State of Delaware
2010 Combined Watershed Assessment Report (305(b)) and Determination for the Clean Water Act Section 303(d) List of Waters Needing TMDLs

Department of Natural Resources and Environmental Control
April 1, 2010

Preface

The State of Delaware 2010 Combined Watershed Assessment Report (305(b)) and Determination for the Clean Water Act Section 303(d) List of Waters Needing TMDLs provides a statewide assessment of surface water and ground water resources, highlights Delaware's initiatives in water resources management and pollution control and provides a list of waters that need TMDLs to meet water quality standards. The document fulfills the reporting requirements set forth under Sections 305(b) and 303(d) of the Federal Clean water Act of 1977, as amended in 1981 and 1987, and is organized in accordance with federal Environmental Protection Agency's (EPA) guidance documents.

This document summarizes statewide water quality assessments, provides an overview of major initiatives and concerns on a statewide basis, and lists waters needing TMDLs. Tables are provided which show the result of water quality analysis and designated use support findings for data from the period of September 2004 through August 2009.

There are two appendices to the report. Appendix A is the data provided by citizen monitoring programs. Appendix B contains comments and responses to the Tentative Determination for the State of Delaware 2010 Clean Water Act Section 303(d) List of Waters Needing TMDLs.

Assessments for the Delaware River and Bay are completed by the Delaware River Basin Commission (DRBC).

For 2010, an addendum of newly available groundwater statistics and information is being prepared and will be published in the immediate future. It is anticipated that in 2012, the groundwater data will be included in the April 1 submission.

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Part I: Executive Summary

Executive Summary

As recently as 1975, Delaware routinely experienced serious water pollution and public health problems as a result of the discharge of untreated sewage and wastes. Since then, as a result of voluntary efforts, regulatory actions, and significant private and public investments in wastewater treatment facilities, localized improvements in water quality have been achieved.

The need for additional cleanup and pollution prevention continues. The focus of water quality management has shifted from point source discharges (end-of-pipe) to decreased stream flows and nonpoint source problems, such as urban and agricultural runoff, erosion, and sedimentation. Unaddressed, these problems lead to poor habitat conditions for fish and other aquatic life, decreased enjoyment of our surface waters for recreation, and unhealthy conditions for those surface waters upon which we rely for drinking water supply and other domestic uses.

Water Quality Monitoring

The DNREC recognizes the need to use its personnel and financial resources efficiently and effectively. To that end, surface water quality monitoring is conducted in a manner that focuses available resources on the Whole Basin Management concept. The Whole Basin Management Program in Delaware operates on a 5-year rotating basis. This new approach enables the DNREC to comprehensively monitor and assess the condition of the State environment with due consideration to all facets of the ecosystem.

Elements of the State's specific Surface Monitoring Program include:

TMDL-Related Monitoring

General Assessment Monitoring

Toxics in Biota Monitoring

Toxics in Sediment Monitoring

Biological Assessment Monitoring

Delaware Rivers and Lakes

Delaware has classified more than 2,509 miles of rivers and streams, and 2,954 acres of lakes and ponds that have been classified using a rating system called for in the Federal Clean Water Act. The classification system is keyed to a management program designed to protect uses of the waters (referred to as "designated uses") for such purposes as drinking water supply, recreation, and the propagation of fish, aquatic life and wildlife. These designated uses serve as Delaware's water quality goals for specific watersheds. In order to protect those uses, a comprehensive set of chemical, biological, and habitat standards have been promulgated. Designated uses and standards are embodied in the State of Delaware Surface Water Quality Standards as amended on July 11,2004.

The Department of Natural Resources and Environmental Control has found that 86% of Delaware’s rivers and streams do not fully support the swimming use and 98% do not fully support the fish and wildlife use. Most of these waters do not meet the standards because of nonpoint source pollution impacts.

Ponds and lakes in Delaware exhibit many of the same problems as rivers and streams. However, ponds and lakes also serve as "catch basins" for a variety of pollutants that are washed from the land and the air into these water bodies. Two indicators which show the tendency for lakes and ponds to accumulate pollutants are fish consumption advisories due to toxic substances in the fish, and the extent of nutrient enrichment. Nutrient enrichment can lead to excessive weed and algae growth, reduced water clarity, and decreases in population of aquatic life and wildlife. The department has found that 44% of Delaware's fresh water ponds and lakes do not fully support the swimming use and 89% do not fully support the fish and wildlife use.

Wetlands in Delaware

Wetlands have many important functions and values to society. They provide fish and wildlife habitat, help maintain water quality, and provide indirect socioeconomic values such as flood and storm water damage protection. With the implementation of federally mandated regulations known as Total Maximum Daily Loads (TMDLs) to reduce pollutants into water bodies, wetland preservation is considered one of the most important strategies for achieving the pollution reduction efforts necessary to meet water quality standards.

Wetlands comprise a significant portion of Delaware's water resources covering over 300,000 acres (about 470 square miles or 23%) of the state. Throughout the state a wide diversity of wetland types occur including both tidal and nontidal wetlands. While some wetlands are directly connected or adjacent to other surface waters such as salt marshes and floodplains, others occur as isolated areas surrounded by uplands such as forested flats and Delmarva Bays. Preserving the abundance, quality, diversity and proportion of different types of wetlands in the landscape is essential to protecting the natural resources and waters of Delaware. Currently the State of Delaware is actively working in each of these areas to protect our high quality wetland resources and restore degraded systems on the watershed scale.

Bacteria (Pathogen Indicators)

As the name implies, "indicator bacteria" are indicators of pathogenic (disease causing) bacteria and viruses. Sources of indicator bacteria (enterococcus and coliform) are widespread. The sources of most concern are those of human origin such as raw or inadequately treated sewage. Wildlife and animal operations such as feedlots can also be significant sources of indicator bacteria, although they represent less of a risk to human health compared to human wastes.

High levels of bacteria pose an increased risk of illness to shellfish consumers, swimmers, and others who may come in contact with contaminated waters. Approximately 86% of Delaware's rivers and streams, 44% of ponds and lakes, and 2 % of estuarine waters (not including the Delaware River and Bay) were found to have bacteria concentrations above the levels considered acceptable for primary contact recreation (swimming, bathing, and water skiing). Many of Delaware's estuarine and tidal waters exhibited bacteria levels above those considered safe for the harvesting and consumption of shellfish. Waters most impacted include the tidal tributaries of the Delaware Bay and portions of Delaware's Inland Bays.

Nutrient Enrichment

Eutrophication of surface waters is a natural process, spanning hundreds to thousands of years, resulting from natural erosion and the breakdown of organic material. Over these extended periods many lakes and ponds under natural conditions would be expected to fill in with

sediments and organic materials, eventually becoming marshes and meadows. Lakes and ponds in various stages of eutrophication are considered a natural feature of Delaware's environment. Activities linked to soil erosion, domestic waste disposal (on-site septic systems), and runoff, can greatly increase the rate and amount of nutrients reaching lakes and ponds, accelerating the eutrophication process. Characteristic symptoms of nutrient enriched water bodies include murky green waters or nuisance plant growth. Delaware waters are generally considered to be impacted by nutrients (nitrogen and phosphorus).

Fish Consumption Advisories

Toxic substances such as Polychlorinated Biphenyls (PCB's), metals and pesticides persist in the environment and accumulate in the flesh of fish. The Department of Natural Resources and Environmental Control and the Department of Health and Social Services issued updated fish consumption advisories for waterbodies in the State during 2009. See the table in Section III, Chapter 4.

National Methylmercury Fish Consumption Advisory

On January 12, 2001, EPA and the Food and Drug Administration (FDA) issued concurrent national fish consumption advisories recommending restricted consumption of freshwater coastal and marine species of fish due to methylmercury contamination. EPA's advisory targeted women of childbearing age and children who may be consuming noncommercial freshwater fish caught by family or friends. The advisory specifically recommends that women who are pregnant or could become pregnant, women who are nursing a baby, and their young children, should limit consumption of freshwater fish caught by family and friends to one meal per week unless the state health department has different advice for the specific waters where the fish are caught. For adults, one meal is six ounces of cooked fish or eight ounces uncooked fish; for a young child, one meal is two ounces of cooked fish or three ounces of uncooked fish.

General Changes or Trends in Water Quality

As a result of water quality protection programs that are in place in Delaware, surface water quality in general has remained fairly stable in spite of increasing development and population growth. Impacts to waters are generally the result of past practices or contamination events, activities that are not regulated nor otherwise managed, or changes that are occurring on a larger regional scale. For example, air pollutants from sources outside of Delaware contaminate Delaware's surface waters via rainfall.

Improvements in water quality have been documented in localized areas where a discharge was eliminated or better treatment installed. Basin-wide water quality improvements in waters that are being impacted by historical contamination and nonpoint pollution sources are very difficult to detect over a short period of time. Targeted monitoring over long time periods (years) is necessary in order to detect changes.

Although Delaware's surface water quality may not have changed significantly over the last several years, there have been many improvements made in watershed assessment approaches and methodologies. Additionally, many water quality criteria are stricter as a result of amendments to the State's Water Quality Standards. Therefore, we have become more proficient at identifying water quality problems and, at the same time, are calling for higher quality waters.

The stability of Delaware's surface water quality is likely the result of increased efforts to control both point and nonpoint sources of pollution. In addition to the significant investments in wastewater treatment technologies previously mentioned, many private business interests are investing in practical and cost-effective nonpoint source pollution control practices (Best Management Practices) on farms, residential developments, and commercial and industrial sites. Likewise, public agencies such as the Delaware Department of Transportation are investing revenues in improved storm water management practices and wetlands creation to mitigate the impacts of maintenance and new highway construction activities.

Ground Water Quality

Ground water provides an abundant, high-quality, low-cost supply of water for residents of the State of Delaware. The latest records indicate that more than 40 billion gallons of water were withdrawn in 1995 from ground water sources, a 25% increase from the 1990 withdrawal of 32 billion gallons. The domestic needs of approximately two-thirds of the State's population are met with ground water provided by both public and private wells. Most of the water used for agriculture, Delaware's largest industry, and self-supplied industrial use, is also derived from ground water sources. These figures will be updated during the next reporting cycle once the next USGS water use values have been compiled.

Ground water in Delaware is a relatively vulnerable resource due to the State's shallow water table and high soil permeability. The shallow unconfined aquifer is the most vulnerable to contamination and has been made unusable in many localized areas. If ground water resources are improperly managed or inadequately protected, many of the advantages previously mentioned may be lost. Contaminants in ground water originate from anthropogenic sources such as domestic septic systems, landfills, underground storage tanks, agricultural activities, chemical spills and leaks, and many other sources and activities. As population and industrialization of the State continues the standards of purity of ground water are more frequently exceeded over larger areas of the State.

The deeper confined aquifers in the State are also susceptible to contamination. This is because all but one of the confined aquifers in Delaware subcrops beneath the unconfined aquifer and all aquifers receive recharge from leakage from overlying aquifers. Consequently, contamination of the ground water in the surficial unconfined aquifer could eventually affect ground-water quality of the underlying confined aquifers. Studies in southern New Castle County have demonstrated the long-term susceptibility of these deeper aquifers where they subcrop beneath the unconfined surficial aquifer.

The Department is responsible for taking appropriate action to eliminate existing ground water contamination problems and reduce the likelihood of future ground water contamination. This is being accomplished by both regulatory programs (e.g., Underground Injection Control, Underground Storage Tank, RCRA, etc.) and non-regulatory programs (e.g., Pollution Prevention, Non-point Source, etc.).

Future Needs and Activities to Improve Environmental Quality of the State

The State of Delaware will continue to focus on nonpoint source pollution problems such as urban and agricultural runoff, erosion and sedimentation and ground water contamination. The Department of Natural Resources and Environmental Control will emphasize pollution prevention, education, and both voluntary and regulatory efforts to improve the quality of surface

and ground water resources. Additional research and assessment efforts will be necessary to better understand the response of aquatic systems to certain pollutants. Additionally, because of the relationship of stream flow to ecological health, the development of a surface water withdrawal/minimum stream flow maintenance policy is a priority. Improved assessment and management of biological health and physical habitat quality are also priorities.

The health of Delaware's aquatic systems and ground water resources will be assessed and managed within the framework of the Department of Natural Resources and Environmental Control's Whole Basin Management Program. This program calls for the Department, in partnership with other governmental entities, private interests, and all stakeholders, to focus its resources on specific watersheds and basins (groups of watersheds) within specific time frames.

Five basins and 45 watersheds have been delineated (see figure I-1 entitled "Delaware Watersheds and Basins"). The Whole Basin Management activities in the State started within the Piedmont Basin in 1996, and were followed by the Chesapeake Basin in 1997, the Inland Bays in 1998 and the Delaware Bay Drainage Basin started in 1999. Similar activities have begun for the Delaware Estuary.

In addition to the planning and preliminary assessment steps, Whole Basin Management will include intensive basin monitoring, comprehensive analyses, management option evaluations, and resource protection strategy development. Public participation and ongoing implementation activities will occur throughout the Whole Basin Management process.

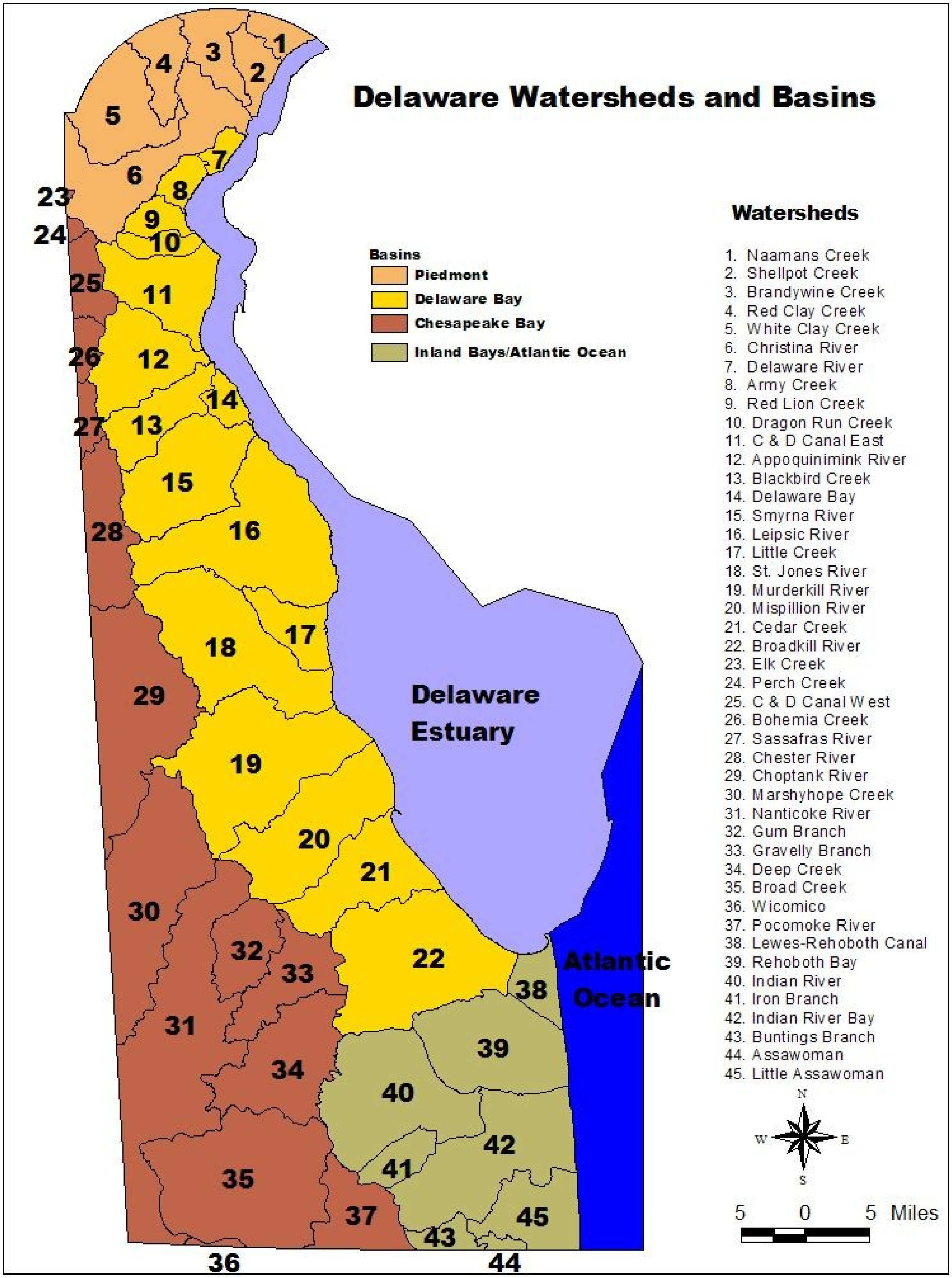
Delaware Watersheds and Basins
Basins
Piedmont
Delaware Bay
Chesapeake Bay
Inland Bays/Atlantic Ocean
Delaware Estuary
Atlantic Ocean
Watersheds
1. Naamans Creek
2. Shellpot Creek
3. Brandywine Creek
4. Red Clay Creek
5. White Clay Creek
6. Christina River
7. Delaware River
8. Army Creek
9. Red Lion Creek
10. Dragon Run Creek
11. C & D Canal East
12. Appoquinimink River
13. Blackbird Creek
14. Delaware Bay
15. Smyrna River
16. Leipsic River
17. Little Creek
18. St. Jones River
19. Murderkill River
20. Mispillion River
21. Cedar Creek
22. Broadkill River
23. Elk Creek
24. Perch Creek
25. C & D Canal West
26. Bohemia Creek
27. Sassafras River
28. Chester River
29. Choptank River
30. Marshyhope Creek
31. Nanticoke River
32. Gum Branch
33. Gravelly Branch
34. Deep Creek
35. Broad Creek
36. Wicomico
37. Pocomoke River
38. Lewes-Rehoboth Canal
39. Rehoboth Bay
40. Indian River
41. Iron Branch
42. Indian River Bay
43. Buntings Branch
44. Assawoman
45. Little Assawoman
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Figure 1 -1

Programs to Correct Impairments

State of Delaware Total Maximum Daily Load Program (TMDL)

Section 303(d) of the Federal Clean Water Act (CWA) requires States to develop a list of water bodies for which existing pollution control activities are not sufficient to attain applicable water quality standards (303(d) List) and to develop Total Maximum Daily Loads (TMDLs) for pollutants of concern. A TMDL sets a limit on the amount of a pollutant that can be discharged into a waterbody such that water quality standards are met.

The State of Delaware was operating under a court-approved Consent Decree that required establishment of nutrient, dissolved oxygen, bacteria, and zinc TMDLs for all impaired streams that were listed on the State's 1996 303(d) list by the year 2006. The Department met the requirements of the Consent Decree by December 2006 and completed TMDLs for all waters of the State that were impaired as the result of high nutrients, low dissolved oxygen, high bacteria levels, or high concentration of zinc.

The Department is currently developing TMDLs for PCBs and other Toxics according to a schedule provided in the 303(d) List. Furthermore, the Department is taking the necessary steps to address habitat and/or biological degradation of the State's waters according to a schedule provided in the 303(d) list.

Pollution Control Strategies

Pollution Control Strategies (PCSs) are plans to achieve the nutrient and bacteria load reductions delineated by Total Maximum Daily Loads (TMDLs). They describe the specific actions that are needed to achieve water quality standards and provide a schedule for implementing those actions. PCSs have been developed for seven watersheds: Christina (Brandywine Creek, Red Clay Creek, White Clay Creek, and Christina River), Appoquinimink River, St. Jones River, Murderkill River, Mispillion River and Cedar Creek, Nanticoke River (including Broad Creek and their tributaries), and the Inland Bays (Rehoboth Bay, Indian River and Bay, Little Assawoman Bay, and their tributaries). The PCSs, for these watersheds except for Mispillion and Cedar Creek Watersheds, have been recommended by diverse groups of citizens (including government officials) called Tributary Action Teams (TATs). These TATs work with the Department's Whole Basin Management Teams and other experts during the process of formulating the PCSs.

The Inland Bays Tributary Action Team, convened by the Center for the Inland Bays, worked diligently in providing the Department with several sets of recommendations for their PCS. This Team was facilitated by Bill McGowan of the Cooperative Extension and Joe Farrell of Delaware Sea Grant. After 6 years of deliberations with a diverse group of watershed interests, DNREC proposed a draft PCS in early 2005. Based on comments received during three public workshops and other meetings with stakeholders, a second draft was presented at three additional workshops in May 2005. Significant concerns were raised by the development community and a group of interested parties including the Delaware Farm Bureau, the Delaware Realtors Association, the Positive Growth Alliance, and the Delaware Homebuilder's Association lobbied the General Assembly to intervene in this process. The Department met with these parties for a year in order to incorporate their concerns and presented the revised Strategy at a third round of

public workshops in August 2006. During these workshops, members of the scientific community raised substantive concerns relating to the buffer portion of the regulation and public outcry resulted in several legislators asking the Department to revisit the buffering issue with the Center for the Inland Bays. In April 2007, the Department attempted to promulgate the PCS regulation with the buffer portion reserved in order to move forward with the Strategy while still taking time to investigate how to successfully craft a buffer rule in lower Delaware. This approach was also not well received and the Department approached specific Sussex County developers to draft a buffer strategy for inclusion in the PCS regulations. Finally on November 11, 2008 the DNREC"s Secretary signed the Inland Bays Pollution Control Strategy which promulgated their regulations requiring regulatory actions in the Inland Bays watershed.

To insure implementation of the Inland Bays Pollution Control Strategy, staff from DNREC's Divisions of Water Resources and Soil and Water Conservation as well as the Sussex Conservation District routinely hold pre-application meetings for new proposed development projects to discuss new stormwater management and buffer requirements. In addition, if proposed projects use onsite wastewater treatment and disposal systems, applicants are informed of new PCS requirements that may apply to those systems as well. Since the PCS regulation went into effect, 12 proposed projects were discussed at these pre-application meetings.

The Cooperative Extension Service convened the Nanticoke watershed's TAT. This group of concerned residents submitted their recommendations at the end of 2002. A PCS has been drafted from their recommendations and has been undergoing review within the Department. The Nanticoke River and Broad Creek PCS will also address additional actions that will be needed for Delaware to achieve its nitrogen, phosphorus, and sediment load reduction commitments as part of the Chesapeake Bay Program. The Department anticipates scheduling public workshops for the draft Nanticoke PCS once the Inland Bays PCS is successfully promulgated.

Since 2000, Delaware has participated with the Chesapeake Bay Program and has committed to achieving water quality goals to protect and improve the bay and tributary waters. EPA is in the process of developing a Total Maximum Daily Load for nitrogen, phosphorus, and sediment that will require significant reductions in point and nonpoint pollutant loadings from all jurisdictions within the Chesapeake Bay Watershed in order to achieve water quality standards. Each jurisdiction is required to develop a Watershed Implementation Plan that details how load allocations will be achieved and maintained into the future. Additionally, jurisdictions will have to exhibit accountability through achieving 2-year milestone goals. In order to achieve these requirements and an aggressive schedule, DNREC has convened the Chesapeake Bay Interagency Workgroup made up of representatives from each DRNEC Division, Department of Agriculture, Department of Transportation, Office of State Planning Coordination, County Conservation Districts, the Natural Resource Conservation District, and other stakeholders. Eight subcommittees have been formed to address: Agriculture; Stormwater; Wastewater; Land Use and Comprehensive Plans; Restoration; Public Lands; Funding; and Information Technology. Subcommittees are tasked with recommending and reviewing sub-allocating methodologies to the various point and nonpoint sources within the basins, assessing current data tracking and reporting systems, determining maximum implementation goals and methods to fill

program and funding gaps, and assist with writing and providing information for the Watershed Implementation Plan.

The Appoquinimink River Tributary Action Team, convened by members of the Appoquinimink School District, also worked hard to educate their community while formulating recommendations for their PCS. The Team created a speaker's bureau that made presentations on water quality for community group meetings and have a monthly column in the Middletown Transcript. A draft of the Pollution Control strategy is written and undergoing internal review. The Appoquinimink River Tributary Action Team has become a 501-c (Appoquinimink River Association) and has been very active implementing the voluntary components of PCS recommendations. Because of the activity of the Appoquinimink River Association, the Appoquinimink Watershed Coordinator, most of the regulations actions proposed in the PCS has been promulgation by the municipalities in the Watershed or be promulgated by State Septic and stormwater regulations.

In the Murderkill River watershed, the Division of Water Resources teamed with the Division of Parks and Recreation to convene the Murderkill TAT at Killens Pond State Park. This Team, formed in 2001, actually began its work before the promulgation of the Murderkill TMDL in December 2001. They held two public forums in May and another in August of 2002. Their recommendations have been drafted into a PCS and Kent County has been incorporating several of their recommendations into their County Comprehensive Plan and ordinances. The regulatory portions of this PCS will go to public hearing following the successful promulgation of the Nanticoke PCS.

The St. Jones TAT was convened by the Cooperative Extension at Delaware State University and held three public forums in early 2006 and submitted their recommendations into the Department in early 2007. In May of 2009, a St Jones Watershed Coordinator was hired to implement on the ground water quality improvement throughout the watershed. Funding for the coordinator has been extended until early 2012.

The Christina Basin was convened by the University of Delaware Water Resource Agency, met for over a year, and submitted their recommendations to the Department in fall 2007.

The Delaware Sea Grant Program convened the Broadkill River TAT in early 2006 and the Department expects the team to submit their recommendations in early 2008.

The Camden-Wyoming Rotary convened the Upper Chesapeake TAT in early 2006 and the Department expects the team to submit their recommendations in early 2008.

The City of Milford convened the Greater Mispillion Tributary Action Team which include Cedar creek Water in 2009, The Mispillion TAT is begin to formulate their Pollution Control recommendations.

Tributary Action Teams for other watersheds with TMDLs will be formed in mid to late 2011 and include the Army Creek-Red Lion Creek-Dragon Run Creek watersheds, the Smyrna River-Leipsic River-Little Creek watersheds, and the Marshyhope Creek-Pocomoke River watersheds.

To date, Tributary Action Teams have documented over 3000 pounds per day of total nitrogen and 275 pounds per day of total phosphorus reductions to Delaware’s surface waters and their proposed Pollution Control Strategies propose to reduce an additional 8,040 pounds per day of

total nitrogen and reduced 133 pounds per day of total phosphorus. These measurable reductions will have significant impacts on Delaware's surface water quality.

The Delaware Nonpoint Source Program

The Delaware Nonpoint Source Program administers a competitive grant made possible through Section 319 of the Clean Water Act. The grant provides funding for projects designed to reduce nonpoint source (NPS) pollution in Delaware. NPS pollution may be defined as any pollution that originates from a diffuse source (such as an open field or a road) and is transported to surface or ground waters through leaching or runoff. Reduction of NPS pollution may often be achieved through incorporation of specific best management practices (BMPs) into project workplans. Projects may target any source of NPS pollution, but most frequently involve agriculture, silviculture, construction, marinas, septic systems, and hydromodification activities. Proposals are reviewed and evaluated, and those which are determined to meet specific requirements are eligible for funding. All projects must include matching funding from a non-Federal source totaling at least 40 percent of the overall project cost.

In addition to funding projects that achieve reductions in NPS pollution, the Delaware NPS Program is committed to addressing the issue through educational programs, publications, and partnerships with other organizations working to reduce NPS pollution in Delaware. More information and annual reports are available online at this url: http://www.dnrec.state.de.us/dnrec2000/Divisions/Soil/NPS/index.htm .

Delaware Riparian Buffer Initiative

Local, State, and Federal governments across the country have recognized the benefits of riparian buffers, including protection of water quality, preservation of flood plains, wetlands, and other important wildlife habitats. Because riparian buffers provide so many different benefits, they can be used to serve many purposes. Grassed or tree-lined buffers at the edge of farm fields trap sediment and filter pesticides and fertilizer. Buffers in urban environments slow stormwater runoff from roads and parking lots. And buffers everywhere offer food and habitat for wildlife, as well as recreational opportunities for people.

The Delaware Riparian Buffer Initiative developed a Watershed level suite of tools for prioritizing areas for riparian buffers. This GIS Planning module was developed through a series of workshops and meetings taking input from Conservation Districts, NRCS, Delaware Department of Agriculture, USFWS, and DNREC staff, facilitated by the Delaware Coastal Programs. This resulted in criteria to identify Very High, High, Medium and Low Priority areas to target for riparian buffers based upon both water quality and wildlife considerations.

The four main functions of this GIS Planning Module are:

- Identify riparian and vegetated wetland areas within a watershed that have or do not have vegetated buffers
- Review the connectivity between riparian areas and plan for riparian corridors
- Prioritize targeting for riparian buffers
- Mapping function to a standard layout design.

Delaware Nutrient Management Commission

The Nutrient Management Act established a 19-member commission that is charged to develop, review, approve, and enforce regulations governing the certification of individuals engaged in the business of land application of nutrients and the development of nutrient management plans. The members of this commission come from many different backgrounds and professions. The Delaware Nutrient Management Commission's official mission is:

"To manage those activities involving the generation and application of nutrients in order to help improve and protect the quality of Delaware's ground and surface waters, sustain and promote a profitable agricultural community, and to help meet or exceed federally mandated water quality standards, in the interest of the overall public welfare.

The mission of The Delaware Nutrient Management Commission is to:

- Consider establishing critical areas for voluntary and regulatory programs.
- Establish Best Management Practices to reduce nutrients in the environment.
- Develop educational and awareness programs.
- Consider incentive programs to redistribute nutrients.
- Establish the elements and general direction of the State Nutrient Management Program.
- Develop nutrient management regulations.

The Delaware Nutrient Management Commission is online at the following url: http://www.state.de.us/deptagri/nutrients/ .

Part II :Background

Background

This report on Delaware's water quality has been prepared pursuant to the requirement set forth in the Federal Clean Water Act of 1977 and the 1981 and 1987 amendments of Section 305(b), which require each state to prepare and submit to Congress a description of the water quality of all navigable waterways within the State on a biennial basis. The information contained herein applies to the period of September 2004 through August 2009.

Water quality assessments contained in this report were based on information available at the time of assessment. All basin assessments were prepared by the Delaware Department of Natural Resources and Environmental Control, Division of Water Resources.

State Atlas

Table 2.1 provides a brief summary of statistics regarding population and waterbody sizes for Delaware. The waterbody sizes listed in the table were obtained from a Geographic Information System (GIS) data layer that was recently developed to index state's stream waters with the U.S. EPA's Reach File 3 network of streams.

Table 2.1 State Atlas

State Population[1]	881,532
State Surface Area	1981 square miles
Number of Basins	5
Number of Watersheds	45
Total Number of Stream and River Miles	2509
Number of Perennial River Miles	1778
Number of Intermittent Stream Miles	405
Number of Ditches and Canals	326
Number of Border Miles	87
Acres of Lakes/Reservoirs/Ponds	2954
Square Miles of Estuarine Waters	841
Number of Ocean Coastal Miles	25
Acres of Freshwater Wetlands	226,530
Acres of Tidal Wetlands	127,338

1. Delaware Population Consortium Estimated Population for 2009 as of March 31, 2010, available online at: http://stateplanning.delaware.gov/information/dpc_projections.shtml .

2. Surface area for Delaware River Zone 5 and Delaware Bay provided by the Delaware River Basin Commission (DRBC), 1994 -1995 305(b) Report. For purposes of this report, Delaware reports on the Inland Bays and DRBC reports on the Delaware River and Bay.

Summary of Classified Uses

The State of Delaware Surface Water Quality Standards (as amended July 2004) contains the following Designated Use categories:

- Public Water Supply (PS)
- Industrial Water Supply (IS)
- Primary Contact Recreation (PCR)
- Secondary Contact Recreation (SCR)
- Fish, Aquatic Life, and Wildlife (FISH,WL)
- Cold Water Fish - Put and Take (CWF)
- Agricultural Water Supply (AS)
- Exceptional Recreational or Ecological Significance (ERES)
- Harvestable Shellfish Waters (SFH)

EPA recognizes that each state may have different designated use categories and definitions. In order to improve reporting consistency and interpretation of assessment information on the national level, EPA has recommended the use of the following designated use categories for reporting purposes:

- Fish Consumption
- Shellfishing
- Aquatic Life Support
- Swimming
- Secondary Contact Recreation
- Drinking Water Supply
- Agriculture

Delaware has applied EPA's categories in reporting designated use support on the following basis:

- Fish Consumption is assessed based on whether a fish advisory exists for a waterbody;
- Aquatic Life Support is equivalent to Delaware's Fish, Aquatic Life, and Wildlife designated use;
- Shellfishing is equivalent to Delaware's Harvestable Shellfish Waters designated use;
- Swimming is equivalent to Delaware's Primary Contact Recreation designated use and also includes water skiing;
- Secondary Contact is equivalent to Delaware's Secondary Contact Recreation designated use and includes activities such as boating;

- Drinking Water Supply is equivalent to Delaware's Public Water Supply designated use;
- Agriculture is equivalent to Delaware's Agricultural Water Supply designated use.

For this report, the attainment of the Clean Water Act goal of fishable waters is primarily based on Aquatic Life Support and Fish Consumption. Less than full support or attainment of either the Aquatic Life Support or Fish Consumption infers that the fishable goal of the Clean Water Act is not fully supported. Less than full support of the Swimming or Primary Contact Recreation designated use infers that the swimmable goal of the Clean Water Act is not fully supported.

Delaware's Exceptional Recreational or Ecological Significance (ERES) designation is applied to special State waters that are accorded a higher level of protection than other waters. Section 5 of the State of Delaware Surface Water Quality Standards (July 2004) contains specific criteria for ERES waters.

All the State's waters are designated for Primary Contact Recreation and for Fish, Aquatic Life, and Wildlife purposes.

Part III: Surface Water Assessments and TMDL List

Part III: Surface Water Assessments

Chapter 1 Monitoring Programs

Surface Water Monitoring Programs

Water quality and biological data for Delaware's surface waters are collected under Delaware's Ambient Surface Water Quality Monitoring Program and Biological Monitoring Program within DNREC. Several active citizen monitoring programs have also been developed throughout Delaware that augment the data collected by DNREC. These programs are discussed below.

The DNREC recognizes the need to use its personnel and financial resources efficiently and effectively. To that end, surface water quality monitoring is conducted in a manner that focuses available resources on the Whole Basin Management concept. The Whole Basin Management Program in Delaware operates on a 5-year rotating basis. This new approach enables the DNREC to comprehensively monitor and assess the condition of the State environment with due consideration to all facets of the ecosystem.

Elements of the State's specific Surface Monitoring Program include:

- TMDL-Related Monitoring
- General Assessment Monitoring
- Toxics in Biota Monitoring
- Toxics in Sediment Monitoring
- Biological Assessment Monitoring
- TMDL Related Monitoring

Section 303(d) of the Clean Water Act (CWA), as amended by the Water Quality Act of 1987, requires States to identify those waters within their boundaries that are water quality limited, to prioritize them, and to develop a Total Maximum Daily Load (TMDL) for pollutants of concern. A water quality limited water is a waterbody in which water quality does not meet applicable water quality standards, and/or is not expected to meet applicable standards, even after application of technology-based effluent limitations for Publicly Owned Treatment Works (POTW) and other point sources.

Delaware DNREC has developed a list of water quality limited waters (303(d) List) and is planning to complete TMDLs for all segments on the 1996 list over a ten-year period. The TMDL development schedule is coordinated with the Department's Whole Basin Management Program.

The TMDL related monitoring is designed to provide the necessary information to develop, calibrate, and verify hydrodynamic and water quality models and/or to support the existing models. The Department uses the hydrodynamic and water quality models as management tools for establishing total maximum daily loads; for allocating loads between point and nonpoint sources of pollutants; and for monitoring progress toward achieving water quality goals and standards.

General Assessment Monitoring

The General Assessment Monitoring Network (GAMN) provides for routine water quality monitoring of surface waters throughout Delaware. Each station is monitored for conventional parameters such as nutrients, bacteria, dissolved oxygen, pH, alkalinity, hardness, and metals. The data from this monitoring is entered into the EPA's STORET database, is reviewed and then analyzed in assessing the water quality condition of each water body system. Figure III-1 is a map of active STORET stations used for this report.

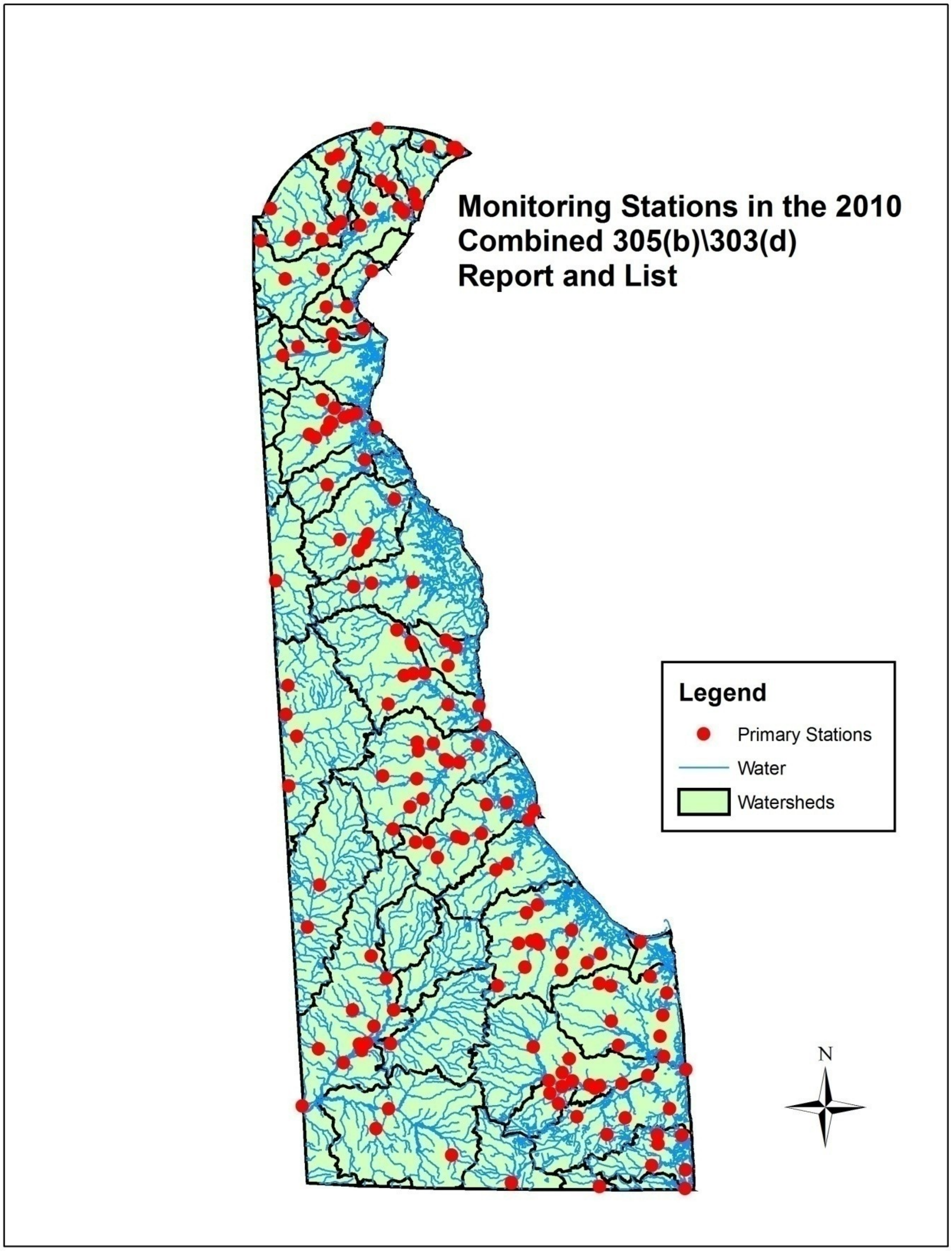

Monitoring Stations in the 2010
Combined 305(b)\303(d)
Report and List
Legend
Primary Stations
Water
Watersheds
N

Figure 3 - 1

Annual Toxics in Biota Monitoring

The Annual Toxics in Biota Monitoring provides for screening level surveys and intensive surveys for toxic contaminants in fish/shellfish. Provision is also made to revisit waters where fish consumption advisories have been issued in the past to determine if contaminant levels in fish are increasing or decreasing over time. Intensive surveys are planned and conducted in areas where contamination has been detected in screening level surveys.

Toxics in Sediment Monitoring

The purpose of the Toxics in Sediment program is to obtain baseline information regarding the levels of various toxics in the sediments of waters throughout the State. The program is designed to complement the Annual Toxics in Biota Monitoring.

Biological Assessment Monitoring

The assessment of the quality of surface waters utilizes a multi disciplinary approach involving physical, chemical, and biological measures. The biological monitoring program is a major tool used by the Department to assess the conditions of surface waters. It includes the assessment of indigenous biological communities and physical habitats of streams, ponds, estuaries and wetlands. The goal of the program is to establish numeric biological criteria in State water quality standards to complement both existing chemical criteria and other assessments focused on fish tissue monitoring and bioassay testing. Standard methods have been developed and tested for assessing the biological community and habitat quality of nontidal streams, and draft numeric criteria are under development. Efforts over the next few years will focus on the development of methods for assessing estuaries and ponds and for assessing the quality and quantity of wetlands

Coordination/Collaboration

Delaware Center for the Inland Bays

The Delaware Center for the Inland Bays was established as a nonprofit organization in 1994 under the Inland Bays Watershed Enhancement Act (Chapter 76 or Del. C. S7603). The mission of the Center for the Inland Bays is to oversee the implementation of the Inland Bays Comprehensive Conservation and Management Plan and to facilitate a long-term approach for the wise use and enhancement of the Inland Bays watershed by conducting public outreach and education, developing and implementing conservation projects, and establishing a long-term process for the preservation of the Inland Bays watershed.

