

## EXECUTIVE SUMMARY

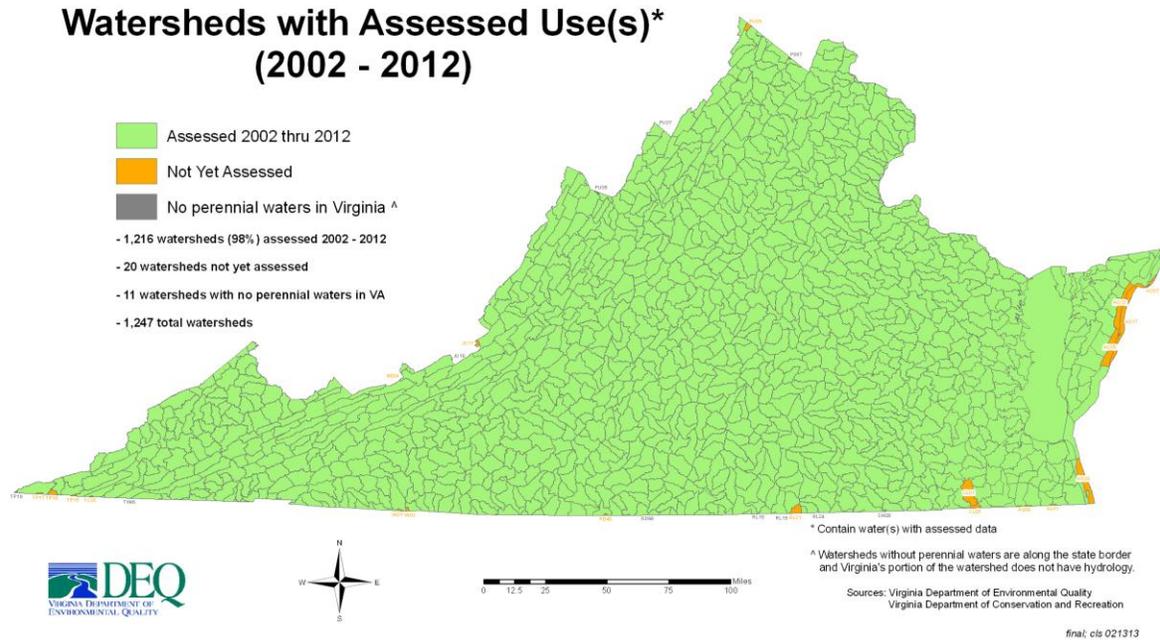
The primary purpose of this report is to provide an overall assessment of quality conditions and trends in the navigable waters of the Commonwealth during the time period January 1, 2005 through December 31, 2010. This report satisfies the water quality reporting requirements of the Commonwealth of Virginia under Sections 305(b), 303(d), 106, 314 and 319 of the Federal Clean Water Act and the Virginia Water Quality Monitoring, Information and Restoration Act (Section 62.1-44.19:5 C of the Code of Virginia). In addition to educating the public about Virginia's water quality conditions, the information provided in this report is intended to be used as a tool in planning and management of waters in the Commonwealth.

The primary objective of Virginia's water quality assessment program is to determine whether the Commonwealth's waters support their applicable designated uses. There are six designated uses that may be applied to surface waters: aquatic life, fish consumption, shellfishing, recreation, public water supply, and wildlife. Virginia's water quality standards define the water quality needed to support each of these uses by establishing the numeric criteria that physical and chemical data are assessed against. If a waterbody contains more of a pollutant than is allowed by the water quality standards, it will not support one or more of its designated uses. Such waters are considered to have "impaired" quality. An "impairment" refers to an individual parameter or characteristic that violates a water quality standard. A water fails to support a designated use when it has one or more impairments.

