Development of an Online Resource of Land Use Regulations Impacting Forestry

by

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Abstract

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Between 2004 and 2006, North Carolina moved from the ninth to seventh fastest growing state in the United States. Research over the past 20 years reveals an increase in local ordinances as areas increase in population size and become more urbanized — and that there has been an increase in ordinances across the Southeast, which can impact forestry practices. Landowners may be unaware of ordinances that impact forestry practices, or how to obtain more information about them. However, ordinance violations can result in substantial fines or penalties and can restrict the ability of a landowner to develop his or her land in the future. Beginning in 2004, a project website was developed to provide information on tree protection and other county and municipal land use ordinances, such as zoning, to non-industrial private forest landowners (NIPF) in North Carolina. Local ordinances were identified from research conducted over a six-year period and ordinance information was posted on a project website developed to assist NIPF landowners in finding regulatory information. Described herein are the methods used for the project research, including sources of ordinance data, and website development.
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Growth, Regulations, and Forestry

Over the last 50 years, just thirteen states in the South have experienced a higher rate of population increase than the rest of the United States according to the 2002 Southern Forest Resource Assessment (SFRA) (Wear 2002). North Carolina is one of these states. Population growth and density in the South is expected to increase over the next several decades as forestland is lost and converted to other uses through urbanization (Wear and Greis 2002). With this growth comes conflict over land uses, and an increase in regulations to address those conflicts, as urban-rural interface areas between cities and counties become increasingly urbanized (Granskog et al. 2002). Impacts of this growth on private forestland, including loss of forestland and shifting of landowner values and uses away from forest management (Tarrant et al. 2002), were discussed in the 2002 SFRA, which noted that not only would an estimated 12 million acres of forestland be lost in the South between 1992 and 2020 due to urbanization and fragmentation — but many areas were expected to continue to grow in both population size and density (Wear 2002). People moving into formerly rural or changing rural areas may not be tied to or have an appreciation for rural land uses (Shands 1991, Malmshheimer and Floyd 1998). As a result they may rely on litigation or new ordinances to curtail activities they find to be nuisances (Malmshheimer and Floyd 1998). Increasing, aging populations moving into these areas may also have views and values in opposition to normal forestry practices like clearcutting (Marcin 1993). Thus, there is an expectation that ordinances impacting forestry will increase over time in states that are experiencing large rates of growth. This corresponds with an understanding developed through research of local regulations since the 1980s that local ordinances regulating forestry practices are becoming more prevalent across the southeast and in other parts of the United States (Cubbage and Raney 1987, Cubbage and Seigel 1998, Jackson et al. 1993, Greene and Seigel 1994, Martus et al. 1995, Spink et al. 2000, Granskog et al. 2002, Jackson et al. 2003, Mortimer et al. 2006). The SFRA notes that expanding population growth will result in a decrease in timber availability in parts of the South and may continue the trend of creation of land use regulations, enacted in response to forestland loss due to urbanization.

Previous Research on Local Forestry Regulations

A review of the literature published since the 1980s (Cubbage and Raney 1987, Cubbage and Seigel 1998, Jackson et al. 1993, Greene and Seigel 1994, Martus et al. 1995, Spink et al. 2000, Granskog et al. 2002, Jackson et al. 2003) indicates that many of the studies commonly focus on local public property protection ordinances and their impact on forestry. Ordinances may affect forestry in a number of ways including requirements for timber harvesting permits to complete prohibitions on forestry practices such as clearcutting (Martus et al. 1995). Other ordinances may restrict the movement of logging trucks and dictate and how logging road access to public roads may be constructed and
located (Cubbage and Raney 1987, Jackson et al. 1993). Ordinances may require performance surety bonds be posted before roads are accessed or used for forestry purposes, which may add additional upfront cost to practicing forestry where those ordinance apply (Cubbage and Raney 1987, Jackson et al. 1993, Henderson et al. 2009). Additionally, local ordinance buffer requirements may take land out of consideration for timber harvesting, thus reducing the total value of harvestable timber on a tract. (Prisley et al. 2006).

These past studies have broken down ordinances into categories based on how forestry was addressed, such as timber harvesting, public property protection, tree protection, environmental, and special feature ordinances, but none of the studies reviewed have addressed whether zoning ordinances allowed forestry as a use. Zoning, if noted in the literature, is lumped into the category environmental protection (Greene and Seigel 1994, Martus et al. 1995). It is important to understand that zoning ordinances do not have to address the protection of trees, special features, or the environment to impact forestry as they may prohibit forestry or agricultural uses in their entirety without these types of provisions.

**North Carolina Growth and Regulations**

Census estimates from the U.S. Census Bureau released in 2006 indicated that North Carolina was the seventh-fastest growing state in the country (U.S. Census Bureau 2006). This rank has increased since 2004, in which it was the ninth fastest growing state in the country (U.S. Census Bureau 2004). With this growth comes conflict over land uses as urban-rural interface areas between cities and counties become increasingly urbanized. New laws and regulations are developed in these areas as municipalities expand their planning jurisdictions through annexation and the creation of extraterritorial jurisdictions — and as cities and counties increase in population size and density. Existing municipal land use regulations are quickly applied to newly annexed areas, and new laws are often created, by counties and municipalities, to address conflicts between new and long practiced land uses.

