

NERRS Science Collaborative Progress Report for the Period 09/01/2013 – 02/28/2014

Project Title: *Developing a Low Impact Development Manual for Coastal South Carolina to Serve as Guidance for Improved Stormwater Management*

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Contributing Team Members and their role in the project:

- April Turner; Collaboration Assistant, South Carolina Sea Grant Consortium
- Greg Hoffmann, P.E.; Applied Science Lead, Center for Watershed Protection
- Sadie Drescher; Applied Science Investigator, Center for Watershed Protection

A. Progress overview:

The overall goal of this project is to produce a *Low Impact Development Manual for Coastal South Carolina* to provide local decision makers with the knowledge and resources to help them implement LID practices on the community, neighborhood, and site scale. To develop a guidance manual that will effectively inform its intended users, the project team is conducting a series of collaborative workshops and focus group meetings with applied science researchers and engineers to develop and tailor stormwater best management practices and an engineering spreadsheet tool to the hydrologic and soil conditions of the South Carolina coast. Simultaneously, the project team is also facilitating meetings with planners, landscape architects, and developers to ensure that the LID Manual provides appropriate land-use planning, site design, and ordinance guidance. Stormwater and climate change experts have identified how these tools and guidance can be adapted to ensure they will be effective under changing climate conditions, such as increased variability in rainfall.

Progress on tasks for this reporting period:

The major tasks defined in the project timeline and that the project team focused on during this period include:

1. *LID Manual Advisory Committee Meetings:* The LID Manual Advisory Committee (LID MAC) held one meeting during this period on October 16th. The MAC continues to serve as a valuable steering committee for the Manual development and stakeholder engagement process.
2. *Climate and Stormwater Roundtable Discussion (Intended User Workshop #3):* This meeting brought together diverse perspectives to discuss climate adaptation opportunities related to Low Impact Development principles and practices. At this round-table discussion, the project team learned from climate specialists about historical and projected climate patterns and discussed how these conditions may affect LID planning and design. We also discussed vulnerabilities associated with the potential impacts climate change, such as sea level rise, and how we might begin to address these vulnerabilities in the context of low impact development. This roundtable discussion was attended by 29 stormwater professionals, climate specialists, and project team members.

3. *A Collaborative Review of the Coastal South Carolina Low Impact Development Manual (Intended User Workshop #4)*: The project team announced and made public a draft of the Coastal SC LID Manual. This one-day workshop was designed to obtain intended user feedback on the current draft of the LID Manual, describe how the manual has been received by state regulatory agencies, and share local examples of incentives for using LID practices. During this program, participants also learned about the site design guidelines and design specifications for structural best management practices. 60 stormwater professionals attended the workshop including design and review engineers, planners, landscape architects, developers, public works staff, and outreach professionals.
4. *Synthesis of intended user workshops 3 and 4*. Evaluation data, presentation information, discussion notes, and other anecdotal information from both stakeholder events are being used by the project team for guidance in developing and editing content for the manual. Additionally, this information will be used to develop future events and stakeholder engagement.
- 5-9 *Update BMP Specifications, update spreadsheet tool, update planning and landscape design guidance, update case study examples*: Drafts of all items listed are complete. In October, drafts were sent to a group of early reviewers from the intended user pool. The early reviewers volunteered to serve in this capacity. Updates were made based on their feedback and the draft was made available publically in November. Since that time, in addition to the workshop (described above) designed to gather intended user feedback, the project team has also received feedback via written comment or through discussions. The project team is incorporating that feedback into the Manual by updating existing content or adding new content. This will continue through this reporting period.
10. *Drafting of LID Manual*: Manual drafting and development began in Quarter 4 or year 1 and will Continue until the end of this reporting period.

B. Working with Intended Users:

During this grant period, intended users were engaged through the project's advisory committee, a focused discussion on climate change predictions and adaptation through LID, an intended user workshop to gather feedback on the Manual content, and through direct interaction and conversations between project team members and coastal decision-makers.

Climate and Stormwater Roundtable Discussion

The Climate and Stormwater Roundtable (held September 20, 2013) was employed to help answer questions related to how changes in precipitation, temperature, and sea level rise may require modifications to proposed design guidance in the LID Manual. A group of 24 climate specialists, engineers, and coastal researchers met at the DNR campus in Charleston to discuss these potential changes and different strategies to address their affects on low impact development design.