The goals of the Center for the Inland Bays are:

To sponsor and support educational activities, restoration efforts, and land acquisition programs that lead to the present and future preservation and enhancement of the Inland Bays watershed.

To build, maintain, and foster the partnership among the general public; the private sector; and local, state, and federal governments, which is essential for establishing and sustaining policy, programs, and the political will to preserve and restore the resources of the Inland Bays watershed.

To serve as a neutral forum where Inland Bays watershed issues may be analyzed and considered for the purposes of providing responsible officials and the public with a basis for making informed decisions concerning the management of the resources of the Inland Bays watershed.

The establishment of the Center was the culmination of more than 20 years of active public participation and investigation into the decline of the Inland Bays and the remedies for the restoration and preservation of the watershed. A key element of this progression was the publication of a Decisions for Delaware: Sea Grant Looks at the Inland Bays (1983) and the participation by Sea Grant researchers and outreach personnel in the problem-solving process. The last six years of this work were accomplished as part of the National Estuary Program.

The National Estuary Program, established under the Clean Water Act and administered by the U.S. Environmental Protection Agency (EPA), provided approximately $2 million to study the Inland Bays, characterize and set priorities for addressing the environmental problems in the watershed, and develop a Comprehensive Conservation and Management Plan (CCMP) to protect and restore the bays. The underlying theme of the program is that a collaborative, consensus-building effort involving citizens; private interests; organized groups; and federal, state, and local governments is essential to the successful development and implementation of the CCMP. Recently completed through a highly successful participatory effort, the Inland Bays CCMP has now been approved by Governor Thomas Carper and the EPA. Funding is provided by the EPA, the State of Delaware and private donations.

Delaware Nature Society Watershed Stewardship Programs

Watershed Stewardship – comprised of Stream Adoption, Technical Monitoring, and Backyard Habitat – is designed to engage citizens statewide in the protection of Delaware's watersheds.

Stream Adoption

The Stream Adoption program educates individuals, families, scout and school groups about stream ecology, the threats to stream health, and their individual role in protecting water quality. Currently, 70 stream segments are "adopted" in 20 watersheds statewide. In 2009, Nature Society staff provided workshops and presentations reaching over 277 individuals. The Nature Society made over 6278 contacts with school students and scout groups through Water Quality education programs.

Technical Monitoring

Established in 1995, Technical Monitoring is a nationally recognized example of the acceptance and use of citizen science data by the State and the Environmental Protection Agency (EPA). Technical Monitoring was developed to supplement the State's monitoring efforts in other locations by providing reliable baseline values for several different chemical and physical parameters. The monthly sampling frequency, strategic site selection, rigorous quality assurance and control measures, and technical equipment allow for more subtle trend analysis.

Technical monitoring data is collected at 37 sites in the Christina River Basin, which includes the Brandywine, Red Clay, and White Clay Creeks, all in northern New Castle County. There are 4 sites monitored on the Mispillion River in Kent & Sussex counties. Technical Monitoring volunteers started monitoring 5 sites on the Appoquinimink River in southern New Castle County in 2008. The Christina Basin Technical Monitoring data is being incorporated into a non-point source pollution water quality model used by DNREC's Division of Water Resources and the US Geological Survey for the Delaware – Pennsylvania Total Maximum Daily Load (TMDL) effort for the Upper Christina Watershed. Data collected in the Mispillion Watershed is providing supplementary data to the Division of Water Resources. In 2009, Technical Monitoring volunteers logged 457 hours.

In addition, the data in both watersheds is published every five years in the Nature Society's State of the Watershed reports. Data collected in the Christina Basin Watershed from 2001-2005 is available online at www.delawarenaturesociety.org. The report summarizing the data from the Mispillion Basin Watershed from 2004-2008 is also available online.

Backyard Habitat

Backyard Habitat, launched in September 2001, provides official certification for properties or residences that provide food, cover, water, and places for wildlife to raise their young. By adopting practices beneficial to wildlife such as landscaping with native plants and limiting use of pesticides, participants help to improve local water quality by reducing their reliance on products that contribute to non-point source pollution. The Nature Society offers homeowners interested in Backyard Habitat certification free, one-on-one technical assistance through our trained Habitat Stewards volunteer corps. In 2009, the Nature Society has certified 32 properties (435 total to date) representing a variety of development types ranging from urban to suburban reserve across all three Delaware counties. Habitat Stewards have provided 16 hours of volunteer service in the past year.

Citizens Monitoring Programs in Delaware

In recent years, many citizens' groups have been formed nationwide in response to the growing concerns about degraded water quality. Delaware was one of the first states to initiate citizens' water quality monitoring program of streams to augment fixed monitoring by state agencies. The involvement of citizens in collecting data and making observations on their streams results in an educated public with an appreciation for their watersheds and awareness of pollution threats to vital resources. Data and observations collected by citizens with a strong sense of environmental stewardship will contribute to the long-term success of environmental strategies.

Delaware has four programs that use citizens to monitor water quality. The Delaware Nature Society in cooperation with DNREC established Delaware Stream Watch in 1985. The Inland Bays Citizen Monitoring program was established in 1990 as part of the Inland Bays Estuary Program. Concerned citizens of the City of Seaford in cooperation with DNREC founded the Nanticoke Citizen Monitoring Program in 1991. The Adopt A Wetland Program initiated in May 1993 by the Division of Water Resources and later transferred to the division of Fish and Wildlife.

Inland Bays Citizen Monitoring Program

The Inland Bays Citizen Monitoring Program is managed by the University of Delaware Sea Grant Marine Advisory Service (SGMAS) through an MOU with DNREC, Division of Water Resources. The progam was established in 1991. The goals of the Inland Bays Citizen Monitoring Program are: 1) to collect verifiable water quality data to be used to support public policy decisions with regard to the management of the Inland Bays and 2) to increase public awareness and support for the protection and management of these aquatic resources through public participation.

About 30 citizen monitors make observations at 25 sites encompassing the Inland Bays watershed, evaluating dissolved oxygen, surface water and air temperature, salinity, secchi depth and water depth. Additional site observations include weather, tides and the abundance of macroalgae in near-shore waters. Volunteers collect samples on a weekly basis from mid-April to mid-October, and every two weeks otherwise, if weather permits. Rainfall data are collected daily at three designated locations in the watershed. Volunteers complete data collection sheets and send them to SGMAS for data entry. Volunteer data are reviewed for errors and entered by the field coordinator into a Microsoft Excel spreadsheet on a microcomputer.

Twice a month, volunteers collect water samples from 17 sites that are transferred to College of Marine Studies (CMS) laboratories for analysis of dissolved inorganic nitrogen (nitrate, nitrite and ammonium), dissolved inorganic phosphorous (orthophosphate), chlorophyll a, and total suspended solids using standard laboratory methods. Six times from April through October, volunteers collect water samples from six sites that are transferred to the DNREC Shellfish Program for analysis of fecal coliform bacteria.

The sampling methodology used in this program has been approved by the U.S. Environmental Protection Agency and has been published under the title Quality Assurance Project Plan for the Inland Bays Citizen Monitoring Project. Quality Assurance is maintained by holding group Quality Assurance/Quality Control (QA/QC) sessions at six month intervals. Sessions are conducted as needed for individual volunteers.

The Citizen Monitoring Program has been successful at forging partnerships with data users, most notably State and local governments. The data is an integrated component of the Inland Bays Monitoring Plan. Citizen data has 1) supported the siting of submerged aquatic vegetation test plots, and 2) has been utilized in the Hydrodynamic and Water Quality model used to calculate Total Maximum Daily Loads (TMDL), or to predict tidal flushing from a proposed artificial inlet. Volunteers have participated in several cooperative mini-projects in which the data they collected was used to support research conclusions made by DNREC and CMS scientists. Citizen concern about pathogens in the water and adverse health effects prompted the addition of fecal coliform testing in 1992. The data has been used to support the opening of shellfish beds in the Inland Bays. Citizen monitors have also been involved in monitoring the growth and survival of clams and oysters to support the development of a shellfish management plan. Community concern about water quality in the canal systems of South Bethany prompted the town council to initiate a community-based study in 1995 to support the development of a stormwater management plan.

Project benefits include 1) improved understanding of water quality dynamics, 2) sense of "ownership" of the study by the community and interest in improving water quality through

better management practices, 3) cooperation among resource agencies and community leading to trust and ongoing relationships.

The Sea Grant Program Manager provides oversight and coordination of the Program. A field coordinator is employed on a one-half time basis. The management team is responsible for data management and analysis, public education, quality assurance, volunteer recruitment, management and training of volunteers, daily operations of the project, conducting training sessions and field workshops, writing summary reports, and writing grant proposals to support additional mini-projects. Funding for the project is through a line-item in the DNREC budget. CMS provides office, laboratory and classroom space, laboratory equipment and technical support. DNREC provides technical advisors for program initiatives, and assistance with training and field sessions. The annual budget is approximately $37,000.

Data Interpretation and Communication

Delaware has converted its older Waterbody System (WBS) database to the new EPA provided Assessment Database (ADB). The ADB is a Microsoft Access© database that generated the summary Use Assessment tables in this report. The ADB was updated in 2007 to a newer version. During the conversion process, it was determined that nutrient impairments had not been accounted for within the database. Accounting for the impairments changed the percent of waters that were supporting their uses. This was not an increase in actual impairments; rather it was a correction to the database.

Chapter 2: Assessment Methodologies and Summary Data

2010 Assessment, Listing and Reporting Methodologies Pursuant to Sections 303(d) and 305(b) of the Clean Water Act

General Provisions

All readily available data and information for the period of September 1, 2004 through August 31, 2009 will be considered for the assessment of most designated uses. For waters of Exceptional Recreational or Ecological Significance (ERES), data from calendar years 1995-2009 will be assessed for trends. Given that adequate water quality data may not be available in all cases, determinations of use attainment will be made with an abundance of caution.

Data Quality and Quantity

Data from the Department of Natural Resources and Environmental Control's (DNREC's) Environmental Laboratory Section (ELS) will be considered for use if it is collected and analyzed in accordance with the DNREC ELS Quality Assurance Project Plan. For data from sources other than the DNREC ELS, the Department will consider the quality controls used in collection and analysis to determine if it will be appropriate for use in this assessment. Data will be considered readily available if it is in an electronic format that can be imported into or exported from a modern spreadsheet or database program like Microsoft Excel, Access or Quattro Pro. Data that is only available on paper will be considered on a case by case basis given the limited resources available to the Department to convert such data to the more usable electronic format.

The Department routinely collects water quality samples at about180 stations throughout the State. That data makes up the bulk of the data available for use in 305(b) assessments. The Department considers data from the most recent five-year period, thus, at each station, there are usually data from 20 sampling dates or more. Some stations are in place for a more limited time period and have smaller data sets. Other readily available data and reports are requested in advance of each assessment from parties outside of the Department and used when they are made available. In addition to electronic mail requests from specific organizations, a notice will be published in the Delaware State News and the News Journal.

For the 2010 assessment, the Department will consider data and information received on or before January 29, 2010 from the following sources:

- Reports prepared to satisfy Clean Water Act (CWA) Sections 305(b), 303(d) and 314 and any updates;
- The most recent Section 319(a) nonpoint source assessment;
- Reports of ambient water quality data including State ambient water quality monitoring programs, citizen volunteer monitoring programs, complaint investigations, and other readily available data sources (e.g., EPA's Storage and Retreival System (STORET), the United States Geological Survey, and research reports), and data and information provided by the public;
- Reports relative to dilution calculations or predictive models;
- Water quality management plans;
- Superfund Records of Decision; and

- Safe Drinking Water Act source water assessments.
- Fish and shellfish advisories
- Restrictions on water sports or recreational contact

Coordination with Delaware River Basin Commission (DRBC) and Chesapeake Bay Program Assessments

The DRBC prepares 305(b) assessment reports every two years for the Delaware River and Delaware Bay. Delaware will incorporate the most recent use attainment determinations made by DRBC for the shared waters of the Delaware River and Delaware Bay into its 2010 303(d) list. Delaware expects to work cooperatively with the DRBC, member states and stakeholders to develop and implement TMDLs in waters of the Delaware River and Bay that the DRBC determines to be impaired.

The Chesapeake Bay Program (CBP) is doing assessments for waters in the Chesapeake Bay and nearby waters that drain into the bay in co-operation with Maryland, Virginia, Washington D.C. and Delaware. Delaware will incorporate the most recent use attainment determinations for waters of the state that use criteria developed by the CBP for waters that drain to the Chesapeake Bay.

Use of Environmental Protection Agency Integrated Assessment Guidance

On July 29, 2005, the EPA published "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act." The guidance is available on the internet at this URL: http://www.epa.gov/owow/tmdl/2006IRG/index.html. The Guidance was reaffirmed in for the 2008 listing process in a memo by Diane Regas of the EPA. That memo is online at this URL: http://www.epa.gov/owow/tmdl/2008_ir_memorandum.html . The Guidance was reaffirmed and expanded upon in a May 5, 2009 memorandum posted online at this URL: http://www.epa.gov/owow/tmdl/guidance/final52009.html . The core recommendation of the guidance is to categorize all waters of the state according to the following five categories:

Category 1: All designated uses are met;

Category 2: Some of the designated uses are met but there is insufficient data to determine if remaining designated uses are met;

Category 3: Insufficient data to determine whether any designated uses are met. Either no data is available or some data is available, but it is insufficient to make a determination

Category 4: Water is impaired or threatened but a TMDL is not needed;

- 4A: All TMDLs for this segment have been completed and EPA approved. Class 4A waters have all necessary TMDLs approved, but one or more impairments exist, despite the approved TMDLs.
- 4B: Other required control measures are expected to result in the attainment of WQSs in a reasonable period of time
- 4C: The impairment or threat is not caused by a pollutant

Category 5: Water is impaired or threatened and a TMDL is needed for at least one pollutant or stressor

Each of Delaware's waterbody segments will be assigned to the appropriate category for each designated use and then 'rolled up' into a final categorization for the segment. For the final categorization, the highest category number from the applicable use determinations will be assigned to each segment. For example, if a hypothetical segment has a Category 1 determination for aquatic life use support based on average dissolved oxygen, a Category 3 determination for primary contact use, and a Category 5 determination for aquatic life use support based on the dissolved oxygen minimum criteria, then the segment would be given an overall categorization of category 5. In this case, DNREC would pursue the collection of additional enterococcus data in order to assess the primary contact use and establish a schedule for developing a TMDL in order to meet the minimum dissolved oxygen criteria.

Dissolved Oxygen (DO) Aquatic Life Use Support (ALUS)

The following types of DO data are potentially available for analysis:

- Field measurements taken by personnel using handheld DO probes; and
- Continuous monitoring data collected using multiparameter monitoring systems that are typically deployed for several days, weeks, or months. In order to get a more accurate picture of dissolved oxygen dynamics and other water quality parameters, the Department continues to increase its use of continuous monitoring systems.

To determine ALUS with regard to Dissolved Oxygen (DO), the following methodology will be used to compare measured DO concentrations to two different standards, the minimum at all times and daily average concentrations. Average DO concentrations are considered to be met if the 10^{th} percentile of available data is above the applicable criteria of 5.0 mg/l for marine waters and 5.5 mg/l for fresh waters. The statewide minimum DO concentration for surface waters is 4.0 mg/l at any time. Stations are judged to be in compliance with this criterion if the minimum is not violated by more than 1% of continuous monitoring data and no more than two field samples are below the minimum.

Assessment of Average DO Criteria Attainment:

If sampling events occurred on at least ten different days during the period September 1, 2004 through August 31, 2009 for each station, attainment of the DO average criteria will be assessed using the method that follows. Stations with fewer than ten different sampling days will be considered to have insufficient data and be placed in Category 3 for this assessment cycle.

For purposes of DO compliance with the daily average criteria in a segment, continuous monitoring data, if available, will be averaged on a daily basis for each station. If no continuous data is available, then the field measurements (as available) will be considered to be representative of the daily average for that day. Any type of sample (continuous or field measurement) will be considered to be representative for that station at the time of collection. Once the daily average for each station (station daily average, SDA) has been determined, the SDAs for each station will be pooled and the upper confidence limit (UCL) of the nonparametric 10^{th} percentile confidence interval will be determined using methods described in Section 3.7 of Helsel and Hirsch . That UCL will be compared to the applicable standard. If the UCL is above

the applicable average criteria for all stations in a segment, the segment will be considered to be fully supporting (Category 1) for the DO average portion of ALUS. If the UCL from any station in a segment is below the applicable average, the segment will be considered not fully supportive of the aquatic life use (Category 5)

Formally stated, the following hypotheses will be tested:

H_0: at the 90% Confidence level, $X_{10} \geq$ Standard

H_1: at the 90% Confidence level, $X_{10} <$ Standard

Where X_{10}= Non parametric estimate of the 10th percentile of available data.

Assessment of Minimum DO Criteria Attainment:

Attainment of the minimum DO criteria will be assessed based on all available data (note that ten samples in 5 years are not needed for the comparison to the minimum). For stations for which no continuous DO monitoring data are available, two or more SDAs in five years below the applicable minimum will be sufficient evidence to show that the aquatic life use is not supported (Category 5).

For stations with continuous monitoring data, available continuous monitoring data will be pooled on an annual basis for each station. The UCL of the first percentile of the data will be calculated and compared to the minimum criteria in the same manner as the average comparison above for each year of the applicable five previous years. One or more years in which the upper confidence limit of the first percentile is below the minimum will be sufficient to determine that aquatic life use is not fully supported in the segment (Category 5). See the flow chart below for a graphical depiction of the dissolved oxygen assessment process.

Nutrient Enrichment Assessment

From a state-wide perspective, nutrient overenrichment is one of the leading causes of water quality impairment in Delaware. While nutrients are essential to the health of aquatic ecosystems, excessive nutrient loadings to surface waters can lead to an undesirable proliferation of aquatic weeds and algae, which in turn can result in oxygen depletion and associated impacts to fish and macroinvertebrate populations. Excessive aquatic plant growth can also preclude or seriously curtail water dependent activities such as fishing and boating when plant densities become so great that uses are not physically possible.

For tidal portions of the Indian River, Rehoboth Bay and Little Assawoman Bay watersheds, the water quality criterion for dissolved inorganic nitrogen is a seasonal average of 0.14 mg/l as N, and for dissolved inorganic phosphorus a seasonal average of 0.01 mg/l. For those stations where sampling events occurred on at least ten different days during the period September 1, 2002 through August 31, 2007, the lower confidence limit (LCL) of the nonparametric estimate of the 90^{th} percentile of the available data for each station will be compared to the above values to assess attainment of desired nutrient levels in these waters. Stations with fewer than ten different sampling days will be considered to have insufficient data and be placed in Category 3 for this assessment cycle. Segments with one or more stations whose LCL is above the criteria will be considered to be not fully supporting the aquatic life use (Category 5).

For the remaining waters of the State, the Department has been using total nitrogen and total phosphorus levels listed in the chart below to make ALUS decisions. These target values were developed in order to implement the narrative provisions in the Surface Water Quality Standards. For those stations with sampling events on at least ten different days during the five-year assessment period, the LCL of the nonparametric estimate of the ninetieth percentile of the available data for each station will be compared to the moderate values shown in the table below. Stations with fewer than ten different sampling days will be considered to have insufficient data and be placed in Category 3 for this assessment cycle. Segments with one or more stations whose LCL is at or above the "moderate" values listed below will be considered to be not fully supporting the aquatic life use (Category 5).

Formally stated, the following hypotheses will be tested:

H_0: at the 90% Confidence level, $X_{90} \leq$ Minimum Moderate Value

H_1: at the 90% Confidence level, $X_{90} >$ Minimum Moderate Value

Where X_{90}= Non parametric estimate of the 90th percentile of available data

Categories of Nutrient Concentrations

Nutrient Range	Total Nitrogen (mg/l)	Total Phosphorus (mg/l)
Low	< 1.0	< 0.1
Moderate	1.0 - 3.0	0.1 - 0.20
High	> 3.0	> 0.20

The following conditions will also result in segments being listed in Category 5:

1. There were documented cases of nuisance algal blooms or excessive macrophyte growth. These cases violate Section 4.1.1.3 of Delaware's Standards which require waters of the State to be free from substances that may result in a dominance of nuisance species;
2. Detailed, site-specific monitoring studies indicated a strong linkage between nutrient levels and indicators of eutrophication such as high chlorophyll-a concentrations, extreme daily variation in dissolved oxygen levels, and high sediment oxygen demand; or
3. For ERES waters, a long-term trend analysis indicates a statistically significant increase in nutrient levels over time. Such increases are inconsistent with the short-term goal of "holding the line" on water quality in ERES waters. Such increases are also inconsistent with the long-term goal of restoring those waters, to the extent feasible, to their natural state.

Assessment of Aquatic Life Use Support Using Site-Specific Data That Results from Environmental Assessments and Other Programs

In the normal course of business, the Department requests, receives and evaluates water quality data for various environmental programs. Similar data may also come from other parties (e.g., State, Federal, or local agencies). The Department will use those site-specific studies to compare water quality data to the applicable water quality standard(s) and make assessment and listing decisions for the affected segments. If the data show no water quality criteria are exceeded and no uses are impaired, no further listing action will be taken. If the data are ambiguous or inconclusive, the segment will be listed in Category 3. If water quality criteria are exceeded or uses are impaired as a result of a contaminated site, and the owners of the site are making substantial progress (as determined by the Department) toward correcting the pollution problem, the segment will be listed in Category 4. If it appears that there is a water quality problem related to a contaminated site, and that substantial progress is not likely in the near future, the segment will be listed in Category 5.

Assessment of Waters of Exceptional Recreational or Ecological Significance

ERES is a special use designation in Delaware's Surface Water Quality Standards that applies to waters deemed to be of Exceptional Recreational or Ecological Significance. The short-term goal for ERES waters is to "hold the line" on pollution and the long-term goal is to restore ERES waters, to the maximum extent practicable, to their natural condition.

The ERES designated use will be assessed using data from the period January 1, 1995 through August 31, 2009 for total nitrogen and total phosphorous concentrations to assess trends for those parameters. Seasonality for each parameter at each station will be determined using the Kruskal-Wallis test at the 5% significance level. Parameters showing no seasonality will be assessed using Sen's slope estimator with an Alpha of .05. Parameters showing seasonality will be evaluated using seasonal Kendall slope estimations at the 95% confidence level. Segments with one or more stations that show statistically significant increases in total nitrogen or total phosphorus levels will be considered to not be in attainment of the ERES designated use.

Primary Contact Recreation Use Assessments

Generally, total enterococcus bacteria water quality samples are collected several times each year at each monitoring station. In addition, for all guarded beaches and many unguarded beaches, samples are collected much more frequently from mid-May through mid-September as part of beach monitoring activities. Assessment of the above two situations for primary contact recreation use support will be as follows.

For segments with no beach monitoring, if sampling events occurred on at least ten different days during the five-year assessment period, the geometric mean of the available enterococcus (colonies/100 ml)data for each station will be compared to the geometric mean values shown in the table below. Stations with fewer than ten different sampling days will be considered to have insufficient data (Category 3) to make a determination if the geometric mean criterion is met. Segments with one or more station geometric means above the values in the table will be considered to not be in support of the Primary Contact Recreation designated use (Category 5).

Water Type	Geometric Mean (Enterococcus colonies/100 ml) Criteria for Primary Contact Use
Fresh	100
Marine	35

Segments with beaches that are closed as a result of poor bacterial water quality data two or more times in a single calendar year will be considered not to support the primary contact designated use (Category 5). Some beaches are routinely closed after rain events without using water quality data to make the decision. These rainfall-based management plans are developed by statistically analyzing the relationship between rainfall amounts and Enterococcus levels. Regression analyses are used to determine the amount of rainfall that will cause exceedances of criteria. However, since the existing management plans are based upon outdated criteria, rainfall-based closures will not be considered for making designated use support decisions.

Listing Criteria for Waters with Fish Consumption Advisories

For purposes of developing Delaware's Integrated 305(b) Report and 303(d) List, the issuance of a "no consumption" or "limited consumption" fish advisory will be interpreted as a violation of Section 4.6.3.2.3 and Section 4.1.1.3 of Delaware's Surface Water Quality Standards. Those two narrative provisions provide, respectively, that 1) waters of the State shall be maintained to prevent adverse toxic effects on human health resulting from ingestion of chemically contaminated aquatic organisms; and 2) waters of the State shall be free from pollutants that may endanger public health. Any segment for which fish consumption advisories are in place as of December 2005 will be placed in Category 5 for each of the chemicals of concern included in each advisory. In the event that fish consumption advisories have been lifted, or any chemical of concern has been removed from an advisory, any requirements to develop a TMDL for that chemical in that segment will be removed if the fish tissue data was originally the sole cause for placement of the segment on the 303(d) list.

Ammonia assessments

In fresh waters, ammonia's toxicity is known to be controlled by both the temperature and pH of the water. EPA recommended criteria are based on the presence or absence of early life stages of fish and specify that the criterion should not be exceeded more than one time in a three-year period. The applicable criterion is calculated for each sampling event.

For stations whose average salinity during the assessment period is below 5 ppt, total ammonia as nitrogen, temperature and pH data will be used to compare the total ammonia data to the criterion calculated according to the following formulas:

When fish early life stages are present:

$$\text{Criterion} = \frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}} * \text{MIN}\left(2.85,\ 1.45 * 10^{0.028*(25-T)}\right)$$

When fish early life stages are absent:

$$\text{Criterion} = \frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}} * \left[1.45\ 10^{0.028*(25-\text{MAX}\ (T,7))}\right]$$

If two or more sampling events from the same station result in exceedances of the calculated criteria, the station will be deemed not supported for aquatic life use support based on ammonia toxicity.

Temperature Assessments

Delaware surface water quality criteria indicate that, in freshwaters, no human induced increase of the daily maximum temperature above 86^{o}F (30.0 ^{o}C) shall be allowed and in marine waters the maximum human induced temperature is 87 ^{o}F (30.6 ^{o}C). Stations for which two or more

sampling events are above the criteria and whose segments receive thermal discharges will be deemed not in support of the aquatic life use.

Assessment of Harvestable Shellfish Waters Use Support

Delaware is a member of the Interstate Shellfish Sanitation Conference (ISSC), the administrative body of the National Shellfish Sanitation Program (NSSP). Delaware's Shellfish Sanitation Regulations are administered as per ISSC / NSSP standards and practices. Section 3.2.1.3 of said Regulations specifies data collection / closure criteria for Delaware shellfish waters, which include parameters constituting administrative closure of shellfish waters. Parameters that would trigger administrative closures in compliance with ISSC/NSSP standards may include theoretical pollution loading, sanitary shoreline survey information, and numerical total coliform data. No Delaware waters are closed to shellfish harvesting as a result of actual total fecal coliform data. All Delaware shellfish waters designated as other-than-Approved, which may include Prohibited, Seasonally Approved, Conditionally Approved, or restricted, are so designated on the basis of administrative decisions. Specifically, these criteria include: 1) theoretical pollution loading, which is determined to be the potential for intermittent pollution discharges, making detection of said theoretical releases non-detectable via conventional sampling methodology; 2) sanitary shoreline survey findings which indicate potential for theoretical pollution loading, also non-detectable via conventional sampling methodology; and 3) may include dilution of theoretical virus discharges from point sources; however, not corresponding to increases in total coliform levels. In order to comply with ISSC / NSSP requirements, Delaware samples all shellfish waters not administratively closed for other reasons for fecal coliform bacteria. Delaware's Shellfish Program is assessed under the auspices of the U.S. Food and Drug Administration, as per ISSC/NSSP standards and practices, and submits bacteriological water quality data to the U.S. Food and Drug Administration to demonstrate compliance.

To assess the harvestable shellfish designated use, the Department will consider the data and reports to FDA for waters that are not administratively closed. Waters that have been administratively closed for shellfish harvesting as a result of fecal coliform exceedances during the assessment period will be assessed as category-5.

Setting Priorities for Water Quality Limited Segments Still Needing TMDLs

Because there are more water quality issues and impacts than there are public and private resources to address those impacts, it is necessary to set priorities for water quality limited segments. This is true for Delaware as well as the country as a whole. With this in mind, and recognizing the need to provide a logical, deliberate, and reasonable path forward, it becomes necessary to organize and order the work at hand into different priorities based upon a number of factors.

The timetable for developing TMDLs for newly listed waters in Delaware are based on the Department's Whole Basin Management Program rotating basin schedule shown below.

Basin	Year for TMDL Development
Piedmont	2009

Chesapeake Bay	2010
Delaware Bay	2012
Delaware Estuary	2013
Inland Bays/Atlantic Ocean	2011

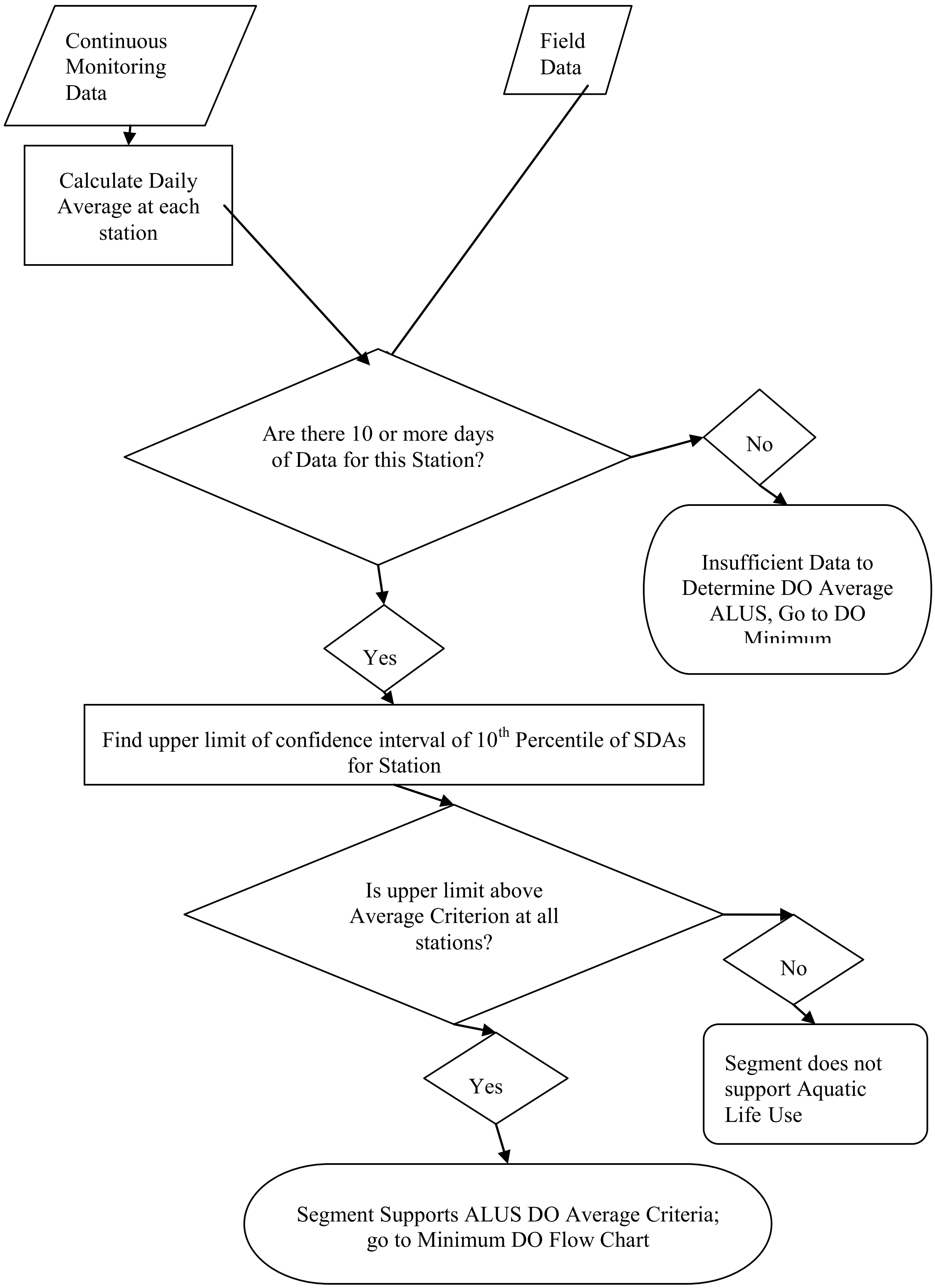
Rationale Used to Designate a Lower Category for Segments Previously Designated for TMDL Development

The Department may move segments from prior 303(d) Lists (equivalent to Category 5) to another category based on any of the following factors, and will document the reasons for doing so on a case-by-case basis.

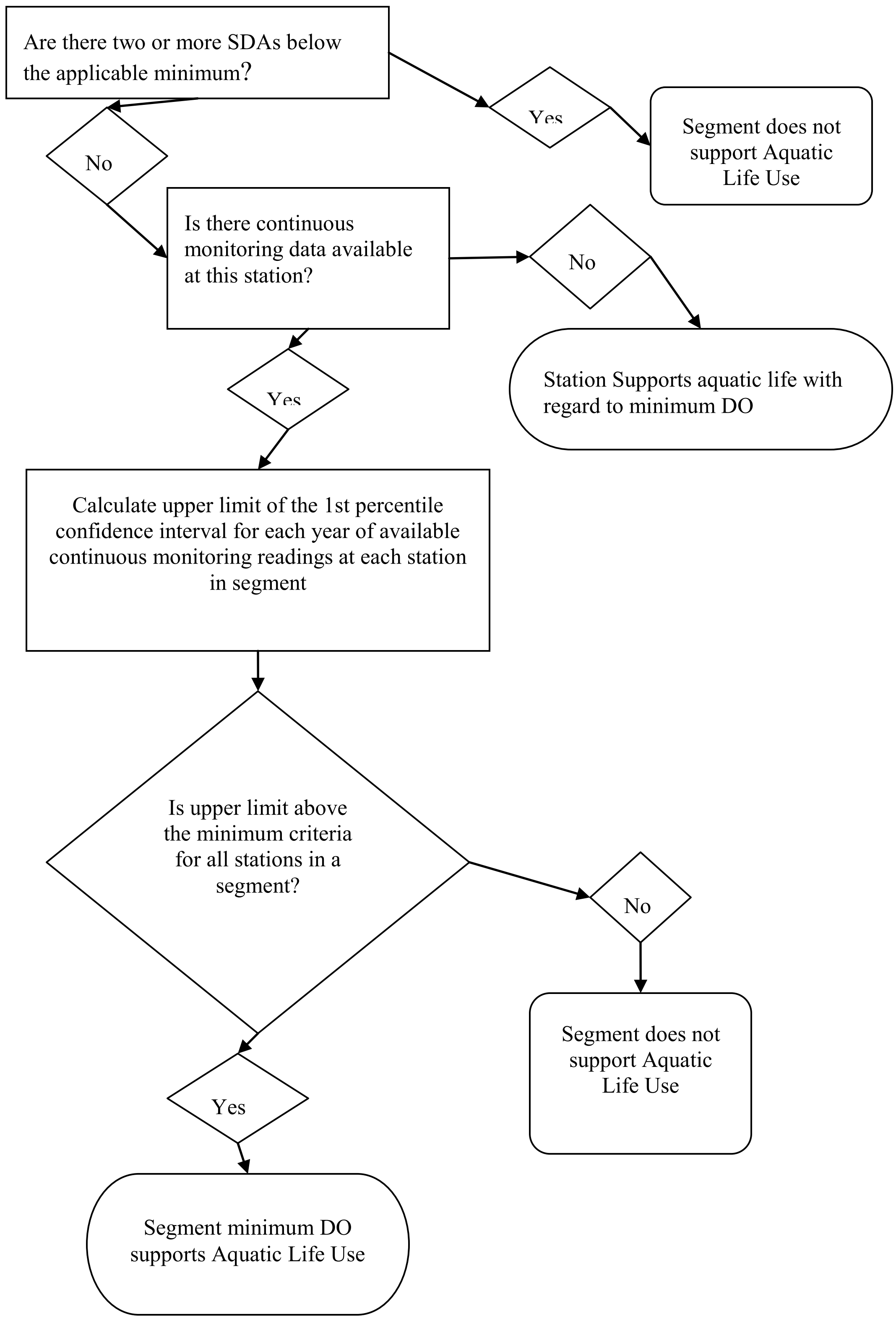
- The assessment and interpretation of more recent or more accurate data demonstrate that the applicable WQS(s) is being met. (Move to category 1)
- The results of more sophisticated water quality modeling demonstrate that the applicable WQS(s) is being met. (Move to category 1)
- Demonstration that flaws in the original analysis of data and information led to the water being incorrectly listed. (Move to category 1)
- The development of a new listing methodology, consistent with State WQSs and federal listing requirements, and a reassessment of the data that led to the prior listing, concluding that WQSs are now attained. (Move to category 1)
- A demonstration pursuant to 40 CFR 130.7(b)(1)(ii) that there are effluent limitations required by State or local authorities that are more stringent than technology-based effluent limitations required by the CWA and that these more stringent effluent limitations will result in the attainment of WQSs for the pollutant causing the impairment. (Move to category 4A or 4B until data and analysis support move to Category 1)
- A demonstration pursuant to 40 CFR 130.7(b)(1)(iii) that there are other pollution control requirements required by State, local, or federal authority that will result in attainment of WQSs for a specific pollutant(s) within a reasonable time. (Move to category 4A or 4B until data and analysis support move to Category 1)
- Documentation that the State included on a previous Section 303(d) List an impaired water that was not required to be listed by EPA regulations; e.g., waters where there is no pollutant associated with the impairment. (Move to category 1 or 4C as appropriate)
- Approval or establishment by EPA of a TMDL since the last Section 303(d) List. (Move to category 4A or 4B until data and analysis support move to Category 1)

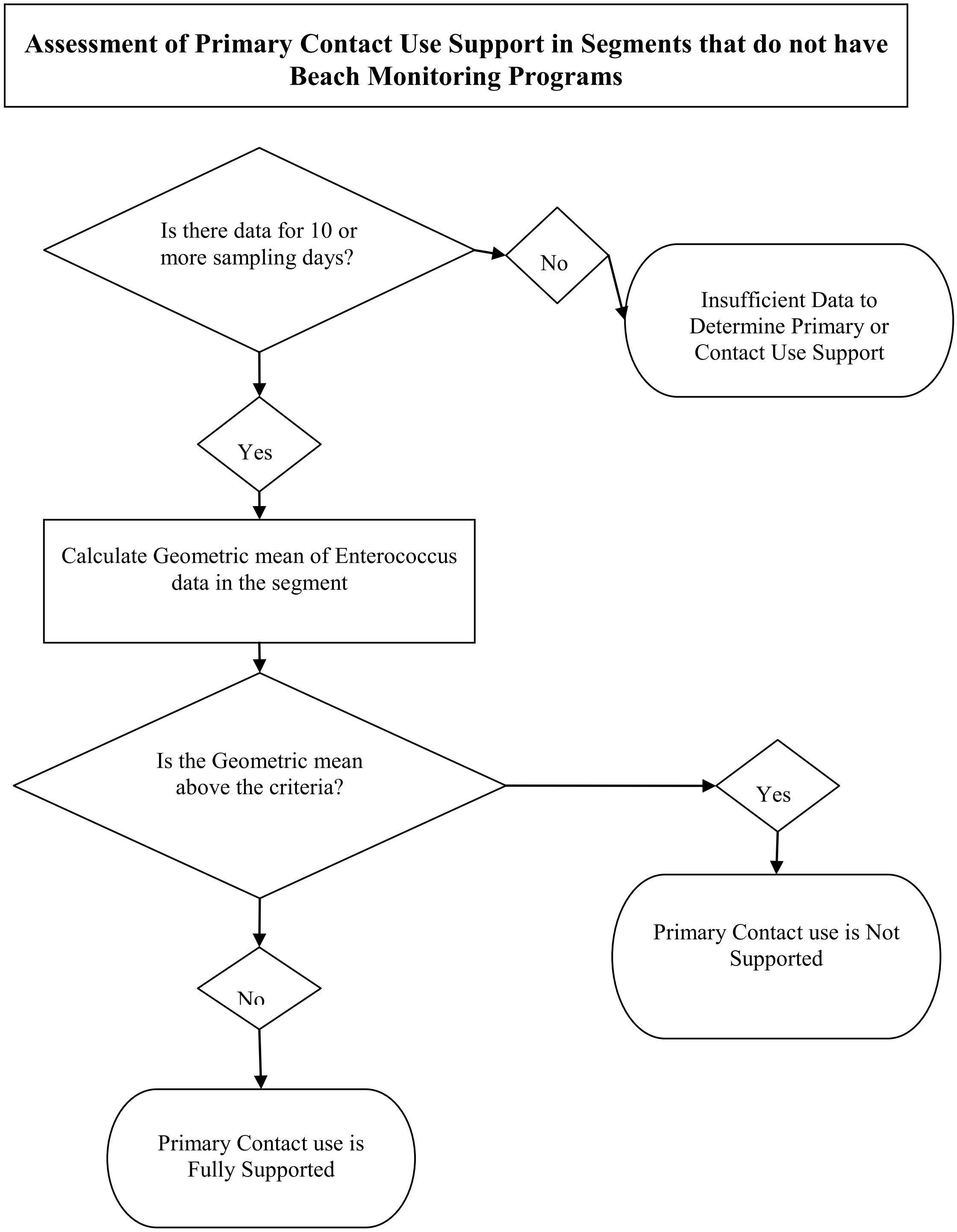
Flow Charts for Designated Use Attainment

