



The Need for National Green Infrastructure Training and Certification

July 14, 2015



Executive Summary

Recently, dramatic shifts have been made toward using green infrastructure as the preferred method for managing stormwater volume and meeting water quality requirements in urban environments. States, counties, municipalities, and regional utilities responsible for stormwater management are making significant investments in green infrastructure to fulfill Municipal Separate Storm Sewer System (MS4) permit requirements, control combined sewer overflows (CSOs), and meet regional watershed restoration goals. While changes in local and regional regulations have driven most green infrastructure implementation, a parallel proliferation of green infrastructure installations across the country is being driven by the green building and sustainability movement through Leadership in Energy and Environmental Design (LEED) and other sustainability rating and certification programs.

Green infrastructure systems being implemented include a multitude of technologies such as bioretention, green roofs, permeable pavement, rainwater harvesting cisterns, and other retention- and detention-based practices. While the technologies differ, their function is similar: to capture and control stormwater volume and improve water quality while delivering a host of secondary triple bottom line (TBL) sustainability benefits. These TBL benefits can include social benefits such as increased community green space and reduced crime, environmental benefits (beyond cleaner water) such as reduced urban heat island effect and habitat creation, and economic benefits such as urban renewal and green jobs creation.

For green infrastructure to be successful and deliver the aforementioned benefits, it must be well-constructed and maintained long term. The construction and maintenance of green infrastructure facilities is typically labor-intensive and needs to be performed by trained and knowledgeable staff. Construction and maintenance activities are accessible to entry-level personnel, provided they receive appropriate training and can demonstrate a base level of applicable knowledge and skill. The entry-level, accessible nature of green infrastructure construction and maintenance jobs offers an opportunity to support job creation and long-term employment opportunities in communities where green infrastructure is being implemented. While the focus of this document is on training and certification related to green infrastructure, benefits of a green infrastructure program extend beyond the environment. Specifically, a link exists between green infrastructure implementation and robust and regular maintenance practices, which entry-level staff can perform. This link matches both the social and economic aspects of TBL benefits of green infrastructure implementation.

Green infrastructure construction and maintenance requires investments in the physical and material aspects of green infrastructure practices and investments in training responsible staff. Ultimately, the skills and knowledge acquired through training and professional development should be captured in a certification reflecting professional expertise. This white paper focuses on the existing universe of green infrastructure and related stormwater certificate/certification programs (with an emphasis on construction and maintenance trainings) while defining and qualifying the difference between the two types of programs. It documents the current disparate and scattered nature of green infrastructure training and certificate/certification programs and outlines the need for a robust, third-party, national green infrastructure certification standard. Similar to other professional credentials that separate training and testing/certification, this standard would ensure competent green infrastructure staff while providing livable wages, professional growth, and job portability. Additionally, it would raise the level of professionalism in the sector for those who construct, inspect, and maintain stormwater management and green infrastructure systems through a robust national green infrastructure training and certification program. The target audience for this effort initially could include entry-level field staff. Eventually, the

program could include certification at the intermediate (field supervisor) level and advanced (green infrastructure construction/maintenance manager) level, promoting long-term employment opportunities within the field.

1 White Paper Goals

The goals of this document include the following:

- **Document green infrastructure implementation drivers**—demonstrate the proliferation of green infrastructure as the preferred approach to stormwater management;
- **Perform a benchmarking study of existing certificate/certification programs**—understand existing green infrastructure and stormwater related certificate/certification programs. Identify existing models, key issues, and lessons learned; and
- **Propose recommended next steps including engagement with key stakeholders**—develop a plan of action based on information presented in this document, moving toward a more actionable phase. A recommended action could include identifying groups with ties to green infrastructure training and certification/certificate and targeting them for engagement. Other potential actions include the development of a more detailed national vision and creating a communication strategy to provide the proper context and motivation for gaining acceptance throughout the sector.

2 Key Drivers for Green Infrastructure Certification

A number of key drivers contribute to increased green infrastructure implementation, an associated increase in green infrastructure maintenance requirements, and, therefore, the demand for a green infrastructure maintenance certification standard. These key drivers illustrate the reasons why green infrastructure facilities have proliferated and highlight the risks of not properly maintaining these facilities. The key drivers fall into the following categories: regulatory and national guidance, green building and construction, and risks associated with inadequate maintenance.

2.1 Regulatory Drivers and National Green Infrastructure Implementation Guidance

Green infrastructure is increasingly being used as a tool to meet the regulatory requirements of managing stormwater runoff. By reducing or mitigating the effects of runoff, green infrastructure provides a means for communities to comply with regulations related to the Clean Water Act. This includes National Pollutant Discharge Elimination System (NPDES)-related MS4 permits, long-term control plans (LTCPs), consent decrees, and total maximum daily loads.

The U.S. Environmental Protection Agency (U.S. EPA) has issued numerous documents and references promoting the use of green infrastructure as the preferred method of stormwater management. The guidance spans from integrating green infrastructure to NPDES permits and LTCPs for CSO control to specific research regarding green infrastructure performance and implementation.

The following excerpt is from U.S. EPA (http://bit.ly/GI_regulatory):

EPA strongly encourages the use of green infrastructure approaches to manage wet weather. Since 2007, EPA's Office of Water has released four policy memos supporting the integration of green infrastructure into NPDES permits and CSO remedies.

There is a similar shift in focus on green infrastructure and low-impact development (LID) practices in the MS4 sector. The recent effort to update U.S. EPA's stormwater program through a national stormwater rulemaking would have established a national performance standard for stormwater management for the first time in the United States. Before the deferment of this regulatory action, U.S. EPA strongly signaled that this standard would likely be retention-based. In the absence of federal action, state MS4 programs are still moving forward with the retention-based approach. Currently, 18 states have some type of retention-based performance standard for stormwater management.

