

CERTIFICATIONS FOR GREEN INFRASTRUCTURE PROFESSIONALS

THE CURRENT STATE, RECOMMENDED
BEST PRACTICES, AND WHAT
GOVERNMENTS CAN DO TO HELP



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The Emmett Environmental Law and Policy Clinic at Harvard Law School is directed by Wendy B. Jacobs and is dedicated to addressing major environmental issues in the United States and abroad and to providing its students an opportunity to do meaningful, hands-on environmental legal and policy work. Students and clinic staff work on issues such as climate change, pollution reduction, water protection, and smart growth.

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EXECUTIVE SUMMARY

“Green infrastructure” (GI) uses or mimics natural processes to manage precipitation where it falls. It can be a cost-effective strategy for meeting Clean Water Act requirements while delivering key co-benefits such as community beautification, recreational spaces, and climate resiliency. As a result, a growing number of communities across the United States are using GI alongside traditional gray infrastructure for their stormwater management needs.

However, more can be done to encourage GI implementation. The development of widely accepted professional certifications reflecting mastery of harmonized GI standards could promote and facilitate GI implementation. This report surveys the current state of GI professional certification programs, discusses obstacles to the development of widely accepted certifications, recommends best practices for certification program design, and suggests measures that governments can take to promote certification programs. The report is written for key stakeholders in the development of GI certification programs, including regulators, certifying bodies, customers (e.g., municipalities and private property owners), employers and contractors, and community development and environmental groups.

At least 18 GI certification programs exist, representing a diverse array of program designs. The substantive content varies widely, ranging from certification in a single type of GI technology to knowledge of sustainable landscaping practices in which GI is only one component. Some certifications are offered in a single locality or by a single supplier of GI products and services, while others are offered state- or nationwide. Some are targeted towards GI professionals, while others seek to educate regulators, businesses, and property owners. Administering bodies range from trade associations to universities to suppliers of particular GI products and services. Some certifications can be attained by passing a multiple choice exam, while others require many hours of training, work experience, and performance evaluation. Some programs employ enforcement mechanisms to protect the integrity of the certification, while others lack any formal enforcement procedures. A few programs provide certified professionals with membership benefits, such as marketing tools and policy updates. We found only one program that tracked its impact on the performance of installed GI; we found no other public data documenting a program's impact.

Once designed and in place, certification programs can serve a number of important functions. Programs help landscaping and construction professionals become familiar with GI best management practices (BMPs) and incentivize use of these techniques in the field. Certifications may also increase customer confidence in GI and in the certified professionals who can install this technology. Finally, certification programs can be a powerful marketing tool for professionals wishing

to distinguish themselves from the pack. At present, GI certifications are typically operating in very small markets and have not achieved wide acceptance or driven demand for either GI or for certified GI workers.

Three factors inhibit more widespread use of GI and acceptance of certification programs:

- For many GI technologies, no widely accepted standards exist such that certification programs can require knowledge of them as a prerequisite to certification. A key exception is pervious pavers, where consensus standards do exist. Significant standards have also been developing for green roofs.
- More generally, GI remains an emerging concept in many parts of the country. While there is a growing interest in this practice, municipalities and other actors face legal, economic, and other barriers to implementing GI.
- There are shortcomings in certification program design.

These obstacles can be overcome. In particular, governments—including the EPA, state environmental protection departments, local stormwater agencies, and public infrastructure agencies—can play a critical role in facilitating demand for GI and for rigorous GI certifications. For example, regulators can require contractors who bid for government projects or property managers who want to qualify for government incentive programs to hire certified GI workers. Regulators can also provide grants or technical assistance to support certification development. Most importantly, governments can develop GI standards or at least require their implementation for public works projects.

Based on the design options we observed in existing GI certifications, we recommend five best practices for GI certification program design and implementation:

- Adhere to accepted standards for the design of high quality certification programs and provide accreditation through a national accreditation body.
- Train and test hands-on skills as well as book knowledge about GI.
- Collaborate with third parties in developing and administering the certification program.
- Support the program with promotional outreach efforts and community-building in-reach efforts.
- To the extent applicable, offer multiple certifications targeted at different audiences.

I. GREEN INFRASTRUCTURE DEFINED

GI is the use of natural, designed, or engineered systems “that use soil and vegetation to capture water, reduce ambient temperatures, and otherwise protect or enhance both environmental quality and public health.”¹ A key function of GI is to reduce stormwater runoff. Stormwater that is not absorbed where it falls on the ground as rain or snow becomes surface runoff. Runoff flows over the land or is channeled through stormwater or sewer systems and eventually enters surface waters, such as streams or lakes.

Improperly managed stormwater causes two types of problems. First, high volumes of stormwater, particularly over short periods of time, can cause flooding. Second, when runoff from stormwater flows over impervious surfaces—such as roofs and roads—it picks up pollution from those surfaces and eventually carries that pollution into surface waters. Stormwater-related pollution is a severe problem for water quality in the United States.²

GI manages stormwater on-site by encouraging infiltration of stormwater into the soil at once or over time. As a result, less water runs off, reducing flooding and stormwater-related pollution.

GI differs from traditional, “gray” stormwater infrastructure in three key ways.³ First, GI mimics *natural* processes, unlike gray infrastructure, which relies on piping and treatment plants to manage stormwater.⁴ Second, GI manages stormwater through *on-site* infiltration, detention, and evaporation instead of channeling the stormwater to an off-site treatment plant.⁵ Third, GI relies on a *decentralized system* of installations ranging from rain barrels and porous paving to bioswales and

1 EMMETT ENVIRONMENTAL LAW & POLICY CLINIC, REGIONAL AND MUNICIPAL STORMWATER MANAGEMENT: A COMPREHENSIVE APPROACH 6-7 (2014) [hereinafter REGIONAL AND MUNICIPAL STORMWATER MANAGEMENT]. See also EPA, *Green Infrastructure*, <http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm> (last visited June 19, 2014); BRENDAN MCEWAN, ET AL., MIT COMMUNITY INNOVATION LAB, GREEN INFRASTRUCTURE & ECONOMIC DEVELOPMENT: STRATEGIES TO FOSTER OPPORTUNITY FOR MARGINALIZED COMMUNITIES (2013) [hereinafter GREEN INFRASTRUCTURE & ECONOMIC DEVELOPMENT]; Stephan Pauleit, Li Liu, Jack Ahern & Aleksandra Kazmierczak, *Multifunctional Green Infrastructure Planning to Promote Ecological Services in the City*, in JARI MIEMELA, URBAN ECOLOGY: PATTERNS, PROCESSES, AND APPLICATIONS (2011); NRDC, ROOFTOPS TO RIVERS II: GREEN STRATEGIES FOR CONTROLLING STORMWATER AND COMBINED SEWER OVERFLOWS UPDATE OCTOBER 2013 (2013); ALVARO SANCHEZ SANCHEZ, GREEN FOR ALL, CLEAN WATER, STRONG COMMUNITIES: TRANSLATING THE VALUE OF WATER INFRASTRUCTURE USING COMMUNITY BENEFIT STRATEGIES (2014).

2 See, e.g., NRDC, *The Problem of Urban Stormwater Pollution*, <http://www.nrdc.org/water/pollution/fstorm.asp> (last visited June 19, 2014); Conservation Law Foundation, *Stormwater Pollution*, <http://www.clf.org/our-work/clean-water/stormwater-pollution/> (last visited June 19, 2014) (“[S]tormwater pollution is the most pressing threat to water quality in the [New England] region today.”).

3 GREEN INFRASTRUCTURE & ECONOMIC DEVELOPMENT, *supra* note 1, at 9.

4 *Id.*

5 *Id.*

enhanced wetlands that cover large portions of the landscape, unlike gray infrastructure, which relies on pipes connected to a single system.⁶

A number of GI “best management practices” (BMPs) have emerged to manage stormwater, and include both organic and non-organic technologies.⁷ Organic technologies rely on vegetation—including trees and other plants—to manage stormwater. Examples include green roofs,⁸ rain gardens,⁹ tree trenches,¹⁰ bioswales,¹¹ land conservation, and wetlands restoration. Non-organic technologies include rain barrels,¹² blue roofs,¹³ and porous paving.¹⁴

6 *Id.*

7 *See generally* EPA, *What is Green Infrastructure?*, http://water.epa.gov/infrastructure/greeninfrastructure/gi_what.cfm (last visited June 19, 2014); GREEN INFRASTRUCTURE & ECONOMIC DEVELOPMENT, *supra* note 1, at 9-10.

8 A green roof is a roof covered with vegetation.

9 A rain garden is a garden planted in a depression. Because water naturally flows downwards (into depressions in the land), a garden in a depression manages the water that tends to flow to and collect in that area.

10 A tree trench is a series of trees connected by an underground structure that helps infiltrate stormwater.

11 A swale is a drainage ditch that conveys surface runoff. A bioswale is a swale that is covered with vegetation, which helps absorb and slow down the flow of the runoff.

12 A rain barrel, or cistern, is a tank for storing stormwater for future uses (such as irrigation or flushing the toilet).

13 A blue roof is a roof that stores stormwater and delays releasing it as runoff.

14 Porous paving is paving (including asphalt and concrete roads and sidewalks) that have small holes in them, allowing water to permeate through the paving into the soil.

II. RECENT GROWTH OF INTEREST IN GI

For more than a century, reliance on nature to manage stormwater has been overlooked. Recently, however, this has started to change. Two key factors have driven a recent increase in GI awareness and investment in the United States. The first is legal: the federal Clean Water Act (CWA) and its implementing regulations regulate stormwater discharges,¹⁵ and the federal Environmental Protection Agency (EPA) has encouraged incorporation of GI into Clean Water Act compliance plans.¹⁶ Some municipalities have found using GI together with gray infrastructure is a more affordable way to meet the Act's requirements than building gray infrastructure alone.¹⁷ A number of municipalities have pledged to implement significant GI projects in the coming years. For example, New York City has committed \$2.4 billion to GI over the next 20 years, and Philadelphia intends to spend \$1.67 billion on GI through 2036.¹⁸

Also driving demand for GI are its environmental and social co-benefits, such as flood control, habitat, community amenities including recreational spaces, and air quality improvements.¹⁹ Municipalities employing the so-called “triple bottom line” analysis have credited GI with improving

15 33 U.S.C. § 1342(p); 40 C.F.R. § 122.26.