Assessment of Aquatic Life Use Support Using Average Dissolved Oxygen Criteria

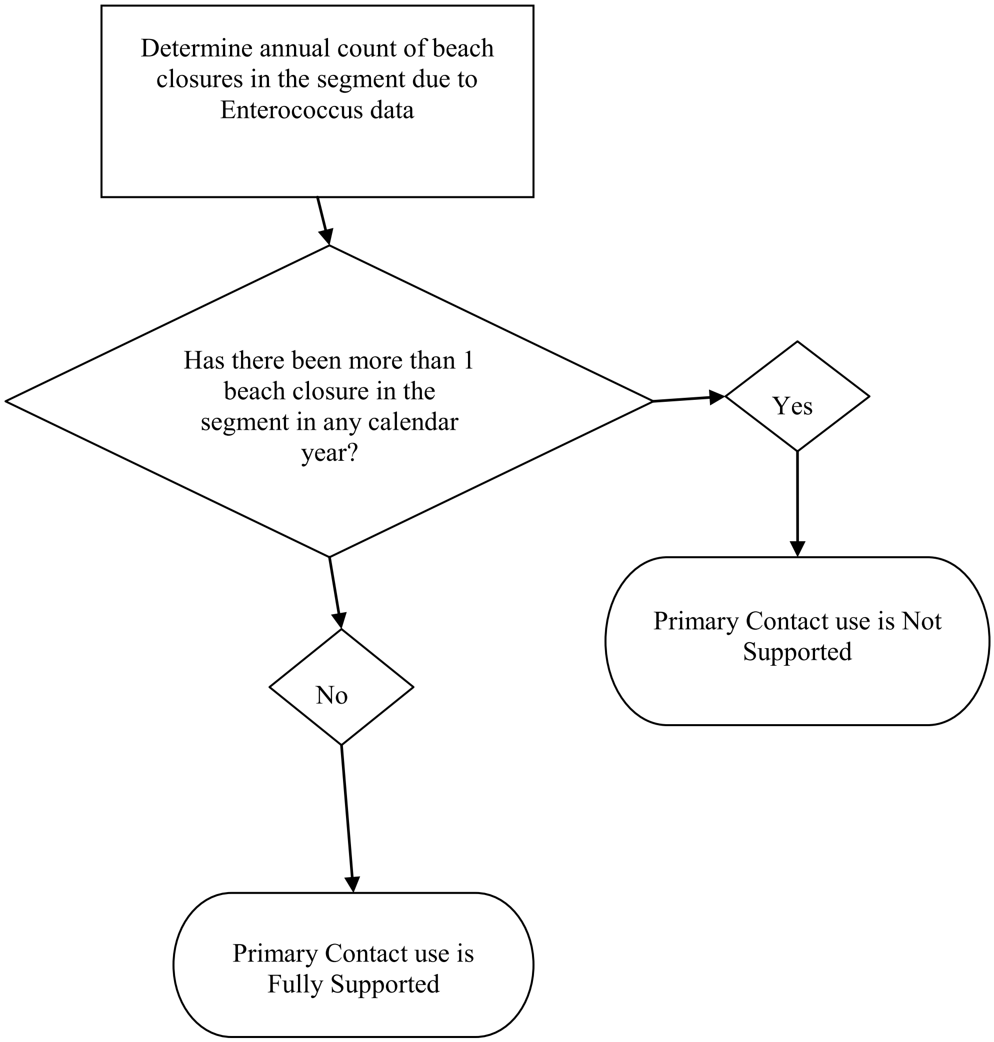


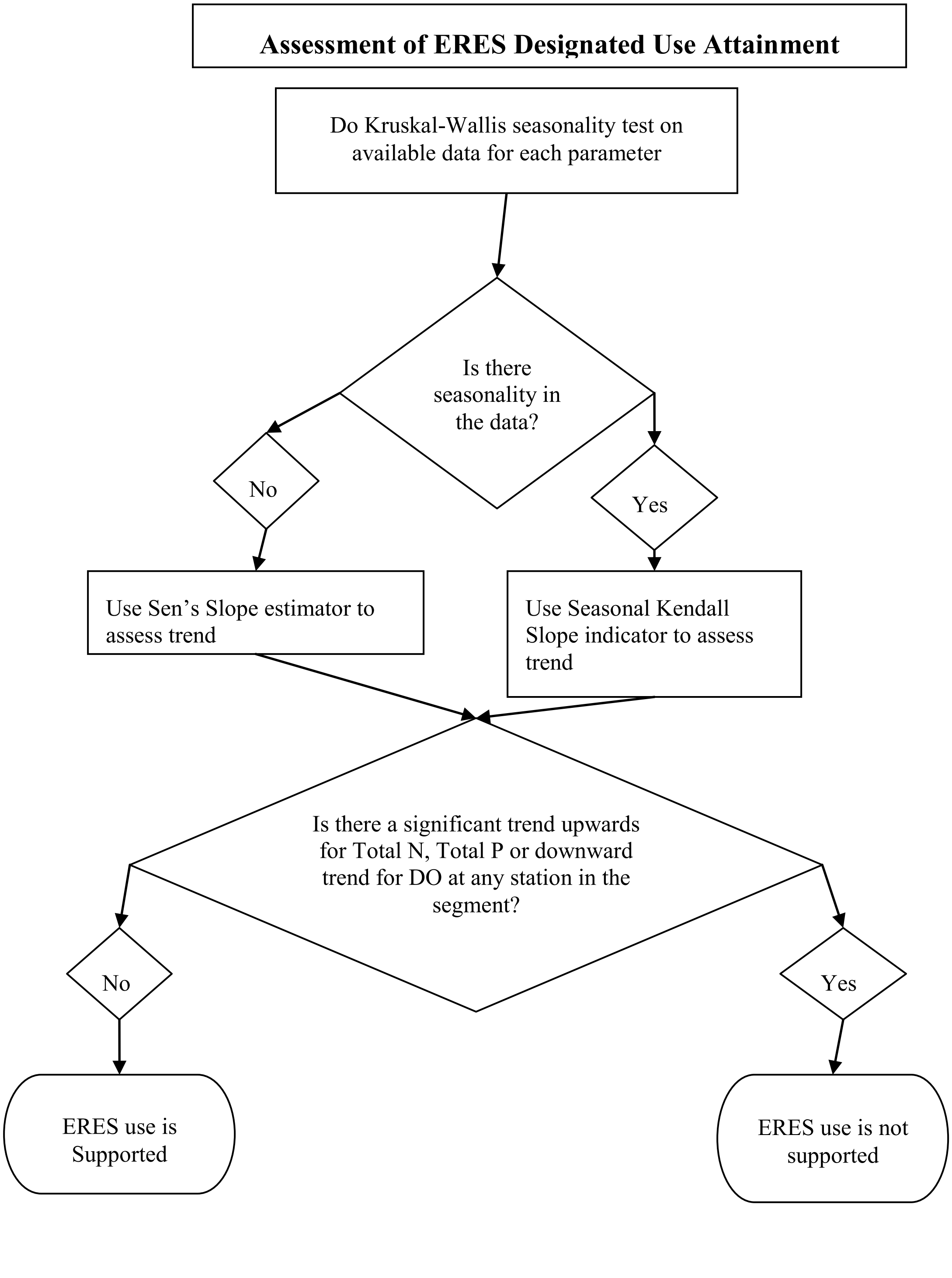
Assessment of Aquatic Life Use Support Using Minimum Dissolved Oxygen Criteria




Assessment of Primary Contact Use Support in Segments that do not have Beach Monitoring Programs
Is there data for 10 or more sampling days?
No
Insufficient Data to Determine Primary or Contact Use Support
Yes
Calculate Geometric mean of Enterococcus data in the segment
Is the Geometric mean above the criteria?
Yes
Primary Contact use is Not Supported
No
Primary Contact use is Fully Supported

Assessment of Primary Contact Use Support in Segments with Beach Monitoring Programs




Assessment of ERES Designated Use Attainment
Do Kruskal-Wallis seasonality test on available data for each parameter
Is there seasonality in the data?
No
Yes
Use Sen's Slope estimator to assess trend
Use Seasonal Kendall Slope indicator to assess trend
Is there a significant trend upwards for Total N, Total P or downward trend for DO at any station in the segment?
No
Yes
ERES use is Supported
ERES use is not supported

References:

Helsel D.R. and R.M. Hirsch, 2002, Statistical Methods in Water Resources

Publication available at: http://water.usgs.gov/pubs/twri/twri4a3/

Conover, W.J., 1980, Practical Nonparametric Statistics, 2 ed., John Wiley and Sons

Chapter 3: Rivers/Streams, Estuaries and Lakes Water Quality Assessments and List of Waters needing TMDLs

Presented on the following pages are seven tables and summaries of use support for Harvestable Shellfish waters, ammonia toxicity assessments and continuous dissolved oxygen findings. Table III-1 is a summary of data collected by the Department in the period from September 1, 2002 through August 31, 2007, by station. For each monitoring station, the segment number, segment description and location are shown with the summary statistics. Table III-2 rolls up the stations into their segments and shows the current use attainment for each segment . Tables III-3, III-4, III-5 and III-6 are use support roll ups based on use of EPA's Assessment Data Base. Table III-7 is the Final Determination for the State of Delaware Clean Water Act Section 303(d) List of Waters Needing TMDLs. Table III-7 integrates current and past assessments into a list of waters needing TMDLs.

Assessment of Harvestable Shellfish Waters Use Support

Data collected pursuant to Interstate Shellfish Sanitation Conference/National Shellfish Sanitation Program requirements, as reported to the U.S. Food and Drug Administration, were evaluated for the Delaware Bay from the New Castle/Kent County Line to Cape Henlopen. In addition, Ocean waters from Cape Henlopen to the Maryland Line were evaluated, in addition to Delaware's Inland Bays, including Rehoboth Bay, Indian River Bay, and the Delaware portion of Assawoman Bay. Little Assawoman Bay is not monitored under Delaware's Shellfish Program, as it is not a productive molluscan bivalve growing area. All waters of the State classified as other-than-Approved (Seasonally Approved or Prohibited) are classified as such due to the potential for contamination (for example, an elicit discharge), a lack of bacteriological data, the need to provide enforceable boundaries, or other administrative reason. No closures (a downgrading of the shellfish harvesting use) have occurred over the past five years as a result of bacteriological water quality data. Therefore, bacteria TMDLs are not currently required for Delaware's shellfish waters.

Assessment of Ammonia Toxicity in Freshwaters

Total ammonia, pH, and temperature data during the assessment period for more than 5600 sampling events in freshwaters was evaluated. Of those sampling events there were twenty two that showed expected toxicity to aquatic life at Browns Branch at Rt. 14 Bridge (see the table below).Three other stations had a single event above the criteria in the assessment period. The Browns Branch station is in a watershed with a TMDL in place for nitrogen. The TMDL requires the nearby point source to control nitrogen and thus ammonia emissions. The current TMDL addresses the ammonia discharge indirectly by controlling the total nitrogen levels in the discharge of the point source.

Station ID	Location	Date	Ammonia-N Total (mg/l)	Criteria	% of Criteria
206041	Browns Branch	9/22/2004	6.69	5.42	123.4%
206041	Browns Branch	7/13/2005	5.17	4.16	124.3%
206041	Browns Branch	9/7/2005	6.71	5.19	129.3%
206041	Browns Branch	6/26/2007	4.44	3.92	113.3%
206041	Browns Branch	7/10/2007	4.12	3.37	122.1%
206041	Browns Branch	7/30/2007	13.4	3.95	339.1%
206041	Browns Branch	8/13/2007	13	4.06	320.5%
206041	Browns Branch	9/5/2007	12.1	4.01	302.1%
206041	Browns Branch	12/5/2007	8.27	6.17	133.9%
206041	Browns Branch	12/19/2007	6.83	5.69	120.0%
206041	Browns Branch	1/28/2008	7.01	4.66	150.4%
206041	Browns Branch	7/28/2008	5.77	3.05	189.3%
206041	Browns Branch	8/25/2008	6.94	3.91	177.7%
206041	Browns Branch	9/15/2008	8.48	3.70	228.9%
206041	Browns Branch	10/8/2008	5.89	5.56	105.9%
206041	Browns Branch	10/20/2008	4.57	1.79	254.9%
206041	Browns Branch	11/12/2008	8.97	4.40	203.8%
206041	Browns Branch	11/24/2008	7.3	2.54	287.4%
206041	Browns Branch	12/8/2008	7.24	2.58	281.0%
206041	Browns Branch	1/20/2009	4.79	2.26	211.8%
206041	Browns Branch	2/11/2009	3.3	2.16	152.6%
206041	Browns Branch	3/24/2009	3.64	2.16	168.4%
208191	Blair’s Pond	9/19/2007	0.25	0.17	146.6%
208231	Beaverdam Branch	5/26/2009	6.91	2.02	342.3%
303011	Ingram Branch	1/9/2008	6.95	4.94	140.7%

Causes/Stressors and Sources of Impairment of Designated Uses

Nutrients, low dissolved oxygen, and biology and habitat degradation were the leading cause of nonsupport of Aquatic Life uses. A direct correspondence was found between the trend in biological quality and the quality of physical habitat. Habitat degradation may result in exceedences of the dissolved oxygen and temperature criteria. Sources of biological and habitat impairment are due to nonpoint source pollution mainly from urban and agricultural runoff.

Pathogenic indicators (bacteria) are the most widespread pollutants impacting designated uses. The pathogen indicator monitored by the State for primary contact recreation is Enterococcus bacteria. Other pathogen indicators, such as total coliform and fecal coliform bacteria, are monitored to regulate shellfish harvesting areas. Indicator organisms are not a threat to human health or aquatic life, but their presence in abundant numbers signals an increased probability that disease causing organisms may be present.

Although pathogenic indicators are the most widespread contaminant in the State, nutrients and toxics pose the most serious threats to water quality, aquatic life, and human health. Most of the State's estuarine waters are considered nutrient enriched. Water quality and aquatic life impacts from nutrient enrichment include eutrophication and low dissolved oxygen levels. A large portion of the nutrients are transported to the estuaries and lakes by the rivers and ground water. The presence of toxics has resulted in widespread fish consumption advisories within Delaware in both fresh and marine waters of the State.

Due to the ubiquitous nature of many pollutants such as pathogen indicators, positive identification of specific sources, and their relative impact, is difficult. Hence, multiple sources are cited for most cases. Agricultural runoff, nonpoint sources, urban runoff, and municipal and industrial point sources are the primary sources of nutrients and toxics.

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Salinity	DO count	DO Value	DO Category	Count Min DO <4	Min DO Category	Ent Count	Ent Geomean	ENT Category	Total Nitrogen Count
Appoquinimink River	DE 010-001-01	109091	Delaware River (Appoquinimink at Mouth)	4.7	36	5.5	1	1	1	36	64.6	1	36
		109121	Rt. 9 Bridge (East)	4.0	38	5.3	5	--	--	38	60.7	1	38
		109141	Mouth of East Br. Drawyer Creek	3.6	24	5.7	1	--	--	24	98.5	1	24
	DE 010-001-02	109041	Rt. 13 Bridge below Odessa	2.4	39	6.6	1	2	5	38	121.5	5	38
		109051	Rt. 299 Bridge, Odessa	2.7	31	5.9	1	1	1	29	118.3	5	31
		109151	Above West Br. Drawyer Creek	3.4	24	5.5	1	--	--	24	117.0	5	24
		109171	MOT Gut (Appo Gut) - West Bank	3.3	31	5.2	5	2	5	30	124.0	5	31
	DE 010-001-03	109071	Drawyer Creek, Rt 13	2.6	39	6.4	1	2	5	37	126.0	5	39
		109251	Deep Creek Br of Appoquinimik River at Rt. 71 Bridge	0.1	12	7.9	1	--	--	12	257.6	5	12
	DE 010-L01	109131	Noxontown Pond Overflow, Rd 38	0.2	39	8.1	1	--	--	35	28.3	1	37
	DE 010-L02	109031	Silver Lake Overflow, Rd 442	0.1	38	8.9	1	--	--	27	19.8	1	37
	DE 010-L03	109191	Shallcross Lake Overflow, Dischrg Drawer Cr, Rd. 428	0.1	39	8.8	1	--	--	28	18.4	1	39
Army Creek	DE 020-001	114011	Rt. 9 Below Llangollen Wells	0.9	38	5.4	5	2	5	35	80.6	1	38
	DE 020-002	114021	Rt. 13 Bridge	0.2	28	5.1	5	3	5	22	316.4	5	28
Blackbird Creek	DE 030-001	110021	Rt. 13 (Northern Branch)	0.1	32	6.6	1	--	--	31	148.0	5	32
		110031	Rd 455, Blackbird Landing	2.7	13	4.5	5	1	1	14	91.2	1	14
		110041	Rt. 9 Taylors Bridge	3.9	38	4.5	5	2	5	37	65.7	1	39
	DE 030-002	110011	Road 463 East of RR Tracks	0.1	20	4.9	5	1	1	21	72.4	1	21
Brandywine Creek	DE 040-001	104011	Footbridge in Brandywine State Park	0.1	47	8.6	1	--	--	43	131.1	5	47
	DE 040-002	104021	Rd. 279 Bridge (USGS guage 014)	0.1	47	9.0	1	--	--	37	67.2	1	47
		104051	Smith Bridge	0.2	47	8.1	1	--	--	41	98.6	1	47
Broad Creek	DE 050-006-03	304671	Raccoon Prong at Rd. 66	0.1	31	3.2	5	7	5	26	108.9	5	31
	DE 050-L03	307171	Horseys Pond 50 Yards Above Spillway 50% RB	0.1	38	8.3	1	--	--	35	31.1	1	36
	DE 050-L04	307011	Records Pond at Rt. 13	0.2	38	8.0	1	1	1	33	30.1	1	38
	DE 060-001	303041	Rt. 1 Bridge (Mainstem)	1.4	42	5.0	5	2	5	37	174.0	5	42
		303061	0.10 Miles From Mouth	18.6	14	5.2	1	--	--	14	70.5	5	14
		303171	Beaverdam Creek at Rd. 88	0.2	42	6.3	1	2	5	38	177.5	5	42

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Salinity	DO count	DO Value	DO Category	Count Min DO <4	Min DO Category	Ent Count	Ent Geomean	ENT Category	Total Nitrogen Count
Broadkill River	DE 060-002	303181	Beaverdam Creek above Rd. 259, Hunters Mill Pond	0.3	42	6.9	1	--	--	34	297.1	5	42
	DE 060-003	303031	Rt. 5 Bridge	0.1	43	8.2	1	--	--	38	34.9	1	43
	DE 060-004	303311	Round Pole Branch at Rd. 88	0.2	42	5.9	1	--	--	39	156.3	5	42
	DE 060-005	303011	Ingram Branch, Savanah Ditch at Rd. 246	0.6	42	5.5	1	1	1	39	194.9	5	42
		303021	Ingram Branch at Rd. 248	0.2	42	7.8	1	--	--	35	356.6	5	42
	DE 060-006	303341	Pemberton Branch at Rt. 30 above Wagamons Pond	0.1	42	7.1	1	--	--	36	268.0	5	42
	DE 060-007-01	303051	Red Mill Pond at Rt. 1	0.1	42	9.4	1	--	--	34	35.8	1	40
	DE 060-008	303481	Ingrams Branch at Rt. 30 above Waples Pond	0.1	22	1.7	5	8	5	20	42.9	1	21
	DE 060-L01	303231	Trib. to Red mill Pond at Rd. 261	0.2	29	8.4	1	--	--	27	85.5	1	29
	DE 060-L02	303351	Wagamons Pond Outlet at County Rd. 250	0.1	29	8.4	1	--	--	25	28.0	1	29
	DE 060-L03	303331	Waples Pond at Rt. 1	0.1	42	8.2	1	--	--	35	25.4	1	42
	DE 060-L03	303381	Sowbridge Branch at Rd. 212, Waples Pond	0.1	41	4.6	5	3	5	38	87.2	1	41
Buntings Branch	DE 070-001	311041	Buntings Branch at Rt. 54	0.1	37	5.7	1	3	5	30	407.2	5	37
Cedar Creek	DE 080-001	301021	Rd. 212, Swiggetts Pond	0.1	44	8.3	1	--	--	41	16.6	1	45
		301031	Rt. 1 Bridge	0.7	44	6.5	1	1	1	43	97.3	1	45
		301091	Rt. 36 Bridge	19.2	44	4.1	5	6	5	43	48.9	5	45
Chesapeake & Delaware Canal	DE 090-001	108021	St. Georges Bridge	2.6	37	6.9	1	--	--	35	23.9	1	37
		108031	Summit Bridge	2.0	30	7.5	1	--	--	25	31.2	1	30
	DE 090-L01	108111	Lums Pond Boat Ramp	1.2	38	7.8	1	--	--	34	39.5	1	36
Chesapeake Drainage System	DE 100-002	112021	Sewell Branch at Rd. 95	0.1	37	3.7	5	8	5	35	105.4	5	37
Choptank	DE 110-001	207081	Tappahanna Ditch at Rd. 222	0.1	37	6.8	1	1	1	35	85.0	1	36
	DE 110-002	207091	Culbreth Marsh at Rd. 210	0.2	37	6.3	1	--	--	34	73.7	1	37
	DE 110-003	207021	Cow Marsh Creek at Rd. 208	0.2	37	6.2	1	--	--	35	64.9	1	37
	DE 110-003	207111	White Marsh Branch at Rd. 268	0.1	37	6.7	1	--	--	37	135.7	5	37
	DE 120-001	106011	Rt. 13/Rt. 9 Bridge	0.5	47	6.3	1	--	--	43	130.1	5	46
		106291	Conrail Bridge (USGS tide gage 01481602) Up river from Port	0.5	47	6.9	1	--	--	42	95.2	1	47

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Salinity	DO count	DO Value	DO Category	Count Min DO <4	Min DO Category	Ent Count	Ent Geomean	ENT Category	Total Nitrogen Count
Christina River	DE 120-002	106021	Rt. 141 Drawbridge, Newport (USGS tide gage 01480065)	0.3	47	6.1	1	1	1	39	120.6	5	47
	DE 120-003	106031	Smalley's Dam Spillway	0.2	48	6.6	1	--	--	41	92.9	1	48
	DE 120-004-01	106141	Rt. 72, Below Newark (USGS guage 01478000)	0.2	47	7.7	1	--	--	38	106.5	5	47
	DE 120-006	106191	Rt. 273, Above Newark	0.1	47	8.5	1	--	--	36	154.5	5	47
	DE 120-007-01	106281	Little Mill Creek at atlantic Avenue (USGS Gage 01480095)	0.3	47	8.6	1	--	--	38	193.0	5	47
Dragon Run Creek	DE 130-001	111011	Rt. 9 Bridge	0.5	39	3.0	5	9	5	32	38.7	1	35
	DE 130-002	111031	Rt. 13 Bridge (flow at Rd. 407), Dragon Creek	0.2	39	2.5	5	10	5	32	97.6	1	39
Indian River	DE 140-001	312011	White Creek at the mouth of Assawoman Canal	23.0	38	4.6	5	2	5	36	31.0	1	38
	DE 140-002	308361	Blackwater Creek at Rd. 54	0.6	33	4.3	5	3	5	30	170.0	5	33
	DE 140-003	308091	Pepper Creek at Rt. 26	0.1	39	7.7	1	--	--	35	148.3	5	39
		308461	Deep Hole Banch at Rd. 382	0.1	24	5.5	1	1	1	21	103.5	5	24
	DE 140-004	306181	Buoy 49, Indian River	16.8	36	5.8	1	2	5	34	21.9	1	36
		306191	Buoy 55, Indian River	13.4	31	6.6	1	--	--	31	40.1	5	31
		306341	Island Creek, upper third	17.2	36	4.6	5	2	5	32	21.4	1	36
	DE 140-005	308301	Swan Creek, Rd. 304	0.2	32	8.3	1	--	--	27	239.6	5	32
		308341	Swan Creek at Rd. 297	0.1	37	7.9	1	--	--	35	139.4	5	37
	DE 140-006	308281	Cow Bridge Branch Rd. 48	0.1	39	7.4	1	--	--	34	33.4	1	39
	DE 140-E01	306121	Buoy 20, Indian River Bay	28.7	42	6.7	1	--	--	25	7.0	1	42
		306131	Buoy 26, Indian River Bay	26.1	31	6.1	1	--	--	22	10.8	1	30
		306321	Indian River Inlet	29.6	45	6.2	1	--	--	15	13.4	1	46
	DE 140-E02	306161	Buoy 38, Indian River	19.7	31	5.2	1	3	5	30	15.5	1	31
		306331	Island Creek mouth	19.4	36	5.1	1	2	5	33	16.8	1	36
	DE 140-L01	308071	Millsboro Dam Overflow	0.1	44	8.3	1	--	--	39	21.2	1	45
Iron Branch	DE 150-001	309021	Iron Branch at Rt. 113 Bridge	0.2	33	6.5	1	--	--	30	130.1	5	33
		309041	Whartons Branch at Rt. 334 Bridge	0.1	38	7.1	1	--	--	33	168.8	5	38
	DE 160-001	202031	DE Rt. 9 Bridge	8.7	38	3.6	5	7	5	40	96.1	5	40

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Salinity	DO count	DO Value	DO Category	Count Min DO <4	Min DO Category	Ent Count	Ent Geomean	ENT Category	Total Nitrogen Count
Leipsic River	DE 160-002	202041	Rt. 42	1.1	32	6.0	1	1	1	29	128.4	5	33
	DE 160-L01	202021	Rt. 13 Bridge, Garrisons Lake	0.2	39	7.5	1	--	--	34	56.2	1	38
	DE 160-L02	202011	Rd. 42 Bridge at Masseys MIllpond	2.8	32	5.5	1	3	5	31	60.8	1	33
Lewes and Rehoboth Canal	DE 170-001	305011	Canal Rt. 1	24.3	37	4.2	5	3	5	33	21.4	1	37
		305041	Lewes and Rehoboth Canal at Rd. 18 Bridge	24.6	37	5.1	1	4	5	32	17.9	1	37
		305081	Munchy Branch at Rd. 270a	0.2	33	3.8	5	7	5	30	187.7	5	33
Little Assawoman Bay	DE 180-001	312041	Assawoman Canal, Rd. 361 Bridge	18.7	37	3.8	5	7	5	36	76.0	5	37
	DE 180-002	310101	Beaver Dam Ditch, Rd. 363, Miller Branch	7.6	32	3.4	5	9	5	31	100.4	5	32
		310121	Beaverdam Ditch at Rd. 368	0.2	42	5.6	1	1	1	40	174.9	5	43
	DE 180-003	310031	Dirrickson Creek, Rd. 381	7.9	38	5.9	1	2	5	33	118.7	5	38
	DE 180-E01	310011	Little Assawoman Bay Ditch at Rd. 58 Bridge	24.1	39	4.9	5	--	--	34	15.3	1	39
		310071	Little Assawoman Bay, Mid-Bay	22.0	38	5.5	1	1	1	27	21.5	1	38
Little River	DE 190-001-01	204031	Rt. 9 Bridge	10.5	39	4.0	5	6	5	35	222.3	5	40
	DE 190-001-02	204041	Rt. 8 Bridge	0.2	39	3.6	5	9	5	36	71.5	1	40
	DE 190-001-03	204011	Pipe Elm Branch, Postles Corner Road (Rd. 348)	0.1	32	5.6	1	1	1	29	147.1	5	33
Marshyhope Creek	DE 200-001	302021	Rt. 404 Bridge, (Woodenhawk Bridge)	0.2	30	8.0	1	--	--	28	37.8	1	30
		302031	Rd. 308 Bridge	0.2	84	7.8	1	--	--	73	35.3	1	85
Mispillion River	DE 210-001	208021	Rt. 1 Bridge	1.8	42	6.7	1	--	--	41	87.7	1	43
		208061	1.09 miles from mouth at lighthouse	20.6	42	4.9	5	1	1	41	29.2	1	42
		208101	3.85 miles from mouth, Revills Landing	11.8	27	3.0	5	9	5	27	61.4	5	27
		208121	7.48 miles from mouth, mouth of Fishing Branch	6.8	35	3.1	5	10	5	36	161.3	5	35
	DE 210-005	208301	Swan Creek at downstream side of Rt. 113	1.2	16	3.9	5	3	5	14	198.5	5	16
	DE 210-L02	208211	Rt. 36 Silver Lake	0.1	44	7.8	1	--	--	42	36.5	1	45
	DE 210-L03	208011	Haven Lake at Rt. 113	0.2	32	7.9	1	--	--	28	26.2	1	32
	DE 210-L05	208191	Blairs Pond off Rd. 443	0.2	32	8.9	1	--	--	30	44.2	1	32
	DE 210-L05	208231	Beaverdam Branch, Rd. 384	0.1	44	6.8	1	--	--	38	275.3	5	45
	DE 210-L06	208181	Abbotts Pond at Rd. 620	0.1	44	7.4	1	--	--	44	43.5	1	45

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Salinity	DO count	DO Value	DO Category	Count Min DO <4	Min DO Category	Ent Count	Ent Geomean	ENT Category	Total Nitrogen Count
Murderkill River	DE 220-001	206091	US Rt. 113 at Frederica By-Pass	4.3	64	4.0	5	9	5	62	153.5	5	65
		206101	Bowers Beach Wharf	20.9	68	5.6	1	1	1	62	32.5	1	68
		206131	1.25 miles from the mouth at Webs Landing	19.4	60	5.1	1	4	5	59	44.4	5	60
		206141	3.25 miles from the mouth	12.2	64	3.9	5	10	5	63	116.7	5	65
		206231	Confluence of Kent County STP trib.	5.6	63	3.5	5	16	5	61	176.1	5	64
		206711	Murderkill River near power lines (4.45 river mile	10.9	39	3.9	5	7	5	39	225.9	5	40
	DE 220-002	206081	Spring Creek at Rt. 12 Bridge	4.3	59	4.5	5	5	5	57	201.8	5	60
		206561	Double Run at Rd. 371	0.4	68	5.4	5	--	--	62	206.9	5	68
		206641	Spring Creek, Pratt Branch at Canterbury Rd.	0.1	37	7.8	1	--	--	30	253.0	5	38
	DE 220-004	206041	Browns Branch at Rt. 14 Bridge	0.2	69	5.8	1	--	--	64	97.9	1	69
		206051	Browns Branch at Rd. 384 Bridge	0.1	62	7.1	1	--	--	58	150.4	5	62
	DE 220-005	206011	US Rt. 13 Bridge below Felton	0.1	70	7.7	1	--	--	64	185.1	5	70
	DE 220-L01	206461	Hudson Branch, McGinnis Pond, Rd. 378	0.1	67	9.1	1	--	--	61	32.0	1	67
	DE 220-L02	206071	Andrews Lake at Rd. 380 Bridge	0.1	61	7.1	1	--	--	56	22.3	1	61
	DE 220-L03	206451	Coursey Pond at Rd. 388 Bridge	0.1	69	8.5	1	--	--	59	34.9	1	68
	DE 220-L05	206361	McCauley Pond near spillway	0.1	69	9.1	1	--	--	58	19.7	1	69
Naamans Creek	DE 230-001-02	101021	Naamans Road	0.2	45	8.1	1	--	--	42	192.8	5	45
		101031	South Branch at Darley Rd.	0.2	31	7.6	1	--	--	29	155.8	5	31
		101041	Rt. 13A	0.2	34	7.5	1	1	1	31	184.3	5	34
		101061	South Branch at Marsh Rd.	0.2	16	8.0	1	--	--	14	130.3	5	16
Nanticoke River	DE 240-001	304041	Middleford Bridge	0.2	37	7.0	1	--	--	34	65.8	1	37
		304071	Buoy 45 (State Line)	0.4	34	6.6	1	--	--	29	31.3	1	32
		304091	Buoy 51 (Conf. Broad Creek)	0.3	29	6.8	1	--	--	27	25.1	1	29
		304151	Buoy 66 (Conf DuPont Gut)	0.1	35	6.1	1	--	--	33	40.8	1	35
		304461	Seaford STP Discharge	0.1	34	5.9	1	--	--	33	63.3	1	34
		304471	Rt. 13 Bridge	0.1	37	6.1	1	1	1	34	64.5	1	37
	DE 240-002	304191	Rd. 545 Mainstem Nanticoke	0.2	82	7.3	1	--	--	71	67.9	1	82
		304291	Rd. 600 Bridge	0.2	31	7.8	1	--	--	26	39.0	1	30

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Salinity	DO count	DO Value	DO Category	Count Min DO <4	Min DO Category	Ent Count	Ent Geomean	ENT Category	Total Nitrogen Count
	DE 240-003	304381	Bucks Branch at Rd. 546	0.1	38	7.1	1	--	--	36	123.7	5	38
	DE 240-005	316011	Gravelly Branch at Rd. 525 Bridge	0.1	38	7.7	1	--	--	34	76.8	1	38
	DE 240-L02	304311	Concord Pond overflow	0.1	38	8.5	1	--	--	30	16.0	1	38
	DE 240-L04	304321	Williams Pond, below the pond at Rd. 535	0.1	38	7.7	1	--	--	35	39.0	1	37
Pocomoke River	DE 250-001	313011	Rd. 419 Bridge	0.1	36	5.5	1	1	1	32	159.9	5	36
Red Clay Creek	DE 260-001	103011	Stanton, Rt. 4 at Stanton Bridge (USGS gage 01480015)	0.2	48	8.8	1	--	--	41	111.8	5	48
		103031	Wooddale, Rt. 48 (USGS gage 01480000)	0.2	47	8.9	1	--	--	38	66.6	1	47
		103041	Ashland, Rd. 258a	0.2	47	8.3	1	--	--	41	103.5	5	47
	DE 260-002	103061	Burrough's Run at Creek Rd. (Rt. 82)	0.1	47	8.9	1	--	--	41	100.2	5	47
Red Lion Creek	DE 270-001-01	107031	Rt. 9 Bridge	0.2	39	5.4	5	2	5	32	156.7	5	39
	DE 270-001-02	107011	Rt. 7	0.1	39	7.1	1	--	--	36	133.4	5	39
Rehoboth Bay	DE 280-001-01	308051	Guinea Creek at Rt. 298 Bridge	9.6	38	6.5	1	1	1	36	117.8	5	38
	DE 280-002	308291	Love Creek, Rd. 277	0.2	33	7.3	1	1	1	26	18.1	1	33
		308371	Bundick's Branch at Rt. 23	0.2	39	7.4	1	--	--	35	205.0	5	39
	DE 280-E01	306071	Buoy 3, Rehoboth Bay	27.7	31	6.9	1	--	--	31	6.6	1	31
		306091	Buoy 7, Rehoboth Bay	28.6	36	6.3	1	--	--	15	5.7	1	36
		306111	Massey's Ditch at Bouy 17	29.3	37	6.7	1	--	--	21	7.1	1	35
	DE 280-L01	308031	Burton Pond, Rd. 24	0.1	38	7.2	1	--	--	33	20.0	1	37
Saint Jones River	DE 290-001-01	205041	3.5 miles from mouth at Barkers Landing	11.9	38	3.8	5	9	5	36	133.5	5	38
	DE 290-001-02	205091	Rt. 10 Bridge near DAFB	4.0	38	4.5	5	4	5	38	132.6	5	38
		205571	Division Street (Dover)	0.1	31	4.9	5	4	5	29	80.1	1	29
	DE 290-002	205241	Rt. 13 North Moores Lake, Issacs Branch	0.1	31	6.4	1	--	--	29	206.9	5	31
	DE 290-003	205151	Rd. 69 State College, Fork Branch	0.2	37	4.1	5	5	5	36	83.8	1	36
	DE 290-L01	205181	Rt. 13 Alt. Moores Lake	0.1	38	7.6	1	--	--	36	44.2	1	38
	DE 290-L02	205191	Silver Lake Spillway, Dover City Park	0.1	45	7.0	1	1	1	43	64.9	1	39
	DE 290-L03	205211	Derby Pond at Rt. 13A	0.1	37	7.5	1	1	1	34	37.5	1	35
Shellpot Creek	DE 300-001-01	102041	Cherry Island at Rd. 501 Bridge	0.3	44	4.4	5	5	5	40	176.9	5	44
	DE 300-001-02	102011	US Rt. 13 Bridge (Gov Printz Blvd)	0.3	31	6.9	1	--	--	28	238.7	5	31
		102051	Rt. 13 Bus (Market Street) Bridge, near USGS station	0.3	14	7.6	1	--	--	12	142.1	5	14

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Salinity	DO count	DO Value	DO Category	Count Min DO <4	Min DO Category	Ent Count	Ent Geomean	ENT Category	Total Nitrogen Count
		102081	Shellpot Crk at Carr Road Bridge	0.2	14	8.2	1	--	--	13	160.5	5	14
	DE 300-001-03	102101	Stoney Creek @ Rt. 13	0.2	26	7.4	1	--	--	22	239.3	5	26
Smyrna River	DE 310-001	201011	Lake Como at US Route 13 Bridge	0.1	15	5.6	1	--	--	14	80.1	1	14
		201031	Mill Creek at DE Route 6 Bridge	3.1	14	4.7	5	2	5	13	221.6	5	14
		201041	Rt. 9 Fleming's Landing	5.9	39	5.1	1	1	1	38	100.5	5	40
	DE 310-002	201021	Rd. 137 Bridge, Mill Creek	0.1	40	8.3	1	--	--	37	74.5	1	39
	DE 310-003	201051	Rd. 485 Bridge at Smyrna Landing	1.8	40	5.0	5	2	5	39	243.0	5	40
		201161	Rd. 38 Bridge, Providence Creek	0.1	33	7.2	1	--	--	33	147.8	5	34
White Clay Creek	DE 320-001	105011	Stanton, Old Rt. 7 Bridge	0.2	33	8.2	1	--	--	27	85.8	1	33
		105031	Chambers Rock Rd. (Road 329) near Thompson	0.2	47	9.0	1	--	--	39	77.1	1	47
		105151	DE Park Race Track (USGS gage 01479000), 35ft downstream	0.2	47	8.3	1	--	--	38	137.2	5	47
		105171	McKee Lane in Newark	0.2	47	8.0	1	--	--	39	63.2	1	47
	DE 320-002	105071	Mill Creek, Above Rt. 4 (DE Park)	0.2	45	8.6	1	--	--	36	145.2	5	45
	DE 320-003	105101	Pike Creek Confluence, Upper Pike Creek Rd. (Rd. 322)	0.1	45	9.0	1	--	--	37	123.8	5	45
		105181	Pike Creek at Paper Mill Road	0.1	46	9.3	1	--	--	37	111.7	5	46
	DE 320-004	105131	Middle Run Confluence, Possum Park Rd. (Rd. 303)	0.1	46	9.3	1	--	--	37	125.6	5	46

