State Water Programs: Nutrient Reduction Programs and Methods

December 2012

Association of Clean Water Administrators

1221 Connecticut Avenue, NW, 2nd Floor
Washington, DC 20036
TEL: 202-756-0600
FAX: 202-756-0605
WWW.ACWA-US.ORG

TABLE OF CONTENTS

Acknowledgements

This report was developed by the Association of Clean Water Administrators' (ACWA) National Office, coordinated by Environmental Policy Graduate Fellow Kirk Tracy and Environmental Program Manager Sara Vinson. ACWA acknowledges the survey, graphic, and drafting work of Casey Sullivan, Graduate Researcher, J.D. Candidate 2013, George Washington School of Law. We also extend our appreciation to the state and interstate officials who took the time to complete ACWA's survey and to review their narrative summaries.

Purpose

Reduction of nutrient impairments to our nation's waters is a top priority for states and interstates. As discussed in detail in the Executive Summary & Overview below, ACWA has a long history of working with the U.S. Environmental Protection Agency ("EPA") on strategies to reduce nitrogen and phosphorus loadings to waterbodies. EPA has continued to emphasize the importance of state adoption of numeric nutrient criteria ("NNC") as the most effective mechanism for ensuring accountable and verifiable reductions. However, states have long advanced that reductions also are being achieved via a rich mosaic of approaches that vary by state, pollutant of concern, sources, and collaborators. This report provides a high level summary of each state's current approach to nutrient reduction. This report's methodology, which was conducted in phases of survey, narrative drafting, and state review, is described below. We are pleased that this report consists of responses from every state and the District of Columbia [hereinafter "state(s)"].

It is important to note that this report does not include a comprehensive summary of state progress towards NNC adoption, although NNC actions may be referenced in various state summaries as a key part of a state's nutrient program or activity. For detailed information on state adoption of NNC, visit the EPA webpages cited here[1] or contact the state lead(s) listed in this report.

At the heart of this effort is the fact that the variety of nutrient reduction strategies employed by states is worthy of solid description and consideration as we collectively discuss comprehensive, integrated, and feasible nutrient reduction strategies. This report seeks to move the dialogue in such a direction by highlighting the myriad and diverse efforts being undertaken by states.

Please note that this report and its information are for REFERENCE USE ONLY. These responses do not represent the full picture of each state's nutrient reduction program or efforts. Responses provided are at a high level and meant to offer a general overview. For specific, detailed, or additional information on a particular state's program, please see the state's designated contact(s). The information in this report was current at the time each entity responded to the survey and/or revised the corresponding state summary (between October 2011 and December 2012). Changes to state programs since the time of response are not reflected.

[1] *Progress towards Adopting Total Nitrogen and Total Phosphorus Numeric Water Quality Standards*, EPA, http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/dataset_standards.cfm (last updated Oct. 19, 2012); *State Development of Numeric Criteria for Nitrogen and Phosphorus Pollution*, EPA,

ACWA takes full responsibility for any errors or omission. New information may be submitted to ACWA Environmental Policy Graduate Fellow Kirk Tracy at ktracy@acwa-us.org. As time and resources allow, ACWA hopes to produce periodic updates to this report.

Executive Summary & Overview

Addressing the impacts of excess nutrients, nitrogen and phosphorus, in the nation's waters poses unique challenges and opportunities. Nutrients are both a natural and essential part of a healthy ecosystem as well as a growing threat to the health and preservation of water resources when found in excess. Indeed, the amount of nutrients found in the nation's waters has increased greatly over the past 50 years, resulting in drinking water impacts, expanded impairment of waters, and habitat degradation.[2]

For state and federal regulators, managing nutrient pollution presents unique challenges.[3] This is particularly true when attempting to apply numeric criteria to nutrients; as aquatic ecosystems can be "healthy" under varying levels of nutrients, managing such pollutants differs greatly from managing threshold pollutants.[4] Several factors contribute to this complexity, both in establishing effective numeric criteria and implementing a control strategy based on such standards, such as weak dose-response relationships, site specific variability of "healthy" levels, and the role of other factors and developing eutrophic conditions.[5]

Attempts to develop site-specific, non-narrative water quality standards for nutrients require a large commitment of resources, often by state agencies that are facing shrinking budgets and reduced funding. Depending on the source of the nutrient loadings, the entities in a watershed, and the tools and strategies at hand, a variety of approaches have been shown to be effective to reduce nutrient loadings. For this reason, the Association of Clean Water Administrators (ACWA) supports the use of diverse, watershed-appropriate, and resource-effective strategies to address nutrient pollution.

Increasingly, EPA has focused on addressing nutrients through state development of numeric nutrient criteria for various categories of surface water. Several states operating in challenging legal and political contexts have made substantial investments and progress in developing numeric criteria for nutrients. In addition, states are employing a variety of tools beyond numeric criteria. EPA's March 2011 nutrient reduction memorandum placed particular emphasis on the importance of state prioritization, the use of creative tools, and other approaches to nutrient reduction, as part of a framework planning tool to "encourage development and implementation of effective state strategies for managing nitrogen and phosphorus pollution."[6] The framework included eight recommended elements for managing nitrogen and phosphorus pollutions approaches, with elements 1-7 promoting state flexibility and the use of various tools for nutrient management, and element 8 focusing on the development of a work plan and schedule for the development of NNC.[7]

---

[2] *See* U.S. ENVIRONMENTAL PROTECTION AGENCY, AN URGENT CALL TO ACTION: REPORT OF THE STATE-EPA NUTRIENT INNOVATIONS TASK GROUP (2001).
[3] ASS'N OF STATE & INTERSTATE WATER POLLUTION CONTROL ADMINISTRATORS, REPORT ON MORE THAN NUMBERS: NUTRIENT SOLUTIONS FOR THE FUTURE, MID-YEAR MEETING WORKSHOP (2011), *available at* http://www.acwa-us.org/#!__testimony-policy/letters,-policy-&-testimony.
[4] *Id.* at 2.
[5] *Id.*
[6] Memorandum from Nancy K. Stoner, Acting Assistant Adm'r, EPA, to Reg'l Adm'rs, Regions 1-10, at 3, 5-6 (Mar. 16, 2011), *available at* http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/upload/memo_nitrogen_framework.pdf.
[7] *Id.*

ACWA believes it is very important to document the state efforts that are designed and implemented to achieve nutrient reductions, and to reflect on the diversity of reduction approaches. To better represent state perspective on nutrient reduction, something which has essentially occurred only anecdotally and in a fragmented way to date, ACWA surveyed representatives of clean water programs for all 50 states and the District of Columbia, in late 2011 to mid-2012. The survey questioned states about the nature and organization of their nutrient reduction efforts, the methods utilized to reduce nutrients, accountability measures implemented, funding sources, and states' general thoughts on the challenges and opportunities raised by nutrient reduction. The survey responses were compiled into state-specific narrative summaries, at times supplemented by publically available documents. The summaries were then reviewed and edited by the corresponding state contact before inclusion in this report. They present a birds-eye-view of the diverse ways in which states are addressing nutrient pollution.

The results of this effort highlights that managing nutrient pollution requires unique and varied strategies. States use of a variety of tools, such as state-level effluent standards, technology requirements, Total Maximum Daily Loads (TMDLs), best management practices and nutrient trading. Together, with NNC, these approaches represent a rich mosaic of solutions providing a variety of nutrient accountability frameworks.

Condensed responses to the survey can be seen in Appendix I. While this report summarizes the states individually, certain overall trends are apparent. 55% of states have an existing nutrient program, while approximately 22% are in the process of developing one [fig. 1].

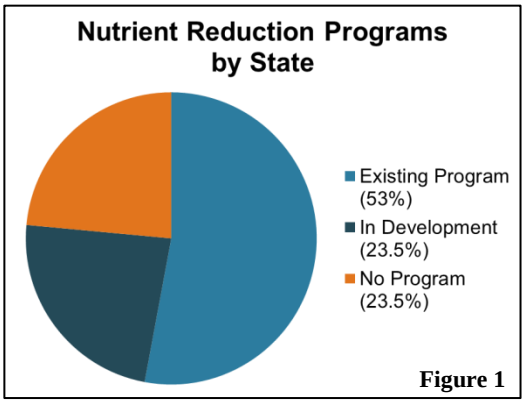


Figure 1

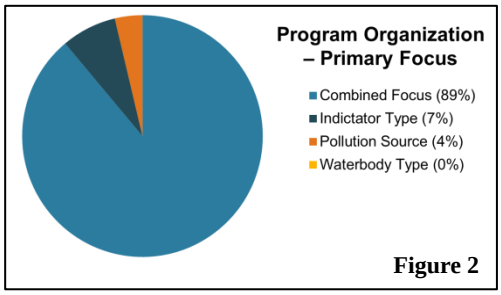
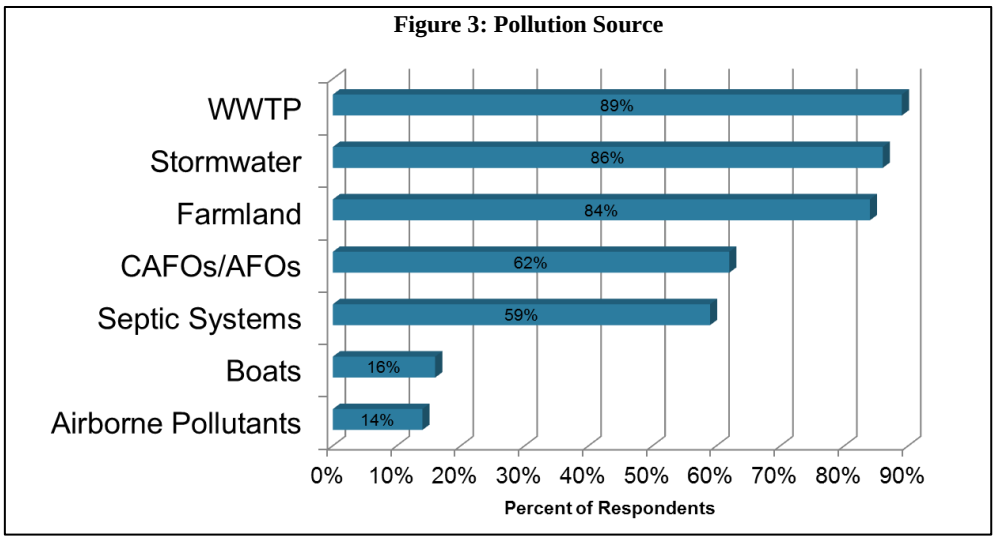


Figure 2

However, all of the remaining states that have "no program" are engaged in efforts that result in nutrient reduction, many of which are wide-ranging. Of the states with nutrient reduction programs, the vast majority, 85%, are statewide in scope. Of states with existing nutrient reduction programs, 89% of programs are organized around a combined focus of waterbody type, indicator, and pollution source, while 7% focus primarily on indicator type, 4% focus on pollution source, and only none focus primarily on waterbody type [fig. 2].

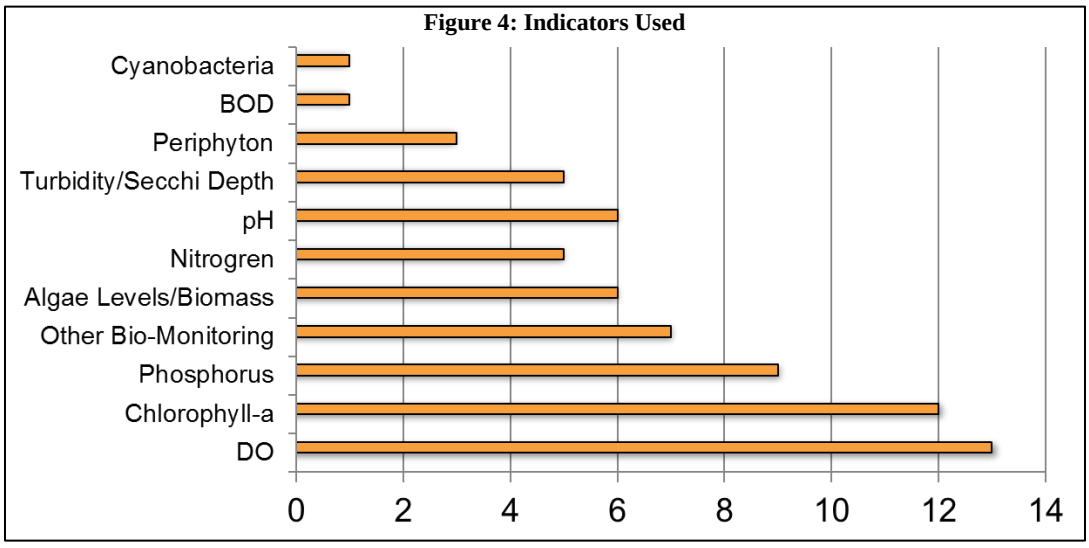
Of the 37 states that indicated primary pollution sources were a focus of their reduction efforts (including states still developing a program and which indicated "no programs"), 89% focus on wastewater treatment plants, 86% on stormwater, 84% on farmland, and 62% focused on CAFOs/AFOs [fig. 3]. Only a quarter of programs exempt certain activities or industries.

Figure 3: Pollution Source



Among the 26 states that specified what indicators they used to assess and respond to nutrients, dissolved oxygen, chlorophyll-a, and phosphorus were the most common responses [fig. 4].

Figure 4: Indicators Used



States were asked which nutrient reduction methods they used. Among the 44 states that responded, the most common nutrient reduction methods were TMDLs, NPDES permitting, BMPs, and nutrient management plans [fig. 5]. Social media campaigns, water quality trading, nutrient reduction agreements, and interstate partnerships were the least used methods [fig. 6].

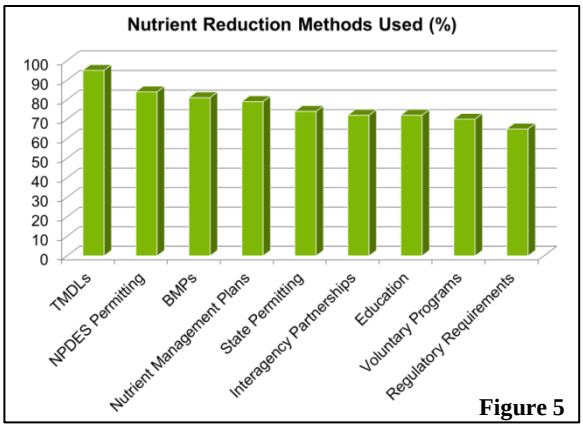


Figure 5

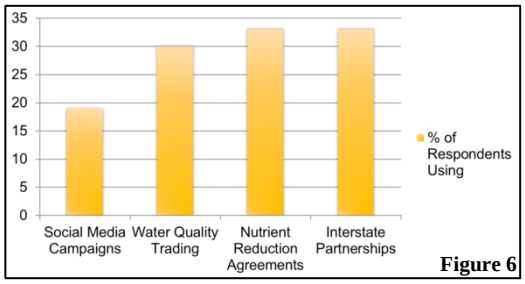
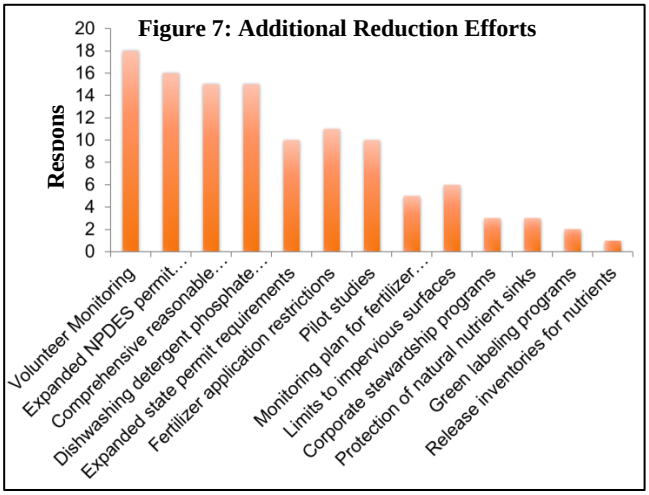
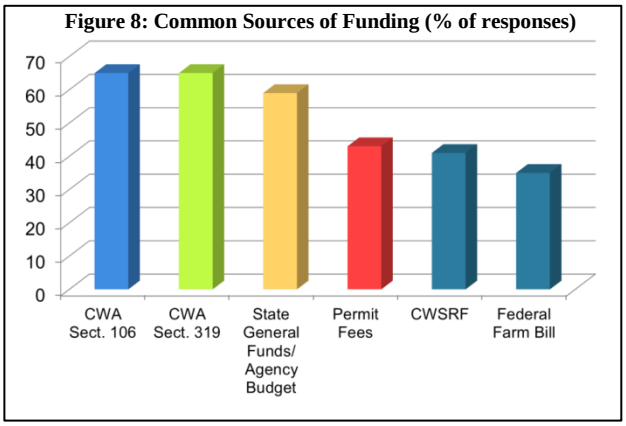


Figure 6

A variety of other nutrient reduction efforts were also identified by the states [fig. 7].



The most prevalent sources of funding were Clean Water Act section 106 and 319 funds, followed by state general funds, agency budgets, and permit fees (32 respondents) [fig. 8]. Lack of funding was a frequent refrain in state comments, often cited as one of the greatest challenges faced in implementing reduction efforts.



States used a wide variety of accountability measures in order to assess the effects their programs are having "on the ground." By far, the most common method of ensuring accountability was through monitoring by state agencies and regulated entities along with reporting requirements in permits. Most state programs applied different accountability measures for point and nonpoint sources. Most point source accountability is accomplished through permit requirements, while progress for nonpoint sources is more generally measured through ambient monitoring [tbl. 1].

Table 1: State Accountability Method - Examples

State	Accountability Methods	State	Accountability Methods
AL	PS - Effluent Nutrient Concentrations NPS - Follow-up stream monitoring	CA	PS - NPDES permit compliance NPS - In Development - Waste discharge permits; Coalition of dischargers permits
CO	PS - Monitoring and reporting of effluent quality NPS - none	CT	PS - Track and Enforce Permit Requirements NPS - Voluntary programs
DC	Regulatory Programs, Permitting, Inspections and Enforcements, Installation of BMPs	DE	Audits and Inspections
FL	Permits - Reporting Requirement BMPs - effectiveness verification, monitoring, iterative implementation	GA	DMRs
IL	PS - NPDES permit compliance NPS - Accountability method in development	KS	Monitoring - 9-element watershed plans PS - enforceable permit limits, NPDES NPS - Voluntary compliance, 303d/TMDL
MA	Monitoring Permit enforcement	MD	WWTPs – DMRs; SW - Annual Reports; Ag. BMPs - Inspections (10% inspection rate); State-Funded Structural Implementations documented
MI	PS - NPDES permit compliance NPS - voluntary only	MN	WW - permit compliance, DMRs Ag/NPS BMP - tracking and nutrient reduction calculations
MS	Monitor, Assess, Plan	NC	PS - Monitoring, Permit Requirements NPS - Source-specific compliance accounting tools
NE	Livestock Program - monitoring and compliance checks Watershed Management Plans - monitoring	NH	Monitoring
NV	Monitoring - ambient and site-specific WQ Permit Requirements	NY	PS - permit compliance NPS - ambient monitoring
OK	Continuous, flow-weighted sampling	RI	Monitoring and Reporting: RIPDES permit limits and enforceable consent agreements. Performance measures built into financial assistance agreements.
TN	PS - permit compliance, monitoring NPS - BMP installation, operation, and maintenance; monitoring	TX	PS - permit requirements; field investigations, WQ monitoring NPS - grant conditions (319 reporting); voluntary compliance
UT	PS - Monitoring NPS - continued evaluation of TMDL goals.	VT	PS - NPDES permit compliance; encroachment permits NPS - Agency of Agriculture the authority to enforce nonpoint source nutrient losses
WA	Regulatory tools, prevention programs, and funding mechanisms PS - NPDES compliance NPS - TMDL compliance; Grant requirements	WI	PS - WPDES Monitoring Requirements NPS - in development
WY	NPS - Voluntary compliance with grant requirements		

Twenty states report that they have conducted analysis of their nutrient reduction programs or efforts (if "no program") to determine the impacts they are having on the ground. The types of analyses done can be seen in table 2.

Table 2: State Nutrient Reduction Analyses

State	Nutrient Reduction Analyses	State	Nutrient Reduction Analysis
AL	PS - Effluent Nutrient Concentrations NPS - Follow-up stream monitoring	CA	PS - NPDES permit compliance NPS - In Development - Waste discharge permits; Coalition of dischargers permits
CO	PS - Monitoring and reporting of effluent quality NPS – none	CT	PS - Track and Enforce Permit Requirements NPS - Voluntary programs
DC	Regulatory Programs, Permitting, Inspections and Enforcements, Installation of BMPs	DE	Audits and Inspections
FL	Permits - Reporting Requirement BMPs - effectiveness verification, monitoring, iterative implementation	GA	DMRs
IL	PS - NPDES permit compliance NPS - Accountability method in development	KS	Monitoring - 9-element watershed plans PS - enforceable permit limits, NPDES NPS - Voluntary compliance, 303d/TMDL
MA	Monitoring Permit enforcement	MD	WWTPs – DMRs; SW - Annual Reports; Ag. BMPs - Inspections (10% inspection rate); State-Funded Structural Implementations documented
MI	PS - NPDES permit compliance NPS - voluntary only	MN	WW - permit compliance, DMRs Ag/NPS BMP - tracking and nutrient reduction calculations
MS	Monitor, Assess, Plan	NC	PS - Monitoring, Permit Requirements NPS - Source-specific compliance accounting tools
NE	Livestock Program - monitoring and compliance checks Watershed Management Plans – monitoring	NH	Monitoring
NV	Monitoring - ambient and site-specific WQ Permit Requirements	NY	PS - permit compliance NPS - ambient monitoring
OK	Continuous, flow-weighted sampling	RI	Monitoring and Reporting: RIPDES permit limits and enforceable consent agreements. Performance measures built into financial assistance agreements.
TN	PS - permit compliance, monitoring NPS - BMP installation, operation, and maintenance; monitoring	TX	PS - permit requirements; field investigations, WQ monitoring NPS - grant conditions (319 reporting); voluntary compliance
UT	PS - Monitoring NPS - continued evaluation of TMDL goals.	VT	PS - NPDES permit compliance; encroachment permits NPS - Agency of Agriculture the authority to enforce nonpoint source nutrient losses
WA	Regulatory tools, prevention programs, and funding mechanisms PS - NPDES compliance NPS - TMDL compliance; Grant requirements	WI	PS - WPDES Monitoring Requirements NPS - in development
WY	NPS - Voluntary compliance with grant requirements		

While the trends discussed above, and shown in the corresponding figures, represent the overarching patterns found across states, each state nutrient reduction program presents a unique combination of strategies for reducing nutrient pollution and preserving water resources, as can be seen in the examples provided in tables 1 and 2. Again, as stated in the Purpose, the variety

of nutrient reduction strategies employed by states deserves greater representation in discussing comprehensive, integrated, and feasible nutrient reduction strategies. This report seeks to move the dialogue in such a direction by highlighting the efforts being undertaken by state officials.

