterial indicator for freshwater systems as it has been proven to be more tightly correlated to actual illnesses. The steady state bacterial water quality criterion for *E. coli* in freshwater is 126 MPN (geomean). For the 2012 Integrated Report, 18 samples collected during 6 separate sampling events (in 2010) resulted in an *E. coli* geomean of 45 MPN for the Camp Mardela Beach. As a result, Camp Mardela Beach remained in Category 2 (criterion met) on the 2012 Integrated Report.

Beach sampling frequencies are determined by the frequency of use and risk level at a particular beach. Since Caroline County has classified Camp Mardela Beach as a Tier 3 beach, it receives at least monthly bacteria sampling during the beach season (Memorial Day through Labor Day). More information on how beach tiers are determined can be found in Code of Maryland Regulations Section 26.08.09.07 (http://www.dsd.state.md.us/comar/getfile.aspx?file=26.08.09.07.htm) and in MDE's Guidance for County Recreational Water Quality Monitoring and Notification Programs (http://www.mde.state.md.us/programs/Marylander/PublicHealthHome/Documents/www.mde.state.md.us/assets/document/MDBEACHfinalrev042008.pdf).

[13] Samples are collected in triplicate so as to provide more reliable values.

MRC Paraphrased Comment 2: In 2010, MDE delisted the assessment unit MD-CHOOH-TF-02130404 for PCBs in fish tissue. This delisting appears to be proposed because the PCB analysis that was done on fish wasn't done by analysis of fillets, rather on a whole fish analysis and ovary analysis. Shouldn't a proposed delisting be supported by (a new) analysis that is done according to MDE specifications, rather than just by disregarding data that was inappropriately analyzed? I would like to see a new analysis that demonstrates that the listing is erroneous rather than removing a listing that was based on PCB contamination of yellow perch without proving that that listing was in error.

MDE Response: MDE confirms that the 2008 Category 5 PCB listing for MD-CHOOH-TF-02130404 was an error, based on the fact that the analysis was completed on a whole fish and separate ovary sample. Maryland's Toxics Assessment Methodology (http://www.mde.maryland.gov/programs/Water/TMDL/Integrated303dReports/Documents/Assessment_Methodologies/Toxics_AM_2012.pdf) specifies that only the parts of the fish typically consumed (i.e. fillets) will be used for making impairment determinations for the Integrated Report. Therefore, in the 2010 Integrated Report, the whole fish and ovary data was removed from the assessment and replaced by newer data based on yellow perch fillets. The new data, analyzed from a 5 fish composite, showed a median PCB-in-fish-tissue concentration of 7.14 ppb which is lower than 39 ppb, the value that Maryland uses as an impairment threshold. The Department has since updated the note for this assessment record (in the Integrated Report) to reflect this newer information.

CHESAPEAKE RIVERKEEPERS, 16928 York Road, Monkton, MD 21111, Theaux M. Le Gardeur, Gunpowder Riverkeeper keeper@gunpowderriverkeeper.org

CRK Condensed and Paraphrased Comment 1: The Chesapeake Riverkeepers feel that the public review process for Maryland's 2012 Integrated Report (IR) failed to provide adequate and robust public participation that would allow for requisite stakeholder input in this important regulatory process. As part of this inadequate public review process, the Riverkeepers feel that there was inadequate notice given to the public regarding the 139 listing reclassifications[14] (hereinafter referred to as Reclassification) included in the Draft IR.