At the national level in 2007, U.S. EPA and four partner organizations (the National Association of Clean Water Agencies, the Association of Clean Water Administrators, the Natural Resources Defense Council, and the Low Impact Development Center) signed a statement of intent promoting green infrastructure as an environmentally preferable approach to stormwater management. In 2014, this effort expanded in the form of the Green Infrastructure Collaborative, a network of 26 partners that includes the Water Environment Federation. These organizations have committed to assist communities in adopting green infrastructure. In addition, seven federal agencies signed a Federal Letter of Support endorsing the collaborative and committing to promote green infrastructure at the federal level (http://bit.ly/GI_Partners).

Support and promotion of green infrastructure nationally has filtered down to the state and local level. Research of all 50 states suggests that 44 states provided state-level green infrastructure guidance on meeting NPDES/MS4 requirements. The result is that many communities at the local level are using green infrastructure to meet wet weather and stormwater management permitting requirements.

Green infrastructure is also being used locally for CSO control. Some examples of communities pursuing green infrastructure for CSO control include Philadelphia, Pennsylvania; Cleveland, Ohio; Cincinnati, Ohio; Louisville, Kentucky; Kansas City, Missouri; New York City; St. Louis, Missouri; Washington, D.C.; Atlanta, Georgia; and Syracuse, New York.

2.2 Influence of Sustainability Rating Systems

A number of existing sustainability rating systems promote green infrastructure implementation. The following examples are not intended to be exhaustive; rather, they are designed to be indicative of green building trends and resulting green infrastructure implementation.

2.2.1 Leadership in Energy and Environmental Design

Leadership in Energy and Environmental Design is a third-party green building certification program run by the U.S. Green Building Council. Projects become LEED certified by meeting specific prerequisites and attaining points within defined sustainable building categories. Categories include "Building Design and Construction", "Interior Design and Construction", "Building Operations and Maintenance", "Neighborhood Development", and "Homes". All of the categories, with the exception of "Interior Design and Construction", include credits for stormwater management using green infrastructure techniques. Since its inception in 2000, approximately 53,000 domestic projects have become LEED certified (<http://www.usgbc.org/leed>).

2.2.2 Sustainable Sites Initiative

Developed in 2006 by the American Society of Landscape Architects, Lady Bird Johnson Wildflower Center, and the U.S. Botanic Garden, the Sustainable Sites Initiative (SITES) is a comprehensive

sustainability rating system for landscapes that includes requirements for on-site stormwater management using green infrastructure techniques. Elements of SITES have been incorporated to LEED, and projects can be certified under both rating systems. A total of 160 projects were piloted during a 2-year period, which culminated in the launch of SITES v2 in 2014. SITES v2 is the first version available to the public (<http://www.sustainablesites.org/>).

2.2.3 Envision

Developed by the Institute for Sustainable Infrastructure, Envision is a rating system for assessing sustainable metrics related to infrastructure projects. The system encourages green infrastructure inclusion as a tool for achieving credits in five categories (<http://www.sustainableinfrastructure.org/>).

2.2.4 Sustainability Tracking Assessment and Rating System

The Association for the Advancement of Sustainability in Higher Education launched the Sustainability Tracking Assessment and Rating System (STARS) in 2007. As of 2014, 682 colleges and universities had registered to use the STARS rating system, with approximately 230 institutions currently rated in the Bronze, Silver, or Gold categories. Under STARS, the credit, “Rainwater Management”, is given only to those institutions using green infrastructure to manage stormwater runoff (<https://stars.aashe.org/>).

2.3 Risks Associated with Poor Construction and/or Inadequate Maintenance

Green infrastructure is an investment in capturing and treating stormwater that can also provide other benefits. When green infrastructure fails or underperforms specifically because of poor construction and/or inadequate maintenance, its functions are not only undermined, but the failure can result in loss of investment and fines because of regulatory noncompliance. Poor construction and/or inadequate maintenance can even result in potential risks to public welfare associated with flooding or exposure to biological contaminants.

A green infrastructure facility is at risk if the staff constructing and/or performing maintenance does not have the proper training, background, and knowledge to understand system functions and maintenance requirements. This risk is carried over to the broader green infrastructure movement, which could lose momentum if facilities underperform and do not fulfill their intended benefits because of widespread inadequate maintenance or poor construction.

Specifically related to maintenance, examples of common missteps that can result in green infrastructure system failure with significant implications include under-watering new plants, cutting or removing desired plant species, or applying unnecessary fertilizer, resulting in excess nutrients. Other common missteps by untrained green infrastructure maintenance staff include failure to remove sediments that can clog bioretention and porous pavements and puncturing green roof waterproofing membranes, resulting in water damage to buildings. Additionally, a failure to log or track maintenance, which results in too few maintenance visits, and allowing mosquito growth and contamination in rainwater harvesting systems are other common mistakes.

3 Benchmarking Study of Green Infrastructure and Stormwater Certification/Certificate Programs in the United States

3.1 Introduction

A review of existing certificate/certification programs for green infrastructure and stormwater management was performed to provide a baseline understanding of this sector (see the “Methods” section in the appendix for more information). This investigation revealed a heterogeneous population of programs that vary in many dimensions. Under some certification programs, construction and maintenance of green infrastructure systems is driven strictly by regulatory requirements, while others focus on a spirit of environmental stewardship. Similarly, the technical depth and complexity of programs varies widely. One significant finding is that a relatively small number of programs focus specifically on maintenance. Most programs cover a wide range of issues, including background, design, construction/installation, inspection, and maintenance.

Generally, programs can be broken down into the following categories, which reflect the entity that created and currently runs the programs:

- National;
- Local, state, and regional;
- Educational;
- Nongovernmental organizations (NGOs) and workforce development groups; and
- Manufactured device producers and trade associations.

This section provides summary information on programs within each category and highlights illustrative examples that may inform a national certification program. The appendix of this document provides additional information on these programs such as target audience, scope and subject of program, technical focus, program architecture and funding, scale, and relative maturity.

3.2 Certification Credibility and Program Elements

In the stormwater field, the terms “certification” and “certificate” are used interchangeably, and often in a manner that is inconsistent with the technical or legal definitions of these terms. Specifically, programs across the country vary in how they train and test professionals in stormwater technical areas, including erosion and sediment control (ESC), post-construction stormwater management, green infrastructure, and LID.