Common Acronyms

ACWA	Association of Clean Water Administrators
AFO	Animal Feeding Operation
BMP	Best Management Practice
CAFO	Confined Animal Feeding Operation
CWA	Clean Water Act
CWA 106	Clean Water Act Section 106, water pollution control program grants
CWA 319	Clean Water Act Section 319, nonpoint source water pollution program grants
EPA	Environmental Protection Agency
MS4	Municipal Separate Storm Sewer System
NNC	Numeric Nutrient Criteria
NPDES	National Pollutant Discharge Elimination System
POTW	Publically Owned Treatment Works
SRF	Clean Water State Revolving Fund
TMDL	Total Maximum Daily Load
WLA	Wasteload Allocation
WWTP	Wastewater Treatment Plant

Alabama

Alabama's Department of Environmental Management is responsible of for protecting and improving the state's waters and the health of its citizens. A seven-member Environmental Management Commission is responsible for developing the state's environmental policy and regulations. A nutrient reduction program is currently in effect throughout the state.

- **Key Elements:** Alabama is implementing nutrient TMDLs statewide by placing nutrient limits and monitoring requirements in NPDES permits and providing CWA 319 funding to install best management practices in nutrient impaired watersheds.

- **Assessment**: Alabama's nutrient reduction program is organized by a combination of waterbody type, pollutant source and indicator. Alabama has adopted numeric site-specific chlorophyll-a criteria for 37 of its 41 large, publically accessible reservoirs. These criteria are expressed as growing season mean chlorophyll-a values measured in composite samples collected from the photic zone of the water column at specific locations within the reservoir.

- **Methods Utilized**: Alabama's Department of Environmental Management's water pollution control programs work closely with local Soil and Water Conservation Districts, the Natural Resources Conservation Service and regulated entities to coordinate nutrient reduction activities through a variety of methods, including TMDLs, NPDES permitting, BMPs, voluntary programs, nutrient management plans, regulatory requirements, and education. BMPs include a wide range of practices designed to reduce nutrient pollution and include such projects as stream restoration and stream buffer planting, stormwater detention basins, constructed wetlands, rotational grazing for cattle, and others. Alabama's Clean Water Partnership, a statewide nonprofit organization, has facilitators in each of the state's 10 river basin groups who educate local watershed stakeholders on nutrient reduction. The agency's CWA 319 program solicits yearly project proposals addressing nonpoint nutrient pollution and provides funding for watershed management plans and the implementation of BMPs. In addition, many of Alabama's NPDES permitted facilities are required to monitor and report nutrient concentrations in effluent discharged to surface waters.

- **Priority Pollution Sources:** Alabama's nutrient reduction efforts are focused on wastewater treatment plants, septic systems, stormwater, and farmland, though no activities or industries are exempt.

- **Accountability:** Where best management practices have been installed and permit limits imposed, follow up monitoring is conducted to assess water quality improvements. Routine ambient monitoring in municipal separate storm sewer permits is used to evaluate the effect of nutrient reduction efforts in urbanized areas.

- **Other Relevant Information:** Alabama's program is primarily funded through federal CWA 106 and 319 funds.

Alabama notes that establishing numeric nutrient criteria for flowing waters is particularly challenging as identification of an appropriate nutrient concentration threshold for impairment of aquatic life uses is difficult and site-specific. Implementation of statewide numeric nutrient criteria will require additional and substantial resources and a much greater investment in new treatment facilities, while, for nonpoint sources, additional education will be needed for landowners.

Contact: Lynn Sisk, Alabama Department of Environmental Management; ls@adem.state.al.us.

Alaska

The Alaska Department of Environmental Conservation's Division of Water seeks to improve and enhance the quality of the state's waterbodies. Alaska does not currently have a nutrient reduction program, but is developing nutrient criteria. The Alaska Department of Natural Resources separately manages water resource issues.

- **Overview:** While Alaska does not currently have a nutrient reduction program, the state's monitoring program has collected ambient nutrient data from both reference- and human-influenced waters in the Cook Inlet ecoregion, the state's most urbanized region with agricultural activity. This data is under review as part of a nutrient criteria development plan submitted to the EPA in 2005. The Division of Water compares reference and potentially impacted waters and monitors related parameters, such as dissolved oxygen and secchi depth. In monitoring the state's waterbodies, the Division considers whether a waterbody is habitat for anadromous species such as salmon and trout. Salmon spawning and die off in these waters results in a high natural nutrient loading from decaying carcasses. High nutrient levels are normal in these waters and support juvenile salmon. The extent of agriculture and urban stormwater in Alaska is relatively limited in comparison to other states and most activity occurs around lakes in the most urbanized basin in south central Alaska.

- **Other Relevant Information:** Alaska supports a watershed or basin approach to nutrients that focuses on those regions that are impacted by or at-risk for nutrient impacts. Additionally, the state believes that avoiding a one-size-fits-all approach is important. Nutrients in Alaska's waters are different from elsewhere, with anthropogenic sources being relatively minor and some of the state's species requiring higher nutrient levels than would be considered acceptable elsewhere.

Contact: Nancy Sonafrank, Alaska Department of Environmental Conservation, Division of Water; nancy.sonafrank@alaska.gov.

Arizona

The natural resources of Arizona are managed and protected by the state's Department of Environmental Quality. The Department's Water Quality Division works to protect and enhance public health and the environment by ensuring safe water and the reducing impacts of pollutants on the state's waterbodies.

- **Overview:** Arizona does not currently have a nutrient reduction program and one is not being developed at this time. However, Arizona has developed nutrient standards for lakes and has standards for a limited number of streams. Arizona is working to develop more comprehensive stream standards. The Department of Environmental Quality has a monitoring program to collect information to be used in developing these stream standards. However, nutrients have not been identified as a significant stressor for streams in Arizona. The majority of the state's WWTPs include denitrification processes to reduce nitrogen and much of the effluent is recharged to groundwater or reused rather than discharged to streams. Runoff from irrigated agriculture is minimal due to efforts to conserve water. Nutrients are a factor in small urban lakes without outlets.

Contact: Debra Daniel, Arizona Department of Environmental Quality, Water Quality Division; daniel.debra@azdeq.gov.

Arkansas

The Arkansas Department of Environmental Quality's Water Division works to protect and enhance the quality of the state's waters. Arkansas is currently developing a comprehensive nutrient reduction strategy while taking concurrent steps to reduce the impact of nutrients on the state's waters.

- **Key Elements:** Arkansas is in the process of developing a strategy to address nutrient impacts to waterbodies throughout the state. Planning is focused on establishing criteria for lakes, reservoirs, and waterbodies of outstanding ecological or economic value. For lakes and reservoirs, numeric nutrient criteria are being considered for chlorophyll-a and secchi depth in specific areas. In analyzing the state of its waterbodies, Arkansas employs data from water quality monitoring networks to identify areas of potential impairment. Nutrient impairment is determined through a variety of indicators, including secchi depth, periphyton, dissolved oxygen, and other indicators.

- **Methods Utilized:** Arkansas currently makes use a variety of methods to reduce the impact of nutrients in its waterbodies. These include TMDLs for nutrients, NPDES and state permitting, regulatory requirements, BMPs, nutrient reduction agreements and nutrient management plans, voluntary programs, and interagency partnerships. Permits for discharges of phosphorous into impaired waters include enforceable limitations, while wastewater permits include effluent limitations with nutrient removal requirements as appropriate.

Contact: Steven Drown or Sara Clem, Arkansas Department of Environmental Quality, Water Division; drown@adeq.state.ar.us, clem@adeq.state.ar.us.

California

California's water resources are regulated by the State Water Resources Control Board, a five-member board tasked with protecting California's water quality through setting statewide policy, coordinating with and supporting intrastate efforts, and allocating surface water rights. Further water quality decisions are made by California's nine Regional Water Boards—semi-autonomous water quality control boards organized around the state's watersheds and establishing water quality requirements based on the unique characteristics and needs of each watershed. These regional boards are responsible for setting regional standards, issuing waste discharge requirements, determining compliance and taking enforcement actions.[8] Currently, nutrient control requirements are established for some regional boards, though the state water board is developing a statewide approach to meet EPA's requirements.

- **Key Elements:** The main focus of California's statewide nutrient policy is to assess possible impairment of water quality by linking nutrient loads to primary and secondary indicators of eutrophication as indicators of impairment of beneficial uses.

- **Assessment:** California's waterbody types are classified as inland surface waters, enclosed bays and estuaries[9]. Waterbodies are further categorized as presumptively impaired, presumptively unimpaired, and potentially impaired. In assessing impairment, the state's nutrient reduction program looks at elements of waterbody type and its characteristics, indicators of eutrophication, exogenous factors, and pollution sources. Separate indicators and waterbody characteristics, such as differentiation between flowing and still waters, are taken under consideration when assessing waterbodies. Biological monitoring is used to confirm and identify nutrient impairments. Indicators to be monitored include algal biomass, chlorophyll-a, and periphyton.

- **Methods Utilized:** The nutrient reduction plan envisions utilizing a variety of tools to address nutrients in California's waterbodies, including: best management practices, nutrient management plans, NPDES and state permitting, TMDL implementation, and interagency partnerships. State permitting includes enforceable provisions to nonpoint sources, reporting requirements for nonpoint sources, the ability to order abatement of discharges, and covers a larger universe than the NPDES program.

- **Primary Pollution Sources:** Waste water treatment plants, stormwater runoff, farmland, and concentrated and other animal feeding operations are the primary foci of California's nutrient reduction program, though no activities or industries are explicitly exempted.

- **Accountability:** Accountability measures are currently under development, but the state's nutrient reduction policy will likely be implemented and enforced through the state's discharge permitting program. Point sources are generally regulated through general or individual NPDES permits, while nonpoint sources are generally regulated

[8] *See* California Water Boards, Office of Public Affairs, California Water Boards: Who We Are & What We Do, available at: http://www.swrcb.ca.gov/publications_forms/publications/factsheets/docs/boardoverview.pdf
[9] Due to their size and unique characteristics, the San Francisco Bay and the Sacramento/San Joaquin Delta are treated separately from other bays and estuaries in the policy.

through waste discharge requirements (analogous to NPDES permits), waivers of waste discharge requirements, or prohibitions of discharge. Some nonpoint sources are regulated as a coalition of dischargers, rather than individual or general permits.

- **Other Relevant Information:** California's nutrient program development and implementation will be primarily funded through permitting fees and EPA 205J funding. In addition to federal laws and regulations, it will rely on the authority of California's Porter-Cologne Water Quality Act, which provides broader permitting and enforcement authority than what is provided for under the Clean Water Act. Specifically, Porter-Cologne allows for permitting of agricultural discharges.

Contact: Steve Camacho, State Water Resources Control Board, Division of Water Quality; scamacho@waterboards.ca.gov, http://www.swrcb.ca.gov.

Colorado

The Water Quality Control Division of the Department of Public Health and Environment is Colorado's leading agency managing water quality. Its work includes monitoring and reporting on the quality of state waters, preventing water pollution and regulating discharge, developing water quality policies, ensuring safe drinking water from public systems, and protecting, restoring, and enhancing the quality of the state's waters.[10] The Water Quality Control Division is currently developing a state nutrient reduction program.

- **Key Elements:** Colorado's statewide nutrient reduction program is a hybrid which includes phased adoption of water quality standards above dischargers for total nitrogen and total phosphorus and phased implementation of technology-based limits for total inorganic nitrogen and total phosphorus in the state's largest permitted dischargers. Water quality impacts are considered through the use of variances, available on a sliding scale dependent on the aggregate point source contribution.

- **Priority Pollution Sources:** During the first 10 years, Colorado's nutrient reduction program focus is on domestic wastewater treatment plants over two million gallons a day (MGD) in priority watersheds and a few designated industrial dischargers. These plants will be required to meet biological nutrient removal (BNR) technology-based effluent limits for total phosphorus and total inorganic nitrogen. Focusing on domestic wastewater treatment plant discharge was driven by the data that shows, in Colorado, these sources are the major contributor. In the second 10-years, domestic dischargers in the rest of the state, down to one half MGD will be required to meet BNR-based limits. Starting next year, virtually all domestic dischargers must monitor and report on effluent nutrient water quality, ensuring that adequate data is available for use in future regulatory reviews. Municipal separate storm sewer systems are required to report on their nutrient contributions and enhance their education programs. With wastewater treatment plants and stormwater as its primary foci, Colorado's program allows exemptions for small systems, groundwater dewatering, and sand and gravel mining.

- **Methods Utilized:** Colorado's program relies on best management practices for stormwater, NPDES permitting, MS4 permitting including education requirements, state-specific technology based limits, and effluent limits in permitting. Additionally, all point sources will be able to participate in Colorado's water quality trading program.[11]

- **Other Relevant Information:** Colorado's program is primarily funded through the state agency budget and general funds, permit fees, and federal CWA 106 funds. In addition to its authority under federal laws and regulations, Colorado's nutrient reduction program relies on the "control regulation" authority of its state act.

[10] *See* Colorado Department of Public Health and Environment, Water Quality Control Division, About the Water Quality Control Division (July 2011), available at: http://www.cdphe.state.co.us/wq/AboutDivision/AboutDivision.html.

[11] For Colorado's pollutant trading policy, see Colorado Department of Public Health and Environment, Water Quality Control Division, Colorado Pollutant Trading Policy (Oct. 2004), available at: http://www.cdphe.state.co.us/wq/permitsunit/policyguidancefactsheets/policyandguidance/TradingPolicy.pdf.

Contact: Sarah Johnson, Colorado Department of Public Health and Environment, Water Quality Control Division; sarah.johnson@state.co.us.

Connecticut

Connecticut's Department of Energy and Environmental Protection, Bureau of Water Protection and Land Reuse, Planning and Standards Division, works to preserve and enhance the state's environment through protecting and regulating Connecticut's water resources. The state has a statewide nutrient reduction program that seeks to reduce the impact of nutrients through a variety of measures.

- **Key Elements:** Connecticut's phosphorus reduction efforts, statewide in scope, are currently focused on lotic waters. The state makes use of biologically-based targets for phosphorus loading reductions that are then translated into regulatory requirements. Nitrogen reductions efforts are focused on addressing hypoxia in Long Island Sound and require statewide reductions in nitrogen for point sources and nonpoint sources. As the nitrogen reductions are keyed to a TMDL, there are regional reductions in nitrogen also required to address water quality impacts in the Sound. Nitrogen loadings are based on improving dissolved oxygen levels in Long Island Sound while phosphorus loadings are based on periphyton community response.

- **Methods Utilized:** The state's nutrient reduction efforts are primarily targeted at wastewater treatment plants, stormwater, and land use. To reduce nutrients, Connecticut makes use of BMPs, TMDLs, NPDES permitting, regulatory requirements, water quality trading, interagency and interstate partnerships, watershed management plans, nutrient management plans, voluntary programs, and education. The state has a TMDL for nitrogen that covers Connecticut, New York, and upper watershed states in New England. The state's permitting program implements nitrogen loading reductions identified within the TMDL, while preliminary water quality-based evaluations of phosphorus in freshwater streams have been translated into proposed permit limits for municipal sewage treatment plants and certain industrial facilities. These recommendations are incorporated into permits as they come up for renewal. Water quality trading is available to certain point sources only, through the state's general permit to implement nitrogen trading under the Long Island Sound TMDL for nitrogen.

- **Accountability:** Accountability is ensured through permit requirements that are tracked and enforced. Additionally, when a project is funded through the state's Clean Water Act Funds or the CWA 319 program, reductions are tracked.

- **Other Relevant Information:** Connecticut's nutrient reduction efforts are primarily funded through state general funds and agency budgets and federal CWA 106 and 319 funds. Connecticut believes that one of the potential challenges moving forward is addressing and tracking nonpoint source pollution and developing biologically-based numeric nutrient criteria that are protective of designated uses and recognize the full range of surface water body types but which differentiate between natural and anthropogenic sources of nutrients. While Connecticut is working towards the goal of developing numeric criteria, the state has been and continues to implement actions to target significant reductions in nutrient loading with documented, substantial environmental improvements despite the lack of numeric criteria.

Contact: Traci Iott, Connecticut Department of Energy and Environmental Protection, Bureau of Water Protection and Land Reuse, Planning and Standards Division; traci.iott@ct.gov.

Delaware

The Delaware Department of Natural Resources and Environmental Control's Division of Water and Division of Watershed Stewardship regulate Delaware's water resources. The Department accomplishes its mandate to protect and preserve the state's waterbodies through a wide array of regulatory, managerial, and conservation tools, including an existing nutrient reduction program, which utilizes a multipronged approach across state agencies and conservation districts in order to meet the requirements established in nutrient TMDL regulations for virtually every waterbody in the state.

- **Key Elements:** Delaware's nutrient reduction program is centered around its TMDLs. The state is organized into four major basins and forty-five watersheds. The DNREC has promulgated nutrient TMDL regulations for almost every waterbody in the state. These regulations provide reduction requirements which agencies include in regulations, permits, or technical standards for best practices. Nutrient management, animal feeding operations, stormwater, discharge permits, MS4, and onsite wastewater programs all include provisions to achieve TMDLs, while Delaware's Division of Air Quality has been aggressively pursuing reductions in pollutants resulting in water quality impairments.

- **Methods Utilized:** Delaware's nutrient reduction efforts are tailored to each watershed. Though focused on TMDLs, the state uses a multitude of tools to reduce nutrients in waterbodies, including education, best management practices, voluntary programs, state and NPDES permitting, regulatory requirements, interagency partnerships, including a strong partnership with USDA agencies, and interstate cooperation.

  Farmers, nutrient management planners, and developers are required to take training and receive certification, while wastewater professionals are licensed and must attend continuing education courses. Regulations and best management practices addressing nutrients are in place for onsite wastewater treatment and disposal, groundwater discharges, and stormwater, for example, and the state operates a nutrient management program. State permitting is used to establish state-specific technology-based limits, mandatory technology implementation, enforceable permitting provisions applied to nonpoint sources, reporting requirements for nonpoint sources, and the ability to order abatements of discharges. In addition, voluntary programs include the creation of rain gardens, restoration of wetlands and reforestation of urban areas, as well as USDA agricultural programs.

- **Accountability:** Accountability is ensured through audits and inspections performed by the state's various regulatory programs and Delaware's extensive surface water monitoring program is used to calculate loads and assess the status of waterbodies as well as developing trends. In addition, the state also makes use of volunteer monitoring, fertilizer application restrictions, and comprehensive reasonable assurance analysis in order to reduce nutrients and ensure that nutrient reduction goals are met. Delaware is a partner in the Chesapeake Bay Program, which has raised the bar on TMDL implementation plans, accountability, and reasonable assurance.

- **Other Relevant Information:** Delaware's nutrient reduction program relies on a variety of state laws in addition to federal laws and regulations and obtains its funding from a wide range of sources, including state general funds and agency budgets, joint agency initiatives, permitting fees, federal CWA § 106, 604(b), 319, 117 (Chesapeake Bay Program) and SRF funds, and the federal Farm Bill Programs.

  While Delaware has fully invested in nutrient reduction, is using CWA and state authorities to provide for reasonable assurance, and has developed a broad array of TMDLs tailored to the needs of individual watersheds, it worries that a focus on nutrient criteria will result in disruption to its regulatory and implementation processes. Most of Delaware's TMDLs are based on numeric expressions of narrative criteria. The adoption of alternative numeric criteria will result in the amendment of existing TMDLs and the opportunity to technically and legally challenge those TMDLs.

Contact: John Schneider, Division of Watershed Stewardship; john.schneider@state.de.us.

District of Columbia

The waters of the nation's capital are protected and managed by the District Department of the Environment. The Water Quality Division is charged with restoring and protecting the surface and ground waters of the District through setting and enforcing water quality standards, monitoring and assessment, and implementing policies designed to improve water resources. DC currently uses a combination of narrative and numeric standards to address nutrients in the District's water.

- **Key Elements:** DC has nutrient driven numeric criteria for dissolved oxygen, water clarity, and chlorophyll-a established by the EPA Chesapeake Bay program, as well as additional narrative water quality standards for nutrients. The District makes use of a variety of additional methods for reducing nutrients in its waters, including BMPs for storm water management, permitting requirements, and continual assessment and monitoring. The primary focus of DC's nutrient reduction efforts are wastewater treatment plants and stormwater.

- **Assessment:** Assessment is conducted by DDOE's Monitoring and Assessment branch, which collects water samples, conducts data analysis, and prepares DC Integrated Reports to be submitted to EPA for review and approval. Additional assessment is conducted through analysis of water quality modeling through the Chesapeake Bay program to determine if the District meets its nutrient loads assigned from the Chesapeake Bay TMDL. Biological monitoring is used to confirm and identify nutrient impairments

- **Methods:** Nutrient reduction is incorporated into TMDLs, BMPs, and permit limits. The District's Storm Water Management Division implements the Best Management Practices and the Watershed Protection Division has regulatory programs in place. The Blue Plains wastewater treatment plant in the District has been a leader in reducing nitrogen and phosphorus discharge from the wastewater treatment process. DC has an ongoing and aggressive program to reduce nitrogen levels discharged from our Blue Plains sewage treatment plant into the Potomac River. Stormwater management BMPs include the use of sand filters, retention ponds, low impact developments, vegetation buffers, and a green roofs program. Finally, the District conducts a variety of educational activities year round, targeted at teachers, environmental educators, and students.

- **Other Relevant Information:** In addition to federal laws and regulation, DC makes use of interagency coordination, public participation, and watershed implementation plans to reduce nutrients in the District's waters. Primary funding sources include District general funds, joint agency initiative funds, CWA 106, 319, and SRF funds.

Contact: Shah Nawaz, District Department of the Environment, Water Quality Division; shaw.nawaz@dc.gov.

Florida

Florida's Department of Environmental Protection has implemented extensive activities to reduce nutrients in the state's waterbodies. Their existing nutrient reduction program regulates point, nonpoint, and air sources throughout the state. FDEP has statewide authority to establish criteria for the state's waters, assess those waters, and regulate point and non-point sources of nutrient contribution, while coordinating with the Florida Department of Agriculture and Consumer Services to establish agricultural BMPs. Florida seeks to continue ensuring that its criteria and other provisions for the assessment of nutrients in the state's waters allows the state to accurately assess and protect state waters so that both human and economic resources are effectively and efficiently directed.

- **Key Elements:** Florida has a rigorous waterbody assessment program which addresses both nutrient variables (nitrogen and phosphorus) and biocriteria (chlorophyll-a, Stream Condition Index, and Lake Vegetation Index). The state's TMDL program allocates reductions to both point and nonpoint sources of nutrients, which are implemented through Basin Management Action Plans.

