

Strategies to Incorporate Green Infrastructure for North Carolina

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Local governments must grapple with diverse challenges including aging infrastructure, population growth, rising demand for services, and development pressures. The traditional approach to addressing these challenges has been to build more grey infrastructure, which is the traditional hardscape providing services like stormwater management, and wastewater treatment. Green infrastructure provides a cost-effective alternative that can assist local governments in providing the services needed by using natural landscape functionality, thus protecting a variety of environmental resources while increasing public health and the quality of life for residents.

Though the use of green infrastructure is not new, improved understanding of the benefits of integrating new development with existing environmental features, resources, and functions, makes green infrastructure increasingly attractive to local governments. There are a number of tools available to incorporate and encourage the use of green infrastructure in development, such as incentive programs for development and redevelopment¹ or through land use regulations, such as ordinances and codes. This brief guide presents approaches for incorporating green infrastructure through legal mechanisms and catalogues a variety of existing resources available to North Carolina communities. This short guide is not intended to be a guide on the process of planning for green infrastructure. For such guidance, local government officials, planners, developers and community members can refer to The Green Infrastructure Center's "[Evaluating and Conserving Green Infrastructure Across the Landscape: A Practitioner's Guide, North Carolina Edition](#)" and/or the North Carolina Forest Service's "[A Quick Guide to Community Planning for Green Infrastructure](#)."

Green Infrastructure



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Definitions for green infrastructure vary but in the broadest of terms, green infrastructure refers to the use of soil, vegetation and other natural landscape features to manage and provide environmental services, such as water treatment for stormwater runoff, air and water quality. The definition may be extended as "a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for America's communities and people."² Because green infrastructure offers many environmental benefits, local governments may benefit economically and environmentally

¹ A full review of options for incentive programs is beyond the scope of this guide. A good resource for case studies of other communities' incentive programs is the US EPA's "[Green Infrastructure Case Studies: Municipal Policies for Managing Stormwater with Green Infrastructure](#)."

² Benedict and McMahon, *Green Infrastructure*, 2006.

by incorporating green infrastructure practices that encompass both of these definitions to meet their local priorities and to direct development as best meets those priorities.

Regulatory Tools for Incorporating Green Infrastructure

Ordinances and codes are the regulatory mechanisms available to local governments for land use and natural resource management. Though local governments in North Carolina have no preexisting grants of power, the General Assembly has made both general grants of power to cities and counties and specific grants of power to regulate other activities under certain special circumstances. Cities and counties are generally allowed to “by ordinance define, regulate, prohibit, or abate acts, omissions, or conditions detrimental to the health, safety, or welfare of its citizens and the peace and dignity of the county; and may define and abate nuisances.”³ Other grants of authority are made to address specific issues, including the environmental impacts of development, and are found in other statutes.

Many of the resources discussed here are written as separate ordinances but could also be modified to work in a unified development ordinance⁴ framework. Some of the ordinances are written as overlay ordinances, which are used to establish additional development requirements in specific areas of a community, such as environmentally sensitive areas. The additional requirements are superimposed over, or “overlay”, the base regulations already in place.

Policy Options for Local Governments

Individual communities have different needs and motivations when incorporating green infrastructure (e.g., urban stormwater runoff control, wildlife conservation, etc.). Thus, local governments may need to revise existing ordinances or even develop and adopt new ordinances and/or overlays to address their community’s particular needs and goals. Policy options for incorporating green infrastructure include ordinances that preserve or restore pre-construction conditions on development sites, and ordinances that direct development away from sensitive areas such as wetlands, streams, and significant natural resources. The resources reviewed below are model environmental ordinances specific to North Carolina communities and/or guidelines for evaluating and revising existing codes and ordinances to integrate green infrastructure practices. These tools must be modified and adapted by each community but they serve as a good starting point for incorporating green infrastructure through regulation.

Preservation and Restoration of Pre-Construction Conditions

Green infrastructure policies can function to reduce, control, and manage stormwater runoff from development, an issue that most local governments must address, as required by state and federal regulations. As a result, effective stormwater controls are an essential element of any comprehensive program to promote green infrastructure.

Model Local Ordinances for Stormwater Regulation

Many local governments in North Carolina are already required to adopt stormwater regulatory programs due either to the urbanizing nature of the community or its location near sensitive resources (e.g., impaired waters, coastal locations). As part of these regulatory programs, DENR collaborated with the University of North Carolina (NCSU) School of Government to develop several model stormwater ordinances that local governments can look to for guidance.

- ***Phase II Stormwater Model Ordinance*** – This [model ordinance](#) was developed to meet requirements under the federal Clean Water Act for cities and towns that operate municipal separate storm sewer systems (MS4s)

³ NC Gen Stat § 160A-174 (2014) for cities; NC Gen Stat § 153A-121 (2014) for counties.

⁴ A unified development ordinance is a comprehensive document that combines all regulatory elements (including traditional zoning and subdivision regulations, design guidelines, building codes, floodplain, stormwater and other environmental regulations, etc.) into one document. UDOs are often more streamlined and easier for stakeholders to use and understand as all standards and definitions are in one place.

located in urbanized areas and serving a population of fewer than 100,000.⁵ The language includes performance standards that address quality, as well as the magnitude and rate of runoff.

- ***Universal Stormwater Management Program Model Ordinance*** – The Universal Stormwater Management Program is a voluntary state program intended to streamline local government stormwater regulations. This [model ordinance](#) contains alternative regulations that, if adopted, will be deemed to meet the requirements for Clean Water Act Phase II communities as well as other state stormwater regulations.
- ***Jordan Model Stormwater Ordinance for New Development*** – This [model ordinance](#) was developed for communities in the Jordan Lake watershed to comply with the Jordan Lake Nutrient Management Strategy. As such, it contains some of the most protective standards for controlling nitrogen and phosphorus discharges in stormwater runoff.