Certification programs are designed to verify a learner’s competency, which is obtained from a wide variety of technical training resources. Certification programs are not to test knowledge of a specific training course or session. During development of a certification exam, “need-to-know” (NTK) criteria are established with the help of subject matter experts. These criteria are used to drive training program curriculum development to ensure that NTK criteria are addressed.

However, it is essential that a strong separation exist between the development of certification exams and the training materials associated with the certification program. Otherwise, program administrators may “train to the test” rather than training to the competencies required for professionals to perform in the sector.

This is in contrast with certificate programs, which are typically less formal and may be associated with continuing education programs. The distinction between “certificate” and “certification” is described

through the American National Standards Institute/National Organization for Competency Assurance (ANSI/NOCA) standard 1100, established in 2009, which states that a certificate program (or an “assessment-based certificate”) is “awarded to someone who attends a particular course of instruction and passes a test based on that course”. In contrast, a “professional certification” is “awarded to someone who passes an examination based on broad industry knowledge that is independent of training courses or course providers”. The Institute for Credentialing Excellence (ICE) provides further clarification of the distinction between “certification” and “certificate” through their 2010 document titled, “Defining Features of Quality Certification and Assessment-Based Certificate Programs”. This document defines a certification program as one in which “the certification program provider conducts the certification program independently of any educational/training programs”, and adds that, “the certification program provider is not the sole provider of any education/training that may be required for certification”.

A review of stormwater sector programs reveals that many use the term “certification”, but do not include the firewalls associated with formal professional certification programs. Rather, existing programs have developed training curricula that may be based on limited stakeholder input¹ and administer both training courses and certifying exams. Some programs have developed more formal procedures to create a firewall between training efforts and proctoring exams, which helps provide additional credibility. However, no programs identified during this review, especially in the green infrastructure maintenance space, met the level of formality associated with a professional certification program as defined by the industry standards cited previously. Therefore, there is a need for a green infrastructure training and certification program on a national level that provides a firewall between training and examination.

Another type of credentialing program in the green infrastructure field is professional licensing associated with engineers (professional engineer) and landscape architects (registered landscape architect). The terms “licensure” and “certification” are often incorrectly used interchangeably as well. A license is granted by an official government or legal authority authorizing an individual to practice the licensed services, similar to a driver’s license or a medical license. In contrast, certifications are often associated with voluntary credentialing of specified skills. In most instances, certifications are not required legally; however, they may be required by a hiring agency to ensure an individual has the proper skills and knowledge.

3.3 National Level

There are five main organizations with certification or certificate programs accepted by several states. These include

- EnviroCert International,
- Stormwater ONE,
- American Public Works Association (APWA),
- National Stormwater Center (NSC), and
- Certified Inspector of Sediment and Erosion Control (CISEC).

Programs typically cover either ESC, postconstruction stormwater management, or both. Because of regulatory history, training and certificate/certification programs in ESC are generally more mature. For instance, EnviroCert International, a national nonprofit, and CISEC, a private for-profit entity, both focus

¹Additional investigation is needed to determine curriculum development procedures associated with existing programs.

on ECS and were established more than 15 years ago. EnviroCert International appears to be the most ubiquitous of the programs reviewed in terms of state approval and usage. Other programs, including the one managed by the national for-profit company Stormwater ONE, have a strong establishment in the commercial and residential land-development sectors. Rather than specific technologies, postconstruction programs typically focus on regulatory compliance and permitting such as developing stormwater pollution prevention plans (SWPPPs) or understanding MS4 program and associated requirements. The National Stormwater Center, for instance, focuses primarily on MS4 permitting and programmatic topics. The national trade association, APWA, covers maintenance issues to a certain degree, but this is considered a secondary emphasis compared to other topics, such as siting, design, construction, and programmatic and regulatory topics.

One common element among all of these programs is that none meet the ANSI/NOCA 1100 or ICE standards described previously for a professional certification program, although some meet the IACET guidelines. This underscores the need for a robust certification program for green infrastructure construction and maintenance professionals that will raise the level of professionalism in the industry and provide job portability.

3.4 Local, State, and Regional Programs

A number of certificate/certification programs currently exist for green infrastructure and stormwater management at the regional, state, and local levels. Regional, state, and local programs tend to be driven by regulatory needs in addition to volunteer and public engagement. Additionally, the nature of the programs varies by scope, from building envelope to site area. Technical focus also varies; for instance, some programs focus more on landscape maintenance than stormwater.

All states were reviewed to check if they had any green infrastructure or stormwater related certificate/certification programs in existence. The following findings summarize the status of state-level programs:

- Approximately 36 states have some type of stormwater or ESC certification requirement;
- Only two states (Michigan and Florida) offer a specific Stormwater Operator Certification; and
- Fourteen of the 36 states have their own stormwater certification, training, or certificate program.

There are more states with ESC-focused programs, which are typically more mature than postconstruction or green infrastructure-focused programs. However, there are examples of green infrastructure-focused programs being developed that may prove useful to stormwater professionals. An example of a local government providing basic training on stormwater facility inspection and maintenance is provided in the appendix, highlighting a common practice for MS4 communities. This type of training, however, does not provide job reciprocity and does not fit the technical definition of “certification”. A robust program with national buy-in would improve job reciprocity by setting consistent standards across regions.

3.5 Educational Programs

A significant number of green infrastructure programs are run by or through educational institutions, and the drivers and nature of these programs vary. For instance, drivers may include local and state regulatory requirements or an identified need for professionals with basic skills and knowledge of stormwater and green infrastructure. Of those highlighted in the appendix, the North Carolina State program is a strong example of a robust technical certificate program, with the University of Minnesota and Washington State University programs not far behind. In each of these programs, there appears to be a strong focus on

technical background and design components and also careful consideration of green infrastructure practice inspection and maintenance. All of these programs include some type of in-field component and are generally inexpensive. Some, however, are relatively young, and, as such, their sustainability is unclear. Regardless, these programs have the potential to deliver training to support a national certification program considering the technically robust nature of the curricula.