In North Carolina, a state that is 59 percent forested (Brown et al. 2006), these new regulations are often in response to the removal of trees within a local government’s planning jurisdiction that have been cut for development purposes — and not for the purpose of legitimate or properly conducted forestry management. Thus, as a result of this increase in growth and development, and the accompanying conflicts between land uses, local officials have expressed frustration and local governments have either promulgated new ordinances to protect trees under their existing statutory authority or have sought special authority through local enabling legislation from the North Carolina General Assembly. Citizens may be unaware of the regulations governing trees on their land and
what uses are allowed under zoning, and local governments often do not know what authorities exist to protect trees in their planning jurisdictions.

**Project Background**

A website was developed to fill a need that existed in 2004 for a single source of information to aid non-industrial private forest (NIPF) landowners in compliance with local regulations. Prior to developing this site, research was conducted online to see if resources existed in other parts of the United States that were similar to this proposed project. Only two were found: one, a website constructed after 2001 and made available through the University of Georgia’s Warnell School of Forest Resources entitled “County Timber Harvesting Regulations and Ordinances in Georgia,” and a South Carolina focused website entitled, “South Carolina Tree Ordinance Summary.” This latter site is based on a study conducted through the University of Clemson’s Strom Thurmond Institute of Government and Public Affairs entitled the “Status of Tree Ordinances in South Carolina,” which is available through the Summary website. At the time this project began, no other similar online resource besides those noted were found to exist in North Carolina, or the southeast, that could provide information to NIPF landowners on local regulations. However, during this period there was a perception on the part of those working with forest landowners that there was increase in the number of tree protection ordinances in North Carolina and forestry was increasingly being regulated by local governments. This corresponds with an understanding developed through research of local regulations since the 1980s that ordinances regulating forestry practices are becoming more prevalent across the southeast (Cubbage and Siegel 1988). Additionally, there were various high profile incidents in North Carolina, some around the Raleigh, N.C. area, involving the clearing of trees for both harvesting (Eisley 1998) and development (McDonald 2005), that prompted the idea and continued support for a site that would collect and organize information to aid in compliance. The project was funded by the North Carolina Department of Environment and Natural Resource’s Urban and Community Forestry Grant Program with funds from the United States Forest Service. The website was developed and made available online in 2004, and information has been posted to the site as it has been collected, reviewed, and organized since that time.

**Project Description and Objectives**

This Master’s project was the development of a website, entitled “Trees and Local Regulations in North Carolina,” at <http://www.ces.ncsu.edu/nreos/forest/ordinance/> , which provides information on local ordinances, as well as state and federal laws and regulations, that have the capacity to impact forestry activities, like thinning and harvesting. The primary objective of the website is to aid NIPF landowners, and professionals that work with these landowners, in achieving compliance with local regulations. However, it also serves local governments that have questions about what
other counties and municipalities are doing with respect to management and protection of urban trees — and citizens who would like to know what regulations exist within their communities to protect trees. Ordinances and local regulations comprise the core of the website’s content, which are contained within the ordinance database page of the website. The website also has a home page and a series of internal pages that provide information about the website or links to other sources of information. The website provides general reference information so that individuals can at least be aware of the types of regulations that may exist and where they can find more information about them, but does not provide legal advice or guidance. Regulations that address trees on private property and within public right-of-ways, or that regulate the clearing of trees for the purpose of subdividing and developing land are generally not within the scope of this website’s content.

**Background on Authority**
Whether local ordinances, including zoning, exist is dependent on the authority with which local governments are endowed to promulgate ordinances – and this authority for municipalities and counties to enact and enforce ordinances varies from state to state. Local governments in some states have their own authority to enact and enforce their ordinances and state authority over such powers is limited. One example is Georgia where local governments have their own authority to enact ordinances to regulate logging access and movement of equipment on public roads (Jackson et al. 2003). In North Carolina, authority is delegated to counties and municipalities to pass and enforce laws like zoning ordinances. However, additional authority for a local government may be required through the passage of local acts if statutory authority to regulate is not clear. These are specific to a town or county and may allow the enactment and enforcement, for example, of a tree protection ordinance. Additionally, many states have laws, which can restrict the ability of local governments to regulate forestry operations under their nuisance abatement authority, and in a few instances their zoning authority, (Malmseimer et al. 1998) — but most of these do not affect the planning and zoning authority of local governments. Zoning ordinances can impact forestry then where states allow local governments to enact zoning ordinances to regulate land uses like forestry. In North Carolina, local governments rely on a combination of statutory authority and local legislation to regulate land uses.