Virginia's Department of Environmental Quality (DEQ) determines designated use support by assessing data collected in an assessment unit (AU). An AU is a portion of a larger waterbody typically characterized by one or more monitoring stations. The land use surrounding an AU is relatively homogenous, with the same hydrology and sources of pollution found at both upstream and downstream ends. Multiple designated uses exist in an AU; the assessment of these uses depends on the amount of appropriate data collected in that AU during the pre-established time window (in this case, 2005-2010). In 2012, a total of 4,981 assessment units were assessed. Because AUs vary in size temporally and spatially, DEQ prefers to track monitoring and assessment progress using the 6<sup>th</sup> Order (12-digit) sub-watershed delineation scheme of the National Watershed Boundary Dataset (NWBD), which breaks down the former 494 watersheds into 1,247 smaller units of relatively uniform size. At this scale 1,181 sub-watersheds were assessed for at least one designated use from 2005 to 2010, using water column and/or living resource data. Figure A shows the sampling coverage of sub-watersheds since 2002. This report also provides statistics in terms of waterbody size: miles for rivers/streams, acres for lakes/reservoirs, and square miles for estuarine waters.

Both human (anthropogenic) activities and natural processes can cause impaired water quality. All anthropogenic impaired waters in Virginia are placed on a federally mandated 303(d) impaired waters list. Waters that are impaired due to human activities require a plan to restore water quality and associated designated use(s). DEQ schedules each of these waters for development of a Total Maximum Daily Load (TMDL), which is a reduction plan that defines the limit of a pollutant(s) that a water can receive and still meet water quality standards. A TMDL Implementation Plan is developed after a TMDL is approved by EPA. Once fully implemented, the TMDL Implementation Plan will restore the impaired waters and maintain its water quality.

Figure A. Map with sub-watersheds assessed since 2002.



