Pender County
Planning and Community Development

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AGENDA
Pender County Planning Board
Tuesday, June 7, 2011 7:00 p.m.
Pender County Public Meeting Room
805 S. Walker Street, Burgaw, North Carolina

Call to Order: Chairman Boney

Roll Call: Chairman Boney
Pender County Planning Board Members:
Boney: ____ Smith: ____ Edens: ____ Garrett: ____ Marshburn: ____ Millette: _____ Williams: _____

1. **Adoption of the Agenda**

2. **Approval of Minutes: May 3, 2011**

3. **Public Comment**

4. **Discussion Items**
    a. Planning Staff
        i. LID Presentation
        ii. Military Growth
        iii. Manufactured Home Standards
        iv. Current Sign Regulations
        v. July Planning Board Date
    b. Planning Board Members

5. **Adjournment**

Implementing Low Impact Development in Pender County, North Carolina

An opportunity for Environmental, Economic, and Quality of Life Improvements

Implementing Low Impact Development in Pender County, North Carolina

An Opportunity for Environmental, Economic, and Quality of Life Improvements

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Introduction

Pender County is a large county in southeastern North Carolina that is growing at an increasing rate, largely due to the county's highly desirable coastal areas, natural resources, and vicinity to the urban areas of Wilmington and Jacksonville. Recognizing the need to appropriately plan for growth, Pender County undertook initiatives to create a new land use plan and development ordinance to set the course for future development. The results of these efforts were adopted in July 2010; the *2010 Pender County Comprehensive Land Use Plan* (*2010 Plan*) sets the policies and goals to guide development in the county, while the *Pender County Unified Development Ordinance* creates the regulations that execute the policies and goals in the land use plan.

The *2010 Plan* dictates several goals and policies to facilitate and encourage sustainable development methods and practices in Pender County. As a result, Planning Staff has created this report to examine how current land use regulations in the county may impair low impact development practices, how these regulatory impediments may be rectified, and how the county may further encourage environmentally-preferred development through incentives.

The purpose of this document is to:

1. Provide an overview of low impact development, including an explanation of the origin and advent of the concept and an evaluation of the perceived benefits and concerns of the practice
2. Explain how low impact development is supported by existing land use policies in Pender County and why LID should be encouraged in the county
3. Reveal the barriers and impediments to LID that exist in current land use regulations in Pender County
4. Create recommendations on how to adjust land use regulations to remove requirements that impede LID
5. Suggest a method to incentivize low impact development in Pender County

The purpose of this document is NOT to:

1. Create additional land use regulations or requirements – The revisions to the Pender County Unified Development Ordinance recommended in this document are suggested to reduce regulations that may impair an LID project. The suggested revisions are minimal and limited to reducing the amount of required parking spaces for two land use types, create parking maximums, and create a system to voluntarily incentivize LID.
2. Create more stringent stormwater regulations – Development projects in Pender County are subject to the stormwater regulations set forth for coastal counties by North Carolina Administrative Code. The intent of the recommended changes to regulations is to encourage the use of low impact development by revising regulations that impede LID and creating incentives for LID projects, but not to create more stringent stormwater regulations above the state requirements. All development projects must treat and control stormwater runoff to satisfy the Division of Water Quality requirements, whether utilizing conventional or LID-based stormwater management.
3. Provide technical information with LID best management practices – A variety of information is available from a host of local, state, federal agencies, as well as non-profit organizations. Developers should seek the consultation of qualified engineers and design professionals for guidance with their development projects. It is recommended that the North Carolina Division of Water Quality's *Stormwater Best Management Practices Manual*, North Carolina State University's *Low Impact Development: A Guidebook for North Carolina,* and the North Carolina Division of Land Resources' *North Carolina Erosion and Sediment Control Planning and Design Manual* be referred to for technical information.

Pender County's unique coastal and natural resources make the county a desirable place to live, work, and recreate; therefore it is important that the county accommodates new development in a manner that preserves and enhances these invaluable resources.

Overview of Low Impact Development

LID Defined

Many terms such as green building, smart growth, sustainable development, low impact development, and conservation design have become commonly used to a point that there is overlap in what these terms reference in relation to development. However, it is important to understand what each of these terms means and how they relate to each other. Generally, sustainable development can be thought of as an overarching, holistic application of development practices that encompasses socioeconomic and environmentally-preferred development methods, while incorporating smart growth principles in order to achieve a mix of land uses, compact building design, diverse housing opportunities, walkable neighborhoods, distinctive, attractive communities, and preserve open space, farmland, natural beauty, and environmentally sensitive areas.

Sustainable development envelopes a variety of components that focus on specific elements of development, such as green building and low impact development. Green building, for instance, focuses on the construction of the structures of a development proposal, such as implementing solar and wind energy harvesting, grey and rain water harvesting, building orientation, using sustainable construction materials, and other structure-specific components. The term LEED® (Leadership in Energy and Environmental Design) has become synonymous with green building, as LEED®, created and managed by the US Green Building Council, has become the internationally recognized certification program for green buildings and accreditation for green building professionals. While green building focuses on the structure itself, low impact development, or LID, focuses on the development site.

Table 1: Comparison of LID and Conventional Stormwater Management Principles

LID	Conventional
Minimize land clearing	Removal of most or all native vegetation
Amend soils	Compact soils
Minimize and/or disconnect impervious surfaces	Excessive use of impervious surfaces
Maximize infiltration of stormwater runoff	Expedite conveyance of stormwater runoff off site
Make the development fit the site	Make the site fit the development

Low impact development is a branch of sustainable development that focuses on creating a "hydrologically functioning landscape". By definition, LID is the practice to design, construct, and maintain a development site to protect or restore the natural hydrology of the site so that the overall integrity of the watershed is protected. This "hydrologically functioning landscape" is achieved through a variety of non-mutually exclusive practices:

- Minimizing the impact on and/or improving the condition of the natural environment
- Mimicking natural hydrology
- Retaining existing site characteristics and conditions
- Restoring a site to its pre-development conditions
- Minimizing impervious surface coverage and maximizing infiltration of stormwater runoff

Low impact development is a practice that counters the principles of conventional stormwater management. While conventional stormwater management focuses on conveying untreated stormwater runoff off-site as quickly as possible, LID focuses on retaining stormwater on-site and maximizing pollutant removal and infiltration of stormwater runoff through the execution of numerous integrated best management practices (BMPs). While a development using conventional stormwater management may use one large retention pond for stormwater management, LID would utilize several smaller management practices such as impervious surfaces, grassy swales, bioretention areas, constructed

wetlands, and others to create a "treatment chain" of stormwater management techniques. Additionally, a hybrid of these two stormwater management styles may be utilized, resulting in several smaller management practices conveying stormwater to a detention or retention basin that would be significantly smaller due to the utilization of the variety of BMPs. The *Case Study: Patuxent Riding, Bowie, Maryland* on Page 6 shows a comparison of a LID and conventional stormwater management based designs.

Advent and Utilization of LID

The roots of low impact development can be traced back to a residential subdivision in Davis, California. Village Homes, built in the early 1970s, utilized open stormwater conveyance systems and provided stormwater retention in open space that was integrated throughout the development. In the mid-1980s, European cities began to utilize integrated stormwater management practices to minimize flows into combined sewer systems (United States, 2004).

Low impact development continued to evolve the late-1980s with the introduction of bioretention technology in Prince George's County, Maryland in response to rising construction costs and increasing environmental concerns. As the concept became more refined, it was acknowledged as a more economical alternative to conventional and expensive centralized stormwater management and further clarified in 1998 in the Prince George's County, Maryland document *Low-Impact Development Design Strategies: An Integrated Design Approach* (Crichton, 2010; Perrin et. al 2009), which is acclaimed as the first LID manual and was later expanded for national distribution in 2000 (United States, 2004).

Since the pioneering efforts of Prince George's County, Maryland, low impact development began to gain momentum around the country. In 1998, the Low Impact Development Center was established to create and disseminate information about LID, including a 2002 feasibility study that provided guidance on how LID could be used to retrofit urban areas. In 2004, the Center developed a comprehensive design document for the Navy to use at all Department of Defense facilities that included information on how LID can be used to address stormwater management requirements and resource protection goals for federal facilities. Low impact development continued to be an attractive and cost-effective alternative to conventional stormwater management around the country, particularly in water resource dependent areas such as the Puget Sound in Washington, the Chesapeake Bay in Maryland, and sensitive coastal areas along seaboards and around the Great Lakes; many local and state agencies across the country began to embrace the new stormwater management concept and incorporate LID into local stormwater regulations.