3.6 Nongovernmental Organization and Workforce Development Programs

Beyond education and state- and regional-based programs, a number of NGOs have attempted to fill the void of a certificate/certification program for green infrastructure design, construction, and maintenance services. The programs highlighted in the appendix illustrate the variability associated with NGO and workforce development programs. The “Build it Green” program is an example of a building-envelope focused program. It is largely driven by the green building movement associated with LEED and similar programs. The “Wild Ones Ecoscaper” program represents landscaping or horticultural-focused programs that may be more appropriate for home or professional gardeners. These landscape-focused programs are limited when viewed in the context of green infrastructure. The “Monterey Green Gardeners” program, on the other hand, has aspects of various workforce and NGO programs and may be a strong partner in a national green infrastructure certification program. The City of Columbus’s “Blueprint Columbus” is a local workforce development program that provides green infrastructure maintenance certification through classroom and in-field experience and is focused on livable-wage jobs and entry-level workers.

3.7 Manufactured Device Producers and Trade Associations

The last category of green infrastructure certificate/certification programs is tied to stormwater equipment manufacturers and trade associations. These programs focus more on structural stormwater controls, such as rainwater harvesting, green roofs, and permeable pavement products, more so than vegetative practices. A common weakness of these programs in the context of a national green infrastructure certification program is the relatively high cost and time investment faced by learners. Additionally, these programs are focused on specific green infrastructure practices and do not provide a comprehensive green infrastructure construction and maintenance program. While the specialized nature of manufactured devices may justify certification/certificate programs based on a single product or practice, only the basic skills and knowledge would apply when integrating these programs into a national model. None of the programs in this category meet the technical definition of a certification program, and there tends to be a focus on in-classroom or online learning with less focus on in-field training.

3.8 Certification Programs in Other Industries

A brief analysis of programs in other industries provides examples of certification, rather than certificate, programs. The Oncology Nursing Certification Corporation, for example, offers a certification program, but they do not provide training within their organization. They provide a firewall between learning and testing, which helps ensure that exams are based on skills and knowledge in the sector of interest rather than specific training material. They also require learners to complete 10 contact hours of continuing education before sitting for the exam, and those hours must be obtained from an accredited provider. Other certifying organizations that provide a firewall between training and exam administration include the National Institute for Certification in Engineering Technologies and the Certified Professional Constructor Certification.

The California Water Environment Association (CWEA) leads a program offering several certifications covering various aspects of the wastewater sector. The CWEA revalidates one program each year. During the revalidation process, subject matter experts review existing content and new practices and regulations are added. Training is provided through CWEA events and by in-house and private trainers. To award contact hours to certificate holders, private trainers are required to seek pre-approval from CWEA.

Another example of professional certification in the clean water sector is led by the Association of Boards of Certification (ABC) and provides several certifications for wastewater, collection system, and drinking water operators. The ABC develops certification exams through a 2-year process in which hundreds of subject matter experts are surveyed. Training is provided by outside providers. The ABC uses a long list of criteria to review training material and approve providers.

3.9 Benchmarking Study Summary

Green infrastructure cuts across multiple professions, including landscape architects, engineers, scientists, permit compliance specialists, and field inspectors. Similarly, those involved in training and certifying green infrastructure professionals vary and include academics, workforce development specialists, product manufacturers, regulatory program managers, and stormwater training specialists. Given these variations and the fact that the stormwater sector is still relatively young, the spectrum of training and certification/certificate programs and their varying nature, scale, and focus is not surprising. There is, however, a consistent theme across these programs: that is, the lack of firewalls within certification programs. A number of national programs exist in the sector, but there is no national certifying body for green infrastructure or stormwater construction, inspection, and maintenance that stands alone and apart from other training programs. While local and regional programs exist, they are limited in scope or scale. The void of green infrastructure certification in the stormwater sector suggests that the creation of a national program is needed. Such a program would ensure long-term performance of green infrastructure facilities and elevate the status of green infrastructure professionals, while moving toward a living wage and job portability afforded other professions.

4 Conclusions, Recommendations, and Next Steps

The effects of the built environment on the nation's water resources are significant. Urban and suburban development has altered the balance of water distribution and led to degraded headwater streams, increasing pollutant loadings in receiving waters, and higher incidences of flooding. The regulatory community recognizes these effects, issuing policy guidance and regulatory actions to compel communities to adequately address stormwater runoff. Specifically, U.S. EPA has keen interest in promoting green infrastructure to augment or enhance more traditional stormwater and wet weather flow management methods. Sustainability rating systems promoting green practices have also grown in the last decade.

Green infrastructure implementation and maintenance are both critical aspects of successful, long-term infrastructure investments. Practices must be designed and constructed using sound techniques and maintained with a robust and well-skilled maintenance workforce to inspect and correct deficiencies to ensure long-term performance. A number of certification/certificate programs have been established to provide the sector with qualified professionals related to the planning, design, construction, inspection, and maintenance of stormwater control measures. Some programs focus on the construction phase while others address postconstruction scenarios. Program scales range from the national to local level, while

organizers include universities, state and local governments, NGOs, manufacturers, and for-profit training companies. These programs have collectively done a great deal to provide technical knowledge and skills for professionals in the stormwater sector. However, the lack of a national program may limit the ability of the sector to meet the growing demand for trained green infrastructure construction and maintenance professionals. A national green infrastructure training and certification program need not compete with existing training, certification, and certificate programs. In fact, the knowledge and experience gained by these existing programs can be leveraged to create a robust and technically sound national program.

Ultimately, a national certification program could raise the level of professionalism in the sector for those who design/construct, inspect, and maintain stormwater management and green infrastructure systems by formalizing their skill and knowledge set. This formalization should result in increased job portability, living wage salaries based on credentials and capabilities, and opportunities for professional growth. A national certification program would provide not only social benefits, but also help the United States realize the goal of fishable and swimmable waters across the country.