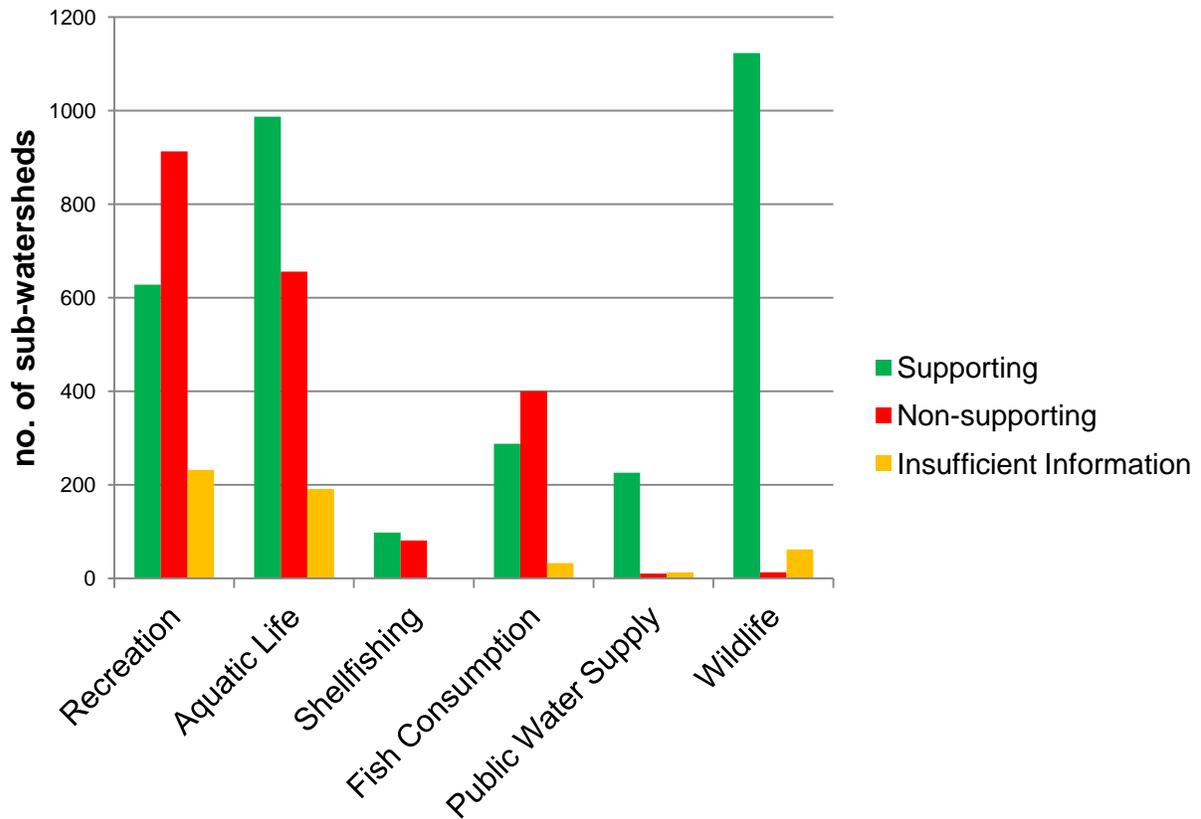
## Overview of Results

Figure B and Table A summarize the assessment status of the Commonwealth's designated uses, broken down by sub-watersheds. Sub-watersheds categorized as "Not Supporting" include waters that do not meet water quality standards, whether they have a TMDL assigned to them or not. Statewide, 5,427 stream miles, 19,638 acres of lakes/reservoirs, and 134 square miles of estuarine waters meet all assessed designated uses. The recreation use is impaired in the most number of sub-watersheds. Fifty percent of assessed rivers/streams (9,156 miles), 1.3% of assessed lake acres (1,532 acres) and 3.4% of assessed estuarine waters (77 square miles) are impaired for this use. As shown in Figure C, elevated levels of the bacteria *Escherichia coli* (*E. coli*) is the most significant impairment for this use, mainly affecting rivers. Agricultural practices, urban runoff, leaking sanitary and storm sewers, and domesticated animals are major sources of *E. coli*. Second to the recreation use, the aquatic life use is also not supported in a large number of sub-watersheds. Thirty percent of assessed rivers/streams (5,504 miles), 43% of assessed lake acres (48,414 acres) and 92% of assessed estuarine waters (2,090 square miles) are impaired for this use. Low dissolved oxygen concentration (hypoxia) is the most important impairment of the aquatic life use. Nutrient enrichment, also known as eutrophication, causes hypoxia by contributing to the formation of oxygen-depleting algae blooms. Low dissolved oxygen is a common impairment of lakes and estuarine waters, including the Chesapeake Bay. Evidence of a degraded biological (benthic) community is another strong indicator that a water does not support the aquatic life use. Chapters 4.2 and 4.3 provide detailed assessment results at state-wide and basin-wide scales, respectively.

Waters of the Chesapeake Bay comprise most of the estuarine waters presented in this report. Bay waters have additional uses underneath the umbrella of "aquatic life use." These "sub-uses" are specific to the diverse assemblages of aquatic organisms that live in the Bay, and they are described in more detail in Chapter 4.4. One special sub-use is the shallow-water submerged aquatic vegetation use. As

the name suggests, this use supports conditions favorable to the growth and survival of submerged aquatic vegetation (SAV). SAV provides critical nursery habitat for blue crabs and fishes and prevents shoreline erosion. Reduced water clarity due to suspended sediments is the major cause of impairment for the shallow-water SAV use. Currently, 53% of this use is impaired, though there are encouraging signs that SAV is returning in impaired areas. Chapter 4.4 provides the assessment results specific to the Chesapeake Bay and its tributaries.

