

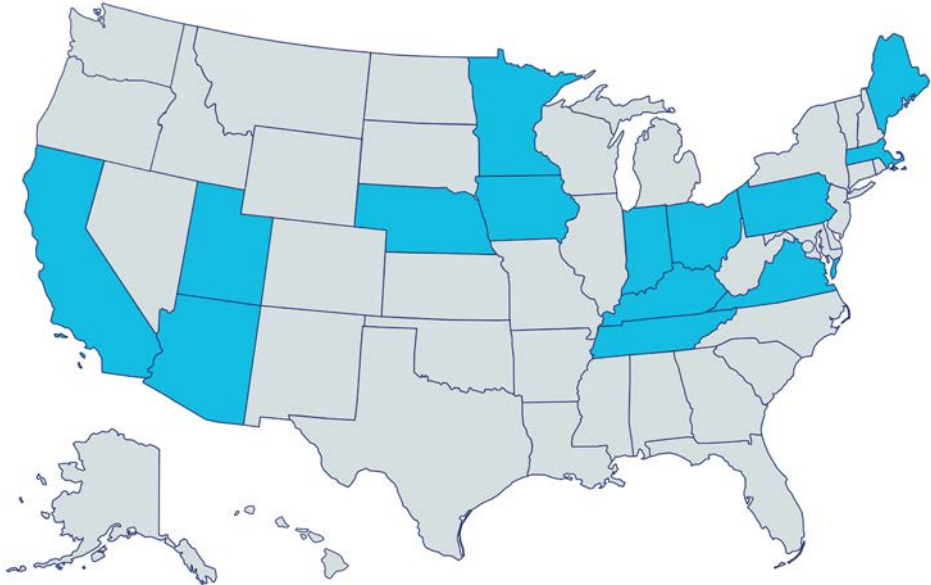
The logo for nmsa is displayed in a bold, lowercase, sans-serif font. The letters are a light blue color and are set against a dark blue, curved background that resembles a stylized wave or a drop of water. The background of the entire page is a light blue with a pattern of fine, diagonal white lines, suggesting rain or water droplets.

**nmsa**

2019 STATE OF  
**storm  
water  
report**



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## Report Overview

This “State of Stormwater Report” provides an overview of the current state of program implementation of municipal separate storm sewer system permits (MS4s) in the US under the National Pollutant Discharge Elimination System (NPDES) permitting program.

This report provides a brief overview of stormwater programs in participating states. The information was compiled by the National Municipal Stormwater Alliance (NMSA) and its member organizations and does not reflect any official state position on permit compliance or receiving water quality. Rather, the information provided is a snapshot of overall MS4 NPDES program implementation, current regulatory issues in the state, and a general estimate of the trend and overall quality of the state’s receiving waters.

NMSA produces this report annually to provide information on sector needs and a qualitative assessment of US receiving water quality and trends.

In future editions of this report, NMSA will strive to include information from additional states until all US states are covered. The goal is to provide information that supports and improves MS4 program implementation and continuing development.



# FORE WORD



## **Adriana Caldarelli**

*Adriana spent 17 years at the New Jersey Department of Environmental Protection and is now with the Water Environment Federation serving as the Director of the Stormwater Institute, a center for excellence and innovation focused on solutions to urban runoff and wet weather issues.*

The U.S. has come a long way since the 1972 amendments to the Federal Water Pollution Control Act, better known as the Clean Water Act. While the country no longer has burning rivers, many of its waters are still not *fishable and swimmable*. While point source permits have significantly improved the quality of discharges to surface waters from industries and wastewater treatment plants, stormwater runoff continues to be an issue. In the Water Environment Federation's (WEF) 2015 report *Rainfall to Results: The Future of Stormwater*, stormwater is cited as the only growing source of water pollution in many watersheds throughout North America. As urban areas and populations continue to grow and as climate change alters rainfall frequency and intensity, stormwater will continue to threaten public water supplies and diminish aquatic life.

Many MS4 communities are looking to innovation in technology, financing, and problem solving to address this growing source of contamination and to develop a path toward sustainable stormwater management. However, it is difficult to determine a path forward without a good sense of the current situation. That is why NMSA's second annual State of Stormwater is so crucial. Building on the results of the first report in 2018, the information in this report can help the sector determine where we are and what is needed to achieve both a healthier water environment and more vibrant, sustainable communities.

So, I'm pleased to present the 2019 State of Stormwater report, which is the result of hard work by NMSA members who also work hard every day to restore and maintain the nation's waters in the face of competing priorities and strained resources.



# Arizona



The Arizona Department of Environmental Quality (ADEQ) is the delegated state authority for MS4 permits. ADEQ has issued eight Arizona Pollutant Discharge Elimination System (AZPDES) Phase I MS4 permits and has a Small MS4 General Permit covering 49 cities and other entities. Four communities, two Phase I and two Phase II, contributed to this overview.

## MS4 Regulatory Updates

ADEQ is interested in issuing a general permit for all non-transportation Phase I MS4s. This would possibly be the first general Phase I MS4 permit in the country.

ADEQ is in the process of reissuing the Multi-Sector General Permit (MSGP), which covers 29 specified industrial sectors in Arizona. The reissued permit may change Benchmark Monitoring to Routine Analytical Monitoring — a name change intended to more adequately address the type of monitoring. Routine analytical monitoring is a performance indicator for the measures taken to meet permitted effluent limitations. ADEQ is also proposing to substitute surface water quality standards for action levels. Numeric action levels are based on a receiving water's designated use. Exceeding an action level does not

indicate a permit violation but requires follow up activity.

ADEQ is in the process of reissuing the construction general permit (CGP). The state is considering changing the permittee from "operator" to "project owner" and eliminating co-permittees.

## MS4 Sector Needs

Clarity and consistency on the definition of waters of the US is needed. The recently proposed definition would eliminate most waters of the US in Arizona. Arizona does not currently have a list of state waters. Additional support and engagement from community leadership, including additional funding and staffing, would allow for better program management and hopefully increased public support and involvement.

# 8

Phase I MS4 permits covering the state's largest population centers and the Arizona Department of Transportation

# 1

Small MS4 General Permit covering 49 cities and other entities



## MS4 Sector Challenges

Assessed water quality standards of metals and bacteria routinely affect exceedance reporting. High levels of both metals and bacteria are measured due to background levels of specific metals, such as copper, and a large amount of fecal matter deposited by birds and other wildlife. In low rainfall areas (less than 10-inches per year), sediments and pollutants accumulate before running off in high concentrations, which produces a heavily weighted first flush contaminant reading.

## Trends in Water Quality

Water quality in watersheds throughout Arizona ranges from static to improving. Find more information in the [2016 Water Quality in Arizona 305\(b\) Assessment Report](#), in particular [Appendix F – Water Quality Improvements](#).

## State Water Quality Rating (1 Poor, 5 Excellent)

Arizona's water quality rating is about a 4. Most state waters are not polluted. However, perennial and intermittent watercourses are few. Those watercourses are generally in rural areas and not within regulated MS4 communities. Only eight of Arizona's MS4s have been required to collect samples and generally have no issue meeting Surface Water Quality Standards, except for some metals (dissolved copper and total lead) and *E. coli* (sanitary quality).





# California

California is widely viewed as a leader in protecting surface waters under the MS4 NPDES program. The state's primary pollutants of concern are trash, bacteria, and nutrients, followed distantly by pesticides and metals. Contaminated sediments are emerging as a prominent issue, particularly in commercial harbor areas. Integration of green infrastructure is well under way in the urbanizing fringe, and green infrastructure retrofits are beginning in existing urban areas.

California has individual Phase I permits and a statewide Phase II permit. Non-traditional MS4s, such as schools, railways, and parks, are covered under the statewide Phase II permit. California also has a general Construction Permit and a general Industrial Permit. MS4 permittees have oversight of entities covered under the general permits within their jurisdiction.



## MS4 Regulatory Updates

California has amended its Water Quality Control Plans for the Ocean and for Inland Surface Waters, Enclosed Bays, and Estuaries of California (ISWEBE) to include control of trash. The amendments were translated into permit requirements for the Phase I and Phase II permits. MS4 permit holders must effectively eliminate trash in regulated receiving waters by about 2028. These requirements have resulted in an increased focus on homeless, requiring removal of homeless encampments in receiving water areas. Homeless

encampments are also being evaluated as a source of bacteria (human-specific HF183 bacteroides).

Phase I Permits in California require a 'Reasonable Assurance Analysis' as part of a plan to bring MS4s into compliance with their permits — in particular the permit limitation that states: "Discharges from the MS4 that cause or contribute to the violation of receiving water limitations are prohibited." The Reasonable Assurance Analysis is a watershed water quality model used to develop a master plan for the suite of treatment controls



and green infrastructure necessary to demonstrate attainment of the receiving water limitations in the permit. This concept is currently being litigated.

Some additional issues the state is grappling with include discharges from agriculture, regional permitting, regulation of pesticides, biological integrity of streams, regulation of biostimulatory substances, and wet weather objectives (particularly for bacteria) in stormwater.

## MS4 Sector Needs

Finding funding to implement master plans is difficult for many California MS4s since new taxes require a two-thirds majority approval by taxpayers. Los Angeles County recently approved a new fee for stormwater (2018). However, retrofit of existing infrastructure is a slow process in addition to the expense. MS4s continue to struggle with public support for stormwater programs. There is also a general sense that the current blueprint for permits (1990 Part 1 Application) may need to be modernized to advance the effectiveness of MS4 programs. A science-based approach focusing on receiving water beneficial uses rather than programmatic activities is a challenge for next generation permit development.