- **Assessment:** Florida's assessment program assesses waters by waterbody type and accounts for both nutrient variables and biocriteria. Waterbodies are classified as Class I, potable water supplies, Class II, shellfish propagation or harvesting, Class III, recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife, Class IV, agricultural water supplies, and Class V, navigation, utility and industrial use, though currently there are no Class V waterbodies. Florida's proposed numeric nutrient criteria rule would further subdivide waterbodies into lakes, spring vents, streams, and estuaries and would differentiate between flowing and still waters.

  Florida currently uses limited biological monitoring to identify or confirm impairment due to nutrients. The state utilizes a rapid periphyton survey to identify streams or rivers with abundant algae due to nutrients, but is revising its assessment methodology to provide for more comprehensive assessment through biological monitoring. Under the revised plans, Florida will use macroinvertebrate, plant, and algal bioassessment methods to assess nutrient impairment. Macroinvertebrate methods include the Stream Condition Index and the Shannon-Weaver Diversity Index. Assessment of plants will utilize the Lake Vegetation Index, linear vegetation survey, and seagrass surveys, and algal imbalances due to nutrients will use both the rapid periphyton surveys and chlorophyll-a concentrations.

- **Methods Utilized:** Florida's nutrient reduction plan makes use of a wide variety of methods to address nutrients in its waterbodies, including: best management practices, NPDES and state permitting, TMDLs, regulatory requirements, water quality trading, interagency partnerships, nutrient management plans, nutrient reduction agreements, voluntary programs, education, and social media campaigns. No industries or activities are exempted from Florida's nutrient reduction program.

- **BMPs:** FDACS, in coordination with FDEP, may adopt by rule BMPs to reduce agricultural nonpoint source pollution and has currently implemented such BMPs for more than 8 million acres of farmland. Additionally, Florida is developing a statewide urban stormwater rule which will include BMPs for nutrient reduction.

- **State Permitting and Regulatory Requirements:** Florida's state permitting requirements addressing nutrients include state specific technology based limits, enforceable provisions for nonpoint sources, reporting requirements for nonpoint sources, and the ability to order abatement of discharges. Additionally, the state has regulatory requirements for Advanced Wastewater Treatment in several large watersheds. Permitting covers wastewater discharge to groundwater, with reuse playing a significant role in the state's antidegredation rules and water policy.

- **Voluntary Programs and Nutrient Reduction Agreements:** Florida has a variety of voluntary programs for nonpoint source discharges and for those wishing to apply a reasonable assurance approach to implement nutrient reduction measures in advance of the TMDL process. In addition to its water quality trading program, nutrient reduction agreements may be achieved through stakeholder agreements as part of a reasonable assurances approach through the state's Basin Management Action Plan. Under a Basin Management Action Plan, stakeholders provide annual updates on the status of project implementation and each plan is monitored to assess water quality improvements.

- **Water Quality Trading:** Florida's water quality trading program consists of a pilot program in the Lower St. Johns River Watershed. Developed to implement the nutrient TMDL for the river, this program is currently limited to nutrients and allows for trading by either point or nonpoint sources, provided that at least one of the parties has an individual NPDES permit. Agricultural operations can only generate credits through advanced BMPs.

- **Priority Pollution Sources:** Currently, the state's nutrient reduction program is primarily targeted at airborne contribution, wastewater treatment plants, septic systems, stormwater, farmland, and AFOs.

- **Accountability**: Permit limits and compliance reporting requirements ensure accountability for permitted point sources. Florida also verifies the effectiveness of BMPs. Nutrient reductions are monitored, reassessed, and addressed through implementation of Basin Management Action Plans. Though accountability mechanisms are different for point and nonpoint sources, the level of accountability is similar for both. Analysis of the impacts of Florida's nutrient reduction program is accomplished through the state's monitoring programs and made publically available through annual reports.

- **Other Relevant Information:** Florida's program is primarily funded through state general funds and agency budgets, permitting and other fees, federal CWA 106, 319, SRF funds, the federal Farm Bill program, and the private sector. In addition to federal laws

and regulations, the state relies on Chapters 373 and 403 for its authority to address nutrients.

Contact: Frank Nearhoof, Florida Department of Environmental Protection, Division of Environmental Assessment and Restoration; frank.nearhoof@dep.state.fl.us.

Georgia

The Watershed Protection Branch of Environmental Protection Division of Georgia's Department of Natural Resources manages water resources in Georgia through permits to local governments and industry to discharge treated wastewater and permits to local governments, industry, farmers, and subdivisions for surface water and groundwater withdrawals. The Branch works to control nonpoint sources of pollution, including erosion and sedimentation, manages storm water discharges, and conducts water quality monitoring. Georgia currently has a statewide nutrient reduction program focused on reducing phosphorus in the state's waterbodies.

- **Key Elements:** Georgia's nutrient reduction efforts are organized around the state's Phosphorus Strategy, which requires new or expanding NPDES permitted facilities greater than 1 MGD be given a total phosphorus limit of 1 mg/L, those less than 1 MGD be given a total phosphorus limit of 8.34 lbs/day, and requires monitoring by existing facilities. Permitted facilities upstream from lakes with chlorophyll and nutrient standards are given lower limits. Water quality impacts are considered in developing watershed and lake models that can be used to evaluate the impact of point source reductions. Biological monitoring for lakes focuses on chlorophyll. If a lake with standards is listed as impaired and a TMDL is developed, reductions in MS4 and agricultural loads are required.

- **Methods Utilized:** Georgia's nutrient reduction program primarily targets wastewater treatment plants, though no activities or industries are exempt. The state's program primarily utilizes NPDES permitting and TMDLs to achieve nutrient reductions. Additionally, the state is developing voluntary programs, working with chicken growers on litter disposal programs, and has adopted a dishwashing detergent phosphate ban.

- **Other Relevant Information:** Georgia's nutrient reduction efforts are primarily funded by state agency general funds and budgets.

Contact: Elizabeth Booth, Georgia Department of Natural Resources, Environmental Protection Division, Watershed Protection Branch; elizabeth.booth@dnr.state.ga.us.

Hawaii

Hawaii's Department of Health works to protect the health and environment of the state. The Environmental Management Division, Clean Water Branch, works to regulate and restore coastal and inland water resources through statewide coastal water monitoring and watershed-based management. While Hawaii does not have and is not developing a nutrient reduction program, several of the state's existing programs address nutrient reduction.

- **Overview:** Hawaii's state water quality standards include criteria for nutrients, differentiated into "wet" and "dry" criteria depending on the season. The Department of Health has established several TMDLs for nitrogen and phosphorus and has a monitoring program that collects shoreline samples for nutrients that are used to establish baseline conditions for evaluating reductions. Additionally, the Clean Water Branch's Polluted Runoff Control Program works to create partnerships with agencies involved in nonpoint source pollution control, to provide community-based watershed management through education and voluntary programs, and funding for BMPs. The Program addresses nutrients in its CWA 319 grant program to address nutrient runoffs in priority watersheds and through providing guidance in nutrient management plans for agriculture.

Contact: Alec Wong, Hawaii Department of Health, Environmental Management Division, Clean Water Branch; alec.wong@doh.hawaii.gov.

Idaho

Idaho's Department of Environmental Quality is responsible for ensuring clean and healthy water throughout the state. The Department works with federal and state agencies, local governments and organizations, and individual citizens to identify and implement cost-effective environmental solutions. The Water Quality Division, Surface Water Program, works to ensure surface waters meet their designated uses and meet state water quality standards. While Idaho does not have and is not developing a nutrient reduction program, several of the state's existing programs address nutrient reduction.

- **Overview:** Idaho's water quality standards include narrative criteria for excess nutrients that cause nuisance aquatic growths and impair designated uses. This criterion is applicable statewide. Also, several TMDLs established by the Department of Environmental Quality include and address nutrients in applicable waterbodies. Additionally, the state's nonpoint source program makes use of agricultural BMPs, such as stream bank restoration and cattle exclusion, which impacts nutrient loads into waterbodies.

Contact: Mary Anne Nelson, Idaho Department of Environmental Quality, Surface Water Program; mary.anne.nelson@deq.idaho.gov.

Illinois

Illinois' waterbodies are protected and regulated by the Illinois Environmental Protection Agency's Bureau of Water, which acts to ensure that the state's rivers, streams and lakes will support all uses for which they are designated. In addressing nutrients in state waterbodies, Illinois uses a variety of distinct strategies and interagency approaches.

- **Key Elements**: Illinois's nutrient reduction efforts are organized around pollution source. The state utilizes distinct strategies for both point and nonpoint nutrients sources. For point sources, reduction efforts are focused on wastewater treatment plants, while nonpoint source efforts are focused on agriculture. Both point and nonpoint approaches are of equal priority and nutrient reduction efforts are driven by the opportunities presented when a permit action arises, when 319 proposals are solicited, or when assisting in watershed-based planning.

- **Assessment**: Assessment procedures start with identifying biological impairment. When impairment is found, the state identifies potential causes of the impairment through analysis of dissolved oxygen problems, excessive algae growth, exceedance of water quality standards, or exceedance of non-standards-based assessment benchmarks. Accountability is assured for point sources through compliance with NPDES permit limits, while accountability mechanisms for nonpoint sources are evolving and include reporting requirements for 319 projects and MRBI as well as potential reporting on agricultural practices.

- **Methods**: In addressing point source contributors, Illinois utilizes a phosphorus effluent standard, anti-degradation analyses focused on phosphorus and nitrogen, and wasteload allocations pursuant to TMDLs. The state is currently planning additional technology-based approaches such as phosphorus limits to be implemented when cultural eutrophication is identified, when significant plant upgrades occur. For nonpoint source pollution, nutrient reduction is a priority for 319 funding and plans have been developed within the agricultural community for promoting nutrient practices in priority watersheds. Illinois EPA and the Illinois Department of Agriculture fund conservations practices that are focused on water quality protection. A key strategy for addressing such nutrient contribution is through the promotion of appropriate BMPs customized to the particular circumstances in the watershed. For example, there is a statewide push by fertilizer retailers to improve customer nitrogen application, but in some watersheds there is additional promotion of the use of cover crops or conservation tillage. Education is a primary tool in the state's approaches towards agricultural nonpoint source pollution and there has been broad-based education across a variety of levels, from statewide conferences to watershed-level education and individualized efforts. Additionally, existing voluntary programs are in place, including 319 projects, CREP, NRCS programs, and state funding of conservation practices, while collaboration with funding agencies seeks to give highest priority to nutrient reduction projects.

- **Other Relevant Information:** Illinois believes that it will continue to be challenged to establish scientifically defensible, cause-effect based numeric nutrient criteria, but

emphasizes the difficulty faced in such a task. From 2003-04, the state funded $1 million in research to establish such a basis, without success. Currently, additional analyses are being conducted, combining Illinois's data with similar waterbodies in other states, in order to develop useful correlations. This process has lead Illinois to rely on a technology-based, conservation practice-based approach in order to see improvements as quickly as possible. Illinois believes that if the state waits for standards, it will let many opportunities for nutrient reduction pass by.

Contact: Marcia Willhite, Illinois Environmental Protection Agency Bureau of Water; marcia.willhite@illinois.gov.

Indiana

The Indiana Department of Environmental Management is tasked with protecting the state's waters through the implementation of federal and state human health and environmental regulations. While the state does not have a formalized nutrient reduction program, a number of the state's agencies' programs have nutrient reduction as an objective.

- **Key Elements:** Indiana's watershed approach to protecting and maintaining waterbodies is founded on internal and external collaboration across program areas.

- **Assessment:** Water quality impacts are considered within the context of the state's watershed approach, which is hydraulically defined and geographically focused. Indiana's watershed approach provides a framework to address water quality issues by taking into account land, air, and water stressors. It integrates multiple programs through the coordination of public, private, and not-for-profit stakeholders to address priority concerns, including nutrient impairments.

- **Methods Utilized:** IDEM addresses nutrients through a variety of programs, both regulatory and non-regulatory. These include nonpoint source programs, such as CWA 319(h) and 205(j) grant programs to fund reduction of nonpoint source pollution, the state's TMDL program, section 401 and state wetland permitting programs, NPDES rules addressing phosphorous removal or control facilities, long term control plans for combined sewer overflow communities, regulations on AFOs and land application of biosolids and industrial waste products, and municipal separate storm sewer systems. Additionally, state and local Departments of Health regulate onsite wastewater treatment systems, the Office of the Indiana State Chemist regulates fertilizers and manure, and there is a state ban on phosphorus in detergents. The state Department of Agriculture assists producers with nutrient reduction management plans, which are required to participate in a number of cost-share programs.

- **Integration with Other Programs:** Indiana's nutrient reduction efforts are accomplished through a collaborative approach based on timely and effective communication and adaptive management. IDEM's senior staff, including the commissioner, meets weekly to discuss progress on priorities. Cross-program teams work to develop courses of action to ensure that internal resources are focused on addressing the most significant environmental issues affecting water quality, such as nutrients. The IDEM Office of Water Quality is additionally on the steering committee for the Indiana Conservation Partnership, which is comprised of other state and federal agencies, universities, and non-profit entities. The Partnership prepares an annual Plan of Work that establishes objectives for up to four conservation focus areas and includes the actions, responsible entities, and deadlines for achieving them. Development of Indiana's State Nutrient Reduction Strategy continues to be one of the four focus areas in the Partnership's Plan of Work.

  As Indiana's representative on the Gulf Hypoxia Task Force, the Indiana State Department of Agriculture (ISDA) is the lead agency on development of the strategy.

ISDA has worked very closely with IDEM to put together a draft to be taken back to the ICP and workgroup comprised of representatives from U.S. Geological Survey (USGS), Indiana Environmental Institute, Farm Bureau, Indiana Pork Producers, Indiana Poultry, and Indiana Dairy. The draft strategy focuses on assessing and prioritizing watersheds with the greatest nutrient enrichment problems, identifying the existing programs (regulatory and volunteer, incentive-based) to address the problems, and determining what further actions need to be taken. We anticipate presenting the draft to the workgroup in mid to late May for further development.

Contact: Marylou Renshaw, Indiana Department of Environmental Management, Watershed Assessment and Planning Branch/Office of Water Quality; mrenshaw@idem.in.gov.

Iowa

Water quality is one of Iowa's top environmental priorities. The Iowa Department of Natural Resources seeks to protect and restore the state's waters through partnering with communities, organizations, and private landowners. To address the impact of nutrients in the states waters, Iowa is currently developing a nutrient reduction program with key stakeholders coordinated by the state's Department of Natural Resources and Department of Agriculture and Land Stewardship.

- **Key Elements:** Iowa's overall nutrient reduction strategy is currently in development and will include targeted actions for wastewater treatment plants, septic systems, stormwater, farmland, and animal feeding operations. Technology-based limits for point sources and reporting mechanisms and a detailed scientific assessment of BMPs for agricultural nonpoint sources are being considered.

- **Methods Utilized:** Iowa is planning to make use of a variety of methods for addressing nutrients including education, BMPs, voluntary programs, permitting requirements, TMDLs, regulatory requirements, water quality trading, and interagency partnerships. State permitting requirements will include technology-based limits for point sources and reporting requirements for nonpoint sources. Analysis will be conducted through ambient water quality monitoring as well as NPDES permitting reductions and nonpoint source BMP reporting. Draft nutrient numeric criteria differentiates between lakes and rivers and streams depending on size and flowing and still waters.

Contact: Adam Schnieders, Department of Natural Resources, Environmental Services Divisions; adam.schnieders@dnr.iowa.gov.

Kansas

The quality of Kansas's water resources is regulated by the Kansas Department of Health and Environment. The Bureau of Water administers water quality programs for the state's waters designed to provide safe drinking water, prevent pollution, and assure compliance with state and federal law.

- **Key Elements:** Kansas's nutrient reduction program is statewide in scope, applied on a watershed basis, and focuses primarily on wastewater treatment plants, farmland, and animal feeding operations. Technology based POTW limits for major facilities are coupled with TMDLs and watershed plans to reduce nutrient concentrations. Once state narrative criteria are met, the nitrogen and phosphorus concentrations that support those narratives are adopted as site-specific criteria. Kansas's nutrient reduction program is tightly integrated with other state programs. Conservation funds through the state Department of Agriculture are combined with 319 funds and State Water Plan funds to support watershed planning and reduction efforts. Additionally, the Bureau of Water works with the USDA to incorporate nutrient reduction in the prioritization of fund expenditures under USDA water quality programs. Water quality impacts are considered through chlorophyll-a criteria for lakes, narrative water quality criteria, and in evaluating nutrient response variables in 303d listings for chlorophyll-a, dissolved oxygen, pH, and bio-indicators. In still waters, chlorophyll-a is used as the primary indicator of eutrophication, while flowing waters use a variety of the above indicators.

- **Methods Utilized:** Kansas's program utilizes education, BMPs, voluntary programs, nutrient management plans, permitting requirements, TMDLs, state regulations, and interagency partnerships in order to reduce nutrients in the state's waters. Technology-based reduction is required for point sources while nonpoint sources are addressed through watershed planning. State permitting requirements focus on non-discharge options for wastewater, including a variety of options from complete re-use to non-discharge lagoons.

- **Accountability:** Antidegradation reviews for new or expanding POTWs focus on nutrient reduction and allow for incorporating enforceable nutrient limits into permits. Accountability is assured through the state's 303d and TMDL process, NPDES permits, and monitoring built in to the state's watershed plans. Analysis of the state's efforts has verified reductions from point sources.

- **Other Relevant Information:** Kansas's nutrient reduction program relies on a variety of funding sources, including state general funds and agency budgets, joint agency initiatives, federal CWA §§ 106, 319, and SRF funds, the federal Farm Bill Program, and private sector contributions.

Contact: Michael Tate, Department of Health and Environment, Bureau of Water; mtate@kdheks.gov.

Kentucky

Kentucky's Division of Water is charged with managing, protecting, and enhancing the water resources of the Commonwealth. The Division of Water currently addresses nutrients in waterbodies through monitoring, assessment, listing, permitting, and other efforts. In addition, the division employs diverse partnerships in accomplishing water quality goals. The Division of Water is expanding its efforts regarding nutrient water quality issues, developing a Nutrient Reduction Strategy with the goal of reducing nutrient loadings into waters of the Commonwealth. The Kentucky Nutrient Reduction Strategy will be a statewide approach to reducing nutrient loadings into waters of the Commonwealth using and building on existing tools and partnerships, conducting nutrient education and outreach, developing monitoring systems to prioritize areas for implementation, measuring success, and employing adaptive practices in response to data and modeling. The intention of the strategy is to create a proactive and comprehensive approach to improved nutrient management in Kentucky.

- **Key Elements:** Kentucky is experiencing an increase in the nutrification of its rivers, streams, and reservoirs, and also recognizes these challenges in downstream waters. Kentucky is well positioned to develop and implement an effective Nutrient Reduction Strategy because of a broad coalition of cross-cutting partnerships and the availability of tools such as the Agriculture Water Quality Act. Kentucky's Nutrient Reduction Strategy will focus efforts where nutrient problems are most evident and use state- and watershed-specific strategies designed to improve water quality in local watersheds by realizing reductions at that scale. This effort will work in tandem with monitoring to provide feedback regarding the efficacy of activities and allow partners to employ adaptive approaches to implementing the Nutrient Reduction Strategy locally. The Nutrient Reduction Strategy will identify key stakeholders and their roles, and employ public education and outreach on the importance and need for nutrient reduction, involving key stakeholders in that effort. A group of technical stakeholders will work to identify sources in Kentucky, assess and prioritize watersheds, develop a monitoring program to document baseline conditions, develop metrics, and conduct reporting. In addition, the division will work with stakeholders to document baseline/current efforts and develop a process for documenting and verifying progress, building on current efforts and evaluating available technologies and methods.

- **Methods Utilized:** The Kentucky Nutrient Reduction Strategy will develop source-specific strategies for nutrient reduction, including municipal and industrial WWTPs, municipal and industrial stormwater, agricultural land uses, on-site wastewater systems, and other nonpoint and unregulated sources. The strategy will look at available technologies and strategies for implementing these technologies, including the use of green infrastructure and other practices to reduce nutrient pollution in municipal and industrial stormwater runoff. The Kentucky Nutrient Reduction Strategy will employ the Kentucky Agriculture Water Quality Act requirements and the BMPs in the statewide Agriculture Water Quality Plan, including nutrient management planning and nutrient management education and outreach/technical assistance with farmers as a primary means for accomplishing nutrient load reductions from agricultural lands. Partnerships also play a key role in Kentucky's nutrient reduction efforts, with the Division of Water

working closely with its regulated stakeholders, the agricultural community via the Agriculture Water Quality Authority, and various agriculture agencies and other agencies such as health departments and those regulated stakeholders. In addition, water quality trading programs are being considered, and are being implemented in a limited capacity in one watershed at this time.

- **Accountability:** Kentucky's accountability measures for its NRS program are still in development and the Division of Water is currently establishing monitoring and other metrics. Additionally, existing permitting requirements and discharge monitoring reports provide for a detailed level of oversight and the state makes additional use of both voluntary monitoring and monitoring for fertilizer applications.

- **Other Relevant Information:** Kentucky's nutrient reduction strategy programs will be funded via various sources, depending on the stakeholder agency and the activity. The sources of funding includes federal Clean Water Act 106 and 319(h) funds, state general funds, agency funds, state cost share funds combined with various federal funds including NRCS and FSA funding, 319(h) funds, Kentucky Agriculture Development Board funds, and other local and as yet unidentified funding sources.

Contact: Peter Goodmann, Department for Environmental Protection, Division of Water; peter.goodmann@ky.gov.

Louisiana

The Louisiana Department of Environmental Quality (LDEQ) works to protect Louisiana's health and environment through inspections of permitted facilities and activities, responding to environmental emergencies, and sound enforcement actions. Several divisions within the LDEQ are engaged in comprehensive watershed management that is collaborative among state, federal and local stakeholders and are currently developing a nutrient reduction strategy to address nutrient impairments. These include the Water Permits Division, the Inspection Division, the Enforcement Division, and the Business and Community Outreach and Incentives Division.

- **Key Elements:** Currently in development, Louisiana's draft Nutrient Reduction Strategy will be statewide in scope, implemented on a watershed basis, and focus primarily on implementing impairment source identification approaches within impaired watersheds to locate and correct offending sources such as wastewater treatment plants, septic systems, stormwater, farmland, and animal feeding operations as well as mining, manufacturing, silviculture, and aquaculture. Water quality impacts will be considered triggers for action, indicators of potential resolutions, and metrics for success. Success and indicator criteria will be specific to each ecoregion and waterbody type.