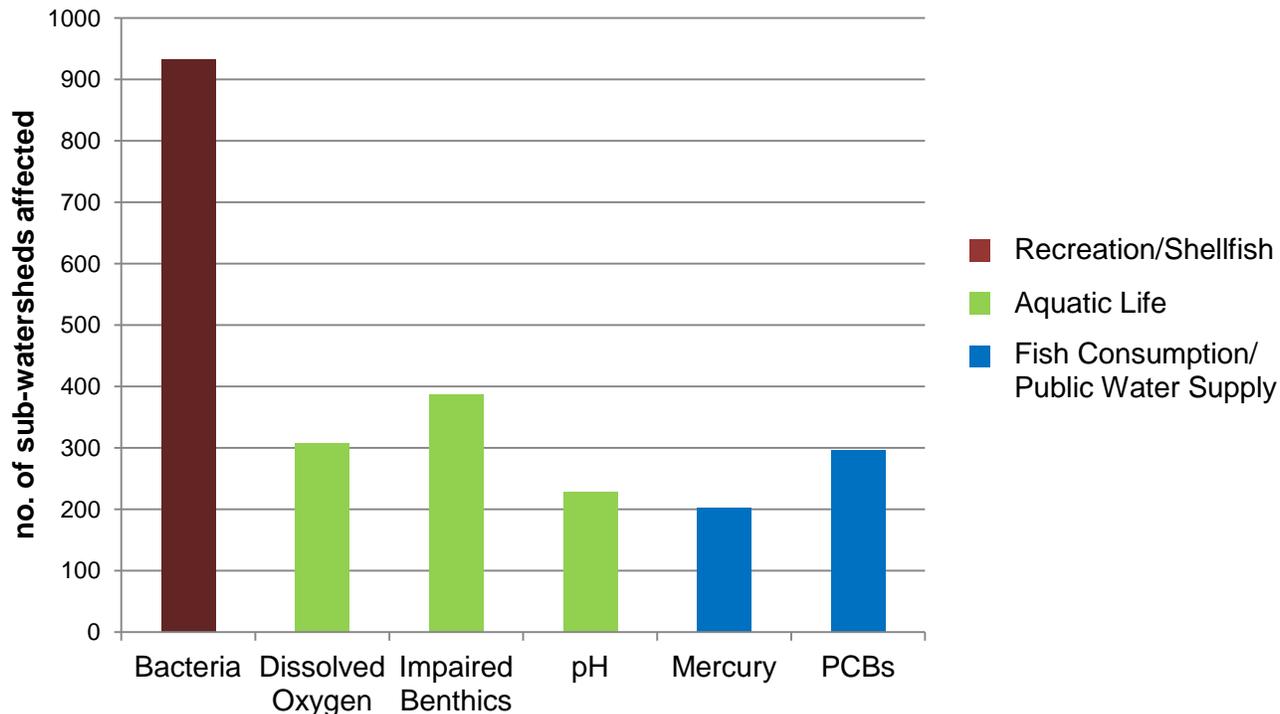
**Figure B. Attainment status of designated uses based on the number of 6<sup>th</sup> Order sub-watersheds assessed for those uses. (Note: A sub-watershed can contain both waters that support and do not support the same designated use).**



**Table A. Overview of assessment results.**

	Rivers (mi)	Lakes (acres)	Estuaries (sq mi)
<b>Total</b>	52,257	116,364	2,684
<b>Impaired (% total)</b>	13,140 (25%)	94,041 (81%)	2,134 (80%)
<b>New Impaired (% total)</b>	846 (1.6%)	100 (0.09%)	2 (0.07%)
<b>Non-Impaired (% total)</b>	5,427 (10%)	19,638 (17%)	134 (5%)
<b>Not Assessed (% total)</b>	33,690 (64%)	2,686 (2%)	416 (15%)

**Figure C. Common causes of designated use impairment.**



Appendix 1 provides the list of impaired waters, which can be visualized using DEQ’s mapper application found here:

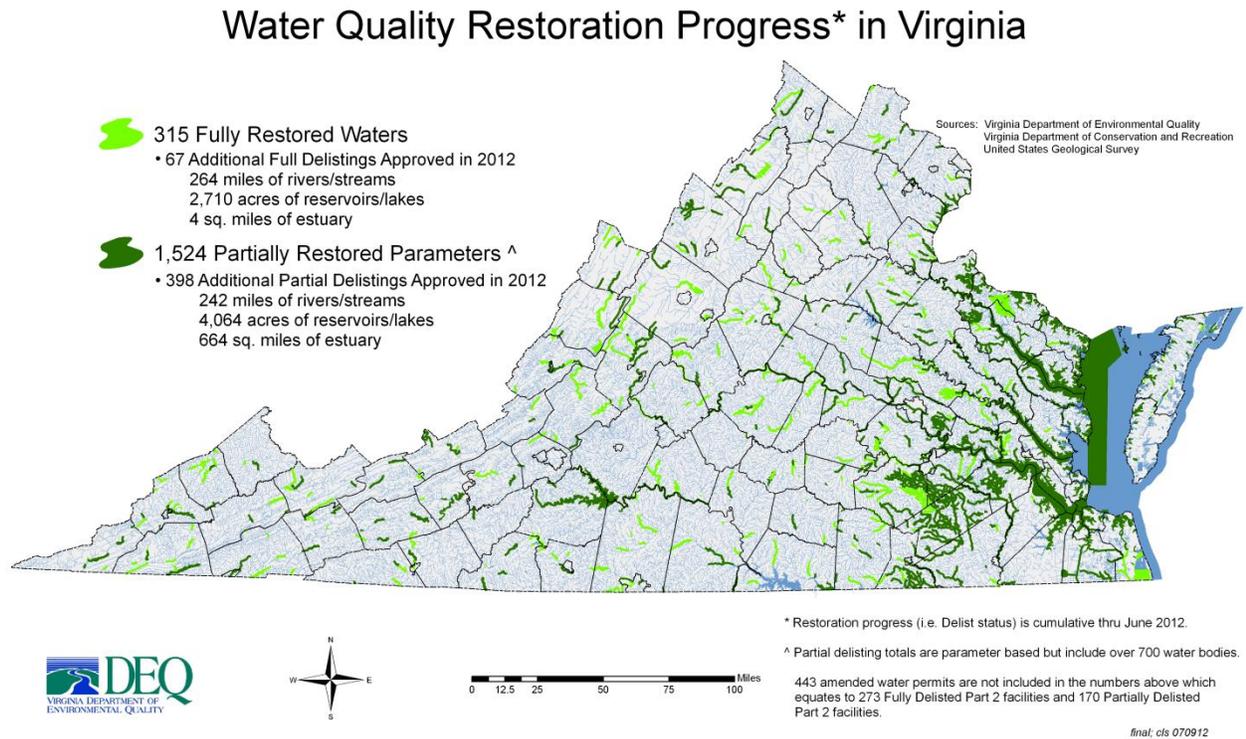
<http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments.aspx>.

Water quality assessment also identifies those waters that were previously listed as impaired but now currently meet standards. Impairment causes of impaired waters are “delisted” from the 303(d) List of Impaired Waters after justification is provided to EPA, the proposed removal is announced to the public, and the removal is approved by EPA. An impairment can be delisted for a number of reasons. First, if a water quality standard is officially changed through rule-making, waters that previously failed that standard may now meet it. Secondly, if assessment methodology for a particular standard has been modified, a water may now meet the standard. Thirdly, a cause can be delisted if new data indicate that water quality standards are currently being attained. This can be the result of successful pollution control efforts, but typically the reason for recovery is unknown. A rationale for each delist candidate is submitted for EPA’s approval before it is removed from the 303(d) list. For the 2012 assessment, DEQ delisted 456 causes, tracked by waterbody size (see Figure D). The most common delisted impairment is bacteria. See Appendix 3 for the list of waters with delisted impairments.

Trend analysis is performed every six years on a network of long-term monitoring stations distributed across the Commonwealth. Change in water quality over time is an indicator of the general health of surface waters. For this report, DEQ presents two sets of analyses: one that characterizes temporal patterns observed at individual stations and one that does the same for watersheds. Traditionally, trend analysis is conducted at pre-selected stations that have long-term datasets for key parameters. DEQ’s trend station network is comprised of 454 monitoring stations, sited in all three waterbody types and monitored monthly for bacteria, total suspended solids (TSS, a measure related to sediment levels), total nitrogen concentration, and total phosphorus. Trends at these stations are analyzed over a twenty-year period. Additionally, DEQ has developed an innovative technique that measures progress in water quality

improvement at the scale of a watershed. This “big picture” view can be compared with the fine-scale