## MS4 Sector Challenges

Stormwater is viewed on a technical basis as a nonpoint source in a point source regulatory framework. Source control approaches (limiting pollutant contact with stormwater and use of green chemistry principles) is generally viewed as a superior approach to end-of-pipe treatment or the use of green infrastructure, but implementation is difficult. Maintenance of treatment controls and green infrastructure is



difficult from a funding and education perspective. Changing municipal codes and communication and education — particularly for politicians and decision makers — is a big challenge.

## Trends in Water Quality

Water quality in the state is generally viewed as improving (by about 61% of those polled). However, new pollutants are 'discovered' frequently, and more comprehensive monitoring data is needed. About 39% of those polled think water quality in California is static. Note that poll respondents include attendees of the January 2019 quarterly CASQA meeting where about 100 members were present.

## State Water Quality Rating (1 Poor, 5 Excellent)

California's state water quality rating is 3, an improvement from the previous year's rating of 2.5. Water in rural, non-agricultural areas is generally good. Water in most urban areas does not completely meet water quality standards and may be impaired for one or more pollutants. Causes of pollution are aerial deposition and runoff from agriculture and urban areas. Note that use of a numeric scale should not imply that this rating is anything but a qualitative assessment of the state's waters.



# Indiana

The Indiana MS4 permit program is administered through the Indiana Department of Environmental Management (IDEM). IDEM has issued one Phase I permit to the City of Indianapolis and has an Indiana Administrative Code (IAC) Rule containing general permit requirements covering 187 Phase II MS4s, traditional and non-traditional.



## MS4 Regulatory Updates

The state is working with EPA Region 5 to convert its construction, industrial, and MS4 NPDES stormwater permit rules into standard, administrative general permits. These rules have not been updated since 2003, so the new, administrative general permits will contain several new US EPA requirements.

1

Phase I MS4 permit covering the City of Indianapolis

## MS4 Sector Needs

Funding is the greatest need for Indiana MS4s. The state's MS4s are expected to pay for and implement complex programs and projects to help improve overall water quality. Program costs are passed down to individual ratepayers or citizens. Only 26% of regulated Indiana counties collect a fee to pay specifically for MS4 programs. Approximately 73 cities and

187

Communities with Phase II MS4 requirements



towns have established stormwater utilities to help offset these expenses. However, Indiana has 108 communities with combined sewer systems, and several stormwater utilities must also help pay to implement Long Term Control Plans for separating combined sewer systems or other combined sewer overflow (CSO) abatement projects.

Indiana MS4s also need clarity to implement various permit requirements, including minimum performance actions for each minimum control measure. For example, there is still confusion about the illicit discharge mapping and screening requirements. While the 2004 Center for Watershed Protection illicit discharge detection and elimination (IDDE) guidance document has been very helpful, MS4s need consistent, clear direction regarding program expectations.

There is an urgent need for follow-up funding or grants to help Indiana's many small communities address septic system issues detected through the MS4 IDDE program. This is a significant problem that occurs in MS4s with populations using older, onsite home sewage treatment systems. The cost of replacing these systems with modern infrastructure is beyond the ability of residents and the local MS4 to finance.

## **MS4 Sector Challenges**

One of the greatest challenges facing Indiana MS4s is implementing post-construction programs. Permits have not mandated specific, targeted goals or standards for this program. Indiana MS4s have developed their own technical standards to help define specific criteria and requirements for their local programs. However, several Indiana communities have received extensive push-back from







developers, contractors, and local design firms over standards that are perceived to be more stringent than what IDEM requires. For example, some MS4s are using 80% TSS removal as their overall standard while others are using channel protection volume.

## Trends in Water Quality

State water quality trends depend very much on the location and specific waterbodies being assessed. In the last decade, IDEM has made great progress in the coverage of water quality monitoring throughout the state as well as the organization and management of these data. The 303(d) list of impaired waters is a mixed bag, with some stream segments improving while new problems are identified in others.

MS4 entities are challenged to maintain or improve the quality of receiving waters for stormwater discharges. While illicit discharges are being eliminated by MS4s, there are other sources (agriculture, CSOs, industry) affecting water quality in these receiving waters and potentially obscuring progress made by the MS4 program.

It is very hard to determine if the water quality in Indiana is improving generally, especially considering IDEM's 303(d) list. Over the past few years, several Indiana waters have been de-listed (mostly for *E. coli* impairments), which would imply that water quality is improving. However, IDEM has developed new ways of categorizing and working with data, so it is difficult to understand the primary driver for the de-listings.

MS4 entities have some BMPs or program activities that help reduce *E. coli*, such as encouraging pet waste pick-up; educating homeowner's associations about not mowing their stormwater ponds up to the edge to discourage geese populations; and looking for and eliminating inadvertent cross-connections between separate storm and sanitary pipes. However, it is very difficult to directly correlate these BMPs with overall water quality improvement. The most significant improvement in Indiana resulting from the MS4 program is positive behavioral change of MS4 employees and the general public through robust educational efforts.

## State Water Quality Rating (1 Poor, 5 Excellent)

Indiana's state water quality rating is a 2.5. This is mostly due to the number of CSOs occurring in several communities throughout the state. Surface waters in CSO communities can be affected by the overflow of untreated domestic sewage and stormwater runoff. CSOs can contain high levels of suspended solids, bacteria, oxygen-demanding organic compounds, and other pollutants. The presence of these materials in local waterbodies can trigger the exceedance of water quality standards.

The assumption in Indiana is that because MS4 entities are implementing their programs, this helps to improve overall water quality in the state. Currently Indiana does not have clearly identified relationships between baseline data, benchmarks, or wet weather water quality standards that could be used to quantify MS4 program effectiveness. MS4s will have to further evaluate the program data they currently collect to look for trends in overall program improvement.

One of the greatest challenges facing Indiana MS4s is implementing post-construction programs.







# Iowa

The Iowa Department of Natural Resources (IDNR) administers the state's NPDES stormwater program. The IDNR has issued MS4 permits to three universities and 44 communities. There are 947 incorporated cities in Iowa, but more than half have fewer than 500 residents.



## MS4 Regulatory Updates

Recent changes to the State of Iowa General Permit #2 for construction site runoff control create additional reporting requirements. The changes require reporting of issues that have not been addressed within a 72-hour time frame. Previously, the rule required issues be reported within seven days.

Kansas State Extension (City of Wichita) is enacting a water quality trading program allowing city stormwater quality requirements to be placed within the watershed upstream. This is an innovative watershed-based approach Iowa will review. It is receiving support in Wichita due to Kansas' enforcement of its total maximum daily loads (TMDL).

Des Moines Water Works filed a lawsuit against northern drainage districts in three counties claiming the districts are discharging high levels of nitrates into the Raccoon River, the source of the city's drinking water. The lawsuit was dismissed by a federal judge who ruled that Iowa's water quality problems are an issue for the state legislature to address.

# 44

Iowa communities covered by MS4 permits

# 3

Universities with MS4 permits



## MS4 Sector Needs

Iowa MS4s will require increased funding and dedicated staffing moving forward. Additional funding could lead to more vigorous inspection and enforcement. Overall, additional funding would enable stormwater programs to provide a greater level of service. Additionally, more public and elected support would increase understanding that all Iowans play a role in improving water quality. Greater direction is needed on methods that truly make an impact on water quality. Such methods require widespread public distribution for greater implementation at the residential level.

There needs to be more emphasis placed on public education so that the public understands that what they do affects local water quality. Stormwater programs would benefit from additional

guidance and direction on what types of educational efforts can truly improve public understanding. This would prevent the sector from continuing less effective outreach and help communities spend limited resources on practices that make an impact.

If green infrastructure continues to be encouraged, there should be specific post-construction requirements in MS4 permits for its adoption.

Strong construction site topsoil retention rules are needed statewide. Iowa has a history of educational efforts in urban areas focused on soil management and quality restoration. This outreach emphasizes the importance of restoring soils in reducing runoff volumes and improving water quality.





To continue expanding water quality improvements in Iowa, more research is needed to quantify the benefits of BMPs being implemented in urban watersheds.

## MS4 Sector Challenges

MS4 challenges in Iowa are threefold. First, voluntary efforts to reduce nutrients on both rural and urban landscapes have not produced meaningful improvements. Second, MS4 cities in Iowa face staffing and funding issues. Finally, departmental turnover in MS4 stormwater programs makes continuous improvement difficult, and there seems to be a lack of political will to provide program direction.

## Trends in Water Quality

Water quality in Iowa may be on the verge of improving in some watersheds where watershed partners are active and an improvement plan is being implemented. However, water quality throughout much of Iowa is static. Sporadic and isolated water quality testing over the last decade has shown essentially constant water quality levels, with no nutrient reductions in many areas.

MS4s play a vital role in reducing nutrients in the urban context. Proportionally, however, land use in Iowa is overwhelmingly agricultural, creating the biggest impact on water quality. Iowa has a voluntary Nutrient Reduction Strategy, yet while MS4s are regulated, the agricultural community in Iowa is not.

To continue expanding water quality improvements in Iowa, more research is needed to quantify the benefits of BMPs implemented in urban watersheds. A tremendous amount of funding has been spent assessing the effectiveness of agricultural BMPs. The agriculture sector needs to focus on implementation. On the urban side, little research has been conducted on the effectiveness of stormwater BMPs using design guidance in the Iowa Stormwater Management Manual.





There is still too much importance placed on grey infrastructure systems and nutrient removal at publicly owned treatment works (POTWs).