16 Memo from Linda Boornazian, Director, Water Permits Division, and Mark Pollins, Director, Water Enforcement Division, re: Use of Green Infrastructure in NPDES Permits and Enforcement (Aug. 16, 2007), available at http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_memo_enforce.pdf; see also Memo from Nancy Stoner, Acting Assistant Administrator, Office of Water, and Cynthia Giles, Assistant Administrator, Office of Enforcement and Compliance Assurance (Oct. 27, 2011), available at <http://water.epa.gov/infrastructure/greeninfrastructure/upload/memointegratedmunicipalplans.pdf>.

17 For example, in one GI project in Portland, Oregon, traditional gray infrastructure solutions would have cost \$144 million, while the mix of gray and green infrastructure that the city ultimately implemented cost \$81 million, saving taxpayers \$63 million. GREEN INFRASTRUCTURE & ECONOMIC DEVELOPMENT, *supra* note 1, at 10; see also NEW YORK CITY, NYC GREEN INFRASTRUCTURE PLAN: A SUSTAINABLE PLAN FOR CLEAN WATERWAYS 9 (2010) (in New York City, using a blend of GI and gray infrastructure predicted to save an estimated \$2.4bn over 20 years relative to using gray infrastructure alone); STRATUS CONSULTING, A TRIPLE BOTTOM LINE ASSESSMENT OF TRADITIONAL AND GREEN INFRASTRUCTURE OPTIONS FOR CONTROLLING CSO EVENTS IN PHILADELPHIA'S WATERSHEDS: FINAL REPORT 5-1 (2009) (in Philadelphia area, using a 100% GI approach predicted to result in net benefits of \$4.466bn over 40 years). GI, however, is not always more cost-effective than using gray infrastructure and significant cost uncertainties exist in some cases. See REGIONAL AND MUNICIPAL STORMWATER MANAGEMENT, *supra* note 1, at 10-12; see also EPA, *Cost-Benefit Resources*, http://water.epa.gov/infrastructure/greeninfrastructure/gi_costbenefits.cfm (last visited June 19, 2014) (collecting resources on cost-benefit analyses of GI). Additionally, GI is more suited for certain climates than others; for example, GI use may be of limited use in dry climates. See Katherine LaBadie, *Identifying Barriers to Low Impact Development and Green Infrastructure in the Albuquerque Area* (2010), available at <http://wrrri.nmsu.edu/research/rfp/studentgrants08/reports/LaBadie.pdf> (feasibility of GI limited given New Mexico's semi-arid climate and high intensity rainstorm events).

18 LAND STUDIO, SEEING GREEN: GREEN INFRASTRUCTURE MAINTENANCE TRAINING AND WORKFORCE DEVELOPMENT OPPORTUNITIES IN NORTHEAST OHIO 11 (2013).

19 EPA, Green Infrastructure Case Studies 7, http://water.epa.gov/polwaste/green/upload/gi_case_studies_2010.pdf, at 10-11; see also http://water.epa.gov/infrastructure/greeninfrastructure/gi_why.cfm.

residential property values, reducing heat-related deaths, and creating jobs.²⁰ GI is also viewed as a “climate resiliency” strategy for municipalities.²¹

As demand for GI increases, certifications will become more important and useful. By certification, we mean a process, administered by a certifying body, through which individuals comply with a set of requirements and in turn receive a document indicating that they have fulfilled those requirements.²²

20 For example, Philadelphia’s triple bottom line analysis of GI considered co-benefits including “recreational use and values,” “enhanced aesthetics (reflected in residential property values),” “heat stress-related premature fatalities avoided,” “water quality and aquatic habitat enhancements and values,” “wetland enhancement and creation,” “poverty reduction benefits of local green infrastructure jobs,” “energy use and related changes in carbon and other emissions,” “air quality pollutant removal from added vegetation.” STRATUS CONSULTING, *supra* note 17, at 4-1 to 4-6; *see also* NRDC, *supra* note 2; LAND STUDIO, *supra* note 18, at 11-26.

21 *See, e.g.*, Resources for the Future, *Building Resilience to Climate Change through Green Infrastructure*, http://www.rff.org/centers/management_of_ecological_wealth/Pages/Building-Resilience-to-Climate-Change-through-Green-Infrastructure.aspx (last visited June 19, 2014); KARA E. REEVE & RYAN KINGSTON, NATIONAL WILDLIFE FEDERATION, *GREEN WORKS FOR CLIMATE RESILIENCE: A GUIDE TO COMMUNITY PLANNING FOR CLIMATE CHANGE* (2014).

22 ISO 17024-2012, § 3.1. As the term is used here, “professional certification” programs embrace two similar types of processes: personnel certification programs and certificate programs. *See generally* ASTM E2659, § 4. While personnel certification is for a limited time (and thus requires continuing education and renewal) because it represents an individual’s continued competency in a particular area, a certificate does not require continued education or renewal. EPA draws no distinction between the two in its catalog of training and certification programs. EPA, *Green Jobs Training: A Catalog of Training Opportunities for Green Infrastructure Technologies* (2010), available at <http://water.epa.gov/infrastructure/greeninfrastructure/upload/greenjobscatalog2010.pdf>. Likewise, we discuss both these types of processes as “professional certification” in this paper.

Professional certification is distinct from product certification (also known as project certification). Product certification certifies that a certain *product* (or project) meets quality standards. For example, a LEED Gold Certification certifies that a given building meets certain standards for green buildings. By contrast, professional certification certifies that a *person* has a particular competency. Nevertheless, product certification and professional certification often work together. Professionals certified by the Institute of Sustainable Infrastructure (ISI) are certified to have knowledge in ISI’s project rating system. ISI, *ISI Credential*, <http://www.sustainableinfrastructure.org/assessors/credentialing.cfm> (last visited June 19, 2014) [hereinafter *ISI Credential*]. In turn, property owners that seek certification of their infrastructure projects from the Institute of Sustainable Infrastructure (ISI) must hire an ISI-certified professional. ISI, *Project Application*, <http://www.sustainableinfrastructure.org/verification/index.cfm> (last visited June 19, 2014).

Note also that professional certification is distinct from licensure and degree programs. Unlike certification, licensure is always offered by a public organization and is mandatory for an individual wishing to practice a certain trade. For example, lawyers and doctors are licensed professionals. That said, licensure and certification can work together. For example, the Council of Landscape Architectural Registration Boards (CLARB), a non-profit organization, administers a certification program for landscape architects. To receive the CLARB certification, a professional must *first* be licensed by a state licensure board. *See* CLARB, Standards of Eligibility for Council Certification, available at <https://www.clarb.org/LandscapeArchitects/CLARBCertification/Documents/StandardsofEligibility.pdf>.

Degree programs generally require at least one-year of coursework at an institute of higher education (such as a university or a community college). By contrast, many certification programs have no coursework requirements, and even if they require training, generally require significantly less training, often ranging from a day to a week. In some cases, individuals who have attained certifications can count those certifications as credit towards attainment of a degree. *See, e.g.*, Paul

III. OBSTACLES

Three factors inhibit widespread acceptance of GI certification programs: the lack of widely accepted GI standards, the lack of demand for GI, and flaws in the design of current certification programs. In the following sections, we discuss steps that governments and other entities involved in GI certification programs can take to overcome each of these three obstacles.

First, for many GI technologies, harmonized BMPs are still evolving.²³ With the possible exception of pervious pavers, no nationally recognized standards exist for GI.²⁴ Some areas of GI, most notably the green roofing industry, have made significant progress in developing industry standards,²⁵ and in some cases, governments have promulgated and endorsed standards or guidelines.²⁶ However, more work needs to be done. Absent well-established standards harmonized across jurisdictions, widely recognized certifications are unlikely: if there is no broad agreement on what standards workers should be certified *in*, then their possession of any one certificate is unlikely to be of much value. This, in fact, is the reason that so many existing GI certifications vary so much in their substantive scope and design.²⁷

Fain, *Assembly Line*, INSIDE HIGHER ED (July 18, 2012), <http://www.insidehighered.com/news/2012/07/18/manufacturing-industry-taps-colleges-help-alternative-credential>.

Certification requirements include meeting “established criteria for proficiency or competency, usually through an eligibility application and assessment. ASTM E2659, § 4.3. Upon meeting the requirements, an individual receives a certificate from the certification body. (Note that we use the terms “certified professional” and “certified worker” interchangeably.) The certification is usually good for a period of one to several years, with the possibility of renewal/recertification.