Low Impact Development: A Guidebook for North Carolina

The North Carolina Cooperative Extension published “[Low Impact Development: A Guidebook for North Carolina](#)” to provide technical guidance to local governments on incorporating the principles of low impact design (LID) to protect and conserve water resources and ecosystem services. The goals of LID are to conserve resources, minimize site impact, optimize water filtration, create areas for storage and treatment of stormwater runoff, and build the capacity for long term maintenance of installed infrastructure.⁶ The guidebook provides specific policy guidance for communities on how to review an LID stormwater management plan, procedures for communities to identify barriers to LID in their ordinances, options for adopting policies to promote LID, and information on best management practices for LID.

Direct New Development Away from Sensitive Natural Resources

Green infrastructure policy can also direct new development towards areas that will have less impact on natural resources, or to areas that already have existing infrastructure readily available. Local governments may wish to adopt ordinances that include floodplain protection⁷, stream setbacks, tree conservation areas, and even set asides for significant natural resources, such as habitat for sensitive species. Most of the stormwater ordinances mentioned previously contain some level of stream setbacks and regulate the types of activities that can occur in and along riparian buffers. The two model ordinances discussed below focus on different types of sensitive natural resources – significant natural resources (which may also include stream setbacks, depending on which resources included in the final ordinance) and tree protection. Other types of local codes that could be considered are conservation subdivision codes. A NC guide to conservation subdivisions is also reviewed below as well as a general resource on planning for greener practices in development.

- ***Model Natural Resources Overlay Conservation Ordinance*** – This model [ordinance](#) addresses degradation of significant natural resources from direct and cumulative development impacts. The measures are based on the scientific literature and designed to be tailored for a community’s specific needs. By creating an overlay, the most sensitive natural resources can be conserved/maintained while additional community growth is accommodated.⁸ An implementation toolkit accompanies the model ordinance to provide guidance on how to implement the model ordinance as an option incentive, based on a density bonus, for conservation development design.

⁵ 33 U.S.C. § 1342(p).

⁶ NC Cooperative Extension, “Low Impact Development: A Guidebook for North Carolina” at 1-3 to 1-4.

⁷ Pursuant to federal law, property owners cannot get flood insurance coverage unless the local government has adopted the federal minimums for flood plain protections 42 U.S.C. § 4002(b). Thus many communities have already adopted such regulations.

⁸ The Cape Fear Council of Government is adapting the Model Natural Resources Overlay Conservation Ordinance to the needs of North Carolina’s twenty coastal counties, which are subject to additional land use and resource management requirements under the state’s Coastal Area Management Act.

- **[Guide to Developing a Model Tree Protection Ordinance](#)** – This [guide](#) provides communities with guidance for retaining trees. Tree protection ordinances can mitigate some of the impact of development while also ensuring community benefits, such as increased property values, stormwater runoff management, cooling, and air quality. The model ordinance sets out a framework for local governments and stakeholders to follow in deciding how to protect trees in their communities.
- **[Conservation Subdivision Handbook: A Guide for North Carolina Communities in the Use of Conservation Design for Land Use Planning](#)** – NCSU’s Forestry and Environmental Outreach Program and the NC Forest Service published [this handbook](#) to provide communities with subdivision guidelines that preserve open space, clustering homes to minimize development impacts. The handbook discusses the benefits of conservation subdivision regulations (also sometimes known as open space regulations) and includes model language for conservation subdivision regulations that communities can adapt to fit their needs.
- **[Green Growth Toolbox](#)** – The [Green Growth Toolbox](#) provides resources for local governments and communities to conserve natural resources and priority wildlife habitats through land use planning methods. Along with technical assistance and training, the Toolbox includes a handbook, conservation data for communities to assess their resources, and provides case studies and recommendations for conservation-based plans, incentives and ordinances. Many of the resources discussed above are discussed in more detail in the Green Growth Toolbox Handbook.

Auditing Tools for Incorporating Green Infrastructure

In addition to passing new ordinances, local governments can also incorporate green infrastructure through revising and amending existing non-environmental resource codes that are relevant to green infrastructure. Subdivision codes, street and parking standards, landscape standards, etc. should all be assessed for opportunities to better accommodate green infrastructure practices. Both EPA and the Center for Watershed Protection provide assessment tools for local governments to use in this endeavor.

EPA’s Water Quality Scorecard: Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scale

[EPA’s Water Quality Scorecard](#) provides a comprehensive guide for local governments and stakeholders to follow, whether reviewing relevant codes to revise and/or remove or to identify opportunities to incorporate greener practices. The Scorecard is designed for a variety of settings—urban, suburban, or rural/urbanizing. It addresses reviewing a local government’s zoning ordinances, subdivision codes, street standards, parking standards, setbacks, height limitations, open space plans, and comprehensive plans.

Center for Watershed Protection’s Better Site Design Guidebook and Codes & Ordinances Worksheet

The [Center for Water Protection’s Better Site Design: A Handbook for Changing Development Rules in Your Community](#) identifies twenty-two (22) principles for creating policies that result in “environmentally sensitive, economically viable, and locally appropriate development.” The principles address a wide variety of development principles including street width and length, cul-de-sac design, use of vegetated open channels, parking ratios and parking standards, open space design and management, tree conservation, and conservation incentives.



Funding for this project was provided in part through the Urban & Community Forestry Program of the North Carolina Forest Service, Department of Agriculture and Consumer Services, in cooperation with the USDA Forest Service, Southern Region.

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