## State Water Quality Rating (1 Poor, 5 Excellent)

Iowa's estimated overall score is 1.5. Most surface waters in Iowa appear to have some pollution. MS4s in Iowa acknowledge their responsibility through regulation within their jurisdictions. Yet, MS4s and POTWs are being held to a different standard than other sources of surface water discharges, including agriculture.

Unfortunately, many MS4s are unable to meet designated uses in surface water systems due to nutrients, bacteria, and other water quality indicators. Additional water quality testing is needed for program feedback and to discern which receiving waters have the most critical issues. Most stream segments in Iowa have not been assessed, so the full water quality picture is difficult to characterize. The responsibility for water quality should be proportional between agricultural and urban land uses. MS4s play a role in keeping water as clean as possible, but all users need to do their part. With more than 100 years of development, it will take a long time to mitigate urban influences and impacts on local water bodies in Iowa.





# Kentucky

The Kentucky Department for Environmental Protection (Kentucky DEP) administers the state's NPDES permit program. Kentucky has individual and general permits for stormwater discharges related to industrial facilities, construction activities, and MS4s.

Kentucky issues two Phase I permits to the City of Lexington and Louisville/Jefferson County and a Phase II general permit covering the entire commonwealth.



## MS4 Regulatory Updates

The following are the main regulatory updates associated with the MS4 sector in Kentucky. First, the Kentucky Division of Water renewed the Phase II MS4 General Permit with an effective date of May 1, 2018. This permit is for the third, five-year permit cycle of the Phase II MS4 program in Kentucky. All Phase II MS4 communities were required to submit their Storm Water Quality Management Plans (SWQMP) within 180 days of the effective date. The two Phase I communities (Louisville/Jefferson County and City of Lexington) are covered under individual permits.

Secondly, the Kentucky Division of Water developed a statewide TMDL for Bacteria

Impaired Waters. In its *2014 Integrated Water Quality Report to Congress*, the Division of Water identified 331 bacteria-impaired waterbodies. The statewide TMDL approach is intended to streamline the typical watershed-level process.

## MS4 Sector Needs

One of the greatest needs in the Kentucky MS4 sector is support for funding at the local level. Many MS4 communities do not have a designated funding source and receive significant push back when attempting to develop one.

There is also a need for statewide education messaging. There is a lack of public understanding of the importance of stormwater management. An effective statewide messaging campaign could inform the public and increase support for programs at the local level.

## MS4 Sector Challenges

Lack of funding is a major challenge for many MS4 communities that do not have the necessary support for developing and maintaining their programs.

## Trends in Water Quality

Trends in water quality vary across Kentucky. The number of impaired segments on the state's 303(d) list continues to increase. However, this is due in part to newly assessed streams. There have been improvements in certain areas due to permit implementation. MS4s continue to be affected by numerous nonpoint sources outside of their designated service areas, which can make monitoring improvements due to permit implementation very difficult.

## State Water Quality Rating (1 Poor, 5 Excellent)

Kentucky's state water quality rating is a 2.5. Bacteria, sediment, and nutrients continue to be listed as the major causes of impairments. The state has a number of streams in less impacted areas that are meeting water quality standards. These Special Use Waters have additional protections for uses such as cold-water aquatic habitat and outstanding state resource waters.

# 2

Phase I MS4 permits covering the City of Lexington and Louisville/ Jefferson County

# 1

Phase II MS4 permit covering the entire state.

Lack of funding is a major challenge for many MS4 communities that do not have the necessary support for developing and maintaining their programs.





# Maine

Maine has an active stormwater community largely catalyzed by consistent issuance and reissuance of the MS4 General Permit (small MS4) since 2003. Maine's fourth permit renewal occurred in summer 2018. All 30 regulated communities and 10 nontraditional MS4s are located around four primary population centers in Maine. Each cluster collaborates and shares resources, and some are incorporated as nonprofits. There are significant regional differences across the regulated clusters, for example coastal communities compared to inland freshwater communities.

Maine has exceptional water resources with over 55,000 miles of rivers and streams, 6,000 lakes and ponds, and over 3,000 miles of tidal shoreline. Maine's water resources are a primary driver for its tourism economy. That state's primary stormwater-based pollution challenges are: (1) freshwater and coastal bacteria and their impact on shell fishing and swimming; (2) chlorides (a challenging threat given the need for public safety in the winter); (3) nutrients in both fresh and salt water; and (4) ocean acidification, which is emerging as another issue for Maine's shellfishery. Trash also threatens water quality in many of the state's coastal communities.



## MS4 Regulatory Updates

**Regional Issues:** Regulated MS4s in southern Maine discharge into the Piscataqua River and Great Bay Estuary. The estuary is the shared boundary with New Hampshire and other regulated MS4 dischargers. New Hampshire is a non-delegated state operating under a 2003 MS4 General Permit that has recently been updated, effective July 1, 2018. There is limited, but potentially increasing, cross-state cooperation on stormwater and water quality due to the differences in permit program development. There are numerous other multi-state and Tribal Lands regional water quality issues, but generally, these are not related to regulated stormwater discharges.



**MS4 general permit:** Maine is currently in the sixth year of the 2013 MS4 General Permit and is now proposing a revised permit. The new permit could either include a two-step permitting process to address the Remand Rule — which requires “clear, specific, and measurable” language be incorporated into all future updated MS4 permits — or the new permit could require development of a Stormwater Program Management Plan in advance of permit reissuance. Consistent with a recently announced, updated MS4 General Permit in Massachusetts and New Hampshire (both non-delegated), there is increasing focus on illicit discharges and revisions/refinements to Construction Erosion and Sediment Control (ESC) and BMPs to address TMDL impaired waters.

**Residual Designation Authority (RDA):**

Maine’s Long Creek watershed is one of the rare water bodies where the US Environmental Protection Agency (EPA) has exercised its RDA to regulate stormwater discharges not otherwise subject to NPDES requirements.

**Maine Stormwater Law and Rules:**

Maine’s Stormwater Management Law lists stormwater standards that apply to projects that disturb more than one acre, which generally includes areas that are stripped, graded, excavated, or filled during construction. The Stormwater Management Law includes standards for both the quantity and quality of stormwater runoff. The Maine Department of Environmental Protection (Maine DEP) has developed rules (Chapters 500-502) establishing standards that must be met by stormwater permit applicants. The standards are more restrictive in certain watersheds including those with “urban impaired streams,” which are often located within the boundaries of regulated MS4s.

**Impervious Cover TMDL:** Maine adopted a state-wide impervious cover TMDL that was approved by the US EPA in 2012. For the 29 watersheds addressed by this TMDL, percent effective impervious cover serves as a surrogate for the mix of pollutants in stormwater. The purpose of these TMDLs is to address impaired aquatic life use in streams receiving a mix of regulated and unregulated urban stormwater.

## MS4 Sector Needs

Dedicated funding for municipal stormwater management, flood control, resiliency, and urban watershed restoration implementation is the greatest need in Maine’s MS4 sector. Only three of the 30 regulated MS4 dischargers have a stormwater user fee to provide a dedicated revenue stream for stormwater compliance and drainage system management. The State of Maine does not currently have a dedicated clean water fund to assist municipalities with stormwater program or capital project implementation. Bonds are periodically floated for water resources work but are limited in funding and scope. Clean Water State Revolving Funds are rarely used for stormwater-only projects in Maine, but they are used for CSO abatement, which is increasingly recognized as a stormwater problem. Additionally, due to limited funding at the state level for impaired water research and study (Section 305(b) and 303(d) programs), MS4 dischargers lack clearly understood or defined implementation strategies for restoration associated with TMDLs.

Increased cooperation between Maine DEP and regulated MS4s is needed, particularly in construction site authority and enforcement. In some cases, there are challenging disconnects between state

stormwater law, the state construction general permit, and MS4 permittee authority and enforcement processes. When the state elects not to pursue enforcement, MS4 authority under local regulations is questioned or insufficient when faced with non-compliance.

There is limited political support for stormwater programs despite flooding problems and increasing concerns about the effects of sea level rise on low-lying communities. There is generally an underappreciation for the function and value of municipal stormwater drainage assets. This lack of understanding creates a disconnect between resiliency and stormwater compliance planning that, if improved, could benefit program managers on both sides of the issue.

## MS4 Sector Challenges

The Maine MS4 General Permit contains very explicit outreach and education requirements that mandate effectiveness testing, which is a significant challenge for permittees.

Maine, like much of the northeast, has very old municipal drainage and sewer infrastructure. In many regulated MS4 communities, this infrastructure includes combined sewers and results in CSOs. While significant abatement of CSOs has taken place, these old storm and sanitary collection systems create an increased threat for illicit discharges. The need for significant rehabilitation further pressures municipal clean water budgets.

Another significant challenge in Maine is addressing chlorides associated with winter snow management. Chlorides are an increasing risk to surface and underground drinking water resources. They create a dilemma for stormwater

managers about whether infiltration and filtration stormwater controls are more of a risk than a benefit in and around coastal/tidal water resources.

## Trends in Water Quality

As in most states, Maine's water quality trends depend on the water resource. However, the consensus is that state waterways are static to improving. Maine's lakes are ranked third best, only behind Alaska and Montana, in Secchi disk readings for water clarity. Since 1987, Maine has moved close to 6,000 miles of stream from Class C to Class B, with 99 percent of all mapped streams as Class B or better. Maine has reduced CSO discharges from approximately 6 billion gallons in 1987 to 290 million gallons per year. The state has greatly improved water quality in its several large inland rivers. Forty years ago, these rivers were considered the "most polluted in the nation" and in part formed the impetus for enacting the Clean Water Act (introduced by Edmund Muskie, a former US Senator from Maine). Coastal conditions — such as eelgrass bed viability and other biological criteria, native shellfishery declines, and bacterial beach closures — are an increasing challenge. However, these issues are not entirely related to stormwater quality. Development in southern Maine is affecting water quality and biological criteria in small urban watersheds, with increasing impairments and challenging, costly, and untested restoration scenarios.