Hope Mizzell, from the SC State Climatology Office, discussed the climate trends and variability in South Carolina over the past 100 years. Extreme events, such as floods, droughts, hurricanes, tornadoes, and snow were highlighted along with how the climatology office has been monitoring for variability and change. The state of SC had been experiencing a 12-14 year drought which ended in 2013. There appears to be an increasing trend in fall and winter precipitation across the coast; additionally, the number of days with precipitation greater than or equal to 1.00 inch (as measured in Charleston) is showing a slight increasing trend, while the number of days with precipitation greater than or equal to 2.00 inches is showing a slight decreasing trend. Also in the coastal plain, we are observing a slight

increase in summer maximum temperatures, with winter and spring minimum temperatures showing a decreasing pattern over time.

Greg Carbone, from the Carolina Integrated Sciences & Assessments organization, discussed climate projections for coastal South Carolina. Tidal gauge and satellite observations have indicated that sea level rise is on the high end of the range of predictions first proposed in the 1990 IPCC report.

Temperature is predicted to show relatively consistent warming trends mid to late century, regardless of the season. Different models predict seasonal changes in precipitation, with a projected 5-10% increase. 19 models collectively suggest modestly wetter conditions in the southeastern US with moderately more intense precipitation. However, predicted changes in the 85th percentile storm are small.

Anne Blair, from the NOAA Hollings Marine Laboratory, discussed how to account for some of these climate change variables using the Stormwater Runoff Modeling System (SWARM), which was presented to the group. The model is used to help understand impacts of climate related threshold events; ecologically, these thresholds describe a point at which there is an abrupt change in an ecosystem quality, property or phenomenon or where small changes in an environmental driver produce large responses in the ecosystem. Climate change coupled with increased development in the coastal plain will create ecological impacts.

These presentations spurred productive discussion in the group about future conditions that may impact LID and what adaptations the Manual should recommend. Discussion was led by Greg Hoffman, CWP, and Kirstin Dow, CISA.

1. What are some vulnerabilities associated with each BMP?
2. Which practices are most sensitive to changes?
3. Which strategies are most robust under different conditions?
4. Are there some strategies that may cease to function effectively under potential scenarios?

The end product of this collaborative meeting was to allow stakeholders to provide feedback for the most appropriate method for including information related to climate and sea level rise adaptations in the Manual. The consensus was that a separate chapter or appendix would be useful to address climate change and adaptation techniques.

Climate Roundtable:



Hope Mizzell, SC Climatologist, presents historical climate information for the state



Greg Carbone, CISA, presents information related to climate predictions for the SC Coast



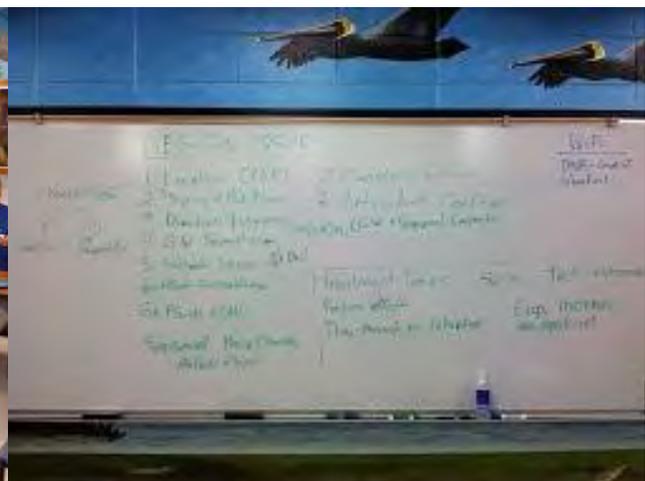
Anne Blair, NOAA HML, describes the SWARM model and its application related to predicting runoff for different climate scenarios



Greg Hoffmann, CWP, leads discussion about applying climate adaptation guidance to the LID Manual.



Group discussion



White Board notes

LID Manual Advisory Committee

The LID Manual Advisory Committee (LID MAC) held one meeting during this period: October 16th. During the meeting, which took place at the DNR Charleston campus and via conference call, the project team and manual advisory committee members discussed the outcome of the Climate Roundtable and the status of preliminary reviews of draft manual documents. About 20 volunteers – engineers, planners, researchers, and other stakeholders – provided an initial internal review by November 1; this allowed the manual project team time to make revisions prior to making the draft Manual more broadly available to the public in December. The LID MAC also started planning the content and individual responsibilities for a stakeholder workshop to be held in January for the purpose of facilitating feedback on the draft Manual documents.