At the same time, efforts to advocate LID in North Carolina were also underway. In 1997, the Watershed Education for Communities and Local Officials (WECO) was created by a grant from the USDA-CSREES Water Quality Program and involved into an information clearing house and advocate organization for watershed management in North Carolina. Simultaneously, professionals at the NC State University Biological and Agricultural Engineering and the North Carolina Cooperative Extension further researched and advocated LID, eventually leading to the 2009 publication of *Low Impact Development: A Guidebook for North Carolina.* In 2008, the NC LID Group was formed at North Carolina State University to provide research, education, outreach, and technical assistance for low impact development; the NC LID Group also created a certification program for professionals, second in the nation only to Washington State University.

Outreach and guidance for LID has occurred specifically in southeastern North Carolina as well. In 2006, the North Carolina Coastal Federation (NCCF) secured a grant from the National Oceanic and Atmospheric Administration (NOAA) that funded the creation of LID guidance manuals for Brunswick County and New Hanover County/City of Wilmington. These manuals provide technical guidance for low impact development design concepts and best management practices, but do not impose any regulatory requirements for the use of LID to control stormwater on a development site.

In summary, LID has been accepted locally, statewide, and internationally as a flexible, economic, and efficient method to manage stormwater runoff. The concept has been embraced and endorsed by a variety of local, state, and federal agencies, non-profits, developers, and other stakeholders. As the benefits of LID continue to be realized and documented, governments are examining how to best implement LID into development regulations. A limited number of governments including the state of Washington have chosen to mandate LID, while others have offered incentives for the use of LID in development projects. As population continues to increase and land continues to be developed, it will become more critical to utilize low impact development to balance development needs with natural resource protection.

General Benefits of LID

Utilizing low impact development versus conventional development accrues a variety of benefits to stakeholders, including developers, local governments, home buyers/owners, and the environment. These benefits have been researched and documented in a variety of publications, research projects, case studies, and practical experience by a number of organizations and entities including the US Environmental Protection Agency, the Natural Resources Defense Council, the US Department of Housing and Urban Development in partnership with the National Association of Home Builders, and many others.

Many of the benefits of LID are easily measured through cost comparisons, life-cycle cost analyses, and cost-benefit analyses, such as the savings a developer may realize by eliminating curb and gutter and using swales and level spreaders instead. However, some benefits such as the value of clean water or increases in quality of life are not easily measured because they are not market traded. Low impact development inherently adds value by providing these benefits, and while the benefits may not be easily measured it is important to understand the concept of these non-market valuations (*LID – An Economic Factsheet*, WECO).

Another method to conceptually gauge the benefits of LID is to understand the hidden costs of conventional development. When natural resources are damaged and ecosystem functions are impaired as a result of development, the true costs of that development are hidden and are traditionally paid by citizens in the form of increased water filtration, reduced aesthetics, and decreased property values (*LID – An Economic Factsheet*, WECO).

Table 2: General Benefits of Low Impact Development to Stakeholders

Developers

- Reduces land clearing and grading costs
- Reduces infrastructure costs (streets, curbs, gutters, sidewalks)
- Reduces stormwater management costs
- Increases lot yields and reduces impact fees
- Increases lot and community marketability

Local Governments

- Protects regional flora and fauna
- Balances growth needs with environmental protection
- Reduces infrastructure (streets, curbs, gutters, sidewalks, storm sewers)
- Reduces system-wide operations and maintenance costs of infrastructure
- Reduces costs of combined sewer overflows (CSOs)
- Increases groundwater recharge
- Fosters public/private partnerships

Home Buyers/Owners

- Protects site and regional water quality by reducing sediment, nutrient, and toxic loads to water bodies
- Preserves and protects amenities that can translate into more marketable homes and increased property values
- Provides shading for homes, which decreases monthly energy bills for cooling
- Reduces flooding
- Saves money through water conservation

Environment

- Preserves integrity of ecological and biological systems
- Reduces demand on water supply and encourages natural groundwater recharge
- Protects site and regional water quality by reducing sediment, nutrient, and toxic loads to water bodies
- Reduces impact on local terrestrial and aquatic plants and animals
- Preserves trees and natural vegetation

Source: *Low Impact Development: A Guidebook for North Carolina,* NC Cooperative Extension WECO

Low impact development creates many economic and environmental benefits. While Table 2 summarizes the general benefits of LID to stakeholders in general, the specific application of these benefits to stakeholders in Pender County will be discussed later in this document.

Case Study: Patuxent Riding, Bowie, Maryland

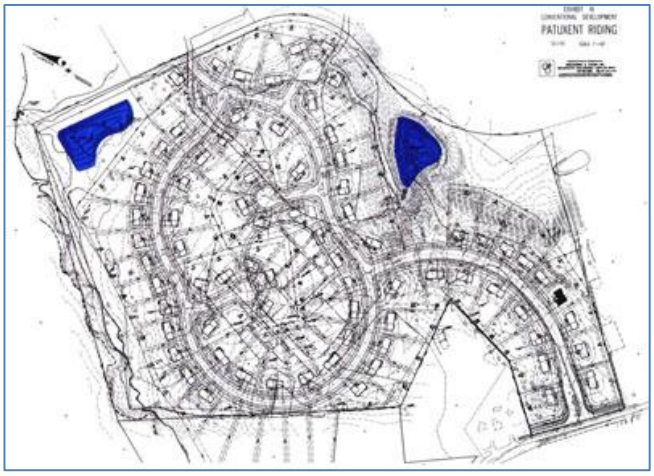


Image 1: Design using conventional "pipe and pond" stormwater management.

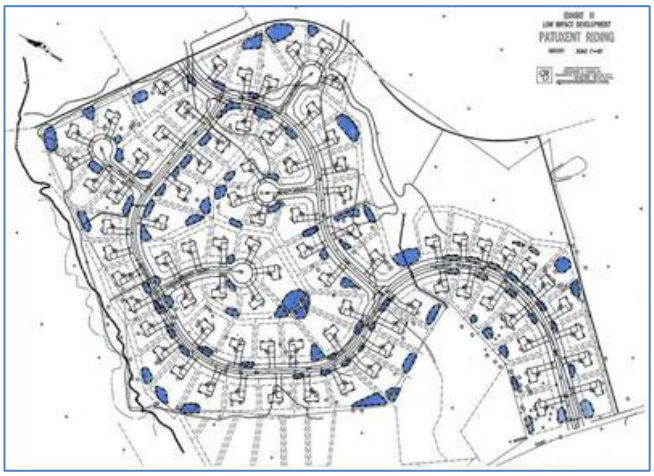


Image 2: Design featuring LID-based stormwater management utilizing smaller integrated stormwater management practices.

In the late 1990's, Prince George's County, Maryland performed several studies evaluating the costs associated with utilizing conventional versus low impact development stormwater management. Three case studies were evaluated, including a residential subdivision called Patuxent Riding, which featured 1/2 to 1/3 acre lots.

The two designs of Patuxent Riding were compared for their costs and benefits. The LID-based design yielded seven additional lots due to the use of small, integrated stormwater management practices that reduced the area dedicated to stormwater management. Nearly a 50% reduction in infrastructure costs was realized by utilizing grassy swales and other natural stormwater conveyances rather than underground stormwater piping. The table below highlights the construction cost comparison for the two designs of Patuxent Riding.

In addition to the additional lots yielded and the reduction in infrastructure costs, the LID design also eliminated the need for an off-site easement for one of the stormwater ponds.

In summary, the LID design reduced construction costs by nearly $200,000 while increasing the number of lots by 7. The Patuxent Riding case study demonstrates that low impact development can produce positive results for developers while simultaneously preserving open space and reducing negative environmental impacts.