**Zoning and Forestry**
Zoning regulations are the most common form of land use regulation in North Carolina. Over 75% of counties in North Carolina have whole or partial zoning, while some still do not have zoning. Most municipalities in North Carolina do not have zoning, but those that do not may also choose to adopt their county’s zoning ordinance. Zoning ordinances are comprised of a map and text, and the table is sometimes separate from the text of the ordinance. The text may include many different sections but the most common are a definitions section, a description of districts and uses, and a table of permitted uses. The
zoning map delineates the various zoning districts created by the zoning ordinance and the ordinance states what uses are allowed in each district. The description of districts usually states the uses the district is intended to support and may provide in a list format what uses are allowed. The definitions section will ideally define uses clearly enough so that a citizen can understand what activities will fit within those listed uses. A table of permitted uses will show in a table format what uses are allowed within zoning districts. Uses may be permitted by right, that is allowed automatically within a zoning district, or they may be allowed conditionally if a permit is obtained or certain conditions are met. The way zoning works is that any use not provided for within a zoning ordinance is by default prohibited (King et al. 2007). Zoning administrators may choose to interpret a proposed use in such a way that it fits one already defined and listed within a zoning ordinance if that use is not already specifically allowed. However, for the purposes of this project zoning ordinances were not reviewed as to whether a use could be allowed, but rather whether forestry was (1) defined within the zoning ordinance or included within the definition of farming or agriculture, and (2) whether forestry, or farming and agriculture if it was included within their definitions, were listed anywhere in the text as allowed uses. Where forestry was provided for this was noted as such on a webpage for a local government and if it was not defined or listed as an allowed use this was indicated instead.

Zoning for Counties and Municipalities in North Carolina

Counts and municipalities must enforce their zoning authority differently over uses that are considered to be “bona fide farm purposes” in North Carolina. For the purposes of county zoning these are defined in N.C.G.S. § 153A-340 (b)(2) [1] and N.C.G.S. § 106-581.1 [2], which N.C.G.S. § 153A-340 (b)(2) includes by reference. N.C.G.S. § 106-581.1 lists “planting and production of trees and timber” as a use under the definition of agriculture. Counties are not allowed to regulate bona fide farm purposes within their zoning ordinances, but municipalities are not required, or authorized, to exempt bona fide farm purposes from their zoning ordinances under North Carolina law. Municipalities may define or not define, and may allow or not allow, within their zoning ordinances, forestry, farming, and horticultural activities. Interestingly, through the research for this project it was found that some municipalities do choose to exempt farming activities from their zoning ordinance – and that some counties, though required, do not properly exempt forestry operations from their zoning ordinances. This latter finding occurs when a county does not list the bona fide purpose exemption within their ordinance, or they list the exemption within the ordinance and define it differently than the statutory language. Because of possible inconsistencies in how counties exempt forestry, these county ordinances were still reviewed to see if they defined and listed forestry as an allowed use within their zoning ordinances.
Another aspect of municipal and county zoning that is important to note is the concept of an Extraterritorial Planning Jurisdiction (ETJ). An ETJ is an area outside of a municipality’s corporate boundaries, where land is subject to municipal land use regulations, but is still governed by county ordinances for other purposes like the regulation of nuisances. Additionally, a few municipalities in North Carolina do have their primary corporate boundaries in more than one county. For these reasons, information on the webpage for a particular municipality also includes the counties that it may be contained within so that a citizen can find any additional county regulations that may apply to their land.

**Framework for Data Collection**

Research for this project focused on ordinances passed under the general ordinance-making authority of counties (N.C.G.S. §§ 153A-121 et seq.) [3] and municipalities (N.C.G.S. §§ 160A-174 et seq.) [4], which can address nuisances like noise or burning — and the planning and zoning authority of counties (N.C.G.S. §§ 153A-340 et seq.) and municipalities (N.C.G.S. §§ 160A-381 et seq.) [5] under which zoning and other land use regulations, like watershed protection and subdivision ordinances, can be enacted. Local bills granting additional authority to specific counties and municipalities, to regulate the clearing of trees or other practices, for example, that might impact forestry management were also reviewed.

At the beginning of the project, information about various types of ordinances was sought for inclusion on the project website regardless of the authority under which the ordinance was enacted — or whether there was an exemption for a forestry practice within the ordinance. Local bills were first researched using the North Carolina General Assembly’s website to see what communities had obtained additional authority with regards to tree protection. Chapter and session laws were found going back to the 1970s that provided some form of additional authority to over 35 local governments. Next, local government websites and online legal databases were used to determine if a local government with additional authority from a local bill had passed an ordinance pertaining to tree protection. In some instances, local governments were found to have passed ordinances based on this authority, but because local ordinance provisions do not cite the authority on which they are based, as is the case with state statutes, it was difficult to determine in many instances if they were based on a local bill, statutory authority, or both. The next step for finding information on local ordinances was to research what types of ordinances might impact forestry operations and where these could be found.

Research framework for this project was revised to look at not only ordinances that had terms like “tree protection” within them but to also research zoning ordinances to see if forestry was an allowed use. All ordinances reviewed were searched using terms like “forestry,” “silviculture,” “logging,” “harvesting,” as well as “farming,” “agriculture,” and other related terms. Ordinance provisions reviewed included jurisdiction and applicability
sections, where exemptions are often listed, as well as definition, district description, table of permitted uses, supplementary use, landscaping and screening, environmental protection, stream buffer, and tree protection and preservation among others. Where an ordinance or ordinance provision was found that could impact forestry, like a zoning ordinance, this was noted in the “Indications” section of the webpage for that local government and citation information was provided also so that users of the site can find the information on their own. Possible exemptions for forestry activities, within tree protection ordinance requirements, like provisions prohibiting the cutting of trees, were noted as well and included in the indications section.

