

NOAA Sea Grant Water Resources Team

Green Infrastructure Webinar Executive Summary

September 14, 2021

Webinar Series Objectives:

- Raise awareness and visibility of Sea Grant water resources programming within the wider Sea Grant Network.
- Highlight innovative Sea Grant research, extension, education, and communication activities related to water resources.
- Provide opportunities for networking and strategic thinking around pressing water issues.

Speakers and Panelists:

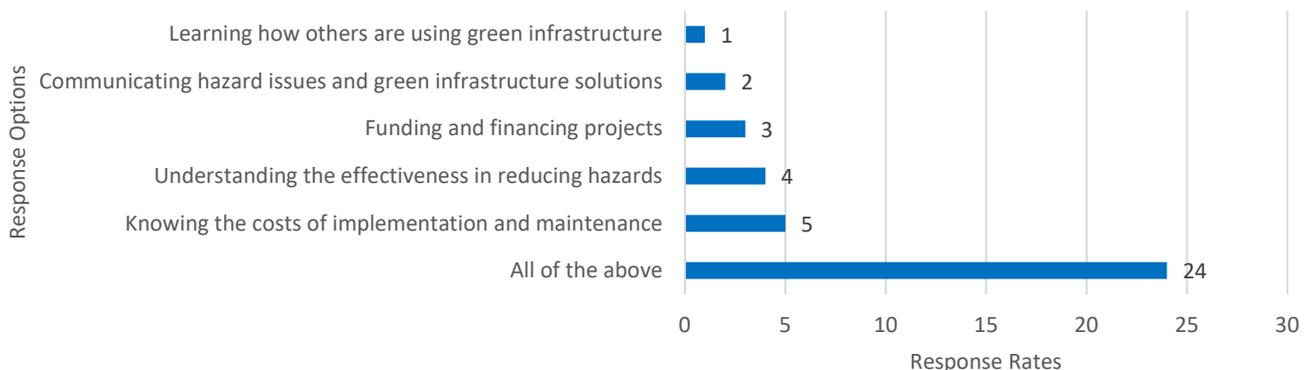
- [Lauren Long](#), Coastal Conservation Specialist, NOAA Office for Coastal Management, “[Green Infrastructure Solutions for Community Resilience](#)”
- [Jessica T.R. Brown, PE](#), Stormwater Specialist, Marine Extension and Georgia Sea Grant, “[Green Stormwater Infrastructure](#)”
- [John Bilotta](#), Senior Research and Extension Coordinator, Minnesota Sea Grant & Minnesota Water Resources Center, “[Great Lakes Green Infrastructure Community of Practice](#)”
- [Peter Rowe, Ph.D.](#), Acting Executive Director & Director of Research and Extension, New Jersey Sea Grant Consortium, “[Optimizing Green Infrastructures \(GI\) and Low Impact Developments \(LID\) to Mitigate Runoff and Pollution Impacts on Freshwater Systems](#)”
- [Kelly Donaldson](#), Communications Lead, Pennsylvania Sea Grant, “[A Layered Approach to Community Engagement](#)”
- [Zeyuan Qiu, Ph.D.](#), Professor of Environmental Science and Policy, New Jersey Institute of Technology

WEBINAR OUTCOMES

91 participants representing 74% of university-based Sea Grant Programs (25/34) and the National Sea Grant Office.

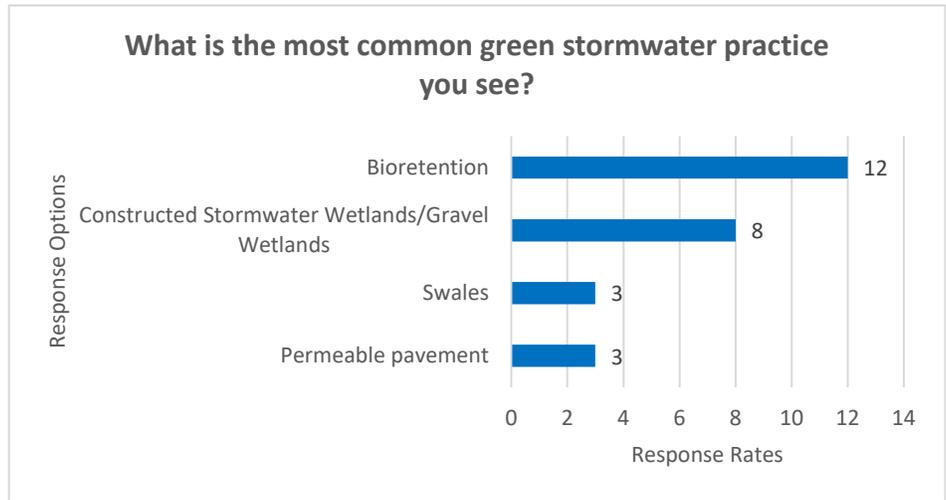
Broad regional representation including participation of Sea Grant programs in the Northeast, Mid-Atlantic, Southeast, Gulf of Mexico, Great Lakes, West Coast, Caribbean, and insular Pacific.

What green infrastructure topics are most relevant to your needs?





When asked **the most common green stormwater practice seen**, respondents most often chose **bioretention**.



GREEN INFRASTRUCTURE WEBINAR ACCOMPLISHMENT

Title: The Sea Grant Network participated in a learning, networking, and strategic thinking workshop regarding green infrastructure.

Recap: The Sea Grant Water Resources Team engaged the Sea Grant Network on the pressing issue of green infrastructure, shared innovative work in understanding the types and uses for green infrastructure, and facilitated a discussion on future needs; 91 individuals representing 74% of university-based Sea Grant Programs and the National Sea Grant Office participated in the workshop.

Relevance: Coastal and Great Lakes communities are facing rising sea levels, aging infrastructure, and intensifying storm and flooding events in some regions and droughts in others. There is a pressing need for enhanced research, monitoring, and evaluation of local and regional water supplies and conditions in the communities Sea Grant serves. In 2018, the Sea Grant Network developed a Water Resources Vision to describe our current work in this area and chart our future actions.

Response: The Water Resources team developed a webinar series to highlight innovative Sea Grant research, extension, education, and communication activities related to water resources while providing opportunities for networking and strategic thinking around pressing water issues. In addition, the series raises awareness and visibility of Sea Grant water resources programming across the wider Sea Grant Network. On September 14, 2021, the team conducted a webinar focused on green infrastructure (GI).

Results: Ninety-one individuals representing 74% of university-based Sea Grant Programs and the National Sea Grant Office participated in the webinar. Participants' evaluations reported the webinar informative, with 68% finding it "very informative." Two speakers provided an overview of GI, and about green stormwater infrastructure specifically. Three additional speakers provided lightning talks about GI opportunities. The webinar concluded with a panel discussion by subject matter experts focused on how Sea Grant can continue to build off GI successes.