Element	Costs (Dollars)		Percent of Total Cost	
	Conventional	LID	Conventional	LID
Paving/Roads	$569,698	$426,575	52%	52%
Storm Drain	255,721	132,558	25%	16%
Stormwater Ponds/Fees	260,858	10,530	24%	1%
Bioretention, Rain Barrels	0	252,124	0%	31%
Total Costs	$1,086,277	$821,787	100%	100%
Units	74	81		
Unit Cost	$14,679	$10,146		

Perceived Concerns of LID

Low impact development has not been received without concerns and criticisms. The concept of LID is often viewed as relatively new, expensive, and complicated. This section will address some of the concerns commonly expressed about low impact development.

Concern 1: It costs more to do LID than conventional development

Because low impact development utilizes more numerous smaller and integrated stormwater best management practices, project costs are perceived to be higher for LID projects. However, many case studies have shown that projects utilizing LID often result in less construction costs. This is further detailed in Table 3, created from data from a factsheet that provides additional information about the EPA's report *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices.*

Table 3: Cost Comparisons of LID and Conventional Project Designs

Project	Costs (Dollars)		Cost Difference (Dollars)	Cost Difference (Percent)
	Conventional Design	LID Design		
2nd Avenue SEA Street	$868,803	$651,548	$217,255	25%
Auburn Hills	$2,360,385	$1,598,989	$761,396	32%
Bellingham City Hall	$27,600	$5,600	$22,000	80%
Bellingham Bloedel Donovan Park	$52,800	$12,800	$40,000	76%
Gap Creek	$4,620,600	$3,942,100	$678,500	15%
Garden Valley	$324,400	$260,700	$63,700	20%
Kensington Estates	$765,700	$1,502,900	-$737,200	-96%
Laurel Springs	$1,654,021	$1,149,552	$504,469	30%
Mill Creek*	$12,510	$9,099	$3,411	27%
Prairie Glen	$1,004,848	$599,536	$405,312	40%
Somerset	$2,456,843	$1,671,461	$785,382	32%
Tellabs Corporate Campus	$3,162,160	$2,700,650	$461,510	15%

**Mill Creek figures shown per unit*

Another example of the reduction in costs realized by utilizing an LID design is more local to southeastern North Carolina. The Ridgefield at Middle Sound project is located on a 30.71 acre tract along Middle Sound Loop Road in northern New Hanover County. The project was originally permitted through the Division of Water Quality as a High Density project with a proposed impervious surface coverage of 38%. However, the developer was hesitant to pursue the conventionally-designed project because it would have involved clear cutting the majority of the natural vegetation on site and significantly altered the topography with fill. Therefore, the project was reviewed and redesigned using LID principles which resulted in an additional four lots, reduced the length of stormwater pipe by 89%, decreased road widths by 9%, eliminated 9,000 linear feet of curb and gutter, eliminated of three infiltration basins, eliminated three stormwater pumps, eliminated of 10,000 linear feet of stormwater forced main, reduced the limit of disturbance by 18%, preserved of the native vegetation, and saved of $1.5 million on fill material alone.

Concern 2: It takes a lot longer to get the permits for an LID project than a conventional development

Because LID projects utilize more BMPs than conventional designs, LID projects are viewed as more complex to engineer and receive permits for. While this may have been true at the time of inception of low impact development, engineers and permitting authorities are able to expedite their processes, having become more familiar with LID projects over the past several years. Specific modeling tools have been developed for low impact development permitting requirements, and the NC Division of Water Quality has adopted technical guidance publications to assist in the design, construction, and maintenance for low impact development.

Concern 3: LID is too new and it hasn't been proven to work yet

As discussed earlier, the concept of low impact development has been applied for nearly 40 years and internationally accepted as a cost effective and environmentally-preferred method for stormwater management. A variety of studies and publications are available that attest to both the economical benefits of LID versus conventional stormwater management, as well as the effectiveness of low impact development to reduce stormwater runoff pollution and volume.

Concern 4: LID projects require a lot of maintenance over the life of the project

Any stormwater BMP must be maintained in order to retain its effectiveness, whether conventional or LID based. BMP maintenance is generally a condition of an approved stormwater management plan, requiring proof of maintenance contracts or reporting requirements for maintenance of BMPs. Because LID uses more BMPs than conventional stormwater management, there may be more time, outreach, and education associated with the maintenance of an LID project's components. However, this can be remedied by requiring a Homeowners Association to manage or contract the maintenance of the stormwater management components. The costs associated with maintenance of an LID project can easily be returned in reduced flooding, reduced home energy heating and cooling costs, increased amenity values, and improvements to water quality. Regardless of having to maintain a few large BMPs or several smaller BMPs, maintenance of any project's stormwater management is a requirement.

Concern 5: An LID project is too risky to sell

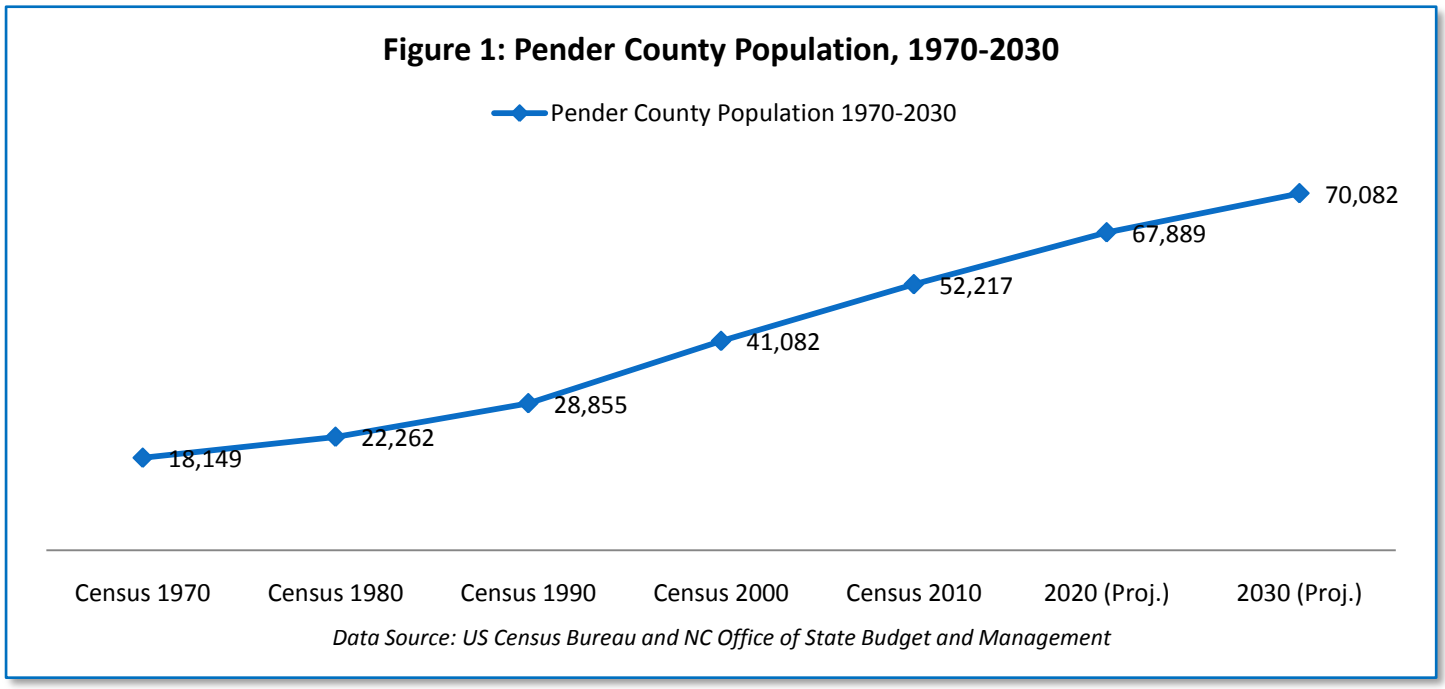
Another concern of low impact development is that it is a risky investment for a developer because consumers dictate through their purchases of homes in conventional developments that there is no market for "non-conventional" homes. However, many statistics prove the contrary. For example, the Gap Creek subdivision in Sherwood, Arkansas was revised from a conventional subdivision with 1.5 acres of open space to a subdivision designed using LID concepts featuring 23.5 acres of open space. The lots in the subdivision sold for $3,000 more and cost $4,800 less to develop, resulting in $2.2 million in additional profit for the developer (*LID – An Economic Factsheet,* WECO).