Unlike the typical notice and comment rulemaking process, there was no publication of notice in the Maryland Register or in a newspaper of general circulation in this case. Furthermore, the initial Fact Sheet published by the Department and made available to the public on its website did not include any substantive information about the Reclassification. The initial Fact Sheet therefore failed to properly engage the public. Only when the Waterkeepers filed their initial comments on March 16, 2012, did the Department post a revised Fact Sheet that contained this information. Thus, notice of the Reclassification was provided to the public for only ten days before the close of the comment period on March 26, 2012 without any indication on the website that the Fact Sheet had changed. The Department missed an opportunity to engage stakeholders in meaningful and robust participation in this important regulatory process. The only alternative available to a member of the public to ascertain the breadth of the mass reclassification of 303(d) listings prior to the availability of the revised Fact Sheet was to

[14] The Reclassification refers to the 139 Chesapeake Bay segment-designated use-pollutant assessment records that were reclassified from Category 5 to Category 4a on the 2012 Integrated Report as a result of the approval of the Chesapeake Bay TMDL in December 2010.

review the entire Draft 2012 IR. Nor was there any discussion about the Reclassification during the original March 12, 2012 public meeting.

MDE Response: The Department respectfully disagrees with the commenter that the public participation process for the Draft 2012 Integrated Report was less than robust. The Department utilized a number of different outreach methods to encourage public participation which included publishing a notice in the Maryland Register (February 10th, 2012 edition), emailing over 600 interested parties, posting an announcement on MDE's home web page and Integrated Report web pages, creating a fact sheet for a quick overview, and tweeting the availability of the Draft 2012 Integrated Report on Twitter©. With regards to addressing the Reclassification in the Fact Sheet, the Department again disagrees with the commenter, noting that the original Fact Sheet did include a statement about the Reclassification in the section titled "How are we addressing these water quality issues?". In addition, during the review period, the Department held a public information meeting at MDE headquarters on March 12, 2012 that provided an overview of all important changes to the 2012 report, including those changes involving the Reclassification. The Department even held an additional, more technical informational meeting on April 19, 2012 and extended the public review period for an additional month (ending on April 26, 2012) at the commenter's request in order to address questions relating to the Reclassification.

CRK Comment 2: In the Draft 2012 IR, the public was not provided with any substantive information on how the Bay Model was being applied to these specific segments (e.g. the WLA's applicable to those segments, etc.).

MDE Response: In general, information on the application of water quality models and the resultant WLAs and LAs is only provided in the TMDL documentation. On the other hand, the Integrated Report provides the summarized analysis results of water quality monitoring data, and tracks the progress toward meeting water quality standards. For information about the Bay models and specific WLAs please see the Chesapeake Bay TMDL which can be accessed at: http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/tmdlexec.html.

CRK Condensed and Paraphrased Comment 3: The public and other stakeholders have been effectively denied a meaningful opportunity to comment on the Reclassification due to the complexity of the issues and the close relationship between the Reclassification and the development of the Chesapeake Bay TMDL. The Department has, in effect, taken a position on the Reclassification that removes a significant component of the public process that is integral to sound and responsible decision-making regarding Chesapeake Bay water quality issues. In summary, the Chesapeake Riverkeepers feel that the process used to reclassify these waters (139 water body-pollutant assessments) from Category 5 to Category 4a did not allow for adequate public review.

MDE Response: The process that results in a water body-pollutant assessment record being reclassified from Category 5 (impaired and requires a TMDL) to Category 4a (still impaired but TMDL completed) on the IR generally proceeds as follows. Once a water body is listed as impaired (Category 5) on the IR, a TMDL is usually developed within an 8-13 year time period, following EPA guidelines. Maryland, being a state with delegated authority, then develops a TMDL in order to establish pollutant loading

goals that, if met, will protect water quality.[15] After the initial draft TMDL has been completed, it must undergo public review in which the Department must respond to all comments. These comments and responses are then reviewed by EPA to ensure that the responses provide adequate basis for the decisions made. Then, provided that the TMDL satisfies all other applicable requirements for legal and technical sufficiency, EPA then approves the TMDL. Once the TMDL is approved, the water body-pollutant assessment record for which it was written (e.g. Magothy River Mesohaline-total phosphorus), is administratively moved from Category 5 to Category 4a on the most current IR. Since the TMDL development process incorporates a public review component, there is no need to re-review the TMDL and the resultant category change during the development and finalization of the IR. Therefore, approval of the TMDL by EPA necessitates the category change from 5 to 4a. In this way, the Department reclassified the Chesapeake Bay and its tidal tributary segments consistent with how other water body TMDLs and reclassifications have been handled and consistent with the other Chesapeake Bay States.

