

Wake County Stormwater and Green Stormwater Infrastructure Best Practice Summary

Introduction

The purpose of this document is to summarize best practices for stormwater management and Green Stormwater Infrastructure (GSI) based upon expertise of stormwater practitioners represented on the Wake County Water Partnership. The document is intended to be used as a resource for jurisdictions seeking to advance stormwater management programs, with a particular focus on integrating GSI. Information covers a range of topics including policies, modeling, maintenance as well as GSI incentive programs and project examples. This document is not intended to be all inclusive, but is a living document that will continue to evolve as science and stormwater policies evolve.

The GSI Subcommittee will reevaluate this document on an annual basis to update information based upon the current state of knowledge and local practice applications.

Policies

Existing

- Town of Holly Springs: [Drainage Policy](#) requires developers to update basin Hydrology and Hydraulic (H&H) model as new development projects are proposed upstream or downstream of known drainage concerns.
- Town of Cary: Peak attenuation rules moved to floodplain ordinance rather than water quality/stormwater ordinance so that peak attenuation will not be impacted by changing state regulations. Stormwater Policies updated in 2022 to form basis for incorporating additional GSI. New LDO Environmental Regulation chapter encompasses: Tree Clearing Certificate, Urban Transition Buffers, Illegal Discharges to the Storm Sewer System, Soil Erosion and Sedimentation Control, Nuisance and Hazard Control Standards, and the updated Flood Damage Prevention Ordinance with the Community Rating System (CRS) program. GSI incorporated into 2040 Community Plan.
- City of Raleigh: Lead by Example Policy requires evaluation of GSI on City's development and improvement Projects.

- Asheville, NC policy: Permeable pavement whenever above minimum parking lot requirement.
- State Policy: [Low Impact Development \(LID\) Policy/Storm EZ](#) to meet stormwater requirements.

In Development

- Garner: Developing comprehensive design manual for streets and stormwater.
- Knightdale: Stormwater as focal features; Stormwater features serve as amenity and bring to forefront.
- Wilmington, NC: Looking at removing wet ponds, incentivizing GSI.
- Cary: Pursues Public/Private Partnerships with developers to address legacy stormwater issues with new development. Basin models provide shovel ready projects that compliment new development easing the burdens rezones cases can manifest allowing a comprehensive approach to stormwater in a cost effective manner.

Incentives

- [Raleigh Rainwater Rewards](#) program provides cost-share funding for GSI projects. Applicants may receive up to 90% cost-share funding depending on location in watershed. A subsidy program added in April 2023 also provides 100% funding for GSI projects on private property for eligible community members that fall within disproportionately impacted areas and meet income/rental thresholds.
- Town of Cary: Cary piloted a program that offered up to \$5,000 grant to those that would like to install/maintain GSI; eligible to homeowners/business that do not have GSI. Based upon success, Cary is looking at reintroducing this incentive in areas where there is no stormwater management.
Partnered with Partners for Environmental Justice (PEJ) in Walnut Creek watershed to mitigate downstream impacts of stormwater. Partnered with Step Up Ministries for GSI job training.

Modeling

- Town of Holly Springs: See Drainage Policy above. Developers update existing models and provide data to Town as new developments initiated.
- Town of Cary: Development of basin models support infrastructure and SCM maintenance and open space initiatives for flood mitigation. Completed Walnut Creek model and initiated work on Swift Creek. Leverage modeling data to fix known infrastructure and SCM issues as redevelopment occurs. Promotes cost-efficient solutions without slowing permitting process; fosters partnerships with developers. Installation of sensors and rain gauges in basins supports modeling and identification of GSI opportunities in basin.

- Town of Morrisville: [Stormwater Drainage System Inventory Map](#) used to help build town-wide model and develop capital project list.
- City of Durham uses watershed Stormwater Management Models (SWMM/PCSWMM) models as part of [Watershed Improvement Plans](#) to evaluate areas of pollutant loading and perform scenario analysis. Models developed for: Eno River, Little Lick Creek, New Hope Creek and Little Creek, Ellerbe Creek, Northeast and Crooked, Third Fork Creek watersheds.
- UNC Chapel Hill: Campus-wide SWMM model to support stormwater management for existing and future development.

Maintenance

- Town of Cary-Town shifted maintenance to the Stormwater Division allowing greater flexibility in expanding the GSI initiative. Town promotes and maintains new development non-regulatory GSI in right-of-way as part of public-private partnership.
- Raleigh Maintenance strategy: Centralize stormwater maintenance for City projects under Stormwater Department.
- All Jurisdictions follow NCDEQ Stormwater Control (SCM) Design Manual: [NCDEQ Stormwater Control Measure \(SCM\) Design Manual](#) used for design and maintenance

Data Mapping

- Town of Morrisville: [Stormwater Drainage and System Inventory Map](#)
- Town of Holly Springs: Stormwater Complaint Map
- Town of Cary: Storm drainage system mapped in ESRI ArcMap, AGOL, and ArcPRO. Mapped SCMs support post-construction management of over 1,400 SCMs.

Partnerships

- Town of Cary: Town promotes partnerships early in the planning phase using basin modeling and developer agreements. New developments incorporate regulatory and non-regulatory GSI (through developer agreements).
- Partners for Environmental Justice (PEJ): PEJ partners with City of Raleigh, Town of Cary and other partners to develop the [Walnut Creek Watershed Learning Network](#), a six-week community engagement and empowerment initiative.
- NC Department of Transportation (NCDOT): NCDOT partnership opportunities with Wake County and municipalities to construct SCM retrofits are available.