The following are next-step recommendations for the development of a national green infrastructure training and certification program:

1. Develop a national core stakeholder group to solicit input on this document and support advancement of a national green infrastructure training and certification program. Stakeholders would include wastewater utilities and MS4 communities with significant existing or upcoming green infrastructure programs and NGOs, professional or industry groups, and federal regulators involved in green infrastructure implementation.
2. Seek funding to support ongoing efforts related to a national green infrastructure training and certification program.
3. Engage in an in-depth investigation of a national green infrastructure training and certification program.
4. Develop the initial framework for a national green infrastructure training and certification program that leverages existing stormwater and green infrastructure training programs.
5. Report the investigative findings to the stormwater sector.

Appendix

Examples of Green Infrastructure and Stormwater Management Certification/Certificate Programs in the United States

1 Introduction

This document provides examples of certification/certificate programs in the stormwater management sector, including ESC and green infrastructure programs from varying regions in the United States. This appendix is not intended to represent a comprehensive and exhaustive listing of programs; rather, it presents a sampling of programs in each category. Program categories include the following:

- National;
- Local, state, and regional;
- Educational;
- Nongovernmental organizations and workforce development groups; and
- Manufactured device producers and trade associations.

2 Methods

The certification/certificate program examples provided throughout this document were reviewed and compiled through online research. Individual organizations and programs were not contacted directly to verify the information presented. The examples presented are based on publicly available information. The criteria used to examine each program includes organization or program maturity, scope and subject of the program, technical focus, program architecture and funding, scale, certification/certificate and training requirements, and target audience.

3 National Level

The following are the five main organizations with certifications/certificate programs that are accepted by several states:

- EnviroCert International,
- Stormwater ONE,
- American Public Works Association,
- National Stormwater Center, and
- Certified Inspector of Sediment and Erosion Control.

3.1 EnviroCert International

EnviroCert International is a 501(c)(6) nonprofit organization that offers the following professional certifications related to stormwater:

- Certified Professional in Erosion and Sediment Control™ (CPESC®) (valid for 1 year),
- Certified Erosion, Sediment and Storm Water Inspector™ (CESSWI™) (valid for 1 year),
- Certified Professional in Storm Water Quality™ (CPSWQ®) (valid for 1 year), and
- Certified Municipal Separate Storm Sewer System Specialist™ (CMS4S™) (valid for 1 year).

These certificate programs cover a wide range of topics, including regulations, design, construction, and inspection and maintenance for both ESC and postconstruction topics. However, the ESC certificate programs are the most widely recognized. A prerequisite for certification includes a review of education background (high school or college level), other technical accreditations, employment history, and references. If deemed acceptable, professionals can sit for an optional 1-day exam review course with an exam given in a separate session, typically spaced 1 day apart. No classroom time is required to become certified under any of EnviroCert's programs; one needs only to pass the exam. There is not a field component for any of their certificate programs. Training and examination sessions can be held by EnviroCert or a private party. According to their Web site, the cost for a 1-day exam review hosted by EnviroCert is \$300, and it is an additional \$100 to take the exam. All certificates are valid for 1 year and require a specified number of professional development hours for the certificate to remain in good standing.

3.2 Stormwater ONE

In operation since 2007, Stormwater ONE is a private occupational trade school for stormwater management. It provides online training and certificate programs in stormwater management and ESC. Its certificate programs and continuing education are based on each state's requirements. Programs include

- Qualified Compliance Inspector of Stormwater Certificate (QCIS) and
- Qualified Preparer of Storm Water Pollution Prevention Plans (QPSWPPP).

The aforementioned certificates are valid for 2 years and have been reviewed and recognized by the U.S. EPA and the U.S. Green Building Council as approved training. The "tuition" cost ranges from \$319 to \$739. The training courses range from 4 to 18 hours, depending on initial certification or recertification and subject matter. An exam is integrated with the training to ensure participant learning meets the level necessary for the specific certificate program. The QCIS certificate program is a "credentialing program [that] educates individuals to properly inspect and maintain a construction site", while the QPSWPPP certificate program "educates individuals to prepare construction SWPPPs".

Stormwater ONE also provides company training, with validity for 1 year, to help companies like Home Depot, K. Hovnanian® Homes, and American Infrastructure meet certain requirements. For instance, there are versions of both the QCIS and QPSWPPP programs specific to Home Depot construction projects. The Home Depot-specific QCIS program is the company's official "Stormwater Professional Training Program" and is mandatory for all land-disturbing contractors and supervisors. Stormwater ONE also offers "Intro to ESC" subcontractor short courses, a basic course to educate and qualify non-land-disturbing subcontractors and support staff to access Home Depot, American Infrastructure, and K. Hovnanian construction sites. Additional programs include the American Infrastructure Stormwater Management Training Program and the Certified Compliance Inspector of Stormwater program for K. Hovnanian.

3.3 American Public Works Association

The APWA launched the Certified Stormwater Manager (CSM) certification at the 2008 International Public Works Congress & Exposition in New Orleans, Louisiana. The CSM certification is intended for experts in the public and private sectors who coordinate and implement stormwater management programs for city, county, state, provincial, and federal agencies. Before taking an exam, a professional is required to submit an eligibility application, which costs \$245 for those who are not members of APWA. The application focuses on a combination of education and work experience. If found eligible, a professional has 1 year to sit for an exam either at APWA's annual conference or via an "Assessment

Center”, either of which costs \$550. Because there is no classroom component or other preparatory materials noted by APWA, it is assumed that this is more of a recognition program than one aimed at skills development. Exam topics include general stormwater management, MS4 program management, communication and public outreach, planning and design issues, regulatory programs, review of best management practices (BMPs), overview of hydrology and hydraulics, and operations and maintenance. This certification is valid for 5 years, with no professional development requirements for maintaining the certification. While the topic of operations and maintenance is included in the exam, there is no field component and little to no opportunity to learn the skills needed to effectively inspect, operate, and maintain green infrastructure.

3.4 National Stormwater Center

The NSC serves the needs of MS4 and industrial and construction stormwater permittees through stormwater inspector training and compliance services and products. It offers the following certificate programs:

- Municipal Certified Stormwater Inspector (valid for 5 years),
- Construction Certified Stormwater Inspector (valid for 5 years),
- Industrial Certified Stormwater Inspector (valid for 5 years),
- Certified Stormwater Inspector recertification (extends certification for another 5 years),
- California Certified Stormwater Inspector (focused on MS4 programs specifically for California), and
- Puerto Rico Certified Stormwater Inspector (focused on MS4 programs specifically for Puerto Rico).