- 23 In general, standards that become the industry norm are generally set by the government, by a standards-setting organization like NIST or ASTM, or by a leading industry trade group; and often are also recognized by a standards organization like ANSI. In the case of GI, however, neither federal government nor a voluntary standards organization such as ASTM has set GI standards. Although industry trade groups have attempted to set many standards, all of these trade groups are fairly new and as of yet few (excepting the concrete trade groups) have the reputation to develop industry norms.
- 24 Between 2010 and early 2014, some thought that EPA would promulgate nationally recognized GI standards through a stormwater rulemaking that resulted from a settlement in a lawsuit over water pollution in Chesapeake Bay. See Amena H. Saiyid, *EPA Proposed Stormwater Rule to Include Green Infrastructure Measures, Strategy Says*, BNA DAILY ENV'T REPORT (Oct. 21, 2013); see also News Release, EPA Reaches Settlement in Chesapeake Bay Lawsuit (May 11, 2010), available at <http://yosemite.epa.gov/opa/admpress.nsf/0/ac46af32562521d48525772000591133?OpenDocument>. But as of March 28, 2014, EPA formally announced its intention to “defer[] action” on a stormwater rule. EPA, *Proposed National Rulemaking to Strengthen the Stormwater Program*, <http://cfpub.epa.gov/npdes/stormwater/rulemaking.cfm> (last visited July 11, 2014). Given the four-year delay between the settlement and EPA’s notice of deferring action, it seems unlikely that EPA will soon complete its stormwater rulemaking, or in doing so, promulgate any GI standards.
- 25 See Green Roofs for Healthy Cities, *Design Standards*, <http://www.greenroofs.org/index.php/resources/designstandards> (last visited July 11, 2014).
- 26 See EPA, *Design and Implementation Resources*, http://water.epa.gov/infrastructure/greeninfrastructure/gi_design.cfm (last visited July 11, 2014); City of New York, *Standards for Green Infrastructure* (2013), available at http://www.nyc.gov/html/dep/pdf/green_infrastructure/bioswales-standard-designs.pdf.
- 27 Compare for example, the Pratt Institute GI Certificate with the NCSU Stormwater BMP Inspection & Maintenance

Second, GI demand is still low in many parts of the country. Significant legal, economic, and other barriers exist to GI implementation.²⁸ Without a sufficiently large market for GI, demand for certified GI professionals will remain low and the costs of administering a certification program may not be sustainable.²⁹ Nevertheless, GI use has been growing in large part due to the EPA's support for GI,³⁰ Clean Water Act enforcement actions,³¹ and growing understanding of GI, its relative cost-effectiveness to gray infrastructure in some instances, and its co-benefits.³² As GI use increases, demand for certification programs will likely grow.

Third, the design of GI certification programs can be improved. The next sections discuss eighteen existing certification programs and highlight key program features and recommendations for improvements.

Certification. Pratt's certificate requires 21 hours of study. Students must take courses in "Drainage and Hydrology in NYC" and "GI Data and Calculations." Students can then elect to study one of three electives: green roofing, public right-of-way, and innovative GI. By comparison, the NCSU certificate requires 14 hours of study and surveys a variety of BMPs, including retention ponds, wetlands, bioretention, swales, green roofs, cisterns, infiltration trenches, permeable pavement, sand filters, and proprietary systems. See N.C. State University Cooperative Extension, *Certification Description Stormwater BMP Inspection & Maintenance*, <http://www.bae.ncsu.edu/topic/bmp-im/certification.html> (last visited July 11, 2014). While there is significant overlap in the content of the two programs, there is also no consensus regarding what information GI professionals must know.

28 See REGIONAL AND MUNICIPAL STORMWATER MANAGEMENT, *supra* note 1, at 6-12.

29 Certification programs cost time and money. Training and application fees can cost hundreds if not thousands of dollars, and in some cases the certification process can require many hours of training and study to take and pass the exam. The renewal process is also costly and time-consuming, and similar to initial certification, can require hundreds of dollars in fees and many hours of continuing education every few years. Professionals and employers will only make these investments if the certification is required or preferred by regulators or customers, or otherwise empower them to command higher prices in the marketplace.

30 EPA, *What is EPA Doing to Support Green Infrastructure?*, http://water.epa.gov/infrastructure/greeninfrastructure/gi_support.cfm (last visited June 19, 2014); EPA Region 1, *Soak Up the Rain*, <http://www.epa.gov/region1/soakuptherain/index.html> (last visited June 19, 2014).

31 EPA, *Green Infrastructure Permitting and Enforcement Series: Supplement 1 (Consent Decrees that Include Green Infrastructure Provisions)*, available at <http://water.epa.gov/infrastructure/greeninfrastructure/upload/EPA-Green-Infrastructure-Supplement-1-061212-PJ.pdf>.

32 See *supra* text accompanying notes 15-21.

IV. THE CURRENT STATE OF GI CERTIFICATION AND RECOMMENDATIONS FOR PROGRAM DESIGN

We surveyed eighteen existing certification programs for GI professionals.³³ These programs were designed by trade groups, universities, suppliers, and government agencies and vary greatly in topical scope and design elements. A few programs have achieved broader recognition, while most remain of limited impact. Of the certification programs we surveyed, all came into existence within the past two decades.

While the design of the certification programs varies greatly, a few common elements do exist: all certification programs involve a certifying body that administers the certification; GI standards on which the certification is based; training (whether provided by the certifying body or by third parties); and a certification exam. Common elements aside, programs exhibit immense diversity. We categorize program features into nine areas:

- Substantive scope of certification;
- Geographic scope;
- Who should get certified;
- Organization of the administering body;
- Certification requirements;
- Enforcement mechanisms;
- Benefits for certified individuals;
- Demonstration of program benefits; and
- Program design standards and accreditation.

We review below variation among certification programs as to each of these elements and make recommendations for improved program design in each category. These recommendations

33 See Appendix A. A note on research methodology: in addition to reading through the webpages and other publications of certification programs, we rely on interviews with experts in a variety of fields, including green infrastructure and landscaping, adult education and workforce development, certification programs, community development, and government. We are grateful for the knowledge and expertise shared by Anne Leiby (EPA), Deb Mutschler (Massachusetts Workforce Alliance), Trevor Smith (Ecological Landscaping Association), Alvaro Sanchez Sanchez (formerly of Green For All), David Rosen (Newsome Associates), Cindy Brown (EPA), Michael Chavez (Enterprise Rose Architectural Fellow), Colin Lobo (NRMCA), and Alex Schroeder (Finding Earth Works). Naturally, we also consulted the secondary literature, and found especially persuasive reports authored by Green For All and a report authored by the MIT CoLab. *See supra* note 1.

are preliminary and based only on our review of these 18 certification programs. Areas for future research include (1) a more detailed examination of the substance of GI BMPs and standards, and the ways those standards interact with certification program design considerations and (2) a survey of successful certification programs in other fields, such as the Building Performance Institute (BPI) and Leadership in Environmental and Energy Design (LEED) programs, and the lessons that can be learned from the experience with other types of successful certification programs.

Substantive Scope

The substantive content of existing GI certification programs varies widely. Programs dedicated exclusively to GI include both specialist and generalist certifications. Specialist certifications certify professionals for a single type of GI technology. For example, the Green Roof Professional³⁴ program certifies professionals in green roofing, while the American Rainwater Catchment Systems Association program certifies professionals in rainwater harvesting. Generalist certifications certify professionals for GI installation and maintenance more broadly. Examples include the Pratt Institute's Urban GI Certificate and the North Carolina State University Stormwater BMP Inspection & Maintenance Certification. Aquascape's RainXchange³⁵ and LiveRoof³⁶ offer certifications for workers installing their products.

Other certification programs are not exclusively GI certifications, but include GI as one component of their certification. For instance, LEED offers a certification for green building professionals, while the Institute of Sustainable Infrastructure offers a certification for sustainable landscape professionals. Both incorporate GI.³⁷

34 Green Roofs for Healthy Cities, *GRP Accreditation*, <http://www.greenroofs.org/index.php/education/grpaccrreditation> (last visited July 14, 2014) [hereinafter *GRP Accreditation*]. In order to become a GRP, individuals must meet certain requirements, including passing a written exam attesting to their knowledge of green roofing. Green Roofs for Healthy Cities, *Green Roof Professional Accreditation Exam Guidebook*, available at http://www.greenroofs.org/resources/GRP_Candidate_Exam_Guide.pdf [hereinafter *GRP Exam Guidebook*]. The program also offers, but does not mandate, training. Green Roofs for Healthy Cities, *GRP Training Program*, <http://www.greenroofs.org/index.php/education/grptrainingprogram> (last visited July 14, 2014) [hereinafter *GRP Training Program*]. Once they have met the requirements, professionals become certified GRPs and may advertise themselves accordingly. To renew the certification, they must undergo roughly sixteen hours of continuing education every two years.

35 RainXchange, *Certified RainXchange Professional Program*, <http://www.rainxchange.com/certified-rainxchange-professional/crp.php> (last visited July 13, 2014) (professionals “[m]ust specify or install complete RainXchange™ System [sic] when representing yourself as a Certified RainXchange™ Professional”).

36 LiveRoof, *Delivery and Installation*, <http://liveroof.com/delivery-and-installation/> (last visited July 13, 2014) (“LiveRoof Certified Installers: LiveRoof installations are conducted by trained independent landscape and roofing contractors who are committed to safe and proper installation practices.”).

37 For example, LEED Development (ND) APs are required to be familiar with the LEED ND Rating System, which has a GI component. U.S. Green Building Council, *LEED 2009 for Neighborhood Development 93-94* (updated July 2014), available at <http://www.usgbc.org/sites/default/files/LEED%202009%20RS%20ND%2007.01.14%20current%20version.pdf>. Similarly, the ISI

Geographic Scope

The geographic scope refers to where the certification program is offered and ranges from international to municipal. For example, Green Roof Professionals practice green roofing across the United States and Canada,³⁸ while Washtenaw County Master Rain Gardeners are active primarily within that Michigan county.³⁹

Some certification programs demonstrate mastery of broadly applicable products and services. For instance, the Pervious Concrete Contractor certification has become widely accepted across the United States because pavers may be used in areas with different rainfall patterns, geology, and hydrology. Other programs may be tailored to specific types of ecosystems. The Northeast Organic Farming Association's certification program is primarily recognized in the New England area.⁴⁰ The North Carolina State University Stormwater BMP certification is required by several localities in North Carolina, and endorsed by the North Carolina Department of Environment and Natural Resources.⁴¹ The Monterey Bay Green Gardener certification is recognized chiefly in the Monterey Bay area.⁴²

Geographically-limited programs make sense to the extent they reflect GI practices suitable for particular climate zones and local hydrology or provide training on unique GI tools. However, the balkanization of standards are often more a reflection of the scattered nature of certification development rather than differences in ecology. In general, certification programs are likely to be more successful if they operate on as large a scale as possible.

certification requires knowledge of its rating system, which also has a GI component. *ISI Credential*, *supra* note 22.