Example Projects

- Town of Morrisville: Large, constructed wetland SCM across from Town Hall to support future priorities. Stormwater wetland serves as amenity and aesthetic; incentive for developers coming into downtown so developers don't have to build SCM directly with development.
- Wake County: [Beech Bluff County Park](#) designed to meet Sustainable [SITES](#) certification; considers landscape in site plan and design; incorporates GSI at design phase; design includes integrated stormwater management-grass swales, bioretention, permeable pavers, rainwater harvesting and education.
- Downtown South Project: Establishment of Riparian Corridor Fund as part of Rezoning conditions. Fund used as matching grant funds for water quality improvement/flood mitigation projects in larger watershed. Local stakeholders key to establishment of fund.
- [Walnut Creek Community Partnership](#): Collaborative effort that supports community engagement and watershed improvement. The Conservation Fund is supporting through [Parks with Purpose](#) initiative. Online [Watershed Action Plan](#) identifies and tracks project opportunities.
- McAdams Engineering: Incorporate GSI into parks
 - Garner examples: Yeargan and Meadowbrook Parks
- Town of Cary: Regional stormwater wetland in Swift Creek watershed near downtown will help mitigate existing flooding issue. Permanent drainage associated with stormwater wetland helps address runoff associated with new development. Cary has 5 additional GSI projects in downtown leveraging Public/Private partnerships.
- NC Water Resources Research Institute (WRRRI): WRRRI is partnering with NCSU Bio & Ag and local hotel in Cary to install Low Impact Development (LID) with support from NCDWR 319(h) grant. An underground infiltration device will be studied as part of grant.
- Cary and NCDOT are working on a GSI project using Cary owned property on NCDOT road. NCDOT will plan and build the facility and Cary will maintain once complete.
- Cary is working to obtain grant for addressing the Walnut Creek corridor from I-40 to downtown park leveraging, open space, riparian buffer, stormwater management, floodplain management, tree canopy, GSI, linear park and greenway trail integration. Cary is pursuing purchasing floodplain and riparian buffer corridor for the entire reach.

Funding

- Stormwater Utility fees fund projects in Raleigh, Holly Springs, Apex, Morrisville
- Debt financing
- City of Raleigh plans to issue revenue bonds for stormwater FY 25
- Budget allocation- Cary has recurring appropriation from Utility Fund balance that is roughly equivalent to roughly 15 cents per 1000 gallons water consumed by Cary Customers that will be applied to Jordan Lake One Water

- Public-Private Partnerships
- [American Rescue Plan \(ARP\) Funding](#)
- Grants:
 - NCDEQ [Financial Resources for Watersheds Water Quality, Cost-Share, Grants and Loans](#)
 - [USEPA: Green Infrastructure Funding Opportunities](#)
 - Watershed Stewardship Network Funding Site: <https://wrrri.ncsu.edu/partnerships/watershed-stewardship-network/resources/watershed-resources/sustainable-funding-resources/>
 - State and Tribal Assistance Grant (STAG) funding: Cary received \$900,000 to support Swift Creek sensors and modeling.
 - [Land and Water Flood Risk Reduction Grant](#)

Integrated Water Management

- Cross-communication between stormwater, planning, general services, parks and recreation departments will help facilitate coordinated stormwater management and support GSI projects that provide co-benefits
- Town of Cary coordinates across departments and is incorporating GSI into the 2040 Community Plan
- City of Raleigh: GSI Advocate to work across departments
- Wake County: Housing Affordability and Community Revitalization Dept. shares affordable housing proposals at early design phase with Water Quality Division to identify potential opportunities for GSI.
- Wake County: Quarterly interdepartmental flood coordination meeting to identify data sharing opportunities/needs, regulatory updates, pilot project opportunities with the following departments: Parks, Recreation and Open Space, Emergency Services, GIS, Planning, General Services Administration, Environmental Services, Soil and Water Conservation District.

Education

- Third party provides GSI presentation to local elected officials: League of Women Voters of NC, UNC Environmental Finance Center, Water Resource Research Institute (WRRRI).
- Walnut Creek Partnership: Informed community helps promote GSI in rezoning, development efforts.
- Town of Cary: Grant funding supported partnership with NCSU Extension to produce [Rain It In](#) video series on GSI.
- Wake County Green Schools Partnership: Collaborative group of school teachers, administrators, environmental educators, parents, businesses, university and government partners that share a common goal to increase school sustainability and environmental literacy. GSI is one of the focus areas of this group.

Resources

- City of Raleigh Menu of GSI-based conditions for rezoning
- [NCDEQ Stormwater Control Measure \(SCM\) Design Manual](#)
- [ACTION PLAN FOR NATURE-BASED STORMWATER STRATEGIES: Promoting Natural Designs that Reduce Flooding and Improve Water Quality In North Carolina](#)
- [NCDEQ Low Impact Development \(LID\) Guidance and Storm EZ Tool](#)

Stormwater Research

- NCDOT's Research & Development Office partners with NCDOT units, universities and business partners (including local governments) to fund research projects and solicits new research ideas on an annual basis. Applicants are encouraged to partner with a NCDOT unit on project proposals. Application information is available on [NCDOT's Research & Development](#) website. A comprehensive list of past research and ongoing research projects is available: on [NCDOT Research Projects](#) page.
- United States Department of Agriculture (USDA) Forest Service publications on the impacts of urbanization on forest hydrology in the piedmont of NC: [Johnny Bogs Publications](#)
- Dr. Bill Hunt, Dr. Sarah Waickowski and Bill Lord 2021 publication: [Maintenance Costs of Stormwater Control Measures \(SCMs\) in North Carolina](#).

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