Based on a review of the literature on ordinances affecting forestry practices, and the conclusions contained therein, that areas that become more urbanized with increasing population sizes are most likely to promulgate ordinances that can restrict forestry, it was determined that the metropolitan counties with larger population sizes would be studied first. Using the U.S. Department of Agriculture (USDA) Economic Research Service’s (ERS) Rural Continuum Codes for communities in North Carolina, counties coded lowest, along with the municipalities contained within those counties, were prioritized for research and inclusion into the website. The Rural Continuum Codes, as described by the USDA ERS website, organize metropolitan counties by size and non-metropolitan counties by degree of urbanization and proximity to metro areas. These codes are represented by the numbers 1 through 9 with 1 representing a county in a metropolitan area with a population of 1 million people or more and 9 designating a non-metropolitan county, which is completely rural or has a population size of less than 2,500. Those counties coded as 9 may further be broken down into counties that are adjacent to metropolitan areas and those that are not adjacent. Next, inquiries were made to counties, municipalities, county rangers, North Carolina Cooperative Extension Service (CES) personnel, and others as to whether they were aware of ordinances that would impact forestry. The primary question asked was whether they were aware of any ordinances or regulations, which would affect forestry management, and if they were where these could be found. They were also asked to include citation information for specific ordinance provision if this information was available. These inquiries were made via mail, telephone, and e-mail and responses were further researched using local government websites and various free, online legal databases. A 2006 study conducted by the University of North Carolina at Chapel Hill’s School of Government (Owens and Branscombe 2006), which looked at the specific types of ordinances adopted by counties and municipalities in North Carolina, was also used as a reference to see which local governments were noted as having zoning and other ordinances. The majority of the information provided on the project website was found through the use of local government websites, online databases, and from electronic or paper copies or ordinances that have been requested directly from county and municipal governments. Ordinances were reviewed for any provisions, that are not required to
exempt forestry practices under North Carolina law, and that restrict the clearing of trees, require permits prior to harvesting, buffers around areas to be harvested, or that would otherwise impact forestry practices on private property. They were also reviewed to see if forestry was an allowed use within zoning ordinances.

**Initial Findings**

Responses to the inquiry were minimal and often required further researching. When a response was given it often referred to landscaping or visual buffer ordinances in addition to tree protection ordinances. Watershed and sedimentation and erosion control ordinances were also noted in responses. However, these types of ordinances are enacted pursuant to state laws that provide exemptions for forestry activities if certain conditions, like following the N.C. Forest Practices Guidelines Related to Water Quality, are met. Data on these types of ordinances has been kept but information on these is not typically provided on the project website. Links to state statutes that contain exemptions for forestry activities are provided on the website, however. Zoning ordinances were also noted in many responses as a form of regulation that would impact forestry and in further analysis of the “no” responses it was found that those communities answering “no” actually had zoning ordinances in effect. Responses were checked to see if zoning was in effect by going to a local government’s website, or by using online legal code service products like Municipal Code Corporation’s Municode Library or American Legal Publishing’s Code Library. This further research into the responses provided by a local government and their local codes of ordinances indicated discrepancies in the information provided by respondents to the inquiry. Because of the discrepancy between what was contained in information obtained through inquiries and the ordinances that were actually in effect for local governments researched, a decision was made to transition the study away from response-based information to coverage of all 100 counties and approximately 545 municipalities at that time, within North Carolina. This also allowed for more data to be obtained as communities could be researched online, or ordinances requested, and analyzed directly, rather than having to rely on communities that did not provide information, including citations or links to ordinances — or that did not interpret their ordinances as having any impact on forestry when in fact a zoning or other type of ordinance was in effect, which would restrict the clearing of trees. Zoning ordinances were reviewed to see whether a zoning ordinance listed forestry as an allowed use somewhere in the zoning ordinance, usually within the description of zoning district or within a table of permitted uses, and whether it was defined; so that it can be considered a use within one or more underlying — or conditional — zoning districts. Zoning administrators may choose to interpret a proposed use in such a way that it fits one already defined and listed within a zoning ordinance if that use is not already listed in an ordinance. However, for the purposes of this research zoning ordinances were not reviewed as to whether a use could be allowed, but were examined to see if forestry was (1) exempt from a zoning ordinance,
(2) defined within the zoning ordinance or included within the definition of farming or agriculture, and (3) whether forestry, or farming and agriculture if it was included within their definitions, were listed anywhere in the text or table of permitted uses as allowed uses.

**Data Collection Issues**

Obstacles to researching and finding ordinance information included issues with contact information and availability of ordinance copies and files. Contact information was obtained through various sources including the North Carolina League of Municipalities (NCLM), the North Carolina Association of County Commissioners (NCACC), the University of North Carolina at Chapel Hill’s School of Government and various other websites listing contact information for local governments. Mailing lists and e-mail lists were obtained for a fee and in some instances for free, from the NCLM and at no charge from the NCACC. In some instances contact information provided from any of these resources for local governments was out of date or incomplete and it was necessary to cross reference one resource with another to find complete and up-to-date mailing addresses, phone numbers, and e-mail addresses. Some local governments provided no contact information, including mailing addresses, on their websites, which made finding contact information difficult.