## State Water Quality Rating (1 Poor, 5 Excellent)

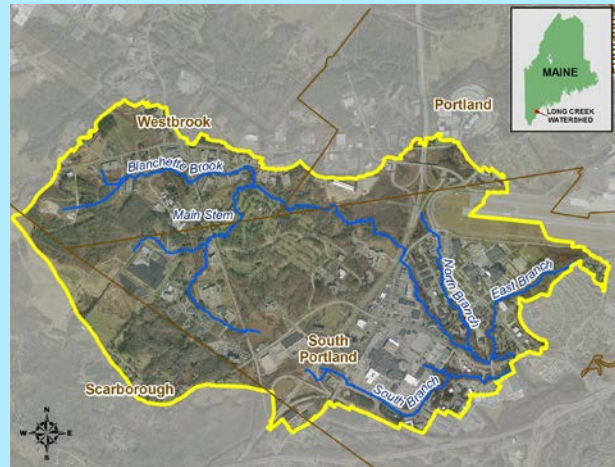
Maine's state water quality rating is a 4. Statewide, Maine has excellent water quality, but there are still many challenges, particularly for urban impaired stream

watersheds within MS4 boundaries. MS4 activities are helping to address some of the issues identified above but have limited quantifiable data to measure improvements associated with non-structural and programmatic stormwater management measures.

## Long Creek RDA

The 3.5-square-mile Long Creek watershed is located in four municipalities. This urban stream system is a Class C stream but does not meet the biological water quality standards for this classification. Long Creek has been the subject of many studies and reports suggesting that urbanization has significantly impaired the stream's health and its ability to support recreation and wildlife. Water quality impairments are a result of increased concentrations of metals, chloride, phosphorus, nitrogen, polycyclic aromatic hydrocarbons, and reduced dissolved oxygen concentrations. There are no regulated wastewater discharges in the watershed, only stormwater and other nonpoint sources.

In 2009, the US EPA exercised a provision in the Clean Water Act, known as RDA, which requires stormwater permitting for designated discharges in the Long Creek watershed. The resulting permits, a collaboration between EPA and Maine DEP, require "an operator of property...to obtain a Maine Pollutant Discharge Elimination System permit" for any parcel or property in the Long Creek watershed with one or more acres of impervious cover. This precedent-setting use of the RDA provision led to the establishment of the Long Creek Watershed Management District and a corresponding annual impervious cover fee.



The Long Creek General Permit was implemented on behalf of 89 permittees that manage 88 percent of the watershed's impervious cover and 98 percent of the total regulated impervious cover. The permittees include:

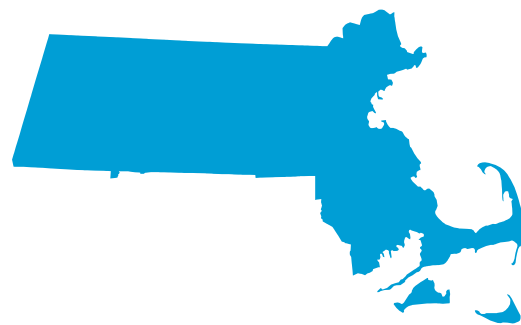
- 83 private landowners, primarily commercial and retail properties with impervious cover from rooftops to driveways, sidewalks, and parking lots
- Three of the four municipalities, whose impervious cover consists primarily of roads and sidewalks
- Maine Department of Transportation and the Maine Turnpike Authority
- Ecomaine, a regional waste management facility providing recycling and waste-to-energy services for a number of southern Maine municipalities





# Massachusetts

Massachusetts is one of only four states not delegated authority for the NPDES program by the US EPA. In Massachusetts, the NPDES MS4 permit is jointly issued by EPA Region 1 with the Massachusetts Department of Environmental Protection (MassDEP). Massachusetts has had one MS4 permit, issued on May 1, 2003 for MS4 operators located in the states of Massachusetts and New Hampshire. This permit covers 260 towns and cities as well as non-traditional MS4s like state universities. This permit expired on May 1, 2008 but has been administratively continued until a new permit is issued.



## MS4 Regulatory Updates

From 2008–2010, the US EPA issued three separate draft Small MS4 General Permits to replace the 2003 MS4 permit. The US EPA issued a new draft permit in 2014 and finalized it in 2016. The 2016 Massachusetts Small MS4 General Permit was signed April 4, 2016 with an original effective date of July 1, 2017. This new permit will cover 270 towns and cities.

Several municipal, industrial, developer, and environmental groups filed appeals of Massachusetts' 2016 permit as well as the

2017 New Hampshire MS4 permit, which is similar. Appeals for the Massachusetts and New Hampshire MS4 permits were consolidated in the federal circuit court in D.C. In response to the appeals and requests from municipalities, the US EPA issued a 1-year postponement of the effective date. The Massachusetts Rivers Alliance filed a suit against the US EPA to overturn the permit postponement. In 2017, the National Association of Clean Water Agencies (NACWA) took over the legal aspects of the appeal because of common issues of concern — that the US EPA did not have the authority to require strict water quality standards beyond the Maximum Extent Practicable standard. The appeals are currently in mediation.

EPA Region 1 issued a press release on May 10, 2018 stating that the permit will go into effect on July 1, 2018.

There are several interesting elements to this new MS4 General Permit.

- Permittees that discharge into impaired or TMDL waters are obligated to implement additional, specific BMPs for applicable areas within the regulated MS4 area. One such obligation is for the Long Island Sound, which is obviously outside the direct jurisdiction of the Commonwealth of Massachusetts.
- Several ponds and the Charles River watershed have specific total phosphorus reduction requirements, and the allowable structural and non-structural BMPs are included directly within the permit (as opposed to a reference document outside of the permit). This will create rather inflexible management options for applicable communities. Several of the TMDL requirements are for a 10-year period despite being included in a 5-year permit.
- IDDE requirements are very specific, requiring several pages in the permit. The requirements obligate every regulated community to investigate and conduct sampling (if there is dry weather flow) for indicator pollutants in 100 percent of their MS4 over 10 years. For many communities, this will likely be a very difficult task.
- IDDE requirements also direct dry weather — and wet weather in many cases — sampling for chlorine, surfactants, bacteria, and ammonia at every outfall with additional sampling requirements for outfalls that discharge directly into impaired waters for other “pollutants of concern.”







## MS4 Sector Needs

In the Massachusetts' MS4 sector, the greatest needs are funding, building awareness among the public and elected officials, regional collaboration, and technical support for MS4s on such topics as mapping, outfall inspections, and IDDE sampling.

## MS4 Sector Challenges

Lack of funding is one of the greatest challenges facing Massachusetts' MS4 sector, especially given the state's aging storm and sanitary sewer infrastructure. There is also a lack of awareness of stormwater issues and understanding of associated costs. The state's municipalities will need to meet evolving regulatory requirements for TMDLs and impaired waters, and finally, there is the challenge of coordination among municipal departments for permit compliance.

## Trends in Water Quality

Massachusetts waters appear to be static to improving, depending on the waterbody. EPA Water Quality Report Cards have shown improvements in urban waters, specifically in the Charles and Mystic Rivers, which are two major river systems in the most urbanized areas of Massachusetts. Report cards have not been created for less urbanized areas of the commonwealth with less active watershed associations, so it is harder to evaluate their water quality.

## State Water Quality Rating (1 Poor, 5 Excellent)

The Statewide Municipal Stormwater Coalition would rate Massachusetts' water quality as a 3, neither good nor bad. More than half of the commonwealth's rivers and streams fail to meet water quality standards. According to the EPA,

stormwater discharges are causing or contributing to at least 55 percent of impairments in all Massachusetts' assessed waters.

The most recent *2017 Massachusetts Beach Testing Results: Annual Report* by the Massachusetts Department of Public Health reported, "The overall low exceedance rates [for water quality standards sampling based on bacteria] indicate that Massachusetts beaches have generally high water quality... Rainfall and pollution sources at sampling sites were identified as two important factors that contributed to elevated bacteria levels at recreational waterbodies. As seen in previous years, the number of exceedances dropped exponentially as the days since rainfall increased."

Based on this information, polluted runoff from MS4 and combined sewer systems appear to be leading causes of water quality issues.

EPA Water Quality Report Cards have shown improvements in urban waters, specifically in the Charles and Mystic Rivers.







# Minnesota



The state delegated MS4 permitting authority is the Minnesota Pollution Control Agency (MPCA). The state's MS4 permits include:

- 2 Phase I cities – Minneapolis and Saint Paul
- 172 Phase II cities
- 27 townships
- 15 counties
- 22 colleges and universities
- 9 watershed districts
- 3 jails
- 2 Minnesota Department of Transportation
- 2 federal hospitals

The MS4-permitted cities have formed the Minnesota Cities Stormwater Coalition, which is directly affiliated with the League of Minnesota Cities. About 68 percent of the state's population live in cities covered by an MS4 permit.

## MS4 Regulatory Updates

The state's two Phase I individual permits were reissued in 2017. MPCA expects to reissue the MS4 General Permit in the fall of 2019. This will be Minnesota's fourth MS4 General Permit, with past permits issued in 2003, 2006, and 2013.