A Collaborative Review of the Coastal South Carolina LID Manual, January 9, 2014

The project team announced and made public a draft of the Coastal SC LID Manual in late November 2013. Over 200 stakeholders were contacted via email and directed to access the manual draft documents from the project webpage for downloading and review. Ultimately, 60 people attended the workshop, including stormwater professionals, engineers, planners, landscape architects, developers, public works staff, and outreach professionals. Attendees learned how the manual has been received by state regulatory agencies, and shared local examples of incentives for using LID practices. During this program, participants were also split into two breakout sessions to provide feedback on the manual related to planning & site design guidance (Chapters 2 & 3) and best management practices (Chapter 4 and Appendices); these breakout sessions were facilitated by CWP staff and MAC members.

The result of the one-day workshop was detailed intended user feedback on the draft of the LID Manual, both during the breakout sessions and in follow up conversations & correspondences since the workshop. Comments have been recorded and made public on the project webpage. The project team is working to address these comments, with a goal of producing a final draft by March 28.

Workshop Pictures:



Blaik Keppler welcomed 60 attendees to the workshop and presented an overview of the project to date.



Shannon Hicks, SC-DHEC, gave a presentation about the regulatory information related to LID in South Carolina.



Sadie Drescher, CWP, facilitates the review of planning and better site design materials.



Greg Hoffmann, CWP, lead discussion related to the technical specifications.

Engaging Intended User Experts

This grant period, the CTP Assistant has focused on working with many stakeholders to continue to refine information in the Manual related to stormwater design requirements, site design guidance, ordinances, and potential case studies to include in the LID manual. She has interacted via telephone, email, and in-person site visits with a total of 115 engineers, landscape architects, property managers, developers, planners, researchers, contractors, HOA delegates, educators, plant experts, business owners, and various other volunteers. After the Collaborative Review Workshop in January, several attendees have expressed interest in helping contribute to writing smaller sections of the manual, such as case studies. One attendee has a strong academic background in climate change and will be helping write that guidance material. The diversity of stakeholders involved in this project reflects the complexity of strategies being employed throughout the Lowcountry to address stormwater issues. Expertise and experiences shared by these individuals has been invaluable to the project team in developing the Manual.

In the next six months

During the next reporting period, the project team will finalize the Manual and work with the Graphics Department within the SC Department of Natural Resources to complete and print the document.

Once the Manual is published, three training sessions will be held; one in the Northern, Middle, and Southern portions of the South Carolina Coast. The training sessions are part of the plan outlined in the project proposal to overcome several barriers to implementation of LID strategies in coastal South Carolina, including maintenance concerns, lack of clear guidelines, and lack of education for implementing LID practices. The training sessions will be facilitated by the project team and provide an opportunity to distribute physical copies of the manual to the end-users. The training sessions will allow intended users to become familiar with the content of the manual, such as planning guidance, site design advice, and best management plan specifications. Additionally, the project team has discussed incorporating training related to incorporating LID recommendations into local ordinances.

Through the trainings, the Applied Science Team intends to increase the capacity of stormwater professionals to conceptualize and design stormwater management systems that incorporate LID strategies. While the specific workshop agenda will be determined based upon attendee needs, the general approach will include presentation and discussion of both water quality goals and stormwater BMP specifications, followed by a facilitated group activity that allows attendees to use the compliance spreadsheet tool in conjunction with an actual site plan to select appropriate stormwater BMPs, design them, and verify compliance. This approach is based on the Center's extensive past experience developing stormwater manuals for state and local governments. By providing the intended users with a hands-on or field exercise that applies the methods and tools defined in the LID Manual, the Project Team will effectively inform and empower intended users to utilize LID practices in this region.

C. Progress on project objectives for this reporting period:

The overall goal of this project is to increase implementation of LID practices through the collaborative development of a *Low Impact Development Manual for Coastal South Carolina*. To accomplish this, the following project objectives are defined:

- *Objective 1: Remove targeted barriers to LID implementation by providing engineers, planners, and other coastal decision-makers with guidance specific to their individual professional needs.*

- *Objective 2: Develop LID BMP engineering tools and planning guidance for South Carolina coastal communities that are relevant under current and future climatic conditions.*

Objective 3: Increase the capacity of local officials, stormwater professionals, and developers to implement LID strategies by providing effective training for coastal communities.