To obtain the most complete ordinance information, attempts were made to obtain zoning and other needed ordinance text in their entirety. However, some local governments had no copies of their ordinances available in hardcopy or electronic format. In these instances information was not provided for those local governments on the project website, but default contact information and resources were provided so that citizens can look for online local government resources at a later time. Where a local government would offer to send a copy of a zoning or other ordinance for a fee to cover the cost of the copy and the shipping and handling, these ordinances were not obtained. Prices for some ordinances ranged from only a few dollars to over fifty dollars a copy. All local governments that did print, or photocopy, and mail ordinances for the project did so at their own expense. Where a local government did not have copies to send and photocopying was not presented as an option, a local government representative, such as a town clerk for example, sometimes offered to go through the ordinance to provide the information needed or to fax the pages of the zoning ordinance that appeared relevant to inquiries presented. Often it was necessary to list only limited information in the indications as to what was contained in the ordinance — and in some instances limited or no citations — if enough of the ordinance was not available to post reliable information to the project page for that local government. However, all of the time and effort provided by various municipal and county governments was appreciated by the developer and did contribute useful regulatory information to the project in many instances. Additionally, speaking with town officials and staff by telephone phone provided insights into how small the
populations sizes are for some local governments in North Carolina, and also how many do not have their own codes but rely upon the county in which they are contained within for all of their ordinances.

Several web site issues presented themselves during the course of data collection for this project and while trying to obtain ordinance information online. These included finding local government websites, the design of the websites, their functionality within browsers, the information included on the website, and the types of files used. These issues included instances where there was no URL for a local government, the URL had expired and the local government’s webpage was replaced with a domain seller’s page, there was a website but no information pertaining to ordinances or zoning or other relevant departments, or the URL listed for a local government was actually for a local chamber of commerce’s website, which often did not have a link to the local government in whose jurisdiction it was operating. When local government websites could be found, and it appeared that ordinance or other necessary information could be obtained, other issues were identified. Some local government websites contained dead links to files or department pages, their drop-down boxes or other navigation functions would only work in one internet browser, like Internet Explorer, but not another, JavaScript functions controlling navigation or other features would be broken, or information was only accessible in frames, which could make all pages of an ordinance difficult to print or save as one file.

Local government websites used for research were a kaleidoscope of styles and formats, and functionality, and when online ordinance could be found during the data collection for this project, issues often arose with the file type and other aspects of the electronic files used by local governments. One issue was the use of scanned Portable Document Format (PDF) files, which were not only very large in file size typically, but were also not searchable. In this type of file, a Joint Photographic Experts Group (JPEG) or Tagged Image File Format (TIFF) image file is used to generate the PDF file, which results in a PDF that only contains “snapshots” of the actual ordinance text rather than the text in electronic form. These types of PDF files required the examination of all sections of a zoning ordinance, particularly in instances where a table of contents was not available that listed page numbers for each ordinance section. In rare instances, an ordinance was scanned, but was also converted to a searchable file through the use of optical character recognition.

Another electronic file issue was the separation of various sections of a zoning or tree protection ordinance, which required downloading multiple files for a single zoning ordinance. Downloading separate sections on occasion added additional time required to reviewing an ordinance. Such separation is advantageous for citizens who need to only download or view one section of an ordinance at a time and who also may be limited by the speed of their internet connection. Some local governments, however, did provide copies of their ordinances in their entirety, which allowed the use of the search function.
throughout a single ordinance file. The developer adopted an alternative method of ordinance review when ordinances were only provided in multiple sections. In these situations, all relevant ordinance sections were downloaded and, using Adobe Acrobat Professional©, were combined into a single ordinance document for ease in searching and review. This allowed for a shorter review time and less distraction when moving between ordinance sections contained within various PDF files. One barrier encountered to this compilation method was password protection of ordinance files, which were not only public documents, but also files publicly available on the web. Additionally, these online ordinances, as noted often by local governments, were not the “official versions” of the ordinances to begin with. Thus, the rationale for password protecting one or more files for a given zoning ordinance is not clear. This password protection, however, made it difficult to combine ordinance files and required that password recovery software be used to find passwords, which allowed the resaving of the document without security settings so that it could be combined with other ordinance files. The majority of PDF files reviewed for this project were not password protected and most files reviewed for this project were searchable PDF files that appeared to be created from file formats like Microsoft Word©.

**Website Development Guidelines and Framework**

Several guidelines were followed to ensure that the website could be constructed, used, and maintained easily while meeting well established best practices for website design as well as state and federal accessibility requirements. Other website requirements were that all website functions had to work on university hosted web space and that the site and its content be accessible over low-bandwidth internet connections and through multiple browsers used on low-cost or older computer systems. These latter constraints were met by developing and testing the website only within the extension server space where the site was to be hosted, by using only Extensible Hyperlink Markup Language (XHTML) for page content, which creates very small file sizes for downloading and viewing, and through the use of only one image on the site consisting of the North Carolina Cooperative Extension Service Logo.