Webinar Planning Committee:

- [Jessica T.R. Brown, P.E.](#), Stormwater Specialist, Marine Extension and Georgia Sea Grant
- [Jennifer Dindinger](#), Watershed Restoration Specialist, Univ. of Maryland Sea Grant Extension
- [Kelly Donaldson](#), Communications Lead, Pennsylvania Sea Grant
- [Brooke Saari](#), Coastal Environmental Quality Program Specialist, South Carolina Sea Grant
- [Stephanie Otts, J.D.](#), Director, National Sea Grant Law Center
- [Karen J. Bareford, Ph.D.](#), Sea Grant Water Resources Lead, Mississippi-Alabama Sea Grant Consortium



The NOAA Sea Grant Water Resources Team engages affiliated professionals interested and working in water-related topics to support and advance such efforts within NOAA Sea Grant. All are welcome. To be added to the listserve, please email your request to: kjbareford@ua.edu or showalt@olemiss.edu. We look forward to working with you!



Green Infrastructure Solutions for Community Resilience



Lauren Long, Coastal Conservation Specialist
Lynker/CSS Team
On contract to NOAA Office for Coastal Management



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Green Infrastructure

Preserve the natural environment and mimic natural processes



9

Our Approach

Mitigate

Hazard Impacts

Using

Ecosystem Services

By

Implementing Green Infrastructure

10

Our Approach

Mitigate

Stormwater runoff

Using

Water infiltration

By

Installing bioretention



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Benefits



WAVE ATTENUATION
Slows and absorbs the energy of waves coming to shore.

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Co-Benefits



Recreation

Habitat

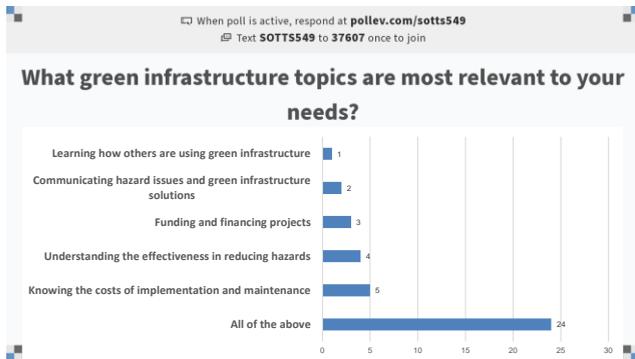
Water quality

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Green Infrastructure Practices



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Digital Coast Academy

coast.noaa.gov/digitalcoast/training/home.html



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Nature-Based Solutions for Coastal Hazards Training

Virtual 101 (2 hours)



coast.noaa.gov/digitalcoast/training/green-virtual.html

In-Person (full day)

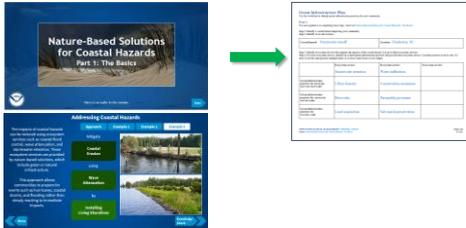


coast.noaa.gov/digitalcoast/training/green.html

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Nature-Based Solutions for Coastal Hazards: The Basics

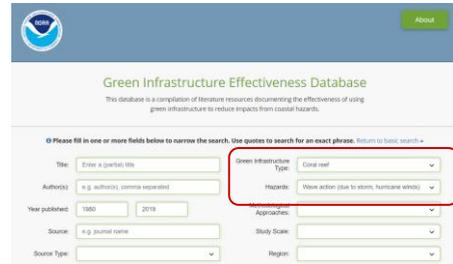
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Green Infrastructure Effectiveness Database

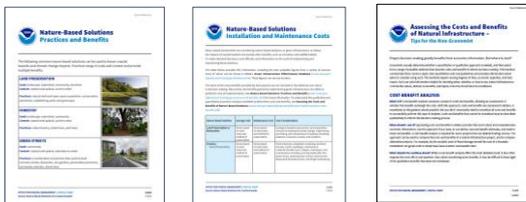
coast.noaa.gov/digitalcoast/training/gi-database.html



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Nature-Based Solutions: Benefits, Costs, and Economic Assessments

coast.noaa.gov/digitalcoast/training/gi-practices-and-benefits.html



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Funding and Financing: Options and Considerations for Coastal Resilience Projects

coast.noaa.gov/digitalcoast/training/financing-resilience.html



Recorded Funding and Financing webinars -
coast.noaa.gov/digitalcoast/training/funding-webinars.html

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Case Studies

coast.noaa.gov/digitalcoast/training/home.html



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Questions?

Lauren.Long@noaa.gov



Office for Coastal Management



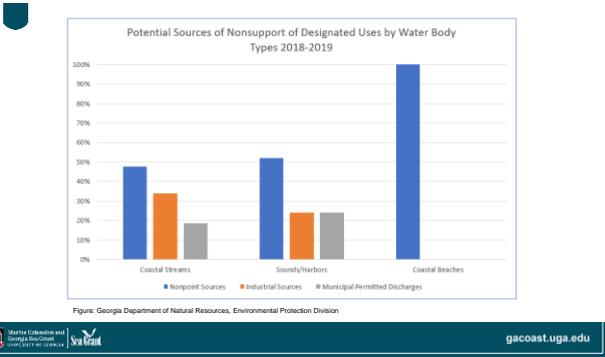
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Green Stormwater Infrastructure

Jessica T. R. Brown, PE

Marion Estabrook and Georgia Sea Grant UNIVERSITY OF GEORGIA Sea Grant

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Photos: Center for Watershed Protection (Pathogens), <http://www.pavement4life.com/CDU/Inpage/Environment118.jpg> (Temperature), Content.time.com, NASA Visible Earth

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Hydrology

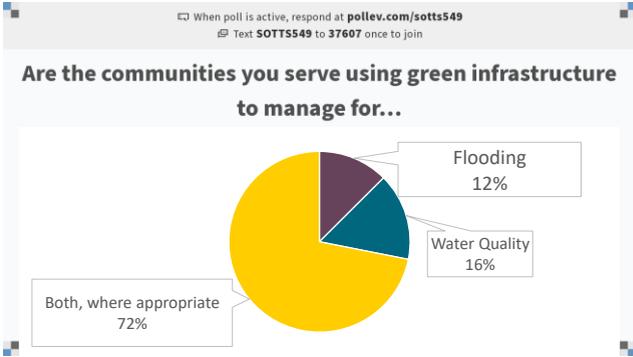
Soils

Vegetation

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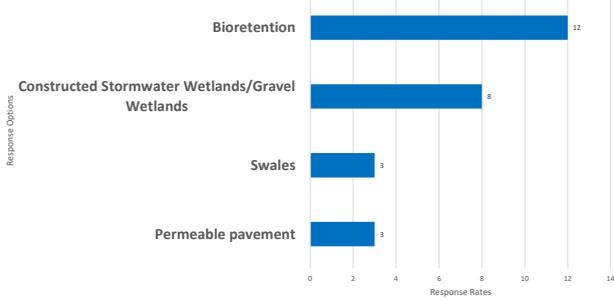
Figure: Xerox Advertisement