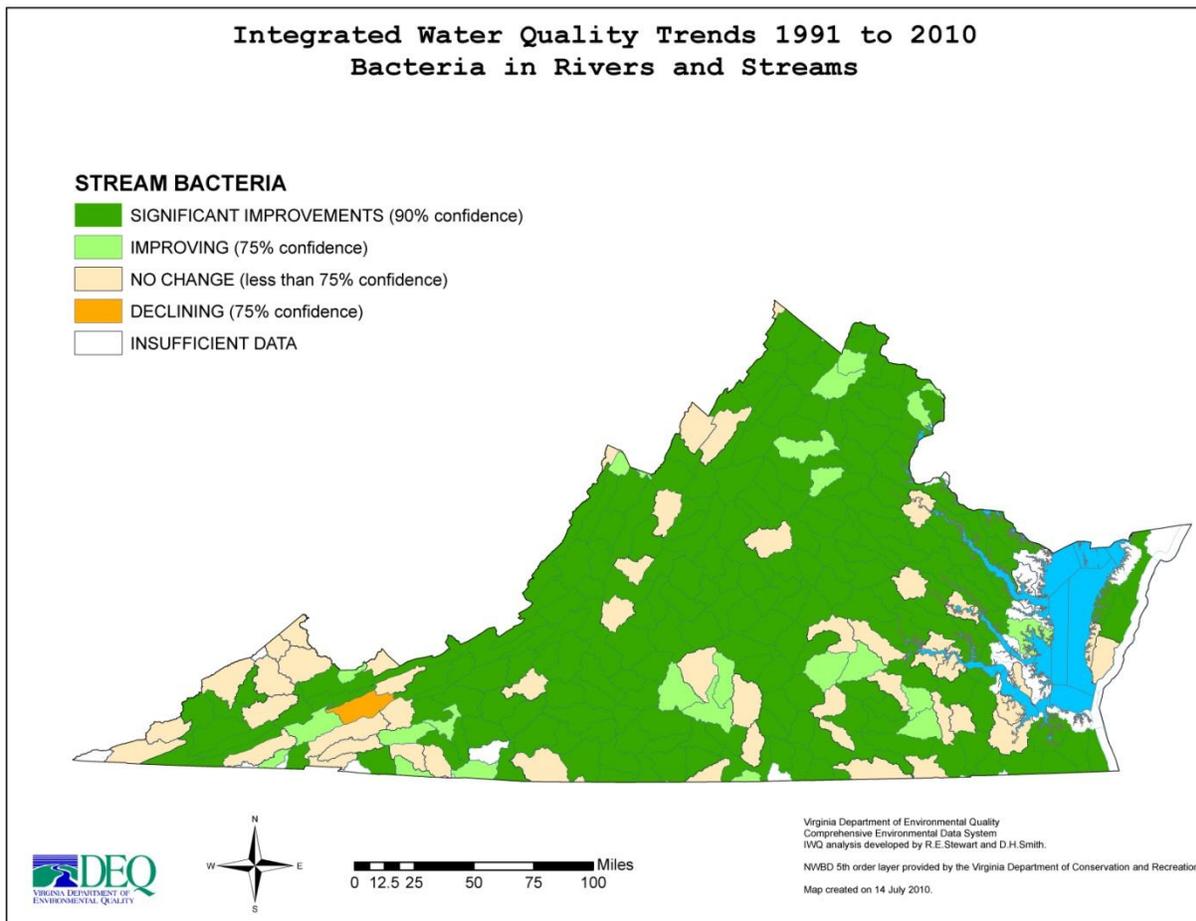
**Figure D. Distribution of waters with causes that have been removed from the 303(d) List of Impaired Waters. (Full delists are waters in which all known impairments have been removed from the list).**