Constraints specific to finding information on the site, and its optimization for search engine indexing, included the requirement that there be multiple ways to find information on the site and that site pages and information contained within them be easily indexed by search engines. These requirements were met by providing a left-side navigation bar, a title for each page in the site that matches the content provided on the page, text-only pages that can be read by search engines, and a site structure that only requires the user to go no more than three links deep into the site. Additionally, a “You Are Here:” breadcrumb is used on each page so that a user knows where they are in relation to the rest of the site and can click up to a higher level within the site if they need to go up to a main webpage. Over the project period changes were made to the site to improve its functionality. One of
the most important additions was a Google™ “custom search” function, which was added to allow users to find ordinance citations. Terms commonly used to find information on the website were also added to the top of the page in the form of hyperlinks that when clicked will display the search results from a Google™ query of that term. Finally, if a user does type in an incorrect URL a custom “404 Not Found” page is generated, which also has a form to contact Extension for assistance in finding the correct page. A similar feedback form is provided for anyone that would like assistance finding information on the site — or who would like to comment on the site or provide information about dead links or other issues.

Testing of the website was conducted prior to its uploading onto university server space in 2004 and monitoring of its content and functions has been conducted since that time to ensure that all constraints have been met. To ensure that the website functions properly in multiple browsers and on various operating systems the site has been tested in Mozilla Firefox®, Internet Explorer®, Opera® and other browsers and in multiple browsers on Microsoft®, Macintosh®, and Linux® based operating systems. Site templates were tested and met Section 508 accessibility standards, using the online HiSoftware® Cynthia Says Portal™, and were validated against the World Wide Web Consortium’s (W3C®) XHTML 1.0 Standard using its online Markup Validation Service. As content has been loaded to this website it has checked for validation using this online service. The cascading style sheets (CSS), used to control the formatting and style of the site (no tables are used except for those in feedback forms) meets the W3C’s CSS Level 2 specifications using the organization’s online CSS validation service.

The framework for the structure and style of the site is comprised of XHTML, CSS, and Hypertext Preprocessor Language (PHP), which were chosen because they could be used to create a website that would not require special software for updating and because they meet current standards and work across multiple browsers. XHTML is used to code the headings, paragraphs, lists, and other text elements that comprise the content of the website. XHTML is a newer version of Hypertext Markup Language (HTML), which allows well-formed, or valid code, to be used for organizing information on a page. Pages properly constructed with XHTML validate according to W3C standards and will look and operate similarly across multiple web browsers. Another advantage of XHTML is that it is forward compatible with the newer HTML 5 standard, which will allow this site to continue to function in newer browsers without requiring recoding to that standard. A single CSS file, or stylesheet, controls the position and background colors of cells in which content resides, the style and color of text fonts, and the size of text and images on each page of the website. This allows for easy updating of site attributes for every page of the website by changing only one file for the website, versus having to change attributes for elements in multiple website pages.
One of the key features of the ordinance database page of this website, and one that also provides the capability of updating only a few files in order to change the entire database, is the use of a single PHP based template. This template contains XHTML code, and references the CSS for style and position of elements, but is a .php file that contains the PHP scripts. These scripts are used to pull user specified information from a flat file database, which is then presented on a webpage based on parameters, like municipal name, that is specified by the user. JavaScript is often used in websites to provide dynamically generated webpages that are created based on user input. However, JavaScript functions may not always work in all browsers and some users, in rare instances, actually turn JavaScript off, which also causes functions to not perform properly.

In the development phase of the website it was determined that a server-side capability was needed, to process the user chosen town or county information, that would not rely on the use of JavaScript — but that would use PHP instead. A server-side capability simply means that the server performs a process using one or more scripts, and variables input into those scripts, so that something is calculated or analyzed by the server using those variables, and an output is produced. Because the site was to be hosted through North Carolina Extension Forestry it was necessary that the CES server be able to support all process and functions necessary for the development and implementation of the project website. The decision to use this language was based on ease of use and reliable upgrading and support by North Carolina CES’s information technology support staff. PHP scripts were obtained for free from various sources, including php.net and modified to suit project needs.

One ordinance database page is used and populated with information from a text file containing all ordinance information for municipalities or only from counties if a user is using the database to find information only at the county level. When a municipality is selected, all information for the counties that it is contained within will appear at the bottom of each file after the municipality’s data. This functionality is coded within the PHP template for municipalities and uses “if” and “then” statements to determine, which counties should be included for each municipality. One PHP template file is used to organize county level information and one PHP template is used to organize information at the municipal level. All combined, the ordinance database page is comprised of only 8 files that can create a page for each local government selected — or hundreds of pages. If the layout information for counties or municipalities needs to be changed then only their respective PHP template files require modification. Also, ordinance information is contained in only two files and so multiple files do not need to be opened to update information for a county or municipality.

PHP also allowed for other features to be added to the website. Because there is not a separate webpage, or file, for every local government included in the database, there
needed to be a way to dynamically add the name of the local government selected to portions of the page based on the name of the local government selected. PHP scripts are used to change the title of the webpage, the name of the government in the “You Are Here;” breadcrumb, and the name of the government contained within the URL in the “Bookmark This Page;” field at the bottom of each page.