In conclusion, many concerns have been raised about low impact development since the concept has gained popularity. While LID may not be feasible for every development, it is important to understand the concerns associated with the non-conventional principles of stormwater management. As LID continues to become more widely used and more research and studies are performed to compare LID and conventional designs, the responses to concerns raised may be clarified further.

Supporting and Encouraging LID in Pender County

Support of LID in 2010 Pender County Comprehensive Land Use Plan

In July 2010, Pender County adopted the 2010 Pender County Comprehensive Land Use Plan (2010 Plan), which is the official land use policy document for the county. The Plan assessed the current land use in the county, identified growth challenges and opportunities, and developed goals and policies that will be utilized to assess land use proposals as the county inevitably grows in population and development.



The 2010 Plan was a collaborative effort between Planning Staff, a 15-member citizen advisory committee, and a consulting firm, and outlines several goals and subsequent policies that relate to and support the concept of sustainable land use and low impact development in Pender County, identified in Table 4 below. Each of the goals and policies listed below can be achieved in part by removing barriers to and potentially incentivizing LID in Pender County.

Table 4: Goals and Policies Supporting LID in 2010 Pender County Comprehensive Land Use Plan
Growth Management Goal 1A.1 - Manage the physical growth and development of Pender County by promoting more intensive land uses in key locations identified for such growth while preserving and protecting the unique physical character and social assets of the predominant rural lifestyle and coastal environment that makes the County a unique place to live. **Policy 1A.1.4** - The County should develop and utilize innovative and flexible land planning techniques that encourage developments to efficiently use land resources that result in more compact urban areas, infill development, redevelopment, and the adaptive re-use of existing buildings. **Policy 1A.1.5** - The County supports a pro-business/pro-growth attitude, balanced by a concern for preserving the natural assets and quality of life factors that make the area attractive to visitors and permanent residents alike.
Transportation Goal 2B.1 - Manage the timing, location and intensity of growth by coordinating transportation improvements in accordance with the Comprehensive Land Use Plan and the Coastal Pender Collector Street Plan. **Policy 2B1.10** - Allow and encourage flexible road design standards, incorporating low impact development and smart growth principles.

Stormwater Management Goal 2G.1 - Protect the water quality of public trust waters in and around Pender County, particularly Class SA waters. (Class SA waters, as designated by the NC Division of Water Quality, are High Quality Waters (HQW) that are rated excellent based on biological and physical/chemical characteristics; SA waters are typically used for commercial shell fishing.)

Policy 2G.1.2 - The UDO shall address the use of fill material to create building sites/lots by altering natural drainage patterns.

Policy 2G.1.3 - Pender County will consider developing policies and techniques that encourage the use of voluntary low impact development standards that can be applied to projects at the individual lot level or to major residential or commercial developments to mimic natural features and predevelopment hydrology.

Policy 2G.1.4 - When considering developing policies and techniques that incorporate low impact development practices Pender County should adhere to the guidance set forth from the Division of Water Quality for details on how to design, construct and maintain LID practices.

Policy 2G.1.5 - Consider implementing fee-based as well as land-based incentive packages for developers that utilize low-impact development (LID) techniques to manage the potential impacts of stormwater runoff.

Preferred Development Patterns Goal 3A.1 - Develop a preferred growth pattern that includes traditional suburban communities but also allows for higher density residential development and for innovative mixed-use developments to encourage more compact, sustainable growth patterns.

Policy 3A.1.1 - Use the creation of the Unified Development Ordinance (UDO) as an opportunity to allow more development flexibility while setting higher standards for sustainable development.

Policy 3A.1.2 - To the extent possible, incorporate more flexible zoning categories that establish performance standards and do not exclude uses as much as encourage compatible co-location of uses to encourage sustainable land use patterns. Neo-traditional or traditional neighborhood planning standards should provide for a compatible mix of uses to encourage more livable communities.

Community Design and Appearance Goal 3B.2 - Improve community appearance by using cluster development options to preserve roadside views and open space.

Policy 3B.2.1 - Incorporate cluster development standards in the Unified Development Ordinance.

Policy 3B.2.2 - Consider providing incentives to encourage use of the cluster development option to preserve environmentally sensitive areas and upland sites as open space to protect community character.

Natural Resources Protection Goal 6A.1 - Ensure that natural resources are maintained or enhanced as development occurs.

Policy 6A.1.2 - Consider regulations that restrict or limit development in flood hazard areas, wetlands, and other identified hazardous or natural resource areas.

Policy 6A.1.3 - Require use of conservation subdivision and low impact development techniques to preserve natural resources on new development sites.

Policy 6A.1.4 - Consider establishing staff resources to manage and strengthen stormwater quality standards in addition to state minimum standards.

Policy 6A.1.5 - Adopt regulations that provide enhanced protection of groundwater resources where needed as appropriate.

Parks, Recreation, Open Space and Waterway Access Goal 7B.1 - Increase the amount of land available and the funding for parks, recreation and open spaces to serve Pender County residents and visitors.

Policy 7B.1.2 Encourage the use of conservation subdivision development to preserve open amenities within new development.

Economic Development Goal 10A.1 - Promote economic development which meets the needs of the County for expanding the non-residential tax base and providing well-paying jobs.

Policy 10A.1.7 - Protect, enhance and encourage a high quality of life, including the conservation and management of natural and man-made resources, as an effective component of an economic development and diversification strategy.

Audit of Impediments to LID in Pender County Unified Development Ordinance

In concert with the 2010 Plan, Pender County also adopted a Unified Development Ordinance (UDO) in 2010. While the 2010 Plan is a policy document, the UDO serves as a regulatory document by creating land use, subdivision, and development codes that implement the policies created in the 2010 Plan.

In order to better understand how to facilitate and encourage LID in Pender County, it is necessary to be cognizant of how current land use regulations may impair low impact development. Therefore, an audit of the Pender County Unified Development Ordinance was performed to evaluate impediments to LID. An evaluation exercise created by the Boston Metropolitan Area Planning Council was utilized, which was designed as a comprehensive regulatory review of local codes for consistency with LID principles.

The audit, as shown in Table 5, revealed the Pender County UDO generally does not create impediments to LID except in two areas: dimensional requirements and parking requirements. Under current regulations, cluster development/conservation subdivisions would be difficult in the Residential Performance (RP) zoning district due to rigid setback and yard requirements. These impediments would not exist for an LID-based residential development proposed in the Planned Development (PD) or Residential Mixed (RM) zoning districts, as the PD and RM districts allows for flexibility in dimensional requirements; all PD and RM developments are reviewed by the Planning Board, at which time the setbacks and densities are considered. Should an applicant wish to pursue an LID development in the RP district, they would have to adhere to setbacks and other dimensional requirements that may create barriers to an LID-based design. Under the current ordinance, an option for the developer would be to rezone the area to PD or RM to take advantage of the flexibility of these districts; however this may not be feasible for all proposals as the minimum acreage requirement for a request to rezone to PD is 100 acres and 10 acres for the RM zoning district. Additionally, the rezoning process would create an additional approximate 6 month waiting period, as the rezoning request is required to be heard by the Planning Board as well as the Board of Commissioners.

Several minimum parking requirements in the UDO can also be considered impediments to low impact development, specifically for office buildings and shopping centers. Also, the Pender County UDO does not establish a maximum for parking areas, which allows for an overdevelopment of impervious areas that are often not utilized. As jurisdictions around the country examine their local regulations for promoting environmentally preferred development, it is becoming more common to establish parking maximums that may not be exceeded, generally at 125 to 150 percent of the minimum parking requirements.