38 Green Roofs for Healthy Cities, *Find a Green Roof Professional*, <http://www.greenroofs.org/index.php/find-greenroofprofessional> (last visited July 13, 2014).

39 See Washtenaw County, *Master Rain Gardener Volunteer Program*, http://www.ewashtenaw.org/government/drain-commissioner/dc_webWaterQuality/rain-gardens/volunteer-information-1/volunteer-information (last visited July 13, 2014).

40 See NOFA, *NOFA Accredited Organic Land Care Professionals*, http://nofa.organiclandcare.net/search_aolcp?page=all&sort_selection=town#results (last visited July 13, 2014) (searchable database for NOFA AOLCPs, most of which are located in the New England area, with a substantial minority in the mid-Atlantic); NOFA, *Credit Opportunities*, <http://www.organiclandcare.net/calendar/credit-opportunities> (last visited July 13, 2014) (listing NOFA continuing education opportunities, which are all in the New England area); NOFA, *About Accreditation*, <http://www.organiclandcare.net/accreditation/about-accreditation> (last visited July 13, 2014) (“65% [of certified professionals] reported an increase in work opportunities and prospects within one year”).

41 See NCSU, *Certification Description*, <http://www.bae.ncsu.edu/topic/bmp-im/certification.html> (last visited July 13, 2014).

42 *Monterey Bay Green Gardener Program*, <http://www.green-gardener.org/> (last visited July 13, 2014).

Who Gets Certified

Certifications can be targeted at a variety of trades and professions, including design professionals (such as licensed professional engineers or registered landscape architects) and the laborers who do the landscaping, paving, or GI infrastructure construction.⁴³ In addition, programs such as the North Carolina State University Stormwater BMP certification have also certified government regulators and private property owners wishing to incorporate GI into their community or industrial park.⁴⁴

Programs that offer multiple or stackable certifications⁴⁵ target different audiences for each type of particular certification. A certification that merely requires passing a written knowledge exam appeals to a general audience, while a certification that requires documentation of prior work history is intended for GI professionals.⁴⁶ Some programs also offer a basic level of certification for GI professionals and an advanced level for professionals with substantial industry experience, allowing the latter to distinguish themselves in the marketplace.⁴⁷ For example, the Pervious Concrete Contractor program provides three levels of certification. The first level, Technician, can be achieved by passing a written exam,⁴⁸ and is intended for a general audience, including general contractors,

43 See, e.g., *NCSU Stormwater BMP Inspection & Maintenance Certification Workshops*, <http://www.bae.ncsu.edu/topic/bmp-im/> (last visited July 13, 2014) (describing certification program).

44 See, e.g., *id.*

45 Stackable certifications are a series of certifications which include a basic certification meant for entry-level professionals and more advanced certifications as the professional develops additional skills. For background on stackable certifications, see generally Louis Soares, *A “Disruptive” Look at Competency-Based Education: How the Innovative Use of Technology Will Transform the College Experience*, CENTER FOR AMERICAN PROGRESS (June 7, 2012), <http://www.americanprogress.org/issues/higher-education/report/2012/06/07/11680/a-disruptive-look-at-competency-based-education>; *The Importance of Stackable Certificates: Interview with Amy Hyams, Commissioner, International Association of Continuing Education and Training*, THE EVOLLLUTION, <http://www.evolllution.com/opinions/audio-the-importance-of-stackable-certificates> (Aug. 14, 2012) (interview with Amy Hyams); Fain, *supra* note 22.

In many cases, a basic certification serves as a prerequisite for a more advanced certification. For example, the Interlocking Concrete Pavement Institute (ICPI) offers a basic certification in concrete paver installation. ICPI, *Installer Certification and Designations*, <http://www.icpi.org/InstallerDesignations> (last visited July 13, 2014). Professionals who hold the basic certification are then qualified to apply for more advanced and specialized certifications in residential, commercial, and permeable concrete paver installation. *Id.*

46 Colin Lobo, personal communication.

47 E.g., NRMCA, *Pervious Concrete Contractor Certification Program*, http://www.nrmca.org/Education/Certifications/Pervious_Contractor.htm (last visited July 13, 2014) (offering Technician, Installer, and Craftsman levels of certification) [hereinafter *Pervious Concrete Contractor Certification Program*]; ARSCA, *Educational & Accreditation Programs*, <http://www.arcsa.org/?page=4> (last visited July 13, 2014) (offering Certified Associate, Accredited Professional, Inspector Specialist, and Rainwater Harvesting Master levels of certification).

48 *Pervious Concrete Contractor Certification Program*, *supra* note 47.

property managers, and regulators.⁴⁹ By contrast, the second level, Installer, requires actual work experience, and is intended as the basic certification for pervious concrete workers.⁵⁰ The third level, Craftsman, requires much more work experience,⁵¹ and is intended for workers who have substantial experience working with pervious concrete.

We recommend that GI certification programs incorporate stackable certifications to enable people to obtain varying levels of certification. For example, a recent high school graduate may want a certification to attest to his basic competency in GI and find his first job. A seasoned GI veteran may want a certification to attest to his high level of expertise and set him apart from those with less experience. Specifically, the program could offer “stackable” certifications that reflect varying levels of GI expertise.

Stackable certifications may be especially attractive to workers, as they generally present workers with a low barrier to entry, while providing a transparent track for career advancement. They are particularly successful if the market is willing to pay a premium for each level of the stack. Therefore, each level must reflect mastery of additional skills that employers and customers find valuable. If they are attractive to workers, stackable certifications can enhance the supply of well-trained labor and, in turn, benefit employers.

Some types of GI will be more amenable to stackable certification than others. For example, installing a residential rain garden is a fairly simple process, which can be taught in a single day. By contrast, installing some other forms of GI, especially large projects for municipalities or businesses, can involve more complex skills amenable to stackable certification.

Administering Body

Various types of organizations, both public and private, administer certification programs. They include public universities (such as the University of Washington and North Carolina State University), private universities (such as the Pratt Institute), trade groups (such as the National Ready Mixed Concrete Association), for-profit online educational companies (such as OSHA.com), suppliers (such as LiveRoof), and government agencies (such as the Washtenaw County water department).⁵²

A certification program may be administered centrally or through local groups affiliated with

49 Colin Lobo, personal communication.

50 *Pervious Concrete Contractor Certification Program*, *supra* note 47.

51 *See id.* (requiring a professional to pass a performance evaluation and “document work experience constructing pervious concrete pavement exceeding 1500 hours,” or in the alternative, document work experience exceeding 3000 hours).

52 *See generally* Appendix A.

a central organization. Centralized administration occurs when a single organization administers all aspects of the certification program. For example, the Pratt Institute administers the entirety of its certification program, as well as the associated coursework for the certificate. Another option is for a certifying body to administer the certification, but allows approved third-party vendors to provide continuing education. The Northeast Organic Framing Association program, for instance, provides an online form which third parties can use to request approval for their continuing education courses.⁵³ In turn, professionals who take approved courses are eligible for continuing education credits.

In some cases, a central organization creates rules and guidelines for certification while the training and evaluation of applicants are handled by local third parties. For example, the rules and guidelines for the Pervious Concrete Contractor certification are promulgated by a central body at the National Ready Mixed Concrete Association.⁵⁴ In turn, local sponsoring groups, which are often statewide concrete trade groups, administer the training and evaluation of applicants.⁵⁵

Regardless of the specific form the administering body takes, it is important that, in designing and operating a certification program, the certifying body should collaborate to some extent with third parties⁵⁶ to share expertise, experience, and training resources. Key third parties include representatives from governments, both as regulators and market actors; businesses, property managers, homeowner associations, and other private sector customers; the GI industry, including contractors, manufacturers, and suppliers; trade groups and professional associations in GI and related fields, such as landscape architecture, landscape design, and concrete; workers, workforce and community development organizations; and environmental groups.

Certification Requirements

All certifications require submission of an application and payment of a fee. Beyond this commonality, requirements for applicants to attain certification vary significantly, ranging from passing a multiple choice exam to undergoing lengthy training and performance evaluation. Certification requirements may be classified into four categories: 1) examination; 2) specific coursework; 3) other qualifications or experience, and 4) standards for renewal.

53 NOFA, *Credit Approval Form*, <http://www.organiclandcare.net/accreditation/creditapproval> (last visited July 13, 2014).

54 NRMCA, *Pervious Concrete Contractor Certification Policies and Procedures Manual*, at RP-1 *et seq.* (2013), available at <http://www.nrmca.org/Education/DOWNLOADS/NRMCA%20Perv%20CC%20Certification%20Policy%20doc%200913.pdf>.

55 NRMCA, *Approved Local Sponsoring Groups*, http://www.nrmca.org/Education/Certifications/Pervious_Groups-List.htm (last visited July 13, 2014).

56 This is also a requirement of the ISO/IEC 17024 standard. *See infra* text accompanying notes 96-107.

Examination

All programs require applicants to pass an exam. Exams are generally in written form. For example, the Green Roof Professional certification requires applicants to pass a 100 question multiple choice exam.⁵⁷ Some programs also require a performance evaluation. For example, the Pervious Concrete Contractor Craftsman certification requires applicants to demonstrate proper installation of a pervious concrete slab.⁵⁸

Specific Coursework

Some programs require applicants to complete specific training courses prior to being certified.⁵⁹ Other programs offer but do not mandate such courses.⁶⁰ The training may be delivered through written material,⁶¹ online courses,⁶² or in-person courses, including lecture, seminar, and hands-on components.⁶³ For those programs that require in-person training, the mandated length varies widely, ranging from two days to semester-long courses. North Carolina State University requires a two-day training course, which includes both classroom lecture and hands-on components.⁶⁴ Green Roof Professional recommends but does not require such training, and offers three separate full-day courses.⁶⁵ The University of Washington offers a semester-long course.⁶⁶

57 *GRP Exam Guidebook*, *supra* note 34; *see also Pervious Concrete Contractor Certification Program*, *supra* note 47 (60 multiple choice questions); U.S. GREEN BUILDING COUNCIL, LEED AP NEIGHBORHOOD DEVELOPMENT CANDIDATE HANDBOOK 8 (updated Nov. 2012), available at <http://www.usgbc.org/sites/default/files/ND-Candidate-Handbook.pdf> (100 multiple choice questions for the basic Green Associate certification, and 100 additional multiple choice questions for the AP specialization).