The nature of these programs reflects NSC’s belief “that permit compliance is the key to achieving the goals of the Clean Water Act, and that inspectors make the difference”. In this context, the term, “inspector”, does not refer solely to professionals who spend a majority of their workday inspecting and maintaining stormwater runoff control practices. Topics covered in the municipal program include instruction in federal, state, and local laws; illicit discharge detection and elimination; pollution prevention; postconstruction; public involvement and education; and inspector protocols. The 2-day course required to take a certifying exam does not include a field component, and the topics are closely tied to regulations; as such, one can infer that these certificate programs are not tailored to maintenance professionals. Additionally, the cost for a 2-day in-person course or a 4-day online version, plus the exam, is \$825, which makes it clear that this is not targeting entry-level professionals. The NSC certification is valid for 5 years and there is no information regarding ongoing professional development requirements.

3.5 Certified Inspector of Sediment and Erosion Control

The CISEC is a private, for-profit entity that administers a nationwide certification program recognizing the skills, experience, and knowledge of inspectors who have demonstrated proficiency in observing, inspecting, and reporting on the implementation of SWPPPs. As the name implies, this program is focused primarily on ESC issues and topics. The path to certification starts with an initial application submittal, which requires at least 2 years of ESC field experience, a complete understanding of sediment and erosion processes, the ability to “read and understand” SWPPPs, and the ability to meet U.S. EPA’s requirements for a qualified inspector. Training modules are provided by CISEC before examinations, although training is not required before the exam. Training consists of a 2-day course covering regulations, ESC BMPs, and inspection skills. The cost for a training module ranges from \$325 and \$355. The exam cost is \$150 if a training module is taken immediately before the exam or \$350 for a stand-

alone exam. Certification holders are expected to accumulate at least 36 continuing development hours over a 3-year period to maintain the certification. These hours can be obtained through field work, volunteer time spent on ESC activities, attending technical conferences, and by publishing or presenting information related to the ESC field.

Table 1 shows an estimate of states in which national certifications/certificate programs are accepted. It is important to note that the table may be incomplete; however, it is intended to provide a snapshot for various states across the United States.

Table 1: Sampling of States Accepting National Certificate Programs

State	EnviroCert International	CISEC	APWA	Stormwater ONE	NSC
Minnesota	CPESC, CPWSQ, CESSWI				
Kentucky	CPESC, CPWSQ				
New York	CPESC				
Missouri	CPSWQ, CESSWI, CPESC, CMS4S	CISEC	CMS		Certified Stormwater Inspector
Arkansas	CMS4S, CESSWI				
Kansas	CESSWI	CISEC		QCIS	
Arizona	CPESC				
Hawaii	CESSWI				
Ohio	CPSWQ, CESSWI, CPESC, CMS4S				
Indiana	CPSWQ, CESSWI, CPESC, CMS4S				
California	CPSWQ, CESSWI, CPESC	CISEC			Certified Stormwater Inspector (municipal)
Iowa	CESSWI	CISEC			

4 Local, State, and Regional Programs

4.1 Local—Montgomery County, Maryland

The Montgomery County Department of Environmental Protection, located in a Rockville, Maryland, a suburb of Washington, D.C., has established the Stormwater Facility Maintenance Contractor Training Program. This program is designed to ensure that contractors inspecting and maintaining stormwater

infrastructure have the necessary knowledge and skills. To perform maintenance services for the county, a contractor must attend a training course and pass an “interim” test. The cost for this certification is not listed.

4.2 State—Iowa

Rainscaping Iowa is a state organization with the goal of promoting “infiltration-based stormwater management practices that protect water quality and reduce polluted runoff”. This organization was formed and funded by the following Iowa-based groups: the Department of Natural Resources, Department of Agricultural and Land Stewardship, Department of Economic Development, Department of Transportation, Iowa Association of Municipal Utilities, and the Polk County Soil and Water Conservation District. Rainscaping Iowa’s “Certified Rainscaper” program offers the following certification options: designer, installer, industry installer (for proprietary devices), and a combined designer and installer choice. The separate designer and installer certifications focus on practices such as bioretention, bioswales, and permeable pavement systems. The combined “designer and installer” certification focuses on more landscape-based practices such as native landscaping and soil quality restoration. The cost to take an exam is \$50 per certification. Benefits for the program include access to marketing resources, networking opportunities, and professional recognition (i.e., being added to the database of certified professionals).

An associated program is the Iowa Certified Inspection and Maintenance Program for Stormwater Practices, which is a certification gained by attending a workshop at a cost of \$65 and passing an exam at the end of the workshop. There are currently less than 30 professionals certified under this program.

4.3 State—Florida

The Florida Stormwater Association (FSA) manages a number of certification programs focusing on ESC and related issues. The FSA Operator Certification program has two levels, along with recertification classes, to stay current at both levels. These programs are recognized by the Florida Department of Environmental Protection. The Level 1 program is “intended to improve the knowledge and competency of stormwater management field personnel...such as foremen, technicians, heavy equipment operators, road stabilization crews, and crew leaders, etc.”. A review of the course agenda for Level 1 shows that the course covers the basics of stormwater management and associated practices, with a focus on maintenance, “good housekeeping”, and work zone safety topics. The Level 1 course also provides an overview of equipment often used in stormwater construction, inspection, and maintenance. The 2-day course, which takes place in the classroom, costs FSA members \$219 and nonmembers \$279.

The same format and costs apply to Level 2. However, this level is “intended to familiarize stormwater management field supervisors with the tools necessary to effectively implement your organization’s goals and objectives”. In Level 2, the focus is on supervising field personnel and activities associated with stormwater management infrastructure, but the course also includes more MS4 program requirements as well as budget, funding, and financing issues. Each level is valid for 5 years before recertification is required, and the recertification costs are \$149 for FSA members and \$199 for nonmembers. The FSA also has a program focusing on ESC issues referred to as the “Stormwater, Erosion & Sedimentation Control Inspector Training & Certification” program. This program is intended to “increase the use of proper design, construction and maintenance of erosion and sediment controls during construction” and targets “inspectors and private contractors/developers...public works personnel and engineers”. This program consists of two components: the basic course and the certification course. As with the Level 1

and 2 trainings, the courses associated with this program are 2-day courses that cost \$149 and \$199 and \$219 and \$279 for members and nonmembers, respectively.