- **Methods Utilized:** The Louisiana strategy will integrate watershed-based investigations, education, BMPs, voluntary programs, nutrient management plans and reduction agreements, state and NPDES permitting requirements, TMDLs, state regulations, interagency partnerships and water quality trading in order to reduce nutrients in the state's waters. Effective BMPs for nonpoint sources, identified through the CWA 319 program, will be promoted and activities which are not directly regulated will be influenced through incentives. State permitting requirements include state-specific technology and water quality-based limits, mandatory technology implementation, reporting requirements for nonpoint sources, and the ability to order abatements of discharges.

- **Accountability:** Louisiana will seek to ensure accountability through using environmental conditions as the ultimate measure of success and requiring that actions proposed be implemented effectively.

- **Other Relevant Information:** Louisiana's draft Nutrient Reduction Strategy relies on a variety of funding sources, including state-federal joint agency initiatives, permit fees, federal CWA §§ 106, 319, and SRF funds, the federal Farm Bill Program, and private sector partnerships.

  Louisiana believes that the key to a sustainable program is through developing ownership of local environmental quality by those who live and work in the watershed (i.e., the "watershed community"). It seeks greater support in innovative approaches that do not rely solely on federal regulatory structures.

Contact: Chris Piehler, Department of Environmental Quality, Office of Environmental Compliance; chris.piehler@la.gov.

Maine

Maine's Department of Environmental Protection (DEP) implements water quality programs under the Clean Water Act and state law. Through the Bureau of Land and Water Quality, the Department is responsible for managing, protecting and enhancing the quality of Maine's water resources through voluntary, regulatory, and education programs. Maine addresses nutrient reduction through a verity of programs and agencies.

- **Overview:** Maine does not have a single nutrient reduction program, but seeks to address the impact of nutrients in the state's waters through several programs, authorities and agencies. These include the Maine Stormwater Management Law, which includes a phosphorus standard, the Maine Nutrient Management Law, administered by the state's Department of Agriculture, and laws promoting the use of phosphorus-free fertilizer. Maine's efforts are organized around a combination of waterbody type, pollution source, and indicator. Sensitive waterbodies have stricter standards under the Storm Water Law and specific standards apply for phosphorus reduction in lake watersheds. Water quality impacts are considered in stormwater standards. Stormwater standards require BMPs that are effective at reducing nutrient impacts. Additionally, the Maine DEP is in the process of developing nutrient criteria rules.

Contact: Don Witherhill, Maine Department of Environmental Protection, Division of Watershed Management; donald.t.witherill@maine.gov.

Maryland

Maryland's Department of the Environment makes use of diverse regulatory and planning programs to reduce the impact of pollutants in the state's waters. Maryland is currently implementing a comprehensive Watershed Implementation Plan (WIP) to reduce nutrient and sediment loadings into the Chesapeake Bay as part of a six state strategy developed as part of the TMDL process.

- **Key Elements:** Maryland's nutrient reduction efforts are tracked and monitored through EPA's Chesapeake Bay Program Office, which is overseeing the multi-state restoration effort. Maryland launched BayStat in 2007 to assess, coordinate, and target Maryland's Chesapeake Bay restoration programs and to provide citizens with a way to track our progress. BayStat helps state agencies identify strategies, actions, and short-term milestones to improve nutrient reduction efforts. BayStat is a collaborative performance management system for Bay restoration. BayStat is a team, led by Governor O'Malley, that includes the Secretaries of Agriculture, Environment, Natural Resources, and Planning, scientists from the University of Maryland, and other key staff. BayStat is a process through which Maryland state agencies develop restoration goals and strategies, and assess their effectiveness and adjust actions as necessary. BayStat provides tools that allow Marylanders to track — and, most importantly, participate in — the Bay restoration effort.

- **Methods Utilized:** Although Maryland's nutrient reduction efforts are now formalized in the Chesapeake Bay WIP, the programs used to build this framework have evolved over of the span several decades. These programs now include a regulatory and funding program that will result in the implementation of enhanced nutrient reduction technology (ENR) at 67 of the largest wastewater treatment plants, upgrades of thousands of septic systems using best available nitrogen removing technology, stormwater regulations that require urban runoff to be managed to the equivalent level of woods in good condition, and dozens of regulatory and non-regulatory agricultural programs that will reduce millions of pounds of nitrogen from entering the Chesapeake Bay. The state has active programs and funding to maximize the use and impact of agricultural BMPS and is using MS4 permits to achieve aggressive nutrient and sediment reductions in urban areas. Maryland is currently exploring water quality trading for both point and nonpoint sources.

- **Accountability:** Accountability for statewide reductions is ensured through NPDES permits, 2-year milestones, and other benchmarks that are tracked through EPA's Bay Program Office. Extensive modeling and monitoring programs are used to analyze the program's impacts and are publically available.

- **Other Relevant Information:** Maryland's nutrient reduction program is primarily funded through state general funds and agency budgets and federal funding through EPA's 106, 319, and SRF and USDA agricultural cost-share programs.

Contact: Tom Thornton, Maryland Department of the Environment; tthornton@mde.state.md.us.

Massachusetts

The Massachusetts Department of Environmental Protection, Division of Watershed Management, works to ensure that the state's inland and coastal waters are monitored, protected, and safe for all. Division of Watershed Management programs focus on developing local and regional partnerships to bring about water quality improvements. Massachusetts has been addressing nutrient management and reduction for many years for both point and nonpoint sources.

- **Key Elements:** In addition to surface water quality regulations, Massachusetts is engaged in a variety of nutrient management programs, including work with USEPA to set nutrient NPDES permit limits for point sources , conducting monitoring and assessment activities, TMDL development, and issuing grant programs to address nonpoint sources as well as to work with other state and federal restoration programs such as MA Coastal Zone Management (MACZM) and the Natural Resources Conservation Services (NRCS). Statewide in scope, Massachusetts' efforts focus on wastewater treatment plants, septic systems, boat waste, stormwater, and agriculture. Water quality impacts are considered in determining impairments and, if found, result in prioritized TMDL development. Waters are classified by their uses and include rivers, ponds, or estuaries. Flowing and still rivers are differentiated by residence time. Massachusetts applies numeric assessment guidelines for biological response variables such as secchi disk, chlorophyll-a, filamentous algae coverage, duckweed, and dissolved oxygen, when performing use assessments. The state has historically relied on best professional judgment and weight-of-evidence in its water quality assessment of "Aquatic Life" impacts due to nutrients and has recently completed developing a Comprehensive Assessment and Listing Method.

- **Methods Utilized:** Massachusetts makes use of education, BMPs, nutrient reduction agreements and management plans, NPDES permitting, TMDLs, regulatory requirements, and interagency and interstate partnerships to address nutrients. Though not a delegated NPDES state, Massachusetts works with EPA to address nutrients in NPDES permits. Permit targets are informed by the state's TMDL program and include technology requirements to reduce effluent limits from 0.5 to 0.2 or 0.1 mg/l for phosphorus and 8gm/L to 5mg/L for total nitrogen. Permits often include monitoring requirements and seasonal effluent limits. Of these permits approximately 50% set limits for total phosphorus and 30% of these permits require seasonal limits of less than 0.2 mg/L total phosphorus. Many are at 0.1 mg/l . Almost all permits that discharge either directly or indirectly to marine waters have, at a minimum, a requirement to monitor for nitrogen constituents in wastewater (e.g., total, nitrogen, total Kjeldahl nitrogen, ammonia, nitrate and nitrite). The NPDES permit program has driven State Revolving Fund grants for wastewater collection and treatment infrastructure.

  MS4 permits require stormwater management programs and, for medium and large cities and certain counties, NPDES permits. Recently, draft MS4 permits have included nutrient reduction requirements to address areas where a TMDL is in place or a waterbody segment has been identified as impaired from nutrients. To date,

approximately 35% of the state's POTWs have nutrient permit limits and many more have specific nutrient monitoring requirements. The state wetlands program contains specific requirements for BMP applications to control runoff and encourage infiltration. State permitting requirements include state specific technology based limits, mandatory technology implementation, reporting requirements for nonpoint sources, and the ability to order abatements of discharges.

Nonpoint sources are addressed through BMPs, public education programs, and grant programs implementing nutrient BMPs. No Discharge Areas have been developed to prevent the discharge of all boat sewage, with the goal of extending such areas to all of the state's coastal waters. The state is working with local communities and the EPA to increase boat pumpout facilities. Also, the federal 319 program places a high priority on projects that are designed to address both nutrients and bacteria since these are the largest reasons for impairment in the state. MassDEP also coordinates with NRCS to prioritize and target EQIP funds to nutrient-impaired water bodies.

The Massachusetts Surface Water Quality Standards contain numeric and narrative surface water quality criteria aimed at the regulation of nutrients. These regulations also contain a narrative standard that prohibits nutrient discharge that would contribute to eutrophication as well as narrative standards for solids, color, turbidity, and numeric criteria for dissolved oxygen and pH. New or increased discharges are prohibited in designated Outstanding Resource Waters, with limited exceptions. Regulations governing septic systems include minimum standards for replacing failed and inadequate systems and inspection requirements before sale or transfer. A nutrient trading program is currently in the pilot stages.

- **Accountability:** In addition to permitting and monitoring requirements, the Division of Watershed Management produces water quality assessment reports periodically for each watershed. These publically available reports review available quality-assured data from other sources, determine the use support status of surface waterbodies, determine the causes and sources of any impairment to uses, and support reporting to the USEPA on the status of the Commonwealth's surface waters. Through the Massachusetts Estuaries Program, the state Department of Environmental Protection, universities, federal agencies, and municipalities have developed a science-based approach to identify and address nutrient issues through regional estuarine monitoring programs, eelgrass mapping, and groundwater, land-use, and estuarine model development and implementation. This program has resulted in over seventy site-specific embayment studies for nutrient control.

- **Other Relevant Information:** Massachusetts' nutrient reduction programs are funded by state general funds, joint agency initiatives, permit fees, and federal CWA 106, 319, and SRF funds.

Contact: Kimberly Groff and Dennis Dunn, Massachusetts Department of Environmental Protect, Division of Watershed Management; kimberly.groff@state.ma.us, dennis.dunn@state.ma.us.

Michigan

The Michigan Department of Environmental Quality, Water Resources Division, works to administer regulations and programs that protect public health and promote the appropriate use, limit the adverse effects on, and restore the quality of the state's waters. To address the impact of nutrients on the state's waters, Michigan is developing a nutrient reduction strategy to reduce nutrient loadings through a combination of point and nonpoint source reduction activities.

- **Key Elements:** Michigan's statewide nutrient reduction efforts are organized by indicator, with a focus on phosphorus, with other indicators taken into consideration as needed. Nutrient-related water quality impacts are identified and prioritized through the 303(d) and TMDL programs. The state's reduction strategy is primarily targeted at wastewater treatment plants, septic systems, stormwater, farmland and animal feeding operations, permitted industrial discharges, and wastewater sewage lagoons. The state is evaluating a process for developing numeric criteria in the future (Michigan is currently prohibited from adopting any new or revised rules pursuant to state law) and currently makes use of visual observations to determine if nuisance aquatic plant growth, associated with nutrients, exists in the state's waters, and is causing water quality impairment.

- **Methods Utilized:** Nutrient reduction efforts include the development of TMDLs for nutrient-impaired waters, prioritizing healthy watersheds, working towards eliminating uncontrolled sewer overflows, evaluating a process for developing numeric nutrient criteria, implementing BMPs, and future monitoring in MS4 storm water permits, working with the Department of Agriculture to develop standards to prioritize Michigan Agriculture Environmental Assurance Program activities on farms to control nutrient runoff, statewide bans on phosphorus in dishwashing detergents and lawn fertilizers, target nitrogen and phosphorus load reduction efforts through the nonpoint source program, and working with the wetland reserve program to restore lost historic wetlands for improving water quality and quantity.

  For BMPs, Michigan makes publically available a BMP manual which can be used to help plan development projects that limit or reduce nutrient inputs to surface waters, through practices such as gully stabilization, livestock exclusion, integrated crop management, and filter strips.

  Michigan implements voluntary nutrient reduction programs through the use of cooperative agreements, development of watershed management plans with stakeholders, and the implementation of nutrient reduction efforts through 319 grants. Currently, there are three watersheds in Michigan with approved TMDLs, where nutrient reduction strategies are being implemented through Cooperative Agreements in order to meet phosphorus TMDL targets. Any stakeholder in the targeted watershed is eligible to participate and monitoring of the waters is encouraged and conducted to assess the progress of the cooperative agreements, and meeting the TMDL targets. Both point and nonpoint sources in the watersheds work collectively to reduce nutrient loading in these

watersheds. Additionally, state permitting is used to include state-specific technology-based limits and to cover a larger universe of activities than the NPDES program.

Regulations establish an effluent discharge standard of 1.0 mg/L for phosphorus for point source discharges to protect the Great Lakes. Additionally, Michigan's narrative nutrient standard is used to protect inland waters and provides the flexibility to limit nutrients that stimulate growths of aquatic plants and algae that become, or that might become, injurious to designated uses.

Educational efforts are targeted towards watershed stakeholders and are implemented through cooperative agreements, watershed management plans, public meetings, nutrient presentations to the public, and educational brochures developed through grant projects. Effectiveness of the educational efforts is monitored through continued environmental assessment and social monitoring that is conducted by grantees.

- **Accountability:** Phosphorus limitations and TMDL waste load allocations are implemented in NPDES permits, nutrient-impaired waters receive higher priority for 319 funding, and monitoring is conducted to evaluate the impact of reduction activities. Limited analysis of nutrient reduction efforts has been completed in targeted areas and monitoring is ongoing to evaluate the effectiveness of the statewide ban on phosphorus in lawn fertilizer. Both ambient monitoring and targeted monitoring are used to determine phosphorus loading in targeted watersheds. The results of analyses are publically available.

Contact: Sarah Holden, Michigan Department of Environmental Quality, Water Resources Division; holdens1@michigan.gov.

Minnesota

Minnesota's waters are protected and managed by the state's Pollution Control Agency in cooperation with the state's Department of Agriculture, Board of Water and Soil Resources, Department of Natural Resources, and Department of Health. Minnesota has several programs that work to reduce nutrient impacts in the state's waters, including a phosphorus strategy under the Minnesota Pollution Control Agency that guides wastewater issues and a developing nutrient management plan through the state Department of Agriculture.

- **Key Elements:** Minnesota's nutrient reduction efforts are primarily focused on wastewater treatment plants, septic systems, stormwater, farmland, and animal feeding operations. Monitoring, assessment, and reduction strategies are being developed on a major watershed basis and implemented on waterbody, watershed, and statewide levels as appropriate. Programs are organized around pollutant source and waterbody type. Programs address excess nutrients from wastewater, stormwater, and feedlot programs, while monitoring is focused around waterbody type. TMDLs have been developed for particular pollutants in individual waterbodies, while the state is currently moving toward major watershed TMDLs that address all pollutants for all waterbodies in the watershed. Minnesota's major watershed approach is as follows: set appropriate water quality standards, including nutrient standards in development; monitor the water; assess the data against standards; list impaired waters; perform watershed modeling and stressor identification work; develop watershed restoration and protection strategies, including TMDLs targeted to priority management areas; and implement practices that will fix and prevent problems. Throughout the watershed process, the state works to integrate all parties and programs that have a stake and an impact on the system, across all levels of government and the private sector. Additionally, Minnesota's Pollution Control Agency works closely with other agencies, local authorities, and the University of Minnesota on the monitoring, assessment, protection, and restoration of the state's waters.

- **Assessment:** Waterbodies are classified as lakes, streams, and wetlands, and water quality standards and beneficial use classes are tailored to waterbody type. Lakes are primarily assessed for aquatic recreation (eutrophication standards) and aquatic consumption (fish tissue and water column) use-support. Wetlands are only assessed for aquatic life use-support and only listed as impaired when impaired biotic conditions are found and when the wetland is hydrologically connected to an impaired lake or stream. Streams are assessed for aquatic life, aquatic recreation, and aquatic consumption use-support based on many parameters; eutrophication standards are still in development. Tiered aquatic life uses are also in development for streams.

- **Methods Utilized:** Minnesota makes use of a variety of nutrient reduction methods, including BMPs, voluntary programs, nutrient management plans, NPDES and state permitting, TMDLs, regulatory requirements, interagency and interstate partnerships, and education and social media campaigns. Biological nutrient removal from wastewater has been increasing steadily for over a decade. A large variety of agricultural BMPs are incentivized through CWA Section 319 funding, Farm Bill conservation programs and cost-sharing agreements. Green Stormwater Infrastructure BMPs are growing in use to

meet MS4 requirements and added attention is being given to feedlot manure application sites. Voluntary programs are focused on agriculture and small stormwater entities. A 2008 amendment to the state constitution created the Clean Water Fund to provide a large amount of funding for incentivizing BMPs.

State permitting requirements include state-specific technology-based limits and the ability to order abatement of discharges. Phosphorus removal from wastewater has been mandatory for many dischargers for over a decade and water quality-based effluent limits are also in place, which consider the impact of other point and nonpoint sources within the watershed. Once a permit is issued with effluent limits, the state has the ability to enforce those limits using civil enforcement tools and criminal actions. The state is also in the process of developing a rule that will allow for point source to point source and point source to nonpoint source water quality trading. Point sources must have a loading limit to be eligible as a buyer or seller, and trade ratios will address the uncertainties of nonpoint source phosphorus removals.

- **Accountability:** Minnesota has developed monitoring systems for water quality impacts to determine pollutant trends over time and is currently generating baseline data. Effectiveness monitoring of the state's oldest TMDLs is beginning, in order to assess water quality impacts. Accountability is ensured through permit compliance, stormwater permit BMP implementation tracking, agricultural and nonpoint source BMP tracking and nutrient reduction calculations. The state has performed calculations based on nutrient reduction assumptions per BMP to track overall reductions from BMPs. Long-term milestone monitoring shows general ambient reductions in phosphorus, but increases in nitrogen. Long-term monitoring data is publically available.

- **Other Relevant Information:** Minnesota's nutrient reduction efforts are primarily funded by state general and clean water funds and agency budgets, permit fees, CWA 106, 319, and SRF funding, and federal Farm Bill funds.

  Minnesota believes that one of the challenges in addressing nutrients is the continued need for state flexibility in developing and implementing nutrient criteria, if progress is to be made. For example, some states are adopting a stressor-response approach to their proposed criteria to reflect important in-state relationships. Lack of consistent support for such approaches is hampering some states' ability to make progress on their criteria development. EPA has indicated a willingness to work with states on this issue; Minnesota hopes to see that cooperative approach continue.

  Another challenge is the need for targets to be set to address downstream and out-of-state impacts such as Gulf hypoxia or other concerns. It seems like the current strategy is to rely on states to develop criteria protective of downstream uses, but without clear targets it is difficult, if not impossible, for states to adopt standards that consider factors outside of their state. Clear targets are needed to address concerns about loading to downstream problems. In the meantime, Minnesota is very much concerned about protecting downstream uses and continues to build that consideration into its nutrient criteria and implementation procedures.

The continued push for tighter controls on regulated nutrient sources in the face of uncertainty due to unregulated nutrient sources is a huge challenge. At a certain point it becomes inefficient at best to expect more from the smallest portion of the problem while relying on voluntary approaches to reducing the biggest portions. There needs to be a certain level of proportionality of expected/required reductions to the amount contributed to the problem.

There is a need to infuse more of an adaptive management/incremental progress mentality into the national debate, especially with respect to nutrient criteria development and TMDL reductions. MPCA is concerned about further reductions in EPA Section 319 base and grant funding which directly affect our ability to conduct nonpoint source pollution reduction activities. To better address nutrient issues, additional funds are needed to build wastewater treatment infrastructure to meet the more stringent limits and federal requirements. Finally, Minnesota believes that the success of its "Watershed Approach" in addressing both point and nonpoint source pollution will require EPA acceptance of such things as submittal of multiple TMDLs in a revised format (Protection & Restoration strategies versus traditional TMDLs), and changes to waste load allocation setting and permit reissuance timing for point sources.

Contact: Glenn Skuta, Water Monitoring Manager, Minnesota Pollution Control Agency, Environmental Analysis and Outcomes Division; glenn.skuta@state.mn.us.

Mississippi

The waters of Mississippi are managed and protected by the state Department of Environmental Quality. The Department's Surface Water Division and Office of Pollution Control have made nutrient pollution and Gulf hypoxia priorities and seek to address these challenges through a variety of actions.

- **Key Elements:** Mississippi has integrated the Gulf Hypoxia Action Plan of 2008 and the Governors' Action Plan of 2009 into the state's approach to reduce nutrient loadings in-basin and to the Gulf. Mississippi uses a highly collaborative, stakeholder-supported process centered on the development and implementation of comprehensive nutrient reduction strategies. Resources from multiple sources are leveraged to address water quality issues while using a tiered monitoring approach to quantify changes in water quality near edge-of-field, in-stream, and downstream integrators. Mississippi has developed regional nutrient reduction strategies integrated into the state's Strategies to Reduce Nutrients and Associated Pollutants. Mississippi is actively engaged in developing numeric nutrient standards and leads the Gulf of Mexico Alliance's coordinated approach among states to support development of numeric nutrient standards.

  Mississippi's approach to reduce nutrient loadings in-basin and in the Gulf involves implementation of local watershed restoration projects coordinated through multiple programs and agencies. The strategies employed provide comprehensive processes to prioritize watersheds and establish quantitative targets for nitrogen and phosphorus load reductions. This process begins with an evaluation of watershed characteristics affecting nutrient runoff using GIS coverages, available water quality information and study results, developed TMDLs, Mississippi's Watershed Characterization and Ranking Tool, SPARROW, and various other tools and resources to identify pollutant sources and reduction goals, including review of historic information to determine baseline conditions and stakeholder interest surveys to document the likelihood of stakeholder support. This also involves collection of quality assured data to assess success of nutrient reduction efforts in streams and manage future activities. Mississippi's efforts are basin-oriented, with watersheds being prioritized on a basin-wide scale. Special emphasis is given to areas identified to be high nutrient loading sources and to watersheds, which account for a substantial portion of loads delivered from urban or agricultural sources. Subwatersheds on a HUC 12 or similar scale are being selected to implement nitrogen and phosphorus load reduction activities. Monitoring data is used for characterizing current conditions, establishing baselines, and tracking changes in nutrient levels.

- **Methods Utilized:** The management practices for implementing the nutrient reduction strategy include water management, input management, established and innovative best management practices, point source treatment, and information management. Special emphasis is given to those management practices that can achieve the mutual benefits of nutrient reduction and enhanced storage and reuse of surface water, such as tail water recovery systems and on-farm storage. Recycling and reusing water can significantly reduce nutrient loadings. Nonpoint source management practices include water

management practices to increase infiltration/denitrification and to allow recycle/reuse of runoff or treated wastewater, conservation practices to reduce runoff and nutrient requirements, input reduction practices to reduce cost and increase revenue, and non-traditional management practices. Point source management practices include improvement of treatment technologies, use of alternative technologies, and reducing stormwater nutrient loads.