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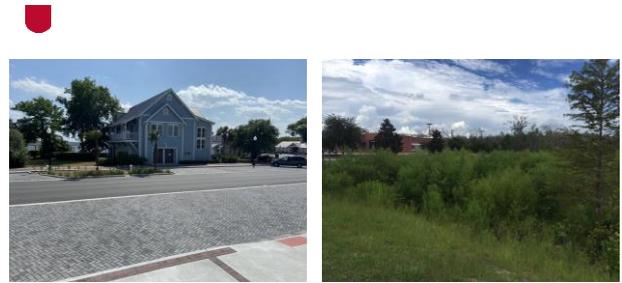


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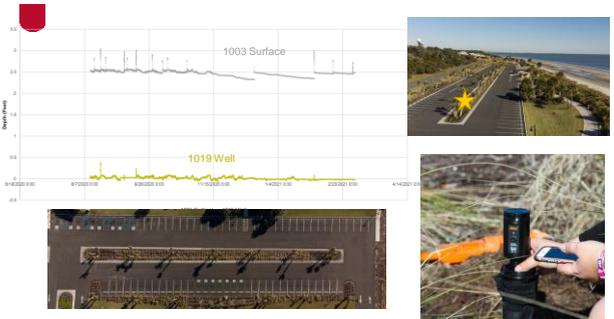
What is the most common green stormwater practice you see?



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"target inspectors completing regular inspections and public works employees and contractors conducting maintenance."

21% of survey respondents in 2019 study cited "private landscapers and public works staff" as "audience in most need for stormwater training."



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Please let us know in the chat:

What Green Infrastructure work/projects are happening in your program? And, who is the lead or contact?

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Lighting Talks



- Great Lakes Green Infrastructure CoP, John Bilotta, MN Sea Grant
- Mitigation Runoff NOFO Awardee, Pete Rowe, NJ Sea Grant
- A Layered Approach, Kelly Donaldson, PA Sea Grant

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John Bilotta
Senior Research and Extension Coordinator
Minnesota Sea Grant &
Minnesota Water Resources Center

Great Lakes Green Infrastructure Community of Practice



<https://northcentralwater.org/green-infrastructure/>
Join the Great Lakes CoP link: <https://groups.webservices.illinois.edu/subscribe/103758>

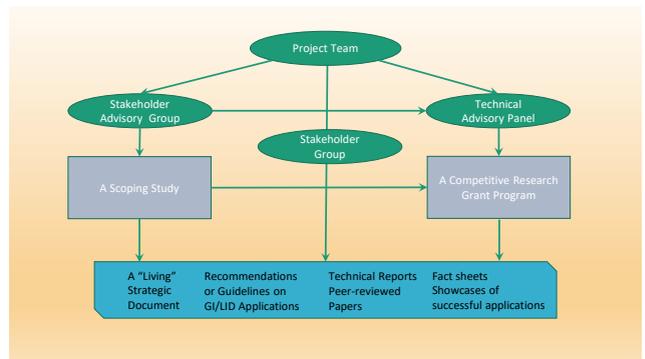
- Also available through the main link noted above

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Optimizing Green Infrastructures (GI) and Low Impact Developments (LID) to Mitigate Runoff and Pollution Impacts on Freshwater Systems

- Project Team
 - Dr. Peter Rowe (PI) – New Jersey Sea Grant Consortium; prowe@njseagrant.org; 732-872-1300 x 31
 - Dr. Dibyendu Sarkar (Co-PI) – Stevens Institute of Technology; dsarkar@stevens.edu; 201-216-8028
 - Dr. Zeyuan Qiu (Co-PI) – Stevens Institute of Technology; qiu@stevens.edu; 973-596-5357
 - Dr. Yang Deng (Co-PI) – Montclair State University; yang@montclair.edu; 973-655-6678
- Project Duration: 9/1/2021 – 8/31/2024
- Project Objective
 - To optimize the deployment of innovative GI/LID techniques through science and catalyzed collaboration of the Sea Grant Network, with other agencies in mitigating runoff and pollution impacts on the freshwater systems, and eventually protecting the coastal ecosystems in the U.S. to maximize their environmental, economic, and social benefits
- Two Project Components
 - A scoping study to develop a "living" strategic document that prioritizes research needs, delineates the roles of the Sea Grant Network, and identifies strategies for the Sea Grant Network in collaboration with other agencies to deploy GI/LIDs in mitigating runoff and pollution impacts on freshwater systems.
 - A regional competitive research grant program to fund research projects, generate research results that fulfill the knowledge gaps identified in Component I, and finalize the recommendations to the Sea Grant Network.

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Kelly Donaldson, Communications Lead
Pennsylvania Sea Grant

A Layered Approach to Community Engagement

Community Engaged Intern: **Isabella Duggan**
Connect with Pennsylvania Sea Grant Green Infrastructure Expert: **Tom Cermak**
Municipal Communications & Outreach: **City of Reading**
Engage with Knauss Fellow: **Brian Redder**
Green Infrastructure Resources

Isabella Duggan
CEI Science Communications Intern

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A Layered Approach to Community Engagement

Connect with Pennsylvania Sea Grant Green Infrastructure Expert: **Tom Cermak**
Municipal Green Infrastructure Communications & Outreach: **City of Reading**

Tom Cermak
Great Lakes Coastal Outreach Specialist

Green Infrastructure Resources

HOMEOWNER'S GUIDE TO GREEN INFRASTRUCTURE

Green vs Gray Infrastructure

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A Layered Approach to Community Engagement
 Engage with Knauss Fellow **Brian Redder**
 Professional development
 Knauss Fellow serving as mentor to undergraduate in **Brian Redder**
Entire process and resources replicable
 Knauss Fellow

- Guidance for writing constituent letter in support of green infrastructure
- Communications & Outreach messaging to legislative staff
- Mentor for career interests including public policy
- Encouragement and guidance for Knauss Fellowship opportunity

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Stay Tuned!

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- **Future Webinars Ideas:**
 - New Sea Grant Liaisons
 - Water-Related NOFO Awardees
 - Sea Grant Water Resources Lead
- **Topics and planning committees will be forming after next All Hands Call.**

10-YEAR NOAA SEA GRANT WATER RESOURCES VISION
 August 2018

https://seagrant.noaa.gov/Portals/1/2018%20OSG%20Water%20Resources%20Vision_1.pdf

NOAA Sea Grant

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Thank you!