Table 5: Audit for LID Impediments in Pender County Unified Development Ordinance
Key to Staff Commentary: □ Items in green: not impediment to LID □ Items in purple: not applicable or not feasible □ Items in orange: somewhat of an impediment to LID or could be modified to better facilitate LID □ Items in red: impediment to LID
Zoning Regulations and Site Plan Review Standards
Dimensional Requirements
Allow and encourage the location of bioretention areas, rain gardens, filter strips, swales, and constructed wetlands in required setback areas and in buffer strips. □ *The Pender County UDO currently allows for stormwater facilities within required buffer yards with the provision that a minimum 10-foot contiguous width of the buffer is preserved as a planting area without stormwater facilities. No prohibition exists regarding stormwater management features within required building setback areas.*
Minimize setback distances in residential districts in order to increase flexibility with regard to house location. □ *For the Residential Performance (RP) zoning district, the Pender County UDO currently requires a 30 ft. front yard setback, 10 ft. side yard setback, and 25 ft. rear yard setback. The front yard setback may impede LID-based designs by increasing the impervious surfaces required to accommodate driveways of at least 30 feet for each residence.*
Allow reduction in frontage (and corresponding road length/paved area) where appropriate, such as in open space residential developments, at the outside sideline of curved streets, and around cul-de-sacs. □ *Currently, frontage of lots must be at least 80% of the minimum required width for the district, except for cul-de-sacs which must be at least 50%. In RP, the minimum lot width is 80 feet and subsequent frontage must be at least 64 feet; for cul-de-sacs, frontage may be reduced to 40 feet. These may be further reduced should the lot be served by public water and sewer; minimum lot width is reduced to 60 feet, minimum frontage is 48 feet, and for cul-de-sacs frontage may be reduced to 30 feet.*
In rural, low-density areas, establish limits on impervious lot coverage (e.g., 15%). This strategy is not appropriate for town centers, transit-oriented districts, and moderate density neighborhoods, where compact development should be encouraged. □ *For the RA zoning district, there is no limit to impervious surface coverage so long as the development adheres to state stormwater and sediment and erosion control regulations. An impervious surface coverage limit in the RA may be considered.*
Establish regulatory controls over the tree clearance and removal of mature trees/forest stands. □ *Currently, a significant tree survey is required for any development proposal in the GB, OI,PD, IT, and GI zoning districts. Should a significant tree be removed by the development, the removal must be mitigated by the onsite planting of two trees of the same species.*
Open Space Developments
Allow open space residential developments (cluster development or conservation subdivision design) as a "by right" form of development. Permit flexible site design criteria such as reduced setbacks and smaller lot sizes. □ *Cluster development/conservation subdivisions would be difficult within the RP and RA zoning districts due to rigid setbacks and residential use type restrictions. However, the flexibility of the PD and RM zoning districts would accommodate such proposals; however, the minimum acreage for a rezoning to PD is 100 acres and 10 acres for RM.*
Allow construction of LID stormwater management techniques on land held in common. □ *Residential developments consisting of more than 10 dwelling units are required to provide open space in the amount of 0.03 acres per dwelling unit. Stormwater management features are not allowed to be included in the open space calculations. However, this probably does not impede conservation design subdivisions because they inherently have more open space and should be able to meet the minimum open space requirements with little trouble, even when excluding the areas used for stormwater management.*
Parking Requirements

Allow use of permeable paving for parking stalls and spillover parking areas. □ *Parking areas provided in excess of the minimum required are required to use pervious surface. Additionally, pervious surface or other LID-based designs are allowed in infrequent use areas such as churches or the outlying parking areas of malls and other shopping areas.*
Do not require more than 1 off-street parking space per 333.333 square feet of gross floor area in professional office buildings. □ *Office uses are required to have 1 off-street parking space per 250 square feet of gross floor area.*
Do not require more than 4.5 off-street parking spaces per 1000 (1 per 222.22 sq. ft. of GFA) square feet of gross floor area in shopping centers. □ *Shopping centers are required to have 1 space per 200 square feet for first 50,000 sq. ft. of gross leasable area and 1 space per 250 square feet of leasable area after that.*
Do not require more than 2 off-street parking spaces per single family home. □ *No parking requirements are prescribed for single family residential uses.*
Establish parking maximums. □ *No parking maximums exist.*
Establish formulas for the utilization of shared parking for uses with different peak demand periods. Allow reduction of parking requirements if shared parking is proposed. Provide model shared parking agreements that can be included as deed restrictions or permit requirements. □ *None of this exists and may be hard to implement. Shared parking areas other than shopping centers are more appropriate for urban settings.*
Allow reduced parking for homes and businesses near major transit stops. □ *Not applicable as there are no major transit stops in the county.*
Allow stall width of 9 feet or less and stall length of 18 feet or less for a standard parking space. □ *Parking spaces can be a minimum of 8'6" in width and 18 feet in length. This is a requirement of the NC Building Code.*
Recommend or require smaller stalls for compact cars, up to 30% of total number of parking spaces. □ *Parking areas may include spaces of a reduced size for compact vehicles, but are not required*
Establish landscaping requirements for parking areas that include vegetated islands with bioretention functions. □ *Landscape requirements for parking areas include terminal islands and intermediate islands that must be pervious but not necessarily have bioretention functions.*
Common Driveways
Allow the use of common driveways to serve up to four houses. □ *SFR lots must have at least 45' of frontage along a public or private street or access easement, but there is no language that specifically allows or prohibits shared driveways. No more than three structures may be accessed from a single access easement.*
Site Plan Requirements
Allow bioretention areas, filter strips, swales, and constructed wetlands to count towards fulfillment of site landscaping/open space requirements. □ *Stormwater management features are not allowed to be included in the open space calculations. However, this probably does not impede conservation design subdivisions because they inherently have more open space and should be able to meet the minimum open space requirements with little trouble, even when excluding the areas used for stormwater management.*
Require driveway width no more than 9 feet. □ *Driveways accessing DOT-maintained roads must adhere to DOT standards. For residential driveways, a "minimal passable travel way" of 20 feet is required. This travel way must be free from obstructions but not paved; the intent is for emergency vehicle access.*
Permit use of pervious material for single family driveways, including porous pavers, paving stones, pervious asphalt or concrete, and/or use of "two-track" design for residential driveways. □ *Pervious materials are allowed for driveways for residential uses.*

Allow for discharge of uncontaminated rooftop runoff to lawn areas and buffers, with level spreader or other velocity reduction mechanism.

- *Runoff from rooftops is allowed to be discharged into lawn areas and buffers.*

Allow temporary (72-hour) ponding of stormwater prior to infiltration.

- *Wet detention basins are allowed as part of a DWQ-approved stormwater management plan.*

Require development of a stormwater management and erosion control plan for construction activities. Ensure that standards comply with NPDES Phase II requirements. Be sure that the plan includes a maintenance program and provides for inspection by local authority.

- *All development must adhere to state requirements for stormwater management and sediment and erosion control.*

Subdivision Rules and Regulations/Roadway Design Standards

Street Location

Considerations for street layout should include reducing street length and minimizing total paved area (including cul-de-sacs), with the goal of protecting site hydrology. Identify the need to reduce cut and fill, do not run streets across steep hillsides, route streets along ridgelines, protect important natural features.

- *All designated private streets are required to be designed and constructed in compliance with the current NCDOT Subdivision Roads Minimum Construction Standards. However, variations to right-of-way widths and geometric design may be permitted upon Planning Board review and approval where certain features such as topography, environmental features, low impact development design or unique needs of a development exist at the Master Development Plan approval.*

Street Cross Sections

Permit a minimum pavement width of 18-22 feet on low-traffic local streets in residential neighborhoods. Allow narrower pavement widths along sections of roadway where there are no houses, buildings, or intersections, and where on-street parking is not anticipated. It is especially important to involve public works officials and emergency response officials in this discussion.

- *See "Street Location".*

Allow for the use of "open section" roadways with roadside swales. Do not require the use of conventional curbs for the full length of all streets in residential neighborhoods. Where curbs are deemed necessary to protect the roadway edge, allow the use of perforated curbs (that allow runoff to flow into swales) or "invisible curbs" (curbs flush with the road surface).

- *Curb and gutter is not required for any development, and alternative curb designs are allowed under an approved state stormwater management plan.*

Establish criteria for the design of roadside swales to ensure adequate stormwater treatment and conveyance capacity.

- *Designs of roadside swales are required to follow the NCDENR DWQ BMP Manual guidelines.*

Allow use of permeable paving for road shoulders/parking lanes in residential neighborhoods, with the use of conventional paving for travel lanes only.

- *Pervious paving is allowed for parking lanes in residential neighborhoods; shoulders must adhere to NC DOT design unless approved by Planning Board (See "Street Location").*

Allow the use of permeable paving for sidewalks

- *Permeable paving for sidewalks is allowed.*

Allow sidewalk placement on one side of the street only in low-density residential neighborhoods. Provide flexibility with sidewalk layout; e.g., alternative pedestrian circulation layout that uses common areas, rather than street ROW. Sidewalks should be designed so that the runoff is disconnected from the stormwater system.

