

Massachusetts Nutrient Management 2013

The addition of nutrients to aquatic systems through cultural enrichment can lead to biological responses that cause impairment of water uses from algal blooms, choking weeds, lack of oxygen, taste and odor problems, turbidity, sedimentation, decreases in biodiversity and elimination of important species. These conditions have contributed to the impairment Massachusetts water use goals for public water supply, recreation and protection of aquatic life. Massachusetts Department of Environmental Protection (MassDEP) has a long history of managing water quality issues attributed to cultural eutrophication. The following link provides an overview of 40-years of implementation of the Clean Water Act on Massachusetts <http://www.mass.gov/dep/water/priorities/cwa40.htm>.

Water quality standards provide the legal framework for protection and enhancement of water resources through enforcement of nutrient controls. The surface water quality standards (314 CMR 4) contain a narrative standard that prohibits discharges containing nutrients in concentrations that would “cause or contribute to cultural eutrophication, including the excessive growth of aquatic plants or algae”, and otherwise render waters unsuitable for designated uses. MassDEP supports a variety of nutrient management activities that include state-wide monitoring and assessment (303(d), 305 (b)), working with the United States Environmental Protection Agency (US EPA) to set NPDES permit limits for nutrients, the establishment of Total Maximum Daily Loads (TMDLs) to address nutrients, and the administration of grant programs designed to protect and enhance water resources (319 Non Point Source (NPS), 604 b Water Quality Management Planning). The Natural Resources Conservation Service (NRCS) is a federal agency that also works hand-in-hand with the people of Massachusetts to improve and protect their soil, water and other natural resources. For decades, private landowners have voluntarily worked with NRCS specialists to prevent erosion, improve water quality and promote sustainable agriculture.

Significant efforts are underway in Massachusetts to manage the impacts of excessive nutrients in water resources on the part of local, state and federal government. A brief description of each of the programs and regulations being implemented to prevent nutrient pollution and restore degraded waters is provided below and represented in the [Massachusetts Nutrient Management Map: Web page](#).

Statewide Monitoring and Assessment

MassDEP’s strategic goal is to implement a comprehensive monitoring program that serves all water quality management needs and addresses streams, rivers, lakes, reservoirs, estuaries, coastal areas, wetlands, and groundwater. To accomplish this goal and to address a wide variety of water quality-related objectives the agency has developed a multifaceted watershed-based monitoring strategy that includes monitoring elements, data analysis, reporting, and use of the data for management decisions. Major components of the monitoring program fulfill requirements of the Federal Clean Water Act (CWA) and the Federal Safe Drinking Water Act. An overview of Massachusetts’ existing surface water monitoring program can be found at <http://www.mass.gov/dep/water/resources/envmonit.htm>. The results obtained from MassDEP’s monitoring efforts, combined with other reliable information, constitute the basis for making water quality assessments in accordance with the requirements set forth in Section 305(b) and 303 (d) of the Clean Water Act (CWA). Use-attainment determinations are made for each waterbody segment for which adequate data and information are available. Assessment methods can be viewed at the following link <http://www.mass.gov/dep/water/resources/2012calm.pdf>. A summary of use assessments is published biennially in an integrated report. The 2012 Integrated Report for Massachusetts can be found at the following link. <http://www.mass.gov/dep/water/resources/12list2.pdf>.

The current extent of waters impaired for nutrients and related causes (e.g., listed for one of more of the following: high phosphorus, high nitrogen, algae, organic enrichment/low DO, DO saturation, macrophytes, duckweed, transparency, eel grass, pH, total suspended solids) identified through the monitoring and assessment program are displayed in the [Massachusetts Nutrient Management Map: Web page](#). The map is divided into freshwater and marine nutrient impaired waters. The legend displays waters that are Nutrient Impaired with TMDL (blue) , Nutrient Impaired without TMDL (green), Nutrient Impaired – with CSO abatement (orange), and waters with CSO abatement measures underway that have not yet been identified as nutrient impaired (lime green). Total Maximum Daily Load (TMDL) and the CSO Abatement programs are explained in more detail below.

Permitting and Regulation

NPDES Permits

Water pollution degrades surface waters, making them unsafe for drinking, fishing, swimming, and other activities. As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The NPDES permit program is administered by the US EPA and MassDEP. Water pollution is controlled by regulating point sources that discharge pollutants to surface waters. The Massachusetts Surface Water Discharge Permitting Program Regulations (314 CMR 3.0) allow MassDEP to take action whenever it determines that a discharge from a storm drain or other source is a significant contributor of pollutants to waters of the Commonwealth.