For additional information please contact:
 Stephanie Ottis, sshowall@olemiss.edu or
 Karen Bareford, kjbareford@ua.edu

Sea Grant

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continue on next page

GREEN INFRASTRUCTURE Q&A – SUMMARIZED RESPONSES

GREEN INFRASTRUCTURE SOLUTIONS FOR COMMUNITY RESILIENCE, [LAUREN LONG](#)

Q: Are these resources available in Spanish?

A: Some are, but not all. Three of our nature-based solutions quick references are available in both Spanish and English as well as our online, self-guided module called “Nature-Based Solutions for Coastal Hazards: The Basics”. Both of those resources are linked from Lauren Long’s presentation. All links have also been added in the resources section.

GREEN STORMWATER INFRASTRUCTURE, [JESSICA BROWN](#)

Q: Is the 2020 BMP study mentioned available online?

A: Link to the International Stormwater BMP Database: 2020 Summary Statistics - https://www.waterrf.org/system/files/resource/2020-11/DRPT-4968_0.pdf.

LIGHTING TALKS

A Layered Approach to Community Engagement, [Kelly Donaldson](#)

Q: Is the Homeowners Guide to Green Infrastructure a public document? If so, where can I find it?

A: No, the outreach materials mentioned during the lighting talk are under development by Pennsylvania Sea Grant. They have not yet been released. There is, however, a Homewowner’s Guide to Stormwater that is publicly available at <https://agsci.psu.edu/aec/research-extension/conservation-tools/stormwater-management>.

PANEL DISCUSSION

Q: How do best GI practices differ across programs and geographic locations? What are the most important factors to consider when prioritizing projects?

A: ([Lauren Long](#)) Looking at the landscape and understanding your issues (whether coastal hazards or something else) and ecosystem services needed from GI is going to determine what you implement. Community values are also key for prioritizing GI. I’ve heard from other experts that it is important to start small and complete small projects and see those successes before going bigger. This will help you get buy-in on additional projects you want to prioritize.

A: ([Jessica Brown](#)) Resource Engineer response is that it depends. It is important to know the location and important to talk to local resources that have an institutional knowledge about that place. Capitalize on those resources to narrow down which is most important.

A: ([John Bilotta](#)) I suggest from observation, that GI differs across programs and geography for a number of reasons including 1) what drives or motivates the use of GO, 2) the desired benefits for using GI, and 3) scale; some with GI programming at house, lot, neighborhood, community and regional scales. All of which are very different.

A: ([Pete Rowe](#)) We might see this in scoping and regional and state differences. My hope is that anything that comes out of our research can be applicable to other regions of the country. A lot of local geography is going to determine how we respond.

Q: Green Infrastructure, Nature based solutions, Natural Infrastructure. Any differences?

A: (Lauren Long) This is a complicated question to talk about terms. We discuss this at times in our office and there are some differences and nuances with various terms. For example, “nature-based” can be associated with stormwater projects or projects that include some type of engineering in addition to vegetation. We try to focus on the issues and the work being done on the ground rather than getting hung up on the terminology.

A: (John Bilotta) This depends on scale. We could take a broad look at GI or zoom in and there are differences. Agree with Lauren that it is important to talk about goals and policies with our stakeholders, but it is a great question to reflect on.

Q: When trying to convince communities being impacted from flood risk to engage in the decision-making process, is including them in a stakeholder advisory group best, or are there other ways to get them actively involved or integrated into the decision-making process?

A: (Jessica Brown) Spending some time in the locations where the flooding is happening is important. A lot of information can be gained from the people in the area. There is value in communities and stakeholder engagement, but nothing beats going to the location with a cup of coffee.

A: (Pete Rowe) Those individuals need to be part of the decision-making process and having those relationships from the beginning is important. We use that knowledge for our research and build that information in from the beginning. Advisory boards can help, but at least for our project the final decision-making process may be above us, but hopefully anyone involved will have those tools and knowledge to move forward. Certainly, need to provide right from the beginning.

A: (Lauren Long) Agreed with other panelists. Having those conversations is really important and encourages a diversity of folks to be involved.

A: (Zeyuan Qiu) From a project perspective, it is essential to engage stakeholders to make the project successful. A GI project affects people's lives and communities and naturally this will engage people with diverse interests. To be successful, stakeholder engagement is crucial especially at the beginning to consider diverse issues related to the project. In the end, the project would achieve broader impacts than what was planned originally as GI is multi-dimensional and multi-functional. From a grant perspective, we need your engagement in our project. Although our project team has broad expertise ranging from science and engineering to social science and economics related to GI, the project is a stakeholder engagement project. I really appreciate the depth and extents of GI knowledge within the Sea Grant network as shown in this webinar. We have the contact information in our presentation slides. Feel free to reach out to us. We want to engage you into our stakeholder process and be an active resource and participant to our project.

Q: I am wondering if there has been any BMP or pilot projects dealing with coastal areas where the available area for any GI infrastructure is very limited (eg. < 5 meters)?

A: (Jessica Brown) We are seeing quite a bit of that in Georgia in the ultra-urban areas. Seeing a lot of permeable pavement applications such as the St. Mary's project I alluded to. Some of the mixed-use applications that can capitalize on any square use that is available

Q: Is this St. Mary's parish you are talking about?

A: No, St. Mary's, Georgia.

Q: What is your experience promoting GI in USACE (U.S. Army Corps of Engineers) flood control projects in US?

A: (Lauren Long) The Corps recently published guidance on NBS for risk reduction. The findings (International Guidelines on Natural and Nature-Based Features for Flood Risk Management) will be released on September 16th. So, they are trying to work on those categories. Link to information about the guidelines document, along with links to the final document and a summary: https://ewn.erdc.dren.mil/?page_id=4351.

Q: What ways do you think we can best leverage extension to help our communities, states, and regions address GI?

A: (Lauren Long) Sea Grant does a great job of hosting community members and training on the topic. After that it is important to bring people back together after training and dive back into more of the detailed products that Kelly highlighted with her work.

A: (John Bilotta) Professional Development. We leverage our expertise for extension and training, so I agree with Lauren. The other piece is research and tackling the unanswered questions that communities have when it comes to GI.

A: (Jessica Brown) Echo colleagues. Working within the network and the role that research and extension have to partner. I have found great information by pairing with our communications team and education team and the policy experts with the law center and abroad. A lot of what we do with technical folks is related to what communities have to tackle.

A: (Lauren Long) Wondering about the opportunity to expand the workplace. Jessica, you mentioned that public works officials need training, so I have been thinking a lot about how we can expand the work force ... how can we train on implementation and not just on topics.

SEA GRANT GREEN INFRASTRUCTURE PROJECTS

COASTAL GREEN INFRASTRUCTURE DESIGN AND CONSTRUCTION INTERNSHIP (Delaware)

Delaware Technical Community College and Delaware Sea Grant offer a paid internship for students to learn professional design and construction skills for coastal green infrastructure projects. The internship consists of seven one-day field-based internship experiences. No contact listed.