58 *Pervious Concrete Contractor Certification Program*, *supra* note 47.

59 *E.g.*, NOFA, *About Accreditation*, *supra* note 40 (“Take the NOFA OLC Accreditation Course in organic landscaping”).

60 *E.g.*, *GRP Training Program*, *supra* note 34.

61 *E.g.*, U.S. Green Building Council, <http://www.usgbc.org/store/products/publications> (last visited July 13, 2014) (LEED study guides).

62 *E.g.*, OSHA.com, <http://www.osha.com/courses/leed-green-infrastructure.html> (last visited July 13, 2014) (LEED Green Infrastructure Courses).

63 *See, e.g.*, NCSU, *Workshop Schedule and Registration Fee Information*, <http://www.bae.ncsu.edu/topic/bmp-im/classes.html> (last visited July 13, 2014) (2 day class); NOFA, *Accreditation Course in Organic Land Care*, <http://www.organiclandcare.net/professionals/accreditation> (last visited July 13, 2014) (30 hour class).

64 NCSU, *Certification Description*, *supra* note 41; *see also* Watershed Management Group, *Green Infrastructure and LID Technical Training*, <http://watershedmg.org/civircrm/event/info?reset=1&id=268> (last visited July 13, 2014) (2 day GI course).

65 *GRP Training Program*, *supra* note 34.

66 *Certificate in Green Stormwater Infrastructure*, UNIVERSITY OF WASHINGTON PROFESSIONAL AND CONTINUING EDUCATION, <http://www.pce.uw.edu/certificates/green-stormwater-infrastructure.html> (last visited July 13, 2014).

Other Qualifications or Experience

Some programs require or recommend the possession of another qualification, such as a certification or university degree, prior to receiving certification.⁶⁷ For example, the Pervious Concrete Contractor Craftsman certification requires that the applicant possess an American Concrete Institute Flatwork Finisher certification, while the Institute of Sustainable Infrastructure certification requires applicants to possess a relevant four year degree or have a Professional Engineer or equivalent professional designation.⁶⁸

Other programs require the applicant to possess and document prior work experience.⁶⁹ For example, American Rainwater Catchment System Association requires the professional to have completed the design or construction of five (5) acceptable rainwater collection systems.⁷⁰

Standards for Renewal

Some certifications expire unless renewed. For example, the Pratt Institute's certificate does not require renewal.⁷¹ Of programs that require renewal, renewal periods range from one to five years.⁷² Professionals must submit renewal paperwork and pay a fee, as well as satisfy continuing education requirements.⁷³ Other requirements may also exist. For example, just like it requires for initial certification, the PCC Craftsman certification requires professionals to pass a written exam and

67 *E.g.*, NCSU, *Certification Description*, *supra* note 41 (“The certification is NOT intended to be a replacement for professional licensure (like PE or RLA), and is only a supplement to those rigorous professional licenses.”); *Pervious Concrete Contractor Certification Program*, *supra* note 47 (Pervious Concrete Craftsmen must “[p]ossess a current ACI Flatwork Finisher Technician or Craftsman certification at the time of application”); LEED AP NEIGHBORHOOD DEVELOPMENT CANDIDATE HANDBOOK, *supra* note 57, at 9-10, 19 (professional must be previously or concurrently certified as a LEED Green Associate).

68 *ISI Credential*, *supra* note 22. (“Qualifications”) (applicants must “[h]old a four year degree OR have a Professional Engineer (PE) or equivalent professional designation”).

69 *E.g.*, U.S. Green Building Council-Northern California, LEED Professional Project Experience Program, <http://www.usgbc-ncc.org/learn/education/leed-project-experience> (last visited July 17, 2014) (LEED AP exam applicant must have, within the past three years, worked on a LEED-registered or -certified project); *Pervious Concrete Contractor Certification Program*, *supra* note 47 (the applicant must provide project experience documentation of successful construction of a minimum of 3 projects with a total area exceeding 10,000 square feet).

70 ARSCA, *Educational and Accreditation Programs*, <http://www.arcsa.org/?page=4> (last visited July 13, 2014).

71 *See, e.g.*, *Urban Green Infrastructure*, PRATT INSTITUTE, <http://www.pratt.edu/academics/continuing-education-and-professional/pro-certification-programs/green-systems-clean-water/> (last visited July 13, 2014) (no mention of renewal).

72 *E.g.*, NCSU, *Certification Description*, *supra* note 41 (renewal required every three years); *GRP Exam Guidebook* *supra* note 34, at 9 (every 2 years); NOFA, *Reaccreditation*, <http://www.organiclandcare.net/accreditation/reaccreditation> (last visited July 13, 2014) (every year); *Pervious Concrete Contractor Certification Program*, *supra* note 47 (every 5 years).

73 *See, e.g.*, sources cited in note 72, *supra*.

submit documentation of work experience in order to renew.⁷⁴

Different programs vary in the number of continuing education units (CEUs) required.⁷⁵ Generally, one unit of continuing education equals one hour of instruction.⁷⁶ Professionals may also fulfill continuing education requirements in other ways.⁷⁷ For instance, LEED requires 30 continuing education units every two years. LEED professionals may fulfill continuing education through actual education (such as university courses, conferences, and courses from other approved vendors), working on a project registered for LEED certification, writing publications, or volunteering on LEED committees.⁷⁸ By comparison, Northeast Organic Farming Association requires four (4) continuing education credits per year, which can be fulfilled either by taking a course or teaching one.⁷⁹

Recommendations for Certification Requirements

Prior to receiving a certification, professionals should be required to undergo training in both practical skills and knowledge about GI.⁸⁰ Training is important to ensure that installed GI will function properly and meet any substantive performance standards set by regulators or by contracts. Training programs, similar to certification programs, should be designed according to best practices.⁸¹ Training may be offered by the certifying body, or by third parties, such as by universities, employers, or local trade associations. Where training is provided by third parties, the certifying body should have a process for approving training vendors and standard guidelines for all training programs. Professionals should be learning the same material and undergoing similar training no matter which vendor they choose.

74 See, e.g., *Pervious Concrete Contractor Certification Program*, *supra* note 47 (requires passing of an exam and documentation of work experience to renew the certificate).

75 E.g., NOFA, *Reaccreditation*, *supra* note 72 (4 units every year); U.S. GREEN BUILDING COUNCIL, LEED AP NEIGHBORHOOD DEVELOPMENT CANDIDATE HANDBOOK, *supra* note 57, at 19 (30 units every two years).

76 E.g., NOFA, *Continuing Education*, <http://www.organiclandcare.net/accreditation/ce-credits> (last visited July 14, 2014).

77 See, e.g., U.S. GREEN BUILDING COUNCIL, LEED CREDENTIAL MAINTENANCE PROGRAM GUIDE 2 (updated Oct. 2013), available at <http://www.usgbc.org/sites/default/files/CMP-Guide.pdf>.

78 *Id.*

79 NOFA, *Continuing Education*, *supra* note 76.

80 We do not recommend that the certifying body mandate training, because some professionals may have the knowledge and experience to pass the certification examination without any training. Training should be an opportunity for professionals to learn and to prepare for the certification exam, not an unnecessary burden.

81 International Association for Continuing Education and Training (IACET) provides accreditation for providers of continuing education and training. See IACET, *Benefits of Authorized Provider Accreditation*, <http://www.iacet.org/index.php/accreditation/benefits-of-authorized-provider-accreditation%23> (last visited July 14, 2014). The international standard for training and continuing education is ANSI/IACET 1-2007, available at http://www.ihs.gov/EHSCT/dsp_folder/dsp_filedownload.cfm?folder=main_resource_docs&filename=IACET_ANSI_Standards.pdf&filetype=pdf.

Training need not be cumbersome and could take many forms: written materials, the Internet, in-person seminars and workshops, and so forth.⁸² To the extent that a certification is targeted toward professionals who install, operate, or maintain GI, training should include a hands-on element, so as to provide the professional with field experience.⁸³

Enforcement Mechanisms

Some certification programs include enforcement mechanisms to protect the integrity of the certification, including auditing provisions, disciplinary procedures, and penalties. Auditing includes both self-auditing and auditing performed by the certifying organization. An example of self-auditing is the PCC certification, which surveys 10% or more its certified professionals annually, questioning them about their use of the certification and their compliance with certification policies, and requiring professionals to file a report.⁸⁴ The Green Building Certification Institute, the organization that administers LEED, audits 5-7% of LEED AP applications, in part to determine whether the alleged work experience (a prerequisite for certification) actually occurred.⁸⁵ By contrast, most certifications we surveyed lacked auditing mechanisms altogether.

Among the 18 programs reviewed, discipline for delinquent behavior varies widely. Some certifications lack disciplinary procedures altogether. For example, the Pratt Institute does not have a mechanism for imposing penalties for misconduct after certification.⁸⁶ The Pervious Concrete Contractor certification may be revoked for good cause.⁸⁷ The LEED certification offers a quasi-adjudicative procedure and provides an aggrieved professional the right to know the facts constituting

82 See *supra* notes and text accompanying notes 61-63.

83 A collateral benefit of training is that knowledge of the purposes of GI and how GI fits into a larger landscape or building design can help workers better understand why they are doing what they are. This is vital because understanding the larger meaning of one's work improves worker motivation and productivity. In addition, this knowledge equips professionals to talk with customers about their work and to answer questions, improving customer satisfaction. The same knowledge also equips professionals to discuss what they do with other people and thus raise public awareness. See generally Christina Bjorklund, *Work Motivation: Studies of its Determinants and Outcomes* 39-41, Ph.D. Thesis for the Stockholm School of Economics (2001), available at <http://www.diva-portal.org/smash/get/diva2:221663/FULLTEXT01.pdf> (summarizing the literature on the effect of a worker's interest on his or her motivation and productivity).