Point Source Discharge Permit Program - Point sources are discrete conveyances such as pipes or man-made ditches. NPDES permits are issued every 5 years. Target permit limits for nutrients are often informed by the TMDL program. Achievable targets for nutrient control are dictated by the best available technology (BAT), which varies effluent limits from 1.0, 0.5, 0.2 or 0.1 mg/l for phosphorus and 8 mg/L to 5 mg/L for total nitrogen. Permits often include seasonal effluent limits to control impacts during the growing season. There are 1451 plants in Massachusetts that have NPDES permits that specify limits or require monitoring for either phosphorus or nitrogen, or both. Approximately 90 plants represent major sources. Of these plants approximately 70% set limits for Total Phosphorus and 50% of these permits require seasonal limits of less than 0.2 mg/L Total Phosphorus. About 95% (139 plants out of 145) of the permits require monitoring for nitrogen constituents in wastewater (e.g., total, nitrogen, total kjeldahl nitrogen, ammonia, nitrate and nitrite).

Massachusetts Nutrient Management Map: [Web page](#) shows the location of the 147 NPDES permitted outfalls with either monitoring requirements for nutrients (green square) or effluent permit limits for nutrients (orange square). The NPDES permit program has guided State Revolving Fund (SRF) grants for construction of wastewater collection and treatment plant infrastructure. Details pertaining to the State Revolving Fund (SRF) can be found at: <http://www.mass.gov/dep/water/wastewater/wastewat.htm#srfinfo>. This program, and its predecessor Construction Grants Program, represent the largest single financial commitment to clean water in Massachusetts and are estimated to have been well over \$7 billion from 1968 -2010.

Stormwater Program – Polluted stormwater runoff is commonly transported through Municipal Separate Storm Sewer Systems (MS4s), from which it is often discharged untreated into local waterbodies. To prevent harmful pollutants from being washed or dumped into an MS4, operators must obtain a NPDES permit and develop a stormwater management program. Phase I, issued in 1990, requires medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges. Phase II, issued in 1999, requires regulated small MS4s in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges. New draft permits, will require municipalities to undertake more stringent measures to ensure control of pollutants from regulated MS4 systems.

Generally, Phase I MS4s are covered by individual permits and Phase II MS4s are covered by a general permit. Each regulated MS4 is required to develop and implement a stormwater management program (SWMP) to reduce the contamination of stormwater runoff and prohibit illicit discharges. The NPDES Phase II stormwater program regulates discharges for a large number of communities so as to further aid in the control of impacts from nutrient runoff as well as other pollutants (NPDES phase II stormwater program coverage is shown in the [Massachusetts Nutrient Management Map: Web page](#), see grey hatch). Bellingham, Franklin and Milford in the Charles River Watershed are also covered under EPA's Residual Designation Authority, requiring additional treatment of regulated stormwater to mitigate polluted discharges including phosphorus.

¹ This information is based on US EPA Integrated Compliance Information System (ICIS) data for Massachusetts FY 11 and may not represent complete information. The count of 145 includes most of the major WWTPs in Massachusetts.

Regulations

Massachusetts employs a variety of regulatory tools to facilitate the protection and restoration of water resources from nutrient-related pollution impairments. These regulatory tools are described below and apply state-wide.

The Massachusetts Surface Water Quality Standards (SWQS) contain numeric and narrative surface water quality criteria aimed at the regulation of nutrients (314 CMR 4). The SWQS contain a narrative standard that prohibits discharges containing nutrients in concentrations that would “cause or contribute to cultural eutrophication, including the excessive growth of aquatic plants or algae”, and otherwise render waters unsuitable for designated uses. The SWQS also include narrative standards for solids, color, turbidity and aesthetics and numeric criteria for dissolved oxygen and pH. See <http://www.mass.gov/dep/water/laws/regulati.htm#wmgt> for the SWQS (314CMR 4).

The Stormwater Policy established a Stormwater Management Standard that is aimed at encouraging recharge and preventing stormwater discharges from causing or contributing to the pollution of the surface waters and groundwaters of the Commonwealth. In 1997, MassDEP published the Massachusetts Stormwater Handbook as guidance on the Stormwater Policy. The Stormwater Management Standards and Massachusetts Stormwater Handbook are designed to promote increased stormwater recharge, the treatment of more runoff from polluting land uses, low impact development (LID) techniques, pollution prevention, the removal of illicit discharges to stormwater management systems, and improved operation and maintenance of stormwater best management practices (BMPs). MassDEP applies the Stormwater Management Standards pursuant to its authority under the Wetlands Protection Act, M.G.L. c. 131, § 40, and the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53. The revised Stormwater Management Standards have been incorporated in the Wetlands Protection Act Regulations, 310 CMR 10.05(6)(k) and the Water Quality Certification Regulations, 314 CMR 9.06(6)(a). The Stormwater Management Standard (310 CMR 10.05(6)) addresses water quality (pollutants) and water quantity (flooding, low base flow and recharge) by establishing standards that require the implementation of a wide variety of stormwater management strategies. These strategies include environmentally sensitive site design and LID techniques to minimize impervious surface and land disturbance, source control and pollution prevention, structural BMPs, construction period erosion and sedimentation control, and the long-term operation and maintenance of stormwater management systems.

