A-0. Areas of Research Needed

Chapter Contents

- Topics Needing More Research
- Crucial Elements in Stormwater Research Projects

Use of this Chapter

This chapter is intended to provide guidance for researchers in North Carolina on selecting, planning and implementing projects to study and innovate stormwater management. The topics included in this Chapter are based on the best professional judgement of NC Stormwater Program staff and is not meant to be an all-inclusive list of research needs.

Topics Needing More Research

Overall, in North Carolina, we need research on stormwater control measures that are cost-effective and can be replicated easily by a wide range of communities and developers. Some of the issues that the NC Stormwater Program has specifically identified as needing more research include the following:

1. ***Wetland Swales:*** DEQ receives numerous complaints about vegetated swales in our coastal areas that do not drain due to high water tables. Because this area of our state is flat, it is not possible to regrade these swales to promote drainage, so research is needed to turn these swales from nuisances to amenities by planting and maintaining them as "wetland swales." Some of the questions that need to be answered about wetland swales are:
    a. What are the most optimal planting plans for wetland swales?
    b. How can we increase public acceptance of wetland swales?
    c. What are the maintenance requirements for wetland swales?
    d. Are there opportunities to plant species in vegetated areas adjacent to swales that are not currently draining to intercept and evapo-transpire some of the drainage that is being stored in swales?

2. ***Floating Wetland Islands (FWIs):*** FWIs may be added as an optional enhancement to wet ponds to increase their effectiveness at removing nutrients. They have the potential to be cost-effective retrofits in nutrient sensitive waters throughout the state because they make use of existing wet ponds to provide a significantly higher level of nutrient reduction that wet ponds currently provide. Some of the questions that need to be answered about FWIs are:
    a. What is the most cost-effective design for FWIs?
    b. What are the maintenance requirements for FWIs?
    c. How should FWIs be credited in the SCM Credit Document?

3. ***Stormwater Filtration Through Sand in SA Waters:*** The Coastal Stormwater Rule, 15A NCAC 02H .1019, requires that the effluent from a wet pond be filtered through a minimum of 18 inches of sand prior to discharge to surface waters. There are several technical questions regarding this requirement that could be addressed with further research, including:
    a. What the best designs to reduce the level of fecal coliform, TSS and other pollutants?
    b. How can this design standard be met when the SHWT is high?
    c. How can maintenance of the sand filtration system be optimized for cost and effectiveness?

4. ***Green Streets and Street Trees:*** Green spaces and street trees can cost-effectively manage stormwater runoff while also providing additional benefits including reducing the heat island effect and improving aesthetics and air quality. Integrated planning of green infrastructure and parks systems (or within public spaces) helps to cost-effectively provide multiple benefits and contributes to more livable communities.
    a. What are some options for designs that treat stormwater while also meeting additional community needs such as safety, tree preservation requirements, etc.?
    b. How should Green Streets and Street Trees be credited in the SCM Credit Document?

5. ***Sand Filters:*** Sand filters are a commonly-used SCM in North Carolina; however, their design and effectiveness have not been well studied in our state. Some of the questions that need to be answered about sand filters include:
    a. What is the most cost-effective design for sand filters?
    b. What are the maintenance requirements for sand filters?
    c. How should sand filters be credited in the SCM Credit Document?

6. ***Flow-Through Stormwater Wetlands:*** The current MDC for stormwater wetlands call for drawing down the water quality volume over two to five days. However, research done by NSCU's Department of Biological and Agricultural Engineering suggests that the detention time needed for effective treatment in a stormwater wetland is likely to be much shorter than two days. If equivalent performance could be achieved with a shorter drawdown period, then the footprint of stormwater wetlands could be reduced, and likely make them more cost-effective than wet ponds.
    a. What is the most cost-effective hydrologic retention time for flow-through stormwater wetlands?
    b. How should flow-through stormwater wetlands be credited in the SCM Credit Document?
    c. Would a shorter/different retention time affect the mortality of the required wetland vegetation?

7. ***Pervious Surface Management:*** Research done by NCSU's Soil Science Department suggests that combining soil amendments with strategic native vegetation choices is likely to result in a landscape that reduces rather than contributes to TSS, nutrients and flooding.
    a. What are some options for pervious surface management that treat stormwater while also enhancing aesthetics?
    b. What is the water quality benefit associated with pervious surface management?
    c. How should Pervious Surface Management be credited in the SCM Credit Document?

Crucial Elements in Stormwater Research Projects

Stormwater Program staff believe the research projects will be most successful at providing additional options for stormwater management if the project includes the following crucial elements:

1. A complete and clear description of the project its objectives.

2. Selection of one or more sites for the project where appropriate permissions and approvals have already been obtained.

3. A clear and detailed description of the projects tasks, including access and easement acquisition, design, permitting and constructions.

4. A monitoring plan that complies with Part F-4 of Chapter F of the NC Stormwater Design Manual.

5. An operation and maintenance plan for both the term of a CWMTF grant contract and long term thereafter such that the SCM continues to function as intended in its design. The operation and maintenance plan should address roles and responsibilities of the parties involved.

6. A plan to share the findings of the study with potential users, possibly including presentations at technical conferences or workshops, submitting a high-quality article to a professional journal for publication, or posting information on a web site.

7. If appropriate, a plan to provide a draft chapter (or redraft of a current chapter) on SCM for the Stormwater Design Manual and a section (or update of a current section) on the stormwater control measure's pollutant removal capabilities for Part D of the SCM Credit Manual.