84 NRMCA, *Pervious Concrete Contractor Certification Policies and Procedures Manual*, *supra* note 54, at § 9.

85 U.S. GREEN BUILDING COUNCIL, LEED AP NEIGHBORHOOD DEVELOPMENT CANDIDATE HANDBOOK, *supra* note 57, at 4-5; see also GBCI, DISCIPLINARY & EXAM APPEALS POLICY § 9(B) (approved Feb. 9, 2012), available at http://www.gbci.org/files/disc_examappeals_policy.pdf.

86 See *Urban Green Infrastructure*, PRATT INSTITUTE, *supra* note 71.

87 NRMCA, *Pervious Concrete Contractor Certification Policies and Procedures Manual*, *supra* note 54, at § 1.11 ("Certification may be revoked for cause including but not limited to: A. Falsifying information on application; B. Cheating on written examination or performance evaluation; C. Misrepresenting certification; D. Lapsing of certification requirements.").

the alleged violation, to retain counsel, to have an oral hearing, and to cross-examine witnesses.⁸⁸ Penalties range from a reprimand, to denial of renewal, to suspension of the certificate. The Green Building Certification Institute may deny or suspend the professional's eligibility for certification; revoke, suspend, or deny renewal of a certification; issue a reprimand; or take "other corrective action."⁸⁹

Benefits for Certified Individuals

In addition to the benefit of certification, some programs offer professionals a host of membership benefits. For example, many certifying bodies feature a list of certified professionals on their websites.⁹⁰ Green Roofs for Healthy Cities, the trade group that administers the Green Roof Professional certification, offers advertising and promotion, discounts (to attend conferences, participate in continuing education, or buy items in the trade group's shop), and member-only newsletters and other publications. Certification may also be a prerequisite to participating in decision-making for the trade group. For example, Green Roof Professional certification is required to participate on the committees that oversee the certification and revise the GI standards.⁹¹

Demonstration of Program Benefits

Quantifying the benefits of a GI certification program is important for demonstrating its value and achieving widespread acceptance. The North Carolina State University certification has gone even farther; it has tracked and reported improvements in BMP performance due to use of GI certified workers. The program determined that prior to certification, roughly 95% of the 425 GI projects implemented in Cary, North Carolina failed inspections because they were not properly maintained. After owners better appreciated the value of maintenance and hired workers certified by NCSU, roughly 95% of BMPs *passed* a second inspection.⁹²

Despite the importance of demonstrating that the program produces real benefits, we found

88 U.S. GREEN BUILDING COUNCIL, LEED AP NEIGHBORHOOD DEVELOPMENT CANDIDATE HANDBOOK, *supra* note 57; GBCI, DISCIPLINARY & EXAM POLICY, *supra* note 85, at § 9(C), (D).

89 GBCI, DISCIPLINARY & EXAM POLICY, *supra* note 85, at § 3.

90 *E.g.*, Green Roofs for Healthy Cities, *Find a Green Roof Professional*, *supra* note 38; NCSU, *List of Certified Professionals*, <http://www.bae.ncsu.edu/topic/bmp-im/professionals.html> (last visited July 14, 2014).

91 Green Roofs for Healthy Cities, *Individual Benefits*, <http://www.greenroofs.org/index.php/membership/membershipbenefits/individualbenefits> (last visited July 14, 2014).

92 It is not clear how much of the increase in performance was due to greater appreciation of the need for proper maintenance and how much was due to hiring certified contractors.

no other publicly available data tracking the impact of GI certification programs.⁹³ More data on the impact of certification on GI project performance would be useful to provide assurance that the certification will help communities achieve Clean Water Act requirements. Impact data can also provide a transparent way for comparing and evaluating the design of different certifications and their underlying GI standards.⁹⁴

In connection with both this characteristic and the previous one (benefits for certified individuals), we recommend that programs develop both outreach and “in-reach” efforts. Successful certification programs do not exist in isolation. They are typically supported by outreach efforts that promote the value of the certification to outsiders and in-reach efforts that connect certified professionals with one another and the certifying body. Examples of outreach include marketing, publications, conferences, lobbying, charitable giving and activities, community partnerships, and student and youth groups. Examples of in-reach include hosting symposia and meetings for professionals, forming local chapters, and distributing discounts.⁹⁵ By promoting the certification program, outreach helps convince key stakeholders that the certification is worthwhile: worthwhile for a regulator to endorse, for a customer or employer to pay for, and for a professional to attain. In-reach can, among other things, facilitate sharing of best practices, and thus improving the performance of certified workers; form positive business relationships within the industry; and create a sense of collective identity among certified professionals.

Certification Programs Should Be Designed According to Accepted Standards and Seek Accreditation

A number of voluntary standards organizations, most prominently the International Standards Organization (ISO) and its American counterpart, the American National Standards Institute (ANSI), have developed a well-accepted standard for the design of certification programs,

93 In addition to our surveys of program websites, we also asked a variety of experts whether they knew of programs that tracked the effect of certification on BMP performance. The uniform answer we received was (with the exception of the NCSU program) “no.” Experts we consulted for this question include Michael Chavez (Rose Architectural Fellow and LEED AP); Alvaro Sanchez Sanchez (formerly of Green For All); Cindy Brown (EPA Region I); and Colin Lobo (NRMCA). It is possible that other programs also have data of the impacts of certification on BMP performance that they do not disclose to the public. Nevertheless, if certification has a measurably positive impact on BMP performance, it would appear to be in the organization’s best interests to prominently advertise that information.

94 We note that much more research has been done on the performance of BMPs themselves. See EPA, *Green Infrastructure: Performance*, http://water.epa.gov/infrastructure/greeninfrastructure/gi_performance.cfm (last visited July 14, 2014). Leading organizations doing this work include the University of New Hampshire Stormwater Center and the Water Environment Research Foundation and its International Stormwater BMP database.

95 The line between outreach and in-reach can be blurred. For example, a conference (among other things) promotes the certification to all conference attendees, while also facilitating business relationships and exchange of knowledge among certified professionals.

called ISO/IEC 17024.⁹⁶ Designing a certification according to this standard and receiving ANSI accreditation indicates that the program conforms to best practices for certification program design.⁹⁷ Accordingly, accreditation provides employers and workers with assurance that the certification represents valuable skills.⁹⁸

Among other things, ISO/IEC 17024 requires:

- The certification scheme to specify the relevant job and task, and the associated competencies;⁹⁹
- “the involvement of appropriate experts,” “the use of an appropriate structure that fairly represents the interests of all parties significantly concerned,” “a job or practice analysis,” and the “alignment of the assessment mechanisms with the competence requirements;”¹⁰⁰
- A recertification process that “confirms continued competence of the certified person,”¹⁰¹ which is often implemented through continuing education;
- A written overview of the certification process;¹⁰²
- Impartiality in administering the certification program;¹⁰³
- Processes for discipline,¹⁰⁴ complaints,¹⁰⁵ and appeals;¹⁰⁶
- A management system that is capable of supporting consistent achievement of this standard.¹⁰⁷

However, obtaining ANSI accreditation can be costly and resource-intensive, requiring

96 ANSI, *Accreditation Program for Personnel Certification Bodies under ANSI/ISO/IEC 17024*, <http://www.ansica.org/wwwversion2/outside/PERgeneral.asp?menuID=2> (last visited July 14, 2014); see also ANSI, *Certificate Program Accreditation Overview*, <http://www.ansica.org/wwwversion2/outside/CAPgeneral.asp?menuID=212> (last visited July 14, 2014) (ANSI/ASTM E2659 for certificates). For the difference between these two certifications, see *supra* note 22. In addition to ANSI, other organizations that accredit certification programs include The Institute for Credentialing Excellence, <http://www.credentialingexcellence.org/>, and the International Certification Accreditation Council, <http://www.icacnet.org/>.

97 ANSI, *Certificate Accreditation Program*, available at <http://publicaa.ansi.org/sites/apdl/Documents/News%20and%20Publications/Brochures/ANSICAP%20Brochure.pdf>.

98 See *id.* at 1.

99 ISO/IEC 17024 at § 8.2.

100 *Id.* at § 8.4.

101 *Id.* at § 9.6.

102 *Id.* at § 9.1

103 ISO/IEC 17024:2012(E), § 4 and throughout.

104 *Id.* at § 9.5

105 *Id.* at § 9.9.

106 *Id.* at § 9.8.

107 *Id.* at § 10.

significant fees, paperwork, and an on-site audit by ANSI personnel.¹⁰⁸ Full accreditation may not be necessary for a narrowly focused certification program, such as a rain garden certification or a program targeting workers in a single metropolitan region. An organization might also consider a hybrid approach, seeking accreditation for an “umbrella” certification covering basic GI principles applicable in any ecosystem, and then setting ANSI-consistent requirements for stackable certifications that focus on regional and local conditions. Even if they do not seek accreditation, certifying bodies can still benefit from understanding the ISO standards and designing the certification according to those best practices.¹⁰⁹

108 Application for ANSI Accreditation Under ANSI/ISO/IEC 17024, PCAC-FR-504 (2009), available at <http://www.ansica.org/wwwversion2/ANSICAfiles/DocumentRevisionFiles/356/PCAC-FR-504.doc>. For example, the applicant must pay a \$3000 application fee and \$1250 per day per ANSI assessor for the on-site audit plus other expenses; complete a 34 page application form; and correct any non-conforming parts of the certification program. *See id.* at 3, 30-31.