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Total N LCL 90th Percentile	Tota N Category	Total Phosphorus Count	Total P LCL 90th Percentile	Total P Category	DIN Value	DIN Category	DIP Value
Appoquinimink River	DE 010-001-01	109091	Delaware River (Appoquinimink at Mouth)	2.2	5	34	0.1905	5	--	--	--
		109121	Rt. 9 Bridge (East)	2.3	5	37	0.185	5	--	--	--
		109141	Mouth of East Br. Drawyer Creek	2.3	5	24	0.178	5	--	--	--
	DE 010-001-02	109041	Rt. 13 Bridge below Odessa	3.0	5	38	0.1995	5	--	--	--
		109051	Rt. 299 Bridge, Odessa	2.4	5	31	0.195	5	--	--	--
		109151	Above West Br. Drawyer Creek	2.1	5	24	0.178	5	--	--	--
		109171	MOT Gut (Appo Gut) - West Bank	2.1	5	30	0.197	5	--	--	--
	DE 010-001-03	109071	Drawyer Creek, Rt 13	3.0	5	38	0.279	5	--	--	--
		109251	Deep Creek Br of Appoquinimik River at Rt. 71 Bridge	4.9	5	10	0.038	1	--	--	--
	DE 010-L01	109131	Noxontown Pond Overflow, Rd 38	2.5	5	38	0.079	1	--	--	--
	DE 010-L02	109031	Silver Lake Overflow, Rd 442	5.6	5	37	0.037	1	--	--	--
	DE 010-L03	109191	Shallcross Lake Overflow, Dischrg Drawer Cr, Rd. 428	3.9	5	38	0.053	1	--	--	--
Army Creek	DE 020-001	114011	Rt. 9 Below Llangollen Wells	1.7	5	38	0.185	5	--	--	--
	DE 020-002	114021	Rt. 13 Bridge	2.5	5	28	0.129	5	--	--	--
Blackbird Creek	DE 030-001	110021	Rt. 13 (Northern Branch)	1.9	5	31	0.09	1	--	--	--
		110031	Rd 455, Blackbird Landing	2.0	5	14	0.238	5	--	--	--
		110041	Rt. 9 Taylors Bridge	1.9	5	38	0.198	5	--	--	--
	DE 030-002	110011	Road 463 East of RR Tracks	2.0	5	20	0.127	5	--	--	--
Brandywine Creek	DE 040-001	104011	Footbridge in Brandywine State Park	4.0	5	47	0.12	5	--	--	--
	DE 040-002	104021	Rd. 279 Bridge (USGS guage 014)	3.6	5	47	0.117	5	--	--	--
		104051	Smith Bridge	3.5	5	45	0.096	1	--	--	--
Broad Creek	DE 050-006-03	304671	Raccoon Prong at Rd. 66	2.2	5	31	0.092	1	--	--	--
	DE 050-L03	307171	Horseys Pond 50 Yards Above Spillway 50% RB	4.5	5	36	0.067	1	--	--	--
	DE 050-L04	307011	Records Pond at Rt. 13	5.6	5	37	0.072	1	--	--	--
	DE 060-001	303041	Rt. 1 Bridge (Mainstem)	4.3	5	41	0.186	5	--	--	--
		303061	0.10 Miles From Mouth	1.7	5	13	0.159	5	--	--	--
		303171	Beaverdam Creek at Rd. 88	9.0	5	41	0.073	1	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Total N LCL 90th Percentile	Tota N Category	Total Phosphorus Count	Total P LCL 90th Percentile	Total P Category	DIN Value	DIN Category	DIP Value
Broadkill River	DE 060-002	303181	Beaverdam Creek above Rd. 259, Hunters Mill Pond	12.3	5	41	0.14	5	--	--	--
	DE 060-003	303031	Rt. 5 Bridge	4.1	5	42	0.052	1	--	--	--
	DE 060-004	303311	Round Pole Branch at Rd. 88	4.8	5	41	0.057	1	--	--	--
	DE 060-005	303011	Ingram Branch, Savanah Ditch at Rd. 246	31.1	5	41	0.622	5	--	--	--
		303021	Ingram Branch at Rd. 248	10.7	5	41	0.169	5	--	--	--
	DE 060-006	303341	Pemberton Branch at Rt. 30 above Wagamons Pond	5.2	5	40	0.035	1	--	--	--
	DE 060-007-01	303051	Red Mill Pond at Rt. 1	3.0	5	41	0.131	5	--	--	--
	DE 060-008	303481	Ingrams Branch at Rt. 30 above Waples Pond	1.9	5	22	0.238	5	--	--	--
	DE 060-L01	303231	Trib. to Red mill Pond at Rd. 261	4.7	5	29	0.086	1	--	--	--
	DE 060-L02	303351	Wagamons Pond Outlet at County Rd. 250	4.8	5	29	0.04	1	--	--	--
	DE 060-L03	303331	Waples Pond at Rt. 1	4.3	5	40	0.031	1	--	--	--
	DE 060-L03	303381	Sowbridge Branch at Rd. 212, Waples Pond	4.5	5	38	0.023	1	--	--	--
Buntings Branch	DE 070-001	311041	Buntings Branch at Rt. 54	5.5	5	38	0.167	5	1.71	5	0.050
Cedar Creek	DE 080-001	301021	Rd. 212, Swiggetts Pond	4.2	5	44	0.029	1	--	--	--
		301031	Rt. 1 Bridge	4.4	5	44	0.156	5	--	--	--
		301091	Rt. 36 Bridge	1.9	5	44	0.18	5	--	--	--
Chesapeake & Delaware Canal	DE 090-001	108021	St. Georges Bridge	2.3	5	37	0.191	5	--	--	--
		108031	Summit Bridge	2.1	5	30	0.15	5	--	--	--
	DE 090-L01	108111	Lums Pond Boat Ramp	1.9	5	38	0.073	1	--	--	--
Chesapeake Drainage System	DE 100-002	112021	Sewell Branch at Rd. 95	2.6	5	36	0.267	5	--	--	--
Choptank	DE 110-001	207081	Tappahanna Ditch at Rd. 222	1.8	5	37	0.091	1	--	--	--
	DE 110-002	207091	Culbreth Marsh at Rd. 210	3.2	5	37	0.091	1	--	--	--
	DE 110-003	207021	Cow Marsh Creek at Rd. 208	1.9	5	37	0.076	1	--	--	--
	DE 110-003	207111	White Marsh Branch at Rd. 268	5.8	5	37	0.081	1	--	--	--
	DE 120-001	106011	Rt. 13/Rt. 9 Bridge	3.0	5	46	0.112	5	--	--	--
		106291	Conrail Bridge (USGS tide gage 01481602) Up river from Port	3.0	5	46	0.117	5	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Total N LCL 90th Percentile	Tota N Category	Total Phosphorus Count	Total P LCL 90th Percentile	Total P Category	DIN Value	DIN Category	DIP Value
Christina River	DE 120-002	106021	Rt. 141 Drawbridge, Newport (USGS tide gage 01480065)	3.1	5	47	0.116	5	--	--	--
	DE 120-003	106031	Smalley's Dam Spillway	1.9	5	47	0.08	1	--	--	--
	DE 120-004-01	106141	Rt. 72, Below Newark (USGS guage 01478000)	2.4	5	45	0.057	1	--	--	--
	DE 120-006	106191	Rt. 273, Above Newark	2.9	5	43	0.042	1	--	--	--
	DE 120-007-01	106281	Little Mill Creek at atlantic Avenue (USGS Gage 01480095)	1.9	5	45	0.072	1	--	--	--
Dragon Run Creek	DE 130-001	111011	Rt. 9 Bridge	1.6	5	39	0.126	5	--	--	--
	DE 130-002	111031	Rt. 13 Bridge (flow at Rd. 407), Dragon Creek	2.3	5	39	0.053	1	--	--	--
Indian River	DE 140-001	312011	White Creek at the mouth of Assawoman Canal	1.4	5	39	0.093	1	0.18	5	0.028
	DE 140-002	308361	Blackwater Creek at Rd. 54	8.6	5	34	0.089	1	4.04	5	0.050
	DE 140-003	308091	Pepper Creek at Rt. 26	4.4	5	40	0.115	5	1.68	5	0.027
		308461	Deep Hole Banch at Rd. 382	8.4	5	24	0.226	5	2.78	5	0.092
	DE 140-004	306181	Buoy 49, Indian River	2.8	5	37	0.213	5	0.82	5	0.045
		306191	Buoy 55, Indian River	3.8	5	31	0.265	5	1.06	5	0.049
		306341	Island Creek, upper third	2.5	5	37	0.158	5	0.67	5	0.039
	DE 140-005	308301	Swan Creek, Rd. 304	5.5	5	29	0.02	1	4.44	5	0.015
		308341	Swan Creek at Rd. 297	3.1	5	35	0.032	1	2.08	5	0.011
	DE 140-006	308281	Cow Bridge Branch Rd. 48	2.2	5	40	0.072	1	0.87	5	0.026
	DE 140-E01	306121	Buoy 20, Indian River Bay	0.7	1	43	0.063	1	0.03	1	0.030
		306131	Buoy 26, Indian River Bay	1.2	5	30	0.107	5	0.16	5	0.038
		306321	Indian River Inlet	0.6	1	46	0.063	1	0.20	5	0.042
	DE 140-E02	306161	Buoy 38, Indian River	2.0	5	31	0.133	5	0.47	5	0.037
		306331	Island Creek mouth	2.4	5	37	0.153	5	0.58	5	0.040
	DE 140-L01	308071	Millsboro Dam Overflow	4.4	5	45	0.041	1	2.64	5	0.017
Iron Branch	DE 150-001	309021	Iron Branch at Rt. 113 Bridge	4.7	5	33	0.073	1	2.29	5	0.019
		309041	Whartons Branch at Rt. 334 Bridge	5.7	5	39	0.103	5	1.83	5	0.017
	DE 160-001	202031	DE Rt. 9 Bridge	1.7	5	39	0.252	5	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Total N LCL 90th Percentile	Tota N Category	Total Phosphorus Count	Total P LCL 90th Percentile	Total P Category	DIN Value	DIN Category	DIP Value
Leipsic River	DE 160-002	202041	Rt. 42	3.3	5	32	0.218	5	--	--	--
	DE 160-L01	202021	Rt. 13 Bridge, Garrisons Lake	2.5	5	39	0.298	5	--	--	--
	DE 160-L02	202011	Rd. 42 Bridge at Masseys MIllpond	3.0	5	32	0.23	5	--	--	--
Lewes and Rehoboth Canal	DE 170-001	305011	Canal Rt. 1	1.0	1	38	0.109	5	0.16	5	0.046
		305041	Lewes and Rehoboth Canal at Rd. 18 Bridge	1.1	5	38	0.0995	1	0.27	5	0.041
		305081	Munchy Branch at Rd. 270a	1.9	5	33	0.08	1	1.00	5	0.016
Little Assawoman Bay	DE 180-001	312041	Assawoman Canal, Rd. 361 Bridge	1.4	5	37	0.085	1	0.20	5	0.024
	DE 180-002	310101	Beaver Dam Ditch, Rd. 363, Miller Branch	4.6	5	32	0.113	5	1.31	5	0.034
		310121	Beaverdam Ditch at Rd. 368	6.2	5	43	0.068	1	2.82	5	0.026
	DE 180-003	310031	Dirrickson Creek, Rd. 381	3.8	5	39	0.42	5	0.76	5	0.093
	DE 180-E01	310011	Little Assawoman Bay Ditch at Rd. 58 Bridge	1.2	5	40	0.055	1	0.15	5	0.022
		310071	Little Assawoman Bay, Mid-Bay	1.4	5	39	0.065	1	0.32	5	0.031
Little River	DE 190-001-01	204031	Rt. 9 Bridge	3.1	5	39	0.378	5	--	--	--
	DE 190-001-02	204041	Rt. 8 Bridge	2.2	5	39	0.139	5	--	--	--
	DE 190-001-03	204011	Pipe Elm Branch, Postles Corner Road (Rd. 348)	0.9	1	32	0.064	1	--	--	--
Marshyhope Creek	DE 200-001	302021	Rt. 404 Bridge, (Woodenhawk Bridge)	4.0	5	30	0.075	1	--	--	--
		302031	Rd. 308 Bridge	3.6	5	85	0.088	1	--	--	--
Mispillion River	DE 210-001	208021	Rt. 1 Bridge	4.9	5	42	0.186	5	--	--	--
		208061	1.09 miles from mouth at lighthouse	2.0	5	42	0.25	5	--	--	--
		208101	3.85 miles from mouth, Revills Landing	2.1	5	27	0.152	5	--	--	--
		208121	7.48 miles from mouth, mouth of Fishing Branch	3.4	5	36	0.195	5	--	--	--
	DE 210-005	208301	Swan Creek at downstream side of Rt. 113	4.0	5	16	0.165	5	--	--	--
	DE 210-L02	208211	Rt. 36 Silver Lake	4.9	5	44	0.054	1	--	--	--
	DE 210-L03	208011	Haven Lake at Rt. 113	5.1	5	32	0.052	1	--	--	--
	DE 210-L05	208191	Blairs Pond off Rd. 443	5.6	5	32	0.036	1	--	--	--
	DE 210-L05	208231	Beaverdam Branch, Rd. 384	4.8	5	44	0.059	1	--	--	--
	DE 210-L06	208181	Abbotts Pond at Rd. 620	4.9	5	44	0.063	1	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Total N LCL 90th Percentile	Tota N Category	Total Phosphorus Count	Total P LCL 90th Percentile	Total P Category	DIN Value	DIN Category	DIP Value
Murderkill River	DE 220-001	206091	US Rt. 113 at Frederica By-Pass	3.9	5	63	0.359	5	--	--	--
		206101	Bowers Beach Wharf	1.9	5	66	0.253	5	--	--	--
		206131	1.25 miles from the mouth at Webs Landing	2.0	5	60	0.237	5	--	--	--
		206141	3.25 miles from the mouth	2.6	5	63	0.306	5	--	--	--
		206231	Confluence of Kent County STP trib.	4.0	5	62	0.507	5	--	--	--
		206711	Murderkill River near power lines (4.45 river mile	2.8	5	40	0.358	5	--	--	--
	DE 220-002	206081	Spring Creek at Rt. 12 Bridge	3.9	5	60	0.3615	5	--	--	--
		206561	Double Run at Rd. 371	3.8	5	66	0.182	5	--	--	--
		206641	Spring Creek, Pratt Branch at Canterbury Rd.	6.2	5	38	0.063	1	--	--	--
	DE 220-004	206041	Browns Branch at Rt. 14 Bridge	8.2	5	67	0.059	1	--	--	--
		206051	Browns Branch at Rd. 384 Bridge	6.6	5	62	0.045	1	--	--	--
	DE 220-005	206011	US Rt. 13 Bridge below Felton	4.2	5	68	0.094	1	--	--	--
	DE 220-L01	206461	Hudson Branch, McGinnis Pond, Rd. 378	4.9	5	65	0.0565	1	--	--	--
	DE 220-L02	206071	Andrews Lake at Rd. 380 Bridge	4.0	5	61	0.084	1	--	--	--
	DE 220-L03	206451	Coursey Pond at Rd. 388 Bridge	4.3	5	67	0.223	5	--	--	--
	DE 220-L05	206361	McCauley Pond near spillway	5.4	5	67	0.084	1	--	--	--
Naamans Creek	DE 230-001-02	101021	Naamans Road	2.0	5	42	0.041	1	--	--	--
		101031	South Branch at Darley Rd.	1.9	5	31	0.049	1	--	--	--
		101041	Rt. 13A	2.0	5	31	0.051	1	--	--	--
		101061	South Branch at Marsh Rd.	2.4	5	14	0.07	1	--	--	--
Nanticoke River	DE 240-001	304041	Middleford Bridge	4.8	5	36	0.05	1	--	--	--
		304071	Buoy 45 (State Line)	4.7	5	33	0.064	1	--	--	--
		304091	Buoy 51 (Conf. Broad Creek)	4.8	5	28	0.066	1	--	--	--
		304151	Buoy 66 (Conf DuPont Gut)	4.6	5	34	0.074	1	--	--	--
		304461	Seaford STP Discharge	4.3	5	33	0.084	1	--	--	--
		304471	Rt. 13 Bridge	4.4	5	36	0.065	1	--	--	--
	DE 240-002	304191	Rd. 545 Mainstem Nanticoke	5.9	5	80	0.085	1	--	--	--
		304291	Rd. 600 Bridge	6.2	5	30	0.0475	1	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Total N LCL 90th Percentile	Tota N Category	Total Phosphorus Count	Total P LCL 90th Percentile	Total P Category	DIN Value	DIN Category	DIP Value
	DE 240-003	304381	Bucks Branch at Rd. 546	11.0	5	37	0.081	1	--	--	--
	DE 240-005	316011	Gravelly Branch at Rd. 525 Bridge	2.8	5	36	0.027	1	--	--	--
	DE 240-L02	304311	Concord Pond overflow	3.1	5	37	0.046	1	--	--	--
	DE 240-L04	304321	Williams Pond, below the pond at Rd. 535	5.4	5	37	0.11	5	--	--	--
Pocomoke River	DE 250-001	313011	Rd. 419 Bridge	3.1	5	37	0.1315	5	--	--	--
Red Clay Creek	DE 260-001	103011	Stanton, Rt. 4 at Stanton Bridge (USGS gage 01480015)	3.9	5	47	0.135	5	--	--	--
		103031	Wooddale, Rt. 48 (USGS gage 01480000)	4.2	5	46	0.151	5	--	--	--
		103041	Ashland, Rd. 258a	4.8	5	46	0.196	5	--	--	--
	DE 260-002	103061	Burrough's Run at Creek Rd. (Rt. 82)	2.6	5	45	0.048	1	--	--	--
Red Lion Creek	DE 270-001-01	107031	Rt. 9 Bridge	2.2	5	39	0.126	5	--	--	--
	DE 270-001-02	107011	Rt. 7	1.2	5	39	0.054	1	--	--	--
Rehoboth Bay	DE 280-001-01	308051	Guinea Creek at Rt. 298 Bridge	3.4	5	39	0.096	1	1.35	5	0.018
	DE 280-002	308291	Love Creek, Rd. 277	2.8	5	33	0.024	1	1.17	5	0.013
		308371	Bundick's Branch at Rt. 23	5.7	5	40	0.0325	1	4.21	5	0.018
	DE 280-E01	306071	Buoy 3, Rehoboth Bay	0.8	1	31	0.088	1	0.07	1	0.030
		306091	Buoy 7, Rehoboth Bay	0.7	1	37	0.073	1	0.07	1	0.031
		306111	Massey's Ditch at Bouy 17	0.6	1	38	0.059	1	0.09	1	0.032
	DE 280-L01	308031	Burton Pond, Rd. 24	2.1	5	38	0.026	1	0.73	5	0.011
Saint Jones River	DE 290-001-01	205041	3.5 miles from mouth at Barkers Landing	2.5	5	37	0.279	5	--	--	--
	DE 290-001-02	205091	Rt. 10 Bridge near DAFB	2.8	5	38	0.314	5	--	--	--
		205571	Division Street (Dover)	2.1	5	31	0.173	5	--	--	--
	DE 290-002	205241	Rt. 13 North Moores Lake, Issacs Branch	5.6	5	31	0.077	1	--	--	--
	DE 290-003	205151	Rd. 69 State College, Fork Branch	1.6	5	37	0.219	5	--	--	--
	DE 290-L01	205181	Rt. 13 Alt. Moores Lake	5.2	5	38	0.086	1	--	--	--
	DE 290-L02	205191	Silver Lake Spillway, Dover City Park	2.4	5	44	0.1825	5	--	--	--
	DE 290-L03	205211	Derby Pond at Rt. 13A	4.2	5	37	0.074	1	--	--	--
Shellpot Creek	DE 300-001-01	102041	Cherry Island at Rd. 501 Bridge	2.5	5	42	0.139	5	--	--	--
	DE 300-001-02	102011	US Rt. 13 Bridge (Gov Printz Blvd)	1.9	5	29	0.054	1	--	--	--
		102051	Rt. 13 Bus (Market Street) Bridge, near USGS station	1.6	5	12	0.095	1	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	Total N LCL 90th Percentile	Tota N Category	Total Phosphorus Count	Total P LCL 90th Percentile	Total P Category	DIN Value	DIN Category	DIP Value
		102081	Shellpot Crk at Carr Road Bridge	1.6	5	12	0.0865	1	--	--	--
	DE 300-001-03	102101	Stoney Creek @ Rt. 13	2.6	5	26	0.143	5	--	--	--
Smyrna River	DE 310-001	201011	Lake Como at US Route 13 Bridge	2.2	5	15	0.156	5	--	--	--
		201031	Mill Creek at DE Route 6 Bridge	2.3	5	14	0.238	5	--	--	--
		201041	Rt. 9 Fleming's Landing	2.2	5	39	0.274	5	--	--	--
	DE 310-002	201021	Rd. 137 Bridge, Mill Creek	2.6	5	39	0.136	5	--	--	--
	DE 310-003	201051	Rd. 485 Bridge at Smyrna Landing	2.9	5	39	0.275	5	--	--	--
		201161	Rd. 38 Bridge, Providence Creek	3.6	5	32	0.05	1	--	--	--
White Clay Creek	DE 320-001	105011	Stanton, Old Rt. 7 Bridge	4.1	5	32	0.1	1	--	--	--
		105031	Chambers Rock Rd. (Road 329) near Thompson	5.1	5	45	0.1405	5	--	--	--
		105151	DE Park Race Track (USGS gage 01479000), 35ft downstream	4.2	5	46	0.117	5	--	--	--
		105171	McKee Lane in Newark	4.5	5	45	0.108	5	--	--	--
	DE 320-002	105071	Mill Creek, Above Rt. 4 (DE Park)	3.3	5	43	0.063	1	--	--	--
	DE 320-003	105101	Pike Creek Confluence, Upper Pike Creek Rd. (Rd. 322)	3.3	5	42	0.036	1	--	--	--
		105181	Pike Creek at Paper Mill Road	3.9	5	43	0.044	1	--	--	--
	DE 320-004	105131	Middle Run Confluence, Possum Park Rd. (Rd. 303)	2.5	5	44	0.041	1	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	DIP Category	ERES Total Nitrogen Support	ERES Total Phosphorus Support
Appoquinimink River	DE 010-001-01	109091	Delaware River (Appoquinimink at Mouth)	--	--	--
		109121	Rt. 9 Bridge (East)	--	--	--
		109141	Mouth of East Br. Drawyer Creek	--	--	--
	DE 010-001-02	109041	Rt. 13 Bridge below Odessa	--	--	--
		109051	Rt. 299 Bridge, Odessa	--	--	--
		109151	Above West Br. Drawyer Creek	--	--	--
		109171	MOT Gut (Appo Gut) - West Bank	--	--	--
	DE 010-001-03	109071	Drawyer Creek, Rt 13	--	--	--
		109251	Deep Creek Br of Appoquinimik River at Rt. 71 Bridge	--	--	--
	DE 010-L01	109131	Noxontown Pond Overflow, Rd 38	--	--	--
	DE 010-L02	109031	Silver Lake Overflow, Rd 442	--	--	--
	DE 010-L03	109191	Shallcross Lake Overflow, Dischrg Drawer Cr, Rd. 428	--	--	--
Army Creek	DE 020-001	114011	Rt. 9 Below Llangollen Wells	--	--	--
	DE 020-002	114021	Rt. 13 Bridge	--	--	--
Blackbird Creek	DE 030-001	110021	Rt. 13 (Northern Branch)	--	--	--
		110031	Rd 455, Blackbird Landing	--	--	--
		110041	Rt. 9 Taylors Bridge	--	--	--
	DE 030-002	110011	Road 463 East of RR Tracks	--	--	--
Brandywine Creek	DE 040-001	104011	Footbridge in Brandywine State Park	--	--	--
	DE 040-002	104021	Rd. 279 Bridge (USGS guage 014)	--	--	--
		104051	Smith Bridge	--	meets	meets
Broad Creek	DE 050-006-03	304671	Raccoon Prong at Rd. 66	--	--	--
	DE 050-L03	307171	Horseys Pond 50 Yards Above Spillway 50% RB	--	meets	meets
	DE 050-L04	307011	Records Pond at Rt. 13	--	meets	meets
	DE 060-001	303041	Rt. 1 Bridge (Mainstem)	--	--	--
		303061	0.10 Miles From Mouth	--	--	--
		303171	Beaverdam Creek at Rd. 88	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	DIP Category	ERES Total Nitrogen Support	ERES Total Phosphorus Support
Broadkill River	DE 060-002	303181	Beaverdam Creek above Rd. 259, Hunters Mill Pond	--	--	--
	DE 060-003	303031	Rt. 5 Bridge	--	--	--
	DE 060-004	303311	Round Pole Branch at Rd. 88	--	--	--
	DE 060-005	303011	Ingram Branch, Savanah Ditch at Rd. 246	--	--	--
		303021	Ingram Branch at Rd. 248	--	--	--
	DE 060-006	303341	Pemberton Branch at Rt. 30 above Wagamons Pond	--	--	--
	DE 060-007-01	303051	Red Mill Pond at Rt. 1	--	--	--
	DE 060-008	303481	Ingrams Branch at Rt. 30 above Waples Pond	--	--	--
	DE 060-L01	303231	Trib. to Red mill Pond at Rd. 261	--	--	--
	DE 060-L02	303351	Wagamons Pond Outlet at County Rd. 250	--	--	--
	DE 060-L03	303331	Waples Pond at Rt. 1	--	--	--
	DE 060-L03	303381	Sowbridge Branch at Rd. 212, Waples Pond	--	--	--
Buntings Branch	DE 070-001	311041	Buntings Branch at Rt. 54	5	--	--
Cedar Creek	DE 080-001	301021	Rd. 212, Swiggetts Pond	--	--	--
		301031	Rt. 1 Bridge	--	--	--
		301091	Rt. 36 Bridge	--	meets	meets
Chesapeake & Delaware Canal	DE 090-001	108021	St. Georges Bridge	--	--	--
		108031	Summit Bridge	--	--	--
	DE 090-L01	108111	Lums Pond Boat Ramp	--	--	--
Chesapeake Drainage System	DE 100-002	112021	Sewell Branch at Rd. 95	--	--	--
Choptank	DE 110-001	207081	Tappahanna Ditch at Rd. 222	--	--	--
	DE 110-002	207091	Culbreth Marsh at Rd. 210	--	--	--
	DE 110-003	207021	Cow Marsh Creek at Rd. 208	--	--	--
	DE 110-003	207111	White Marsh Branch at Rd. 268	--	--	--
	DE 120-001	106011	Rt. 13/Rt. 9 Bridge	--	--	--
		106291	Conrail Bridge (USGS tide gage 01481602) Up river from Port	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	DIP Category	ERES Total Nitrogen Support	ERES Total Phosphorus Support
Christina River	DE 120-002	106021	Rt. 141 Drawbridge, Newport (USGS tide gage 01480065)	--	--	--
	DE 120-003	106031	Smalley's Dam Spillway	--	--	--
	DE 120-004-01	106141	Rt. 72, Below Newark (USGS guage 01478000)	--	--	--
	DE 120-006	106191	Rt. 273, Above Newark	--	--	--
	DE 120-007-01	106281	Little Mill Creek at atlantic Avenue (USGS Gage 01480095)	--	--	--
Dragon Run Creek	DE 130-001	111011	Rt. 9 Bridge	--	--	--
	DE 130-002	111031	Rt. 13 Bridge (flow at Rd. 407), Dragon Creek	--	--	--
Indian River	DE 140-001	312011	White Creek at the mouth of Assawoman Canal	5	--	--
	DE 140-002	308361	Blackwater Creek at Rd. 54	5	--	--
	DE 140-003	308091	Pepper Creek at Rt. 26	5	--	--
		308461	Deep Hole Banch at Rd. 382	5	--	--
	DE 140-004	306181	Buoy 49, Indian River	5	meets	meets
		306191	Buoy 55, Indian River	5	--	--
		306341	Island Creek, upper third	5	--	--
	DE 140-005	308301	Swan Creek, Rd. 304	5	--	--
		308341	Swan Creek at Rd. 297	5	--	--
	DE 140-006	308281	Cow Bridge Branch Rd. 48	5	--	--
	DE 140-E01	306121	Buoy 20, Indian River Bay	5	meets	meets
		306131	Buoy 26, Indian River Bay	5	--	--
		306321	Indian River Inlet	5	meets	meets
	DE 140-E02	306161	Buoy 38, Indian River	5	--	--
		306331	Island Creek mouth	5	meets	meets
	DE 140-L01	308071	Millsboro Dam Overflow	5	--	--
Iron Branch	DE 150-001	309021	Iron Branch at Rt. 113 Bridge	5	--	--
		309041	Whartons Branch at Rt. 334 Bridge	5	--	--
	DE 160-001	202031	DE Rt. 9 Bridge	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	DIP Category	ERES Total Nitrogen Support	ERES Total Phosphorus Support
Leipsic River	DE 160-002	202041	Rt. 42	--	--	--
	DE 160-L01	202021	Rt. 13 Bridge, Garrisons Lake	--	--	--
	DE 160-L02	202011	Rd. 42 Bridge at Masseys MIllpond	--	--	--
Lewes and Rehoboth Canal	DE 170-001	305011	Canal Rt. 1	5	--	--
		305041	Lewes and Rehoboth Canal at Rd. 18 Bridge	5	--	--
		305081	Munchy Branch at Rd. 270a	5	--	--
Little Assawoman Bay	DE 180-001	312041	Assawoman Canal, Rd. 361 Bridge	5	meets	meets
	DE 180-002	310101	Beaver Dam Ditch, Rd. 363, Miller Branch	5	--	--
		310121	Beaverdam Ditch at Rd. 368	5	--	--
	DE 180-003	310031	Dirrickson Creek, Rd. 381	5	meets	meets
	DE 180-E01	310011	Little Assawoman Bay Ditch at Rd. 58 Bridge	5	meets	meets
		310071	Little Assawoman Bay, Mid-Bay	5	meets	meets
Little River	DE 190-001-01	204031	Rt. 9 Bridge	--	--	--
	DE 190-001-02	204041	Rt. 8 Bridge	--	--	--
	DE 190-001-03	204011	Pipe Elm Branch, Postles Corner Road (Rd. 348)	--	--	--
Marshyhope Creek	DE 200-001	302021	Rt. 404 Bridge, (Woodenhawk Bridge)	--	--	--
		302031	Rd. 308 Bridge	--	--	--
Mispillion River	DE 210-001	208021	Rt. 1 Bridge	--	--	--
		208061	1.09 miles from mouth at lighthouse	--	--	--
		208101	3.85 miles from mouth, Revills Landing	--	--	--
		208121	7.48 miles from mouth, mouth of Fishing Branch	--	--	--
	DE 210-005	208301	Swan Creek at downstream side of Rt. 113	--	--	--
	DE 210-L02	208211	Rt. 36 Silver Lake	--	--	--
	DE 210-L03	208011	Haven Lake at Rt. 113	--	--	--
	DE 210-L05	208191	Blairs Pond off Rd. 443	--	--	--
	DE 210-L05	208231	Beaverdam Branch, Rd. 384	--	--	--
	DE 210-L06	208181	Abbotts Pond at Rd. 620	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	DIP Category	ERES Total Nitrogen Support	ERES Total Phosphorus Support
Murderkill River	DE 220-001	206091	US Rt. 113 at Frederica By-Pass	--	--	--
		206101	Bowers Beach Wharf	--	--	--
		206131	1.25 miles from the mouth at Webs Landing	--	--	--
		206141	3.25 miles from the mouth	--	--	--
		206231	Confluence of Kent County STP trib.	--	--	--
		206711	Murderkill River near power lines (4.45 river mile	--	--	--
	DE 220-002	206081	Spring Creek at Rt. 12 Bridge	--	--	--
		206561	Double Run at Rd. 371	--	--	--
		206641	Spring Creek, Pratt Branch at Canterbury Rd.	--	--	--
	DE 220-004	206041	Browns Branch at Rt. 14 Bridge	--	--	--
		206051	Browns Branch at Rd. 384 Bridge	--	--	--
	DE 220-005	206011	US Rt. 13 Bridge below Felton	--	--	--
	DE 220-L01	206461	Hudson Branch, McGinnis Pond, Rd. 378	--	--	--
	DE 220-L02	206071	Andrews Lake at Rd. 380 Bridge	--	--	--
	DE 220-L03	206451	Coursey Pond at Rd. 388 Bridge	--	--	--
	DE 220-L05	206361	McCauley Pond near spillway	--	--	--
Naamans Creek	DE 230-001-02	101021	Naamans Road	--	--	--
		101031	South Branch at Darley Rd.	--	--	--
		101041	Rt. 13A	--	--	--
		101061	South Branch at Marsh Rd.	--	--	--
Nanticoke River	DE 240-001	304041	Middleford Bridge	--	fails	meets
		304071	Buoy 45 (State Line)	--	--	--
		304091	Buoy 51 (Conf. Broad Creek)	--	--	--
		304151	Buoy 66 (Conf DuPont Gut)	--	meets	meets
		304461	Seaford STP Discharge	--	meets	meets
		304471	Rt. 13 Bridge	--	fails	meets
	DE 240-002	304191	Rd. 545 Mainstem Nanticoke	--	fails	meets
		304291	Rd. 600 Bridge	--	fails	meets

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	DIP Category	ERES Total Nitrogen Support	ERES Total Phosphorus Support
	DE 240-003	304381	Bucks Branch at Rd. 546	--	--	--
	DE 240-005	316011	Gravelly Branch at Rd. 525 Bridge	--	meets	meets
	DE 240-L02	304311	Concord Pond overflow	--	meets	meets
	DE 240-L04	304321	Williams Pond, below the pond at Rd. 535	--	meets	meets
Pocomoke River	DE 250-001	313011	Rd. 419 Bridge	--	--	--
Red Clay Creek	DE 260-001	103011	Stanton, Rt. 4 at Stanton Bridge (USGS gage 01480015)	--	--	--
		103031	Wooddale, Rt. 48 (USGS gage 01480000)	--	--	--
		103041	Ashland, Rd. 258a	--	--	--
	DE 260-002	103061	Burrough's Run at Creek Rd. (Rt. 82)	--	--	--
Red Lion Creek	DE 270-001-01	107031	Rt. 9 Bridge	--	--	--
	DE 270-001-02	107011	Rt. 7	--	--	--
Rehoboth Bay	DE 280-001-01	308051	Guinea Creek at Rt. 298 Bridge	5	meets	meets
	DE 280-002	308291	Love Creek, Rd. 277	5	--	--
		308371	Bundick's Branch at Rt. 23	5	--	--
	DE 280-E01	306071	Buoy 3, Rehoboth Bay	5	--	--
		306091	Buoy 7, Rehoboth Bay	5	meets	meets
		306111	Massey's Ditch at Bouy 17	5	meets	meets
	DE 280-L01	308031	Burton Pond, Rd. 24	5	meets	meets
Saint Jones River	DE 290-001-01	205041	3.5 miles from mouth at Barkers Landing	--	--	--
	DE 290-001-02	205091	Rt. 10 Bridge near DAFB	--	--	--
		205571	Division Street (Dover)	--	--	--
	DE 290-002	205241	Rt. 13 North Moores Lake, Issacs Branch	--	--	--
	DE 290-003	205151	Rd. 69 State College, Fork Branch	--	--	--
	DE 290-L01	205181	Rt. 13 Alt. Moores Lake	--	--	--
	DE 290-L02	205191	Silver Lake Spillway, Dover City Park	--	--	--
	DE 290-L03	205211	Derby Pond at Rt. 13A	--	--	--
Shellpot Creek	DE 300-001-01	102041	Cherry Island at Rd. 501 Bridge	--	--	--
	DE 300-001-02	102011	US Rt. 13 Bridge (Gov Printz Blvd)	--	--	--
		102051	Rt. 13 Bus (Market Street) Bridge, near USGS station	--	--	--

Table III-1 Station Summary Statistics

Watershed	Segment	Station	Location	DIP Category	ERES Total Nitrogen Support	ERES Total Phosphorus Support
		102081	Shellpot Crk at Carr Road Bridge	--	--	--
	DE 300-001-03	102101	Stoney Creek @ Rt. 13	--	--	--
Smyrna River	DE 310-001	201011	Lake Como at US Route 13 Bridge	--	--	--
		201031	Mill Creek at DE Route 6 Bridge	--	--	--
		201041	Rt. 9 Fleming's Landing	--	--	--
	DE 310-002	201021	Rd. 137 Bridge, Mill Creek	--	--	--
	DE 310-003	201051	Rd. 485 Bridge at Smyrna Landing	--	--	--
		201161	Rd. 38 Bridge, Providence Creek	--	--	--
White Clay Creek	DE 320-001	105011	Stanton, Old Rt. 7 Bridge	--	--	--
		105031	Chambers Rock Rd. (Road 329) near Thompson	--	meets	meets
		105151	DE Park Race Track (USGS gage 01479000), 35ft downstream	--	--	--
		105171	McKee Lane in Newark	--	--	--
	DE 320-002	105071	Mill Creek, Above Rt. 4 (DE Park)	--	--	--
	DE 320-003	105101	Pike Creek Confluence, Upper Pike Creek Rd. (Rd. 322)	--	--	--
		105181	Pike Creek at Paper Mill Road	--	--	--
	DE 320-004	105131	Middle Run Confluence, Possum Park Rd. (Rd. 303)	--	--	--

Table III-2: Segment Use Support

WATERBODY ID	WATERSHED NAME	SEGMENT	DO Status	ENT Status	otal N Statu	otal P Statu
DE010-001-01	Appoquinimink River	Lower Appoquinimink River	5	1	5	5
DE010-001-02	Appoquinimink River	Upper Appoquinimink River	5	5	5	5
DE010-001-03	Appoquinimink River	Drawyer Creek	1	5	5	5
DE010-L01	Appoquinimink River	Noxontown Pond	1	1	5	1
DE010-L02	Appoquinimink River	Silver Lake	1	1	5	1
DE010-L03	Appoquinimink River	Shallcross Lake	1	1	5	1
DE020-001	Army Creek	Lower Army Creek	5	1	5	5
DE020-002	Army Creek	Upper Army Creek	5	5	5	5
DE030-001	Blackbird Creek	Lower Blackbird	5	5	5	5
DE030-002	Blackbird Creek	Upper Blackbird	5	1	5	5
DE040-001	Brandywine Creek	Lower Brandywine	1	5	5	5
DE040-002	Brandywine Creek	Upper Brandywine	1	1	5	5
DE050-006-03	Broad Creek	Raccoon Prong	5	5	5	1
DE050-L03	Broad Creek	Horseys Pond	1	1	5	1
DE050-L04	Broad Creek	Records Pond	1	1	5	1
DE060-001	Broadkill River	Lower Broadkill	5	5	5	5
DE060-002	Broadkill River	Beaverdam Creek	1	5	5	5
DE060-003	Broadkill River	Upper Broadkill River	1	1	5	1
DE060-004	Broadkill River	Round Pole Branch	1	5	5	1
DE060-005	Broadkill River	Ingrams Branch	1	5	5	5
DE060-006	Broadkill River	Pemberton Branch	1	5	5	1
DE060-007-01	Broadkill River	Lower Red Mill Branch	1	1	5	5
DE060-008	Broadkill River	Primehook Creek	5	1	5	5
DE060-L01	Broadkill River	Red Mill Pond	1	1	5	1
DE060-L02	Broadkill River	Waggamons Pond	1	1	5	1
DE060-L03	Broadkill River	Waples Pond and Reynolds Pond	5	1	5	1
DE070-001	Buntings Branch	Buntings Branch	1	5	5	5
DE080-001	Cedar Creek	Lower Cedar Creek	5	5	5	5
DE090-001	Chesapeake & Delaware Canal	C&D Canal	1	1	5	5
DE090-L01	Chesapeake & Delaware Canal	Lums Pond	1	1	5	1
DE100-002	Chesapeake Drainage System	Sewell Branch, including tributaries	5	5	5	5
DE110-001	Choptank	Tappahanna Ditch	1	1	5	1
DE110-002	Choptank	Culbreth Marsh Ditch	1	1	5	1

Table III-2: Segment Use Support

WATERBODY ID	WATERSHED NAME	SEGMENT	DO Status	ENT Status	otal N Statu	otal P Statu
DE110-003	Choptank	Cow Marsh Creek	1	5	5	1
DE120-001	Christina River	Lower Christina River	1	5	5	5
DE120-002	Christina River	Mid Christina River	1	5	5	5
DE120-003	Christina River	Upper Christina River	1	1	5	1
DE120-004-01	Christina River	Lower Christina Creek	1	5	5	1
DE120-006	Christina River	Upper Christina Creek	1	5	5	1
DE120-007-01	Christina River	Little Mill Creek and Willow Run	1	5	5	1
DE130-001	Dragon Run Creek	Lower Dragon Run Creek	5	1	5	5
DE130-002	Dragon Run Creek	Upper Dragon Run Creek	5	1	5	1
DE140-001	Indian River	White Creek	5	1	5	1
DE140-002	Indian River	Blackwater Creek	5	5	5	1
DE140-003	Indian River	Pepper Creek, including tributaries	1	5	5	5
DE140-004	Indian River	Indian River	5	5	5	5
DE140-005	Indian River	Swan Creek	1	5	5	1
DE140-006	Indian River	Stockley Branch	1	1	5	1
DE140-E01	Indian River	Lower Indian River Bay	1	1	5	5
DE140-E02	Indian River	Upper Indian River Bay	1	1	5	5
DE140-L01	Indian River	Millsboro Pond	1	1	5	1
DE150-001	Iron Branch	Iron Branch	1	5	5	5
DE160-001	Leipsic River	Lower Leipsic River	5	5	5	5
DE160-002	Leipsic River	Upper Leipsic River	1	5	5	5
DE160-L01	Leipsic River	Garrisons Lake	1	1	5	5
DE160-L02	Leipsic River	Masseys Mill Pond	1	1	5	5
DE170-001	Lewes and Rehoboth Canal	Lewes and Rehoboth Canal	5	5	5	5
DE180-001	Little Assawoman Bay	Little Assawoman Canal	5	5	5	1
DE180-002	Little Assawoman Bay	Miller Creek	5	5	5	5
DE180-003	Little Assawoman Bay	Dirickson Creek	1	5	5	5
DE180-E01	Little Assawoman Bay	Little Assawoman Bay	5	1	5	1
DE190-001-01	Little River	Lower Little River	5	5	5	5
DE190-001-02	Little River	Upper Little River	5	1	5	5
DE190-001-03	Little River	Pipe Elm Branch	1	5	1	1
DE200-001	Marshyhope Creek	Marshyhope Creek	1	1	5	1
DE210-001	Mispillion River	Lower Mispillion	5	5	5	5

Table III-2: Segment Use Support

WATERBODY ID	WATERSHED NAME	SEGMENT	DO Status	ENT Status	otal N Statu	otal P Statu
DE210-005	Mispillion River	Mispillion Tributaries From Dam At Silver I	5	5	5	5
DE210-L02	Mispillion River	Silver Lake	1	1	5	1
DE210-L03	Mispillion River	Haven Lake	1	1	5	1
DE210-L05	Mispillion River	Blairs Pond	1	5	5	1
DE210-L06	Mispillion River	Abbotts Mill Pond	1	1	5	1
DE220-001	Murderkill River	Lower Murderkill	5	5	5	5
DE220-002	Murderkill River	Spring Creek	5	5	5	5
DE220-004	Murderkill River	Browns Branch	1	5	5	1
DE220-005	Murderkill River	Upper Murderkill River	1	5	5	1
DE220-L01	Murderkill River	McGinnis Pond	1	1	5	1
DE220-L02	Murderkill River	Andrews Lake	1	1	5	1
DE220-L03	Murderkill River	Coursey Pond	1	1	5	5
DE220-L05	Murderkill River	McCauley Pond	1	1	5	1
DE230-001-02	Naamans Creek	North Branch and South Branch	1	5	5	1
DE240-001	Nanticoke River	Lower Nanticoke River	1	1	5	1
DE240-002	Nanticoke River	Upper Nanticoke River	1	1	5	1
DE240-003	Nanticoke River	Clear Brook Branch	1	5	5	1
DE240-005	Nanticoke River	Gravelly Branch	1	1	5	1
DE240-L02	Nanticoke River	Concord Pond	1	1	5	1
DE240-L04	Nanticoke River	Williams Pond	1	1	5	5
DE250-001	Pocomoke River	Pocomoke River	1	5	5	5
DE260-001	Red Clay Creek	Mainstem	1	5	5	5
DE260-002	Red Clay Creek	Burroughs Run	1	5	5	1
DE270-001-01	Red Lion Creek	Lower Red Lion	5	5	5	5
DE270-001-02	Red Lion Creek	Upper Red Lion	1	5	5	1
DE280-001-01	Rehoboth Bay	Chapel Branch	1	5	5	1
DE280-002	Rehoboth Bay	Love Creek, including tributaries	1	5	5	1
DE280-E01	Rehoboth Bay	Rehoboth Bay	1	1	1	1
DE280-L01	Rehoboth Bay	Burton Pond	1	1	5	1
DE290-001-01	Saint Jones River	Lower Saint Jones	5	5	5	5
DE290-001-02	Saint Jones River	Upper Saint Jones	5	5	5	5
DE290-002	Saint Jones River	Isaac Branch	1	5	5	1
DE290-003	Saint Jones River	Fork Branch	5	1	5	5

Table III-2: Segment Use Support

WATERBODY ID	WATERSHED NAME	SEGMENT	DO Status	ENT Status	otal N Statu	otal P Statu
DE290-L01	Saint Jones River	Moores Lake	1	1	5	1
DE290-L02	Saint Jones River	Silver Lake	1	1	5	5
DE290-L03	Saint Jones River	Derby Pond	1	1	5	1
DE300-001-01	Shellpot Creek	Lower Shellpot Creek	5	5	5	5
DE300-001-02	Shellpot Creek	Upper Shellpot Creek	1	5	5	1
DE300-001-03	Shellpot Creek	All other tributaries located in the watersh	1	5	5	5
DE310-001	Smyrna River	Lower Smyrna River	5	5	5	5
DE310-002	Smyrna River	Mill Creek	1	1	5	5
DE310-003	Smyrna River	Tributary of Smyrna River	5	5	5	5
DE320-001	White Clay Creek	Mainstem	1	5	5	5
DE320-002	White Clay Creek	Mill Creek	1	5	5	1
DE320-003	White Clay Creek	Pike Creek	1	5	5	1
DE320-004	White Clay Creek	Middle Run	1	5	5	1

Summary Data Tables

The following summary tables (Table III-3- III-6) summarize 2010 Use Support determinations in Table III-2.