Nutrient reduction in Mississippi is being achieved through a collaborative process involving multiple state and federal agencies and non-governmental organizations.

- **Accountability:** Mississippi ensures accountability related to nutrient reductions through water quality monitoring, documenting historical trends, and establishing nutrient targets that support designated uses of waterbodies. Analyses of watershed projects are current and ongoing. The Department of Environmental Quality, Army Corp of Engineers Vicksburg District, and US Geological Survey jointly developed a GIS-based Data Compendium to provide the public with access to water quality and quantity data and obtain map-based information, such as point source dischargers, installed BMPs, impaired waterbodies, permits, and other information.

- **Other Relevant Information:** Continued implementation of the nutrient reduction strategies will require additional resources to achieve the needed levels of protection and restoration that will be consistent with the designated uses of Mississippi waters. Considering the cost-involvement, available technologies for nutrient reduction could also become a challenge for some of the smaller communities and municipalities of the state. Funding will remain a challenge for criteria development, for implementing BMPs, and for upgrading treatment facilities to meet the criteria. There is also insufficient funding for long-term monitoring to be able to quantify improvements.

  The state emphasizes that nutrient reduction in Mississippi will be an ongoing process to evaluate effectiveness of these strategies through implementation. The project partners regularly review progress and provide oversight and necessary technical guidance on issues related to the continued implementation of the nutrient reduction strategies in Mississippi. The partners have been participating in this project to attain the highest possible level of land and water resource stewardship for a more sustainable and profitable future for the present and future generations of Mississippians.

Contact: Kay Whittington, Mississippi Department of Environmental Quality, Surface Water Division and Office of Pollution Control; kay_whittington@deq.state.ms.us.

Missouri

Missouri's Department of Natural Resources is charged with protecting and managing the state's water resources. To address nutrients in the state's waters, Missouri is currently developing a nutrient reduction strategy.

- **Key Elements:** The development of Missouri's nutrient reduction strategy is just beginning, the first stakeholder meeting was held in October 2011 and a total of four meetings have been held to date. The State is currently working with external stakeholders who represent a wide range of expertise on nutrients, though the specifics of the strategy have yet to be finalized. In previous actions to address nutrients, certain NPDES permits, particularly for larger facilities, have included nutrient limits. In the watershed of Table Rock Lake and Lake Taneycomo, all permitted discharges are restricted to 0.5 mg/l of total phosphorus. Additionally, Missouri has adopted a ban on phosphorus in detergents in that part of the state.

- **Additional Methods Utilized:** Missouri currently makes use of a variety of nutrient reduction methods, volunteer monitoring, expanded NPDES permit requirements, limits to impervious surfaces, community composting, pilot studies, and comprehensive reasonable assurance analysis for TMDLs.

Contact: Mark Osborn, Missouri Department of Natural Resources, Environmental Quality and Water Protection Program; mark.osborn@dnr.mo.gov.

Montana

Montana's water resources are managed by the state's Department of Environmental Quality. The Department seeks to protect, maintain, and improve a clean and healthy environment for current and future generations and specifically addresses nutrients through the Water Quality Planning Bureau.

- **Overview:** Montana's nutrient reduction program addresses nutrients primarily through NPDES permits and CAFO permits, including requirements governing the proper disposal and application of manure. The program is organized by indicator type and water quality impacts are considered in permit limits. Additionally, Montana's TMDL program includes limits for total nitrogen and phosphorus where necessary.

- **Key Elements:** A key element of the Department's strategy to address nitrogen and phosphorus pollution has been a long-term commitment to developing defensible numeric nutrient criteria. The Department has recently completed its first major revision to its wadeable stream criteria recommendations (first released in 2008). The Department continues to work on appropriate criteria for large rivers, will address a large reservoir in 2014, and has completed the basic data collection needed to develop criteria for natural lakes.

  The Department has used a combination of reference site data, empirical nutrient-response relationships, and ecoregions to develop the wadeable stream criteria. Large rivers and the large reservoir criteria are being developed differently, via computer simulation modeling (using, for example, QUAL2K).

  Numeric nutrient standards were adopted on the Clark Fork River in 2002, and the Department recently evaluated long-term trends and achievement of the standards (data were derived from a monitoring program initiated even prior to the adoption of the standards). The data indicate that large reaches of the river have shown significant improvement in water quality and achievement of the standards in spite of basin-wide population growth, whereas in other parts of the river the standards are not yet achieved.

  The Department has also invested considerable energy into developing sound implementation policies for the numeric nutrient criteria, and has been working closely with a diverse group of stakeholders to craft the policies. Many of the numeric nutrient criteria are difficult to achieve in the absence of adequate dilution, and the Department believes that cost and technology changes over time will make the criteria more achievable. As such, the Department has crafted policies that will allow dischargers to incrementally achieve the standards over an approximately 20-year time frame.

Contact: Michael Suplee, Montana Department of Environmental Quality, Water Quality Planning Bureau; msuplee@mt.gov.

Nebraska

Nebraska's water resources are protected and managed by the state's Department of Environmental Quality. Though not organized as a formal program, the Department's Water Quality Division makes nutrient reduction a fundamental element of several of its programs.

- **Key Elements:** Nutrient reduction and management is a central focus of Nebraska's nonpoint source watershed management plans and livestock waste programs. Lakes and impounded waters nutrient criteria are organized into three classes—eastern, western, and sandhills—while watershed management plans are developed in accordance to the unique needs of each watershed. Biological monitoring is used to conform or identify nutrient impacts, with chlorophyll-a as the criterion.

- **Methods Utilized:** Nebraska's nutrient reduction efforts are focused primarily on farmland and CAFOs. To reduce nutrients, the state makes use of BMPs, TMDLs, NPDES and state permitting, voluntary programs, interagency and interstate partnerships, and education. BMPs include cost shares with local natural resource districts and the Natural Resource Conservation Service to build conservation practices under the state's nonpoint source program. Most BMPs implemented through this program are voluntary. State permitting covers a larger universe of activities than the NPDES program and includes the ability to order abatements of discharges. Educational efforts are targeted at local watershed stakeholders, as planned through watershed councils.

- **Accountability:** Nebraska seeks to ensure accountability in its nutrient reduction efforts through compliance with its livestock program and the use of water quality monitoring to measure the success of watershed management plans. Watershed management plans are assessed for success through a post-project monitoring plan, assessment, and report, which are publically available upon request.

- **Other Relevant Information:** Nebraska's nutrient reduction efforts are funded primarily through federal CWA 106 and 319 funds.

Contact: John Bender, Nebraska Department of Environmental Quality, Water Quality Division; john.bender@nebraska.gov.

Nevada

Nevada's Department of Environmental Protection works to preserve and enhance the state's environment through protecting and regulating Nevada's water resources. Nevada has a statewide nutrient reduction program that seeks to reduce the impact of nutrients through a variety of measures.

- **Key Elements:** Nevada nutrient reduction program addresses all waterbody types. Phosphorus numeric criteria and site-specific water quality standards have been established for many rivers, streams, and lakes. Nevada also has a narrative standard for total nitrogen for certain waterbodies. Biological monitoring is used to confirm or identify nutrient impairments. Additionally, the states has developed nutrient screening protocols to qualitatively and quantitatively evaluate algae levels.

- **Methods Utilized:** Nevada's nutrient reduction efforts are primarily target at wastewater treatment plants, septic systems, stormwater, CAFOs and AFOs, and airborne sources. The state makes use of BMPs, TMDLs, NPDES and state permitting, nutrient management plans, voluntary programs, and education. The state implements a wide variety of BMPs, from constructed wetlands to fertilizer management and brush layering. State permitting covers a larger universe of activities than the NPDES program and permits are used to implement water quality standards. While return flows from irrigated agriculture are exempt from regulation, the state supports voluntary actions to address these activities. Other voluntary programs include stream bank stabilization and restoration and environmental education. The state works with and supports a variety of state and local agencies to implement environmental education programs for the general public and students.

- **Accountability:** Accountability is ensured through ambient and site-specific water quality monitoring and permit requirements. Water quality is routinely evaluated during development of the state's Integrated Report and is publically available.

- **Other Relevant Information:** Nevada's nutrient reduction efforts are primarily funded through permit fees, federal CWA 106 and 319 funds, and private sector contributions. Nevada believes that reduced federal 106 and 319 funds will greatly hamper efforts to address nutrient problems.

Contact: Kathy Sertic, Nevada Division of Environmental Protection; ksertic@ndep.nv.gov.

New Hampshire

The Water Division of New Hampshire's Department of Environmental Services works to ensure that New Hampshire's waterbodies remain clean, supportive of healthy ecosystems, provide habitat for a diversity of plant and animal life, and maintain appropriate uses. To advance this mission, New Hampshire has developed a nutrient reduction program that utilizes a variety of means to address nutrient pollution and closely integrates with other state programs.

- **Key Elements:** New Hampshire's statewide nutrient reduction program is organized around water quality assessments and classifications performed by a Watershed Management Bureau which considers waterbody type, pollution source, and indicators. The state makes use of a narrative standard for nutrients. Numeric nutrient thresholds are developed on a case-by-case basis, considering environmental response variables that are used as the ultimate indicators of water quality impacts. Lakes, rivers, and estuaries are differentiated from other waterbodies in considering characteristics that may impact nutrients and environmental response variables. Biological monitoring is used to confirm and identify nutrient impairments.

- **Methods Utilized:** New Hampshire's nutrient reduction program addresses wastewater treatment plants, septic systems, fertilizers, stormwater, farmland, and airborne nutrient sources. To reduce the impact of nutrients, the state makes use of BMPs, NPDES and state permitting, TMDLs, regulatory requirements, nutrient management plans, voluntary programs, social media, and education. NPDES permitting in New Hampshire is handled by the U.S. Environmental Protection Agency because New Hampshire is a non-delegated state. New development projects with an impact of over 100,000 square feet are regulated by a state permit that requires stormwater management that includes BMPs. NPDES permits may require nutrient controls, and in each case the requirements generally become more stringent in areas of impaired or high value waters. Stormwater and nonpoint source management control is typically accomplished through BMPs. For example, new developments are encouraged to adopt BMPs such as pervious pavement and localized infiltration.

- **Accountability:** New Hampshire seeks to ensure accountability through monitoring within the regulated community. The state also performs independent monitoring, though resources for such monitoring are limited.

- **Other Relevant Information:** New Hampshire's nutrient reduction efforts are funded primarily through federal CWA 106 and SRF funds. New Hampshire notes that state monitoring to document water quality and to accurately depict environmental responses is challenging in a period of diminishing resources for these activities.

Contact: Harry Stewart; New Hampshire Department of Environmental Services, Water Division; harry.stewart@des.nh.gov.

New Jersey

New Jersey's water resources are managed by the state Department of Environmental Protection which is charged with the task of protecting state waters to ensure continued public benefit, achieved through effective and balanced implementation and enforcement of environmental laws. New Jersey addresses nutrients in the state waters through a variety of methods, though it currently does not have and is not developing a unified nutrient reduction program.

- **Key Elements:** New Jersey's existing nutrient policies apply to all waters and prohibit objectionable algal densities, nuisance aquatic vegetation, and impairment of designated uses. Existing nutrient criteria limits total phosphorus to 0.05 mg/L for lakes and 0.1mg/L in streams. Water quality-based effluent limits are imposed in NPDES permits based on the numeric phosphorus criteria. A method to assess whether nutrients should be identified as a cause on the 303(d) list has been developed for wadeable streams using bioassessments and continuous dissolved oxygen to determine if the stream experiences excessive diurnal swings due to photosynthesis. TMDLs addressing nutrients are both currently in place and under development. For example, the Passaic River TMDL was developed based on an assessment of compliance with narrative phosphorus criteria using response indicators, including dissolved oxygen, pH, and chlorophyll-a. Other TMDLs use natural conditions or numeric phosphorus criteria as a target for nutrient reduction. New Jersey also makes use of effluent standards for phosphorus discharged by NPDES-permitted facilities. The state may impose nutrient monitoring requirements from point source discharges in the Delaware Estuary and Bay. Additionally, New Jersey is conducting technical studies to investigate links between stressors and biological responses, and to develop assessment indices.

- **Other Relevant Information:** New Jersey believes that, currently, the state faces pressure to develop numeric nutrient criteria as the regulated community wants finality so that they know what to build to meet. If loading reductions could be treated as adaptive management and we took a "wait and see" attitude, we might be able to make more progress. Generally the pushback has been to prove that there's a nutrient impact at which point the state will consider taking actions to reduce. Additionally, New Jersey feels that states should have an option to pursue either nutrient reductions or criteria development. There are not enough state resources to do both. Loading reductions, technology-based approaches, and BMPs together may improve water quality so that numeric criteria are not necessary.

Contact: Debra Hammond, New Jersey Department of Environmental Protection, Water Monitoring and Standards; debra.hammond@dep.state.nj.us.

New Mexico

The New Mexico Environment Department works to provide the highest quality of life throughout the state by promoting a safe, clean, and productive environment. To address the impact of nutrients on the state's surface waters, the Surface Water Quality Bureau (SWQB) has been employing a holistic approach that emphasizes threshold development for certain nutrient-related water quality variables (e.g., total nitrogen (TN), total phosphorus (TP), dissolved oxygen, chlorophyll-a, etc.) to ensure effective and appropriate assessment of the narrative nutrient criterion and encourages and promotes near-term nutrient load reductions in impaired watersheds through TMDL development and implementation. SWQB is currently developing a nutrient reduction strategy document to describe this process.

- **Key Elements:** New Mexico's nutrient reduction efforts are organized around a combination of waterbody type, indicator, and pollution source. The SWQB determines impairment by evaluating various indicators of enrichment through a weight-of-evidence assessment. Thresholds for indicators are determined by waterbody type (i.e., streams, rivers, or lakes), ecoregion (e.g., Southern Rockies, Chihuahuan Desert, Arizona/New Mexico Plateau, etc.), aquatic life use (e.g., cold water, warm water, etc), and/or site-specific conditions.

- **Methods Utilized:** New Mexico has been reducing nutrients through a combination of 303(d) listing, TMDL, and NPDES permitting processes. Where stream impairment is found, a nutrient TMDL is typically written to address load and wasteload allocations for pollution sources. In New Mexico, point sources typically discharge into streams with little or no dilution capacity. This has resulted in stringent nutrient limits for NPDES permits.

- **Other Relevant Information:** Wastewater treatment plant upgrades are essential for meeting New Mexico's stringent nutrient limits for NPDES permits. However, the necessary technology is expensive, and sometimes not adequate to meet TMDL limits. Funding for such upgrades remains a challenge and has resulted in a variety of implementation discussions and options, such as phased implementation and the potential for longer compliance schedules as well as seasonal effluent limits. New Mexico does not have NPDES primacy and cannot control or set guidelines on how the TMDL and NPDES permit will be implemented; however, the state has been working with EPA Region 6 to draft appropriate and achievable strategies for implementation.

Contact: Shelly Lemon, New Mexico Environment Department, Surface Water Quality Bureau; shelly.lemon@state.nm.us.

New York

New York State's Department of Environmental Conservation works to conserve, improve, and protect New York's natural resources and environment and to prevent, abate, and control water, land, and air pollution, in order to enhance the health, safety, and welfare of the people of the state and their overall economic and social well-being. The Division of Water addresses the impact of nutrients through a number of nutrient reduction components within its water quality programs.

- **Key Elements:** New York's nutrient reduction efforts are water quality driven and organized around pollutant source. Statewide in scope, the primary targets of the program are wastewater treatment plants, septic systems, boats, stormwater, farmland, and animal feeding operations. Biological and chemical monitoring is used to confirm and identify nutrient impairments. A specific metric to determine nutrient impacts has been incorporated into the state's comprehensive multi-metric Biological Assessment Profile scoring system.

- **Methods Utilized:** Nutrient reduction efforts include the development of TMDLs for nutrient impaired waters, BMPs, nutrient management plans, state permitting and regulatory requirements, voluntary programs, interagency and interstate partnerships, and educational efforts. BMPs are the primary focus in the state's nonpoint source reduction programs for agriculture and stormwater. State permitting requirements include state specific technology-based limits, mandatory technology implementation, enforceable provisions applied to nonpoint sources, reporting requirements for nonpoint sources, and the ability to order abatement of discharges. Voluntary programs include guidance in maintenance of onsite wastewater treatment programs and educational efforts are typically aimed at partners, local governments, and business and trade groups, but also reach the general public.

- **Accountability:** New York seeks to ensure accountability through compliance with permit requirements and routine monitoring of the condition of waters compared to applicable water quality standards and criteria. Accountability efforts are not significantly different between point and nonpoint sources, though point source compliance is driven to a greater extent by compliance with permit limits while progress on nonpoint sources is more likely to be reflected in ambient monitoring efforts. Waterbody assessments have been conducted to determine the effects of nutrient reduction efforts and are publically available.

- **Other Relevant Information:** Federal CWA 106 and 319 funds primarily fund New York's efforts. New York is concerned that cuts to or limitations on these funding sources could severely hamper its program delivery.

  New York strongly believes that application of effective numeric nutrient criteria must incorporate the use of response variables to hone total phosphorus and nitrogen criteria. Without this ability, numeric criteria risks being set too low and requiring costly measures for waters that do not have water quality problems or could result in high

criteria numbers that may not protect all waters that need protection. Because of the complicating factors relating to nutrients and the impact numeric nutrient criteria are likely to have across the state, New York is taking an intentionally deliberate approach to developing such criteria. The Department of Environmental Conservation will evaluate and communicate the implications of such criteria, to ensure that the final plan will be effectively and successfully implemented.

Contact: Jeff Myers, New York State Department of Environmental Conservation, Division of Water; jamyers@gw.dec.state.ny.us.

North Carolina

The North Carolina Department of Environmental and Natural Resources, Division of Water Quality, works to protect and enhance the state's water resources through monitoring, permitting, management, and enforcement. The state has been working to address the impact of nutrients in its waters since the late 1970s. Since the mid-1990s, North Carolina has developed and carried out a number of large-watershed, comprehensive regulatory nutrient restoration strategies, which now cover approximately a third of the state's land area. North Carolina has also begun to pursue a regulatory initiative to establish proactive chlorophyll-a thresholds to protect against future impairments.

- **Key Elements:** North Carolina's program includes chlorophyll-a and other nutrient-related standards applicable statewide as well as watershed-specific design and implementation of rules created to enforce those standards. North Carolina has a supplemental classification of Nutrient Sensitive Waters used in response to nutrient-driven impairment. This classification requires the development of remedial management plans. Nutrient strategies are driven first by impairment indicator. Chlorophyll-a is used as the primary indicator of impairment. Turbidity and pH impairments have been used to a lesser extent. Once nutrient impairment is identified, an assessment of load reduction needs and contributing sources is undertaken, often through nutrient response and watershed load modeling. Restoration strategies are undertaken on a watershed basis in response to impairments. The state is also contemplating new restoration strategies for impaired water not classified as Nutrient Sensitive Waters.

- **Methods Utilized:** North Carolina's nutrient reduction efforts primarily target wastewater treatment plants, stormwater, farmland, and animal feeding operations, though no activities or industries are exempted. The state makes use of BMPs, NPDES and state permitting requirements, TMDLs, regulatory requirements, water quality trading, nutrient management plans, interagency partnerships, and education. State rules addressing agriculture, stormwater, riparian buffer protection and wastewater operate in addition to federal requirements. A water quality trading program for nutrients is in place and all point and nonpoint sources are eligible. In developing nutrient reduction strategies, the Division of Water makes use of collaborative stakeholder processes to work with all affected parties including fellow regulators and resource agencies.

  For BMPs, all sources are subject to strategy-specific rules that generally use a performance bases appropriate to the source type and often do not mandate specific technologies. North Carolina requires that all types of agriculture collectively meet nitrogen and phosphorus loss reduction requirements that reflect strategy goals. Producers use state or federal cost-shared BMPs per NRCS standards for nutrient management, buffering practices, livestock exclusion, controlled drainage, scavenger crops, conservation tillage, and cropland conversion. New developments must meet nitrogen and phosphorus unit-area loading rate targets for stormwater, choosing from a range of nutrient-reducing BMPs. They also may use offsite offsets, generally riparian buffer restoration, after meeting minimum onsite requirements. Local governments must also meet stormwater load allocations for developed land through retrofitting

conventional stormwater BMPs or other measures. These may include various wastewater controls and trading for agricultural reductions, including riparian buffer and stream restoration.

- **Accountability:** North Carolina ensures accountability related to nutrient reductions through source-specific compliance accounting tied to strategy reduction goals. The Division of Water Quality conducts instream monitoring to gauge progress, including use support monitoring of impaired waters, nitrogen and phosphorus load trends to impaired waters and within the watershed, nitrogen and phosphorus constituent characterization, and research instream monitoring to better characterize sources and evaluate management regimes. Point sources are monitored through individual permits, while monitoring of nonpoint sources makes use of source-specific compliance accounting tools to estimate total loads to stream or from edge-of-management-unit. Analysis of program impacts has been conducted and is publically available. Results to date have been varied, showing recovery of several waterbodies, while others remain impaired.

- **Other Relevant Information:** In addition to federal authorities, a series of state statutes allows North Carolina to conduct rulemaking to address nutrient impairments and require loading reductions from both point and nonpoint sources, as well as granting authority over stormwater and discharge permitting and water supply protection. The state's nutrient reduction program is primarily funded through state general funds and agency budgets, Federal CWA 319 and SRF funds, Farm Bill funds, and private sector contributions.

  North Carolina believes that each nutrient strategy improves on the last, allowing technical knowledge, management options, and accounting processes to improve. This progress allows the state to more fully address the range of contributing sources, and to reduce the uncertainties in its requirements and accounting. The opportunity for successful, more cost-effective reductions through water quality trading will increase proportionally as uncertainties are reduced.

Contact: Rich Gannon, North Carolina Department of Environment and Natural Resources, Division of Water Quality, Planning Section; rich.gannon@ncdenr.gov.

North Dakota

North Dakota's water resources are protected, managed, and restored by the Department of Health, Division of Water Quality. North Dakota is currently in the early stages of developing a nutrient reduction plan.

- **Overview:** North Dakota is beginning to develop a nutrient reduction plan for the state. Currently, North Dakota has set narrative "free from" water quality standards, applicable to all state surface waters, which prohibit the discharge of pollutants which may impair existing or beneficial uses of receiving waters. The state makes use of its Section 319 Nonpoint Source Pollution Management Program to address nutrients loadings to its surface and ground waters. In addition, TMDLs for nutrients and dissolved oxygen are in place for several lakes and reservoirs in the state. As North Dakota moves forward in the nutrient management planning process it seeks to bring together diverse stakeholders, increase recognition of the importance of nutrient reduction and strengthen stakeholder engagement in reducing contributions.