MPCA is following a robust stakeholder engagement process for this general permit reissuance. In late 2018 and early 2019, MPCA held two stakeholder meetings to discuss concepts for permit changes related to post-construction design standards and TMDLs. MPCA plans to post a pre-public notice draft of the new permit to the Minnesota Stormwater Manual website in spring 2019 followed by a public notice version of the permit in summer 2019.

Minnesota has two remarkable examples of state-wide source control initiatives — a [restriction on phosphorus in lawn fertilizer](#) and a [ban on the sale and use of coal tar-based sealcoat](#), which was formerly used on driveways and parking lots.

MPCA manages a robust stormwater program, with staff levels for all NPDES

stormwater permitting programs between 15 to 25 people since 2003. The MPCA created and maintains the [web-based Minnesota Stormwater Manual](#), which is a valuable stormwater resource.

MPCA regularly performs local MS4 program audits. When deficiencies are found, the agency works with permittees to improve their programs and correct the deficiencies. In rare instances where a permittee has neglected an entire category of their permit responsibilities, for example, MPCA has issued fines based on audit results.

The state's first MS4 General Permit was challenged in court by the Minnesota Center for Environmental Advocacy. Because of that court ruling, the MS4 General Permit has included provisions addressing antidegradation since 2006. MPCA must also review and provide public notice for every MS4 General Permit application and associated local Stormwater Pollution Prevention Plan (SWPPP). After receiving, reviewing, and responding to comments as well as possible revisions to the SWPPPs, MPCA approves the submitted documents. This process matches the Option 2 process, or "Procedural Approach," listed in the relatively recent federal MS4 Remand Rule.

## MS4 Sector Needs

As is the case for municipalities across the US, more funding is needed for local programs and implementation. According to the [2018 Western Kentucky University Stormwater Utility Survey](#), Minnesota has 198 stormwater utilities, the highest number of such utilities in any US state.

MPCA completed the [2017 MS4 Technical Assistance and Outreach Needs Survey](#). In response to needs articulated by

MS4 permittees, MPCA created the [MS4 Digital Document Library \(DDL\)](#). The DDL is an online space for MPCA stormwater program staff to store and circulate example documents that are being used by MS4 permittees and others to manage stormwater pollution prevention programs (SWPPPs). The DDL includes:

- Inspection checklists and forms,
- Site plan review checklists,
- Documentation tracking mechanisms,
- Standard operating procedures, and
- Many other useful materials to implement a local SWPPP.

Documents in the DDL are available to all site users for download and use. MPCA staff have reviewed all materials to ensure their compliance with the state MS4 General Permit prior to posting. MPCA believes that having example documents will reduce the resources required to implement effective SWPPPs. Part of the DDL is an [MPCA Flickr site](#) with multiple albums of stormwater photographs.





Minnesotans highly value their water and recognize that water quality problems and solutions are complex and challenging.

There is also a need for more urban stormwater research. The nonprofit [Minnesota Stormwater Research Council \(MSRC\)](#) was established in 2016 to:

- Facilitate the completion of needed applied research that enables more informed decisions about the use, management and protection of water resources in urbanized areas.
- Periodically assess the status of research, identify consensus research priorities, and communicate these priorities to Minnesota's public and private research agencies and organizations.
- Promote coordination of research goals, objectives, and funding among research agencies and organizations.

The MSRC is an independent organization of stormwater professionals, practitioners, managers, engineers, researchers, and others currently operating as an unincorporated association with the University of Minnesota Water Resources Center as the fiscal agent. The MSRC recently selected and funded its first round of research projects.

## MS4 Sector Challenges

MS4 permittees in Minnesota are facing significant challenges in complying with TMDL wasteload allocations. A 2017 report by Minnesota Management and Budget estimated that meeting TMDL wasteload allocations will cost the state's MS4-permitted cities \$317 million per year.

Further, there is concern about contamination of constructed stormwater pond sediments by polycyclic aromatic hydrocarbons (PAHs). MS4 cities have counted and reported more than 14,000 constructed ponds and wetlands in about 160 Minnesota cities. Over multiple MS4 permit cycles, permittees will be required to assess their ponds' depth. Where depth has decreased due to sedimentation, the ponds will need to be dredged to ensure they can still perform their water quality functions. PAH levels in some pond sediments are high enough to require disposal of the dredgings in lined landfills. The extra cost for this disposal is estimated in the range of \$1 to \$5 billion. This is a huge problem for which MS4s do not currently have a solution. Early in 2019, seven Minnesota cities [filed lawsuits](#) against refiners of coal-tar sealant, the main source of PAH in pond sediments, to seek compensation for these costs.

## Trends in Water Quality

About 40% of waters assessed in Minnesota are impaired. Through a constitutional amendment passed in 2008, Minnesota established the [Clean Water Fund](#). The fund is a revenue stream of close to \$100 million per year designated for protecting and restoring waterbodies throughout the state.

Minnesota is protecting and restoring water quality through NPDES permitting programs and watershed districts. These efforts have countered negative water quality trends due to urbanization, resulting in neutral or slightly positive water trends in urban and suburban areas.

Agriculture remains unregulated and problematic in other portions of the state. Tile drainage on a large scale, along with loss of wetlands and more intense storms, have resulted in increased stream and river flows that cause large-scale bank failures and erosion. Agricultural fertilizer is also causing increased nitrate levels in groundwater in locations around the state.

## State Water Quality Rating (1 Poor, 5 Excellent)

Water quality in Minnesota is rated 3 on a scale of 1 to 5. Minnesotans highly value their water and recognize that water quality problems and solutions are complex and challenging. They are willing to support and participate in protecting and restoring water quality statewide through their financial support, behavior changes, collective engagement, local government regulation, and political backing. The MS4 program in Minnesota is strong and productive, a great example of what can be achieved through relatively simple and flexible regulations combined with largely voluntary compliance and local creativity.







# Nebraska

The Nebraska Department of Environmental Quality (NDEQ) administers the state's NPDES stormwater program. NDEQ has issued two Phase I Individual MS4 Permits and one Phase II Individual Permit. It also has issued two MS4 General Permits covering 26 cities, counties, or other entities.



## MS4 Regulatory Updates

NDEQ reissued two MS4 General Permits with an effective date of July 1, 2017 for Phase II permittees. These two general permits have identical requirements but different coverage areas. NDEQ reissued one Phase II individual permit to Omaha effective January 1, 2018; one Phase I individual permit to the Nebraska Department of Transportation effective April 1, 2018; and Lincoln's Phase I individual permit will be reissued soon. As required under the MS4 Remand Rule, all stormwater management plans (SWMPs) for Phase II communities were placed on public notice and review, a new update to the program.

## MS4 Sector Needs

The greatest current need for Nebraska MS4 permittees is guidance in the form

of compliance assistance from the state and other regulatory entities to ensure that programs are well managed and stormwater discharges are protective of water quality. Working partnerships between the state and permittees has improved over the last few years. However, MS4 permittees need resources to help with developing post-construction standards and projects, IDDE sampling procedures and forms, and MS4 training.

## MS4 Sector Challenges

One major challenge for Nebraska MS4 communities is funding for stormwater program management, improvements, and enforcement. Permittees have faced difficulties enacting stormwater utility fees, though some MS4 programs have successfully implemented fees. Recently submitted SWMPs from permittees will aid in compliance with NDEQ and



federal requirements, though the MS4 communities must ensure they have all required tools and enforcement mechanisms.

## Trends in Water Quality

NDEQ maintains a fixed-station ambient stream monitoring network with approximately 97 locations sampling monthly. NDEQ also conducts basin rotational monitoring. The results from 2002–2014 have placed all but one stream basin in the fair or above water quality index (above 50). Over half of the basins are rated good (70–80), and one is rated as excellent (White Hat). However, in five basins, total nitrogen is trending upward, with only one river basin trending down. Two basins show increasing total phosphorus trends while a decrease was observed in three basins.

## State Water Quality Rating

According to Nebraska's *2018 Water Quality Integrated Report*, 208 of the state's 329 (~63 percent) lakes assessed are listed as impaired, and 276 of the 627 (~44 percent) stream segments assessed are listed as impaired. The most common impairments for lakes were nutrients, fish consumption, chlorophyll a, high pH, low DO, and bacteria. The most common stream impairments were bacteria, aquatic community, atrazine, fish consumption, and low DO. In Nebraska, the most common TMDLs are for fecal coliform and *E. coli*.

The greatest current need for Nebraska MS4 permittees is guidance in the form of compliance assistance from the state and other regulatory entities to ensure that programs are well managed and stormwater discharges are protective of water quality.





# Ohio

The Ohio Environmental Protection Agency (Ohio EPA) issues MS4 NPDES permits in the state. There are four individual MS4 permits for the cities of Dayton, Toledo, Akron, and Columbus. Ohio also has a Phase II general permit with about 275 permittees, not including co-permittees. The Ohio EPA also administers the Construction General Permit, Industrial Storm Water General Permit, and a Marina Storm Water General Permit.



regulated MS4 entities in Ohio to implement proper program resource planning and forecasting.

## MS4 Regulatory Updates

Locally and statewide, there is a need for: (1) more details and clarity on performance standards for each minimum control measure (MCM); (2) additional direction and clarity on measurable goals and documenting MCMs, BMP implementation, and water quality successes; (3) permit guidance on the potential for partnering to address post-construction control requirements with other entities via in-lieu fees or other mechanisms.

## MS4 Sector Needs

Sustainable funding mechanisms would enable municipal and non-traditional

Elected official support is always critical.