Individual Use Support Summaries

(National and State Uses)

Individual Use Support Summary for DE

Table III-3

Report for Water Type: RIVER; Units: MILES

USE	Size Assessed	Size Fully Supporting	Size Not Supporting
Fish, Aquatic Life, and Wildlife	2,478.17	58.2	2419.97
Primary Contact Recreation	2,479.38	355.6	2,123.78
Waters of Exceptional Recreational or Ecological Significance	867.25	190	677.25

Type of Waterbody: Freshwater Lake
Note: All numbers are in Acres

Table III-4 Report for Water Type: FRESHWATER LAKE; Units: ACRES

USE	Size Assessed	Size Fully Supporting	Size Not Supporting
Fish, Aquatic Life, and Wildlife	2,953.9	245.2	2708.7
Primary Contact Recreation	2,953.9	1,642.7	1,311.2
Waters of Exceptional Recreational or Ecological Significance	757.8	256.7	501.1

Table III-5

Report for Water Type: ESTUARY; Units: SQUARE MILES

USE	Size Assessed	Size Fully Supporting	Size Not Supporting
Fish, Aquatic Life, and Wildlife	28.95	0	28.95
Primary Contact Recreation	29.54	28.95	0.59
Waters of Exceptional Recreational or Ecological Significance	29.54	3	26.54

Table III-6

Type of Waterbody: Coastal Waters
Note: All numbers are in Miles

Use	Size Assessed	Size Fully Supporting	Size Not Supporting
Aquatic Life Support	25	25	0
Primary Contact (Recr)	25	25	0

Table III-7: 2010 303(d) List

FINAL DETERMINATION FOR THE STATE OF DELAWARE 2010 CLEAN WATER ACT SECTION 303(d) LIST OF WATERS NEEDING TMDLs

WATERBODY ID	WATERSHED NAME	SEGMENT	Overall CALM Code	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Polllutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
Piedmont Basin													
DE230-001-01	Naamans Creek	Lower Naamans Creek	4a	From the mouth at the Delaware River, upstream to the first railroad bridge	0.30 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	2002	2004	2005	4a	2006	
DE230-001-02	Naamans Creek	North Branch and South Branch	5	Upper Naamans Creek, including all tributaries on the North Branch and	7.8 miles	Nutrients	NPS	1996	2004	2005	4a	2006	
						Bacteria	NPS	1996	2004	2005	4a	2006	
				First tributary after the headwaters of South Naamans Creek to the mainstem	1.15 miles	Biology and Habitat	NPS	1998	2009		5		
				From the confluence of Naamans Creek and West Branch Naamans Creek to the confluence of Naamans Creek and North Branch Naamans Creek	0.56 miles	Biology and Habitat	NPS	1998	2009		5		
DE300-001-01	Shellpot Creek	Lower Shellpot Creek	5	From the head of tide below the east set of railroad tracks to the mouth of the Delaware River	1.0 mile	Nutrients	NPS Del. River	1996	2004	2005	4a	2006	
						DO		1996	2004	2005	4a	2006	
						Bacteria		2002	2004	2005	4a	2006	
						PCBs		2002	2009		5		
						Chlordane		2002	2009		5		
DE300-001-02	Shellpot Creek	Upper Shellpot Creek	5	From the headwaters to the head of tide below the east set of railroad tracks	7.7 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	1996	2004	2005	4a	2006	
				Western tributary of the headwaters to the confluence of the next larger stream order	1.4 miles	Biology and Habitat	NPS	1998	2009		5		
				From the headwaters of Matson Run to the confluence with mainstem Shellpot Creek	1.3 miles	Biology and Habitat	NPS	1998	2009		5		
DE300-001-03	Shellpot Creek	All other tributaries located in the watershed but NOT on the mainstem	5	Western tributary of the headwaters of Stoney Creek to the confluence with mainstem Stoney Creek	0.63 miles	Habitat	NPS	1998	2009		5		
				From the confluence of the headwaters of Stoney Creek to the mouth of the Delaware River	1.2 miles	Biology and Habitat	NPS	1998	2009		5		
						Nutrients	NPS	2008	2005		5		
						Bacteria	NPS	2010	2001		4a		
DE040-001	Brandywine Creek	Lower Brandywine	5	Mainstem Lower Brandywine	3.8 miles	Nutrients	PS, NPS, SF	1996		2000	4a	2004	
						PCBs		1996	2009		5		
						Bacteria		2002	2004	2005	4a	2006	
						Habitat	NPS	1998	2009		5		

Table III-7: 2010 303(d) List

WATERBODY ID	WATERSHED NAME	SEGMENT	Overall CALM Code	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Polllutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
DE040-002	Brandywine Creek	Upper Brandywine	5	From State Line to Wilmington	9.3 miles	Bacteria	PS, NPS, SF	1996	2004	2005	4a		Bacteria, listed in 1996, delisted 2006 , relisted 2008
						Nutrients		1996		2000	4a		
						PCBs		1996	2009		5		
						Dioxin		2002	2009		5		
				From State line to the confluence with the Christina River	8.0 miles	Habitat	NPS	1998	2009		5		
DE040-003	Brandywine Creek	All tributaries on Brandywine Creek from the headwaters at PA-DE line to the confluence with the Christina River	5	Eastern tributary of Beaver Creek, from headwaters to the confluence with mainstem Beaver Creek	0.96 miles	Biology and Habitat	NPS	1998	2009		5		
				Tributary originating in Pennsylvania on the western side of Brandywine Creek	0.26 miles	Biology and Habitat	NPS	1998	2009		5		
				Tributary of Brandywine Creek, off Route 100 (near PA-DE border)	0.92 miles	Habitat	NPS	1998	2009		5		
				Tributary of Brandywine Creek just below Beaver Creek	0.85 miles	Habitat	NPS	1998	2009		5		
				Eastern tributary of the headwaters of Rocky Run(upper half)	1.16 miles	Habitat	NPS	1998	2009		5		
				Eastern tributary of the headwaters of Rocky Run(lower half)	1.16 miles	Biology and Habitat	NPS	1998	2009		5		
				From the confluence of the headwaters of Wilson Run to the next larger stream order (lower half)	0.64 miles	Habitat	NPS	1998	2009		5		
				From the confluence of the headwaters of Wilson Run to the next larger stream order (upper half)	0.64 miles	Biology and Habitat	NPS	1998	2009		5		
				Wilson Run, from start of the third order stream to the confluence with Brandywine Creek	0.88 miles	Biology	NPS	1998	2009		5		
				Tributary of Wilson Run on Montchanin Road from the headwaters to the first confluence	0.45 miles	Habitat	NPS	1998	2009		5		

Table III-7: 2010 303(d) List

WATERBODY ID	WATERSHED NAME	SEGMENT	Overall CALM Code	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Polllutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
DE260-001	Red Clay Creek	Mainstem	5	From PA-DE line to the confluence with White Clay Creek	12.8 miles	Bacteria	PS, NPS, SF	1996	2004	2005	4a	2006	
						Nutrients		1996		2000	4a	2004	
						Zn		1996		1999	4a	2004	
						PCBs		1996	2009		5		
						Dioxin		2002	2009		5		
						Chlorinated Pesticides		2002	2009		5		
				From the confluence of West Branch Red Clay Creek to the confluence with White Clay Creek (lower half)	6.4 miles	Habitat	NPS	1998	2009		5		
				From the confluence of West Branch Red Clay Creek to the confluence with White Clay Creek (upper half)	6.4 miles	Biology and Habitat	NPS	1998	2009		5		
DE260-002	Red Clay Creek	Burroughs Run	5	From PA-DE line to the confluence with Red Clay Creek	2.6 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
					2.6 miles	Nutrients	NPS	1996		2000	4a	2004	
				From the confluence of the headwaters of Burroughs Run to the confluence with Red clay Creek	4.21 miles	Biology	NPS	1998	2009		5		
DE260-003	Red Clay Creek	All other tributaries located in the watershed but NOT on the mainstem	5	Second tributary below Burroughs Run to the confluence with Red Clay Creek	1.4 miles	Habitat	NPS	1998	2009		5		
				Western tributary of the headwaters of Hyde Run to the confluence with the next larger stream order	1.2	Biology and Habitat	NPS	1998	2009		5		
DE260-L01	Red Clay Creek	Reservoir	3	Hoopes Reservoir	200.0 acres	Bacteria	PS, NPS	1996			3	2004	This segment was listed in 1996, apparently based on earlier reports but no data were used for the listing. No data has been collected in the interim. The Department will study the segment to determine if a listing is appropriate.

Table III-7: 2010 303(d) List

WATERBODY ID	WATERSHED NAME	SEGMENT	Overall CALM Code	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Polllutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
DE320-001	White Clay Creek	Mainstem	5	From the PA-DE line to the confluence with the Christina River	15.6 miles	Bacteria	PS, NPS	1996	2004	2005	4a	2006	
						Nutrients	PS, NPS	1996		2000	4a	2004	
						Zn (below Paper Mill Road)	PS, NPS	1996		1999	1	2004	Zinc, listed in 1999 delisted 2004 based on improved water quality
						PCBs	PS, NPS	1996 , 2006	2009		5		Advisory updated in 2006 to entire White Clay Creek from PA line to River Mouth
				From the confluence of East Branch White Clay Creek and West Branch White Clay Creek to the confluence with the Christina River	16.2 miles	Biology and Habitat	NPS	1998	2009		5		
DE320-002	White Clay Creek	Mill Creek	5	From the headwaters to the confluence with White Clay Creek	8.3 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	1996		2000	4a	2004	
				From the confluence of the headwaters of Mill Creek to the confluence with the next larger stream order	0.27 miles	Biology and Habitat	NPS	1998	2009		5		
				Second western tributary-- From the headwaters of mainstem Mill Creek	0.04 miles	Habitat	NPS	1998	2009		5		
				From the confluence of the headwaters of Mill Creek to the confluence with White Clay Creek (upper half)	1.64 miles	Habitat	NPS	1998	2009		5		
				From the confluence of the headwaters of Mill Creek to the confluence with White Clay Creek (lower half)	1.64 miles	Biology and Habitat	NPS	1998	2009		5		

Table III-7: 2010 303(d) List

WATERBODY ID	WATERSHED NAME	SEGMENT	Overall CALM Code	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Polllutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
DE320-003	White Clay Creek	Pike Creek	5	From the headwaters to the confluence with White Clay Creek	5.4 miles	Nutrients	NPS	1996		2000	4a	2004	
						Bacteria	NPS	1996	2004	2005	4a	2006	
				Third eastern tributary after the headwaters of Pike Creek (upper half)	0.21 miles	Biology	NPS	1998	2009		5		
				Third eastern tributary after the headwaters of Pike Creek (lower half)	0.21 miles	Biology and Habitat	NPS	1998	2009		5		
				Second eastern tributary after the headwaters of Pike Creek	0.96 miles	Biology and Habitat	NPS	1998	2009		5		
				From the confluence of the headwaters of Pike Creek to the confluence with White Clay Creek	4.7 miles	Biology and Habitat	NPS	1998	2009		5		
DE320-004	White Clay Creek	Middle Run	5	From the headwaters to the confluence with White Clay Creek	4.5 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	1996		2000	4a	2004	
				Eastern tributary of the headwaters of Middle Run to the confluence of the next larger stream order (upper half)	0.89 miles	Biology	NPS	1998	2009		5		
				Eastern tributary of the headwaters of Middle Run to the confluence of the next larger stream order (lower half)	0.89 miles	Biology and Habitat	NPS	1998	2009		5		
				Western tributary of the headwaters of Middle Run to the confluence with the mainstem	1.3 miles	Habitat	NPS	1998	2009		5		
DE320-005	White Clay Creek	All tributaries from the headwaters to the confluence with the Christina River	5	First tributary after State line to the confluence of White Clay Creek, along Thompson Station Road	1.1 miles	Habitat	NPS	1998	2009		5		
				Tributary off The Hunt at Louviers	0.38 miles	Biology	NPS	1998	2009		5		
				Tributary off White Clay Creek that parallels Paper Mill Road-- Jennys Run	0.38 miles	Biology	NPS	1998	2009		5		
				First tributary after Pike Creek--from the headwaters to the confluence with White Clay Creek	1.1 miles	Habitat	NPS	1998	2009		5		

Table III-7: 2010 303(d) List

WATERBODY ID	WATERSHED NAME	SEGMENT	Overall CALM Code	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Polllutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
DE120-001	Christina River	Lower Christina River	5	Mainstem Lower Christina River	1.5 miles	Nutrients	NPS, SF	1996		2001	4a	2004	
						DO	NPS, SF	1996			1	2002	DO, listed in 1996, delisted 2002
						PCBs	NPS, SF	1996	2009		5		
						Bacteria	PS,NPS	2002	2004	2005	4a	2006	
						Dieldrin	PS, NPS	2002	2009		5		
DE120-002	Christina River	Mid Christina River	5	Between White Clay Creek and Brandywine River	7.5 miles	Nutrients	NPS	1996		2001	4a	2004	
						PCBs	SF	1996	2009		5		
						Bacteria	PS, NPS	2002	2004	2005	4a	2006	
						Dieldrin	NPS	2002	2009		5		
						DO	NPS	2008		2001	1		DO Listed 2008, Delisted 2010
DE120-003	Christina River	Upper Christina River	5	Mainstem Upper Christina River	6.3 miles	Nutrients	NPS, PS	1996		2001	4a	2004	
						PCBs	NPS, PS	1996	2009		5		
						Bacteria	NPS, PS	1996	2004	2005	1	2006	Bacteria, Listed 1996, Delisted 2010
						DO	NPS, PS	2004		2001	1	2006	DO, listed in 2004, delisted 2006
						Chlordane	NPS, PS	2006	2013		5		
				Segments from Smalley's Pond overflow to the confluence with White Clay Creek	5.77 miles	Biology and Habitat	NPS	1998	2009		5		
				Tributary downstream of Smalleys Pond on the Christina River	0.65 miles	Biology	NPS	1998	2009		5		
DE120-003-02	Christina River	Lower Christina Creek	5	Tributary from Smalleys Pond overflow to White Clay Creek	1.0 mile	Biology and Habitat	NPS	1998	2009		5		
						Nutrients	NPS	2002		2001	4a	2004	
						DO	NPS	2002		2001	4a	2004	
						Bacteria	NPS	2002	2004	2005	4a	2006	

Table III-7: 2010 303(d) List

WATERBODY ID	WATERSHED NAME	SEGMENT	Overall CALM Code	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Polllutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
DE120-004-01	Christina River	Lower Christina Creek	5	Mainstem Lower Christina Creek	8.4 miles	Bacteria	NPS,	1996	2004	2005	4a	2006	
						Nutrients	NPS	1996		2001	4a	2004	
						PCBs	NPS, SF	1996	2009		5		
						DO	NPS	2002		2001	1	2006	DO, listed in 2002, delisted 2006
						Dieldrin	NPS	2006	2013		5		
				From the confluence of West Branch Christina River to the confluence with the mainstem	6.0 miles	Biology and Habitat	NPS	1998	2009		5		
DE120-004-02	Christina River	Belltown Run	5	From the headwaters above Becks Pond to the confluence with the Christina River	3.8 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	2002	2004		4a	2006	
						DO	NPS	2002	2004		4a	2006	
				Eastern tributary of the headwaters of Belltown Run to the confluence with the Christina River	4.2 miles	Biology and Habitat	NPS	1998	2009		5		
				Western tributary of the headwaters of Belltown Run to its confluence	0.88 miles	Habitat	NPS	1998	2009		5		
DE120-004-03	Christina River	Muddy Run	5	From the headwaters above Sunset Pond to the confluence with Belltown Run below Becks Pond	8.0 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
				From the headwaters of Iron Hill Run to the next larger stream order	2.3 miles	Habitat	NPS	1998	2009		5		
				Eastern tributary of the headwaters of Iron Hill Run to the next larger stream order	0.71 miles	Habitat	NPS	1998	2009		5		
				Eastern tributary above Sunset Pond to the confluence of the next larger stream order	2.3 miles	Biology	NPS	1998	2009		5		
				Eastern tributary of the headwaters of Muddy Run to its confluence	0.63 miles	Habitat	NPS	1998	2009		5		
DE120-005-01	Christina River	West Branch	4a	West Branch including Persimmon Run and Stine Haskell Branch	5.3 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	1996		2001	4a	2004	

Table III-7: 2010 303(d) List

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DE120-006	Christina River	Upper Christina Creek	5	Mainstem Upper Christina Creek	8.3 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients		1996		2001	4a	2004	
				From the confluence of the headwaters of Upper Christina River to the confluence of West Branch	2.6 miles	Biology and Habitat		1998	2009		5		
				First western tributary after the headwaters of the Upper Christina River to mainstem Upper Christina River (upper half)	0.67 miles	Habitat		1998	2009		5		
				First western tributary after the headwaters of the Upper Christina River to mainstem Upper Christina River (lower half)	0.67 miles	Biology and Habitat		1998	2009		5		
DE120-007-01	Christina River	Little Mill Creek and Willow Run	5	From the confluence of Willow Run and Chestnut Run to the confluence with the Christina River	5.1 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	1996		2001	4a	2004	
						DO		1996			1	2002	DO, listed in 1996, delisted 2002
						PCBs	NPS	1996	2009		5		
				First western tributary after the headwaters of Little Mill Creek to the confluence with mainstem Little Mill Creek	1.4 miles	Habitat	NPS	1998	2009		5		
				From the headwaters of Willow Run to the confluence with the Christina River	0.54 miles	Habitat	NPS	1998	2009		5		
				From the confluence of the headwaters of Little Mill Creek to the confluence of Chestnut Run	4.4 miles	Biology and Habitat	NPS	1998	2009		5		
				Little Mill Creek--from the confluence of Chestnut Run to the confluence with the Christina River	3.4 miles	Biology and Habitat	NPS	1998	2009		5		
DE120-007-02	Christina River	Chestnut Run	5	From the headwaters of Chestnut Run to the confluence with the Christina River	2.8 miles	Bacteria	NPS	1996	2004	2005	4a	2006	
				Eastern tributary of the headwaters of Chestnut Run to the confluence of the next larger stream order	1.1 miles	Habitat	NPS	1998	2009		5		
				Left tributary of the headwaters of Chestnut Run to the confluence of the next larger stream order	0.43 miles	Biology and Habitat	NPS	1998	2009		5		

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DE120-L01	Christina River	Smalleys Pond	5	Smalleys Pond east of Newark	30.0 acres	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	1996	2004	2004	4a	2006	
						PCBs	NPS	1996	2009		5		
						DO	NPS	2004	2004		4a	2006	
DE120-L02	Christina River	Becks Pond	5	Becks Pond southeast of Newark	25.6 acres	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	1996		2004	1	2002	Nutrients, listed in 1996, delisted 2002
						PCBs	NPS	2002	2009		1		Listed in 2002, Delisted 2010 due to removal of advisory
						Mercury	NPS	2002	2009		1		
DE120-L03	Christina River	Sunset Pond	4a	Sunset Pond south of Newark	40.0 acres	Bacteria	NPS	1996	2004	2005	4a	2006	
						Nutrients	NPS	2002	2004	2004	4a		
						DO	NPS	1996	2004	2004	4a	2006	

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CHESAPEAKE BAY BASIN													
DE100-001	Chesapeake Drainage System	Cypress Branch, including tributaries	5	Mainstem	6.6 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	2002	2005	2005	4a	2006	
						DO	NPS	1996	2005	2005	4a	2006	
				Cypress Branch--from the confluence of Black Stallion Ditch to the MD-DE line	1.60 miles	Biology	NPS	1998	2010		5		
						DO	NPS	1998	2005	2005	4a	2006	
				Tributary of Cypress Branch--from the confluence of the headwaters to the confluence with the mainstem	0.35 miles	Biology	NPS	1998	2010		5		
DE100-002	Chesapeake Drainage System	Sewell Branch, including tributaries	5	Mainstem	7.2 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						DO	NPS	1996	2005	2005	4a	2006	
						Nutrients	NPS	1996	2005	2005	4a	2006	
				From the confluence of the headwaters to the confluence with Sewell Branch	8.20 miles	Biology and Habitat	NPS	1998	2010		5		
				From the confluence of the headwaters to the confluence with Sewell Branch		DO	NPS	1998	2005	2005	4a	2006	
DE100-003	Chesapeake Drainage System	Gravelly Run, including tributaries	5	Mainstem	7.7 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						DO	NPS	1996	2005	2005	1	2008	DO, Listed 1996, delisted 2008
						Nutrients	NPS	1996	2005	2005	4a	2006	
				Gravelly Run--from the confluence of Jamison Branch to the MD-DE line	1.08 miles	Habitat	NPS	1998	2010		5		
				Tributary of Gravelly Run--from the headwaters to the confluence with the mainstem	0.22 miles	Habitat	NPS	1998	2010		5		
				Tributary of Gravelly Run--first western tributary upstream of Gravelly Run	1.21 miles	Biology and Habitat	NPS	1998	2010		5		
				Tributary of Gravelly Run--second eastern tributary from the headwaters of Gravelly Run to the mainstem	1.25 miles	Habitat	NPS	1998	2010		5		
				Gravelly Run--from the start of the third order stream to the confluence with Jamison Branch	2.28 miles	Biology and Habitat	NPS	1998	2010		5		
				From the confluence of Gravelly Run and Jamison Branch to the MD-DE line	1.14 miles	Biology and Habitat	NPS	1998	2010		5		
DE100-004	Chesapeake Drainage System	Tributaries of Elk River	5	First eastern tributary after the headwaters of Great Bohemia Creek	1.55 miles	Habitat	NPS	1998	2010		5		
				Eastern tributary of the headwaters of Back Creek to its confluence	1.26 miles	Biology	NPS	1998	2010		5		

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DE100-005	Chesapeake Drainage System	Tributaries of Sassafras River	5	Western tributary of the headwaters of Sassafras River to its confluence	1.92 miles	Biology	NPS	1998	2010		5		
				From the confluence of the headwaters of Sassafras River to the next larger stream order	0.95 miles	Biology and Habitat	NPS	1998	2010		5		
DE110-001	Choptank	Tappahanna Ditch	5	Mainstem	7.5 miles	Bacteria	NPS	1996	2005	2006	1	2008	Bacteria, Listed 1996, Delisted 2010
						DO	NPS	1996	2005	2005	1	2008	DO, listed 1996, delisted 2008
						Nutrients	NPS	1996	2005	2005	4a	2006	
				From start of the fourth order stream to the confluence with Tidy Island Creek	6.58 miles	Biology and Habitat	NPS	1998	2010		5		
				Start of third order stream on Tappahanna Ditch to the confluence of the next larger stream order	1.12 miles	Biology and Habitat	NPS	1998	2010		5		
				First western tributary after the headwaters of Tappahanna Ditch to its confluence	0.40 miles	Habitat	NPS	1998	2010		5		
				Tidy Island Creek--from the confluence with Tappahanna Ditch to the MD-DE line	0.21 miles	Habitat	NPS	1998	2010		5		
				Choptank River--from the start of the third order stream to the confluence with Choptank River	2.31 miles	Biology and Habitat	NPS	1998	2010		5		
				Seventh eastern tributary upstream of Tappahanna Ditch	1.30 miles	Habitat	NPS	1998	2010		5		
						DO	NPS	1998	2005	2005	4a	2008	
				Tributary of Tappahanna Ditch--western tributary of the headwaters to its confluence	0.38 miles	Biology and Habitat	NPS	1998	2010		5		
				Second western tributary after the headwaters of Tappahanna Ditch to its confluence	0.88 miles	Biology and Habitat	NPS	1998	2010		5		

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DE110-002	Choptank	Culbreth Marsh Ditch	5	Mainstem	10.0 miles	Bacteria	NPS	1996	2005	2005	1	2008	Bacteria, Listed 1996, Delisted 2010
						DO	NPS	1996	2005	2005	1	2008	DO, listed 1996, delisted 2008
						Nutrients	NPS	1996	2005	2005	4a	2006	
				Luther Marvel Prong--from the confluence of the headwaters to the confluence with Culbreth Marsh Ditch	1.07 miles	Biology and Habitat	NPS	1998	2010		5		
				From the confluence of Powell Ditch to the confluence with Ross Prong	1.31 miles	Habitat	NPS	1998	2010		5		
				Culbreth Marsh Ditch--from start of the fourth order stream to the confluence with Mud Millpond (lower half)	1.79 miles	Habitat	NPS	1998	2010		5		
				Culbreth Marsh Ditch--from start of the fourth order stream to the confluence with Mud Millpond (upper half)	1.79 miles	Biology and Habitat	NPS	1998	2010		5		
						DO	NPS	1998	2010		4a		
						Temperature	NPS	1998	2010		5		
				Culbreth Marsh Ditch--from the confluence of Ross Prong to the confluence with the next larger stream order	3.62 miles	Biology and Habitat	NPS	1998	2010		5		
				Culbreth Marsh Ditch--from the confluence of Mud Millpond to the confluence of Cow Marsh Creek	1.86 miles	Biology	NPS	1998	2010		5		
				Third western tributary upstream of Culbreth Marsh Ditch	1.99 miles	Biology and Habitat	NPS	1998	2010		5		
				Ross Prong--from the confluence of the headwaters to the confluence with Culbreth Marsh Ditch	2.61 miles	Biology and Habitat	NPS	1998	2010		5		

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DE110-003	Choptank	Cow Marsh Creek	5	Mainstem	15.1 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						DO	NPS	1996	2005	2005	1	2008	DO, listed 1996, delisted 2008
						Nutrients	NPS	1996	2005	2005	4a	2006	
				First upstream tributary on Meredith Branch	0.46 miles	Habitat	NPS	1998	2010		5		
				From the confluence of the headwaters of Sangston Prong to the confluence Gravelly Branch	1.98 miles	Biology and Habitat	NPS	1998	2010		5		
				Tributary of Gary Mill Pond Branch--from the confluence of the headwaters to the confluence with Gary Mill Pond Branch	1.00 miles	Biology and Habitat	NPS	1998	2010		5		
				First eastern tributary after the headwaters of Wildcat Branch	1.21 miles	Biology and Habitat	NPS	1998	2010		5		
				Willow Grove Prong--from the start of the third order stream to the confluence with Cow Marsh Creek	1.24 miles	Biology and Habitat	NPS	1998	2010		5		
				Tributary of Cow Marsh Creek--first eastern tributary upstream of Cow Marsh Creek	1.32 miles	Biology	NPS	1998	2010		5		
				Cow Marsh Ditch--from start of third order stream to the confluence with Cow Marsh Creek	1.44 miles	Habitat	NPS	1998	2010		5		
				Cow Marsh Ditch--from the confluence of the headwaters to the confluence with the next larger stream order	1.49 miles	Habitat	NPS	1998	2010		5		
				Bullock Prong--mainstem to the confluence with Price Prong	3.12 miles	Habitat	NPS	1998	2010		5		
				Third tributary upstream of Cow Marsh Ditch--from the headwaters to the confluence with Cow Marsh Ditch	1.86 miles	Habitat	NPS	1998	2010		5		
				Iron Mine Prong--from the confluence of Black Swamp to the next larger stream order	2.02 miles	Habitat	NPS	1998	2010		5		
				Meredith Branch--from the start of the third stream order to the confluence with the next larger stream order	2.08 miles	Biology and Habitat	NPS	1998	2010		5		
				White Marsh Branch--from the start of the third order stream to the confluence with Gravelly Branch and Sangston Prong	2.92 miles	Biology	NPS	1998	2010		5		
				Cow Marsh Creek--from the confluence of Iron Mine Prong to the confluence with Choptank River	4.97 miles	Habitat	NPS	1998	2010		5		

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DE110-L01	Choptank	Mud Mill Pond	5	Pond south of Marydel	60.0 acres	Bacteria	NPS	1996	2005	2006	4a	2008	
						DO	NPS	1996	2005	2005	4a	2006	
						Nutrients	NPS	1996	2005	2005	4a	2006	
DE200-001	Marshyhope Creek	Marshyhope Creek	5	From the headwaters to the State Line	19.7 miles	Bacteria	NPS	1996	2005	2006	1	2008	Bacteria, listed 1996, delisted 2008
						DO	NPS	1996	2005	2005	1	2008	DO, listed 1996, delisted 2008
						Nutrients	NPS	1996	2005	2005	4a	2006	
				Tributary to Black Arm Prong--third tributary upstream of Black Arm Prong	0.56 miles	Habitat	NPS	1998	2010		5		
				Marshyhope Creek--from the confluence of Prospect Branch to the confluence with the MD-DE line	8.78 miles	Habitat	NPS	1998	2010		5		
				From the confluence of Black Prong and Marshyhope Ditch to the confluence of Prospect Branch	4.50 miles	Biology and Habitat	NPS	1998	2010		5		
DE200-002	Marshyhope Creek	Tributaries from the headwaters to the State line	5	Marshyhope Ditch	6.26 Miles	DO	NPS	2002	2005	2005	4a	2006	
						Nutrients	NPS	2002	2005	2005	4a	2006	
						Bacteria	NPS	2002	2005	2006	4a	2008	
				First tributary upstream of Prong No. 2--from the eastern headwater to its confluence	0.55 miles	Habitat	NPS	1998	2010		5		
				Point Branch--from the headwaters to the confluence with the first tributary downstream	0.80 miles	Habitat	NPS	1998	2010		5		
				Tributary of Tomahawk Branch--third eastern tributary downstream of the headwaters	1.54 miles	Habitat	NPS	1998	2010		5		
				Tributary of Tomahawk Branch--first eastern tributary upstream	0.69 miles	Habitat	NPS	1998	2010		5		
				Tributary of Salisbury Creek--from the MD-DE line to the confluence with Salisbury Creek	0.82 miles	Biology and Habitat	NPS	1998	2010		5		
				Salisbury Creek--from the start of the third order stream to the confluence with Cattail Branch (upper half)	0.60 miles	Biology and Habitat	NPS	1998	2010		5		
				Salisbury Creek--from the start of the third order stream to the confluence with Cattail Branch (lower half)	0.60 miles	Habitat	NPS	1998	2010		5		

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	Marshyhope Creek	Tributaries from the headwaters to the State line	5	Prospect Branch--western tributary of the headwaters to its confluence	1.25 miles	Habitat	NPS	1998	2010		5		
				Prong No. 2--from the start of the third order stream to the confluence with Bright-Haines Glade Branch	1.50 miles	Biology and Habitat	NPS	1998	2010		5		
				From the confluence of the headwaters of Green Branch to the confluence with Marshyhope Creek	3.51 miles	Biology and Habitat	NPS	1998	2010		5		
				Tributary of Salisbury Creek--from the MD-DE line to the confluence with Salisbury Creek	1.21 miles	Biology and Habitat	NPS	1998	2010		5		
				Short and Hall Ditch--from the confluence of the headwaters of with Marshyhope Creek	1.45 miles	Habitat	NPS	1998	2010		5		
				Brights Branch--from the start of the third order stream to the MD-DE line	1.78 miles	Habitat	NPS	1998	2010		5		
				Bright-Haines Glade Branch--from the start of the fourth order stream and Prospect Branch to the confluence with	1.30 miles	Habitat	NPS	1998	2010		5		
						DO	NPS	1998	2010	2005	4a	2008	
						Temperature	NPS	1998	2010		5		
				Cattail Branch--from the start of the fourth order stream to the confluence with Salisbury Creek (upper half)	2.17 miles	Biology and Habitat	NPS	1998	2010		5		
				Cattail Branch--from the start of the fourth order stream to the confluence with Salisbury Creek (lower half)	2.17 miles	Habitat	NPS	1998	2010		5		
						DO	NPS	1998	2010	2005	4a	2008	
						Temperature	NPS	1998	2010		5		
				Tributary to Black Arm Prong--second tributary after the headwaters	0.52 miles	Habitat	NPS	1998	2010		5		
				Eastern tributary of the headwaters of Cattail Branch to its confluence	0.87 miles	Habitat	NPS	1998	2010		5		
				From the confluence of the headwaters of Green Branch to the confluence Marshyhope Creek	2.34 miles	Biology and Habitat	NPS	1998	2010		5		
				Tributary to Cattail Branch--fourth western tributary downstream of the headwaters of Cattail Branch	1.08 miles	Biology and Habitat	NPS	1998	2010		5		
				Tributary of Prong No. 2--from the start of the third order stream to the confluence with Bright-Haines Glade Branch	1.50 miles	Habitat	NPS	1998	2010		5		
				Tributary to Cattail Branch--third western tributary upstream of Salisbury Creek	1.06 miles	Habitat	NPS	1998	2010		5		
				Tributary to Tomahawk Branch--first western tributary after the headwaters	0.95 miles	Habitat	NPS	1998	2010		5		

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DE240-001	Nanticoke River	Lower Nanticoke River	4a	From the head of tide in Middleford to the MD-DE State line	15.1 miles	Bacteria	PS, NPS	1996		2006	1	2004	Bacteria, listed in 1996, delisted 2004
						Nutrients	PS, NPS	1996		1998	4a	2004	
						DO	PS, NPS	1996		1998	4a	2004	DO, Listed 1996, Delisted 2010
DE240-002	Nanticoke River	Upper Nanticoke River	5	From the headwaters of the Nanticoke River to the head of tide at Middleford	18.6 miles	Bacteria	PS, NPS	1996		2006	1	2004	Bacteria, listed in 1996, delisted 2004
						Nutrients	PS, NPS	1996		1998	4a	2004	
						DO		1996		1998	1	2002	DO, listed in 1996, delisted 2002 .
				Tributary of White Marsh Branch--first western tributary downstream of the headwaters of White Marsh Branch	0.49 miles	Habitat	NPS	1998	2010		5		
				Kent-Sussex Line Branch--from the start of the third order stream to the confluence with Nanticoke River (lower half)	1.33 miles	Habitat	NPS	1998	2010		5		
				Kent-Sussex Line Branch--from the start of the third order stream to the confluence with Nanticoke River (upper half)	1.33 miles	Biology and Habitat	NPS	1998	2010		5		
				Nanticoke Branch--from the confluence of Polk Branch to the confluence with Gum Branch	2.48 miles	Habitat	NPS	1998	2010		5		
				Grubby Neck Branch--from the confluence of Polk Branch to the confluence with Gum Branch	1.24 miles	Habitat	NPS	1998	2010		5		
				Nanticoke Branch--from the confluence of Kent-Sussex Line Branch to the confluence with Cart Branch	5.23 miles	Habitat	NPS	1998	2010		5		
				Nanticoke River--from the start of the third order stream to the confluence with Kent-Sussex Line Branch.	3.13 miles	Biology and Habitat	NPS	1998	2010		5		
				Tributary to Marsh Branch--first eastern tributary after the headwaters to its confluence	0.83 miles	Habitat	NPS	1998	2010		5		
DE240-003	Nanticoke River	Clear Brook Branch	4a	From the headwaters of Clear Brook, Friedel Prong, and Bucks Branch to the confluence with Williams Pond	12.9 miles	Bacteria	NPS	1996	2005	2006	4a	2006	Bacteria, listed in 1996, delisted 2006, relisted 2010
						Nutrients	NPS	1996		2000	4a	2004	
						DO	NPS	1996		2000	1	2006	DO, listed in 1996, delisted 2006.

Table III-7: 2010 303(d) List

WATERBODY ID	WATERSHED NAME	SEGMENT	Overall CALM Code	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Polllutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
DE240-004	Nanticoke River	Deep Creek Branch	5	From the headwaters above Concord Pond to the confluence with the	5.5 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
				McColleys Branch--from the confluence of New Ditch to the confluence with Deep Creek	3.24 miles	Habitat	NPS	1998	2010		5		
				Deep Creek--from the start of the third order stream to the confluence with Deep Creek and McColleys Branch	2.51 miles	Habitat	NPS	1998	2010		5		
				Tyndall Branch--from the start of the third order stream on Stoney Creek to the confluence of Tyndall Branch and Deep Creek	5.00 miles	Habitat	NPS	1998	2010		5		
DE240-005	Nanticoke River	Gravelly Branch	5	From the headwaters of Gravelly Branch above Collins Pond to the confluence	6.5 miles	Bacteria	NPS	1996	2005	2006	1	2008	Bacteria, listed 1996, delisted 2008
						Nutrients	NPS	1996		2000	4a	2004	
				Gravelly Branch--from the start of the third order stream to the confluence with the next larger stream order	2.12 miles	Habitat	NPS	1998	2010		5		
				Prong No. 1--from the start of fourth order stream to the confluence with Gravelly Branch on Nanticoke River	0.73 miles	Habitat	NPS	1998	2010		5		
				Maple Branch-- from the start of the third order stream to the confluence with Prong No. 1	1.0 mile	Habitat	NPS	1998	2010		5		
DE240-006	Nanticoke River	Bridgeville Branch	5	From the headwaters of Bridgeville Branch to the confluence with Nanticoke River	7.2 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
						DO	NPS	1996		2000	4a	2004	
				Bridgeville Branch---from the start of the third order stream to the confluence with Nanticoke River	3.92 miles	Habitat	NPS	1998	2010		5		
DE240-007	Nanticoke River	Gum Branch	5	From the headwaters located northeast of Woodland Ferry to the confluence with	6.0 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
				Gum Branch.--from the start of the third order stream to the confluence with Nanticoke River	2.37 miles	Habitat	NPS	1998	2010		5		
DE240-008	Nanticoke River	Lewes Creek	4a	Lewes Creek, including Butler Mill Branch and Chapel Branch	10.3 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
						DO	NPS	2002		2000	4a	2004	
DE240-009	Nanticoke River	DuPont Gut	n/a	DuPont Gut has been determined by USEPA not to be Waters of the U.S. , therefore the prior listing was withdrawn in 2002. This information is provided for continuity with prior 303(d) lists.	1.0 mile	Temperature	PS	1996				2002	Temperature, listed in 1996, delisted 2002 based on new information and US EPA findings.