For land uses with higher potential pollutant loads (such as those identified through the TMDL process), source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00, the Wetlands Protection Act, M.G.L. c. 131, §40 and the regulations promulgated there under at 310 CMR 10.00. If a proponent is proposing a project that is in the watershed of a waterbody with a TMDL, and if the project is subject to wetlands jurisdiction, the proponent must select structural BMPs that are consistent with the TMDL. Because pollution prevention is an interest identified in the Wetlands Protection Act, conservation commissions and MassDEP may require use of such BMPs when reviewing projects subject to jurisdiction under the Act. The TMDL may contain information on appropriate BMPs. See <http://mass.gov/dep/water/resources/tmdls.htm> for TMDL reports.

Redevelopment projects are required to meet the Stormwater Management Standards to the maximum extent practicable (eg., Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable). A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions. The selection of appropriate BMPs for a given location is site- specific.

The MassDEP also has statewide regulations in place that require minimum standards for the design of onsite wastewater systems (310 CMR 15.00, Title 5 Program). Septic discharges can contain bacteria and viruses, nutrients, and chemicals that can be harmful to water quality and public health. Title 5 regulations ensure protection of surface water and groundwater from contamination by regulating the design, construction, and maintenance of onsite wastewater systems. The regulations also provide minimum standards for replacing failed and inadequate systems. The Department has established a mandatory requirement that all septic systems must be inspected and upgraded to meet Title 5 requirements at the time of sale or transfer of the each property.

Antidegradation Policy - The United States Environmental Protection Agency's (EPA) regulation, 40 CFR § 131.12, requires states to develop and adopt antidegradation policy and methods for implementing such policy. Massachusetts' SWQS include provisions for antidegradation review. In addition, the antidegradation "policy" explains how the antidegradation provisions of the Massachusetts Surface Water Quality Standards (SWQS or Standards) are implemented. Certain waters are designated in the SWQS for Protection as Outstanding Resource Waters (ORW) under 314 CMR 4.06. These waters include Class A Public Water Supplies (314 CMR 4.06(1)(d)1.) and their tributaries, certain wetlands as specified in 314 CMR 4.06(2), and other waters as determined by the Department based on their outstanding socio-economic, recreational, ecological and/or aesthetic values. The regulations required that the quality of these waters shall be protected and maintained (314 CMR 4.04(3)). New or increased discharges are prohibited in waters designated as ORWs in the SWQS, except in very limited circumstances. The SWQS regulation applies statewide, however, 314CMR 4 should be consulted for the list of waters designated as ORWs.

Phosphorus Detergent and Fertilizer Ban-In February 2008, the state of Massachusetts passed legislation that made it illegal for retailers to offer dishwashing detergents containing more than 0.5% or phosphates by weight. The rule became effective July 1, 2010. Massachusetts is one of 16 states in the country setting limits on phosphorus in dishwashing detergents sold in the state. With the new limit, manufacturers have reformulated their products for markets across the country. Dishwasher detergent is estimated to account for up to 10 to 12 percent of all the phosphate present in wastewater. A regional initiative to discuss limiting nutrients from turf fertilizer is currently underway. The Bill, was enacted and sent to the Governor on August 23, 2012 (John Fernandes (D-Milford) H 4306).

Phosphorus Policy – Massachusetts Bureau of Resource Protection published a phosphorus policy. The intent of the policy was to establish clear definitions, guidance and protocols for requiring appropriate levels of phosphorus removal in publicly-owned treatment plants permitted by the Department in accordance with Massachusetts Surface Water Discharge permit program (314 CMR 3). Also, where supported by a TMDL, necessary NPDES permits are issued that require treatment at the limit of technology (0.1 mg/L Total Phosphorus and 5 mg/L Total Nitrogen).

No-Discharge Areas – [The Massachusetts Nutrient Management Map: Web page](#) shows the extent of Massachusetts No Discharge Areas, or NDAs (pink coverage). Boat sewage can contain bacteria and viruses, nutrients, and chemicals that can be harmful to water quality and public health. No Discharge Areas, or NDAs, are designated bodies of water where the discharge of all boat sewage, whether treated or not, is prohibited. The Massachusetts Office of Coastal Zone Management (CZM) is working with coastal communities to develop applications to the US EPA for no discharge status and is supporting efforts to increase boat pump out facilities to make proper sewage disposal more convenient for boaters.