<https://www.deseagrant.org/green-infrastructure-internship?rq=green%20infrastructure%20internship>

THE PARTNERSHIP FOR PLASTIC FREE RESTORATION OF OYSTER SHORELINES (Florida)

The Partnership for Plastic Free Restoration of Oyster Shorelines (PROS) is a network of practitioners, educators, and local government partners will work toward implementing living shoreline projects using a newly developed plastic-free material called reef prisms. Before we dive into the PROS collaboration, let's learn more about reef prisms. **Contact:** Savanna Barry, *Regional Specialized Extension Agent* (sbarry@ufl.edu). <http://blogs.ifas.ufl.edu/ncbs/2021/09/03/a-partnership-for-pros-plastic-free-restoration-of-oyster-shorelines/>

ADAPTIVE STORMWATER MANAGEMENT PLAN FOR HINESVILLE, GEORGIA (Georgia)

Marine Extension and Georgia Sea Grant worked in collaboration with the Georgia Department of Natural Resources Coastal Resources Division to create a sustainable, innovative and cost-effective stormwater management plan by identifying stormwater green infrastructure opportunities in the city

of Hinesville. The plan will serve as a guide to begin implementing green infrastructure practices and allow the local community to manage stormwater runoff more effectively. **Contact:** Jessica Brown, P.E., *Stormwater Specialist* (jtrbrown@uga.edu). https://gacoast.uga.edu/wp-content/uploads/2021/01/FINAL-ASM-Hinesville_ADA.pdf

COASTAL GEORGIA RAIN GARDEN PROGRAM (Georgia)

The Coastal Georgia Rain Garden Program provides resources for nonprofessional participants (Residential, business, institutional) to design, build, operate, and maintain site-specific rain gardens. A pilot incentive program was launched in 2021 with the goal of implemented rain gardens that manage and infiltrate a minimum of 10, 000 gallons of stormwater annually. **Contact:** Jessica Brown, P.E., *Stormwater Specialist* (jtrbrown@uga.edu). [Rain Gardens in Coastal Georgia Guide](#).

LOW IMPACT DEVELOPMENT INVENTORY (Georgia)

Marine Extension and Georgia Sea Grant collaborated with the Georgia Department of Natural Resources to create a Low Impact Development (LID) inventory for coastal Georgia. LID practices manage stormwater by minimizing impervious cover using natural or man-made systems that incorporate science-based strategies and tools to treat stormwater before it flows into streams and estuaries. The inventory includes best practices from 11 of Georgia's coastal communities. Information about the type of practice, along with photographs and summary reports will be included. These data will be used to support the design, development and permitting of future projects in coastal communities. **Contact:** Jessica Brown, P.E., *Stormwater Specialist* (jtrbrown@uga.edu). [2017 Inventory](#). 2022 Inventory assessments are underway.

MONITORING INFILTRATION RATES OF COASTAL LOW IMPACT DEVELOPMENT PRACTICES (Georgia)

Unique coastal conditions and associated factors such as fluctuations of ten (10) feet in the daily diurnal tide, shallow groundwater, and local soil properties and soil characteristics impact the performance of the bioinfiltration practices. Studies have shown that water quality benefits and corresponding pollutant removal efficiencies are linked with hydrologic performance. Yet, there are limited published data available about how bioinfiltration systems perform in the coastal plain and the impact that coastal characteristics have on the infiltration and exfiltration rates associated with these practices. This project is working to better understand the hydrologic performance and effectiveness of green infrastructure/low impact development (GI/LID) bioinfiltration practices in Georgia's coastal environment. **Contact:** Jessica Brown, P.E., *Stormwater Specialist* (jtrbrown@uga.edu). [Project presentation](#) from the National Water Quality Monitoring Conference, April 2021.

RETHINKING RUNOFF PLAN (Georgia)

The City of Brunswick needs a unified strategy for implementing stormwater green infrastructure to address nonpoint source pollution. The City of Brunswick is a historic, port city that is striving to be "A City for All Seasons" and a business-friendly environment. To achieve the quality of life for its residents, reach its economic development goals, and protect the natural resources that surround it – the City is committed to "Rethinking Runoff" by creating a plan to utilize innovative green infrastructure solutions to manage stormwater. Anticipated completion in 2022. **Contact:** Jessica Brown, P.E., *Stormwater Specialist* (jtrbrown@uga.edu).

STORMWATER OPERATION, INSPECTION AND MAINTENANCE TOOLS (Georgia)

Marine Extension and Georgia Sea Grant and partners developed a suite of photo-based resources for inspectors and maintenance staff engaged in stormwater management. The created resources include a six-minute video highlighting permeable pavement maintenance and the role of stormwater green

infrastructure in coastal Georgia, inspection checklists with photos of varying levels of performance, as well as fact sheets on coastal Georgia's most common stormwater green infrastructure practices.

Contact: Jessica Brown, P.E., *Stormwater Specialist* (jtrbrown@uga.edu). [Compiled Toolkit](#).

LAWN TO LAKE PROGRAM (Illinois-Indiana)

The "Lawn to Lake" program is working to improve awareness on the overuse chemical fertilizers, pesticides, and water. Lawn to Lake focuses on outreach to multiple audiences, including municipalities, landscape professionals, homeowners, master gardeners, teachers, retailers, and commercial property owners. The three-year project is funded by a grant from the [U.S. EPA Great Lakes Restoration Initiative](#), and aims to reduce the amount of toxins entering Great Lakes Basin waters. **Contact:** Margaret Schneemann, *Water Resource Economist* (MSchneemann@cmap.illinois.gov).

<https://iiseagrant.org/lawn-to-lake-program-promotes-natural-lawn-care/>

ONE BLOCK AT A TIME (Illinois, Minnesota, and Pennsylvania)

The "One block at a time" project is a National Sea Grant funded effort to address the impacts of flooding through equitable and inclusive stormwater management. The Sea Grant programs will focus on improving resilience to climate-related hazards through paired projects in four marginalized communities on the Great Lakes coast. Project objectives include an assessment and identification of vulnerable communities/neighborhoods and their associated climate challenges, listening sessions and focus groups bridging municipal and community leaders, and visioning exercises for implementation of multi-beneficial green infrastructure. **Contacts:** Kara Salazar, *Assistant Program Leader and Extension Specialist For Sustainable Communities*, IISG (salazark@purdue.edu); Madison Rodman, *Resilience Extension Educator*, MNSG (mrodman@umn.edu); Sara Stahlman, *Extension Leader*, PASG (sstahlman@psu.edu).