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DE240-010	Nanticoke River	Gum Branch on Upper Nanticoke River	5	Gum Branch--from the confluence of Stallion Head Branch to the confluence with West Branch Gum Branch	3.51 miles	Habitat	NPS	1998	2010		5		
				Toms Dam Branch--from the start of the third order stream to the confluence with Gum Branch	5.23 miles	Habitat	NPS	1998	2010		5		
DE240-L01	Nanticoke River	Craigs Pond	4a	Pond southwest of Seaford and below Butler Mill Branch	11.9 acres	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
						DO	NPS	2002		2000	4a	2004	
DE240-L02	Nanticoke River	Concord Pond	4a	Pond east of Seaford on Deep Creek Branch	87.4 acres	Nutrients	NPS	1996		2000	4a	2004	
DE240-L04	Nanticoke River	Williams Pond	4a	Pond located in Seaford and below Middleford	100.0 acres	Nutrients	NPS	1996		2000	4a	2004	
						Bacteria	NPS	2002	2005	2006	1	2006	Bacteria, Listed in 2002, delisted 2006
DE240-L05	Nanticoke River	Hearns Pond	4a	Pond located north of Seaford on Clear Brook Branch	67.0 acres	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
DE050-001	Broad Creek	Lower Broad Creek	5	Lower Broad Creek, including Collins and Culvert Ditch, Holly Ditch, and Rossakatum and Cooper Branches	24.8 miles	Bacteria	PS, NPS	1996	2005	2006	4a	2008	
						Nutrients	PS, NPS	1996		1998	4a	2004	
						DO	PS, NPS	2002		1998	1	2004	DO, listed 2002, Delisted 2010
				Cooper Branch--from the start of the third order stream on Rossakatum Branch to the confluence of Broad Creek	2.73 miles	Habitat	NPS	1998	2010		5		
DE050-002	Broad Creek	Tussocky Branch	5	Tributary west of Laurel, excluding Portsville and Tussock Ponds	7.9 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
				Tussocky Branch--from the confluence of Mill Creek to the confluence with Broad Creek	3.42 miles	Habitat	NPS	1998	2010		5		
DE050-003	Broad Creek	Little Creek	5	Tributary south of Laurel, excluding Horsey’s Pond	2.4 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
DE050-004	Broad Creek	Chipman Pond Branch	5	Tributary northeast of Laurel, excluding Chipman Pond	6.7 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
				Jobs Ditch--from the headwaters to the confluence with Dukes and Jobs Branch	0.98 miles	Habitat	NPS	1998	2010		5		
				Mirey Branch--from the start of the third order stream to the confluence with Elliott Pond Branch	1.28 miles	Habitat	NPS	1998	2010		5		
				Dukes Ditch--from the headwaters to the confluence with Dukes and Jobs Branch	2.45 miles	Habitat	NPS	1998	2010		5		
DE050-005-01	Broad Creek	James Branch	4a	James Branch, including Pepper Pond Branch, Hitch Pond Branch, and Grays Branch	11.1 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
						DO	NPS	2002		2000	4a	2004	

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DE050-005-02	Broad Creek	Trussum Pond Branch	4a	From the headwaters to the confluence with James Branch, excluding Trussum Pond	3.5 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
				Wards Branch--from the confluence of the headwaters to the confluence with James Branch	3.18 miles	DO	NPS	1998		2000	4a	2004	
DE050-006-01	Broad Creek	Trap Pond Branch	4a	From the headwaters of Trap Pond including Saunders and Thompson	2.9 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
DE050-006-03	Broad Creek	Raccoon Prong	4a	Headwaters of Raccoon Pond and Trap pond	9.11 miles	Bacteria	NPS	2002	2005	2006	4a	2008	Bacteria, listed 2002, delisted 2006, relisted 2008
						Nutrients	NPS	2002		2000	4a	2004	
						DO	NPS	2002		2000	4a	2004	
DE050-L01	Broad Creek	Portsville Pond	4a	Pond west of Laurel on Tussocky Branch	14.5 acres	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
DE050-L02	Broad Creek	Tussock Pond	4a	Pond southwest of Laurel	8.6 acres	Bacteria	NPS	2002	2005	2006	4a	2008	
						Nutrients	NPS	2002		2000	4a	2004	
DE050-L03	Broad Creek	Horseys Pond	4a	Pond south of Laurel on Little Creek tributary	46.3 acres	Bacteria	NPS	1996		2006	1	2004	Bacteria , listed in 1996, delisted 2004
						Nutrients	NPS	1996		2000	4a	2004	
DE050-L04	Broad Creek	Records Pond	4a	Pond adjacent to Laurel	91.9 acres	Bacteria	PS, NPS	1996	2005	2006	1	2008	Bacteria, Listed in 1996, delisted 2008
						Nutrients	PS, NPS	1996		2000	4a	2004	
						DO		1996 / 2006		2000	1	2008	DO, listed in 1996, delisted 2002, relisted 2006, delisted 2008
DE050-L05	Broad Creek	Chipman Pond	4a	Pond located north of Laurel on Chipman Branch	47.0 acres	Nutrients	NPS	1996		2000	4a	2004	
						Bacteria	NPS	2002	2005	2006	4a	2008	
DE050-L06	Broad Creek	Trussum Pond	4a	Pond southeast of Laurel on James Branch	58.7 acres	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
						DO	NPS	2002		2000	4a	2004	
DE050-L07	Broad Creek	Trap Pond	4a	Pond east of Laurel on Hitch Pond Branch	88.0 acres	Nutrients	NPS	1996		2000	4a	2004	
						DO	NPS	2002		2000	4a	2004	
						Bacteria		1996		2006	1	2002	Bacteria, listed in 1996, delisted 2002
DE050-L08	Broad Creek	Raccoon Pond	4a	Pond east of Laurel on Hitch Pond Branch	13.5 acres	Bacteria	NPS	1996	2005	2006	4a	2008	
						Nutrients	NPS	1996		2000	4a	2004	
						DO	NPS	2002		2000	4a	2004	
DE250-001	Pocomoke River	Pocomoke River	5	Pocomoke River, from headwaters to the MD-DE State line	11.8 miles	Bacteria	NPS	1996	2005	2006	4a	2008	
						DO	NPS	1996	2005	2005	1	2008	DO, listed 1996, delisted 2008
						Nutrients	NPS	1996	2005	2005	4a	2006	
				Pocomoke River--from the confluence of Bald Cypress Branch and Gum Branch to the MD-DE line	0.99 miles	Habitat	NPS	1998	2010		5		
				Pocomoke River--from start of the third order stream to the confluence with Bald Cypress Branch and Gum Branch	4.55 miles	Habitat	NPS	1998	2010		5		
DE250-002	Pocomoke River	Tributaries from the headwaters to MD-DE State line	5	Bald Cypress Branch--from the confluence of the headwaters to the confluence with the next larger stream order	3.5 miles	Habitat	NPS	1998	2010		5		
						Bacteria	NPS	2004	2005	2005	4a	2006	
						Nutrients	NPS	2004	2005	2005	4a	2006	
						DO	NPS	2006		2005	4a	2006	

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INLAND BAYS/ATLANTIC OCEAN BASIN													
DE170-001	Lewes and Rehoboth Canal	Lewes and Rehoboth Canal	4a	Tidal waters from the confluence of Delaware Bay to the confluence with Rehoboth Bay	8.9 miles	Bacteria	PS, NPS	1996	2006	2006	4a	2008	
						Nutrients	PS, NPS	1996	2003	2004	4a	2006	
						DO		1996 , 2004	2003	2004	4a	2006	DO, listed in 1996, delisted 2002 and relisted 2004.
DE280-001-01	Rehoboth Bay	Chapel Branch	5	From the headwaters of Chapel Branch to the confluence of Herring Creek, including Hopkins Prong, Unity Branch,	27.0 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2003	2004	4a	2006	
						DO	NPS	1996		2004	1	2004	DO, listed in 1996, delisted 2004
				Chapel Branch--from the start of the second order stream to the confluence with Herring Creek	3.75 miles	Habitat	NPS	1998	2013		5		
DE280-002	Rehoboth Bay	Love Creek, including tributaries	4a	Love Creek, Bundicks Branch and Goslee Creek to the confluence with Rehoboth Bay	4.2 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2003	2004	4a	2006	
						DO		1996		2004	1	2002	DO, listed in 1996, delisted 2002
DE280-E01	Rehoboth Bay	Rehoboth Bay	4a	Near coastal waters extending north from the confluence with Indian River Bay at Burton Island	12.0 sq. mi.	DO	PS, NPS	1996		1998	1	2006	DO, listed 1996, delisted 2006
						Nutrients	PS, NPS	1996		1998	4a	2004	
DE280-L01	Rehoboth Bay	Burton Pond	4a	Pond northeast of Millsboro	33.0 acres	Nutrients	NPS	1998	2003	2004	4a	2006	
DE140-001	Indian River	White Creek	4a	Saline tidal waters extending from the north end of Assawoman Canal to the Indian River Bay	4.9 miles	Bacteria	NPS	1996	2006	2006	1	2008	Bacteria, listed 1996, delisted 2008
						Nutrients	NPS	1996	2003	2004	4a	2006	
						DO	NPS	1996	2003	2004	4a	2008	DO, listed 1996, delisted 2008, Relisted 2010
DE140-002	Indian River	Blackwater Creek	4a	Saline tidal waters from the headwaters to the confluence with Indian River Bay	7.2 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	2002	2003	2004	4a	2006	
						Nutrients	NPS	2002	2003	2004	4a	2006	
DE140-003	Indian River	Pepper Creek, including tributaries	4a	Pepper Creek including Vines Creek, McCrays Branch, and Deep Hole Branch	24.8 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2003	2004	4a	2006	
						DO	NPS	1996	2003	2004	1	2006	DO, Listed 1996, Delisted 2010
DE140-004	Indian River	Indian River	4a	Saline tidal portion of river from Millsboro Pond to Power Plant intake	4.6 miles	Bacteria	PS, NPS	1996	2006	2006	4a	2008	
						Nutrients	PS, NPS	1996		1998	4a	2004	
						Temperature	PS, NPS	1996	1998	2004	4a	2004	EPA TMDL December 2004
						SS	PS, NPS	1996		1998	4a	2004	
						DO	PS, NPS	2002		1998	4a	2004	

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DE140-005	Indian River	Swan Creek	4a	Freshwater tidal river from the headwaters of Swan Creek to the confluence with Indian River	8.6 miles	Bacteria	PS, NPS	1996	2006	2006	4a	2008	
						Nutrients	PS, NPS	1996	2003	2004	4a	2006	
						Temperature							Temperature, listed in 1996, delisted in 2002 as sole point source discharger was removed
DE140-006	Indian River	Stockley Branch	4a	From the confluence of Alms House Ditch with Stockley Branch to the confluence with Millsboro Pond	8.23 miles	Bacteria	PS, NPS	1996	2006	2006	1	2008	Bacteria, listed 1996, delisted 2008
						Nutrients	PS, NPS	1996	2003	2004	4a	2006	
						DO	PS, NPS	2002		2004	1	2004	DO, listed in 2002, delisted 2004
DE140-007	Indian River	Eli Walls Tax Ditch	4a	From the headwaters of McGee Ditch, Eli Walls Tax Ditch, and Gills Branch to the confluence with Morris Millpond	13.6 miles	Bacteria	PS, NPS	1996	2006	2006	4a	2008	
						Nutrients	PS, NPS	1996	2003	2004	4a	2006	
DE140-008	Indian River	Deep Branch, including tributary	4a	Deep Branch, including Peterkins Branch, White Oak Swamp Ditch, Sockorockets Ditch, Welsh Branch, and Simpler Branch	16.9 miles	Bacteria	PS, NPS	1996	2006	2006	4a	2008	
						Nutrients	PS, NPS	1996	2003	2004	4a	2006	
						DO	PS, NPS	1996	2003	2004	4a	2006	
DE140-009	Indian River	Mirey Branch, including tributaries	5	Mirey Branch, including Sheep Pen Ditch, and Narrow Drain	23.5 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	2004	2003	2004	4a	2006	
				Mirey Branch-- from the confluence of the headwaters to the confluence with Sheep Pen Ditch	5.40 miles	Habitat	NPS	1998	2013		5		
DE140-010	Indian River	Betts Pond Branch	4a	From the headwaters of the tributaries of Ingrams Pond and Betts Pond to the confluence with Millsboro Pond,	17.5 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	2002	2003	2004	4a	2006	
						Nutrients	NPS	2002	2003	2004	4a	2006	
DE140-E01	Indian River	Lower Indian River Bay	4a	From inlet to Pepper Creek	13.0 sq. mi.	Bacteria	PS, NPS	1996	2006	2006	1	2008	Bacteria, listed 1996, Delisted 2010
						Nutrients	PS, NPS	1996		1998	4a	2004	
						DO	PS, NPS	1996		1998	1	2008	DO, listed 1996, delisted 2008
DE140-E02	Indian River	Upper Indian River Bay	4a	Upper portion of estuary from power plant cooling water intake to Pepper Creek, including Island Creek	0.95 sq. mi.	Bacteria	NPS	1996	2006	2006	1	2008	Bacteria, listed 1996, Delisted 2010
						Nutrients	NPS	1996		1998	4a	2004	
						Temperature	NPS	1996	1998	2004	4a	2004	EPA TMDL December 2004
						DO	NPS	2002		1998	1	2004	DO listed 2002, Delisted 2010
DE140-L01	Indian River	Millsboro Pond	4a	Pond north of Millsboro	126.0 acres	Bacteria	PS, NPS	1996		2006	1	2006	Bacteria, listed 1996, delisted 2006
						Nutrients	PS, NPS	1996	2003	2004	4a	2006	
						DO		1996 , 2004		2004	1	2006	DO, listed in 1996, delisted 2002 , relisted 2004 , delisted 2006

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DE140-L02	Indian River	Betts Pond	4a	Pond northwest of Millsboro	80.0 acres	Nutrients	NPS	1996	2003	2004	4a	2006	
						Bacteria	NPS	1996		2006	1	2004	Bacteria, listed in 1996, delisted 2004
DE140-L03	Indian River	Ingrams Pond	4a	Pond west of Millsboro	48.0 acres	Bacteria	NPS	1996	2003	2006	4a	2008	
						Nutrients	NPS	1996	2003	2004	4a	2006	
DE140-L04	Indian River	Morris Mill Pond	4a	Pond between Millsboro and Georgetown	44.0 acres	Bacteria	PS, NPS	1996	2006	2006	4a	2008	
DE150-001	Iron Branch	Iron Branch	5	From the headwaters of Iron Branch and Whartons Branch to the confluence with Indian River	13.1 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2003	2004	4a	2006	
						DO	NPS	1996	2003	2004	1	2008	DO, listed 1996, delisted 2008
				Whartons Ditch--from the start of the third order stream to the confluence with Whartons Branch	3.55 miles	Habitat	NPS	1998	2013		5		
						DO	NPS	1998	2013	2004	4a	2006	
						Temperature	NPS	1998	2013		5		
DE070-001	Buntings Branch	Buntings Branch	4a	From the headwaters to the MD-DE State line	4.6 miles	Nutrients	PS, NPS	1996	2003		4b		Delaware DNREC, EPA and MD Dept. of Environment are working cooperatively to implement the MD TMDL for the downstream portion in Delaware's portion of this shared waterbody for these parameters. DO, listed 1996, delisted 2008.
						DO	PS, NPS	1996	2003		1	2008	
						Bacteria	PS, NPS	2002	2006	2006	4a	2008	
DE350-E01	Assawoman Bay	Assawoman Bay	4a	Portion of the estuary up to the MD-DE State line	0.59 sq. mi.	Bacteria	NPS	1998	2006	2006	4a	2008	
DE180-001	Little Assawoman Bay	Little Assawoman Canal	4a	Saline tidal waters from the confluence with White Creek to the confluence with little Assawoman Bay	3.1 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2003	2004	4a	2006	
						DO	NPS	1996	2003	2004	4a	2006	
DE180-002	Little Assawoman Bay	Miller Creek	5	From the headwaters of Miller Creek to the confluence with Little Assawoman bay	6.5 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2003	2004	4a	2006	
						Nutrients	NPS	1996	2003	2004	4a	2006	
				Beaver Dam Ditch--from the confluence of Blackwater Creek to the confluence with the next larger stream order	2.31 miles	Habitat	NPS	1998	2013		5		
DE180-003	Little Assawoman Bay	Dirickson Creek	5	From the headwaters of Dirickson Creek to the confluence with Little Assawoman bay	13.3 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2003	2004	4a	2006	
						DO	NPS	2002	2003	2004	1	2006	DO listed 2002, Delisted 2010
				Bearhole Ditch--from the confluence. of the headwaters to the confluence with Batson Branch	2.39 miles	Habitat	NPS	1998	2013		5		
				Agricultural Ditch--from the confluence of the headwaters to the confluence with Dirickson Creek	2.97 miles	Habitat	NPS	1998	2013		5		
DE180-E01	Little Assawoman Bay	Little Assawoman Bay	4a	Estuary from the confluence with Assawoman Canal to the confluence with Assawoman Bay	3.0 sq. mi.	Bacteria	NPS	1996	2006	2006	1	2006	Bacteria, Listed 1996, delisted 2006
						DO	NPS	1996	2003	2004	4a	2008	DO, listed 1996, delisted 2008, Relisted 2010
						Nutrients	NPS	1996	2003	2004	4a	2006	

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DELAWARE BAY BASIN													
NA	Delaware River	DRBC Zone 5	5	From the Pennsylvania- Delaware line to Liston Point, Delaware.	59.0 sq. mi.	Bacteria	PS, NPS	1996	2005		1		Bacteria , listed in 1996, delisted 2004 based on 2004 DRBC 305(b) assessment
						PCBs	PS, NPS, SF	1996	2005	2003	4a	2006	
						Arsenic		2002			1	2006	Not a contaminant of concern in fish consumption advisories for these waters
						Dioxin		2002	2015		5		
						Mercury		2002	2011		5		
						Chlorinated Pesticides		2002	2011		5		
						Chronic Toxicity (DRBC Zones 5a and 5b, 25 sq miles)	PS, NPS, SF	2002			3		The protocol for gathering chronic toxicity data and related information has been questioned. There is a need to collect supplementary data in order to determine the validity of the data used for this listing and the extent of impairment which may exist in the river segment.
						Iron		2004			3		Surface water levels of iron in the segment sometimes exceed the applicable criterion. The Department believes further study of surface water iron levels and a determination of whether a use impairment is resulting from those levels is an appropriate response to the available information.
NA	Delaware River	DRBC Zone 5c	5	Lower portion of DRBC Zone 5	31 sq. mi.	DO	PS, NPS	2006	2019		5		Delaware will work with the DRBC, EPA, other States and Stakeholders to develop and implement a TMDL in these waters.
DE020-001	Army Creek	Lower Army Creek	5	Segment from Route 13 to mouth at Delaware River tidal freshwater segment	3.0 miles	Nutrients		1996	2006	2006	4a	2008	
						DO		1996	2006	2006	4a	2008	
						Bacteria		2002	2006	2006	1	2008	Bacteria, Listed 2002, Delisted 2010
						PCBs		2006	2013		5		
						Dioxin/Furans		2006	2013		5		
						Dieldrin		2006	2013		5		
						Toxaphene		2006	2013		5		
				First tributary on Army Creek after the headwaters	0.73 miles	Habitat	NPS	1998	2011		5		
				Segment from Route 13 to the mouth of the Delaware River	2.00 miles	Biology and Habitat	NPS	1998	2011		5		
DE020-002	Army Creek	Upper Army Creek	5	Nontidal segment from headwaters to Route 13	1.1 miles	Nutrients	NPS	1998	2006	2006	4a	2008	
						DO	NPS	1998	2006	2006	4a	2008	
						Bacteria	NPS	2002	2006	2006	4a	2008	
						PCBs		2006	2013		5		
						Dioxin/Furans		2006	2013		5		
						Dieldrin		2006	2013		5		
						Toxaphene		2006	2013		5		
DE020-003	Army Creek	Tributary to Army Creek	4a	Unnamed Tributary to Army Creek, monitored by STORET station 114051	0.78 miles	Bacteria	NPS	2006	2006	2006	4a	2008	
						Nutrients	NPS	2006	2006	2006	4a	2008	
						DO	NPS	2006	2006	2006	1	2008	DO, listed 2006, delisted 2008
						DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	

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WATERBODY ID	WATERSHED NAME	SEGMENT	Overall CALM Code	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Polllutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
DE270-001-01	Red Lion Creek	Lower Red Lion	5	From U.S. Route 13 to the mouth at Delaware River	1.5 miles	Chlorinated Benzenes		1996			1	2002	Chlorinated Benzene, listed in 1996, delisted 2002 based on improved conditions.
						Bacteria	NPS	2002	2006	2006	4a	2008	
						PCBs	NPS	2002	2011		5		
						Dioxins	NPS	2002	2011		5		
				First tributary downstream of Doll Run from the headwaters to the confluence with Red Lion Creek	0.91 miles	Biology	NPS	1998	2011		5		
DE270-001-02	Red Lion Creek	Upper Red Lion	5	From the headwaters to the location where Route 13 intersects Red Lion	1.9 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
				First tributary after the headwaters of Red Lion Creek	0.28 miles	Biology	NPS	1998	2011		5		
DE130-001	Dragon Run Creek	Lower Dragon Run Creek	4a	From dam at the water supply pond to the mouth of Delaware River	3.2 miles	Nutrients	NPS	1998	2006	2006	4a	2008	
						DO	NPS	1998	2006	2006	4a	2008	
						Bacteria	NPS	2002		2006	1	2008	Bacteria, listed 2002, delisted 2006, relisted 2008, Delisted 2010

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DE130-002	Dragon Run Creek	Upper Dragon Run Creek	5	From headwaters to water supply pond	4.1 miles	Bacteria	NPS	1996	2006	2006	1	2008	Bacteria, Listed 1996, Delisted 2010
						DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
				From the confluence of the headwaters to the water supply dam	3.42 miles	Biology	NPS	1998	2011		5		
DE090-001	Chesapeake & Delaware Canal	C&D Canal	5	C&D Canal from the MD Line to Delaware River	15.0 M	Nutrients	NPS	2002	2011		5		
						PCBs	NPS	2002	2011		5		
						Dioxins	NPS	2002	2011		5		
						Dieldrin	NPS	2006	2011		5		
						Chlordane	NPS	2006	2011		5		
DE090-002	Chesapeake & Delaware Canal	Tributaries of Chesapeake & Delaware Canal	5	Scott Run-- from the headwaters to the confluence with Chesapeake & Delaware Canal	4.81 miles	Biology and Habitat	NPS	1998	2011		5		
						DO	NPS	1998	2006	2006	5		
				Crystal Run--from the headwaters to the confluence with Chesapeake & Delaware Canal	1.52 miles	Biology	NPS	1998	2011		5		
				Joy Run--from the headwaters to the confluence with Chesapeake & Delaware Canal	1.99 miles	Biology	NPS	1998	2011		5		
				Eastern tributary on Lums Pond--from the headwaters to the confluence with Lums Pond	1.04 miles	Biology and Habitat	NPS	1998	2011		5		
DE090-L01	Chesapeake & Delaware Canal	Lums Pond	4a	Pond south of Newark	189.3 acres	Bacteria	NPS	1996			1	2004	Bacteria, listed in 1996, delisted 2004
						Nutrients	NPS	2002		2011	5		
DE010-001-01	Appoquinimink River	Lower Appoquinimink River	5	Saline Tidal Reach, excluding Hangman's Run	7.1 miles	DO	PS, NPS	1996		1998	4a	2004	
						Nutrients	PS, NPS	1996		1998	4a	2004	
						Bacteria	NPS	2002	2006	2006	1	2006	Bacteria, listed 2002, delisted 2006
						PCBs	NPS	2002	2011		5		
						Dioxins	NPS	2002	2011		5		
DE010-001-02	Appoquinimink River	Upper Appoquinimink River	5	Freshwater Tidal Reach	6.1 miles	Nutrients	PS, NPS	1996		1998	4a	2004	
						DO	PS, NPS	1996		1998	4a	2004	
						Bacteria	PS, NPS	2002	2006	2006	4a	2008	
						PCBs	NPS	2002	2011		5		
						Dioxins	NPS	2002	2011		5		
DE010-001-03	Appoquinimink River	Drawyer Creek	5	From the headwaters of Drawyer Creek to the confluence with the Appoquinimink River, including Shallcross Lake	8.2 miles	Bacteria	NPS	1996	2006	2006	4a	2008	Bacteria, listed 1996, delisted 2008, Relisted 2010
						Nutrients	NPS	1996		2003	4a	2004	
						DO	NPS	1996		2003	1	2008	DO, listed 1996, delisted 2008
				Tributary of Drawyer Creek--from the confluence of the headwaters to the confluence with the mainstem	2.30 miles	Biology and Habitat	NPS	1998	2011		5		
				Western tributary of the headwaters of Drawyer Creek to its confluence	2.20 miles	Habitat	NPS	1998	2011		5		
				Tidal Portion	5.45 miles	PCBs	NPS	2002	2011		5		
						DDT	NPS	2002	2011		5		

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DE010-002-01	Appoquinimink River	Wiggins Mill Pond to confluence with Silver Lake	5	From the headwaters of Wiggins Mill Pond to the confluence with Noxontown Pond	3.4 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996		2003	4a	2004	
						Nutrients	NPS	2002		2003	4a	2004	
				From the confluence of the headwaters of Wiggins Mill Pond to the confluence with Noxontown Pond	1.62 miles	Biology	NPS	1998	2011		5		
DE010-002-02	Appoquinimink River	Deep Creek to confluence with Silver Lake	5	From the headwaters of Deep Creek to confluence with Silver Lake, excluding Silver Lake	2.4 miles	Bacteria	NPS	2002	2006	2006	4a	2008	
						Nutrients	NPS	2002		2003	4a	2004	
						DO		1996		2003	1	2002	DO, listed in 1996, delisted 2002
				First western tributary after the headwaters of Silver Lake	1.98 miles	Biology	NPS	1998	2011		5		
				Deep Creek.-- from the confluence of the headwaters to Appoquinimink River	1.84 miles	Biology	NPS	1998	2011		5		
DE010-L01	Appoquinimink River	Noxontown Pond	4a	Pond southwest of Odessa	158.6 acres	Bacteria	NPS	1998		2006	1	2006	Bacteria, listed 1998, delisted 2006
						Nutrients	NPS	1998		2003	4a	2004	
DE010-L02	Appoquinimink River	Silver Lake	5	Lake adjacent to Middletown, below Deep Creek	38.7 acres	Bacteria	NPS	1996			1	2006	Bacteria, listed in 1996, delisted 2006
						Nutrients	NPS	1996	2001		5		
						PCB	NPS	2002	2011		5		
						Dieldrin	NPS	2002	2011		5		
						DDT	NPS	2002	2011		5		
						Dioxin	NPS	2002	2011		5		
DE010-L03	Appoquinimink River	Shallcross Lake	4a	Lake above Drawyer Creek	43.1 acres	Nutrients	NPS	1996	2001	2003	4a	2004	
						Bacteria	NPS	1996			1	2004	Bacteria, listed in 1996, delisted 2004
DE030-001	Blackbird Creek	Lower Blackbird	4a	Tidal segment from Route 13 to mouth of the Delaware River	13.8 miles	DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						Bacteria	NPS	2002	2006	2006	4a	2008	
DE030-002	Blackbird Creek	Upper Blackbird	5	Nontidal segment from headwaters to Route 13	13.6 miles	Bacteria	NPS	1996	2006	2006	1	2008	Bacteria, Listed 1996, Delisted 2010
						DO	NPS	1996	2006	2006	4a	2008	DO, listed 1996, delisted 2008, Relisted 2010
						Nutrients	NPS	1996	2006	2006	4a	2008	
				First eastern tributary after the headwaters to the confluence with Blackbird Creek	2.19 miles	Biology	NPS	1998	2011		5		
				Upper Blackbird Creek--from the confluence of the headwaters to the confluence with Barlow Branch	2.11 miles	Biology	NPS	1998	2011		5		
				From the confluence of the headwaters to the confluence with Barlow Branch	2.27 miles	Biology	NPS	1998	2011		5		
DE030-003	Blackbird Creek	Tributaries on the mainstem	5	Sandom Branch to the confluence with Blackbird Creek (upper half)	1.16 miles	DO	NPS	2004	2006	2006	4a	2008	
						Nutrients	NPS	2006	2006	2006	4a	2008	
						Bacteria	NPS	2006	2006	2006	4a	2008	
						Biology and Habitat	NPS	1998	2011		5		

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DE310-001	Smyrna River	Lower Smyrna River	4a	From the head of tide to the Delaware River	10.2 miles	DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						Bacteria	NPS	2002	2006	2006	4a	2008	
DE310-002	Smyrna River	Mill Creek	5	From the headwaters to Lake Como	5.2 miles	Bacteria	NPS	1996	2006	2006	1	2008	Bacteria, Listed 1996, Delisted 2010
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	2002	2006	2006	1	2008	DO, listed 2002, delisted 2008
				Providence Creek--from the confluence of the headwaters of Mill Creek to the confluence with Lake Como	2.18 miles	Biology and Habitat	NPS	1998	2011		5		
DE310-003	Smyrna River	Tributary of Smyrna River	5	Tributaries from the headwaters to the confluence with Delaware Bay	4.2 miles	Bacteria	NPS	1998	2006	2006	4a	2008	
						DO	NPS	2004	2006	2006	4a	2008	
						Nutrients	NPS	1998	2006	2006	4a	2008	
				From the confluence of the headwaters of Paw Paw Branch to the confluence with Providence Creek	2.68 miles	Biology and Habitat	NPS	1998	2011		5		
				First eastern tributary after the headwaters of Paw Paw Branch to the confluence with Smyrna River	0.86 miles	Habitat	NPS	1998	2011		5		
				Eastern tributary of the headwaters of Sawmill Branch to its confluence	0.67 miles	Biology and Habitat	NPS	1998	2011		5		
				Sawmill Branch--from the confluence of the headwaters to the next larger stream order	3.81 miles	Biology	NPS	1998	2011		5		
DE310-L01	Smyrna River	Lake Como and Duck Creek Pond	4a	Lake Como in Smyrna	82.0 acres	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	2006	2006	2006	4a	2008	
DE160-001	Leipsic River	Lower Leipsic River	4a	From dam at Garrisons Lake to mouth at Delaware River	13.6 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	4a	2008	
DE160-002	Leipsic River	Upper Leipsic River	5	From headwaters to Garrisons Lake, excluding Masseys Mill Pond	5.8 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	1	2008	DO listed 1996, Delisted 2010
						Nutrients	NPS	1996	2006	2006	4a	2008	
				From the start of the third order stream on Pinks Branch to the confluence with	2.70 miles	Biology	NPS	1998	2011		5		
						DO	NPS	1998	2006	2006	4a	2008	
				Tributary of Leipsic River--from the confluence of the headwaters to the confluence with Leipsic River	0.93 miles	Biology	NPS	1998	2011		5		
DE160-003	Leipsic River	Tributary from the dam at Garrisons Lake to mouth at Delaware Bay	5	From the confluence of the headwaters of Alston Branch to the confluence Leipsic River	2.16 miles	Biology	NPS	1998	2011		5		
				Tributary of Leipsic River--eastern tributary of the headwaters to its confluence	0.91 miles	Habitat	NPS	1998	2011		5		
		Dyke Branch	4a	Dyke Branch from headwaters to confluence with Leipsic River	4.39 miles	DO	NPS	2004	2006	2006	4a	2008	
						Nutrients	NPS	2006	2006	2006	4a	2008	
						Bacteria	NPS	2006	2006	2006	4a	2008	
DE160-004	Leipsic River	Muddy Branch	4a	Muddy Branch from headwaters to the confluence with Leipsic River	5.59 miles	DO	NPS	2004	2006	2006	4a	2008	
						Nutrients	NPS	2006	2006	2006	4a	2008	
						Bacteria	NPS	2006	2006	2006	4a	2008	

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DE160-L01	Leipsic River	Garrisons Lake	4a	Lake south of Smyrna	85.9 acres	Bacteria	NPS	1996		2006	1	2006	Bacteria, Listed 1996, delisted 2006
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	2002	2006	2006	1	2008	DO, Listed 2002, Delisted 2010
DE160-L02	Leipsic River	Masseys Mill Pond	4a	Pond south of Clayton	30.0 acres	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
DE190-001-01	Little River	Lower Little River	4a	From the confluence of Upper Little River and Pipe Elm Branch with the Lower Little River to the mouth at	2.9 miles	DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						Bacteria	NPS	2002	2006	2006	4a	2008	
DE190-001-02	Little River	Upper Little River	5	From the headwaters to the confluence with Lower Little River	5.5 miles	Bacteria	NPS	1996	2006	2006	1	2008	Bacteria, Listed 1996, Delisted 2010
						DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
				Morgan Branch--from the confluence of the headwaters to the confluence with the next larger stream order	0.60 miles	Habitat	NPS	1998	2011		5		
				Start of the third order stream near the headwaters of Little River to the confluence with Morgan Branch	4.14 miles	Biology and Habitat	NPS	1998	2011		5		
DE190-001-03	Little River	Pipe Elm Branch	4a	From the headwaters to the confluence with Little River	2.1 miles	Bacteria	NPS	1996	2006	2006	1	2008	Bacteria, Listed 1996, Delisted 2010
						DO	NPS	1996	2006	2006	4a	2008	DO, Listed 1996, Delisted 2010
						Nutrients	NPS	1996	2006	2006	4a	2008	
DE290-001-01	Saint Jones River	Lower Saint Jones	5	From Old Lebanon Bridge to the mouth of Delaware Bay	8.3 miles	DO	NPS	1996	2006	2006	4a	2008	
						PCBs	NPS	1996	2011		5		
						Nutrients	NPS	1996	2006	2006	4a	2008	
						Bacteria	NPS	2002	2006	2006	4a	2008	
						Dioxin	NPS	2002	2011		5		
						Mercury	NPS	2002	2011		5		
						Arsenic	NPS	2002			1	2006	Not a contaminant of concern in fish consumption advisories for these waters
DE290-001-02	Saint Jones River	Upper Saint Jones	5	From the dam at Silver Lake to Old Lebanon Bridge at Road 357	6.7 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	4a	2008	
						PCBs	NPS	1996	2011		5		
						Nutrients	NPS	1996	2006	2006	4a	2008	
						Dioxin	NPS	2002	2011		5		
						Mercury	NPS	2002	2011		5		
						Arsenic	NPS	2002			1	2006	Not a contaminant of concern in fish consumption advisories for these waters
				Tributary of Silver Lake in Dover	0.32 miles	Habitat	NPS	1998	2011		5		
				Puncheon Branch--from the confluence of the headwaters to the confluence with the Saint Jones River	1.84 miles	Biology and Habitat	NPS	1998	2011		5		

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DE290-002	Saint Jones River	Isaac Branch	5	From the headwaters to the confluence with Saint Jones River, excluding Moores Lake	9.1 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO		1996		2006	1	2002	DO, listed in 1996, delisted 2002
				From the confluence of Allabands Mill Stream to the confluence with Saint Jones River	3.62 miles	Biology	NPS	1998	2011		5		
				From the confluence of the headwaters of Almhouse Branch to the confluence of Isaac Branch	2.50 miles	Biology	NPS	1998	2011		5		
				Second tributary upstream of Wyoming Lake on Isaac Branch	1.28 miles	Habitat	NPS	1998	2011		5		
				Wyoming Mill Pond	28.5 Acres	PCB	NPS	2002	2011		5		
						Dioxin	NPS	2002	2011		5		
						DDT	NPS	2002	2011		5		
DE290-003	Saint Jones River	Fork Branch	5	From the headwaters to Silver Lake in Dover	7.7 miles	Bacteria	NPS	1996	2006	2006	1	2008	Bacteria, Listed 1996, Delisted 2010
						DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
				Cahoon Branch--from the confluence of the headwaters to the confluence with the next larger stream order	2.33 miles	Habitat	NPS	1998	2011		5		
				Maidstone Branch- from the confluence of the third order stream to the confluence with Cahoon Branch	3.09 miles	Biology	NPS	1998	2011		5		
				Tributary to Maidstone Branch---from the confluence of the headwaters to the confluence with Maidstone Branch	0.13 miles	Habitat	NPS	1998	2011		5		
				Fork Branch--from the start of the third order stream to the confluence with	6.24 miles	Habitat	NPS	1998	2011		5		
						DO	NPS	1998	2011	2006	4a	2008	
				From the start of the third order stream on Cahoon Branch to the confluence with Maidstone Branch	1.28 miles	Biology	NPS	1998	2011		5		

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DE290-004	Saint Jones River	Tidbury Branch	5	From below Derby Pond to the confluence with the Saint Jones River	3.8 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO		2002	2006	2006	4a	2008	
				From the confluence of the headwaters of Tidbury Creek to the confluence with Derby Pond	1.08 miles	Biology and Habitat	NPS	1998	2011		5		
				Tributary of Tidbury Creek--from the headwaters to the confluence with Tidbury Creek	0.75 miles	Habitat	NPS	1998	2011		5		
				Red House Branch--from the confluence of the headwaters to the confluence with Derby Pond	0.71 miles	Biology	NPS	1998	2011		5		
				Tidbury Creek--from the confluence with Derby Pond to the confluence with Lower Saint Jones River	4.53 miles	Biology	NPS	1998	2011		5		
DE290-L01	Saint Jones River	Moores Lake	5	Lake east of Camden	27.1 acres	Bacteria	NPS	1996	2006	2006	1	2008	Bacteria, listed 2006, delisted 2008
						PCBs	NPS	1996	2011		5		
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	1	2002	DO, listed in 1996, delisted 2002
						DDT	NPS	2002	2011		5		
DE290-L02	Saint Jones River	Silver Lake	5	Silver Lake at Dover	157.8 acres	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						PCBs	NPS	1996	2011		5		
						Dioxin	NPS	2002	2011		5		
						Mercury	NPS	2002	2011		5		
DE290-L03	Saint Jones River	Derby Pond	4a	Pond south of Wyoming	23.1 acres	Bacteria	NPS	1996		2006	1	2004	Bacteria, listed in 1996, delisted 2004
						Nutrients	NPS	1996	2006	2006	4a	2008	
DE220-001	Murderkill River	Lower Murderkill	4a	From the confluence with Spring Creek to the mouth at Delaware Bay	7.6 miles	Nutrients	PS, NPS	1996	2006	2001	4a	2004	
						DO	PS, NPS	1996	2006	2001	4a	2004	
						Bacteria	PS, NPS	2002	2006	2006	4a	2008	
DE220-002	Murderkill River	Spring Creek	5	From the headwaters to the confluence with Murderkill River , excluding Andrews Lake and McGinnis Pond	15.8 miles	Bacteria	PS, NPS	1996	2006	2006	4a	2008	
						DO	PS, NPS	1996		2001	4a	2004	
						Nutrients	PS, NPS	1996		2001	4a	2004	
				Tributary of Hudson River--from the headwaters to the confluence with the next larger stream order	0.49 miles	Biology and Habitat	NPS	1998	2011		5		
				Pratt Branch--eastern tributary of the headwaters to its confluence	1.27 miles	Biology	NPS	1998	2011		5		

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DE220-003	Murderkill River	Mid Murderkill River	5	From McCauley and Coursey Pond to the confluence with Spring Creek	9.2 miles	Bacteria	PS, NPS	1996	2006	2006	4a	2008	
						Nutrients	PS, NPS	1996		2001	4a	2004	
				Ash Gut-- from the headwaters to the confluence with the next larger stream order	1.04 miles	Biology and Habitat	NPS	1998	2011		5		
DE220-004	Murderkill River	Browns Branch	5	From the headwaters adjacent to Harrington to the confluence with McCauley Pond	8.8 miles	Bacteria	NPS	1998	2006	2006	4a	2008	
						DO	NPS	1998		2001	1	2008	DO, listed 1996, delisted 2008
						Nutrients	NPS	1998		2001	4a	2004	
						Ammonia	PS, NPS	2004		2001	4a	2004	
				Tributary of Browns Branch-- from the confuence of the headwaters wtot he confluence with Browns Branch	1.77 miles	Biology and Habitat	NPS	1998	2011		5		
DE220-005	Murderkill River	Upper Murderkill River	5	From the headwaters to the confluence with Coursey pond, excluding Killens and Coursey Ponds	7.4 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	2004		2001	1	2006	DO, listed in 2004, delisted 2006
						Nutrients	NPS	1996		2001	4a	2004	
				Spring Branch--tributary on Coursey Pond	2.52 miles	Biology	NPS	1998	2011		5		
				Fan Branch--from the headwaters to the confluence with Murderkill River	2.31 miles	Habitat	NPS	1998	2011		5		
						DO	NPS	1998	2011		5		
						Temperature	NPS	1998	2011		5		
				Tributary of Black Swamp Creek--from the headwaters to its confluence	0.28 miles	Habitat	NPS	1998	2011		5		
				Beaver Dam Branch--from the confluence of the headwaters to the confluence with Murderkill River and Black Swamp Creek	2.96 miles	Biology	NPS	1998	2011		5		
				Black Swamp Creek--from the headwaters of Black Swamp to the confluence with the next larger stream	0.75 miles	Biology and Habitat	NPS	1998	2011		5		
						DO	NPS	1998	2011		5		
DE220-L01	Murderkill River	McGinnis Pond	4a	Pond east of Viola	31.3 acres	Bacteria	NPS	1998		2006	1	2006	Bacteria, listed in 1998, delisted 2006
						Nutrients	NPS	1998		2001	4a	2004	
						DO	NPS	2002		2001	1	2008	DO, listed 2002, delisted 2008
DE220-L02	Murderkill River	Andrews Lake	4a	Pond West of Frederica	17.5a cres	Bacteria	NPS	2002	2006		1	2006	Bacteria, listed in 2002, delisted 2006
						Nutrients	NPS	2002		2001	4a	2004	
DE220-L03	Murderkill River	Coursey Pond	4a	Pond southwest of Frederica	58.1 acres	Nutrients	NPS	1996		2001	4a	2004	
						Bacteria	NPS	2002			1	2004	Bacteria, listed in 2002, delisted 2004

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DE220-L04	Murderkill River	Killens Pond	4a	Pond southwest of Felton	75.1 acres	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996		2001	4a	2004	
DE220-L05	Murderkill River	McCauley Pond	4a	Pond northeast of Harrington	49.0 acres	Bacteria	NPS	1996			1	2004	Bacteria, listed in 1996, delisted 2004
						Nutrients	NPS	1996		2001	4a	2004	
DE210-001	Mispillion River	Lower Mispillion	4a	From dam at Silver Lake to mouth at Delaware Bay	13.2 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
DE210-002	Mispillion River	Upper Mispillion	5	From the headwaters to Silver Lake in Milford, excluding Silver, Haven, and Griffith Lakes; Blairs, Abbotts, and Tub	11.2 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996		2006	1	2006	DO, listed 1996, delisted 2006
						Nutrients	NPS	1996	2006	2006	4a	2008	
				Tantrough Branch--from the headwaters to the confluence with Blairs Pond	3.24 miles	Biology	NPS	1998	2011		5		
				Beaverdam Branch--western tributary of the headwaters to its confluence	2.69 miles	Biology	NPS	1998	2011		5		
DE210-003	Mispillion River	Johnson Branch including its tributaries	5	Johnson Branch--from the confluence of the headwaters to the confluence with Haven Lake	4.02 miles	Habitat	NPS	1998	2011		5		
						Bacteria	NPS	2006	2006	2006	4a	2008	
						Nutrients	NPS	2006	2006	2006	4a	2008	
DE210-004	Mispillion River	Tributary from the headwaters to Silver Lake	5	Lednum Branch---eastern tributary of the headwaters to its confluence	1.31 miles	Habitat	NPS	1998	2011		5		
						Bacteria	NPS	2006	2006	2006	4a	2008	
						Nutrients	NPS	2006	2006	2006	4a	2008	
DE210-005	Mispillion River	Mispillion Tributaries From Dam At Silver Lake	4a	King's Causeway Branch	2.45 miles	DO	NPS	2004	2006	2006	4a	2008	
						Bacteria	NPS	2006	2006	2006	4a	2008	
						Nutrients	NPS	2006	2006	2006	4a	2008	
DE210-L01	Mispillion River	Tub Mill Pond	4a	Pond north of Milford	4.8 acres	Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	2006	2006	2006	1	2008	DO, listed 2006, delisted 2008
DE210-L02	Mispillion River	Silver Lake	4a	Silver Lake at Milford	28.5 acres	Bacteria	NPS	1996			1	2006	Bacteria, listed 1996, delisted 2006
						Nutrients	NPS	1996	2006	2006	4a	2008	
DE210-L03	Mispillion River	Haven Lake	4a	Lake west of Milford; upstream of Silver Lake	82.5 acres	Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996		2006	1	2006	DO, listed 1996, delisted 2006
						Bacteria	NPS	2002		2006	1	2004	Bacteria, listed in 2002, delisted 2004
DE210-L04	Mispillion River	Griffith Lake	4a	Lake west of Milford; upstream of Haven Lake	32.2 acres	Nutrients	NPS	1996	2006	2006	4a	2008	
DE210-L05	Mispillion River	Blairs Pond	4a	Pond southwest of Milford	28.5 acres	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO		1996		2006	1	2002	DO, listed in 1996, delisted 2002
DE210-L06	Mispillion River	Abbotts Mill Pond	4a	Pond southwest of Milford	25.6 acres	Bacteria	NPS	1998		2006	1	2006	Bacteria, listed 1998, delisted 2006
						Nutrients	NPS	1998	2006	2006	4a	2008	
						DO	NPS	2002	2006	2006	4a	2008	
DE080-001	Cedar Creek	Lower Cedar Creek	4a	Tidal segment from Cedar Creek Mill Pond to mouth at Delaware Bay	8.8 miles	DO	NPS	1996	2006	2006	4a	2008	
						Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	