4.4 State Department of Transportation—The California Department of Transportation

California Department of Transportation (also known as “Caltrans”) certification programs ensure that professionals working on stormwater projects have the skills needed to perform at an acceptable level. Programs include the Qualified SWPPP Practitioner (QSP) and Qualified SWPPP Developer (QSD). These two certifications are based on meeting and applying the elements of a SWPPP. The QSD is for those who write, amend, and certify SWPPP documents, whereas QSPs are limited to implementing the SWPPP. Because this program focuses on SWPPPs, there is an emphasis on ESC activities and practices, with less of a focus on postconstruction topics. As with many state departments of transportation programs, a professional license (e.g., professional engineer, geologist, landscape architect, or hydrologist) is automatically recognized as both a QSD and QSP. Others can obtain certification through training courses offered by multiple private parties. These trainings commonly are 2-day QSP or 3-day QSD trainings at a cost of approximately \$300 to \$400 or \$500 to \$600, respectively. Beyond training, one must pass a half-day QSD or QSP exam, which costs \$125 and is valid for 2 years. Renewal of these certifications requires a review of construction general permit documents and a renewal fee of approximately \$100. Certification can also be obtained via other related certifications (CPESC, CPSWQ, CESSWI, or CISEC), with additional training required in some instances.

4.5 Regional—Chesapeake Bay Region

A consortium of partners including nonprofits, universities, and state and local governments within the Chesapeake Bay region have developed the Chesapeake Bay Landscape Professional Certification program. The program includes a Maintenance Tier for landscape professionals who maintain such practices as rain gardens, bioswales, tree plantings, riparian buffers, and cisterns. The program provides “trusted, skilled contractors to local governments, non-profits, and property owners”. It protects green infrastructure investments and ensures properly designed, installed, and maintained practices. Additional goals are to reduce duplication of landscape contractor training efforts across the region and to increase trade marketability and earning potential. Program pilots are expected to be rolled out in 2015. No further information related to this program, such as costs and curriculum, is available online.

5 Educational Programs

5.1 North Carolina State University

The BMP Inspection and Maintenance Certification is one of many certificate/certification programs related to green infrastructure that are offered through the North Carolina State University (NCSU) Cooperative Extension. This program is well organized and directed specifically to green infrastructure maintenance issues. The NCSU’s database includes more than 2,000 people who have gone through this program. While it is called a “certification” program, it is not clear that the framework reflects a robust certification program with the firewall between the testing body and training body and formal development of NTK criteria. There are formal rules regarding the timing of testing and retesting and those related to passing the test to become “certified”. The NCSU encourages requiring this certification program at the local level, for example, “communities in North Carolina may either require or recommend this certification of people who conduct maintenance on and/or inspect stormwater management practices”. The training agenda shows that the basic principles of stormwater management

and green infrastructure/LID are covered. Additionally, there is a focus on the maintenance aspect of each practice, and a field tour of practices makes this a course relevant to the type of approach that should be considered for a national course. The cost for taking the course and test is \$265 for a “regular registration”, which is a reasonable price point considering that recertification is required every 3 years at a cost of only \$75.

5.2 University of Minnesota

The University of Minnesota launched a certificate/certification program focused on BMP maintenance in 2014. A review of the agenda and materials reveals a robust 2-day course covering common green infrastructure practices and maintenance needs. More specifically, there are technical sessions and materials that clearly illustrate common maintenance issues and approaches. Similar to the NCSU course, there is an outdoor component to the training. Funding for this program is unclear, and while it is young program, it still may provide a strong model for a national certificate program. However, structural changes are required for this type of program to be considered a certification program.

5.3 University of Massachusetts Amherst

The University of Massachusetts (“UMass”) Extension “Green School” program (Amherst, Massachusetts) “emphasizes a systems-based approach to plant care...and focuses on environmental stewardship, best management practices, and integrated pest management”. At \$725, the program is costly; it is also time-intensive, with 12 classes required over a course of 2 to 3 months. It focuses more heavily on horticultural practices than the Minnesota or North Carolina programs. Considering these facts, this program would not be applicable for a national green infrastructure training and certification program.

5.4 Syracuse University

The Green Train Landscaping and Urban Ecology program was created in 2010 through a partnership between the Syracuse University College of Science and Forestry and a number of social, community, and economic development groups. This program coincided with Onondaga County and the City of Syracuse’s (New York) increased use of green infrastructure and one of the program goals is to “prepare Syracuse citizens with the knowledge, skills, and attitudes necessary for employment in the emerging field of green infrastructure”. Another goal is to partner with regional organizations to train underemployed local residents in an emerging green sector, while also supporting innovative stormwater management in Syracuse. This program includes 8 weeks of classroom training on stormwater and green infrastructure and hands-on experience installing practices locally. A 2-week internship with nurseries and landscape contractors also allows participants to gain professional experience. This program focuses primarily on workforce issues, and no information is presented regarding certificate/certification.

5.5 Washington State University

The Washington State University (WSU) Extension established an LID Certificate Program that is also supported by the WSU Civil and Environmental Engineering Department. The intent is for certified individuals to indicate that they have received the latest design concepts for LID practices and have a level of technical knowledge necessary to recognize design opportunities and challenges to optimize LID systems. The intended audience includes engineers, planners, landscape architects, and local government staff who deal with stormwater programs. To gain certification through this program, one must complete four 2-day courses that cover the following: bioretention; permeable pavements; site planning; and LID for buildings, including green roofs, LID foundations, and rainwater harvesting systems. Individuals must

also complete two 2-hour lectures that can include a site tour of various LID facilities. They must also pass five different online tests covering the four areas cited previously in addition to an overall final exam. Finally, all of the exams must be taken and passed within the same year that courses and lectures are attended. The cost to attend all four required workshops is \$220, and it is unclear if exams and lectures incur an additional cost. Agendas for the workshops are available online, and they indicate that each workshop covers background, design and construction considerations, siting, and inspection and maintenance issues related to specific practices. A site visit is incorporated to each workshop. There is no information on how long the certificate is valid or how renewal is performed.