WATERSHED STEWARDS ACADEMY (Maryland)

The Watershed Stewards Academy (WSA) is a training program to empower residents to improve the quality of local waterways. By sharing resources, forming partnerships, and coordinating efforts, WSA works with a Consortium of Support Professionals, Master Watershed Stewards and their communities to reduce pollutants, infiltrate stormwater and restore natural systems. Currently, the Watershed Steward Academy is in six counties and the National Capital Region. No contact listed.

<https://extension.umd.edu/programs/environment-natural-resources/program-areas/watershed-protection-and-restoration-program/watershed-stewards-academy>

GREEN INFRASTRUCTURE RESEARCH (Mississippi-Alabama)

The Mississippi-Alabama Sea Grant Consortium issued a grant to University of Mississippi researchers to analyze technical, financial, and legal barriers to implementing green stormwater infrastructure (GSI). The performance of GSI in runoff reduction was assessed via computer modeling for different types of green infrastructure, such as grassy ditches, permeable pavement, and rain gardens. The research aims to help coastal cities become more resilient to flooding by improving their stormwater management practices on a site-by-site basis. **Contact:** Kristina Alexander, J.D., *Research Counsel*

(kalexan@olemiss.edu). <http://masglp.olemiss.edu/projects/greeninfrastructure/index.html>

IMPLEMENTING AND MONITORING GREEN INFRASTRUCTURE AT GREAT LAKES MARINAS AND THE CLEAN MARINA STORMWATER TOOLKIT (Michigan, Ohio, and Wisconsin)

MI, OH and WI Sea Grant programs, along with partners Wisconsin Coastal Management, The OSU Stormwater Management Program, and Ohio DNR, were funded by the Great Lakes Protection Fund to implement and monitor green infrastructure at Great Lakes marinas. All of the GI practices have been

constructed, and monitoring and outreach will continue through 2022. In addition, the project team developed the Great Lakes Clean Marina Stormwater Toolkit, an online resource for outreach and marina staff to learn, visualize and build GI practices at marinas. **Contact:** Julia Noordyk, *Water Quality and Coastal Communities Outreach Specialist*, WISG (noordykj@uwgb.edu). <https://www.michiganseagrant.org/cmst/>

MINNESOTA STORMWATER RESEARCH AND TECHNOLOGY TRANSFER PROGRAM (Minnesota)

Minnesota is making millions of dollars' worth of investments into research on urban stormwater including green infrastructure. The Minnesota Stormwater Research and Technology Transfer program was established in 2016 and coincides with the [Minnesota Stormwater Research Council](#) consisting of stakeholders, practitioners, professionals, and policymakers that guide research investments and help ensure the program addresses the highest priorities and needs. **Contact:** John Bilotta, *Senior Research and Extension Coordinator* (jbilotta@umn.edu). <https://www.wrc.umn.edu/projects/stormwater>

EROSION AND STORMWATER MANAGEMENT CERTIFICATION PROGRAM (Minnesota)

Minnesota makes the transfer of scientific knowledge a high priority by developing and offering professional certifications and training to stormwater practitioners, professionals, and policymakers. One such example is the University of Minnesota Stormwater Practice Inspection and Maintenance Certification Course. In this certification, participants are trained in the best methods for stormwater practice inspection and maintenance through both online and in-field exercises, presentations, discussions and concludes with an exam. New research is integrated into the course as it is discovered. **Contact:** John Bilotta, *Senior Research and Extension Coordinator* (jbilotta@umn.edu). <https://erosion.umn.edu/>

GREAT LAKES ONE WATER PARTNERSHIP (Minnesota)

The Great Lakes One Water (GLOW) Partnership is a Great Lakes Basin-wide initiative that brings together local community foundations and partners to address a broad suite of water quality and quantity issues. Minnesota Sea Grant leads the Lake Superior GLOW team and their [Resilient Future Project](#), which is working with local municipal, non-profit, and philanthropic partners to equitably address stormwater issues and urban flooding in Duluth, Minnesota. The Lake Superior team also focuses on improving community resilience through increased information sharing, capacity building, and collaboration among local organizations. **Contact:** Madison Rodman, *Resilience Extension Educator*, MNSG (mrodman@umn.edu). <https://greatlakesonewater.org/>

CLIMATE CHANGE IMPACT PROJECTS FOR THE TOWN OF CHELSEA (MIT)

MIT Sea Grant has mentored individuals and teams of students to help provide solutions to climate-related challenges for the city of Chelsea, a densely populated, highly built out coastal environmental justice community north of Boston, MA. Specific projects have included: (1) providing a detailed park design proposal for an undeveloped coastal parcel which explored ways of integrating public use with living shoreline design elements; (2) analyzing open space suitability for future park planning to manage stormwater and mitigate urban heat island effects; and (3) analysis of vulnerability of municipal properties to flooding from stormwater and sea level rise. **Contact:** Juliet Simpson, Ph.D., *Coastal Ecologist* (simpsonj@mit.edu).

STORMWATER MASTER PLANS FOR SCHOOLS (North Carolina)

North Carolina Sea Grant collaborated with Sound Rivers, Inc. and the Department of Biological and Agricultural Engineering (BAE) of North Carolina State University to secure funding from multiple organizations to develop stormwater master plans for schools through the Neuse and Tar River basins.

Master plans were developed for 20 school campuses including middle, high school, and community colleges. Existing stormwater issues and opportunities were reviewed with principals, presidents, faculty, and facilities staff. The top stormwater measures were prioritized and to date two stormwater wetlands and several cisterns have been installed on school campuses. **Contact:** Barbara Doll, Ph.D., PE, *Extension Associate Professor*, (bdoll@ncsu.edu).

CASCADE CREEK STREAM RESTORATION (Pennsylvania)

Since 2004, Pennsylvania Sea Grant has worked with numerous partners in the Erie region to restore the heavily urbanized Cascade Creek watershed. Urban stormwater runoff had led to the severe degradation and the stream lacked much of the natural form and function that existed pre-development. Six phases of stream restoration have occurred, and two additional phases are in the design and engineering phase.

Contact: Thomas Cermak, *Coastal Outreach Specialist* (tjc29@psu.edu).