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DE080-002	Cedar Creek	Upper Cedar Creek	4a	From the headwaters to Cedar Creek Mill Pond, including Church Branch and Cedar Mill Pond, Cubbage Pond,	13.0 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	2004	2006	2006	4a	2008	
DE080-003	Cedar Creek	Slaughter Creek	4a	From the headwaters to The Confluence with Cedar Creek	7.91 Miles	DO	NPS	2004	2006	2006	4a	2008	
						Nutrients	NPS	2006	2006	2006	4a	2008	
						Bacteria	NPS	2006	2006	2006	4a	2008	
						PCBs	NPS	2010	2023				
						Dioxin/Furans	NPS	2010	2023				
DE060-001	Broadkill River	Lower Broadkill	4a	From the confluence with Beaver Dam Creek to mouth at Delaware Bay, excluding Red Mill Pond	8.1 miles	Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	4a	2008	
						Bacteria	NPS	2002	2006	2006	4a	2008	
DE060-002	Broadkill River	Beaverdam Creek	4a	From the headwaters to the confluence with Broadkill River	8.3 miles	Bacteria	PS, NPS	1996	2006	2006	4a	2008	
						Nutrients	PS, NPS	1996	2006	2006	4a	2008	
						DO	PS, NPS	2002	2006	2006	1	2008	DO, listed 2002, delisted 2008
DE060-003	Broadkill River	Upper Broadkill River	5	Broadkill River from below Waggamons Pond to the confluence with Beaver Dam Creek	5.0 miles	Bacteria	PS, NPS	1998, 2006	2006	2006	4a	2004	Bacteria, listed in 1998, delisted 2004 , relisted 2006
						Nutrients	PS, NPS	1998	2006	2006	4a	2008	
						DO	PS, NPS	2006	2006	2006	4a	2008	
DE060-004	Broadkill River	Round Pole Branch	4a	Tributary from the headwaters to confluence with Upper Broadkill River	5.2 miles	Bacteria	NPS	1996		2006	4a	2008	Bacteria, listed 1996, delisted 2006, relisted 2008
						DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
DE060-005	Broadkill River	Ingrams Branch	4a	From the headwaters to Waggamons Pond, including Diamond Pond	7.6 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
				Ingrams Branch-- western tributary of the headwaters	1.70 miles	DO	NPS	1998	2006	2006	4a	2008	
						Habitat	NPS	1998	2012	2006	4a	2008	
DE060-006	Broadkill River	Pemberton Branch	4a	From the headwaters to Waggamons Pond	5.0 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						Nutrients	NPS	1996	2006	2006	4a	2008	
DE060-007-01	Broadkill River	Lower Red Mill Branch	4a	From Red Mill Pond to the confluence with Lower Broadkill River	5.3 miles	Nutrients	NPS	1996	2006	2006	4a	2008	
						DO		1996		2006	1	2002	DO, listed in 1996, delisted 2002
						Bacteria	NPS	2002		2006	1	2004	Bacteria, listed in 2002, delisted 2004
DE060-007-02	Broadkill River	Martin Branch	5	From the headwaters to Red Mill Pond	1.5 miles	DO	NPS	1996		2006	1	2006	DO, listed in 1996, delisted 2006
						Nutrients	NPS	1996	2006	2006	4a	2008	
						Bacteria	NPS	2006	2006	2006	4a	2008	
				Tributary above Red Mill Pond--from start of the second order stream to the confluence with Red Mill Pond	0.06 miles	Habitat	NPS	1998	2011		5		
DE060-007-03	Broadkill River	Heronwood Branch	4a	From the headwaters to Red Mill Pond	1.0 miles	Bacteria	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	4a	2008	
DE060-008	Broadkill River	Primehook Creek	5	Entire Creek	12.6 miles	Mercury	NPS	2010	2023		5		
DE060-L01	Broadkill River	Red Mill Pond	4a	Pond located on Martin Branch	150.0 acres	Bacteria	NPS	1996		2006	1	2006	Bacteria , listed in 1996, delisted 2006
						Nutrients	NPS	1996	2006	2006	4a	2008	
						DO	NPS	1996	2006	2006	1	2008	DO, listed 1996, delisted 2008

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DE060-L02	Broadkill River	Waggamons Pond	4a	Pond adjacent to Milton	35.0 acres	Nutrients	PS, NPS	1996	2006	2006	4a	2008	
DE060-L03	Broadkill River	Waples Pond and Reynolds Pond	4a	Ponds located on Sowbridge Branch of Primehook Creek	88.8 acres	Bacteria	NPS	1998		2006	1	2006	Bacteria , listed in 1998, delisted 2006
						Nutrients	NPS	1998	2006	2006	4a	2008	
						DO	NPS	1998		2006	1	2006	DO, listed 1998, delisted 2006
						Mercury	NPS	2010	2023				Mercury listing in Waples Pond Only

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DELAWARE ESTUARY BASIN													
N/A	Delaware Bay	DRBC Zone 6	5	From Liston Point to the confluence with the Atlantic Ocean	782.0 sq. mi.	Bacteria	PS, NPS	1996			1		Bacteria , listed in 1996, delisted 2004 based on 2004 DRBC 305(b) assessment
						PCBs	PS, NPS, SF	1996	2005	2006	4a	2008	
						Mercury		2002	2012		5		
						Dioxin		2002			1	2006	Not a contaminant of concern in fish consumption advisories for these waters

KEY for Pollutant(s) or Stressor(s):
DO = Dissolved Oxygen

KEY for Probable Source(s):
NPS = Nonpoint Source(s)
PS = Point Source(s)
SF = Superfund Site(s)

KEY for CALM Code
1= Fully Supporting for this parameter
3= Information is insufficent to make a determination
4a= TMDL has been completed and approved by EPA
4b= Management Actions are expected to solve impairment
5= TMDL Needed

Chapter Four: Public Health/Aquatic Life Concerns

State of Delaware Fish Consumption Advisory Update

Certain chemicals build up in the food chain to levels that can be harmful to human and ecological health. DNREC and DHSS collect and analyze fish from Delaware waters to monitor the extent that these chemicals accumulate in fish from Delaware waters. When elevated levels are detected, the information is shared with the public and consumption advisories are issued to notify the angling public, their families, and friends regarding contaminants in fish from affected waterways. The advisories include specific advice on the number of meals to be consumed annually and proper trimming and cooking. The goal of this advice is voluntary reduction of exposure until the contamination is sufficiently cleaned up.

The following table lists the current fish consumption advisories (recommended limitations on the consumption of particular fish species) issued jointly by the Delaware Department of Natural Resources and Environmental Control and the Department of Health and Social Services, as of 2009.

2009 Delaware Fish Consumption Advisories				
Statewide Fresh Water, Estuarine & Marine Waters				
Waterbody	**Species**	**Geographical Extent**	**Contaminants of Concern**	**Advice*** **One meal = 8-oz. serving for an adult and a 3-oz serving for children**
All Waters NOT Specifically Listed Below	All Species NOT Specifically Listed Below	All Areas NOT Specifically Listed Below	All	No more than one meal per week
Delaware Estuary and Tributaries				
Waterbody	**Species**	**Geographical Extent**	**Contaminants of Concern**	**Advice*** **One meal = 8-oz. serving for an adult and a 3-oz serving for children**
Delaware River	All Finfish	Delaware State Line to the C&D Canal	PCBs, Dioxin, Mercury, Chlorinated Pesticides	No Consumption

Lower Delaware River and Delaware Bay	Weakfish-all sizes; Bluefish-14 inches or less	Chesapeake & Delaware Canal to the Mouth of the Delaware Bay	PCBs	No more than one meal per month
	White Perch American Eel Channel Catfish White Catfish Bluefish-greater than 14 inches	Chesapeake & Delaware Canal to the Mouth of the Delaware Bay	PCBs, Mercury	No Consumption for women of child-bearing age and children. All others, eat no more than one meal per year
	Striped Bass	Chesapeake & Delaware Canal to the Mouth of the Delaware Bay	PCBs, Mercury	No Consumption for women of child-bearing age and children. All others, eat no more than two meals per year
Tidal Shellpot Creek	All Finfish	Governor Printz Blvd to Delaware River	PCBs	No Consumption
Non-tidal Shellpot Creek	All Finfish	All waters upstream of Governor Printz Boulevard	Dieldrin	No more than one meal per year
Army Creek and Pond	All Finfish	Entire Creek and Pond	PCB, Dioxin/Furans, Dieldrin, Toxaphene	No more than two meals per year
Red Lion Creek	All Finfish	Route 13 to the Delaware River	PCBs, Dioxin	No more than one meal per year
Chesapeake & Delaware Canal	All Finfish	Entire Canal in Delaware	PCBs, DDT, Dieldrin, Chlordane	No Consumption
Appoquinimink River	All Finfish	Tidal Portions	PCBs, Dioxin	No more than one meal per year
Drawyers Creek	All Finfish	Tidal Portions	PCBs, DDT	No more than one meal per year

Silver Lake Middletown	All Finfish	Entire Lake	PCBs, Dieldrin, DDT, Dioxin	No more than one meal per year
Saint Jones River	All Finfish	River Mouth to Silver Lake Dam	PCBs, Dioxin, Mercury	No more than two meals per year
Moores Lake	All Finfish	Entire Pond	PCBs, DDT	No more than two meals per year
Silver Lake Dover	All Finfish	Entire Pond	PCBs, Dioxin, Mercury	No more than two meals per year
Wyoming Mill Pond	All Finfish	Entire Pond	PCBs, Dioxin, DDT	No more than two meals per year
Prime Hook Creek	All Finfish	Entire Creek	Mercury	Women of child-bearing age and children should not eat more than one meal per month. All others, eat no more than two meals per month.
Waples Pond	All Finfish	Entire Pond	Mercury	Women of child-bearing age and children should not eat more than one meal per month. All others, eat no more than two meals per month
Slaughter Creek	All Finfish	Entire Creek	PCBs, Dioxin/Furans	No more than six meals per year
Christina Basin				
Waterbody	**Species**	**Geographical Extent**	**Contaminants of Concern**	**Advice*** **One meal = 8-oz. serving for an adult and a 3-oz serving for children**

Tidal Brandywine River	All Finfish	River Mouth to Baynard Blvd.	PCBs	No Consumption
Non-tidal Brandywine River	All Finfish	Baynard Blvd. To Pennsylvania Line	PCBs, Dioxin	No more than six meals per year
Tidal Christina River	All Finfish	River Mouth to Smalley's Dam	PCBs, Dieldrin	No Consumption
Non-tidal Christina River	All Finfish	Smalley's Dam to DE/MD Line.	PCBs, Dieldrin, Chlordane	No more than six meals per year
Tidal White Clay Creek	All Finfish	River Mouth to Route 4	PCBs	No Consumption
Non-tidal White Clay Creek	All Finfish	Route 4 to DE/PA Line	PCBs	No more than one meal per month
Red Clay Creek	All Finfish	State Line to Stanton	PCBs, Dioxin, Chlorinated Pesticides	No more than six meals per year
Little Mill Creek	All Finfish	Creek Mouth to Kirkwood Highway	PCBs	No Consumption

Stocked Trout				
Waterbody	**Species**	**Geographical Extent**	**Contaminants of Concern**	**Advice*** **One meal = 8-oz. serving for an adult and a 3-oz serving for children**
Christina Creek	Stocked Trout	Rittenhouse Park to DE/MD Line	PCBs, Dieldrin	No more than six meals per year

Designated Trout Streams and Ponds other than Christina Creek	Stocked Trout	Designated Trout Stocking Areas are listed in the Delaware 2009 Fishing Guide: http://www.fw.delaware.gov/Fisheries/Documents/2009fishingguidewebfinal.pdf	PCBs	No more than one per month
Delaware Atlantic Coastal Waters including Delaware Inland Bays				
Waterbody	**Species**	**Geographical Extent**	**Contaminants of Concern**	**Advice* One meal = 8-oz. serving for an adult and a 3-oz serving**
Delaware Atlantic Coastal Waters including Inland Bays	Bluefish-14 inches or less	Coastal Delaware from Mouth of the Delaware Bay Southward to MD/DE Line	PCBs	No more than one meal per month
	Bluefish-greater than 14 inches	Coastal Delaware from Mouth of the Delaware Bay Southward to MD/DE Line	PCBs, Mercury	No Consumption for women of child-bearing age and children. All others, eat no more than one meal per year
	Striped Bass	Coastal Delaware from Mouth of the Delaware Bay Southward to MD/DE Line	PCBs	No Consumption for women of child-bearing age and children. All others, eat no more than two meals per year

Notes:

1. The pollutant listed first is of the greatest concern in this system.

2. Proper trimming and cooking of fish can reduce but not eliminate the risk associated with PCBs, dioxins, and chlorinated pesticides. Trimming and cooking does not reduce the risk associated with mercury.

* Do not add meal restrictions together. The advice for different species and different water bodies should not be combined.

The contaminant of primary concern for these advisories is polychlorinated biphenyl (PCB). To a lesser degree chlorinated pesticides, dioxins and mercury have been identified as contaminants of concern. PCBs have been designated as probable human carcinogens by the EPA, are believed to affect the immune system and have been linked to developmental problems in infants. PCBs were banned in the 1970s but are extremely persistent in the environment. PCBs are found in bottom sediments and continue to enter Delaware waters from upland sources, though not at an increasing rate. Data collected to date show that PCBs in fish are not an imminent public health threat, though they are a significant, avoidable exposure. Exposure may be avoided by eating fish from uncontaminated waters. Delaware will continue to monitor the situation and coordinate work between and within agencies to coordinate remediation activities.

National Methylmercury Fish Consumption Advisory

On January 12, 2001, EPA and the Food and Drug Administration (FDA) issued concurrent national fish consumption advisories recommending restricted consumption of freshwater coastal and marine species of fish due to methylmercury contamination. EPA's advisory targeted women of childbearing age and children who may be consuming noncommercial freshwater fish caught by family or friends. The advisory specifically recommends that women who are pregnant or could become pregnant, women who are nursing a baby, and their young children, should limit consumption of freshwater fish caught by family and friends to one meal per week unless the state health department has different advice for the specific waters where the fish are caught. For adults, one meal is six ounces of cooked fish or eight ounces uncooked fish; for a young child, one meal is two ounces of cooked fish or three ounces of uncooked fish.

The FDA issued advice on mercury in fish bought from stores and restaurants, which includes ocean and coastal fish as well as other types of commercial fish. The advice was that women who are pregnant or could become pregnant, nursing mothers, and young children, not eat shark, swordfish, king mackerel, or tilefish. FDA also advises that women who are pregnant or could become pregnant may eat an average of 12 ounces of fish purchased in stores and restaurants each week. EPA recommends that women who are or could become pregnant, nursing mothers, and young children follow the FDA advice for coastal and ocean fish caught by family and friends. EPA and FDA both recommend that the public check with state or local health authorities for specific consumption advice about fish caught or sold in the local area. The EPA and FDA advisories are available through the EPA fish advisory website.

Shellfish and Recreational Waters Program

Shellfish Program

Delaware, along with 26 other states, and nine foreign countries, is a member of the Interstate Shellfish Sanitation Conference (ISSC), administrative body of the National Shellfish Sanitation Program (NSSP). The ISSC is a tripartite organization, with the membership including state participants, the U.S. Food and Drug Administration, and the shellfish industry. Member-states / countries establish water quality and pollution source parameters for determining the safety of shellfish for human consumption. Additionally, parameters are established for sanitation in harvesting, processing, and shipping shellfish (molluscan bivalves).

DNREC's role is to maintain Delaware's NSSP conforming status, as per FDA scrutiny (annual Program evaluations), thereby allowing Delaware to ship and receive shellfish. This is necessary for the preservation of Delaware's shellfish industry. Additionally, and most importantly, this ensures a safe product for the shellfish consumer.

Recreational Water (beach monitoring) Program

DNREC also ensures that natural bathing beaches are safe for swimming. Of particular concern are viruses shed by humans. Delaware uses total enterococci as an indicator of possible human fecal contamination. As is the case with the Shellfish Program, there is a qualitative component in the assessment of the risk to swimmers. Enterococci in the presence of possible sources of human fecal contamination may represent an unacceptable health risk. However, there is an increasing body of evidence, including studies conducted in Delaware, that so-called indicator bacteria are ubiquitous in the environment. Delaware's standards are based on Delaware-specific bacteria and illness data, and reflect a threshold swimming advisory level of 12.5 illnesses per 1,000 swimmers. The actual prevailing risk may be in the range of two in 100,000. Guarded beaches are tested weekly from mid-May to Labor Day.

Part IV: Wetlands Assessment

Introduction

Wetlands comprise a significant portion of the water resources of Delaware covering over 300,000 acres of the state. Throughout the state a wide diversity of wetland types occur including both tidal and nontidal wetlands. While some wetlands are directly connected or adjacent to other surface waters such as salt marshes and floodplains, others occur as isolated areas surrounded by uplands such as forested flats and Delmarva Bays. Preserving the abundance, quality, diversity and proportion of different types of wetlands in the landscape is essential to protecting the natural resources and waters of Delaware. Currently the State of Delaware is actively working in each of these areas to protect our high quality wetland resources and restore degraded systems on the watershed scale.

Delaware Wetlands Conservation Strategy

The Delaware Wetlands Conservation Strategy is an initiative to protect and restore Delaware wetlands while continuing biological research and public education endeavors and was adopted by the Department in 2008. This strategy will guide the efforts of State agencies to improve Delaware's wetland resources through increased agency coordination, data availability, education, monitoring, and restoration efforts. Goals will be implemented over the next five years and will be reevaluated in 2013. Funding from federal grants, state sources, and cost-share opportunities will be vital and will serve as the catalyst for this strategy's success.

Access to the entire Delaware Wetlands Conservation Strategy in PDF format is available on the new Delaware Wetlands website at http://www.dnrec.delaware.gov/Admin/DelawareWetlands.

Functions and Values of Wetlands

Wetlands perform a variety of functions including surface and subsurface water exchange, surface and subsurface water storage, sediment retention, nutrient cycling, organic carbon export, providing faunal and flora habitat, maintaining intact food webs, and maintaining interspersion and connectivity in the landscape. Because wetlands are diverse and occur in a variety different ecosystems, they do not all perform the same functions therefore, it is generally difficult to determine a wetland's function without a specific site analysis. Variables to consider in assessing wetland function include: wetland type, landscape position, vegetation, soils, hydrology, size, adjacent land use, and human disturbance.

In contrast to function, wetland value is determined by the usefulness of the wetland and the functions it is performing to humans. According to Wohlgemuth (1991), wetlands offer three broad categories of values: fish and wildlife habitat values, environmental quality values and socioeconomic values. The location of the wetland, human pressures on it, or the size of the wetland may indicate the value of a functional ecological process (Mitch and Gosselink, 1986). For example, clean water associated with wetlands provides drinking water to upland species, and provides an uncontaminated environment necessary for many fish species, and ultimately, recreational value in the form of hunting and fishing for humans. Because wetland values are

determined by their benefit to humans, a wetland in one locality may be more highly valued than a wetland performing the same function in another locality.

Fish and Wildlife Habitat

Wetlands provide food and habitat for a variety of terrestrial and aquatic species including fish, birds, mammals, amphibians, reptiles, and invertebrates. Some of these animals are either fully or partially dependent on wetlands to complete their lifecycles. Most Commercially important fish species, for example, are wholly dependent on wetlands for spawning and nursery areas. Wetlands also provide breeding, feeding, and nesting habitats for a variety of waterfowl species and furbearers. Some species of frogs, toads, and salamanders depend on wetland habitat for their survival, and provide food for animals in higher trophic levels. Reptiles, such as turtles and snakes, use these areas for the same reasons as the above. Invertebrates such as aquatic insects are important in the maintenance of the food web.

Environmental Quality Benefits

Wetlands are considered among the most productive ecosystems in the world. Wetland plants produce more plant material than most very productive cultivated farm fields. Wetland plant communities sustain a high diversity of plant species including a large number of rare and threatened species in Delaware. Additionally, when the plants die and are broken down into detritus by bacteria and other microorganisms, they form the base of the food web that supports higher animals such as commercial fish species. Wetlands also help maintain and improve water quality. The following are specific environmental quality benefits of wetlands:

Pollutant removal (heavy metals, pathogens)

Sediment trapping

Nutrient uptake and recycling

Oxygen production

Socioeconomic Values

Some of the functions that wetlands perform are economically valuable, such as protection from flood and storm damage. Because these benefits provide dollar savings, they tend to be more appreciated.

The following are some socioeconomic wetland values:

Flood and storm water damage protection

Erosion control

Water supply and ground water recharge

Natural products supply (e.g., timber, fish, wildlife, firewood… etc.)

Recreation (e.g., waterfowl, fishing, boating, nature study… etc.)

Wetland Quantity

Estimates of wetland acreages have changed as more technologically refined techniques have been developed over the last couple of years. Until the advent of this higher resolution color

aerial infrared photography, it was found that much of the wetland land base was underestimated. In fact, previous estimates by Tiner (1985) assessed 221,800 total acres of tidal and nontidal wetlands in Delaware, while a recent estimate by the same author realized a more refined estimate of 353,868 (Tiner 2002). The higher figure reported in the latter estimate can, however, be attributed in part to the inclusion of 29,000 acres of nontidal agricultural wetlands that were intentionally omitted in the previous assessment effort (See table 1).

Table V-1. Current tidal and nontidal Delaware wetland acreage estimates (Tiner 2002).

Tidal wetlands	127,338
Nontidal wetlands*	226,530
Total wetland acreage	353,868

* Includes 29,000 acres of nontidal agricultural wetlands

I.2.1 The Statewide Wetland Mapping Project (SWMP) and Wetland Trends in Delaware (1981/2-1992)

In an attempt to improve existing wetland inventories, the State Wetlands Mapping Project (SWMP) was conceived as a collaborative effort between the Delaware Department of Natural Resources (DNREC), Delaware Department of Transportation (DELDOT), and the United States Fish and Wildlife Service (USFWS; Pomato 1994). Utilizing aerial color digital orthophotography, the SWMP maps (derived from same named project), employ a modified Cowardin et. al. (1979) hierarchical classification scheme for classifying Delaware's wetlands. These aerial color photographs provide higher level resolution "wetland signatures" than the older monochromatic National Wetlands Inventory (NWI) maps, which increases the precision and accuracy of wetland delineation, identification of vegetative types (e.g., broad-leaved deciduous, broad-leaved evergreen…etc), and the identification of hydrologic regimes (e.g., A, B, C…etc.).

Utilizing color infrared aerial photography for the decade-long time period (1981/2-1992), the service assessed statewide wetland losses, gains, and changes in wetland type by photo interpretation of "wetland signatures." Wetland trends were also assessed separately in the following four drainage basins: 1) Northern Piedmont, 2) Delaware Bay, 3) Chesapeake Bay and, 4) Inland Bays.

Statewide Wetland Losses (1981/2-1992)

Approximately 2000 acres of vegetated wetlands were destroyed from 1981/2 to 1992 time period. Most of the wetland losses were palustrine vegetated wetlands (1890 acres), while estuarine wetlands losses were minor. (106 acres; Tiner et al. 1999).

Agricultural activities had the greatest impact on Palustrine wetland losses (954 acres). Residential activities also destroyed significant amounts of wetlands (436 acres). The remaining wetland losses were derived from pond and road construction practices, with each being responsible for 7 percent of the losses. Palustrine vegetated wetlands accounted for 95 percent of all wetland losses in Delaware. Palustrine forested wetlands experienced the bulk of losses of all

palustrine vegetated types (1505 acres; Tiner et al. 1999). Most of the losses to estuarine wetlands were due to saltwater impoundments (52.2 acres). Filling in wetlands also accounted for some significant acreage losses (32.7acres). Highway road projects and residential development accounted for the balance of estuarine wetland losses (11 acres; Tiner et al. 1999).

Northern Piedmont Drainage Wetland Losses

The Northern Piedmont drainage is the smallest and most urbanized drainage basin in the state. About 9 percent of the state's land area fall within this drainage basin, which contains approximately 3.2 percent of the state's wetlands.

During this decade-long study period (1981/2-1992), palustrine vegetated wetlands experienced the greatest losses. These wetland s declined by 137.8 net acres. Of all palustrine vegetated types, palustrine forested wetlands experienced the greatest losses, with about 110 acres or 75 percent of total palustrine vegetated wetland being converted to uplands. Residential and Industrial development were the leading causes attributed to their destruction of 70 percent and 18 percent, respectively. (Tiner et al. 1999).

Estuarine wetlands were not subject to the same degree of destruction as palustrine wetlands during the decade long study period. Approximately 1 acre of wetlands was destroyed by conversion to industrial development, or impounded estuarine deepwater habitat (Tiner et al. 1999).

Delaware Bay Drainage Wetland Losses

The Delaware Bay Drainage is the largest drainage in Delaware. About 41 percent of the state's land area fall within this drainage basin, which also contains approximately 34 percent of the state's wetlands. From 1981/2-1992, palustrine vegetated wetlands experienced the greatest losses (679.2 acres), though estuarine wetlands experienced lesser, though not insignificant losses (78.4 acres; Tiner et al. 1999).

The primary agent in palustrine vegetated wetland destruction was residential development, accounting for about 35 percent of the losses. Agriculture and Highway road construction accounted for the remainder of the losses – about 28 percent and 10 percent, respectively (Tiner et al. 1999).

From 1981/2-1992, estuarine wetlands experienced net losses only second to palustrine vegetated wetlands (78.4 acres). The primary cause of their losses was conversion to estuarine open water impoundments and dredged channels (36.8 acres), miscellaneous filling practices (37.4 acres; Tiner et al. 1999).

Chesapeake Bay Drainage

The Chesapeake Bay drainage is the second largest drainage in Delaware (approximately 32 percent), and contains the greatest percentage of wetlands (approximately 54 percent) of the four drainages. Palustrine vegetated wetlands are the predominant wetland system type found in this basin. About 712 acres of palustrine vegetated wetlands, or 84 percent of these wetlands, were lost due to agricultural expansion during the 1981/2-1992 study period. Significant acreages of estuarine vegetated wetlands are not found in this basin (Tiner et al. 1999).

Most of the palustrine vegetated wetland losses were palustrine forested wetlands. Approximately 701 acres of these wetlands were destroyed during the 1981/2-1992 study period. Agricultural operations were responsible for 82 percent of the losses of this wetland type (Tiner et al. 1999).

Inland Bays Drainage

The Inland Bays Drainage is comprised of three coastal bays: Indian River Bay, Rehoboth Bay, and Little Assawoman Bay. This drainage comprises about 18 percent of Delaware's surface land area and contains both Palustrine and Estuarine wetlands. Consistent with the other three drainages, Palustrine vegetated wetlands experienced the greatest losses (Tiner et al. 1999).

A loss of 271.3 acres of palustrine vegetated wetlands were recorded during the 1981/2-1992 time period, of which forty-eight percent were directly attributed to agricultural operations. The remainder of the losses were agricultural and residential – about 20 percent and 24 percent, respectively (Tiner et al. 1999).

Forested wetlands bore the brunt of these losses. About 254.3 acres of forested wetlands were lost during the 1980s, which represents 90 percent of the drainage's palustrine vegetated wetland base. Palustrine deciduous forests experienced the greatest losses, with 178.4 acres converted to uplands or 70 percent of the palustrine forested wetland base. Agricultural activities were responsible for 38 percent of the total losses. Residential development and pond construction accounted for remaining wetland losses, 33 percent and 26, respectively (Tiner et al. 1999).

Wetland Quality

The State of Delaware is committed to assessing its wetland resources to understand the current condition of the resource and how this condition is changing over time. Understanding the condition of wetlands will allow the State and other conservation partners to better direct resources aimed at restoration and protection efforts to avoid impacts that will further lower the condition of wetlands and promote restoration of impacted wetlands. The goal of the Wetland Monitoring and Assessment Program (WMAP) of the Delaware Department of Natural Resources and Environmental Control (DNREC) is to assess the condition or health of wetlands and the functions and ecosystem services that wetlands provide. This information is then be used to inform the citizens of Delaware and to improve existing education, restoration, protection, and land use planning efforts. The Delaware Wetland Monitroing Strategy guides future efforts of the WMAP in the areas of protocol development, wetland monitoring and assessment activities, research, and application of information.

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Wetlands and Total Maximum Daily Load (TMDL) Regulations

As noted above, wetlands processes can be important in the removal and mitigation of excessive sediment, nutrients, and other pollutants. These pollutants have a direct bearing on the quality of water in the receiving waterbody. Delaware has recently enacted TMDL regulations to improve water quality in waterbodies that are not meeting their designated uses. The Department believes active preservation and restoration of high quality wetlands will be important components of a successful TMDL implementation process.

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Wetland Condition in the Nanticoke River Watershed (Maryland and Delaware)

The Maryland Department of Natural Resources (MD DNR) and the Delaware Department of Natural Resources and Environmental Control (DNREC) along with the Smithsonian Environmental Research Center, The Nature Conservancy and multiple other public and private groups collaborated to assess the condition of freshwater nontidal wetlands in the Nanticoke watershed. The goal of this project was to obtain baseline information on the condition of these wetlands and to gain an understanding of the stressors that are impacting wetland condition to target wetland protection and restoration activities.

The condition of nontidal wetlands in the Nanticoke River watershed was assessed using a probabilistic sampling design developed by EPA Ecological Monitoring and Assessment Program (EMAP). This approach allowed us to correct for biases due to access to sites and extrapolate the sample results to the entire population of wetlands in the watershed. We gained access to 67% of the privately owned sites to sample a total of 191 sites (54 riverine sites in 1999 and 2000, 89 flats in 2000 and 48 depressions in 2003). Additionally, we sampled 2 farmed wetlands and 4 excavated wetlands that were selected by EMAP but were not part of the target population and 29 restored wetlands that were randomly selected based on an inventory of restoration projects.

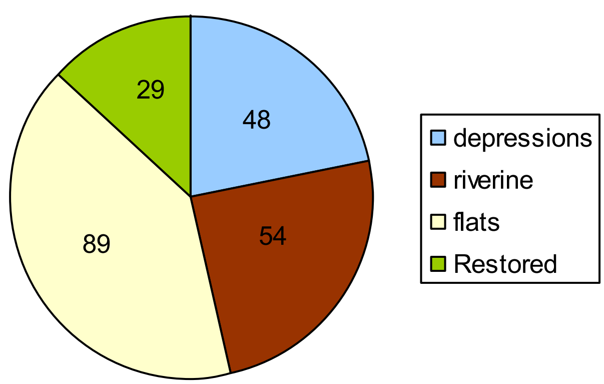

Figure 1 – number of random wetland sites sampled in the Nanticoke River watershed

Hydrogeomorphic (HGM) models were used to assess 5 functions for flat, riverine, and depressional wetlands.

> Maintenance of characteristic hydrology – the ability of a site to maintain typical water level fluctuations as compared reference sites of similar wetland type. Hydrology is the driver behind all other wetland functions and determines the capacity of a wetland to perform these functions.
>
> Biogeochemical cycling and storage – the ability of a wetland to perform biological and chemical processes such as nutrient cycling, carbon sequestration, and sediment storage as compared to reference sites of similar wetland type.

Plant community integrity – the ability of a wetland to support characteristic native vegetation as compared to reference sites of similar wetland type. The plant community in turn supports other processes and ecosystem services such as wildlife habitat, nutrient cycling and biodiversity.

Wildlife habitat integrity – the ability of a site to support characteristic wildlife species as determined by the structure of the vegetation and other physical characteristics of the site.

Buffer integrity – the condition of the adjacent habitat surrounding the wetland. Buffers in better condition provide protection of the wetland from stressors that can degrade all other functions and also provide linkages to other habitats such as uplands and streams to connect animal and plant populations and sustain processes that span large areas such as removal of nutrients.

HGM functions are composed of variables that are scaled to reference conditions in the Nanticoke River watershed and surrounding areas. Additionally, an index of wetland condition (IWC) was calculated that combines the strongest variables to produce an overall score of condition. Breakpoints in the IWC scores were determined to categorize sites into three condition classes: minimally or not stressed, moderately stressed, and highly stressed. To provide wetland protection and restoration recommendations, we used general patterns of wetland condition based on the scores of multiple functions at a site.

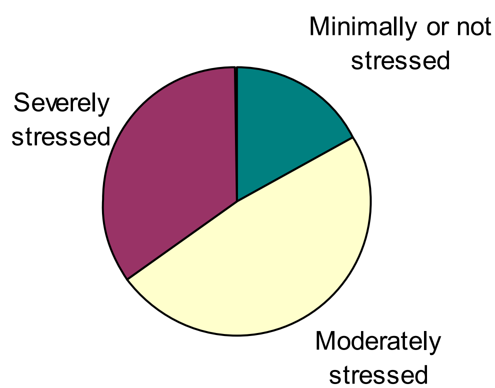

Figure 2. Condition of nontidal wetlands in the Nanticoke River watershed as determined by the Index of wetland condition

Overall, 17% of the nontidal wetlands in the Nanticoke River watershed are considered minimally or not stressed based on the IWC, 48% were moderately stressed and 35% were highly stressed. All wetland types had a low percent that were minimally altered for both hydrology and vegetation (16% of the riverine wetland area, 8% of flat wetland area, and 6% of

depressions) indicating the need to prioritize protection efforts on the few minimally impacted wetlands that remain.

Flats are the dominant wetland type comprising 71% of the wetlands in the watershed. Fifteen percent of flats were minimally or not stressed and 34% were highly stressed. The average functional scores varied with the plant community integrity having the lowest of 51% of reference condition whereas the buffer integrity function was performing the best at 90% of reference condition. The average wildlife habitat function score was 63 and the average plant community integrity function score was 50. Dominant stressors impacting wetlands and lowering condition were hydrology alterations due to ditching and vegetative alterations due to forestry practices, which alter species structure and composition.

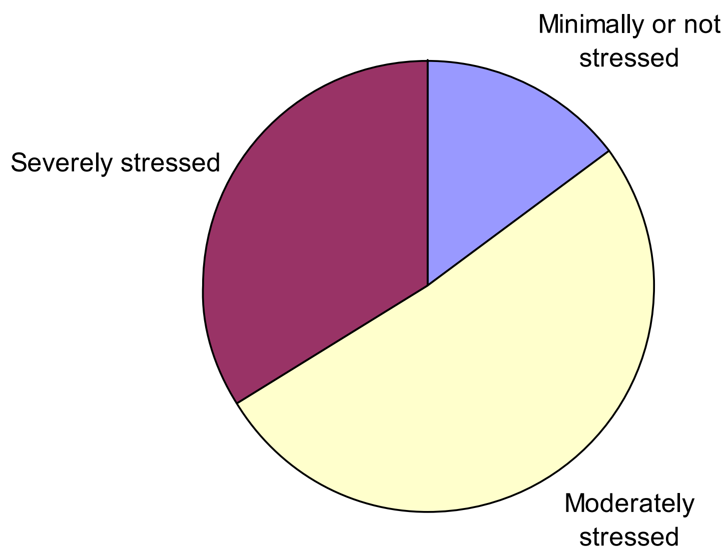

Figure 3. Condition of flat wetlands in the Nanticoke River watershed as determined by the Index of Wetland Condition.

Within flat wetlands, 58% of the wetland area has species composition and vegetative structure alterations that was not related to hydrologic alterations. Many of the vegetative alterations are due to the conversion of the native mixed hardwood forests to loblolly pine plantations, which alters species composition and structure of the vegetation community. Restoration for the flats subclass should focus on restoring a native vegetative community with a hydrology that is sustainable given current landscape level alterations. Enhancement of existing wetlands and re-establishment of former wetlands should focus on improving and increasing areas within and adjacent to large forest blocks.

The IWC for riverine wetlands averaged 69 with 30% of the riverine wetlands considered minimally or not stressed and 25% highly stressed. Biogeochemical cycling was functioning the lowest at an average of 45% of reference while the plant community integrity had the highest average function of 84. The wildlife habitat integrity and plant community integrity were functioning at higher levels compared to the flats because of lower incidence of direct alteration by agriculture, forestry, and development. The dominant stressor to riverine wetlands was

hydrologic alteration due to stream channelization. In the watershed, 86% of the nontidal streams are either channelized or ditched.

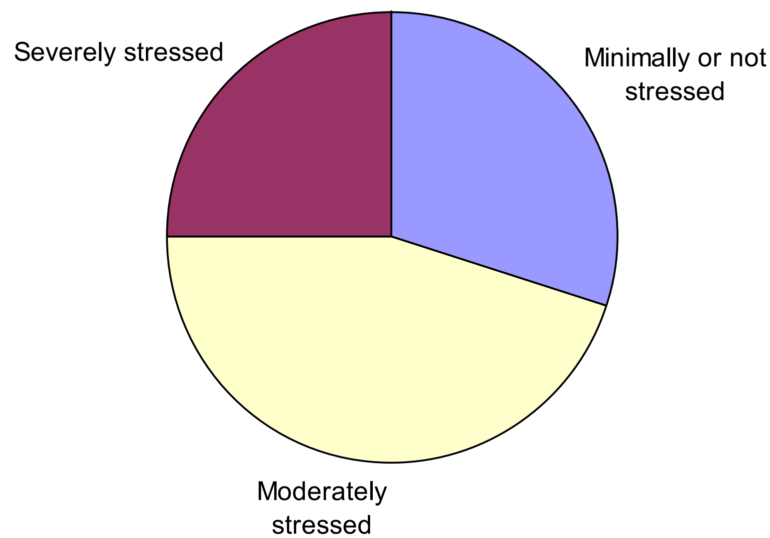

Figure 4. Condition of riverine wetlands in the Nanticoke River watershed as determined by the Index of Wetland Condition

The hydrology of 80% of the area of riverine wetlands is impacted primarily by channelization of streams, road crossings and dams. Of the riverine wetlands that had hydrologic impacts, 61% of these areas also had vegetative alterations. However, if the hydrology of the wetlands remained intact, only 4% of the wetlands had vegetative alterations. Therefore, riverine wetland restoration should focus foremost on hydrologic improvements. Sites that do not have species composition alterations (33%) should be targeted first to restore the hydrology before species composition shifts occur or non-native and invasive species become established.

Depressions had that highest levels of degradation compared to reference. They had an average IWC of 62 with only 22% of the wetlands minimally or not stressed and 44% highly stressed. The functions of depressions are significantly altered from reference standard condition with the average function values ranging from 58 for plant community integrity to 70 for buffer integrity. These low scores compared to reference standard condition for all functions are due to multiple

stressors that are impacting depressions and affecting all parts of the system.

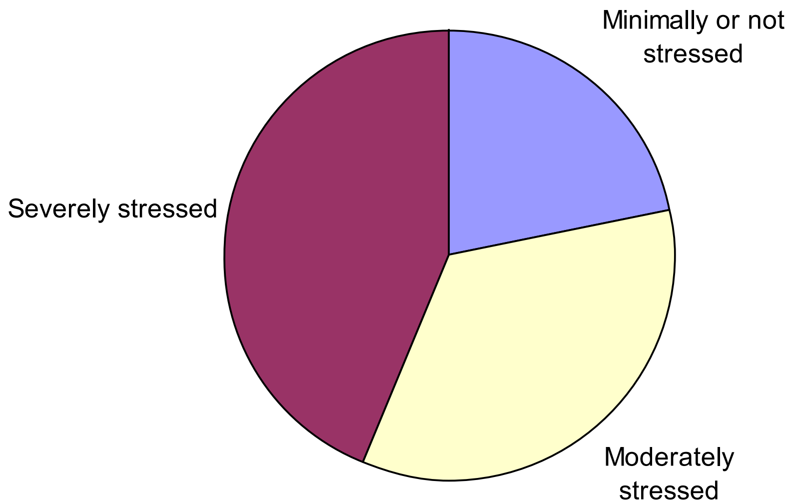

Figure 5. Condition of depressional wetlands in the Nanticoke River watershed as determined by the Index of Wetland Condition

Depressions have the highest levels of hydrologic and vegetative stressors and thus lowest condition of non-tidal wetlands in the watershed. Forty-two percent of the wetlands had altered hydrology and vegetative structure, and species composition shifts. Many of these wetlands are impacted by major stressors such as excavation, plowing, or extensive ditching. Restoration of depressional wetlands should be targeted on an individual site basis and within a larger landscape context to support the unique amphibian and bird species that rely on these unique wetland habitats.

All of the restored wetlands had increased function compared to farmed and excavated wetlands. However, the average IWC for restored wetlands was 26.5 and ranged from 10.0 to 47.8 which is a similar level of function as highly stressed natural wetlands. The low condition of restored wetlands reflects the lack of a mature vegetative community most notably trees due to the age of the sites (1 to 7 years post construction) or to the maintenance of early successional communities. We would expect the function scores to increase over time if natural successional processes are not inhibited.

Wetland restoration and protection activities need to be integrated into larger landscape level plans to ensure the ability of wetlands to perform functions and provide ecosystem services. To this end, three strategies are recommended in the following priority: protection, enhancement of existing wetlands, and restoration of former wetlands. These strategies are currently being combined into a restoration strategy for the Nanticoke Watershed by a multi-disciplinary team of wetland scientists and managers.