Further, more flexibility in the permit process would benefit regulated entities, as permittees could submit alternative approaches that are demonstrably as restrictive as the permit requirements. Entities with general permits need the ability to mold their programs to fit their unique challenges, whether those challenges relate to staffing, finances, or other issues.

Given increases in development and impervious areas, there should be an increased emphasis on flow-based controls as well as mechanisms incentivizing those who disconnect or reduce impervious cover.



Flooding and stormwater runoff are becoming increasingly integrated, blurring the line between these events. A funding mechanism that addresses both flooding and stormwater could be beneficial for the state MS4 sector.

## MS4 Sector Challenges

Lack of funding continues to be a major issue, which leads to a limited ability to plan or forecast program needs, objectives, goals, and targets. Additionally, limited regulatory staffing has made it difficult for Ohio to follow up on previous TMDL studies and implement enforcement actions in the watershed.

Another significant challenge in Ohio is the disconnect between urban and agricultural runoff. There is a lack of fair and equitable water quality requirements that integrate agriculture into the stormwater equation.

## Trends in Water Quality

Water quality trends in Ohio are relatively static. Ohio is a water-rich state with 290 miles of shoreline on Lake Erie and more than 23,000 miles of rivers and streams. According to the *2018 Integrated Water Quality Monitoring and Assessment Report (IR)*, water quality in Ohio's large rivers remained essentially unchanged compared to the 2016 IR. Currently, 87.5 percent of assessed large river units meet full attainment for aquatic life use. Smaller streams, however, are improving, with the percent meeting attainment increasing by 3.2 percent from the 2016 IR. Most aquatic life impairment is caused by sediment, nutrients, habitat modification, hydromodification, and organic enrichment due to land disturbances related to agriculture activities and urban development.

Algae is an issue of concern in Ohio and the state is actively working to address nutrients in Lake Erie. Of 119 public drinking water supply assessment units, 37 are listed as impaired by algae and another 17 are on the algae watch list. Ohio is also proposing to list the shorelines and open water in the western basin of Lake Erie as impaired for recreation use due to algae.

## State Water Quality Rating (1 Poor, 5 Excellent)

Ohio's state water quality rating is a 2. The MS4 program has provided some benefit, but limited funding has introduced a ceiling on what can be accomplished. To move the needle forward in a meaningful way, stormwater runoff should be viewed holistically and address the connections between urban, rural, agricultural, linear, and industrial elements.

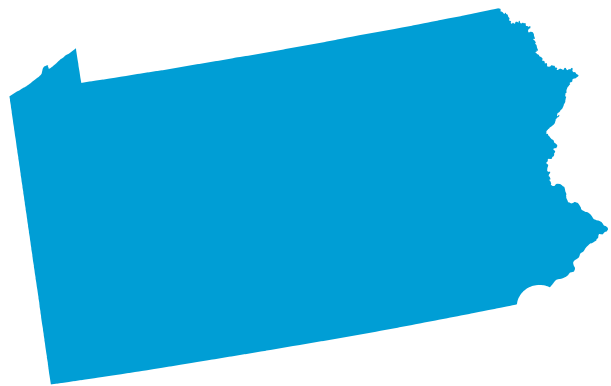






# Pennsylvania

Pennsylvania Department of Environmental Protection's (PADEP) Bureau of Clean Water (BCW) administers the NPDES permitting and compliance monitoring programs for industrial, municipal, and construction stormwater in Pennsylvania. In the commonwealth, there are two large MS4s, no medium MS4s, and 953 small MS4s. BCW also oversees implementation of the Stormwater Management Act (Act 167), which requires counties to prepare and adopt watershed stormwater management plans, in the PADEP's regional offices.



## MS4 Regulatory Updates

Municipalities are beginning to implement their new 2018 MS4 permits and newly required Pollutant Reduction Plans. These plans are required for MS4s that discharge nutrients and sediments to an impaired waterway or the Chesapeake Bay. Stream restoration is a popular BMP localities are using in their Pollutant Reduction Plans. To ensure the success of these projects, it is important for municipalities to have access to technical resources and experienced contractors.

## MS4 Sector Needs

One of the greatest needs in Pennsylvania's MS4 sector is funding, through stormwater fees and authorities as well as state grants. Up-to-date, state-wide guidance for integrating new technologies is also needed, as the state's last PADEP BMP manual was published in 2006. The sector is also in need of optimum designs for green infrastructure that include cost-benefit analyses. Further, fostering municipality recognition of the importance of stream water quality monitoring (before and after projects) would help to guide activities.

## MS4 Sector Challenges

Integrating water quality requirements is one of the greatest challenges facing Pennsylvania's MS4 sector. More guidance is needed on how to address sewer overflows and stormwater management in an integrated fashion while producing the greatest, most cost-effective outcome for water quality. The state's MS4 sector is in the initial stages of planning at the watershed scale rather than confining decision making to municipal borders. Initial conversations between municipalities on contributing to a central, watershed-wide fund for projects could lead to a better approach that enables the sector to be more flexible and targeted in siting projects. Finally, factoring changes in the intensity of rainfall events into design is another important challenge facing the sector.

## Trends in Water Quality

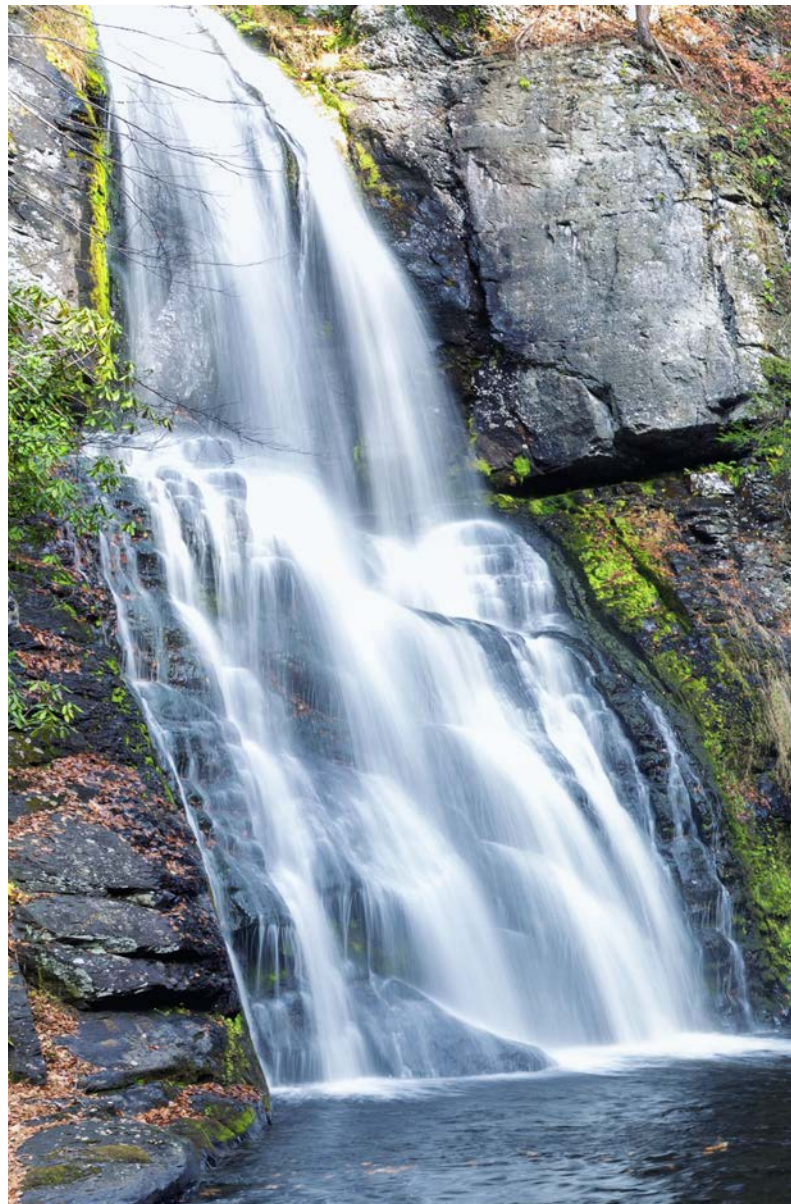
No information

## State Water Quality Rating

Monitoring information in PADEP's *2016 Final Pennsylvania Integrated Water Quality Monitoring and Assessment Report* indicates that, of the commonwealth's 86,000 miles of rivers and streams, 66,565 miles support designated aquatic life use. The four largest sources of reported impairment for aquatic life are agriculture, abandoned mine drainage, urban runoff/storm sewers, and habitat modification. The leading causes are siltation, metals, pH, nutrients, and water/flow variability.

**2** Phase I MS4s

**953** Phase II MS4s







# Tennessee

The Tennessee Department of Environment and Conservation (TDEC) administers the state's stormwater program. TDEC administers four Phase I MS4 permits to the cities of Knoxville, Nashville, Memphis, and Chattanooga.

Tennessee issued a Small MS4 General Permit on August 31, 2010, effective on October 1, 2010. The general permit covers 81 small MS4s and an individual Phase II permit for the Tennessee Department of Transportation.

## MS4 Regulatory Updates

In 2018, Tennessee revised its Water Quality Control Act to limit permit requirements for post-construction stormwater discharges to the minimum protection demanded by US EPA rules. The act was similarly revised to restrict permit requirements for animal production operations to the minimum protection required by US EPA regulations.