6 Nongovernmental Organization and Workforce Development Programs

6.1 Build It Green

An NGO called “Build it Green” has established a program to “provide building professionals with the technical expertise they need to build and certify quality green buildings”, which focuses primarily on the building envelope. A certified green building professional designation is required to take a 2-day course covering issues such as energy conservation and efficiency, resource conservation (including water conservation and reuse), and indoor air quality. Individuals must also take an exam. Costs for this program are unknown because they require credentials to gain this information.

6.2 Wild Ones Ecoscaper Program

The Wild Ones Ecoscaper certification program was created to enhance “knowledge about landscaping in harmony with nature”. This program has three levels that move from the “basics of native landscaping” to “more challenging experiences outside your backyard” and, finally, to “thinking more on your own and [getting] out into the community”. This group is an environmental NGO focusing on education and advocacy. Certification at any of the three levels costs \$60 for members and \$150 for nonmembers, and continuing education credits cost \$15 per application.

6.3 City of Columbus Blueprint Program

The City of Columbus, Ohio, has partnered with a variety of groups in the private, academic, and NGO sectors to train a workforce that can provide high-quality construction and maintenance of green infrastructure practices in support of the city’s efforts to alleviate CSOs and sanitary sewer overflows. The Blueprint Columbus Workforce Development Program is an initiative to address poverty and unemployment with small, minority, and female-oriented business development coupled with efforts to solve wet weather issues. The city is leveraging local technical knowledge in academic institutions to develop and deliver a training curriculum structured around livable-wage jobs specifically to construct and maintain green infrastructure practices. This curriculum includes “applied environmental concepts”, such as soil properties, hydrology, and plant identification, developed by Columbus State Community College. Course participants also study stormwater control measures, including construction and installation, and maintenance and Occupational Safety and Health Administration training. Additionally, to increase job retention, coursework includes a 4-week work-readiness training program that provides entry-level workforce skills and knowledge. A certificate is granted upon completion of the program that can be viewed as the equivalent of on-the-job experience.

6.4 Monterey Bay, California, Green Gardeners Program

A consortium of environmental nonprofits and local and regional trade associations in landscaping has created a series of Monterey Bay-Friendly Landscaping Programs. The goal of these programs is to

“encourage behavior changes that lessen the impact of conventional landscape practices on the local environment by providing home gardeners, landscape professionals, and local governments with the necessary skills and resources to create beautiful, healthy, and sustainable gardens and landscapes”. Specifically related to water conservation and stormwater practices, the Green Gardener Certification Program has a basic level of certification requiring 20 total hours of instruction through weekday evening classes over 10 weeks. There is also an advanced certification requiring an additional 10 hours of training over 4 weeks. Both include a weekend project and both require passing an exam. Topics covered in the basic level focus on horticultural topics such as soil health, pest management, irrigation, and mulching. The advanced level covers topics such as green and sustainable design, efficient irrigation design and technologies, graywater irrigation systems, stormwater management, and LID practices. The training and exam costs are unclear, but are estimated at approximately \$200.

7 Manufactured Device Producers and Trade Associations

7.1 American Rainwater Catchment Systems Association

The American Rainwater Catchment Systems Association (ARCSA) established a Rainwater Harvesting Certification program that provides accreditation of skills and knowledge for professionals in the rainwater harvesting sector, ranging from an introductory level to an advanced level. The most basic level is the “Certified Associate” program, which requires membership to ARCSA, completion of a 6- to 8-hour workshop, and passing an exam with 70% or better. Combined, the workshop and exam cost \$275. Additional levels include the “Accredited Professional”, “Design and Construction”, “Inspection Specialist”, and “Rainwater Harvesting Master” programs. To become an Inspection Specialist, one must be an ARCSA member and an Accredited Professional. Additionally, individuals must complete a workshop and pass an exam. The Inspection Specialist level is designed to provide “the tools needed to make rainwater harvesting system inspections”, and covers developing an initial assessment of the system and follow-up inspections. Students also learn how to fill out inspection checklists while making a visual inspection of a system. Recertification is required every 3 years at a cost of \$245. Considering cost for certification at each additional level, this would cost approximately \$1,000 and comprise a total of 4 days of classroom time.

7.2 Green Roofs for Healthy Cities

Green Roofs for Healthy Cities (GRHC) established a Green Roof Professional Accreditation program in 2003 to “support the development of the living architecture industry”. The GRHC states that the Green Roof Professional program “is the most prestigious credential in the green roof industry” and that it “serves as a comprehensive reference for individuals who design, install and maintain green roofs”. At \$1,495, the course is costly, and comprises 10 weeks of online coursework requiring an estimated 5 hours of work per week. This course also provides continuing education units for other certification programs and organizations, such as LEED, The American Institute of Architects, and the Association of Professional Landscape Designers. Considering the program cost and time commitment and the lack of field training and reliance on the Internet, this program seems to be geared toward professional rather than entry-level, workers. Therefore, it does not meet the spirit of a robust training and certification program.

7.3 National Ready-Mix Concrete Association

The National Ready-Mix Concrete Association (NRMCA) has established a Pervious Concrete Contractor Certification program that focuses on the application and installation of pervious concrete,

general design principles, and inspection and maintenance issues. Three levels of certification are available ranging from “Technician” to “Installer” to “Craftsman”. The NRMCA states that the Technician level is “intended for any non-contractor persons...that need to understand the pervious concrete system”. To receive a Technician certification, one needs to pass a written examination that costs \$100 and is based on a textbook available for \$60. No classroom experience is needed for this level, but it is suggested that a 3- to 4-hour workshop be taken to prepare. However, no cost information is available on this service. Recertification is required every 5 years. Approximately 680 professionals have some level of certification through this program as evidenced in NRMCA’s online database.