109 *See* ANSI, *Personnel ANSI/ISO/IEC 17024: Forms and Guidance Documents*, <http://www.ansica.org/wwwversion2/outside/PERformsguidance.asp?menuID=2> (last visited July 14, 2014); ANSI, *Certificates ANSI/ASTM: Forms and Guidance Documents*, <http://www.ansica.org/wwwversion2/outside/CAPformsguidance.asp?menuID=212> (last visited July 14, 2014).

V. RECOMMENDATIONS FOR GOVERNMENTS

Even with the design improvements identified above, GI certification programs will still face substantial hurdles to achieving widespread acceptance. Federal, state, and municipal governments can help overcome these hurdles by publicizing the importance of GI and otherwise driving demand for GI and for GI-certified workers. Relevant agencies include not only environmental protection and stormwater agencies, but also transportation, housing, forestry, and agriculture agencies, as well as business improvement districts. Specific actions that governments can take include providing support for certification programs or the underlying standards and BMPs; stimulating demand for GI; and giving preference in procurement and incentive programs to certified contractors.

Promote GI Standards and BMPs

First and foremost, governments can drive development of GI standards and deployment of GI. As identified above, the lack of widely-accepted BMPs for many aspects of GI is one of the main obstacles to widespread acceptance of GI certification programs. Governments can address this shortcoming in three different ways. The most direct would be to create and codify GI BMPs and provide a model for other public and private sector entities. Another option would be to provide funding or other incentives for the development of GI standards by the private sector. Finally, governments can adopt already existing standards and give them greater public exposure and regulatory heft. Note that none of these approaches requires the government to take on the burden of administering the certification program itself.

Support GI Certification Programs

The standards and BMPs provide the necessary foundation for certification programs, but it is still necessary to develop and implement the programs themselves. Governments can also support GI certification programs by providing grants, technical assistance, or marketing. For instance, several city agencies contributed to the curriculum of the Pratt Urban Green Infrastructure certification.¹¹⁰ Meanwhile, EPA's website offers a guide featuring selected GI training and certification programs.¹¹¹

Some local governments have opted to administer their own GI certification programs. For example, the Water Resources Commissioner of Washtenaw County, Michigan administers a rain

110 *Urban Green Infrastructure*, PRATT INSTITUTE, *supra* note 71.

111 EPA, GREEN JOBS TRAINING OPPORTUNITIES CATALOG (2010), *available at* <http://water.epa.gov/infrastructure/greeninfrastructure/upload/greenjobscatalog2010.pdf>.

gardener certification.¹¹² We note that government administration may not ultimately be ideal, as the program may be less nimble in responding to private sector innovation and may suffer from public resource constraints. Moreover, local government certifications contribute to the problem of having many small certifications rather than more widely accepted programs based on harmonized GI standards. We therefore do not recommend that governments administer certification programs, but instead provide support in the other ways identified in this report.

Stimulate Demand for Certification by Stimulating the Market for GI

Governments can also promote GI certification indirectly by increasing the demand for GI itself. The lack of demand for GI in many parts of the country is a key obstacle to the success of certification programs. Stimulating demand benefits GI certification programs because certification is more easily monetized where significant demand for GI exists. For example, governments can drive deployment of GI by requiring its incorporation into publicly funded infrastructure projects. To promote the use of GI in privately-funded projects, local governments can amend their zoning laws and other aspects of their municipal codes to encourage deployment of GI.¹¹³ Governments could also undertake or fund research into the effectiveness of GI techniques, which would document success rates and build confidence in these technologies, thereby encouraging private investment.

Many governments have used these strategies to support deployment of GI. For example, the City of Philadelphia supports GI through its prominent Green City Clean Waters initiative.¹¹⁴ The Philadelphia Water Department (PWD) has developed standards for GI BMPs and requires that the first inch of stormwater be managed on-site.¹¹⁵ PWD stimulates private investment in GI by charging a stormwater fee, which property owners can reduce by implementing GI. PWD also provides tax credits to businesses that install green roofs¹¹⁶ and educates the public about the benefits of GI through community partnerships, public demonstrations, and its website.¹¹⁷ Other prominent examples of

112 Washtenaw County, *Master Rain Gardener Volunteer Program*, *supra* note 39.

113 For examples of municipal code provisions that either encourage or inhibit the use of GI, see REGIONAL AND MUNICIPAL STORMWATER MANAGEMENT, *supra* note 1.

114 Tina Casey, *Philadelphia to be National Model for Green Infrastructure*, TRIPLE PUNDIT (Jan. 27, 2014), <http://www.triplepundit.com/2014/01/philadelphia-transforms-its-urban-watershed/>. For information about the Green City Clean Waters program, see generally PHILADELPHIA WATER DEP'T, GREEN CITY, GREEN WATERS (amended June 2011), *available at* http://www.phillywatersheds.org/doc/GCCW_AmendedJune2011_LOWRES-web.pdf.

115 See PHILADELPHIA WATER DEP'T, STORMWATER MANAGEMENT GUIDANCE MANUAL (revised Feb. 10, 2014), *available at* <http://www.pwdplanreview.org/WICLibrary/Full%20Manual.pdf>.

116 See GREEN INFRASTRUCTURE & ECONOMIC DEVELOPMENT, *supra* note 1, at 26.

117 Philadelphia Water Dep't, *Community Partnerships*, http://phillywatersheds.org/what_were_doing/community_partnerships (last visited July 15, 2014).

cities supporting GI include New York City, Washington, DC, and Portland, Oregon.¹¹⁸

Give Preference in Procurement and Incentive Programs to Certified Contractors

Governments can also drive market support of GI certifications by promulgating preferential procurement or contracting rules. One example of preferential procurement is to give “bonus points” to certified professionals in the bidding process for government contracts just as bonus points are often assigned in the bidding process to businesses that are certified as minority- or women-owned businesses.¹¹⁹ Governments can also require property owners who want to take advantage of government incentive programs to hire certified contractors. For example, Seattle requires residents to hire certified contractors to install GI if they want to qualify for the city’s Rainwise rebate program.¹²⁰ As mentioned above, Philadelphia reduces stormwater fees for property owners who implement GI on their property.¹²¹ Municipalities could also consider requiring owners to hire certified contractors as a condition for fee reduction.

Many communities in North Carolina either mandate or recommend that contractors who maintain GI BMPs be certified by North Carolina State University, or by an equivalent program.¹²² The state Department of Environment and Natural Resources also endorses (but does not mandate) the certification.¹²³

118 See New York City, *Green Infrastructure Plan and Annual Reports*, http://www.nyc.gov/html/dep/html/stormwater/nyc_green_infrastructure_plan.shtml (last visited July 15, 2014); DC Water & Sewer Authority, *DC Water’s Green Infrastructure Plan*, <http://www.dewater.com/education/green.cfm> (last visited July 15, 2014); City of Portland, Or., *Grey to Green*, <http://www.portlandoregon.gov/bes/47203> (last visited July 15, 2014); see also generally EPA, *Green Infrastructure Case Studies*, <http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm#tabs-4> (last visited July 15, 2014); EPA, GREEN INFRASTRUCTURE: CASE STUDIES (2010), available at <http://rfcd.pima.gov/pdd/lid/pdfs/epa-gi-policy-case-studies.pdf>; REGIONAL PLAN ASSOCIATION, 9 WAYS TO MAKE GREEN INFRASTRUCTURE WORK (Nov. 2012), available at <http://www.rpa.org/library/pdf/RPA-9-Ways-to-Make-Green-Infrastructure-Work.pdf>; Water Environment Federation, *Five Types of Green Infrastructure Programs* (Jan. 10, 2013), <http://stormwater.wef.org/2013/01/five-types-of-green-infrastructure-incentive-programs/> (listing five ways for governments to incentivize GI and providing examples). Public universities also conduct significant research on GI. E.g., Stormwater Center, UNIVERSITY OF NEW HAMPSHIRE, <http://www.unh.edu/unhsc/> (last visited July 15, 2014). The federal EPA also supports GI in numerous ways. *What is EPA Doing to Support Green Infrastructure?*, *supra* note 30.

119 See, e.g., Prince George’s County Public Schools, *Purchasing and Supply Services: Minority Business Information*, <http://www1.pgecps.org/purchasing/index.aspx?id=38424> (last visited July 17, 2014).

120 City of Seattle, *Rainwise Rebates*, <https://rainwise.seattle.gov/city/seattle/overview> (last visited July 14, 2014).

121 Philadelphia Water Dep’t, *Reduce Your Stormwater Fees*, http://www.phillywatersheds.org/whats_in_it_for_you/reduce-your-stormwater-fees (last visited July 14, 2014).

122 NCSU, *Certification Description*, *supra* note 41.

123 *Id.*

VI. CONCLUSION: THE PATH TO WIDESPREAD ACCEPTANCE

Once designed and in place, certification programs can serve a number of important functions. As a result of training and certification, professionals become familiar with GI BMP and are more likely to use these techniques in the field.¹²⁴ Proper implementation of any technology is important; however, it is especially critical for GI given present concerns about its ability to perform adequately.¹²⁵ If certified professionals can improve GI performance, the programs will increase consumer confidence in GI's ability to meet Clean Water Act requirements. Moreover, customers can hire professionals with greater confidence, trusting in the reputation of the certification program, the underlying standards, and the organization backing them. As a result of greater customer confidence, the market may demand more GI services and certifications.

Certifications also incentivize holders to behave more professionally.¹²⁶ For example, certification programs can punish certified professionals for misconduct, unethical behavior, and the like.¹²⁷ Programs can also create an ethos of professionalism, such as by requiring a training session on professional ethics, or requiring professionals to affirm an ethics clause prior to receive their certification.¹²⁸

Finally, certification provides a way for professionals to demonstrate their expertise and differentiate themselves from competitors.¹²⁹ For certification programs built upon proprietary rating systems or technologies, certification is the authoritative badge of knowledge of those proprietary systems or technologies.¹³⁰

However, for any of these goals to be met, a certification program needs to enjoy broad acceptance. Of the programs we surveyed, only the PCC pervious pavement certification has achieved

124 *E.g., GRP Accreditation, supra* note 34 (one purpose of GRP is to “[p]rotect[] the industry from the inevitable failures that result from inappropriate design, installation and maintenance practices); *NCSU Stormwater BMP Inspection & Maintenance Certification Workshops, supra* note 43 (“BMPs are not managed as standard landscape features, as they are water quality treatment devices, and specialized training is needed to perform inspection and maintenance activities.”).