*Background:* The state and a group of MS4s from across Tennessee worked with the US EPA to become one of the first states to require a one-inch runoff retention standard under the post-construction minimum measure in the



2010 Phase II General Permit. This standard continued into the 2016 permit.

This specific requirement of the Phase II permit was under appeal by both the Homebuilders Association of Tennessee and state water quality groups. In October 2018, all parties signed a settlement agreement. The agreement and edited permit language may be found on [TDEC's website](#). TDEC will promulgate a Post-Construction Rule subject to public notice requirements, and after approval — if the parties agree — the settlement agreement and rule will be final. At that point, TDEC plans to reissue all Phase I permits and the general Phase II permit, which expires September 30, 2021.

This does not affect the current Phase II General Permit cycle, but TDEC must promulgate the rules prior to issuing any future Phase I or II NPDES MS4 permit.

# 4

Phase I MS4 permits covering the cities of Knoxville, Nashville, Memphis, and Chattanooga.

# 99

Small MS4 General Permits

## MS4 Sector Needs

Tennessee MS4s need staffing, technical support, and budget resources for projects. Some innovative MS4s have been able to establish user fee programs, which will be a significant improvement. Approximately 35 programs have implemented fees, with new ones being initiated regularly. Flooding concerns along with inadequate and deteriorating stormwater infrastructure precipitates community acceptance for fees. Tennessee does have enabling legislation that authorizes stormwater fees (TCA 68-221-1101).

However, in general, the role and importance of MS4 operations are often not understood or appreciated by local government leaders or the public. The MS4 mission of protecting public and ecological health, as well as safety and property, gets over-simplified as drainage maintenance. MS4s are working to change that through education and public participation events. Public support is so critical to MS4 program effectiveness in Tennessee and across the country. Additional training for stormwater managers in effective communication with elected officials and with the public would be very beneficial to MS4s.





## MS4 Sector Challenges

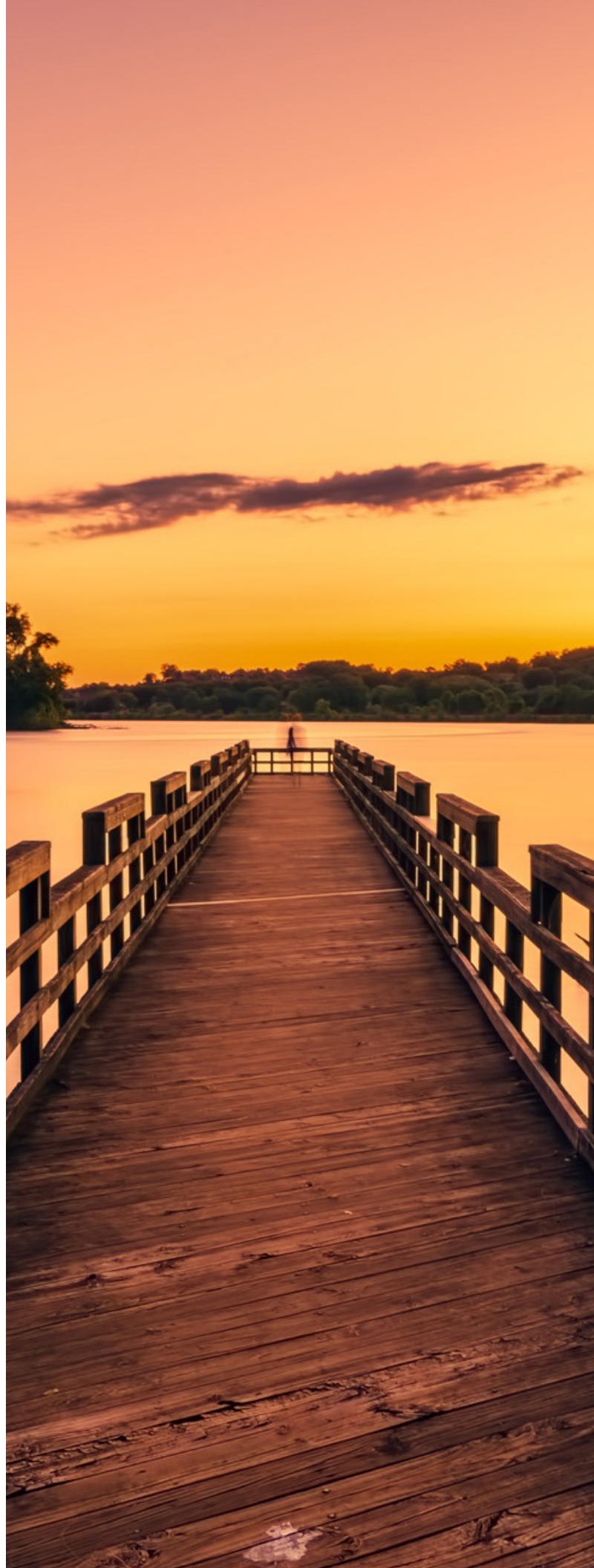
Many of Tennessee's urban areas continue to experience significant population growth along with development and densification. Urban watersheds are under intense pressure from land use conversion, construction site runoff, and loss of headwater streams.

MS4s are working to educate their communities on the importance of stormwater controls and floodplain management. However, stormwater managers along with engineers, planners, and designers are still learning how to properly design, review, and approve post-construction stormwater control measures (runoff reduction). These professionals need long-term maintenance and effectiveness data to improve annual reporting as well as tracking and documentation of stormwater control measures. However, a consistent challenge is having the personnel to inspect, track, and enforce the implementation and maintenance of stormwater control measures.

## Trends in Water Quality

Water quality is only partly related to the permitting program's effectiveness. The dominant source of impairment in Tennessee, like most states, is unregulated agriculture. Improvements in that area are coming from education and development of new technologies and methods for production.

Municipal wastewater utilities are making significant efforts to better manage wastewater and collection systems, which is an improvement. Tennessee's urban populations are seeing fewer sanitary sewer overflows. On the other hand, the state is losing



green space and headwaters to rooftops and pavement, which will have water quality consequences.

Overall, waters are improving where the state is improving systems and controls. Water quality is declining where the state experiences the uncontrolled consequences of growth.

## State Water Quality Rating (1 Poor, 5 Excellent)

The best reference for Tennessee water quality is the state's 305(b) report, [\*The Status of Water Quality in Tennessee\*](#).

Based on the state's report, the ranking of 3 on a 5-scale may be appropriate. The state's waters are almost entirely unimpaired for the uses of domestic water supply, industrial water supply, irrigation, and navigation.

In contrast, 40 percent of assessed waters fail to support fish and aquatic life, and almost half of the assessed waters in Tennessee are impaired for recreation.

Tennessee's most recent 305(b) report identifies MS4 discharges as the fourth leading source of impairment to the state's streams, trailing only animal agriculture, channelization, and crop production. MS4 discharges are by far the leading pollution source in Tennessee that is subject to regulation.



The MS4 mission of protecting public and ecological health, as well as safety and property, gets over-simplified as drainage maintenance.





# Utah

Over the past few years, Utah has increasingly focused on addressing stormwater quality. The Utah Division of Water Quality (DWQ), part of the Utah Department of Environmental Quality, is actively engaged with MS4 permittees to develop stormwater programs that address permit requirements. There are 91 permittees in Utah that are covered by one of the following four Utah Pollutant Discharge Elimination System (UPDES) permits:

- Modified General Permit for Discharges from Small MS4s, UTR090000 (Dec. 2016)
- Jordan Valley Municipalities, UTS000001 (Sep. 2013)
- Salt Lake City, UTS000002 (Feb. 2015)
- Utah Department of Transportation, UTS000003 (Dec. 2015)

## MS4 Regulatory Updates

Permittees are currently required to develop specific hydrologic methods to calculate runoff volumes and flow rates to treat runoff from a specific design storm. However, the December 2016 Small MS4 Permit also contains a provision that will require permittees to retain the 90th percentile volume onsite by March 2020. It is anticipated that future MS4 permits will contain similar prescriptive requirements.



## MS4 Sector Needs

One of the greatest needs in Utah's MS4 sector is unity. Differences in program implementation approaches between MS4 permit holders affects overall perception of water quality requirements. Differences in design, construction, and post-construction requirements cause misunderstandings by the development community regarding water quality requirements. These differences are resulting in inconsistent implementation of MS4 permit programs.

The greatest difficulties in handling the new retention requirements are current

municipal land use and zoning ordinances and Utah's varying geological differences. Solving the unification issue will require coming to a consensus about varying local opinions and permittee practices and overcoming the state's unique geologic and economic MS4 conditions.

Funding is also a need throughout the state. Most municipalities have developed stormwater utility fees to fund stormwater management programs. However, new permit requirements could result in the need for more robust stormwater programs that require additional funding. Possible sources of funding include municipal general funds that have typically been channeled to stormwater programs through public works, public utilities, or maintenance divisions.

## MS4 Sector Challenges

A continuing difficulty in implementing Utah's retention standard and existing permit requirements is getting developers to respond and comply. Successful implementation of new low impact development designs by development and municipal groups will be challenging.

## Trends in Water Quality

Both awareness of water quality and implementation of stormwater requirements are improving. The Utah Storm Water Advisory Committee (USWAC) is perhaps the state's most valuable stormwater organization. The committee provides an opportunity for representatives from each permittee throughout the state to meet once a month with DWQ to discuss permit-related issues and facilitate solutions.