**Framework for Website Content**
The layout for each local government webpage provided through the ordinance database was designed to be easily scanned by the user. The purpose of each page was to provide only general information about the types of ordinances that may be in effect and where the user could find more information about these ordinances using the contact information, links, and citations provided. However, in none of the information on this website is any personal or identifiable information provided for anyone that has submitted information to this project. The first section provides contact information for each local government. In instances where contact information was not available “None” was inserted. This was done also for e-mail addresses where the address was specific to an individual working for that local government. When that individual moves from that department their e-mail address may become invalid, so only e-mail addresses that clearly go to just a department or agency of a local government were used. The next section provides links to online legal code resources like Municode or to department webpages or files on local government websites. Where a link was not available for a local government, links to another government that might provide planning services to a municipality, for example, were provided. The number of links added to each page was minimized to reduce the amount of dead links that will be contained within the site as external website URLs are changed or terminated over time. The indications section provides short summaries or terms regarding the types of ordinances, and requirements, that may be in effect. Where an ordinance was not available for a local government, but information had been provided by a local government official, their data was entered into this section. In some instances, citations were not provided in those responses and so directions were added to this section for the user to contact their local government for more information. The citations section typically contains the name of the code of ordinances or name of the local government’s zoning or other ordinance that contains relevant requirements as well as articles, chapters, and subdivisions so that the user can go down to the section of the ordinance noted in the indications section of the page. For scanning purposes and ease of use the last section or subpart that a user needs to find is always listed at the beginning of a citation.
Future Website Issues
Maintaining website content — as well as the code and structure — will be important considerations for ensuring continued website usability. Ordinance information changes constantly as zoning ordinances are created and amended. Additionally, state statutes that provide ordinance-making powers to local governments are constantly in a state of flux as they are created, amended, and sometimes repealed. Local bills are also passed every year in the North Carolina General Assembly giving select local governments additional authorities not provided to them through the state statutes. Research must be conducted with some frequency to update ordinance information on the website or alternatively survey devices may be used at some point in the future, as are used by the School of Government, to ask local governments about updates to information provided about them on the site. Partnerships with organizations like the School of Government, or other universities or non-governmental organizations like councils of government, may provide opportunities to update this information with only a reduced amount of funding needed. However, more local governments are posting their ordinances and other regulatory information online, which will make finding information by hand for each local government easier. Additionally, these will be made available in a format that is more readily searchable when reviewing the ordinance text as they will be posted using some form of html, as is the case with those made available through American Legal Publishing, or in some cases searchable PDF files posted on local government websites. To increase the ease of updating ordinance information, an online interface for updating the municipal and county information files could be created so that this information can be updated without the use of an HTML or other code editor.

The site is currently constructed using XHTML, which according to current standards, will be compatible with web browsers into the near future. The CSS used is also forward compatible. However, upgrades to PHP on cooperative extension servers will need to be considered, which can cause scripts to break so that some or all of the PHP functions of the website will no longer work. To date this has not happened, and cross-testing on different versions of PHP engines, between North Carolina State University’s Office of Information Technology servers and CES servers has eliminated the use of out-of-date and insecure PHP functions that will not be allowed to work on current and future versions of PHP. Additional funding for website maintenance and updates will be required in the future.

Project Outcomes
Information from this website has been used in the creation of other project deliverables funded by the Urban and Community Forestry Grant Program. Publications targeted towards citizens and local governments have been created to educate about ordinance compliance and creation. Workshops for forest landowners, professionals that work with forest landowners, such as consulting foresters and county rangers, and local governments
on local ordinances addressing tree protection and forestry were delivered to these audiences through the CES in 2007, 2008, and 2009. Additionally, through the use of information from this site, presentations and meetings with local governments have been conducted to assist them with answering questions about the impacts of zoning on forestry activities and about tree ordinance development.

Inquiries and feedback from citizens and local governments indicate that this website is used by both groups of users to find information on compliance with land use regulations — and information about what other communities are doing with regards to tree protection and land use regulations pertaining to the clearing of trees for development or forestry purposes. Usage of the website is indicated in Figure 1, which shows approximately 400 visits per month. However, it should be noted that the program currently in use at North Carolina State University for this website at the time these visits were recorded, The Webalizer, does not exclude visits from search engine webbots indexing the site. Additionally, visits from the developer and others related to the project cannot be excluded from the usage statistics using their IP addresses using this program. Search terms then are also useful indications as to how this website is being used.

![Visits](image)

**Figure 1. Visits to the Trees and Local Regulations in North Carolina website from November 2008 through October 2009.**

Search terms that are used on search engines, which then direct users to the website, range from queries regarding tree ordinances to those surrounding noise and the use of outdoor clotheslines. This indicates that the site is being used to find ordinance information that lies outside the scope of the websites original objectives (Table 1). However, this site could be duplicated or modified at some point over time to provide information pertaining to
other issues of citizen or local government concern. Some of these include the use of land for wind, solar, or biofuel energy production and ordinance information pertaining to these activities could be researched and made available for the purpose of compliance with new ordinances addressing these new and emerging uses.