- *Sidewalks in residential neighborhoods may be used to fulfill recreational requirements, but are not required. As such, flexibility is allowed for sidewalk designs.*

Dead Ends

Minimize the required radii for cul-de-sacs. A radius of 35 feet is optimal, depending on emergency vehicles.

- *Cul-de-sacs are required to be designed to the NCDOT Subdivision Roads Minimum Construction Standards, which requires a minimum 35' radius.*

Allow the creation of landscaped island (and bioretention cells) within cul-de-sacs. □ *Cul-de-sacs are required to be designed to the NCDOT Subdivision Roads Minimum Construction Standards, which allow cul-de-sacs with an interior island subject to the approval of the Division Engineer after review on an individual basis.*
Allow the use of one-way loop streets to eliminate turnarounds. □ *Subdivision roads must adhere to the NCDOT Subdivision Roads Minimum Construction Standards, which do not allow for one-way roads. However, variations to right-of-way widths and geometric design may be permitted upon Planning Board review and approval where certain features such as topography, environmental features, low impact development design or unique needs of a development exist at the Master Development Plan approval.*
Allow use of the "hammerhead" turnaround design instead of cul-de-sacs. □ *"Hammerhead" (also known as "t" cul-de-sacs) designed to the NCDOT Subdivision Roads Minimum Construction Standards are allowed after review on an individual basis by the NCDOT Division Engineer.*

Environmental Benefits of Low Impact Development

Low impact development provides a variety of environmental benefits, including retention of natural vegetation and habitat, increased groundwater recharge, and reduction in flooding. However, perhaps the greatest benefit that is realized from LID is the reduction of stormwater pollution and volume.

Polluted stormwater runoff is a tremendous problem that is becoming exacerbated with the increase in development of environmentally sensitive areas, such as the coastal watersheds of Pender County. Coastal areas are a highly desirable place to live, and in fact, coastal counties in the United States (which include the Great Lakes) contain 53% of the nation's population, yet, account for only 17% of the land area (excluding Alaska) (NOAA, 2004). Ironically, it is the very resources and attributes of coastal areas that draw residents that are in jeopardy as a result of developing coastal areas. As land shifts from a natural to more urbanized use, the amount of runoff significantly increases while the amount of water infiltrated into the groundwater significantly decreases, as shown in Image 1. Not only does the volume of runoff increase, but the receiving waters generally are burdened with more pollution resulting from the increase in impervious surfaces.

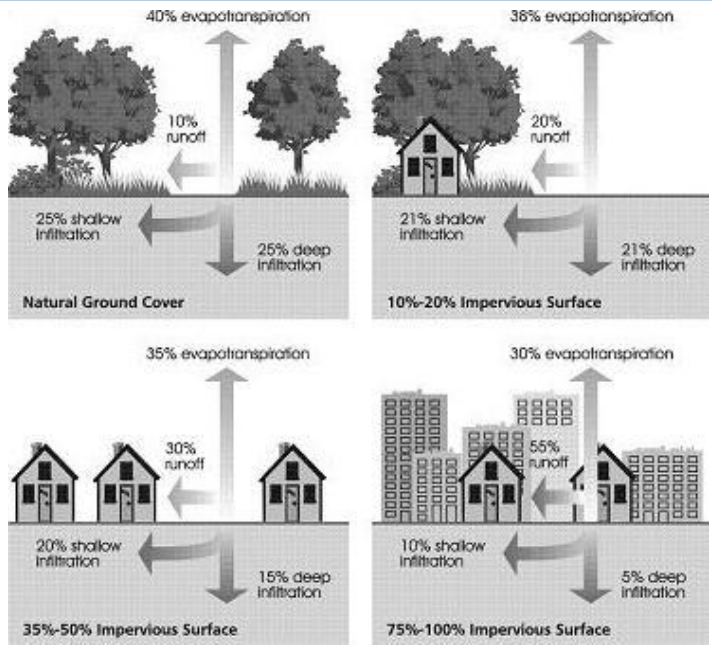


Image 1: Comparison of pre- and post-development hydrologic conditions. Source: Prince George's County, MD

The link between increased development and declination of stormwater quality can be easily evaluated in Pender County. Map 1 in the appendix shows a delineation of Pender County's tidal creek watersheds, the platted lots within the watersheds, and the open and closed shellfish harvesting areas in coastal Pender County. Whether shellfishing areas are open or closed are a good indicator of water quality. Because shellfish are filter feeders, they retain in their bodies the pollution from the water that they filter out, including fecal coliform, metals, and chemicals. If a human consumes shellfish from polluted waters, they can become sick; therefore, the Division of Marine Fisheries evaluates water quality in coastal areas and closes shellfish harvesting areas that can impair the health of people who consume oysters or other shellfish from these areas.

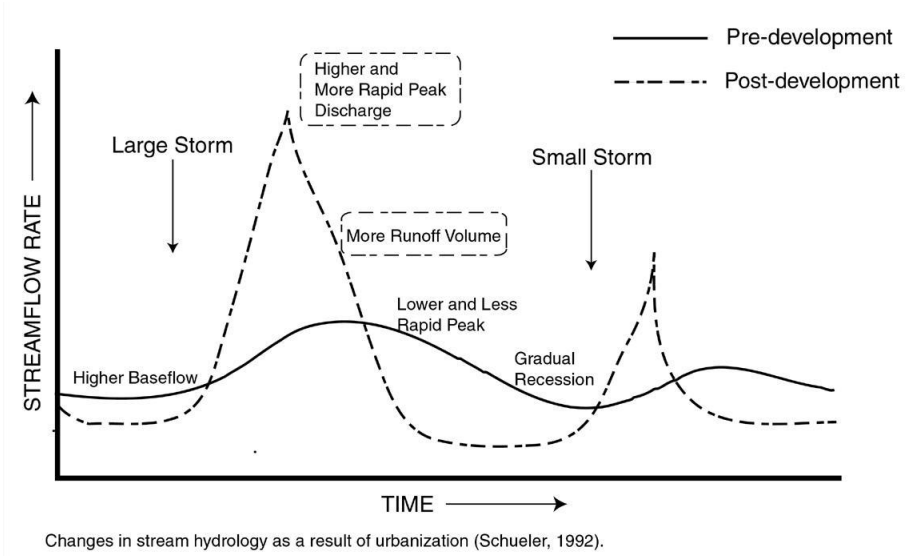


Image 2: Comparison of pre- and post-development streamflow rates. Source: Prince George's County, MD

Another gauge of water quality in Pender County is the waters within the county listed on the EPA's 303(d) list of impaired waters. The North Carolina Division of Water Quality is tasked with evaluating waters of the state for their uses, and whether or not the waters can support their designated uses based on their quality. Waters that cannot support their use are considered Category 4 or 5 Impaired Waters, and this list is then submitted to the EPA for approval. Several water bodies in Pender County have been included on the most recent *NC 2010 Integrated Report Categories 4 and 5 Impaired Waters* (August 31, 2010), including Burgaw Creek, Burnt Mill Creek, the Northeast Cape Fear River, and others, as shown on Map 2 in the Appendix. Each of these waters is listed as impaired for specific factors, also indicated on Map 2.

By encouraging low impact development in Pender County, existing water quality may be retained and the quality of impaired waters may be improved.

Economic Benefits of Low Impact Development

Pender County's unique coastal areas and other pristine natural resources draw residents and visitors seeking to live, work, and recreate in the county. The tourism and fishing industries are strong economic drivers for the area that are dependent on the quality of the county's natural resources. However, declining water quality and loss of open space and other natural areas deter visitors and residents, as well as inhibit industries such as fishing and shellfishing. As such, it is imperative that Pender County balance its development needs with preserving its natural resources, which can be achieved through promoting smart growth principles including low impact development.