<https://seagrant.psu.edu/topics/stream-restoration-and-stormwater-management/projects/cascade-creek-restoration>

CHESTER CITY GREEN STORMWATER INFRASTRUCTURE PLAN (Pennsylvania)

Completed in 2017, Pennsylvania Sea Grant worked with the City of Chester, PA to develop the Chester City Green Stormwater Infrastructure Plan. This document, which follows and complements the City's Climate Adaptation Plan, provides a framework to manage stormwater with methods that contribute to safe, attractive, and more resilient neighborhoods. **Contact:** Thomas Cermak, *Coastal Outreach Specialist* (tjc29@psu.edu). <https://seagrant.psu.edu/topics/green-infrastructure-chester-climate-change-climate-change-and-hazard-resiliency/resources>

MILLCREEK TOWNSHIP GREEN PARKING ORDINANCE

In 2016, Pennsylvania Sea Grant worked with Millcreek Township to draft a zoning amendment that requires all new and redeveloped parking lots to include a minimum of 7% vegetation. These standards, which passed unanimously by the township supervisors, apply to parking lots that accommodate 15 or more parking spaces and are intended to increase pervious surfaces that facilitate groundwater recharge as well as mitigate runoff. **Contact:** Thomas Cermak, *Coastal Outreach Specialist* (tjc29@psu.edu). <https://seagrant.psu.edu/topics/land-conservation-and-public-access/projects/greener-parking-lots-millcreek-township-erie>

MULTI-MUNICIPAL SHADE TREE PLANTING PROGRAM (Pennsylvania)

Pennsylvania Sea Grant has partnered with the Erie Area Council of Governments and the City of Erie Arborist to implement a multi-municipal shade tree planting program. In addition to increased aesthetics, added trees will increase water infiltration, air quality, and help to relieve urban heat island effect. **Contact:** Thomas Cermak, *Coastal Outreach Specialist* (tjc29@psu.edu).

<https://www.erieareacog.org/current-projects-eacog/pages/multi-municipal-shade-tree-planting-project>

RIPARIAN BUFFER AND OTHER LAND CONSERVATION (Pennsylvania)

Pennsylvania Sea Grant works with state and local conservation organizations to facilitate the conservation of natural assets within the Pennsylvania Lake Erie watershed. Once conserved, these locations will continue to provide benefits in the form of water filtration, reduce flood risk, and provide nature-based recreational opportunities for residents and non-residents alike. **Contact:** Thomas Cermak, *Coastal Outreach Specialist* (tjc29@psu.edu). <https://seagrant.psu.edu/topics/land-conservation-public-access>

LAS SALINAS DE CABOROJO NATURE-BASED INTERVENTIONS TO MITIGATE CURRENT AND ANTICIPATED EFFECTS OF SEA LEVEL RISE ON COASTAL COMMUNITIES, NATURAL AND CULTURAL ASSETS (Puerto Rico)

This is a multiagency collaboration effort to restore and mitigate sea level rise in the historical Las Salinas Salt Flats located in the Municipality of Cabo Rojo, Puerto Rico. This area is protected and managed by the USFWS. Puerto Rico Sea Grant will conduct outreach, capacity building and education efforts related to the project for the local communities, stakeholders, elected officials, and NGO's among others. The project will impact approximately 200 acres of salt flats which provide habitat for over 40,000 migratory birds from North and South America. The ecosystems surrounding the salt flats are a subtropical dry forest, hypersaline lagoons, salt marshes, seagrass, marine lagoons, coral reefs, and mangroves. **Contact:** Lillian Ramírez Durand, *Research Associate* (lillian.ramirez@upr.edu).

PUERTO RICO SEA GRANT ADVISORY COMMUNITY CENTER (Puerto Rico)

The goal of this project is to establish the "*Sea Grant Advisory Community Center*" to continue advising, facilitating, and collaborating with organizations and environmental community groups of Puerto Rico, in their efforts to protect our environment, its biodiversity, flora, fauna and nature-based solutions for the infrastructure projects (promoting GI designs and alternatives for the USACE flood control projects in Puerto Rico). We envision the Center as a network of citizens who, together with experts, can detect impacts on the environment, offer scientific and technical support, as well as carry out research and transfer information. **Contact:** Ana J Navarro Rodríguez, Ph.D., *Research Associate* (ana.navarro2@upr.edu).

LIST OF RESOURCES

NOAA OFFICE FOR COASTAL MANAGEMENT RESOURCES (VIA DIGITAL COAST)

Digital Coast: Data, tools, and training that communities can use to manage their coastal resources.

<https://coast.noaa.gov/digitalcoast/>

Digital Coast Academy: Information about in-person training, online instructor led training, self-guided online resources, case studies, quick references, videos and recorded webinars. So all kinds of resources along a learning spectrum. <https://coast.noaa.gov/digitalcoast/training/home.html>

Green Infrastructure Resources:

- **Nature-Based Solutions for Coastal Hazards: The Basics** (*self-guided resource, available in English and Spanish*): <https://coast.noaa.gov/digitalcoast/training/nbs-basics.html>
- **Nature-Based Solutions for Coastal Hazards Training**
 - *Virtual 101 (2 hours)*: <https://coast.noaa.gov/digitalcoast/training/green-virtual.html>
 - *In-person (full day)*: <https://coast.noaa.gov/digitalcoast/training/green.html>
- **Nature-Based Solutions: Benefits, Costs, and Economic Assessments** (*landing site with links to the following quick references*): <https://coast.noaa.gov/digitalcoast/training/gi-practices-and-benefits.html>
 - *Nature-Based Solutions: Practices and Benefits (English and Spanish)*
 - *Nature-Based Solutions: Installation and Maintenance Costs (English and Spanish)*
 - *Nature-Based Solutions: Tips for the non-Economist (English and Spanish)*

- Green Infrastructure Effectiveness Database: <https://coast.noaa.gov/digitalcoast/training/gi-database.html>
- Funding and Financing: Options and Considerations for Coastal Resilience Projects: <https://coast.noaa.gov/digitalcoast/training/financing-resilience.html>
- Case Studies: <https://coast.noaa.gov/digitalcoast/training/?filter=Case%20Studies>

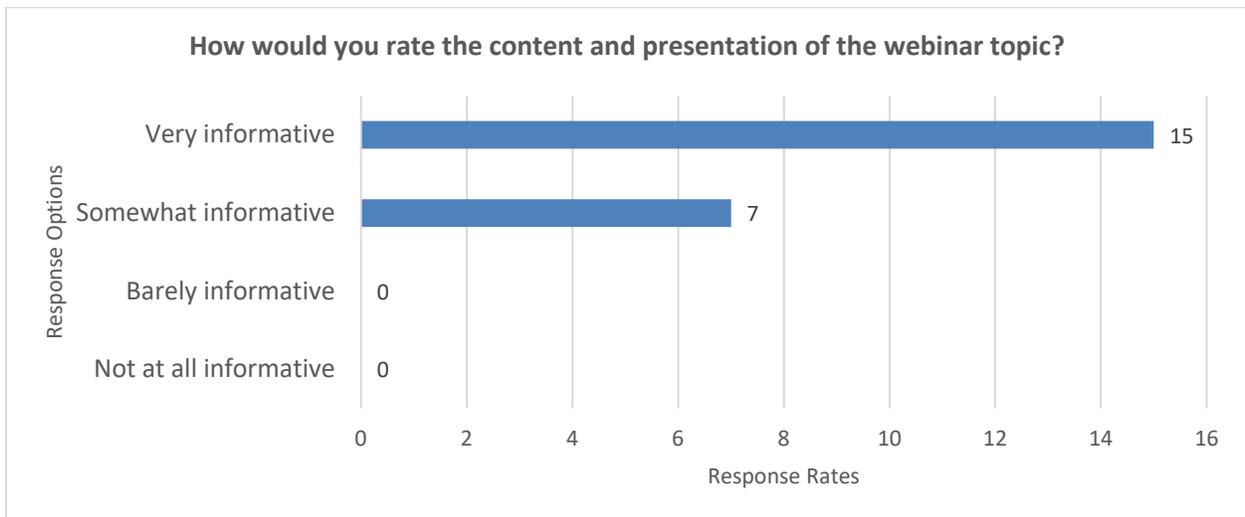
OTHER RESOURCES IDENTIFIED DURING THE WEBINAR

International Stormwater BMP Database: 2020 Summary Statistics (*The Water Research Foundation*): https://www.waterrf.org/system/files/resource/2020-11/DRPT-4968_0.pdf