125 *See* REGIONAL AND MUNICIPAL STORMWATER MANAGEMENT, *supra* note 1, at 12.

126 *E.g., GRP Accreditation, supra* note 34 (one purpose of GRP is to “[establish] a high-level of professionalism”).

127 *E.g., NRMCA, Pervious Concrete Contractor Certification Policies and Procedures Manual, supra* note 54, at § 1.11.

128 *E.g., id.* at § 1.12.

129 *E.g., GRP Accreditation, supra* note 34 (GRP certification enables “professionals to differentiate themselves in the marketplace”).

130 One professional we interviewed told us that employers generally place far greater value on prior work experience than on a GRP certification. Michael Chavez, personal communication. Another professional expressed concern that the GRP certification did not prove competency, as it only requires passing a multiple choice exam. Trevor Smith, personal communication. Many GRPs, of course, are well versed in installing green roofing.

this level of recognition. Over 11,000 professionals have been certified since the program's creation in 2004,¹³¹ and close to 9000 professionals are currently certified.¹³² The leading industry trade group, the American Concrete Institute, requires that pervious concrete be installed by a PCC certified Installer or Craftsman.¹³³ The certification is endorsed and partly administered by numerous statewide concrete associations.¹³⁴ In addition, the Federal Highway Administration has recognized the PCC certification as a relevant certification for pervious concrete work.¹³⁵ Some state and local government agencies require the certification as well.¹³⁶

There is no reason why additional GI certifications cannot share in the success that the PCC certification enjoys. By addressing current obstacles to widespread acceptance of GI certifications and implementing the recommendations for program design and government actions we identify above, the value of GI certification programs can be enhanced and they can help drive demand for GI certified workers and further deployment of GI.

131 Colin Lobo, personal communication.

132 *NRMCA Certified Professional Database*, <http://www.nrmca.org/certifications/pervious/Search/PERVIOUS/ShowPERVIOUSTablePage.aspx> (last visited July 15, 2014).

133 Scott Erickson, *Pervious Contractor Qualifications*, *CONCRETE CONSTRUCTION* (Oct. 29, 2013), <http://www.concreteconstruction.net/pervious-concrete/pervious-concrete-contractor-certification.aspx>; see *522.1-13 Specification for Pervious Concrete Pavement*, AMERICAN CONCRETE INSTITUTE, <http://www.concrete.org/Store/ProductDetail.aspx?ItemID=522113> (last visited July 15, 2014).

134 NRMCA, *Approved Local Groups*, http://www.nrmca.org/Education/Certifications/Pervious_Groups-List.htm (last visited July 15, 2014).

135 Federal Highway Administration, *TechBrief: Pervious Concrete 6* (2012), available at <http://www.fhwa.dot.gov/pavement/concrete/pubs/hif13006/hif13006.pdf>.

136 See, e.g., City of Seattle, High Point Phase II Abatement Demolition, Grading and Infrastructure, Conformance Specifications including Addenda, Porous Portland Cement Concrete Pavement, http://www.seattle.gov/util/groups/public/@spu/@usm/documents/webcontent/spu02_020009.pdf.

APPENDIX A: LIST OF CERTIFICATIONS

This appendix lists certifications for GI professionals. The list is organized by the type of certifying organization: higher education; trade groups; online education vendors; and suppliers. We mark with a star (*) the certification programs we reviewed. We selected the starred programs for our survey in part due to suggestions from experts with whom we spoke,⁹⁴ and in part with the intent of reviewing certifications with a wide range of design elements.

Higher Education

Pratt Institute

- Certificate in Urban Green Infrastructure: Green Systems Clean Water*
<https://www.pratt.edu/academics/continuing-education-and-professional/pro-certificate-programs/green-systems-clean-water/>

North Carolina State University Cooperative Extension, Bio & Ag Engineering

- Stormwater BMP Inspection & Maintenance Certification*
<https://www.bae.ncsu.edu/topic/bmp-im/>
- Stormwater BMP Reviewer Certification
http://www.bae.ncsu.edu/workshops/bmp_review/index.php
- Residential Rain Garden Certification for Professionals http://www.bae.ncsu.edu/stormwater/training/rg_200.html

University of Washington, Professional & Continuing Education

- Certificate in Green Stormwater Infrastructure Design & Management*
<http://www.pce.uw.edu/certificates/green-stormwater-infrastructure.html>

Alabama Cooperative Extension System

- Rain Garden Certification*
<http://www.aces.edu/natural-resources/water-resources/watershed-planning/stormwater-management/rain-gardens/rg-certification.php>

⁹⁴ For a list of the experts we consulted, see *supra* note 33.

Washtenaw County, Michigan

- Master Rain Gardener Certificate*
http://www.ewashtenaw.org/government/drain_commissioner/dc_webWaterQuality/rain-gardens/volunteer-information-1/volunteer-information

Rutgers, The State University of New Jersey, New Jersey Agricultural Experiment Station

- Rain Garden Certification Program
http://water.rutgers.edu/Rain_Gardens/RGWebsite/rgs_rgst_cert.html

Illinois Community College System

- Stormwater Management Technician, AAS, with stackable certificates in Soil Conservation, Sedimentation Control, Natural Resources and Environmental Science, GIS Mapping⁹⁵
<http://igencareerpathways.org/about/projectnarrativeigencareer.pdf>, <http://www.mchenry.edu/green/sustainabilitystrategicplan.pdf>

The Seed Center

- Listing of Community College Green Programs and Courses
<http://www.theseedcenter.org/Colleges-in-Action/Green-Program-Course-Listings>

Trade Groups

Green Roofs for Healthy Cities (GRHC)

- Green Roof Professional (GRP)*
<http://www.greenroofs.org/>

Watershed Management Group

- Water Harvesting Certification (organization also offers numerous other trainings in GI)*
<http://watershedmg.org/tech-trainings/whc>

American Rainwater Catchment Systems Association (ARSCA)

- Professional Accreditation (Accredited Associate, Accredited Professional, Inspector Specialist)*
<http://www.arcsa.org/?42>

⁹⁵ This certification is described in the linked technical proposals. There was funding given, but the documents do not make clear if this program was ever implemented.

National Ready Mixed Concrete Association (NRMCA)

- Pervious Concrete Contractor Certification Program (Technician, Installer, Craftsman)*
http://www.nrmca.org/Education/Certifications/Pervious_Contractor.htm
- Environmental Professional Certification
http://nrmca.org/Education/Certifications/Environmental_Cert.htm
- Building Green with Concrete Course and Certification
http://www.nrmca.org/Education/Seminars/Building_Green_Online.htm
- Concrete Sustainability Specialist Certification
<http://nrmca.org/Education/Certifications/Sustainability.htm>

Interlocking Concrete Pavement Institute

- Installer Certifications (Concrete Paver Installer Certification, Residential Paver Technician Certification, Commercial Paver Technician Certification, PICP Specialist Designation)*
<https://www.icpi.org/InstallerDesignations>

Northeast Organic Farming Association's Organic Land Care Program (NOFA OLC)

- Accredited Organic Land Care Professional (AOLCP)*
<http://organiclandcare.net/accreditation/about-accreditation>

Monterey Bay Green Gardener Program

- Certified Green Gardener*
<http://www.green-gardener.org/>

Institute for Sustainable Infrastructure (ISI)

- ENV Sustainability Professional (ENV SP)*
<https://www.sustainableinfrastructure.org/assessors/credentialing.cfm>

Washington State Nursery & Landscape Association

- ecoPRO Certified Sustainable Landscape Professional
<http://www.wsnla.org/ecoprocertified>

U.S. Green Building Council (USGBC) and Green Building Certification Institute (GBCI)

- LEED Certifications (LEED Green Associate, LEED Accredited Professional (AP) Building + Construction, LEED AP Operation + Maintenance, LEED AP Interior Design + Construction, LEED AP Homes, LEED AP Neighborhood Development, LEED Fellow, LEED for Homes Green Rater, and Green Classroom Professional)*
<http://www.usgbc.org/leed/credentials>

GPRO: Green Professional Building Skills Training

- Fundamentals of Building Green
<http://gpro.org/courses/fundamentals/>

Sustainable Sites Initiative

- SITES project certification (no professional certification yet⁹⁶)
<http://www.sustainablesites.org/>

Online Education Vendors

Green Professional Training Center

- Green Infrastructure: Guidelines Certification Program*
http://www.greenprofessional.net/green_infrastructure.php

OSHA.COM: Online OSHA Training

- LEED Green Infrastructure Certificates*
<http://www.osha.com/courses/leed-green-infrastructure.html>

Suppliers

Green Living Technologies

- Certified GLT Installers, Certified Maintenance Technician
<http://www.greenroofs.com/premium.php?sid=153>

96 SITES professional training may exist by spring 2014. See http://www.seattle.gov/util/groups/public/@spu/@conservation/documents/webcontent/01_027985.pdf.

LiveRoof

- LiveRoof Certified Installer*
<http://liveroof.com/delivery-and-installation/>

GAF

- GAF Certified Green Roofer
http://www.gaf.com/Other_Documents/Green_Roof_Central/Certified_Green_Roofer_Program.pdf

Aquascape

- Certified RainXchange™ Professional*
<http://www.rainxchange.com/certified-rainxchange-professional/crp.php>

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The background of the page features a large, light green watermark of the Harvard University crest. At the top, the word 'VERITAS' is written across three open books. Below this, there are three stylized trees, each with a bird perched on its branches. The crest is centered and spans most of the width of the page.

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