Quality of Life Improvements of Low Impact Development

Low impact development inherently provides quality of life improvements to residents, resulting in a happier, healthier, and more productive society. LID neighborhoods increase the amount of area available for outdoor recreation within close proximity to residences, facilitating exercise and contact among residents resulting in an increased "sense of place". Reduced vehicle trips through promotion of alternative transportation such as walking and biking results in reduction of carbon gas emissions, further contributing to a healthy society. Open space retention and attractively designed buildings create a more attractive place to live and increasing the well-being of residents. Other factors already discussed further contribute to quality of life improvements, including cost savings, reduced flooding, improved water quality, and improved groundwater recharge.

Recommendations for Implementing LID in Pender County

Two sets of recommendations are offered in this report that should be further pursued through a collaborative effort involving Planning Staff, the Planning Board, the Board of Commissioners, and other stakeholders as necessary. The first set of recommendations are presented in order to remove the impediments to low impact development that exist in Pender County's land use regulations, and the second set is recommended in order to voluntarily incentivize LID.

Recommendation 1: Address Barriers to LID in Pender County UDO

a. Create a system to allow reductions to dimensional requirements for yard for projects meeting LID Project Criteria.
b. Adjust minimum parking requirements for shopping centers to 1 space per 225 square feet of gross floor area for the first 50,000 square feet of gross leaseable area (GLA) and 1 space per 250 square feet of GLA thereafter.
c. Adjust minimum parking requirements for office uses to 1 space per 300 square feet of gross floor area.
d. Create a requirement that proposed parking shall not exceed 125% of the minimum required parking spaces.

Recommendation 2: Incentivize LID Projects in Pender County

a. Create objective, systematic criteria that a project must meet in order to be deemed an LID project.

Recommended Pender County LID Project Criteria:

1. *The project must meet the requirements for stormwater management as set forth in 15A NCAC 02H.1005.*
2. *The project must employ LID stormwater control practices as defined in Section 4.2 – BMPs Used to Implement LID of North Carolina State University's* Low Impact Development: A Guidebook for North Carolina *to control and treat runoff from the first 1 inch of rainfall in order to achieve average annual 85% Total Suspended Solids (TSS) removal for the developed area of a site.*
3. *The project must employ LID stormwater control practices as defined in Section 4.2 – BMPs Used to Implement LID of North Carolina State University's* Low Impact Development: A Guidebook for North Carolina *to control and treat the increase in storm water runoff volume associated with post-construction conditions as compared with pre-construction (existing) conditions for the 1-year frequency, 24-hour duration storm event. This may be achieved by hydrologic abstraction, recycling and/or reuse, or other accepted management practice as described in the North Carolina Division of Water Quality's Stormwater Best Management Practices Manual, and in consultation with North Carolina State University's Low Impact Development: A Guidebook for North Carolina.*
4. *Where any stormwater BMP employs the use of a temporary water quality storage pool as a part of its treatment system, the drawdown time shall be a minimum of 48 hours and a maximum of 120 hours.*
5. *No one BMP shall receive runoff from an area greater than five (5) acres. However, the total drainage area from BMPs used in series (i.e., integrated) can exceed this five (5) acre maximum.*

b. Incentivize LID through reduction in taxes, reduced permit fees, expedited project review and permitting times, and/or increased allowable density.
c. Maintain a qualified staff person whose job responsibilities include review of proposed projects to determine whether they meet the qualifications and criteria to be deemed an LID project. This staff person shall also be available for no-cost professional consultation with applicants interested in developing an LID project. This staff person should have a thorough, working knowledge of the principles and practices of LID, and should successfully complete and maintain, with support from Pender County, the NC Low Impact Development Certification Program through NC State University Cooperative Extension and Biological and Agricultural Engineering Department.

References

The City of Bellingham. *2009 Survey of Interest in Green Building Incentives & Barriers: Bellingham, Washington*. By Noe Penney and Ethan Rommen. Web.

Clar, PE, Michael. "Low Impact Development Case Studies." Web. <http://www3.villanova.edu/VUSP/Outreach/pasym01/pdffiles/A42text.pdf>.

Crichton, Karyn. *Should Low Impact Development Be Mandated in New Hanover County?* Capstone. University of North Carolina Wilmington, Fall 2010.

Gunderson, Jeff, Robert Roseen, Todd Janeski, Jamie Houle, and Michael Simpson. "Cost-Effective LID in Commercial and Residential Development." *Stormwater* Mar.-Apr. 2011: 38-44. Print.

HBC - H. Burkert & Co., Inc., Inc. *Lower Cape Fear Stewardship Development Program Application - Ridgefield at Middlesound*.

"LID Urban Design Tools - Background." *Low Impact Development (LID) Urban Design Tools*. Web. 12 Apr. 2011. <http://www.lid-stormwater.net/background.htm>.

North Carolina Cooperative Extension. *Low Impact Development - An Economic Factsheet*. By Christy Perrin and Patrick Beggs. Watershed Education for Communities and Officials. Web. <http://www.ces.ncsu.edu/depts/agecon/WECO/transylvania/WECO_LID_econ_factsheet.pdf>.

North Carolina Cooperative Extension. *Low Impact Development - A Policy Factsheet*. By Christy Perrin and Patrick Beggs. Watershed Education for Communities and Officials. Web. <http://www.ces.ncsu.edu/depts/agecon/WECO/transylvania/WECO_LID_policy_factsheet.pdf>.

North Carolina Cooperative Extension and NC State University Department of Biological and Agricultural Engineering. *Integrating LEED, LID, and Policy*. Materials from Workshop at Forsyth County Extension Center, Winston-Salem, NC, October 6, 2009.

North Carolina Cooperative Extension and NC State University Department of Biological and Agricultural Engineering. *Introduction to LID and LEED.* Materials from Workshop at Watauga County Ag Conference Center, Boone, NC, August 12-13, 2009.

North Carolina Cooperative Extension and NC State University Department of Biological and Agricultural Engineering. *NC Low Impact Development and Green Building Workshop: Showcasing the 2009 NC Low Impact Development Guidebook.* Materials from Workshop at Central Carolina Community College, Pittsboro, NC, October 15, 2009.

Perrin, C., L. Milburn, L. Szpir, W. Hunt, S. Bruce, R. McLendon, S. Job, D. Line, D. Lindbo, S. Smutko, H. Fisher, R. Tucker, J. Calabria, K. Debusk, K.C. Cone, M. Smith-Gordon, J. Spooner, T. Blue, N. Deal, J. Lynn, D. Rashash, R. Rubin, M. Senior, N. White, D. Jones, W. Eaker. 2009. *Low Impact Development: A Guidebook for North Carolina* (AG-716). NC Cooperative Extension Service, NC State University. <http://www.ncsu.edu/WECO/LID>