During the second grant period, the project team continued to work on Objectives 1 and 2. The Climate and Stormwater Roundtable on September 20th, 2013 and the Collaborative Review Workshop held on January 9th, 2014 were designed to inform intended users about the guidance that was developed with their input and gather feedback. The workshop was discussion-based with participants sharing examples, engaging in conversation about specific pieces of guidance, and providing feedback on Manual content.

Data Collection

Data collected at the two meetings described above is qualitative and includes detailed notes and evaluation comments. The project team is using this data to finalize the guidance that will be included in the LID Manual. During the workshops, designated note takers from the Manual Advisory Committee

recorded important questions, comments, and suggestions from stakeholders and presenters. These notes were synthesized into documentation that was publically posted on the project website.

There has also been a great deal of data collected from individual interaction with stakeholders. The project team has found that by arranging phone calls or in-person meetings with different stakeholders (mostly from the list of manual volunteers) has yielded valuable, detailed suggestions for improving the content and/or organization of the Manual.

Changes to methods

During the previous grant period, we reported that our progress during that time brought about one slight change to our method with respect to Intended User Workshop #3, the workshop to address climate change implications in coastal South Carolina and identify adaptation considerations for LID practices. Rather than a large stakeholder workshop, the project team decided to employ a roundtable discussion approach to this topic which included climate scientists as well as key stakeholders from several professional sectors, such as planning, engineering, and the regulatory sector. There were two reasons for this change. First and foremost, the project team found the focused, roundtable type discussion to be an extremely effective method of communication with stakeholders while discussing research topics. Because of the complexity and hypothetical nature of the topic of future conditions related to current stormwater design practices, the project team felt that a smaller discussion with a highly targeted participant list would lead to much more effective discussion. Secondly, staffing changes necessitated a more focused approach. The Climate and Roundtable Discussion described above is this result of this method change and we feel that it was highly successful. The smaller roundtable approach allowed all participants the opportunity to ask thoughtful questions and get detailed responses from presenters and facilitators. The response from all participants and presenters was very positive. An additional benefit to including professionals as well as researchers was that the engineers and planners brought relevant “real world” design perspective to the discussion. Their feedback has helped shape the way recommendations will be worded.

Plans for meeting project objectives

In the next six months, project staff will continue to make progress on Objective 1 (*providing engineers, planners, and other coastal decision-makers with guidance specific to their individual professional needs*). As guidance is finalized, intended users will be consulted to ensure that the manual (a) addresses their suggestions and concerns, (b) is clear and user-friendly, and (c) appropriately accounts for the natural conditions of coastal South Carolina. These steps will help ensure that the project team continues to create a product that stormwater and development practitioners will be able to use in their decision-making.

The team will also continue to address Objective 2 in the next reporting period (*Develop LID BMP engineering tools and planning guidance for South Carolina coastal communities that are relevant under current and future climatic conditions*). We will develop a section of the document that describes how Low Impact Development can be a strategy for climate change adaptations. First and foremost, encouraging infiltration on-site and spreading the treatment across several techniques (e.g. a treatment train of several best management practices) is itself an adaptation strategy because it provides redundancy and backups in the design. Also, the CWP technical lead is currently working on writing general recommendations for selection of the best LID BMPs for a given location; for example, one technique to consider is avoiding placement of bioretention or stormwater wetlands in flood zones that may be impacted by sea level rise. At our Manual Review Workshop (Jan 9), a participant with a strong

academic background in climate change has agreed to help review and edit these climate adaptation recommendations included in the Manual.

In the next grant period, the team will also develop details for a strategy to accomplish Objective 3 (*Increase the capacity of local officials, stormwater professionals, and developers to implement LID strategies by providing effective training for coastal communities*). We are in the process of planning workshops for late summer/fall to engage stakeholders in the review of the final published materials for the manual and spreadsheet tool.

D. Benefit to NERRS and NOAA:

The project team continues to promote and collect data for a list of stormwater and LID-related research projects, database of stormwater codes and ordinances, and the LID atlas. Also, the project team is participating in a NERRs Science Collaborative Transfer of Knowledge Grant Proposal to share lessons learned, tools, and resources between several LID-related projects. If funded, we will be able to share these lessons with other Reserves as they deal with LID and Green Infrastructure issues.

E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.

None at this time.