Grant Projects

MassDEP's grant and loan programs are funded with federal funds from EPA through the Clean Water Act Sections 604(b) and 319. Additional programs may be funded through state appropriation. Each of these programs provides an opportunity for watershed initiative planning and/or implementation. The locations of specify projects that have been implemented to address nutrient sources is depicted in [Massachusetts Nutrient Management Map: Web page](#).

319 Non Point Source Program - The management and remediation of non-point sources of pollution is best accomplished through the implementation of best management practices (BMPs) and responsible landuse. The CWA Section 319 addresses the identification and management of non-point sources of pollution and provides grant monies for the implementation of Best Management Practices (BMPs) and

public education programs. Many other agencies, as well as non-governmental organizations (NGOs), private institutions, watershed associations and citizen environmental advocacy groups, commit time and financial support to educating the public and promoting behaviors that will lead to cleaner waters in Massachusetts. Since its inception in 1990, the 319 NPS program has provided \$25 million in grant funding, leveraging another \$16 million in matching funds, for projects that prioritize implementation of BMPs and public education programs to remediate water quality impairments and meet beneficial uses. The location of projects funded through 319 for the education/control of nutrients and sediment are depicted the map by black circles. For more information about the NPS program in Massachusetts see the following link <http://www.mass.gov/dep/water/resources/nonpoint.htm>.

Natural Resource Conservation Service (NRCS) – Massachusetts coordinates with the Natural Resource Conservation Service (NRCS) to provide implementation incentives through the Federal Farm Bill. As a result of this effort, NRCS now prioritizes MassDEP's list of impaired waters as one criterion for selecting projects to be funded through its Environmental Quality Incentive Program (EQIP). The Program also provides high priority points to those projects designed to address TMDL recommendations. In 2010 approximately \$12-16 million in EQIP funds were available to address water quality goals. Over the past several years, EQIP funds have been used throughout the Commonwealth to address water quality goals through the application of structural and non-structural agricultural BMPs. The location of NRCS Farm Bill projects that addressed nutrients and nutrient-related impairments in the state of Massachusetts are depicted by a series of colored circles and described below.

Waste Management - Composting facilities are installed for the purpose of biological stabilization of waste organic material. The main purpose of this practice is to biologically treat waste organic material and produce humus- like material that can be recycled as a soil amendment (add- in) or organic fertilizer. **Waste Storage Facilities** consist of some sort of constructed containment or enclosed facility to provide for temporary storage of waste material from the production of agricultural products, consisting of animal waste products or contaminated runoff from other types of agricultural activities.

Crop & Grazing Management - Implementation measures described in this category include a variety of measures to protect soil, water and other natural resources. **Conservation Cover** involves establishing and maintaining a protective cover of perennial vegetation on land retired from agricultural production. This practice reduces soil erosion and associated sedimentation from barren soil, improves water quality, and enhances wildlife habitat. **Cover Crop** measures consist of growing a crop of grass, small grain, or legumes during off season periods of prime production periods for cropland, orchards, or vineyards. This practice mainly helps to prevent soil erosion from barren soil, and it also helps to improve overall soil fertility. **Field Border** describes the practice of establishing a strip of perennial grass or shrubs at or around the edge of a field, to prevent soil erosion, provide pollution control, as well as provide a wildlife cover. **Prescribed Grazing** is implemented to prevent accelerated soil erosion. **Residue and Tillage Management** ensures that most of the crop residue on the soil surface is maintained throughout the year. The benefits of this practice include reduction of soil erosion, and the addition of organic material to the soil.

Management Riparian Buffer– **Riparian Forest Buffer's** include a strip of trees and/or shrubs located just adjacent to, or bordering a body of water. This strip of vegetation extends outward from the waterbody to: (1) create shade to reduce waterbody temperature; (2) improve habitat for wildlife and aquatic animals/organisms; (3) provide a food source for wildlife and aquatic animals/ organisms; (4) provide a buffer to filter out sediments and pollutants such as organic matter, fertilizer, and pesticides. **Riparian Herbaceous Cover** is used to manage grasses, and/or sedges, rushes, mosses, ferns, or legumes as a transitional zone between upland drier areas and lower elevation aquatic habitats. Net effects of the practice include: (1) providing food and cover for fish, aquatic organisms, livestock and wildlife; (2) improved water quality, trap sediments, and increase water storage capacity; (3) reduced soil erosion; (4) increased carbon storage capacity in the biomass; and (5) enhanced stream bank protection.