## State Water Quality Rating (1 Poor, 5 Excellent)

Utah's state water quality rating is a 3. Of the 901 waters assessed in Utah's 2016 Integrated Report, 25 percent support assessed or designated uses; 37 percent are either impaired or have an approved or required TMDL; and 37 percent have insufficient data. TMDLs for Utah's impaired waters are not intended to identify pollutant-generating activities, so MS4s cannot use them to interpret their pollution sources. At this point, permittees' impact on receiving waters with respect to allowable effluent concentrations is unknown. With more prescriptive retention and monitoring requirements appearing in MS4 permits, it is expected that DWQ will have a better understanding of permittees' impact in the coming years.







# Virginia

The Virginia Department of Environmental Quality (VDEQ) is the lead agency for developing and implementing statewide stormwater management and nonpoint source pollution control programs to protect the commonwealth's water quality and quantity. As authorized under the State Water Control Law and the federal Clean Water Act, the Virginia Pollutant Discharge Elimination System (VPDES) permitting program regulates point source pollution.

## MS4 Regulatory Updates

VDEQ recently reissued MS4 Phase II General Permit regulations effective 2018 – 2023. Individual MS4 Phase I permittees are scheduled to begin receiving reissued permits. The Chesapeake Bay TMDL — developed by the US EPA for six states and the District of Columbia in the 64,000-square mile watershed — is the largest TMDL of its kind. Portions of Virginia drain to the Chesapeake Bay and must meet Chesapeake Bay TMDL pollution reduction targets for nitrogen, phosphorus, and sediment. These targets are enforced through the special conditions of each successive permit, which started in 2013 and has continued with each reissuance of general and individual permits. These requirements are expected to be fulfilled by 2028 and are rear-loaded in each 5-year permit. Permit holders were required to



reduce TMDL pollution by 5 percent during the previous MS4 permit cycle (2013–2018). The current permit cycle (2018–2023) requires an additional 35 percent (40 percent total) reduction, and the final 60 percent (100 percent total) is required during the third permit cycle (2023–2028). These mandates must be generally accomplished by implementing costly stormwater structural BMPs as retrofits.

Watershed Implementation Plans (WIP) developed by each of the Bay jurisdictions are intended to provide a roadmap for implementing the Chesapeake Bay TMDL. Virginia submitted its Phase I and II WIPs to the US EPA in 2010 and 2012, respectively. The Phase III WIP and associated Phase 6 modeling process — along with plans to create load allocations for unregulated areas outside MS4 service areas — has the potential to move the goal post and require additional reductions beyond those in the Phase II WIP.

Virginia's TMDL program has identified several local impairments and requires a different set of practices and accounting

rules for compliance. The Governor's Executive Order #6 requires review of VDEQ's water quality programs, among others, and the findings have the potential to modify the current regulatory framework.

## MS4 Sector Needs

The greatest need in the MS4 sector is program funding. For MS4s in the Chesapeake Bay watershed, this includes increasing costs to install and maintain stormwater quality infrastructure that addresses mandated Bay TMDL target reductions. The Phase III WIP will likely require even further reductions from localities, necessitating even more funding. For all MS4 localities, increasing program funding is needed for the increased compliance requirements in each successive permit. The state provides some funding through Stormwater Local Assistance Fund (SLAF) grants depending on the governor's budget priorities. To address increasing requirements, urban stormwater funding assistance must increase to levels comparable with those in the wastewater industry.

Funding for drainage and flood mitigation projects, including grey infrastructure maintenance and renewal, also places great burden on localities. For many, funding needs for drainage projects greatly outweigh those for water quality projects. However, with the increased focus on water quality, flood mitigation and drainage projects may not receive the priority and consideration deserved alongside the locality's overall costs.

## MS4 Sector Challenges

Next to funding, the greatest challenge in Virginia's MS4 sector is the lack of regulatory consistency and certainty due to changing requirements. The

Phase III WIP will likely increase pollution reduction requirements. Development of load allocations during this process also threatens stability of the programs.

## Trends in Water Quality

Comparing Virginia's 2016 Water Quality Assessment Integrated Report (IR) with the 2014 IR, state water quality seems to be improving. Impairments decreased over that time, and the percentage of unimpaired waters increased. According to the report, many of the Commonwealth's waters indicate a "supporting" status for one or more designated uses. Efforts by MS4s and increased spending on stormwater management programs has likely contributed to this trend. However, there seems to be an overreliance on bacteria indicators that are often predominantly associated with wildlife, which is likely not a good indicator of MS4 program effectiveness.

## State Water Quality Rating (1 Poor, 5 Excellent)

According to Virginia's 2016 IR, many of the Commonwealth's waters contain data indicating a 'supporting' status for one or more designated uses. Virginia separately reports on rivers, lakes, and estuaries in its reports. Of those assessed, 15% of rivers, 80% of lakes, and 75% of estuaries were impaired, according to the 2016 IR. Given this data, the rating for rivers would be around 4, lakes around 1.5, and estuaries around 2. Overall this gives state waters an average rating of 2.5. Note that there remains a dichotomy between urban and rural streams. Urban waterbodies are assessed more often, which may give the appearance that there are more impairments in urban areas.



# Water Environment Federation



The Water Environment Federation (WEF) is a 501.c.3 organization representing nearly 35,000 water quality practitioners across the U.S. and the world. WEF has been a leader in water quality for nearly a century and is currently a close partner with NMSA on stormwater programs and products.

To articulate its vision for addressing stormwater challenges, WEF convened a meeting of leading stormwater professionals in 2015 that resulted in *Rainfall to Results: The Future of Stormwater*. The report details the challenges, opportunities, and pathways to improving the nation's stormwater systems to make them more efficient, effective, and sustainable. The report was released at the official launch of the [WEF Stormwater Institute \(SWI\)](#), which is the entity that brings together all the organization's stormwater initiatives, products, and groups.

*Rainfall to Results* identifies six objectives central to supporting the future of stormwater vision:

- **Work at the Watershed Scale**  
All communities will have integrated, watershed-scale assessments of water resources needs and challenges.
- **Transform Stormwater Governance**  
Communities will catalyze further formation of stormwater utilities, and stormwater regulations will stimulate stormwater control innovation and performance improvement by focusing on program outcomes.
- **Support Innovation and Best Practices**  
A broad suite of verified stormwater controls and best practices will support confident planning and maintenance.
- **Manage Assets and Resources**  
Stormwater systems will be maintained through robust asset management programs and supported by innovative information technology.
- **Close the Funding Gap**  
Communities will align stormwater management efforts with broader community goals to garner funding options and have access to innovative financing opportunities.



## Highlighted Update

One of the greatest challenges in the stormwater sector is a lack of data on MS4 program needs, resources, and most significantly, the funding gap.

The WEF SWI led the first-ever MS4 Needs Assessment Survey in 2018. This effort targeted more than 6,000 communities to gather data on the leading challenges for MS4 program managers as well as information needs and resources. The survey effort also provided data on current MS4 budgetary needs and anticipated budget shortfalls.

The WEF SWI received more than 600 responses, producing a statistically-significant dataset covering 47 states and all 10 EPA regions. The survey findings indicate that funding and financing of MS4 programs present a clear challenge and informational need. Challenges noted also included evolving regulations and aging infrastructure. Information needs identified include technical information on innovative and green infrastructure practices as well as asset management.

NMSA played a role in this effort and will continue to partner with the WEF SWI on future survey efforts. The survey results were also shared with the American Society of Civil Engineers as they consider including stormwater in their upcoming (2021) Infrastructure Report Card®.

- **Engage the Community**  
Communities will understand and value the contribution stormwater management makes to flood risk reduction, clean and safe water, climate resiliency, and other benefits.

This vision has shaped WEF SWI products and initiatives, including:

- **MS4 Awards Program**  
A recognition program for high-performing and innovative MS4 programs
- **National Green Infrastructure Certification Program (NGICP)**  
A program focused on training entry-level professionals who construct, inspect, and maintain green stormwater infrastructure
- **Stormwater Testing and Evaluation for Products and Practices (STEPP)**  
A national program envisioned to develop ASTM standards for stormwater products and practices and to provide robust verification based on these standards for greater confidence in stormwater system performance



# Concluding Remarks



## **Robert C. Backman**

*Robert is the Chief Operating Officer of AbTech Industries, Inc., which offers innovative solutions for stormwater management and industrial water and wastewater treatment.*

*Robert joined the company in February 2018, bringing over 35 years of business development experience in municipal and industrial water sector markets.*



I remember some years ago when stormwater was relatively unknown and green infrastructure was part of another trend in the sustainability movement. Today, stormwater management and green infrastructure are making their way into the larger conversation about what it means to live in a healthy, safe community. Yet, certain challenges continue to depress nationwide progress.

To move from reactive to proactive stormwater management, municipalities face two key obstacles. These include funding for stormwater programs and regulations for stormwater products and technologies. Stormwater is not only a health and environmental challenge but remains an underfunded regulatory mandate. Aging water infrastructure is at risk, especially as rainfall events increase in size and frequency. In its current condition, the nation's water infrastructure is exposing people to water contaminated with such pollutants as oil, harmful bacteria, and heavy metals linked to a variety of health and environmental dangers. States, regional authorities, individual municipalities, and other stakeholders are bearing the brunt of increased cost from unguarded human-water interactions.

Part of this cost can be attributed to uncertainty around the safety and performance of stormwater technologies and products. There are vast differences in regulations for stormwater solutions, sometimes even within the same state. However, as regulating bodies begin to coordinate, the stormwater sector is poised to expand at a faster rate — beyond the enormous strides it has already made.

Already, site renovations involving environmental restoration and protection are creating jobs, educating communities, and bringing people together. As more communities embrace stormwater solutions, environmental protection and economic stimulation will follow together. I look forward to the exciting and innovative ways the sector will continue to rise above its obstacles.







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