Protecting wetlands through fee simple acquisitions and conservation easements should be the highest priority strategy for maintaining wetland functions and services in the Nanticoke River watershed. Integrating protection of wetlands that are minimally or least stressed and their associated buffers with existing landscape conservation plans will ensure that these systems will remain in tact and be able to provide associated functions.

Enhancement activities should be used to increase the condition of these wetlands by reducing or eliminating the dominant stressors that are impacting different wetland types. These activities will likely produce a greater increase in function in the short term with less effort than attempting to restore former wetlands.

Restoring former wetlands is critical because it increases the acreage of wetlands in the watershed to recover functions from areas that have been effectively drained or changed to non-wetland habitats. Restoration of former wetlands also increases function from pre-restoration levels. More information is needed to understand the functions and services they provide and how these differ from natural wetlands. When restoring former wetlands, data from natural wetlands should be used as guidance during construction to ensure projects will be sustainable in the current landscape.

The full report, "Jacobs, A.D. and D.F. Bleil. 2008. Condition of nontidal wetlands in the Nanticoke River Watershed, Maryland and Delaware. Delaware Department of Natural Resources and Environmental Control, Watershed Assessment Section, Dover, DE 78pp" downloadable at:
http://www.dnrec.delaware.gov/Admin/DelawareWetlands/Pages/NanticokeWatershed.aspx or can be obtained from DNREC/ Division of Water Resources, Watershed Assessment Section, 820 Silver Lake Blvd., Ste 220, Dover, DE 19904 or by calling 302-739-9939.

Wetlands Condition of the Inland Bays Watershed

Volume 1: NonTidal Wetlands

The Delaware Department of Natural Resources and Environmental Control (DE DNREC) and The Center for the Inland Bays assessed the condition of freshwater nontidal wetlands in the Inland Bays watershed. The goal of this project was to report on the condition of these wetlands across the watershed and identify the stressors that are impacting wetland condition in order to guide wetland protection and restoration activities. Tidal wetlands (meso- to polyhaline tidal fringe) were assessed in 2008 and will be included in Volume II of this report in 2009.

Wetlands perform a variety of functions related to hydrology, nutrient cycling and storage, and the plants and wildlife that inhabit these areas. These functions support ecosystem services to the watershed such as reducing flooding, maintaining stream flows, preventing erosion, improving water quality by removing nutrients and pollutants, providing habitat for wildlife, and sustaining globally rare plant species. Large portions of historic nontidal wetlands in the Inland Bays have been lost to date, over 60% in several subwatersheds, which makes existing wetlands even more important. Understanding the condition of wetlands on a local scale and how this affects the functions and services that they provide is needed to better direct the State and its conservation partners to allocate resources for wetland restoration and protection efforts across the Inland Bays watershed.

We assessed the condition of nontidal wetlands in the Inland Bays watershed using a probabilistic sampling design developed by EPA Ecological Monitoring and Assessment Program (EMAP). This approach allowed us to correct for biases due to site access and allowed us extrapolate the sample results to represent the entire population of wetlands in the watershed. We reported on the two most prevalent nontidal wetland subclasses (flats and riverine) in the

Inland Bays. Riverine wetlands adjacent to natural streams provide storage for overbank flow, subsurface water, and precipitation. Interactions with surface water improve water quality and reduce downstream flooding (DE DNREC 2001, NRCS 2008). Flat wetlands, are typically located at the headwaters of the watershed and the interfluvs between streams, have poor vertical drainage and are fed by precipitation and groundwater. In the Inland Bays watershed, the majority of flats are in the poorly drained southern portion. These wetlands can absorb heavy precipitation and filter water slowly to surface and groundwaters, prevent flooding downstream, improve water quality, and provide wildlife habitat in large forested areas (DE DNREC 2001, NRCS 2008).

From a pool of randomly selected wetlands across the watershed we attempted to access 386 riverine and flat nontidal wetland sites on public or private land in 2005 and 2006. Overall, we had a 66% rate of success for gaining access to

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the wetlands in the watershed. From 137 privately owned riverine sites we attempted to access, 9% were denied by the landowner, 41% of landowners did not respond to our request, and 50% granted access. Of our 50 sampled riverine sites, 84% were on private land and 16% were on public land. From 101 privately owned flats sites, 32% were denied by the landowner, 29% did not respond and 40% granted access. Of the 49 sampled flats sites, 51% were on private land, 37% were in a private conservation area known as the Cypress Swamp and 12% were on public land.

We sampled 50 nontidal riverine sites and 49 nontidal flats wetlands using the Delaware Rapid Assessment Protocol (DERAP). The DERAP takes a field crew of 2-4 people 30 minutes to 2 hours to complete and collects data on the presence and intensity of 41 stressors related to habitat, hydrology and buffer features (Jacobs 2007a). We also sampled 25 of the riverine sites and 24 of the flats sites with the Delaware Comprehensive Assessment Protocol (DECAP). The DECAP requires a field crew of 4-5 people and 3-6 hours of field work and collects more detailed, quantitative data on 20 variables related to vegetation, soils, hydrology, topography, and surrounding landuse (Jacobs et al. 2008). We summarized the condition of wetlands by subclass, using wetland functions and an Index of Wetland Condition (IWC) which ranged from 0 to 100 with 100 being closest to reference standard. We also isolated the common stressors affecting each wetland subclass in the watershed.

Hydrogeomorphic (HGM) models were used to assess 5 wetland functions for flats and riverine wetlands: maintenance of characteristic hydrology, biogeochemical cycling and storage, plant community integrity, wildlife habitat integrity, and buffer integrity. HGM functions are composed of DECAP variables that were scaled to reference conditions in the Nanticoke River and Inland Bays watershed and surrounding areas. Additionally, an index of wetland condition (IWC) was produced that combined the strongest variables to produce an overall score of condition for each subclass.

Flats wetlands in the Inland Bays watershed scored an average IWC value of 80.7±15; 18% were classified as highly stressed, 40% moderately stressed and 42% minimally or not stressed. Plant Community Integrity had the highest functioning average of 85.8%±13 and the highest scoring composition due to a low occurrence of invasive plants, high shrub species richness, and a high occurrence of wetland indicator tree species. Buffer Integrity was functioning well with an average of 82%±18 but had some channelized streams and ditches (30%), and trails (34%)

present. The Wildlife Habitat Integrity function averaged 77%±14 due to high scoring tree density, as well as shrub density and tree basal area, but had habitat stressors such as forestry activities within 50 years (34% of flats), and garbage and isolated dumping (26% of flats) present. The Maintenance of Characteristic Hydrology averaged 71%±34 and the scoring distribution highlighted that severe alterations to hydrology (e.g. ditching for agriculture or forestry) have been concentrated to a portion of flats wetlands, leaving other portions largely intact and few in the middle. The Biogeochemical Cycling and Storage function is based on the hydrology FCI and tree components, and averaged only 55%±29 which reflected low hydrology functioning in combination with low occurrence of deadwood.

Because the Cypress Swamp was owned by a conservation partner we considered if the condition of these wetlands would be different. We separated data for the Cypress Swamp flats sites and compared their condition scores and stressors to privately and publicly owned sites. We found that the average IWC ($F_{23,1}=9.34$, $P=0.044$), Plant Community ($F_{18,1}=6.42$, $P=0.002$) and Buffer Integrity ($F_{16,1}=9.34$, $P=0.001$) function averages were greater in the Cypress Swamp. Also, on average sites in the Cypress Swamp had fewer stressors present (2.6) compared to the other flats sites (6.4). Common stressors found in both types were found less frequently at Cypress Swamp sites as well.

The IWC for riverine wetlands in the Inland Bays averaged 64.3±24. Based on the IWC, 32% of nontidal riverine wetlands were minimally or not stressed, 32% were moderately stressed and 36% were severely stressed. The presence of channelized streams in the assessment area and in the buffer, invasive plant species, garbage and isolated dumping, and fill or excavation in the wetland were the stressors most commonly affecting riverine wetlands in the Inland Bays watershed. Due to the pervasive hydrologic alterations through ditching and channelization, Hydrology and Biogeochemistry had the lowest functioning averages of 33.7±35 and 28.7±31, respectively. The Plant Community function averaged 67.6±23 and was affected by the presence of invasive species and shifted plant species composition. Buffer Integrity performed well with an average of 70.8±25, but was still affected by the presence of channelized streams and ditches, septic systems and row crops or nurseries within 100m of the wetland. Wildlife Habitat had the highest functioning average of 73.2±22.

An overall evaluation of all nontidal wetlands in the watershed including flats, riverine, ponds, and farmed wetlands found that 38% of the nontidal wetlands were minimally or not stressed, 37% were moderately stressed, and 25% were highly stressed. This perspective gives a simple view of nontidal wetland condition in the Inland Bays watershed; over a third of the nontidal wetlands are minimally stressed and are functioning relatively well, but one quarter have been severely altered and, as a result, are not able to function well and provide the caliber of ecological benefits to the residents of the State of Delaware.

Prioritizing wetland protection and restoration efforts on the watershed level will encourage a proactive approach to improving the condition of wetlands and provide direction for stakeholders performing restoration activities. This will ensure that projects are strategically targeted to maximize wetland performance and that resources and funding are effectively utilized. Protecting the condition and acreage of wetlands in the Inland Bays is critical. Because we have lost over 60% of the wetland resources and degraded many of those that remain, the functions and services that the remaining wetlands provide are essential to maintaining the ecological integrity of the Inland Bays watershed and the Bays. All wetlands need to be protected from conversion to other land uses or degradation to a lower condition due to activities within and

surrounding the wetland. Funds for protection should be used for high condition wetlands and wetlands that are part of large intact areas first. We recommend that restoration focus first on improving the condition of existing wetlands by eliminating stressors and protecting healthy areas. Working with existing wetlands is more cost-effective, returns greater function improvements, and has a greater likelihood of success. Re-establishing wetlands is the only way to increase our wetlands acreage, but should be performed with funds that are designated for wetland re-establishment only and cannot be used for protection or enhancement of existing wetlands. We recommend the following specific objectives:

Improve protection of nontidal wetlands through state and local regulations, fee simple acquisitions and conservation easements, and outreach and community involvement.

Ensure that wetland functions are replaced before permitting the destruction or degradation of wetlands.

Prioritize restoring hydrology to riverine wetlands by removing stream channelization and reconnecting surface water flow to wetlands.

Encourage the use of best management practices to protect flats wetlands from additional stressors.

Focus protection and re-establishment of flats with the goal of increasing large forested wetlands.

Develop a watershed restoration plan based on the best available science to prioritize areas for protection, enhancement, and re-establishment of wetlands.

Use outreach within the watershed to better inform the general public about the status and value of their local wetland resources and ways in which they can reduce indirect wetland impacts.

Wetlands Condition of the Inland Bays Watershed

Volume 2: Tidal Wetlands

The Delaware Department of Natural Resources and Environmental Control (DE DNREC) assessed the condition of tidal wetlands in the Inland Bays watershed. The goal of this project was to determine the condition of estuarine intertidal emergent wetlands in the Inland Bays watershed and identify the presence of wetland stressors. This information will then be used to guide protection and restoration activities. Volume I of this report provides general watershed characteristics and information on nontidal wetlands in the Inland Bays watershed.

The Inland Bays watershed contains 9,825 acres of salt or brackish tidally-influenced wetlands along river and bay shorelines and behind barrier islands. High human population density especially near the coast has brought stressors associated with development that can impact wetlands and diminish the services and functions that they provide. Sudden wetland dieback (SWD) was first documented in Delaware in 2006 in the Inland Bays watershed. This condition is characterized by the rapid and partial or complete death of emergent saltmarsh vegetation or the failure of that vegetation to grow during one or several growing seasons.

We assessed the condition of wetlands using the MidAtlantic Tidal Rapid Assessment Method (MidTRAM) at 50 randomly selected sites in the watershed. We had an 89% success rate for gaining access to sites. Sites were equally dispersed between wetlands that had been affected versus not affected by SWD. At a subset of sites we also sampled vegetative biomass and the marsh bird community.

The average MidTRAM condition score was 70±10 on a scale of 0 to100; 28% were categorized as severely stressed, 56% moderately stressed and 16% minimally or not stressed. Hydrology was the highest scoring attribute group with an average of 74±10. The most common hydrology stressors across the watershed were wetland diking and tidal restriction mainly due to the Indian River Inlet, and wetland ditching and draining. The buffer attribute group averaged 68±21 and was most commonly scored down for landscape condition due to invasive plants and human disturbance. Also, we found that 30% of tidal wetlands had upland barriers to marsh migration such as bulkhead, houses or roads, with restrictions varying from 0 to 100% of the landward shoreline. The presence of development in the surrounding buffer was also a common stressor. The habitat attribute group averaged 70±16 and was most commonly scored down for the presence of *Phragmites australis*. Compared to the Murderkill and St. Jones watershed of the Delaware Bay, the Inland Bays had the greatest percent of wetlands that were severely stressed.

Overall, our comparison of MidTRAM scores to the marsh bird index of integrity and above and below ground vegetative biomass were inconclusive, likely due to small sample 2 sizes. However, there was a pattern of increasing marsh condition with higher amounts of below ground biomass which is concurrent with previous research.

Comparisons between the 20 assessment sites affected by SWD and the 30 sites unaffected by SWD did not show any differences in overall condition or between the buffer, hydrology, and habitat attributes. The similarity in scoring between affected and not affected sites indicated that, based on the rapid indicators of MidTRAM, SWD did not have a lasting effect on the overall condition of tidal wetlands 2 years after it was first detected. More intensive vegetative cover and elevation data at four monitoring stations from 2006 to 2008 suggested that the resilience of the marsh vegetation to recover after SWD may be related to surface elevation. The 4 sites showed varying levels of recovery with elevation trends.

Based on our observations of tidal wetland condition in the Inland Bays we offer recommendations to improve the management of wetlands and identify additional data needs. These actions will improve the future of tidal wetlands in the Inland Bays:

1. Protect tidal wetlands from further degradation by minimizing activity in wetlands and in the adjacent buffers. Even small permitted activities can have large cumulative impacts across the watershed.

2. Enforce buffer regulations and allow migration of wetlands with future climate change. Riparian buffers will maintain wetland condition, will allow wetlands to shift with sea level rise and will ensure continued wetland services into the future.

3. Determine the stressors that are having the greatest impact on tidal wetland condition and focus on these for restoration and enhancement activities. Determine the relationships between wetland stressors and wetland functions to help direct management activities.

4. Further evaluate the relationship between wetland condition, elevation, and biomass to make informed decisions to improve tidal wetland resiliency to future stressors. This, in addition to

more information on wetland subsidence and accretion rates, will provide information to understand how tidal wetlands will be affected by sea level rise, sudden wetland dieback and other future stressors as well as the best management action to limit negative impacts.

5. Monitor changes in wetland condition over time. Trends over time can then be used to implement adaptive management practices and adjust protection and restoration priorities and management actions.

The full reports, "Jacobs, A., A. Rogerson, D. Fillis, and C. Bason. 2009. Wetland condition of the Inland Bays watershed. Volume 1. Delaware Department of Natural Resources and Environmental Control, Watershed Assessment Section, Dover, Delaware, USA" and "Rogerson, A., A. Howard, and A. Jacobs. 2009. Wetlands condition of the Inland Bays watershed. Volume 2. Delaware Department of Natural Resources and Environmental Control, Watershed Assessment Section, Dover, Delaware USA".are downloadable at: http://www.dnrec.delaware.gov/Admin/DelawareWetlands/Pages/InlandBays.aspx

or can be obtained from DNREC/ Division of Water Resources, Watershed Assessment Section, 820 Silver Lake Blvd., Ste 220, Dover, DE 19904 or by calling 302-739-9939. Rogerson, A., A. Howard, and A. Jacobs. 2009. Wetlands condition of the Inland Bays watershed. Volume 2. Delaware Department of Natural Resources and Environmental Control, Watershed Assessment Section, Dover, Delaware USA.

Condition of Wetlands in the St. Jones River Watershed

The Delaware Department of Natural Resources and Environmental Control (DE DNREC) assessed the condition of wetlands in the St. Jones River watershed in 2007-2008. The goal of this project was to determine the condition of both tidal and nontidal wetlands in the St. Jones River watershed and changes in wetland acreage, and to identify the presence of wetland stressors that are degrading wetlands. We will use wetland condition, stressor information and watershed wide trends to guide and improve future protection and restoration activities, education and effective planning to ensure the conservation Delaware's wetland resources.

Located in Kent County Delaware, the St. Jones River watershed covers 23,327ha (57,643ac) of the Delaware Bay and Estuary Basin. The St. Jones River is dammed at Silver Lake in Dover and then winds 16km (10mi) through residential and commercially developed areas, the Delaware National Estuarine Research Reserve, and the Ted Harvey Wildlife Area before emptying into Delaware Bay. Flat wetlands, usually forested, exist mostly in the upper portion of the watershed and eventually drain into tributary creeks and streams. Nontidal riverine wetlands and tidal emergent wetlands line the banks of the river, sometimes up to 1km wide toward the mouth of the river. Wetlands comprise 3,913ha (9,669ac) of the watershed and provide critical services such as nutrient removal, erosion control, habitat for plants and wildlife, flood abatement, and storm water detention to the citizens of Delaware. The extent to which wetlands can perform these functions and thrive in the future depends on their condition.

We evaluated changes in acreage for major wetland subclasses by comparing the 1994 state wetland inventory to historic wetland acreage based on hydric soils. Our comparison indicated that 47% of the wetland acreage has been lost from the St. Jones River watershed since the time

of settlement. The loss of 57% of nontidal wetlands was largely accounted for by conversion to cropland or residential development. Tidal wetland loss occurred mostly at tributary headwaters where the high tide line has risen and in coastal towns where development has increased.

To assess the condition of wetlands and identify the prominent stressors affecting wetland health, we applied a rapid assessment method to random sites across the watershed on nontidal flat, riverine, and depressions, as well as tidal wetlands on both private and public land. We used a probabilistic sampling design that allowed us to correct for site access and extrapolate sample results to represent the entire wetland population in the watershed.

We completed rapid assessments on 32 flats, 29 riverine, 5 depressions and 50 tidal sites. Each assessment method evaluated indicators of condition and stressors related to plant community, hydrology and wetland buffers. We also collected more intensive data from a subsample of sites, including detailed

vegetation measurements, soil characterizations, surveys of the bird community and quantification of vegetative biomass.

Tidal wetlands were in fair condition with an average condition score of 76 out of 100. The highest condition sites scored over 90 and were characterized as having undisturbed hydrology, little to no development or barriers to marsh migration, extensive buffers and very little invasive plant cover. The most degraded wetlands scored as low as 39 and were characterized by severe wetland diking and tidal restrictions, disturbed buffer condition, and low density of below ground plant fragments. Overall, hydrology features appeared to be less impacted compared to habitat and buffer features. Compared to the nearby Murderkill and Inland Bays watersheds, the St. Jones River had the highest average tidal condition and the largest portion of tidal wetlands considered to be minimally or not stressed by disturbance.

Intensive surveys of the avian community and vegetative biomass indicated that tidal sites with higher wetland condition scores had lower avian species richness composed of primarily wetland specific species. Lower condition sites had greater species, but also included more upland species. We did not see a relationship between site condition scores and the marsh bird community index. Wetlands with greater condition scores had greater amounts of total below ground biomass and had a greater ratio of total above to total below ground biomass.

Historically, large areas of headwater flats have been lost, mostly to agricultural production and development. Thirty-five percent of wetlands across the watershed were flats and had an average condition of 81, ranging from 57 to 94. Using condition categories, 37% of flat wetlands were minimally stressed, 47% were moderately stressed, and 16% were severely stressed. Among the 1,385ha of flats, over half (53%) had not been forested (e.g. clear-cut, selective cut) in at least 50 years. Flats in higher condition had minimal garbage or dumping, low coverage by invasive plants, minimally altered microtopography, and had a low occurrence of wetland ditching. Forestry activity, such as cutting and harvesting, within wetlands as well as development and agriculture in buffers appeared to be the major source of stressors.

Riverine wetlands, found adjacent to streams and rivers, accounted for 24% of the watershed's wetland acreage and had an average condition score of 72. Over half (55%) were considered minimally stressed, with low occurrences of invasive species, fill, and ditching, but frequently had dumping in addition to development and roads in the buffer. The severely stressed portion (10%) had condition scores as low as 27, related to the high prevalence of forestry activity,

dumping, fill, storm water inputs and development within the buffer. The presence and intensity of development (residential, commercial and/or transportation) in the 100m *St. Jones River Watershed Report* 3

assessment site buffer were related to the prevalence of wetland stressors such as storm water inputs, invasive plants and garbage or dumping.

Based on our findings, we offer specific recommendations to improve wetland management, to maximize the natural benefits of tidal and nontidal wetlands, and encourage informed decisions concerning the future of wetlands.

1. Improve protection of nontidal wetlands through improved regulations on the state and municipal level, conservation easements and education of citizens and decision makers.

2. Protect tidal wetlands from further degradation and prepare for future changes by utilizing existing regulations and land use planning to their fullest extent. Track permitted impacts thoroughly.

3. Focus on restoring and re-establishing degraded and fragmented flat wetlands to improve wetland services such as improving water quality, providing wildlife habitat and maintaining native biodiversity.

4. Improve tidal wetland buffer regulations by consistently enforcing codes, promoting natural shorelines in lieu of shoreline stabilization and requiring natural plant communities and the removal of invasive plants.

5. Improve nontidal wetland buffer regulations by updating regulations to begin at the wetland-upland boundary, by protecting buffers from disturbances and by requiring forested buffers.

6. Collaborate with the Delaware National Estuarine Research Reserve and their Coastal Training Program to enhance education and outreach efforts and share our coastal wetland information with professionals and decision makers.

7. Design a restoration plan for the St. Jones River watershed that identifies restoration and protection priority areas pertinent to the county, state, federal and non-profit organizations.

8. Ensure that wetland functions are replaced before permitting the destruction or degradation of wetlands by adopting assessment methods into the Army Corps of Engineers review process and by strictly enforcing current guidelines.

9. Control the extent and spread of invasive plants to improve wetland condition, promote native communities and improve biodiversity.

The full report, “Rogerson, A.B., A.D. Jacobs, and A.M. Howard. 2010. Wetland condition of the St. Jones River Watershed. Delaware Department of Natural Resources and Environmental Control, Watershed Assessment Section, Dover, USA. 66p. “ can be downloaded from http://www.dnrec.delaware.gov/Admin/DelawareWetlands/Pages/DataPortal.aspx.

Appendices

Appendix A: Citizen Monitoring Program Data Summaries

UD Citizen Monitoring Program
Dissolved Oxygen Statistics
9/1/04 - 8/31/09, Sites with Measurements < 4

Test Site Code	Test Site Location	# of DO Samples	Average DO (mg/L)	# of DO Samples less than 4.0 mg/L
	Delaware Bay			
DB01	End of Cape Shores pier	68	8.38	0
	Broadkill Watershed - Fresh			
BR06	Ingram Ditch at the intersection of Rds 212 and 231.	49	6.92	1
BR10	Ingram Branch at Rt 319	106	5.98	5
BR48	Diamond Pond	73	9.60	1
	Broadkill Watershed - Tidal			
BR01	Broadkill river @ PEL dock.	67	6.38	5
BR02	Prime Hook Creek NWR Petersfield Ditch water control structure, 50m N of	16	7.96	0
BR03	Prime Hook Creek at Boat Ramp at Refuge Headquarters	125	5.08	45
BR13	2707 S. Bayshore Drive	8	3.94	4
BR19	Canary Creek at New Road	99	4.02	58
BR20	Broadkill River at Milton tidal pond	48	8.46	0
BR21	Old Mill Creek downstream from Red Mill Pond	151	4.16	84
BR40	Canary Creek at Pilottown Rd	131	6.15	19
	Rehoboth Bay Watershed			
AC2S	DNREC Site, Arnell Creek, surface sample	20	7.07	2
ML	Massey's Landing	32	7.12	0
RB02	Lewes - Rehoboth Canal at Lewes	122	5.91	10
RB03	Lewes - Rehoboth Canal at Harbor View Road	11	4.67	3
RB04	Herring Creek, Mid-Section	48	7.84	0
RB05	Mouth of Guinea Creek (Pot Nets Creekside)	158	6.05	28
RB06	Guinea Creek (Winding Creek Village)	132	6.49	5
RB06A	Guinea Creek @ Rd 298 Bridge	15	8.74	0
RB07	West Bay Park	157	6.69	11
RB08	Lewes City Dock	5	3.80	3
RB34	Love Creek at Rt 24 Bridge	67	6.43	4
RB40	Burton Prong	5	8.60	0
RB46	Torquay Canal at East bulkhead on Land's End.	17	5.18	5
RB55	Hopkins Prong	10	10.40	0
RB60	Community Dock at Creek's End	21	7.11	1
RB69	Torquay Canal DNREC site. TC1	19	7.70	1
RLC2S	DNREC site, upper Love Creek	20	8.75	0
	Indian River Watershed			
IR03	Yellow Bank	36	5.77	7
IR04	Warwick Cove	130	8.38	4
IR07	Holt's Landing State Park	22	5.78	1
IR11	Pot Nets Seaside Pier	124	6.95	0
IR12	Broken marshes, 1/4 mile SE of Quillens Point - 300 Bayfront Drive	109	7.28	4
IR20	Bay Colony	121	5.40	35
IR21	Entrance to Boat House Pond, Indian River Bay	131	5.78	31
IR23	Bethany Marina	40	6.72	2
IR29	Holly Terrace Acres Canal, White Creek	110	4.37	61
IR32	Holly Terrace Acres Canal Dead End, White Creek	30	5.00	13
IR36/36B	James Farm, base of Pasture Point or, Knee deep 150 yds from shore	28	7.32	0
IR38	Vines Lane	109	5.87	27
IR39	North side of Inlet at Wheelchair fishing platform under new bridge.	34	7.02	0
IR50	Assawoman Canal at N end, marina dock	17	4.39	9
IR59	White Creek - west prong near Food Lion	13	4.06	8
IR60A	Ocean View; E Branch of White Creek	15	3.79	10
IR62	Loop Canal, Pa Ave terminus, Bethany Beach	20	2.41	17
IR64	Bethany Beach canal off dead end at 3rd street East of Evans Rd.	13	2.78	10
IR73	Western edge of Salt Pond	16	4.41	7
	Little Assawoman Bay Watershed			

UD Citizen Monitoring Program
Dissolved Oxygen Statistics
9/1/04 - 8/31/09, Sites with Measurements < 4

LA03	Mulberry Landing	77	7.10	6
LA09	Dirickson Creek at Road 381 bridge.	33	5.13	14
LA10	Assawoman Canal @ Kent Ave Bridge	114	4.97	43
LA20	Swann Keys: boat ramp at S end of Blue Teal Rd	11	3.17	9
LA21	Williams Creek tributary, bridge on Rd 364a	14	3.05	12
LA31	Double Bridges road bridge at Plantation Park	13	3.44	9
LA43	Fenwick Island Lagoon	147	6.22	33
LA44	Fenwick Island Cove	147	6.66	17
LA45	Fenwick Island Bayside	151	6.82	9
SB01	Anchorage Canal @ Rt 1	47	5.32	14
SB02	Anchorage Canal near elbow	35	5.65	6
SB04	Petherton canal/rt1	45	4.76	21
SB05	Petherton canal, between lots 156 and 162	12	4.87	2
SB07	Layton Canal, South Bethany	96	5.60	18
SB09	Carlisle canal	43	4.74	21
SB10E	Russell Canal east dead end	39	3.63	24
SB10W	Russell Canal west dead end	57	4.29	29
SB12	Jefferson Canal West side @ tidal gage	45	5.87	7
Assawoman Bay Watershed				
BA01	Keenwick on Bay, Roy Creek	25	6.27	2

UD Citizen Monitoring Program
Total Suspended Solids, Chlorophyll a, Nutrients (DIP and DIN) and Total Enterococcus Statistics
9/1/04 - 8/31/09

Test Site Code	Test Site Location	# of TSS Samples	Average TSS (mg/L)	# of Chl a Samples	Average Chl a (µg/L)	# of DIP Samples	Average DIP (µM)	# of DIP Samples >0.3 µM (>0.01 mg/L)	# of DIN Samples	Average DIN (µM)	# of DIN Samples >10 µM (>0.14 mg/L)	# of TE Samples	# of Tidal Water TE Samples >35 Colonies per 100 mL	# of Fresh Water TE Samples >100 Colonies per 100 mL
	Delaware Bay													
DB01	End of Cape Shores pier	0		0		0			0			48	2	
	Broadkill Watershed - Fresh													
BR06	Ingram Ditch at the intersection of Rds 212 and 231.	64	6.0	64	2.5	35	0.75	27	35	572.5	35	58		42
BR10	Ingram Branch at Rt 319	70	7.5	71	2.6	37	9.48	37	37	1396.6	37	66		57
BR44	Wagamon's Pond, Milton	32	12.2	33	43.0	9	0.54	5	9	208.2	9	31		8
BR48	Diamond Pond	67	6.3	67	9.3	33	0.42	18	33	271.6	33	62		2
	Broadkill Watershed - Tidal													
BR01	Broadkill river @ PEL dock or, by boat	76	81.7	76	14.0	42	0.44	21	42	19.9	16	80	13	
BR02	Prime Hook NWR Petersfield Ditch water control structure, 50m	32	35.1	32	38.5	9	0.41	6	9	66.7	3	33	15	
BR03	Prime Hook Creek at Boat Ramp at Refuge Headquarters	64	42.4	64	58.9	34	0.83	25	34	25.7	13	59	38	
BR04	Prime Hook NWR Osprey area near Walls Island water control	13	230.8	14	190.0	9	14.17	9	9	259.5	9	14	12	
BR132	Deep Hole Creek	14	93.7	14	21.8	9	0.94	9	9	81.7	9	13	8	
BR19	Canary Creek at New Road	54	44.0	54	38.2	31	0.88	29	31	47.8	26	54	46	
BR20	Broadkill River at Milton tidal pond	68	4.6	68	9.0	34	0.27	5	34	250.8	34	63	21	
BR21	Old Mill Creek downstream from Red Mill Pond	63	29.5	63	48.6	34	0.37	14	34	63.3	23	58	50	
BR40	Canary Creek at Pilottown Rd	66	71.1	67	12.2	36	0.53	24	36	23.2	20	62	12	
	Rehoboth Bay Watershed													
ML	Massey's Landing	82	85.2	82	9.2	73	0.36	38	73	22.5	31	73	1	
RB02	Lewes - Rehoboth Canal at Lewes	70	93.4	71	11.9	62	0.60	43	62	35.0	44	69	11	
RB04	Herring Creek, Mid-Section	59	61.8	59	21.7	55	0.13	0	55	42.7	43	52	14	
RB05	Mouth of Guinea Creek (Pot Nets Creekside)	81	73.0	81	16.7	72	0.15	5	72	33.2	54	74	10	
RB06	Guinea Creek (Winding Creek Village)	81	45.6	81	22.7	72	0.28	18	72	70.1	67	75	56	
RB06A	Guinea Creek @ Rd 298 Bridge	71	28.1	71	26.2	71	0.38	27	71	122.6	69	64	58	
RB07	West Bay Park	82	71.3	82	13.9	73	0.44	32	73	24.7	36	74	13	
RB34	Love Creek at Rt 24 Bridge	80	43.1	81	55.6	71	0.30	19	71	59.3	62	73	51	
RB60	Community Dock at Creek's End	0		0		0			0			15	10	
	Indian River Watershed													
IR04	Warwick Cove	82	66.1	82	34.4	73	0.69	37	73	61.9	69	74	19	
IR11	Pot Nets Seaside Pier	81	78.6	81	9.1	72	0.44	39	72	23.8	31	74	10	
IR20	Bay Colony	70	60.7	70	19.1	63	0.92	41	63	53.1	60	65	14	
IR21	Entrance to Boat House Pond, Indian River Bay	0		0		0			0			60	9	
IR23	Bethany Marina or North Lagoon	0		0		0			0			27	3	
IR32	Holly Terrace Acres Canal Dead End, White Creek	75	63.1	77	43.9	68	0.42	26	68	53.8	56	69	27	
IR36/36B	James Farm, base of Pasture Point or, Knee deep 150 yds from	42	69.4	43	11.9	36	0.48	19	36	26.2	20	38	7	
IR38	Vines Lane	22	68.9	22	31.8	13	0.47	7	13	77.9	13	22	9	
	Little Assawoman Watershed													
LA03	Mulberry Landing	78	53.0	78	17.9	70	0.16	5	70	30.8	40	71	12	
LA09	Dirickson Creek at Road 381 bridge.	81	31.8	82	43.3	72	1.94	60	72	91.5	50	74	64	
LA10	Assawoman Canal @ Kent Ave Bridge	28	56.5	28	10.9	19	0.34	8	19	49.1	19	29	27	
LA45	Fenwick Island Bayside	66	60.6	66	13.6	58	0.12	2	58	25.6	34	57	38	
SB01	Anchorage Canal @ Rt 1	21	35.6	21	22.4	12	0.43	6	12	39.8	12	29	17	
SB02	Anchorage Canal near elbow	0		0		0			0			19	3	
SB04	Petherton canal/rt1	0		0		0			0			29	23	
SB07	Layton Canal, South Bethany	22	52.5	22	12.2	13	0.23	1	13	45.3	13	38	10	
SB09	Carlisle canal	0		0		0			0			14	2	
SB10W	Russell Canal west dead end	0		0		0			0			19	5	
BA01	Keenwick on Bay, Roy Creek	79	65.4	79	12.6	53	0.13	5	53	14.6	25	69	14	

Appendix B

Commenter: Center for Biological Diversity

Comment: On behalf of the Center for Biological Diversity, I am writing to request that the Delaware Department of Natural Resources and Environmental Control: List all ocean waters and Delaware Bay as threatened or impaired due to ocean acidification under section 303(d) of the Clean Water Act.

(Editors Note: The Commenter followed up the request with 17 pages and a CD of information related to and in support of the request. They are available for inspection on request)

Response:
The Department is aware of research being conducted by US EPA into the issue raised. EPA has web pages at the following URLs related to the questions raised by the commenter:
http://www.epa.gov/waterscience/criteria/aqlife/marine-ph.html
http://www.epa.gov/owow/TMDL/oceanfrMarch_2010/

The Department is not convinced it is appropriate to list all ocean waters for pH at this time for the following reasons:

1. *There is evidence that indicates that ocean acidification may not be as certain as the commenter asserts.*
2. *The submission had no Delaware specific data or information.*
3. *No evidence was submitted showing that Delaware's applicable pH standards were not being attained.*
4. *There is no Delaware specific evidence that ocean acidification is a serious water quality problem facing DNREC.*
5. *Delaware has 25 miles of Coastline and less than a million inhabitants. The Clean Water Act certainly doesn't mandate the State of Delaware reverse possible degradation of a resource shared by in excess of 6 billion people and potentially affected by air and water pollution from sources literally around the globe. Two requirement of a TMDL are that it be both enforceable and achievable. Those requirement are not remotely possible without an international commitment to work on the issue, if it indeed exists.*

At this time, the Department feels it is most appropriate to work with EPA and stakeholders to determine what course, if any, to proceed on this issue.

Commenter U.S. EPA

(Editors note: These comments are extracted from comments on the Draft Methodology which were received in February 2010)

Comment 1: Throughout the "What are the Components of an Integrated Report" portion of in the IRG, EPA outlines a number of expectations for waters listed in certain categories. These expectations in part include the establishment of a schedule for listing waters in Category 3, and the minimal data needed to support a listing in Category 4B. Delaware•s assessment methodology makes no mention of such expectations.
EPA made a similar comment during the last listing cycle. At that time, DNREC replied that they were working on Data analysis, restoration plans and guidance internally and with stakeholders, and that as the work proceeds, assessment, listing methodologies and restoration plans may be updated and modified as appropriate. As no modifications have been made to this documents, EPA would be interested in knowing the status and progress of DNREC's efforts.

The Department, in cooperation with EPA, has engaged the services of a contractor to explore these issues and expects the resultant work product to address them.

Comment 2: EPA notes that DNREC has language that indicates that stations with fewer than ten different sampling days will be considered to have insufficient data and be placed in Category 3 for this assessment cycle. In the flow chart "Assessment of Aquatic Life Use Support Using Average Dissolved Oxygen Criteria," a the decision point "Are there 10 or more days of Data for the Station?" the action resulting from a "no" answer indicates "Go to DO minimum." The flowchart does not harmonize with the written Methodology (i.e., "Go to DO minimum" vs. "place in Category 3").

The Department evaluates small data sets for possible DO minimum violations, even if there are less than 10 samples. Thus, going to the DO minimum flow chart is appropriate.

Comment 3: EPA is confused as to how the "Categories of Nutrient Concentrations" relate to the nutrient criteria endpoints already established in the existing watershed scale TMDLs for nutrients. If a stream is located in a watershed that already has an established TMDL, it would seem that sampling data should be assessed using the nutrient criteria endpoints in that TMDL.

TMDLs are written assuming worst case conditions, that is, low flow and high temperatures. We are considering how to translate those endpoints during "normal" conditions. For the 2008 cycle we adjusted the Nutrient Concentration categories in the assessments to reflect model results, TMDL requirements and best professional judgments.

Comment 4: Assessment of Aquatic Life Use Support Using Site-Specific Data that Results from Environmental Assessments and Other Programs. It will be useful to

elaborate on determining the appropriate time frame needed for making "substantial progress" toward compliance. It should be articulated under which part of Category 4 a segment will be listed under if an owner of a contaminated site is making substantial progress toward correcting a pollution problem. If it is Category 4B, note that 4B requires legally defensible timetables for achieving compliance.

As these sites and conditions are expected to be rare, and "substantial progress" at one site will be different from the next, the Department expects to use best professional judgment to determine that time frame when and if a decision is required. To date, no sites have fallen into this Assessment methodology. The Department is aware of the 4B requirement to be legally defensible.

Comment 5: EPA notes that DNREC will no longer be assessing its ERES waters for dissolved oxygen. We are curious as to why DNREC has determined that they will no longer assess for this parameter.

The Department is not assessing ERES water for dissolved oxygen (DO) because of the ambiguous nature of an uptrend in DO. It is possible that an uptrend may be the result of increasing nutrient concentrations that fuel algal responses that will increase DO during daylight hours. Thus an apparent "good" result may actually indicate increasing pollution.

Comment 6: EPA notes that the 2010 Methodology still indicates that the existing rainfall-based management plans are based on outdated criteria. EPA has been commenting on this issue for several cycles. Please indicate if DNREC has any plans to revising the management plans.

The Department may consider updating the plans in the future. It is noted that practically speaking, almost all waters of the State are under TMDLs for bacteria. Changing the plans is not expected to be of significant benefit in the 305(b)/303(d) context.

Comment 7: It is noted that in these methodologies there is no mention of assessment of biological monitoring data. EPA understood that DNREC has an active biological monitoring program. This document should detail how DNREC uses biological data for listing decisions.

The Department does have an active Biological Monitoring program. Much of the recent activity of the program has been in support of possible TMDL development for earlier listings. The data is also being used to support possible nutrient criteria development actions. As noted in the response to comment 1, we are actively engaged with a contractor at this time to assess Biology and Habit TMDLs, and hope that the resultant work product will inform the use of biological data for future listing cycles.

Commenter: John Austin

Comment 1: Existing fish advisories for Blue Fish and Striped Bass seemingly would place all of Rehoboth Bay, Indian River Bay, and the Indian River below Millsboro in Category 5. Also, the closed shellfish beds of the Indian River and other Creeks feeding the Inland Bays.

Delaware worked with The Eastern Coastal Striped Bass and Bluefish Consumption Advisory Workgroup to come to the conclusion that it was appropriate to issue a multi-state advisory for consumers of bluefish and striped bass from their coastal waters that consumption of those species should be limited or not consumed at all for women of child bearing age. The workgroup report is online at: http://www.maine.gov/dhhs/eohp/fish/9_08Final.pdf As the fish are migratory, they also travel into the Inland Bays. Thus the Department extended the advise in the Inland Bay waters. As part of its own fish tissue advisory program, the Department found no Inland Bay local species were tainted with enough PCBs or mercury to trigger advise against eating them. This was particularly true for shellfish that are known to accumulate those pollutants to a higher degree than finfish. Thus, the Inland Bays are not being impacted by pollution from PCBs from local sources. It would be inappropriate to list the Inland Bays for TMDL development for these pollutants at this time.

It is noted that the Department had not considered the possibility of the situation that occurred in the Inland Bays for this cycle while developing the methodologies. Future methodologies documents will address this issue.
The Department is interested in working with EPA, the other coastal states that also issued advisories, and stakeholders to develop strategies to address PCB and mercury contamination in these migratory species.

The shellfish beds of the Indian River and other creeks feeding the Inland Bays are closed to shellfishing because of ISSC guidelines relating to proximity to marinas, discharges and shoreline development, and will likely never be open to fishing because of the guidelines. Thus, a TMDL is inappropriate for these waters.

Comment: With EPA ORD revision of the IRIS Arsenic Slope factor these waters will also exceed acceptable cancer risk levels, especially for shellfish, whether or not one uses Greens tissue data, or a calculation of a criteria based on the 350 BCF of oysters & 1.3% inorganic arsenic reported by Green.
…
I assume from our prior exchanges that DNREC will not address Arsenic contaminated waters until EPA's final adoption of the IRIS value.
I find that rather short sighted, as is the absence of continued arsenic measurements in areas of known contamination, such as the Invista site, and Indian River Power Plant.

As noted by the commenter, current arsenic criteria are being met in surface waters. Fish tissue advisories for arsenic have not been issued for fish in the Inland Bays. Thus, it is inappropriate to list the waters of the Inland Bays for TMDL development. When, as and

if EPA develops final guidance for arsenic, the Department will take appropriate actions in concert with stakeholders and EPA with regards to standards and fish tissue advisories.