Total Maximum Daily Load (TMDL) & Wastewater Planning

River and Lake Nutrient TMDL – Water quality assessment reports are produced periodically for each watershed by the MassDEP Division of Watershed Management (DWM), to: provide data collected by DWM to the public; review available quality-assured data from other sources; determine the use support status of surface waterbodies; determine the causes and sources of any impairments to uses; and

support reporting to the US EPA on the status of the Commonwealth's surface waters. When a waterbody is impaired, a total maximum daily load (TMDL) is developed along with a plan to restore the waterbody. A TMDL is the greatest amount of a pollutant that a waterbody can accept and still meet water quality standards for protecting public health and maintaining the designated beneficial uses of those waters for drinking, swimming, recreation, and fishing. A TMDL is implemented by specifying how much of that pollutant can come from point, non-point, and natural sources. The TMDL provisions require states to identify and list waterbodies that are threatened or not meeting water quality standards despite controls on point source discharges.

Massachusetts has been aggressive in the development of nutrient TMDLs for the restoration of impaired lakes and rivers. [The Massachusetts Nutrient Management Map: Web page](#) identifies the status and aerial extent of nutrient river TMDLs that are in draft form (Nashua River Watershed – total phosphorus) or approved by EPA (Charles River Watershed, Assabet River Watershed – total phosphorus, Long Island Sound – total nitrogen). The required nutrient load reduction for each of these major projects and the extent of area that applies to the TMDL [brown shaded areas in the map] can be viewed in the individual reports at the following link. (<http://www.mass.gov/dep/water/resources/tmdls.htm#info>). Massachusetts has also finalized TMDLs for restoration of lakes and ponds impaired by cultural eutrophication and total phosphorus. These TMDL activities cover a significant number of nutrient-impaired waters in the state and are depicted in the yellow highlighted sections of the map.

Marine Nutrient TMDL – To date impairments in marine waters have been addressed through the Massachusetts Estuaries Program (MEP). This initiative began in 2001 to combine state, regional and local agencies and groups for the restoration and protection of estuarine resources from nutrient enrichment. The Massachusetts Department of Environmental Protection (MassDEP) and the University of Massachusetts/Dartmouth School of Marine Science and Technology (SMAST) have created partnerships with the Cape Cod Commission, United States Geological Society (USGS), and municipalities. This effort is a science-based approach to identify and address nutrient enrichment through the development of regional estuarine monitoring programs, eelgrass mapping, groundwater, land-use, and estuarine model development and implementation (<http://www.oceanscience.net/estuaries/about.htm>). The activities associated with the Massachusetts Estuaries Program (MEP) are displayed in the watersheds of Cape Cod and the Islands. The [Massachusetts Nutrient Management Map: Web page](#) identifies the locations of TMDL activities that set nitrogen loads for Southeastern Massachusetts embayment's. The status of Comprehensive Wastewater Management Plans that are being developed by municipalities to address the requirements of the TMDL is depicted by the green shading. Site-specific embayment studies for nutrient control that are either underway, draft or final are also depicted (see diamond for project locations).

CSO Abatement- Combined sewer overflows, or CSOs, were built as part of sewer collection systems that were designed to carry both sewage and stormwater in the same pipe. When there is not a lot of stormwater, this mix is transported to a wastewater treatment plant where it is processed. However, after heavy rainfall or snowmelt, stormwater and sewage overload the system. Without CSOs, this mix would back up into homes, businesses, and public streets.

Combined sewer systems have regulator structures that allow overloaded systems to discharge into rivers, lakes and coastal areas subjecting them to higher pollutant loads, including nutrients. This can compromise a waterbody's uses and lead to water quality violations in the receiving waters, including potential violations of the nutrient narrative standard.

CSO discharges are regulated by MassDEP and US EPA in accordance with state and federal CSO policies and the State Water Quality Standards (WQS). Massachusetts has 24 CSO permittees that have National Pollutant Discharge Elimination System (NPDES) permits issued by EPA Region 1 and MassDEP's Surface Water Discharge Permitting Program. Communities with CSOs include most of the older urbanized communities across the state, such as Boston, New Bedford, Worcester, and Springfield. CSO permittees are required to develop and implement Long-Term CSO Control Plans, which must demonstrate compliance with the SWQS. For more information see (<http://www.mass.gov/dep/water/wastewater/csafaqs.htm#what>). The [Massachusetts Nutrient Management Map: Web page](#) identifies receiving waters for CSO permittees in Massachusetts and these are coded in the Monitoring and Assessment legend.