approach of the station analysis to inform and guide decision-making of pollution control activities. Both analyses indicate that significant progress is being made across the state, particularly in regards to the control of bacteria. Figure E shows a map of the 5<sup>th</sup>-order watershed-level trends for bacteria, with green indicating statistically significant (90% confidence) decreasing concentrations over a twenty-year time frame. Many pollution control activities are overseen by the DEQ programs discussed in Chapter 7. In addition to evaluating the effectiveness of restoration efforts in impaired waters, routine trend analysis also allows for the detection of threatened waters so that future impairments can be avoided. Chapters 4.5 and 4.6 provide in-depth presentations of DEQ’s trend analyses.

Water quality assessment serves as the first step in the development of Total Maximum Daily Loads (TMDLs). TMDLs can be viewed as a “pollution diet” for a particular water, prescribing the maximum level (or “load”) of a pollutant that the water can handle before it violates water quality standards. To date, DEQ has completed or scheduled 939 TMDLs. Most have been focused on eliminating bacteria impairments. The Chesapeake Bay TMDL, described in Chapter 7.6, is one of the new TMDLs developed since the last report. It is the largest TMDL in the nation to date. Figure F shows the sub-watersheds where TMDLs have been developed or completed. Chapter 7.1 provides more information regarding DEQ’s TMDL program.

**Figure E. Map of watershed-scale trend analysis on bacteria concentrations from 1991 to 2010.**



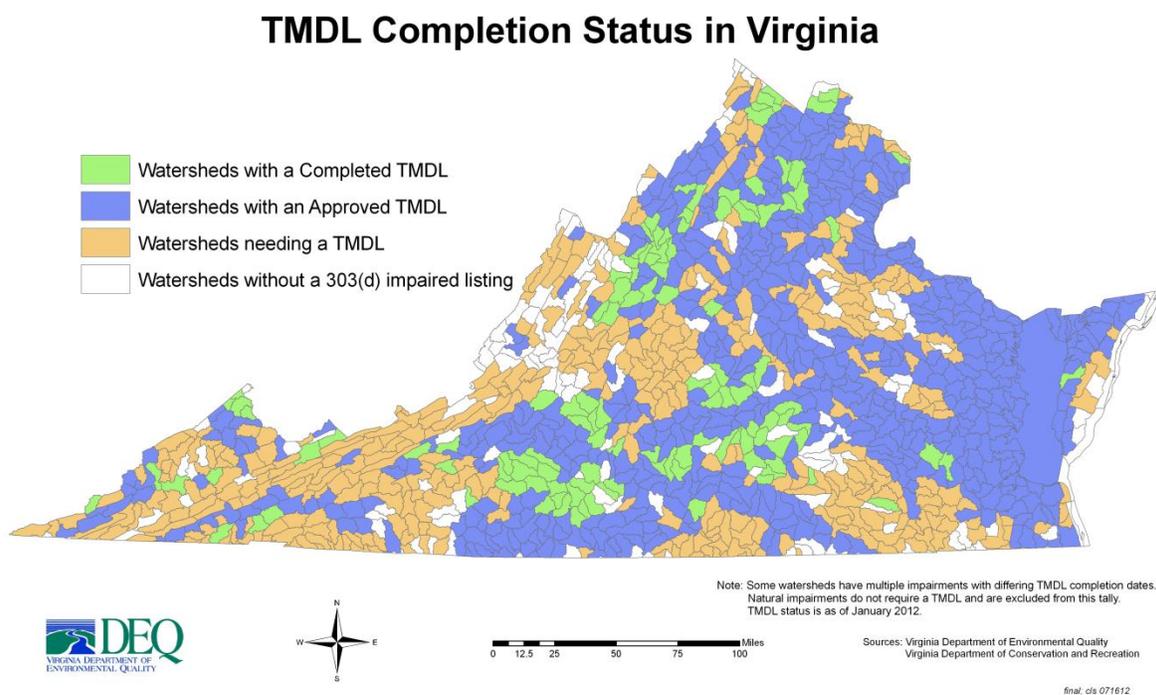
Most of the information in this report pertains to the condition of surface waters (freshwater rivers, lakes/reservoirs, and estuaries). But surface water is only one component of Virginia’s water resources. DEQ is charged with characterizing, protecting, and improving all waters. Chapters 6, 7.5, and 7.7 discuss programs focused on the protection of groundwater, coastal waters, and wetlands.