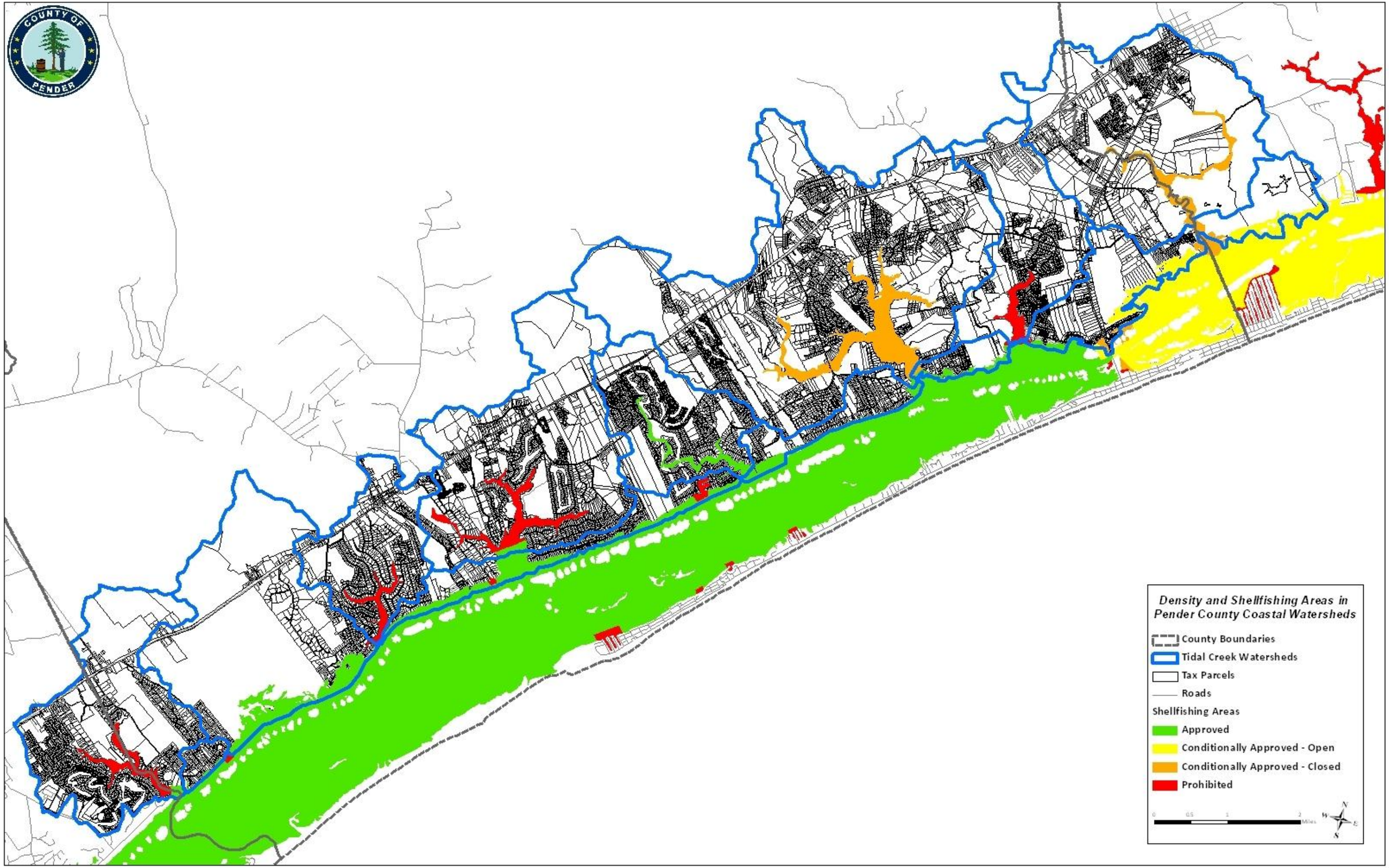
U.S. Department of Commerce. National Oceanic and Atmospheric Administration. National Ocean Service. *Population Trends Along the Coastal United States: 1980 - 2008*. By Kristen M. Crosset, Thomas J. Culliton, Peter C. Wiley, and Timothy R. Goodspeed. NOAA's National Ocean Service Management and Budget Office, Sept. 2004. Web. <http://oceanservice.noaa.gov/programs/mb/pdfs/coastal_pop_trends_complete.pdf>.

United States Department of Defense. *Unified Facilities Criteria - Design: Low Impact Development Manual*. 25 Oct. 2004. Web. 12 Apr. 2011. <http://www.lowimpactdevelopment.org/lid%20articles/ufc_3_210_10.pdf>.

United States Environmental Protection Agency. Nonpoint Source Control Branch. *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices*. Dec. 2007. Web. <www.epa.gov/nps/lid>.

United States Environmental Protection Agency. Nonpoint Source Control Branch. *Managing Stormwater with Low Impact Development Practices: Addressing Barriers to LID*. April. 2009. Web. <www.epa.gov/nps/lid>.

Washington State University. Pierce County Extension. *Low Impact Development - Technical Guidance Manual for Puget Sound*. By Curtis Hinman. Ed. Bruce Wulkan. Puget Sound Action Team, Jan. 2005. Web. 12 Apr. 2011. <http://www.psp.wa.gov/downloads/LID/LID_manual2005.pdf>


Density and Shellfishing Areas in Pender County Coastal Watersheds
County Boundaries
Tidal Creek Watersheds
Tax Parcels
Roads
Shellfishing Areas
Approved
Conditionally Approved - Open
Conditionally Approved - Closed
Prohibited
0
0.5
1
2
Miles
N
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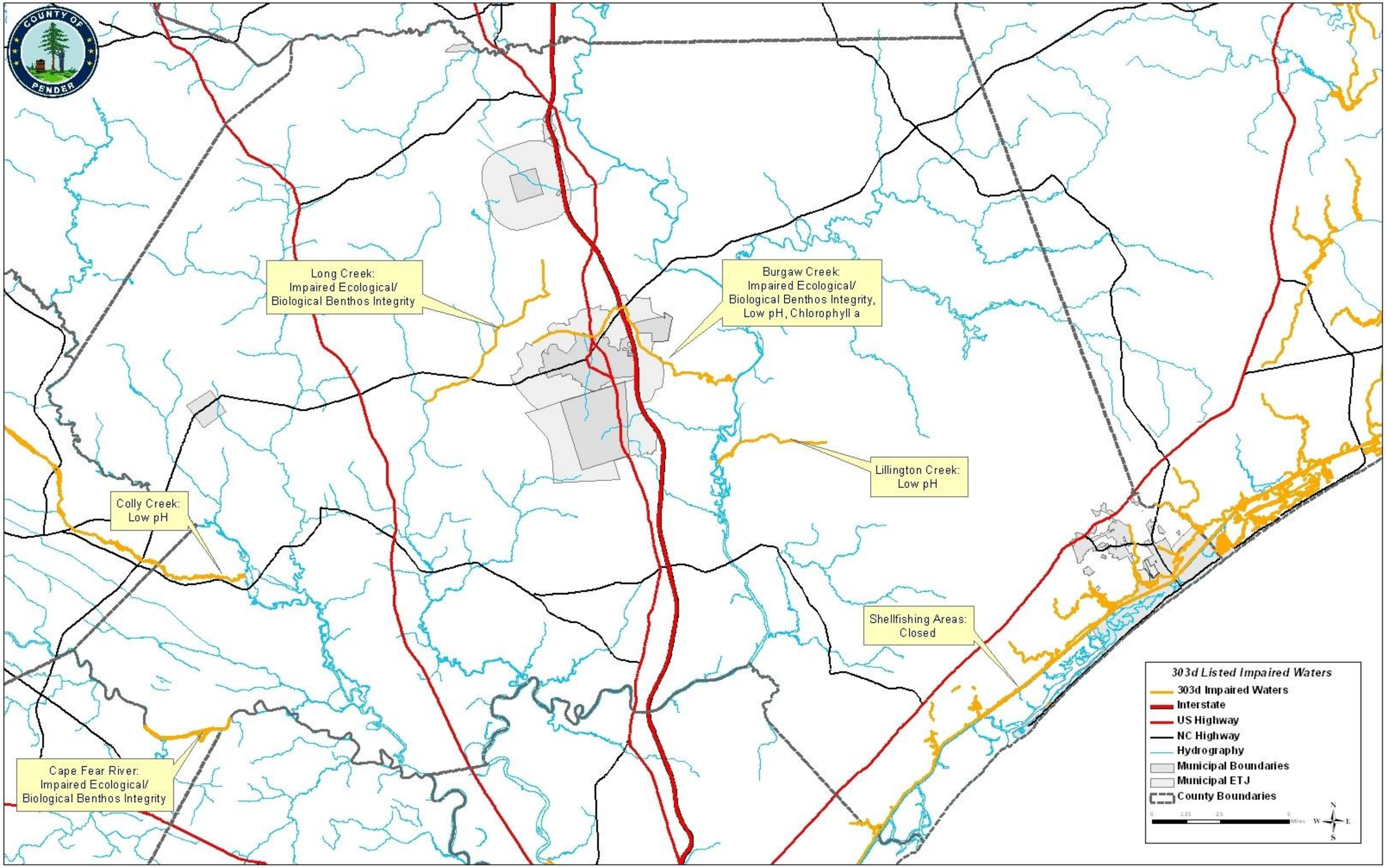
Long Creek:
Impaired Ecological/
Biological Benthos Integrity
Burgaw Creek:
Impaired Ecological/
Biological Benthos Integrity,
Low pH, Chlorophyll a
Lillington Creek:
Low pH
Colly Creek:
Low pH
Shellfishing Areas:
Closed
Cape Fear River:
Impaired Ecological/
Biological Benthos Integrity
303d Listed Impaired Waters
303d Impaired Waters
Interstate
US Highway
NC Highway
Hydrography
Municipal Boundaries
Municipal ETJ
County Boundaries
0 1.25 2.5 5 Miles
N
W
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