Other Comments Submitted by the Chesapeake Riverkeepers
Not Pertinent to the Integrated Report

CRK Comment 4: Gunpowder Riverkeeper is concerned about the Department's sole use of the Chesapeake Bay Water Quality Model's ("the Bay Model") Criteria in these reclassifications; namely, that dissolved oxygen as a surrogate for numeric nutrient criteria may not necessarily be informative or appropriate to characterize nutrient loading and impairment status.

MDE Response: The Department respectfully disagrees. The Chesapeake Bay criteria development process incorporated a vast amount of scientific research and peer review in order to derive water quality criteria representative of the critical requirements to sustain Bay life. For more information on the Chesapeake Bay water quality criteria and their development please see the document titled "Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and its Tidal Tributaries" (2003) and all subsequent addenda. Please address any additional questions or comments relating to the Chesapeake Bay water quality criteria to Mr. Richard Batiuk of Chesapeake Bay Program at batiuk.richard@epamail.epa.gov or Mr. John Backus of MDE's Water Quality Standards Program at jbackus@mde.state.md.us.

CRK Paraphrased Comment 5: The Chesapeake Riverkeepers feel that the development of the Chesapeake Bay TMDL was not consistent with how other TMDLs have been developed. Specifically, the Chesapeake Bay TMDL did not: establish specific waste load allocations for various sources, incorporate seasonal variation information, or have a margin of error for the segments subject to the Reclassification. In addition, the Chesapeake Bay TMDL did not incorporate intense water quality monitoring data for specific segments to support TMDL development for those segments.

MDE Response: The Department respectfully disagrees. The Chesapeake Bay TMDL incorporated all aspects required for a scientifically rigorous TMDL, including all of the items mentioned by the

[15] In the case of the Chesapeake Bay TMDL, it was developed through the collaborative efforts of the Chesapeake Bay Program and the other Bay Partners (e.g. Virginia, Maryland, etc). However, the same progression of steps was followed.

commenter. For specific information on these items please visit the website for the Chesapeake Bay TMDL at: http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/tmdlexec.html. Please address any additional questions or comments relating to the Chesapeake Bay TMDL to Mr. Richard Batiuk of Chesapeake Bay Program at batiuk.richard@epamail.epa.gov or to Mr. Lee Currey of MDE's TMDL Development Program at lcurrey@mde.state.md.us.

CRK Paraphrased Comment 6: The Chesapeake Riverkeepers state that the public participation process for the Chesapeake Bay TMDL was inadequate to engage the public in a way that addressed specific segments included under the Chesapeake Bay TMDL. The Riverkeepers believe that a separate public process for each segment's reclassification (from Category 5 to Category 4a) is necessary in order to properly provide comment on each Bay segment's TMDL.

MDE Response: The Department respectfully disagrees. From November 2009 through the 45-day public comment period for the Draft Bay TMDL and Phase I WIP (9/24/10-11/8/10), Maryland and EPA conducted extensive public outreach in numerous forums throughout the State on all aspects of the development of both the TMDL and the WIP. Public participation was integral to this process, and encouraged through mass notifications of many informational meetings, webinars, listening sessions, and regional exchanges that were held throughout this period. Question and answer sessions were part of all of these events. Information about the Bay TMDL and Phase I WIP was also made available and regularly updated on the EPA and MDE websites, and contact information for agency staff was routinely provided to stakeholders who wished to discuss issues and concerns outside of the public meeting forums. Please address any additional questions or comments relating to the Chesapeake Bay TMDL to Mr. Richard Batiuk of Chesapeake Bay Program at batiuk.richard@epamail.epa.gov or to Mr. Lee Currey of MDE's TMDL Development Program at lcurrey@mde.state.md.us.