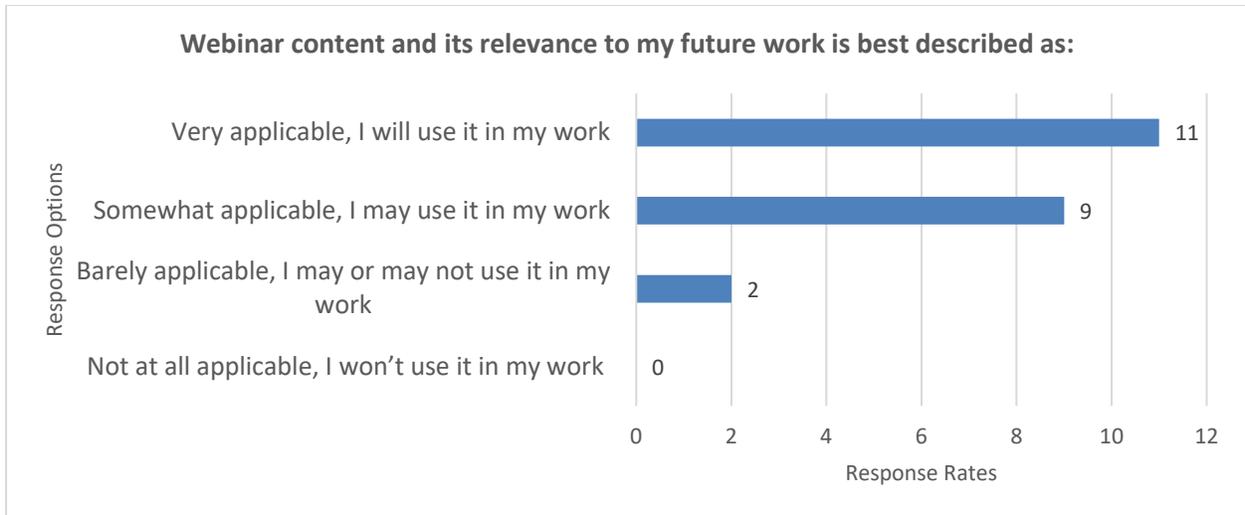
The Homeowner’s Guide to Stormwater (Penn State College of Agricultural Sciences): <https://agsci.psu.edu/aec/research-extension/conservation-tools/stormwater-management>

International Guidelines on Natural and Nature-Based Features for Flood Risk Management (U.S. Army Corps of Engineers, Engineering With Nature Initiative): https://ewn.erd.c.dren.mil/?page_id=4351

WEBINAR EVALUATION RESPONSES



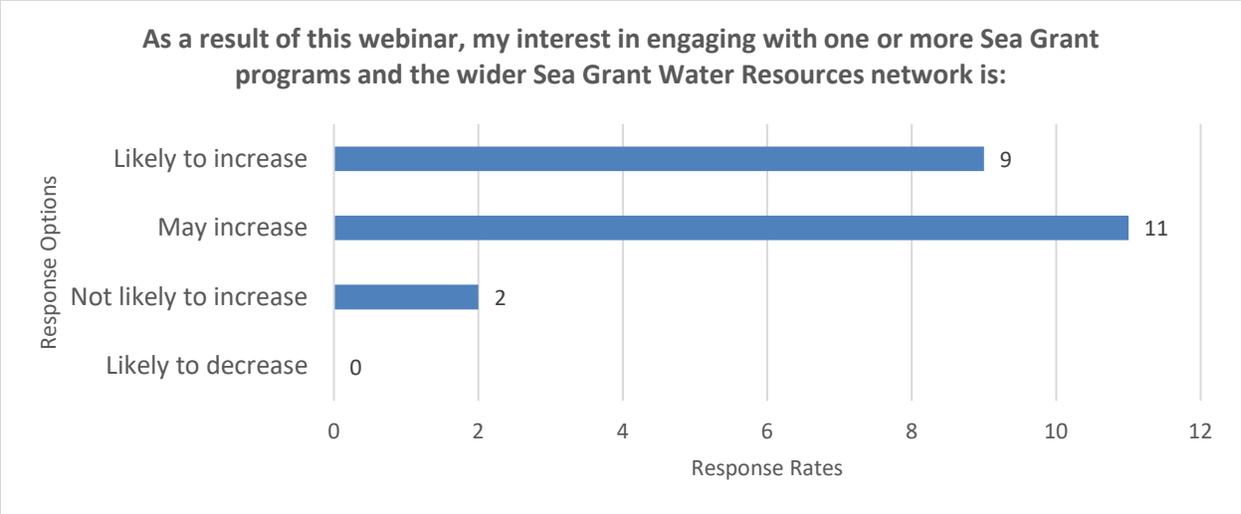
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If you answered that you will or may use webinar content in your future work, how might you do that?

- as reference for planning future work
- add information to education programs
- We need to see what can be applied to San Juan, Puerto Rico
- Continue to advocate for the use of GI techniques in municipal planning and private construction projects
- It was valuable to learn about other types of green infrastructure processes that we don't currently incorporate, and see where our work overlaps with other programs.
- To provide outreach services to coastal communities
- use to share resources with stakeholders to help with adoption/acceptance of green infrastructure
- Future programming
- Using the program the presenter mentioned and shared the link.
- I will continue to attend the Green Infrastructure CoP presentations to learn about what my colleagues are doing. Perhaps I'll try to partner with someone in a nearby state on a future proposal.

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Did the presentation turn on any DEI lightbulbs for you? Any connections that we can make to the material presented and DEI goals for the Sea Grant network?

- lots of good resources to play with from noaa!
- no, or I might have missed that part.
- no
- Great to see GI work around the network and see how it can be applied.
- No
- Exploring applications for DEI within the GI maintenance community
- The mentoring by the Knauss Fellow by the PA SG Community Engaged Intern seems like a great idea!