Contact: Mike Ell, North Dakota Department of Health, Division of Water Quality; mell@nd.gov.

Ohio

The Ohio Environmental Protection Agency seeks to protect Ohio's water resources and human health through responsible regulations. In order to further reduce negative impacts of nutrients on Ohio's waterbodies, Ohio EPA is currently developing a nutrient reduction program with a strong focus on nonpoint source nutrient contributors.

- **Key Elements:** Ohio's nutrient reduction program focuses on pollution source, with nonpoint sources as its highest priority. Pollution sources of greatest concern for the program are agricultural and urban sources, for nonpoint source contributors, and POTWs, CAFOs/CFOs, and stormwater for point sources.

- **Assessment:** Ohio's reduction plans are triggered by confirmation of existing or potential pollution impacts linked to excessive phosphorus or nitrogen, as determined through Ohio's Trophic Index Criterion, a multi-metric indicator. Ohio's biologically-based Trophic Index Criterion will form the ultimate benchmark for the desired water quality endpoint.

- **Methods:** Nutrient reduction is incorporated into TMDLs, WLAs, and permit limits. Additionally, while no final decisions on program components have been made, framework documents include BMPs, nutrient management plans for agricultural producers, NPDES permitting, and the adoption of state water quality standards to ensure that all waters attain their desired beneficial uses. In addition, Ohio utilizes regulations for manure handing and more stringent restrictions when water quality is impacted and when a watershed is declared "in distress" by the State Chief of Division of Soil and Water.

- **Other Relevant Information:** As Ohio moves forward, it is concerned that threats of legal action, both in Ohio and other states, and a political climate where regulations are discredited without objective consideration may cause distractions. However, Ohio sees the severity of water quality in some regions and water bodies as an urgent call for action and state leadership in action in response to these problems.

Contact: Dan Dudley, Ohio EPA Division of Surface Water; dan.dudley@epa.state.oh.us.

Oklahoma

Oklahoma's waterbodies are protected and managed by the efforts of several agencies, including the Oklahoma Water Resources Board and the Oklahoma Conservation Commission. The Oklahoma Water Resources Board's primary duties include water use permitting, water quality monitoring and standards, financial assistance for wastewater systems, and technical studies and research. The Conservation Commission's Water Quality Division is the state's nonpoint source technical lead agency, responsible for conducting nonpoint source pollution management activities including monitoring, planning, education, and implementation. Together, these two agencies address the impact of nutrients in the state's waterbodies through established water quality criteria, establishing monitoring and best management practice implementation efforts (BMPs), developing nutrient reduction programs among other efforts.

- **Key Elements:** Oklahoma's nutrient reduction efforts, statewide in scope, are founded on Oklahoma's Water Quality Standards. Waterbodies are classified by general type, such as river or lake, and then assigned beneficial uses. The Oklahoma Water Resources Board has established a water quality criterion for a select group of waterbodies and is currently developing reduction programs for phosphorus. A significant portion of available resources are focused toward the state's priority watershed list, which is developed using a ranking system integrating approximately fifteen parameters, including waterbody type, number of impacts, pollution type and beneficial use. The Conservation Commission is the primary recipient of CWA Section 319 funds, which are used to implement watershed planning efforts, water quality education programs focused on nutrient, sediment, and bacteria reduction, fixed-site and ambient monitoring efforts with a focus on nutrients, and incentive-based implementation programs primarily targeted at agricultural based NPS issues.

  The Commission has one of the strongest bioassessment programs in the nation, having collected fish, benthic macroinvertebrate, and physical habitat data statewide for over twenty years. These data are used in assessment of beneficial use attainment and listing of streams for nutrient related impacts due to dissolved oxygen, suspended and bedded sediments, pH, and biocriteria. Implementation programs are often preceded by model-based targeting to determine nutrient delivery hotspots. The Commission also chairs and coordinates the state's NPS Working Group, which establishes NPS management priorities and sets the primary watershed ranking. Oklahoma's nutrient reduction efforts consider water quality impacts through the state's integrated reporting efforts. Monitoring data is used to assess beneficial use attainment for over 250 sites on wadeable streams, and includes both direct and indirect assessment of nutrient impact. In addition, beneficial use assessment of indirect nutrient impacts (bioassessment) evaluated through probabilistic monitoring on another 50 wadeable streams each year.

- **Methods Utilized:** Oklahoma utilizes BMPs, NPDES and state permitting requirements, TMDLs, nutrient reduction agreements and nutrient management plans, interagency and interstate partnerships, education, social media, and voluntary programs. Animal waste-related BMPs are required to control nonpoint source nutrient contribution to impaired Scenic River waters and other nutrient-impaired waterbodies with completed nutrient

TMDLs or as a result of court rulings. However, in most cases, BMP implementation is voluntary rather than required. The Conservation Commission also implements a varied suite of BMPs as directed by local watershed advisory groups. These include riparian area buffers, alternative water supplies, manure management, septic system management, land conversion, and others. The Conservation Commission's nonpoint source management program is implemented through voluntary, incentive-based means. Through a network of conservation districts, the Commission manages priority watershed projects which utilize 319, state, and private funding to work with agricultural producers in implementing BMPS on a voluntary basis. State permitting makes use of state-specific technology-based limits, and negotiated agreements have been developed between Oklahoma, the EPA, and neighboring states.

- **Accountability:** Due to its extensive monitoring efforts, Oklahoma has demonstrated reductions in priority nonpoint source pollutants and is a national leader in delisting streams from the state's 303(d) list due to NPS-related water quality improvement. The Conservation Commission implements continuous, flow-weighted sampling in both treatment and control watersheds to monitor priority pollutant loads for watershed implementation projects. Analyses of nutrient reduction efforts are publically available. Finally, Oklahoma must estimate nutrient reductions due to its nonpoint source program annually and report these findings to EPA through the Grants Reporting and Tracking System. In 2011, Oklahoma led the nation in estimated NPS-related nutrient reductions through the EPA 319 program.

- **Other Relevant Information:** In addition to the programs discussed here, jurisdiction over Oklahoma's waters is shared across state agencies. For example, the state Department of Agriculture, Food and Forestry is responsible for regulatory approaches for permitted agricultural sources, such as CAFOs, and silviculture and the Department of Environmental Quality is responsible for most other regulatory programs, such as NPDES permitting, 401, and septic systems.

  The state's nutrient reduction programs are primarily funded by state general funds and agency budgets, federal CWA 319 funds, and private sector contributions.

  The Conservation Commission believes that the primary risk in addressing nutrients in the future is the potential loss or diminishment of the nation's 319 program. The 319 program is one of the only programs the CWA has that actually deals directly with the nonpoint source nutrient contribution through implementation efforts, yet has the most stringent measures of program effectiveness that inadequately reflect its effects. However, it is also one of the most proportionately underfunded programs. There needs to be stronger support to continue and increase funding for one of the EPA's only programs that results in money being spent on the ground to abate nonpoint source pollution and monitor its effectiveness.

Contact: Shanon Phillips, Oklahoma Conservation Commission, Water Quality Division, shanon.phillips@conservaton.ok.gov; Derek Smithee, Oklahoma Water Resources Board, Water Quality Division; drsmithee@owrb.ok.gov.

Oregon

The Oregon Department of Environmental Quality (DEQ) is responsible for protecting and enhancing Oregon's water quality. DEQ accomplishes this through a combination of technical assistance, inspections, and permitting to help public and private facilities and citizens understand and comply with state and federal regulations. Oregon DEQ does not have numeric nutrient criteria, but rather addresses the impact of nutrients throughout its various water quality programs.

- **Key Elements:** In evaluating the impact of nutrients on water bodies, Oregon assesses water bodies against dissolved oxygen and pH criteria, a chlorophyll-a action level, and a narrative algal growth criterion. Oregon uses agricultural (CAFO), stormwater, and point source permitting as well as TMDLs and HAB activities that integrate with nutrient control and reduction as needed.

- **Priority Pollution Sources:** Oregon does not focus its efforts on a single pollution source, but rather focuses its efforts on nutrient control where such a need has been determined. This may include where waters are identified as impaired, where a TMDL has been developed, or where HAB warnings/beach closures have been issued.

- **Methods Utilized:** Nutrients are addressed through agricultural (CAFO), stormwater and point source permitting as well as through waterbody-specific TMDLs. Many TMDLs developed to address dissolved oxygen, pH, and algal growth problems have developed nutrient targets and wasteload allocations, most commonly for phosphorus. Additionally, Oregon DEQ has entered into several agreements for the protection of the state's waters with agencies including the Forest Service, BLM, and the Oregon Departments of Agriculture, Forestry, and Land Conservation and Development's Oregon Coastal Management Program, among others. In addition, Oregon has an onsite sewage treatment program that it operates cooperatively with counties, as well as a groundwater management program to protect groundwater and nearby surface waters from excessive nutrients.

- **Other Relevant Information:** Due to the variability in nutrient levels and impacts on beneficial uses, Oregon DEQ seeks to ensure that nutrients are addressed in those areas where they are impacting beneficial uses, allowing the state to focus its resources and those of regulated parties on priority water quality issues in order to achieve measureable results.

Contact: Debra Sturdevant, Oregon Department of Environmental Quality, Water Quality Standards; sturdevant.debra@state.or.us, http://www.deq.state.or.us/.

Pennsylvania

Pennsylvania's Department of Environmental Protection works to protect and preserve Pennsylvania's water resources through proper planning, management, and regulation. Currently, Pennsylvania is in the process of developing a more comprehensive approach to the identification of nutrient-related use impairments of waterbodies and setting reduction goals.

- **Key Elements:** Pennsylvania's existing nutrient reduction efforts utilize TMDLs for impaired waterways while also addressing on the impact of agriculture on nutrient levels.

- **Assessment:** Pennsylvania's assessment protocol is being revised to include a more robust examination of the adverse impacts from excessive nutrient inputs. Biological indicators such as the macroinvertebrate community, algal biomass, algal indicator species, or community structure, along with diurnal oxygen fluctuations will be used in making impairment determinations.

- **Methods Utilized:** TMDLs for Pennsylvania's waterbodies address nutrients from both point and nonpoint sources. To address nutrient contribution from agriculture, the state utilizes permitting requirements, mandatory nutrient management plans for AFOs, and BMPs for manure storage facilities and AFOs. The state makes use of one-time cost sharing funds for the implementation of BMPs for agriculture. Additionally, Pennsylvania is currently assessing the feasibility and effectiveness of the state's nutrient reduction credit trading program and makes use of composting facilities capable of reducing nutrient loading and citizen volunteer monitoring programs to aid in compliance.

Contact: Dana Aunkst, Pennsylvania Department of Environmental Protection, Office of Field Operations; daunkst@pa.gov.

Rhode Island

Water quality in Rhode Island's waterbodies is protected and managed by the state's Department of Environmental Management, Office of Water Resources. The state's nutrient reduction program works to lessen the impact of nutrients in Rhode Island's waters through a host of programs and methods.

- **Key Elements:** Rhode Island's nutrient reduction program is statewide in scope and primarily targets wastewater treatment plants, septic systems, stormwater runoff, and certain agricultural activities. Narrative nutrient water quality criteria are specified for all types of surface waters: estuarine, flowing, and impounded freshwaters. A numeric limit for phosphorus is applied to lakes and tributaries where they enter lakes. Excess nutrient enrichment is identified through the application of criteria as part of the state's water quality assessment process. Nutrient pollution abatement measures are identified through water quality restoration plans and discharge permit development. Water quality impacts are considered through narrative and numeric criteria (i.e. numeric phosphorus or numeric criteria for eutrophication indicators such as dissolved oxygen) and use of EPA Gold Book and Ecoregion guidance. In some cases, river or estuary water quality models are utilized. Permits requirements for wastewater facilities are water quality-based with a link to technology based requirements. BMPs for nonpoint sources are selected to meet both narrative and numeric requirements.

- **Methods Utilized:** Rhode Island makes use of BMPs, NPDES and state permitting requirements, TMDLs, nutrient management plans, regulatory requirements, voluntary programs, and education. Wastewater treatment facility permits include nutrient limits, including both nitrogen and phosphorus effluent limitations where applicable (e.g. discharges into coastal tributaries). The state has mandated the use of advanced nitrogen removal onsite wastewater treatment technologies in certain environmentally sensitive coastal areas. DEM is also implementing a multi-year statewide program to compel the phase-out of cesspools in certain areas near surface waters. DEM further supports the operation and maintenance of onsite wastewater systems through the development of municipal wastewater management programs and related outreach efforts. The State's new stormwater design and standards manual (2011) requires implementation of BMPs for stormwater that are more effective at nutrient removal than prior practices. These BMPs focus on low-impact design, infiltration, and removal of soluble pollutants. Several TMDLs also address excessive nutrients. Where needed, state permitting requirements include state specific technology based limits and the ability to order abatement of discharges. Water quality regulations include narrative and numeric criteria and DEM is currently refining phosphorus criteria for freshwater lakes and ponds. RIPDES regulations require technology-based best professional judgment limits that meet water quality standards. DEM can use its authorities to require best management practices for various land uses subject to its jurisdiction. DEM also promotes voluntary use of BMPs by offering technical assistance and in some cases financial assistance. Additionally, activities such as volunteer monitoring, local limits to impervious surfaces, community composting, protection of natural nutrient sinks, and applied research and pilot studies contribute to achieving nutrient reductions.

- **Accountability:** Accountability is ensured through RIPDES permit limits and enforceable consent agreements with monitoring and reporting. Performance measures are built into financial assistance agreements. Rhode Island has also conducted effluent monitoring of wastewater treatment facilities, and derived information to track annual loadings which shows reductions in nutrients. Nonpoint source reductions are tracked through EPA's GRTS system. The state's analyses of its programs' impacts are publically available.

- **Other Relevant Information:** In addition to federal laws and regulations, Rhode Island's program relies on authority from the state water pollution control act, wetlands act, groundwater protection act, and associated regulations. The state's program is funded primarily through CWA SRF contributions, with much smaller amounts of funding coming from CWA 106, 319, federal Farm Bill, and state bond funds.

  Rhode Island believes that some EPA Regions and many states have made significant progress implementing nutrient reductions using BMPs, technology-based limits, and narrative criteria. Delays implementing nutrient control actions are not due solely to lack of numeric nutrient criteria. Even once numeric criteria are established, there will be many instances where calibrated water quality models or other predictive tools will be needed to determine the reductions required to meet numeric criteria.

Contact: Angelo Liberti, Rhode Island Department of Environmental Management, Office of Water Resources; angelo.liberti@dem.ri.gov.

South Carolina

South Carolina's water resources are protected by the state Department of Health and Environmental Control's Bureau of Water. The DHEC seeks to protect and enhance the state's water quality, as relevant to nutrients, through addressing the impact of animal feeding operations on the state's waters.

- **Key Elements:** South Carolina's nutrient reduction program, operating with a statewide scope, focuses on phosphorus as its primary nutrient indicator. Through the Agricultural Section's permitting authority, each applicant is reviewed for possible effects on water quality. Additionally, when establishing TMDL for specific watersheds, the Agricultural Section works to review possible sources of contamination and eliminate such sources through comprehensive nutrient management plans.

- **Priority Pollution Sources:** South Carolina's nutrient reduction program is focused on animal feeding operations.

- **Methods Utilized:** Nutrient reduction is achieved through agricultural permitting, regulatory requirements, comprehensive nutrient management plans, best management practices, TMDLs, interagency partnerships, and education efforts. Though animal feeding facilities operating below 30,000 pounds of live animal weight are exempted from parts of the program, they are required to provide a nutrient management plans to be permitted. South Carolina's nutrient reduction program is funded through state general funds and agency budgets.

Contact: William Chaplin, South Carolina Department of Health and Environmental Control, Bureau of Water, Agriculture Permitting and Dam Safety Section; chapliwp@dhec.sc.gov.

South Dakota

South Dakota's waters are protected and managed by the state Department of Environment and Natural Resources. The Department works to protect public health and the environment through monitoring and assessment, technical and financial assistance for environmental projects, and regulatory services. South Dakota currently directs its watershed protection and funding efforts toward nutrient reductions.

- **Program Overview:** South Dakota's nutrient reduction program is organized around a combination of waterbody type, indicator, and pollution source. The Department of Environment and Natural Resources includes water quality, stormwater, and air quality within the same department and works closely with agricultural agencies and producer groups. On an informal basis, the Department directs the majority of its funding efforts to improve water quality.

Contact: Pete Jahraus, Department of Environment and Natural Resources, Financial and Technological Assistance; pete.jahraus@state.sd.us.

Tennessee

The natural resources of Tennessee are managed and protected by the state's Department of Environment and Conservation. The Department's Division of Water Resources is currently in the final stages of developing a nutrient reduction program. The state's program uses source-based nutrient loadings derived from modeling to prioritize watersheds and establish reduction goals, requiring a shared percentage of reduction from urban and agricultural sources.

- **Key Elements:** Under Tennessee's program, nutrient-impaired waters are identified by poor biological conditions along with nutrient concentrations that are above normal for the particular region. The reduction program is applied at the HUC10 watershed level. The current program focuses on lotic waters. Modeling and implementation are based on the U.S. Geological Survey's SPARROW program's modeling results. The state plans on beginning implementation with the Tennessee River Basin and expanding as more data becomes available. In West Tennessee, a different strategy is being developed as agricultural sources in that area represent nearly the entire nutrient load in impaired watersheds.

- **Methods Utilized:** Tennessee's program will focus primarily on wastewater treatment plants, stormwater, and farmland. To reduce nutrients, the state will make use of BMPs, NPDES and state permitting, regulatory requirements, water quality trading, voluntary programs, and interagency partnerships. For urban areas, BMPs such as bioretention areas and constructed wetlands will be implemented to achieve runoff reductions. Agricultural BMPs will include filter strips, terrace systems, division systems, reduced tillage systems, containment structures, and animal waste systems, applied where appropriate to reduce impacts from livestock grazing and crop production. The Division of Water Resources is also planning on working with the University of Tennessee Extension to promote BMP implementation. State permitting requirements include state-specific technology-based limits and mandatory technology implementation. Permitting covers animal feeding operations that do not require NPDES permits and mandates nutrient management plans. Water quality trading is also planned for all point and nonpoint sources. The state also anticipates that nutrient reduction agreements will be available to all sources within a watershed, with incentives for participation being primarily financial, in the form of cost-share or low-interest loans.

- **Accountability:** Accountability is ensured through permit compliance and instream monitoring for point sources and, for non-point sources, through BMP installation, operation and maintenance, and instream monitoring.

- **Other Relevant Information:** Tennessee's efforts are funded primarily through state general funds and agency budgets, permit fees, and federal CWA 106 funding. In addition to federal laws and regulations, the state's program further relies on the Tennessee Water Quality Control Act for its authority. Tennessee believes that, moving forward, challenges will include funding for infrastructure improvements necessary for nutrient reduction and BMP implementation, as well as ensuring adequate voluntary participation for agricultural BMPs. The state believes that its strategy provides an

opportunity to focus on the most pressing problems facing Tennessee first and presents a rational basis for required reductions resulting in realistic goals.

Contact: Sherry Wang, Tennessee Department of Environment and Conservation, Division of Water Resources; sherry.wang@tn.gov.

Texas

The waters of Texas are managed and protected by the Texas Commission on Environmental Quality. The Commission's Office of Water works toward clean and available water through planning, permitting, and monitoring to protect the state's water resources. The Commission's efforts to reduce nutrients are coordinated among multiple inter-agency programs and partners and nutrients are a part of the state's framework for reducing pollution in Texas.

- **Key Elements:** The Commission on Environmental Quality manages permitting, TMDLs, water quality standards development and implementation, and 319 funds. The Texas State Soil and Water Conservation Board is responsible for managing agricultural nonpoint source contributions. Texas currently has water quality standards applicable to all surface waters, including wetlands. Surface water quality standards include narrative provisions to prevent excessive growth of aquatic vegetation and which provide a framework to allow regulatory requirements in permitting and TMDLs. Texas has also adopted site-specific chlorophyll-a criteria for 75 reservoirs, which is currently under EPA review.

  Water quality impacts from nutrients are considered in the context of each program's goal. Water quality parameters that demonstrate the effects of excess nutrients, such as chlorophyll-a and Secchi depth, are being considered by the Nutrient Criteria Development Workgroup for proposed criteria. Potential impacts from discharged effluent are considered on a case by case basis when developing recommendations for nutrient requirements in permits and some TMDLs have focused directly on the impacts of nutrients and on implementing plans to control nutrient loadings. Major surface waters are classified as segments for purpose of water quality management and designation of site-specific standards. Classified segments are aggregated by basin, and include such waterbody types as freshwater streams and rivers—differentiated as intermittent, intermittent with perennial pools, or perennial—reservoirs, wetlands, and coastal, bay, or gulf waters. Flowing and still waters are differentiated.

- **Methods Utilized:** Texas's nutrient reduction program primarily targets wastewater treatment plants, septic systems, stormwater, farmland, animal feeding operations, and boats. To reduce the impact of nutrients, the state makes use of BMPs, NPDES and state permitting, TMDLs, regulatory requirements, nutrient reduction agreements and nutrient management plans, water quality trading, interagency partnerships, voluntary programs, and education. Various BMPs to reduce nutrients are implemented through projects funded by the state's nonpoint source program and include low-impact developments, which seek to treat rainfall runoff as close to its source as possible, before it collects and transfers pollutants to surface water and groundwater. Other BMPs include vegetated swales, rain gardens, green roofs, porous pavement, and retention ponds. State permitting covers a larger universe than the NPDES program and includes state-specific technology-based limits. Regulatory requirements include watershed protection rules and water quality and surface water quality standards and implementation procedures. Additionally, nutrient reduction agreements may be made part of TPDES permitting requirements. Under one TMDL project, efforts are underway to coordinate water

quality trading programs among point sources. Education is a component of the state's 319 projects. Education efforts are directed at stakeholders within nonpoint source project watersheds and the public at large. Texas also makes use of volunteer monitoring, monitoring plans for fertilizer application, community composting, comprehensive reasonable assurance analysis, and pilot studies.

- **Accountability:** Accountability in Texas's 319 program is ensured through grant conditions requiring that load reductions be reported biannually. In the state's TMDL program, routine ambient water quality monitoring is coordinated annually and nutrient reduction projects are supplemented with monitoring stations when resources allow. The results of sampling and analysis are publically available. Finally, point source accountability measures related to permits include permit-specific conditions monitored through field investigations, with enforcement measures taken when necessary.

- **Other Relevant Information:** Texas believes that identifying threshold concentrations as the basis for criteria development has historically worked well for toxic pollutants, but may not work as easily with nutrients. Since nitrogen and phosphorus are necessary for healthy ecosystems, the primary challenge is to identify stressor and response relationships and develop appropriate nutrient criteria to prevent undesirable impacts. Allowing a weight-of-evidence approach in the criteria development process is an opportunity to overcome uncertainty associated with nutrient stressor and response relationships.