*Assessment Scheme Used in This Report*

DEQ has incorporated the Integrated Reporting (IR) guidance and associated “Category” classification the U.S. Environmental Protection Agency (EPA) developed for the 2004 assessment. Like the previous three reports, the 2012 assessment combines the 305(b) overall assessment of Virginia’s waters with those waters assessed as impaired but not needing a Total Maximum Daily Load (TMDL) (Category 4) as well as impaired and needing a TMDL (Category 5), as per Section 303(d) of the Clean Water Act. Every water or “assessment unit” (AU) has been placed in the highest category applicable (i.e. 5 > 1) to any of the designated uses for which they were assessed. Below are the US EPA defined categories:

- Category 1: Water fully supports all designated uses.
- Category 2: Water fully supports all designated uses data are available for, but there is either insufficient or no information regarding the remaining designated uses.
- Category 3: There is insufficient information to determine if any designated uses are being met.
- Category 4: Waters are impaired or threatened but do not need a TMDL.
- Category 5: Waters are impaired and do need a TMDL.

**Figure F. Sub-watersheds containing TMDLs**



The EPA Integrated Report guidance allows the states to sub-divide the federal categories to address state programmatic needs. Virginia established sub-categories for most EPA categories in 2004 and continues to refine sub-categories, as needed, for 2012. See Chapters 1 and 4.1 of this report for a description of the Virginia defined sub-categories and other information on the methodologies used for the assessment.

EPA defines threatened waters as those waters that are predicted to exceed water quality standards during the next 305(b) reporting cycle and therefore, considered needing a TMDL. DEQ believes impairment should be confirmed by current monitoring data, using rigorous assessment methodology, before scheduling TMDL development. However, DEQ does identify threatened waters using a combination of trend analysis at ambient monitoring stations and probabilistic monitoring in freshwater,

free-flowing, wadeable streams (ProbMon). Chapters 4.5, 4.6, and 4.7 contain additional details on the 2012 trend analyses and ProbMon.

Virginia continues to use the “observed effects” classification found in Virginia sub-categories 2B and 3C for waters that may indicate potential water quality problems. These assessments are primarily based on evaluated or other related data, especially those associated with nonpoint source impacts. A water with an observed effect is scheduled for follow-up monitoring, as resources allow, to generate a dataset sufficient for a more conclusive assessment in the future. Additional details on impairment causes and sources can be found in Chapter 4.3.

### *Significant Changes in the Reporting Process and Assessment*

Every three years, states are required by the federal Clean Water Act to review and revise, if needed, their water quality standards. This process is called Triennial Review. Amendments proposed in Virginia’s last Triennial Review were finalized February 1, 2010 and were used in the 2010 assessment. Additional changes to Bay standards proposed by EPA were approved by the State Water Control Board and made effective on January 6, 2011. These adjustments, which relate to how dissolved oxygen and chlorophyll *a* are assessed in Bay waters, were applied to the current assessment. They are described in more detail in Chapter 4.4. Information regarding Virginia’s water quality standards can be found here: <http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityStandards.aspx>.

DEQ’s fish tissue and sediment monitoring program was suspended from 2009 to 2011. Thus, the fish consumption advisories issued by VDH are based on data current to 2008. DEQ plans to reinstate this program in 2012. VDH fish consumption advisories are listed in Chapter 7.4.

Finally, the nonpoint source assessment presented in Chapter 5 is also carried over from the previous assessment. This is due to unexpected staffing changes at Virginia’s Department of Conservation and Recreation (DCR), the agency tasked with controlling nonpoint source pollution. It is anticipated that the 2014 Integrated Report will have an updated assessment.