Contact: Jill Csekitz, Texas Commission on Environmental Quality, Water Quality Planning Division, Office of Water Quality; jill.csekitz@tceq.texas.gov.

Utah

Utah's waters are managed and protected by the Utah Department of Environmental Quality's Division of Water Quality. The Division of Water Quality seeks to reduce the impacts of nutrients in the state's waters through a variety of frameworks, including its existing programs, and its current efforts to revise its nutrient reduction program.

- **Key Elements:** Utah's nutrient reduction efforts are waterbody specific, with most nutrient reduction efforts applied to specific waterbodies and watersheds, though several nutrient reduction programs and potential effects of nutrients are evaluated statewide. Utah is developing numeric nutrient criteria and currently makes use of both nitrate and phosphorus numeric indicators. Sites where these values are exceeded are listed as impaired when other evidence indicates the existence of nutrient-related problems. Additionally, numeric criteria exist for several nutrient-related parameters, including dissolved oxygen, biochemical oxygen demand and pH. The same numeric and narrative criteria currently apply for all waterbody types, though different assessment methods, such as numeric translators of narrative criteria, are employed for lakes and streams. Both causative indicators, such as nitrogen and phosphorus, and response indicators, such as quantitative biological assessments and other more qualitative field observations of excessive primary production (i.e., excessive filamentous algae (streams), high cyanobacteria counts (lakes)), are used to identify sites that are degraded from excessive nutrients. Waters are classified in several ways, such as by beneficial use classes, antidegradation classes, watershed management units, and assessment units. Additionally, the Division of Water Quality has developed several nutrient-specific monitoring and assessment techniques (functional indicators) that quantify intermediate responses between nutrients and designated uses. These responses are being used to develop several classification schemes for the specific purpose of creating regionally-specific nutrient indicators. Flowing and still waters are differentiated through the use of different assessment methods and response indicators, different schemes for delineation of assessment units, different models for waste load analyses to determine permit limits, and different models and approaches for TMDL development.

- **Methods Utilized:** Utah's nutrient reduction program primarily targets wastewater treatment plants, septic systems, stormwater, farmland, animal feeding operations, and boats. To reduce the impact of nutrients, the state makes use of BMPs, NPDES permitting via mechanistic models that predict effects on nutrient-related numeric parameters, TMDLs, nutrient management plans, interagency partnerships, voluntary programs, and education. As a result of Utah's current assessment process, over half of existing and planned TMDLs include nutrient endpoints. Historically, these end points focused on phosphorus, though recent procedures show that nitrogen is as much of a concern, resulting in plans for future TMDLs to include endpoints for both nitrogen and phosphorus. Similarly, the Department of Water Quality is actively developing assessment procedures that will allow for the identification of sites where carbon is a primary nutrient of concern. BMPs and documented nutrient reductions are required for nonpoint source allocations within TMDLs with nutrient endpoints. BMPs are also required through implementation of Utah's AFO/CAFO program which requires manure

management strategies for all of these facilities. NPDES permitting includes nutrient permit limits at sites with TMDL nutrient endpoints. Additionally, Utah is making use of dishwater detergent phosphate bans, community composting, comprehensive reasonable assurance analysis, and pilot studies.

- **Accountability:** Utah seeks to ensure accountability through continued monitoring and evaluation of TMDL goals. Analysis of TMDL implementation efforts is ongoing, with some documented positive environmental outcomes. Older TMDLs—typically >10 years— are revisited; endpoints and load allocations are revised, if necessary to meet water quality goals. The results of these analyses are publically available.

- **Other Relevant Information:** In addition to federal laws and regulations, Utah's nutrient reduction efforts rely on authority from the state's water quality rules and regulations. The program is funded through state general funds and agency budget, Federal CWA 106, 319, and SRF contributions, and federal Farm Bill funds.

  Utah sees several potential challenges and opportunities in moving forward to reduce nutrients in the state's waters. Among the challenges is EPA's policy of independent applicability, which prevents states from considering numeric criteria in the context of observed deleterious effects. Other challenges include the high cost of implementation, which requires a phased approach that will be a challenge to develop in a way where different groups feel that they are being fairly treated. Lag times in recovery, which are likely in most cases, need to be addressed in order to set realistic expectations among members of the public. Discontinuity in scale also poses challenges. Site-specific conditions are critical for establishing appropriate protections, yet the issue of nutrient reduction also must be addressed, through numerous regulatory programs, at a larger, often statewide, scale. Among the opportunities Utah identifies are of growing interest in nutrient reduction nationally, coupled with the simultaneous development of numerous creative programs for addressing eutrophication. The national emphasis has lead to greater acknowledgement that something must be done to address the excessive nutrients in our waters. As the remaining water quality threats to aquatic life uses principally stem from non-toxics, successful approaches for nutrients could be applied for other non-toxic threats as well. This presents an opportunity to rethink the general applicability of several interrelated water quality programs and to develop policies that provide a more comprehensive and equitable approach for addressing water quality problems.

Contact: Jeff Ostermiller, Utah Department of Environmental Quality, Division of Water Quality; jostermiller@utah.gov.

Vermont

Vermont's Department of Environmental Conservation envisions a state where people live in harmony with diverse and healthy natural systems, appreciate and enjoy natural resources, work together responsibly to reduce waste and risks to human health and the environment, and prosper without significant degradation of natural systems. To do so, the Department's Watershed Management Division work to protect, maintain, enhance, and restore the quality of the state's surface waters. Vermont manages its surface waters in conjunction with the Statewide Surface Water Management Strategy, of which nutrient management is a core component.

- **Key Elements:** Vermont's nutrient management approach is spread across several programs administered within the Department of Environmental Conservation and partner state and federal agencies. The Surface Water Management Strategy's planning process to support nutrient reductions is designed around use of monitoring and assessment data to geographically target interventions to subwatersheds demonstrating the greatest need. The Strategy identifies four major landscape stressors that result in nutrient-related pollutant loading: channel erosion, land erosion, encroachment, and non-erosion nutrient loading. Each stressor has a specific recipe of management intervention that is articulated across five categories of act: monitoring and assessment, technical assistance, funding, regulation, and education and outreach. For nutrient criteria development, Vermont has attempted to develop nutrient criteria that fit within the Classification and Tiered Aquatic Life Use frameworks that are the foundation of the state's water quality standards. A maximum mean phosphorus concentration for POTW effluent of 0.8 mg/L is in place for the Lake Champlain Basin, and water quality standards have narrative criteria for nutrients in all waters and numeric criteria for certain waters. Flowing and still waters are differentiated and nutrient criteria are separately applicable to lakes and streams. Biological monitoring is used to confirm and identify nutrient impairments.

- **Methods Utilized:** Vermont's nutrient reduction program primarily targets wastewater treatment plants, septic systems, stormwater, farmland, and animal feeding operations. Vermont makes use of BMPs, NPDES and state permitting, TMDLs, regulatory requirements, nutrient reduction agreements and nutrient management plans, interagency and interstate partnerships, voluntary programs, and education. The Department of Environmental Conservation works in partnership with the state Agency of Agriculture and Natural Resources Conservation Service to target BMPs as appropriate. Numerous programs are involved, including regulatory permit programs for large- and medium-sized farm operations and nutrient management planning. State-specific NPDES requirements for stormwater require the capture of ninety percent of the annual storm events, removal of eighty percent of the average post development total suspended solids load, and removal of forty percent of the total phosphorus load. State permitting includes state-specific technology-based limits and the ability to order abatement of discharges. Vermont also makes use of dishwater detergent phosphate bans, volunteer monitoring, fertilizer application restrictions and monitoring plans, and comprehensive reasonable assurance analysis.

- **Accountability:** Department of Environmental Conservation programs have the authority to enforce permit limitations in NPDES and encroachment permits. The Department has permit and enforcement authority to require all in-channel alterations to be consistent with the promotion of equilibrium river conditions, to one square mile drainages. Through an interagency memorandum of understanding, the Department confers to the Agency of Agriculture authority to enforce nonpoint source nutrient losses to surface waters where water quality standards are violated. The same agreement allows the Agency of Natural Resources jurisdiction to enforce where discharges are direct to surface waters.

  Analysis has been conducted to evaluate the program's success at reducing nutrient impacts on the ground and is publically available. As part of the Lake Champlain phosphorus TMDL, the Department, in partnership with the Lake Champlain Basin Program, EPA, Untied States Geological Survey, and others, maintains a robust monitoring program. The most recent trend evaluations document declining trends in the flow-adjusted nutrient loads over the past decade. The Department also works with EPA to provide measures of progress and success.

- **Other Relevant Information:** In addition to federal laws and regulations, Vermont's nutrient reduction efforts rely on authority from the state's water quality rules and pollution control statutes. The program is funded through state general funds and agency budget, joint agency initiatives, permit fees, Federal CWA 106, 319, and SRF contributions, and federal Farm Bill funds. In 2011, the EPA revoked its previous approval of the Vermont portion of the 2002 Lake Champlain Phosphorus TMDL, which had established wastewater discharge limits and nonpoint source loading allocations for a watershed draining nearly half of the state. The EPA is in the process of developing a new TMDL for Lake Champlain.

Contact: Neil Kamman, Vermont Department of Environmental Conservation, Watershed Management Division, Office of Monitoring Assessment and Planning; neil.kamman@state.vt.us.

Virginia

The Virginia Department of Environmental Quality's (DEQ) Water Division administers state and federal laws and regulations to improve and protect Virginia's waters. DEQ administers programs for controlling point sources of pollution under a variety of regulatory permits. The Department of Conservation and Recreation administers nonpoint source programs to control polluted runoff from agricultural, forested, and urban/suburban land, using a combination of permits and cooperative financial/technical assistance. Virginia's nutrient reduction efforts are primarily targeted at reducing nutrient (and sediment) impacts on the Chesapeake Bay and its tributaries. In 2010, Virginia's Phase I Watershed Implementation Plan (WIP) was submitted to EPA in response to the Chesapeake Bay TMDL and the Phase II WIP was submitted in 2012. In areas outside the Bay watershed, TMDLs have been developed for water quality impairments where the stressors are either nitrogen or phosphorus, although nutrient standards for free flowing rivers and streams are still being developed. Virginia has adopted nutrient standards for lakes and estuaries.

- **Key Elements:** Virginia's efforts to address nutrients are organized primarily around the Chesapeake Bay TMDL. Water quality is assessed based on compliance with water quality standards/criteria and a waterbody's ability to meet designated uses. Indicators include dissolved oxygen, chlorophyll-a, nutrients, benthics and aquatic vegetation. Waterbodies are classified as rivers, lakes, and estuaries.

- **Methods Utilized:** The primary targets of Virginia's efforts are wastewater treatment plants, farmland and animal feeding operations, urban/suburban stormwater, and septic systems. The state makes use of a variety of nutrient reduction strategies, including BMPs, NPDES, CAFO and Watershed General Permits, regulatory requirements, nutrient management plans, water quality trading, and interagency and interstate partnerships. Pollution waste load allocations are in place for wastewater treatment plants and stormwater systems; load allocations have been set for agricultural and forestry sources, septic and air sources. Wastewater permitting includes enforceable provisions capping annual mass discharges of total nitrogen and phosphorus, and individual VPDES permits can include annual average concentration limits based on the technology installed. Nutrient management plans for agriculture address tillage, cover crops, retention, buffers and livestock exclusion. Virginia also makes use of water quality trading, with both point and nonpoint sources allowed to participate. Additionally, Virginia established chlorophyll-a numeric criteria for the James River watershed.

- **Accountability:** Virginia seeks to ensure accountability through biennial water quality monitoring reports (the Integrated 303(d)/305 (b) Report), the Secretary of Natural Resources' annual report (with six-month updates) on the "Virginia Chesapeake Bay and Impaired Waters Cleanup Plan," increased oversight and implementation of erosion and sediment controls, and increased reporting of stormwater management practices. Both the state and private citizens undertake monitoring. The state's annual reports are available to the public. Virginia is also subject to EPA's "accountability framework" regarding the implementation of the Chesapeake Bay WIPs.

Contact: Melanie Davenport, Virginia Department of Environmental Quality, Water Division; melanie.davenport@deq.virginia.gov.

Washington

Washington's Department of Ecology (Ecology) works to protect and enhance the quantity and quality of the state's water resources. Ecology's Water Quality Program–Watershed Management Section oversees the state's nutrient strategy, utilizing a combination of regulatory tools, prevention programs, and funding mechanisms to control nutrient loads from both point and nonpoint sources.

- **Key Elements:** Washington's statewide nutrient strategy uses stringent dissolved oxygen and pH criteria as indicators of potential nutrient problems for rivers and streams. The state's TMDL plans and STI projects are organized around indicators (DO and pH—usually as part of a multi-parameter TMDL or STI project) and watersheds. However, Ecology's implementation plans' primary focus is on pollutant sources. Ecology organizes targeted efforts, compliance response, and enforcement around both pollution sources and watersheds, while grant and loan programs can be organized around watersheds, indicators, and/or pollution sources.

- **Methods Utilized:** Washington's nutrient reduction program primarily targets wastewater treatment plants, septic systems, stormwater, farmland, animal feeding operations, and boats. To reduce the impact of nutrients, the state utilizes BMPs, NPDES and state permitting, TMDLs, regulatory requirements, nutrient management plans, water quality trading, interagency partnerships, voluntary programs, social media, and education. To address nutrient pollution from nonpoint sources, use of Ecology-approved suites of BMPs (made up of foundational and supporting BMPs) can provide presumed compliance with the water quality standards and state water quality law. For example, to address nutrient pollution from livestock operations, the state recognizes three foundational BMPs: the Riparian Forest Buffer (NRCS 391), Fence (NRCS 382), and off-stream Watering Facility (NRCS 614). The Riparian Forest Buffer which has a thirty-five foot minimum width requirement is used as the primary means to reduce delivery of nutrients to waters of the state. The fence and off-stream Watering Facility are needed to support the permanent exclusion of animals from surface waters and the riparian buffer zone. Additional supporting practices, such as heavy use area protection and waste storage facility siting and design may be required based on site-specific factors. A similar set of foundational and supporting practices apply to manure application. For stormwater, BMP guidance is provided in stormwater manuals. State permits include the ability to order abatement of discharges. Washington has also developed a water quality trading framework, with a combination of various point and nonpoint sources eligible to participate. Ecology sees water quality trading as having the specific goal of helping point source dischargers meet permit limits through the purchase of pollution reduction credits from a source, often a nonpoint source, of the same pollutant that is able to reduce pollution at lower costs than the point source. Additionally, Ecology administers grant and loan programs to address nonpoint source pollution, including nutrient pollution.

- **Accountability:** Accountability in Washington's nutrient reduction efforts is ensured through a combination of regulatory tools, prevention programs, and funding

mechanisms, each with accountability requirements built in. For example, the state makes use of TMDL programs and associated Detailed Implementation Plans to provide accountability for TMDLs. NPDES permits also have accountability built in to meeting the conditions of the permit.

- **Other Relevant Information:** Washington's nutrient reduction efforts are primarily funded by state general funds and agency budgets, as well as CWA 319 funds. The state believes that providing clear standards, through approved suites of BMPs, and a regulatory certainty framework for nonpoint sources presents an important opportunity to take a more comprehensive approach to address nutrient pollution.

Contact: Benjamin Rau, Washington Department of Ecology, Water Quality Program, Watershed Management Section; ben.rau@ecy.wa.gov.

West Virginia

The Division of Water and Waste Management of the West Virginia Department of Environmental Protection works to protect, restore, and enhance West Virginia's waterbodies. The Division's nutrient reduction efforts are currently focused on improving the Chesapeake Bay through the Chesapeake Bay TMDL.

- **Key Elements:** West Virginia's nutrient reduction efforts are focused on protecting and restoring the Chesapeake Bay through the implementation of the Chesapeake Bay TMDL, through which the state seeks to substantially reduce the amount of nutrient and sediment loads in Potomac Basin watershed. Multiple agencies are involved with the Bay TMDL projects, and the Department of Environmental Protection works closely with Department of Agriculture in developing Bay TMDL products.

- **Methods Utilized:** West Virginia's Bay TMDL program targets municipal facilities, sewer overflows, industrial discharge, stormwater, agriculture, and forestry. To reduce the impact of nutrients, the state makes use of BMPs, NPDES and state permitting, TMDLs, regulatory requirements, nutrient reduction agreements and nutrient management plans, interagency partnerships, voluntary programs, and education. Permitting covers sewage treatment and overflows, industrial facilities, stormwater, MS4s, and CAFOs, and includes enforceable provisions and the ability to require abatements. Education efforts are ongoing and directed at stakeholders throughout the Potomac Basin watershed. Statewide, the Division is assessing the impacts from nutrients and, if applicable and necessary, working on the development of site-specific nutrient criteria. Currently some streams, in both the Bay watershed and Ohio River watershed, are being assessed for potential site-specific nutrient criteria development.

Contact: Kevin Coyne, West Virginia Department of Environmental Protection, Division of Water and Waste Management; kevin.r.coyne@wv.gov.

Wisconsin

Wisconsin's Department of Natural Resources works to manage, conserve, and restore the state's water resources. Its nutrient reduction efforts are primarily focused on addressing excess phosphorus in state waterbodies.

- **Key Elements:** Wisconsin's waterbodies are classified as lakes and reservoirs, rivers and streams, wetlands, and the Great Lakes. These waters are evaluated through compliance monitoring studies, studies of long-term trends in rivers and lakes, and fish management evaluation studies. Wisconsin's nutrient reduction program is organized by a combination of pollution source and phosphorus levels and encompasses both point and nonpoint sources.

- **Methods Utilized:** The primary targets of Wisconsin's efforts are wastewater treatment plants, stormwater, farmland, and animal feeding operations. The state makes use of a variety of nutrient reduction strategies, including BMPs, NPDES and state permitting (WPDES), regulatory requirements, nutrient management plans, TMDL programs, water quality trading, nutrient management plans, interagency partnerships, voluntary programs, and educational efforts. Presently, the state is starting to incorporate phosphorus water quality-based effluent limits in WPDES permits based on numeric water quality standards. Wisconsin only allows trading on water quality-based limits, for a combination of some point and nonpoint sources. State wastewater permitting utilizes state-specific, technology-based limits, mandatory technology implementation, enforceable provisions applied to nonpoint sources, and the ability to order abatement of discharges. Best Management Practices include performance standards and prohibitions, which include nutrient management (both P and N) and a maximum phosphorus index value. These performance standards are implemented through a number of state, federal, and local programs. CAFOs have stringent nutrient management plans. The nutrient management program relates directly to agricultural conservation and working lands programs. Also, MS4 permits control nutrients as a side benefit to sediment control. Wisconsin's voluntary programs are described in section 319 management plans, including cross compliance for income tax credits for farmers.

- **Accountability:** Wisconsin seeks to ensure accountability through monitoring requirements in WPDES permits. Methods are being developed for nonpoint source accountability.

- **Assessment:** Point source reductions and some nonpoint source reductions have been shown in lakes or streams. An overall assessment of Wisconsin's nutrient reduction program is in development.

- **Other Relevant Information:** For point sources, Wisconsin has had a technology-based limit of 1 mg/L or alternate that has been in effect since the early 1980s in the Great Lakes drainage basin and statewide since 1993. In addition to federal laws and regulation, Wisconsin makes use of state administrative rules to reduce nutrient impacts. Primary funding sources include state general funds, state bonding and agency budgets,

permitting and other fees, federal CWA 106 and 319 funds, SRF funds, and the federal Farm Bill program. Moving forward, control of nonpoint sources remains difficult, while point source controls are pushing technology and costs to a level that may not be affordable.

Contact: Russell Rasmussen, Wisconsin Department of Natural Resources, Bureau of Watershed Management; russell.rasmussen@wisconsin.gov.

Wyoming

The waters of Wyoming are managed and protected by the Wyoming Department of Environmental Quality. The Department's Water Quality Division works to protect and enhance the state's water resources. The Department's efforts to reduce nutrients are managed cooperatively among multiple agency programs and partners.

- **Key Elements:** Wyoming's nutrient reduction program, statewide in scope, is organized by waterbody type and pollution source. Nutrients are addressed by waterbody type according to the state's stream classification system, which organizes each state waterbody by designated use and corresponding water quality standard. Permits are written to protect the waterbody type and include an evaluation of nutrients and assessments are made to determine if a waterbody is meeting its designated uses. Nutrients are also addressed through pollution source and regulated through the permitting of domestic waste treatment facilities and CAFOs. Flowing and still waterbodies are differentiated through the state's permitting and assessment programs. Discharges permitted to flowing waters have site-specific limits for ammonia, developed partially based upon the flow of the waterbody, while discharges to still or closed waters are developed based on volume. Biological monitoring is used to confirm and identify nutrient impairments. The state's monitoring program evaluates whether a waterbody is meeting its designated uses through the collection of chemical, physical, and biological data, including fish collection, periphyton and phytoplankton, and macroinvertebrates.

- **Methods Utilized:** Wyoming's nutrient reduction program primarily targets wastewater treatment plants, septic systems, stormwater, farmland, and CAFOs. The state makes use of BMPs, NPDES and state permitting, TMDLs, regulatory requirements, interagency and interstate partnerships, nutrient management plans, voluntary programs, education, and social media. Many of Wyoming's state-issued permits contain BMPs. A formal BMP agreement is required for fish hatcheries over a certain size and includes nutrient load reductions. Other BMPs include fencing requirements, riparian buffers, off-creek water projects, corral relocations, wetland construction, septic replacement, and irrigation system upgrades. Discharge permitting includes criteria for ammonia, nitrate, and nitrite, depending on the classification of the receiving waterbody.

  Many of the CWA programs managed by the Department of Environmental Quality (303, 319, 402, etc.) are managed cooperatively and integrated with other programs within the state. For example, the 319 program works with other agricultural agencies as needed to establish program directions and priorities and to implement BMP projects, which impact nutrients. The 319 program also works with the Wyoming Pollution Discharge Elimination System stormwater program on urban runoff control. This program also coordinates with agriculture through permitting of concentrated animal feeding operations (CAFO) within the state.

- **Accountability:** Wyoming ensures accountability related to nutrient reductions through load reduction estimates for nitrogen and phosphorus under the state's CWA 319 program requirements. Analysis has been done to determine the impacts of the state's

319 program and is publically available in annual program reports and the Grants Reporting and Tracking System (GRTS).

- **Other Relevant Information:** Wyoming's nutrient reduction program is primarily funded through state general funds and agency budgets, permit fees, CWA 319 funding, and the federal Farm Bill program. In addition to federal laws, the state relies on Wyoming Water Quality Rules and Regulations as additional authorities for its nutrient reduction efforts.

  Wyoming believes that the major challenges facing the state are associated with resources, funding, and timing. Wyoming has limited resources to devote to the development of standards. Additionally, Wyoming has a number of small towns with lagoon systems, the upgrading of which would incur significant costs. Based on the State's climate and pollution, Wyoming believes that it has a great deal of opportunity to develop and implement additional nutrient reduction programs appropriate to the state. Wyoming further believes that the complexity of nutrient criteria lends itself to a state-by-state approach. Wyoming recognizes that what may work well in one state may not be appropriate in others. Likewise, Wyoming believes that regulatory agencies such as the EPA need to realize that a one size fits all approach is not appropriate for a problem as complex as nutrients.

Contact: Lindsay Patterson, Wyoming Department of Environmental Quality, Water Quality Division; lindsay.patterson@wyo.gov.

APPENDIX I: CONDENSED SURVEY RESPONSES*

*Responses as of 12/14/2012

	Program Basics		Scope	Program Focus	Which Sources Targeted							Exemptions
State	Existing Nutrient Program?	Other Efforts that result in Nutrient Reduction?	Statewide Program Scope?	Focus on combination of waterbody type, indicator, and pollution source	Airborne	WWTP	Septic	Boats	SW	Farmland	CAFO/AFO	Exempt certain Activities or Idustries?
AL	Yes	N/A	Yes	Combination		WWTP	SS		SW	Farmland		No
AK	No Program	Yes		Waterbody only								
AR	Developing	N/A		Waterbody only		WWTP				Farmland		
AZ	No Program	Yes		No Response								
CA	Developing	N/A		Combination		WWTP			SW	Farmland	CAFO/AFO	No
CO	Developing	N/A	Yes	Pollution Source		WWTP			SW			Yes
CT	Yes	N/A	Yes	Combination		WWTP			SW			Yes
DC	Yes	N/A	Yes	Combination		WWTP			SW			No
DE	Yes	N/A	Yes	Combination	Airborne	WWTP	SS		SW	Farmland	CAFO/AFO	No
FL	Yes	N/A	Yes	Combination	Airborne	WWTP	SS		SW	Farmland	CAFO/AFO	No
GA	Yes	N/A	Yes	Combination		WWTP			SW			No
HI	No Program	Yes		No Response								
IA	Developing	N/A	Yes	Combination		WWTP	SS		SW	Farmland	CAFO/AFO	No
ID	No Program	Yes		No Response								
IL	Yes	N/A	Yes	Pollution Source		WWTP				Farmland		No
IN	No Program	Yes		Combination								
KS	Yes	N/A	Yes	Combination		WWTP				Farmland	CAFO/AFO	No
KY	Developing	N/A	Yes	Combination		WWTP	SS		SW	Farmland		No

	Differentiation	Analysis		Accountability			BioMonitoring	Indicators
State	Diff. Lentic/Lotic?	State Done Analsys of NRP?	Public Avail?	Accountability methods	Accountability methods (Modified description)	Diff. Accountability PS/NPS?	Bio-Monitoring Used?	Type of indicators used (P, Surrogates, Bio-monitoring)
AL	No	In Progress	No	M&R	PS - Effluent Nutrient Concentrations NPS - Follow up stream moitoring	Yes	Yes	Chlor-a
AK								DO, secchi depth
AR								Secchi depth, periphyton, DO
AZ								
CA	Yes	In Dev		In dev	PS - NPDES permit compliance NPS - In Development - Waste discharge permits; Coalition of dischargers permits	Yes	Yes	Algal biomass, Chlor-a, periphyton
CO		No	No	M&R	PS - Monitoring and reporting of effluent quality NPS - none	Yes	No	N & P
CT	Yes	Yes		Permit tracking	PS - Track and Enforce Permit Requirements NPS - Voluntary programs	Yes	Yes	DO, Perhiphyton
DC	Yes	Yes	Yes	M&R	Regulatory Programs, Permitting, Inspections and Enforcements, Installation of BMPs	No	Yes	Chlor-a, DO, turbidity
DE	No	Yes	No	M&R	Audits and Inspections	Yes	Yes	
FL	Yes	Yes	Yes	M&R	Permits - Reporting Requirement BMPs - effectiveness verification, monitoring, iterative implementation	Yes	Yes	N, P, Chlor-a, Stream Cond. Index, Lake Veg. Index; Periphyton
GA	No			DMRs	DMRs		Yes	Chlor-a
HI								
IA	Yes	In Dev	No	In dev	In development	Yes	Yes	
ID								
IL		No	Yes	M&R	PS - NPDES permit compliance NPS - Accountability method in development	Yes	Yes	DO, algae growth, P, N
IN								
KS	Yes	Yes	No	M	Monitoring - 9-element watershed plans PS - enforaceable permit limits, NPDES NPS - Voluntary compliance, 303d/TMDL	Yes	Yes	Chlor-a, DO, pH, bio-indicators
KY	Yes	In Dev	No	In dev	In development	Yes	Yes	

	Reduction Methods Used												
State	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	Interstate Partnerships
AL	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting		TMDL Program	Regulatory Requirements		Interagency Partnerships	
AK													
AR			Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	
AZ													
CA			Best Management Practices			Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	
CO	Education		Best Management Practices				NPDES Permitting	State Permitting			Water Quality Trading		
CT	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting		TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	Interstate Partnerships
DC	Education		Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	Interstate Partnerships
DE	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	Interstate Partnerships
FL	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	
GA				Voluntary Programs			NPDES Permitting		TMDL Program				
HI													
IA	Education		Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	
ID													
IL	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting		TMDL Program				
IN													
KS	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	
KY	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	

	Other Methods Used													
State	Dishwashing detergent phosphate ban	Protection of natural nutrient sinks	Volunteer monitoring	Expanded NPDES permit requirements	Expanded state permit requirements	Fertilzer applicaton restrictions	Monitoring plan for fertilizer application	Green labeling programs	Corporate stewardship programs	Limits to impervious surfaces	Community composting	Release inventories for nutrients	Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
AL			Volunteer monitoring	Expanded NPDES permit requirements										
AK														
AR														
AZ														
CA					Expanded state permit requirements									Comprehensive reasonable assurance analysis (TMDL)
CO														
CT				Expanded NPDES permit requirements			Monitoring plan for fertilizer application			Limits to impervious surfaces				Comprehensive reasonable assurance analysis (TMDL)
DC		Protection of natural nutrient sinks		Expanded NPDES permit requirements					Corporate stewardship programs	Limits to impervious surfaces	Community composting	Release inventories for nutrients		Comprehensive reasonable assurance analysis (TMDL)
DE			Volunteer monitoring	Expanded NPDES permit requirements	Expanded state permit requirements	Fertilzer applicaton restrictions								Comprehensive reasonable assurance analysis (TMDL)
FL	Dishwashing detergent phosphate ban	Protection of natural nutrient sinks	Volunteer monitoring			Fertilzer applicaton restrictions		Green labeling programs					Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
GA	Dishwashing detergent phosphate ban													
HI														
IA														
ID														
IL	Dishwashing detergent phosphate ban					Fertilzer applicaton restrictions								
IN														
KS				Expanded NPDES permit requirements	Expanded state permit requirements									
KY			Volunteer monitoring	Expanded NPDES permit requirements			Monitoring plan for fertilizer application							

	Primary Sources of Funding								
State	State General Funds or State Agency Budget	Joint Agency Intitiative	Permit Fees	Other Fees	Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	Private Sector
AL					Federal CWA 106	Federal CWA 319			
AK									
AR									
AZ									
CA			Permit Fees						
CO	State Gen/Agy Budget		Permit Fees		Federal CWA 106				
CT	State Gen/Agy Budget				Federal CWA 106	Federal CWA 319			
DC	State Gen/Agy Budget	Joint Agency Intitiative			Federal CWA 106	Federal CWA 319	Federal CWA SRF		
DE	State Gen/Agy Budget	Joint Agency Intitiative	Permit Fees		Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	
FL	State Gen/Agy Budget		Permit Fees	Other Fees	Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	Private Sector
GA	State Gen/Agy Budget								
HI									
IA									
ID									
IL	State Gen/Agy Budget		Permit Fees		Federal CWA 106	Federal CWA 319		Federal Farm Bill Program	
IN									
KS	State Gen/Agy Budget	Joint Agency Intitiative			Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	Private Sector
KY	State Gen/Agy Budget		Permit Fees	Other Fees	Federal CWA 106	Federal CWA 319			

	Program Basics		Scope	Program Focus	Which Sources Targeted							Exemptions
State	Existing Nutrient Program?	Other Efforts that result in Nutrient Reduction?	Statewide Program Scope?	Focus on combination of waterbody type, indicator, and pollution source	Airborne	WWTP	Septic	Boats	SW	Farmland	CAFO/AFO	Exempt certain Activities or Idustries?
LA	Developing	N/A	Yes	Combination		WWTP	SS		SW	Farmland	CAFO/AFO	No
MA	Yes	N/A	Yes	Combination		WWTP	SS	Boats	SW	Farmland		
MD	Yes	N/A	Yes	Combination		WWTP	SS		SW	Farmland		No
ME	No Program	Yes		Combination								
MI	Developing	N/A	Yes	Indicator Only		WWTP	SS		SW	Farmland	CAFO/AFO	No
MN	Yes	N/A		Combination		WWTP	SS		SW	Farmland	CAFO/AFO	Yes
MO	Developing	N/A		No Response								
MS	Yes	N/A	Yes	Combination	Airborne	WWTP	SS	Boats	SW	Farmland	CAFO/AFO	No
MT	Yes	N/A		Indicator Only								
NC	Yes	N/A	Yes	Combination		WWTP			SW	Farmland	CAFO/AFO	No
ND	Developing			No Response								
NE	No Program	Yes		Combination						Farmland	CAFO/AFO	No
NH	Yes	N/A	Yes	Combination	Airborne	WWTP	SS		SW	Farmland		No
NJ	No Program	Yes		No Response								
NM	No Program	Yes		Combination								
NV	Yes	N/A	Yes	Combination	Airborne	WWTP	SS		SW		CAFO/AFO	Yes
NY	No Program	Yes	Yes	Pollution Source		WWTP	SS	Boats	SW	Farmland	CAFO/AFO	No

	Differentiation	Analysis		Accountability			BioMonitoring	Indicators
State	Diff. Lentic/Lotic?	State Done Analsys of NRP?	Public Avail?	Accountability methods	Accountability methods (Modified description)	Diff. Accountability PS/NPS?	Bio-Monitoring Used?	Type of indicators used (P, Surrogates, Bio-monitoring)
LA	Yes	No	No	In dev	In development	Yes	Yes	
MA	Yes	Yes	Yes	M&R	Monitoring Permit enforcement	Yes	Yes	secchi depth, chlor-a, algae, duckweed, DO
MD	No	Yes	Yes	M&R	WWTPs - DMRs SW - Annual Reports Ag. BMPs - Inspections (10% inspection rate) State-Funded Structural Implementations documented	Yes	Yes	
ME								
MI		Yes	Yes	M	PS - NPDES permit compliance NPS - voluntary only	Yes	Yes	nuisance plant growth (visual), P
MN	No	Yes	Yes	M&R	WW - permit compliance, DMRs Ag/NPS BMP - tracking and nutrient reduction calculations	Yes	No	N, P
MO								
MS		Yes	Yes	Monitoring	Monitor Assess Plan	Yes	Yes	
MT								
NC	No	Yes	Yes	M&R	PS - Monitoring, Permit Requirements NPS - Source-specific compliance accounting tools	Yes	Yes	chlor-a, turbidity, pH
ND								
NE	Yes	Yes	Yes	M	Livestock Program - monitoring and compliance checks Watershed Management Plans - monitoring	Yes	Yes	chlor-a
NH	Yes	No	No	M	Monitoring	Yes	Yes	
NJ							Yes	chlor-a, DO, pH, P
NM								
NV	Yes	Yes	Yes	Monitoring Permits	Monitoring - ambient and site-specific WQ Permit Requirements	Yes	Yes	Algae levels
NY		Yes	Yes	M&P	PS - permit compliance NPS - ambient monitoring		Yes	

	Reduction Methods Used												
State	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	Interstate Partnerships
LA	Education		Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	
MA	Education		Best Management Practices		Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	Interstate Partnerships
MD	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	
ME													
MI	Education		Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	Interstate Partnerships
MN	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	Interstate Partnerships
MO													
MS	Education		Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	Interstate Partnerships
MT							NPDES Permitting		TMDL Program				
NC	Education		Best Management Practices			Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	
ND									TMDL Program				
NE	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program			Interagency Partnerships	Interstate Partnerships
NH	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements			
NJ									TMDL Program				
NM							NPDES Permitting		TMDL Program				
NV	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program				
NY	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans		State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	Interstate Partnerships

	Other Methods Used													
State	Dishwashing detergent phosphate ban	Protection of natural nutrient sinks	Volunteer monitoring	Expanded NPDES permit requirements	Expanded state permit requirements	Fertilzer applicaton restrictions	Monitoring plan for fertilizer application	Green labeling programs	Corporate stewardship programs	Limits to impervious surfaces	Community composting	Release inventories for nutrients	Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
LA														
MA	Dishwashing detergent phosphate ban		Volunteer monitoring			Fertilzer applicaton restrictions							Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
MD	Dishwashing detergent phosphate ban		Volunteer monitoring	Expanded NPDES permit requirements	Expanded state permit requirements	Fertilzer applicaton restrictions				Limits to impervious surfaces			Pilot studies	
ME														
MI	Dishwashing detergent phosphate ban		Volunteer monitoring	Expanded NPDES permit requirements	Expanded state permit requirements	Fertilzer applicaton restrictions		Green labeling programs	Corporate stewardship programs				Pilot studies	
MN	Dishwashing detergent phosphate ban		Volunteer monitoring	Expanded NPDES permit requirements		Fertilzer applicaton restrictions								
MO	Dishwashing detergent phosphate ban		Volunteer monitoring	Expanded NPDES permit requirements						Limits to impervious surfaces	Community composting		Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
MS				Expanded NPDES permit requirements	Expanded state permit requirements				Corporate stewardship programs				Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
MT														
NC				Expanded NPDES permit requirements	Expanded state permit requirements									
ND			Volunteer monitoring											
NE														
NH	Dishwashing detergent phosphate ban		Volunteer monitoring	Expanded NPDES permit requirements						Limits to impervious surfaces				
NJ														
NM														
NV			Volunteer monitoring											Comprehensive reasonable assurance analysis (TMDL)
NY	Dishwashing detergent phosphate ban		Volunteer monitoring		Expanded state permit requirements	Fertilzer applicaton restrictions								

	Primary Sources of Funding								
State	State General Funds or State Agency Budget	Joint Agency Intitiative	Permit Fees	Other Fees	Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	Private Sector
LA		Joint Agency Intitiative	Permit Fees		Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	Private Sector
MA	State Gen/Agy Budget	Joint Agency Intitiative	Permit Fees		Federal CWA 106	Federal CWA 319	Federal CWA SRF		
MD	State Gen/Agy Budget			Other Fees	Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	
ME									
MI			Permit Fees		Federal CWA 106	Federal CWA 319			
MN	State Gen/Agy Budget		Permit Fees		Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	
MO									
MS	State Gen/Agy Budget				Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	Private Sector
MT									
NC	State Gen/Agy Budget					Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	Private Sector
ND									
NE					Federal CWA 106	Federal CWA 319			
NH					Federal CWA 106		Federal CWA SRF		
NJ									
NM									
NV			Permit Fees		Federal CWA 106	Federal CWA 319			Private Sector
NY					Federal CWA 106	Federal CWA 319			

	Program Basics		Scope	Program Focus	Which Sources Targeted							Exemptions
State	Existing Nutrient Program?	Other Efforts that result in Nutrient Reduction?	Statewide Program Scope?	Focus on combination of waterbody type, indicator, and pollution source	Airborne	WWTP	Septic	Boats	SW	Farmland	CAFO/AFO	Exempt certain Activities or Idustries?
OH	Developing	N/A	Yes	Pollution Source		WWTP			SW	Farmland	CAFO/AFO	No
OK	Yes	N/A	Yes	Combination			SS		SW	Farmland		Yes
OR	No Program	Yes		Indicator Only								
PA	Developing	N/A		No Response								
RI	Yes	N/A	Yes	Combination		WWTP	SS		SW	Farmland		No
SC	Yes	N/A	Yes	Indicator Only							CAFO/AFO	Yes
SD	No Program	Yes		Combination								
TN	Developing	N/A		Combination		WWTP			SW	Farmland		
TX	Yes	N/A	Yes	Combination		WWTP	SS	Boats	SW	Farmland	CAFO/AFO	No
UT	Yes	N/A	Yes	Combination		WWTP	SS	Boats	SW	Farmland	CAFO/AFO	No
VA	Yes	N/A		Combination		WWTP	SS		SW	Farmland	CAFO/AFO	
VT	Yes	N/A	Yes	Combination		WWTP	SS		SW	Farmland	CAFO/AFO	Yes
WA	Yes	N/A	Yes	Combination		WWTP	SS	Boats	SW	Farmland	CAFO/AFO	Yes
WI	Yes	N/A	Yes	Combination		WWTP			SW	Farmland	CAFO/AFO	
WV	Yes	N/A		Combination					SW	Farmland	CAFO/AFO	
WY	Yes	N/A	Yes	Combination		WWTP	SS		SW	Farmland	CAFO/AFO	No

	Differentiation	Analysis		Accountability			BioMonitoring	Indicators
State	Diff. Lentic/Lotic?	State Done Analsys of NRP?	Public Avail?	Accountability methods	Accountability methods (Modified description)	Diff. Accountability PS/NPS?	Bio-Monitoring Used?	Type of indicators used (P, Surrogates, Bio-monitoring)
OH			No	In dev	In development	No	Yes	
OK	No	Yes	Yes	M&R	Continuous, flow-weighted sampling	Yes	Yes	bio-monitoring
OR							Yes	DO, pH, chlor-a, algal growth
PA							Yes	
RI	Yes	No	Yes	M&R	Monitoring and Reporting: RIPDES permit limits and enforceable consent agreements. Performance measures built into financial assistance agreements.	Yes	Yes	P, DO
SC								P
SD								
TN	Yes	No	No	Permit tracking	PS - permit compliance, monitoring NPS - BMP installation, operation, and maintenance; monitoring	Yes	Yes	
TX	Yes	Yes	Yes	M&R	PS - permit requirements; field investigations, WQ monitoring NPS - grant conditions (319 reporting); voluntary compliance	Yes	Yes	bio-monitoring
UT	Yes	Yes	Yes	M	PS - Monitoring NPS - continued evaluation of TMDL goals.	Yes	Yes	N, P, DO, BOD, pH, algae, cyanobacteria
VA	Yes	Yes	Yes	M&R		Yes	Yes	DO, chlor-a, nutrients, benthics, aquatic vegetation
VT	Yes	Yes	Yes	M	PS - NPDES permit cmpliance; encroachment permits NPS - Agency of Agriculture the authority to enforce nonpoint source nutrient losses	Yes	Yes	
WA	No	No	No	M&P	Regulatory tools, prevention programs, and funding mechanisms PS - NPDES compliance NPS - TMDL compliance; Grant requirements	Yes	No	DO, pH
WI	Yes	In Dev	Yes	M	PS - WPDES Monitoring Requirements NPS - in development	Yes	Yes	
WV								
WY	Yes		Yes	R	NPS - Voluntary compliance with grant requirements	Yes	Yes	

	Reduction Methods Used												
State	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	Interstate Partnerships
OH									TMDL Program				
OK	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program			Interagency Partnerships	Interstate Partnerships
OR								State Permitting	TMDL Program			Interagency Partnerships	
PA									TMDL Program				
RI	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements			
SC	Education		Best Management Practices			Nutrient Management Plans		State Permitting	TMDL Program			Interagency Partnerships	
SD													
TN			Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting		Regulatory Requirements	Water Quality Trading	Interagency Partnerships	
TX	Education		Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	
UT	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting		TMDL Program			Interagency Partnerships	
VA			Best Management Practices			Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	Interstate Partnerships
VT	Education		Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	Interstate Partnerships
WA	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	
WI	Education		Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements	Water Quality Trading	Interagency Partnerships	
WV	Education		Best Management Practices	Voluntary Programs	Nutrient Reduction Agreements	Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	Interstate Partnerships
WY	Education	Social Media Campaigns	Best Management Practices	Voluntary Programs		Nutrient Management Plans	NPDES Permitting	State Permitting	TMDL Program	Regulatory Requirements		Interagency Partnerships	Interstate Partnerships

	Other Methods Used													
State	Dishwashing detergent phosphate ban	Protection of natural nutrient sinks	Volunteer monitoring	Expanded NPDES permit requirements	Expanded state permit requirements	Fertilzer applicaton restrictions	Monitoring plan for fertilizer application	Green labeling programs	Corporate stewardship programs	Limits to impervious surfaces	Community composting	Release inventories for nutrients	Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
OH	Dishwashing detergent phosphate ban			Expanded NPDES permit requirements		Fertilzer applicaton restrictions								
OK			Volunteer monitoring				Monitoring plan for fertilizer application							Comprehensive reasonable assurance analysis (TMDL)
OR														
PA														
RI		Protection of natural nutrient sinks	Volunteer monitoring	Expanded NPDES permit requirements	Expanded state permit requirements					Limits to impervious surfaces	Community composting		Pilot studies	
SC														
SD														
TN														
TX			Volunteer monitoring		Expanded state permit requirements		Monitoring plan for fertilizer application				Community composting		Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
UT	Dishwashing detergent phosphate ban										Community composting		Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
VA														
VT	Dishwashing detergent phosphate ban		Volunteer monitoring			Fertilzer applicaton restrictions	Monitoring plan for fertilizer application							Comprehensive reasonable assurance analysis (TMDL)
WA	Dishwashing detergent phosphate ban													Comprehensive reasonable assurance analysis (TMDL)
WI	Dishwashing detergent phosphate ban		Volunteer monitoring	Expanded NPDES permit requirements		Fertilzer applicaton restrictions					Community composting		Pilot studies	Comprehensive reasonable assurance analysis (TMDL)
WV														
WY														

	Primary Sources of Funding								
State	State General Funds or State Agency Budget	Joint Agency Intitiative	Permit Fees	Other Fees	Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	Private Sector
OH			Permit Fees		Federal CWA 106				
OK	State Gen/Agy Budget					Federal CWA 319			Private Sector
OR									
PA									
RI							Federal CWA SRF		
SC	State Gen/Agy Budget								
SD									
TN	State Gen/Agy Budget		Permit Fees		Federal CWA 106				
TX									
UT	State Gen/Agy Budget				Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	
VA									
VT	State Gen/Agy Budget	Joint Agency Intitiative	Permit Fees		Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	
WA	State Gen/Agy Budget					Federal CWA 319			
WI	State Gen/Agy Budget		Permit Fees	Other Fees	Federal CWA 106	Federal CWA 319	Federal CWA SRF	Federal Farm Bill Program	
WV									
WY	State Gen/Agy Budget		Permit Fees			Federal CWA 319		Federal Farm Bill Program	