Table 1. Top 20 search terms used to find site in October 2009.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Hits</th>
<th>User Search String</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>forestry land that has been cut in lagrange</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>ordinances in waxhaw nc</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>cary nc noise ordinance</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>charlotte ordinances</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>mecklenburg county ordinances</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>charlotte mecklenburg ordinances</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>city raleigh ordinance</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>raleigh ordinances</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>town of cary ordinances</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>tree protection clear cutting ordinance nc</td>
</tr>
<tr>
<td>11</td>
<td>3</td>
<td>tree retention</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>asheville nc statutes</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>charlotte noise ordinance</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>city of greensboro code of ordinances</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>city of winston salem city ordinances</td>
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<tr>
<td>16</td>
<td>2</td>
<td>code ordinance in charlotte nc</td>
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<tr>
<td>17</td>
<td>2</td>
<td>concord nc city ordinances</td>
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<td>18</td>
<td>2</td>
<td>durham nc noise ordinance</td>
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<tr>
<td>19</td>
<td>2</td>
<td>fayetteville nc noise ordinance</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>forsyth county nc permitted uses</td>
</tr>
</tbody>
</table>

Endnotes

References Cited


Appendix: November 4, 2009 Project Presentation
Development of an Online Resource of Land Use Regulations Impacting Forestry

Brandon King
Department of Forestry and Environmental Resources

Fundied through the Urban and Community Grant Program
North Carolina Division of Forest Resources

Overviews

- Project Objectives and Background
- Background on Authority
- Case Study Methods
- Initial Findings
- Zoning and Forestry – For Counties and Municipalities
- Data Issues
Overviews

- Website Development and Content Frameworks
- Future Website Issues
- Project Outcomes
- Other Land Use Implications
- Resources for Data Collection and Website Creation

Project Background

- Local bills in the North Carolina General Assembly
- Perception of increase in “tree protection” ordinances
- High profile tree clearing incidents
- No single source of information available on local regulations impacting forestry
Objectives

- Find regulations that could affect forestry activities on private property (not street trees)
  - Primary focus was clearing of trees for forestry
  - Burning and other ordinances noted when obtained

- Provide general information about regulations online through website

- Assist forest landowners with compliance and local governments with questions

Background on Authority

- “Dillon’s Rule” State
  - Local governments are creations of and derive their authority from state government

- “Home Rule” State
  - Authority to govern is primarily held by the county or municipality

- N.C. is a Dillon’s Rule State
  - Statewide legislation for authority
  - Local bills required for new and additional
Background on Authority

Case Study Methods

- Initial framework looked at all types of ordinances
  - General ordinance-making authority
  - Planning and zoning
  - With or without exemptions

- Framework restructured
  - Narrowed focus
  - Identify relevant ordinance types and components
Case Study Methods

• Local bills
  – Not necessarily an indicator that regulations are in effect

• Rural-Urban Continuum Codes
  – United States Department of Agriculture, Economic Research Service
  – Big to small
  – Size not indicative of a particular ordinance

Case Study Methods

• Originally inquired from large to small
  – Conflicting responses
  – Little useful information
  – Needed verification and links to online information

• Transitioned to 100% coverage of all counties and towns
  – 100 counties
  – ~545 municipalities
Case Study Methods

• Data collection
  • Online research
    – Local government websites
    – Free, online code services (E.g. Municode, AmLegal)
  • E-mail, telephone, mail, Listservs
  • Word of mouth

Case Study Inquiry

• Knowledge of ordinances or other regulations in your county, town, or city planning jurisdiction, which may affect forestry

• More examples given in later inquiries:
  – Zoning, watershed, riparian buffer, landscaping, visual buffer, or tree preservation/tree protection/tree harvesting
Initial Findings

• Few “tree protection” ordinances noted
  
  — “Buffer ordinance does not allow cutting or harvesting within the buffer. Trees or shrubs that die are to be replaced. Existing trees are credited toward meeting the buffering requirement” - Wendell
  
  — “No” and “Yes” for the same town - Rural Hall
  
  — “Zoning Article X, Section 15-146, Use 14.200 Silviculture requires zoning permit in some areas and is not allowed in other areas” - Carrboro
  
  — “Most regulations I am aware of exempt forestry and silviculture” - Oak Island

Initial Findings

• Some communities noted zoning as a form of regulation that could affect forestry practices

• Others said they had no regulation but when checked they had zoning

• Zoning mentioned frequently

• Research transitioned to include “tree protection” regulations and zoning
Initial Findings

• Some communities noted zoning as a form of regulation that could affect forestry practices

• Others said they had no regulation but when checked they had zoning

• Zoning mentioned frequently

• Research transitioned to include “tree protection” regulations and zoning

Initial Findings

• What about these?
  – Subdivision, Watershed, Sediment

• Ordinances not targeted
  – Development focused
  – With state-wide exemptions for forestry

• Targeted
  – Landscaping/Tree protection, Zoning
Zoning – How does it impact forestry?

• Uses not provided for in ordinance are prohibited
  – Districts created and uses allowed for each district
  – Base districts and overlay districts (E.g. Highway Overlay)

• Uses may be interpreted to be allowed -- or not
  – Fall under other definition or listed use
  – Discretion of local government to interpret
  – Uncertainty
  – Amend ordinance or map

Zoning – How does it impact forestry?

• Landscaping and tree protection provisions – in zoning or Unified Development Ordinance (UDO)

• Does it allow forestry as a use?
  – Definitions
  – Descriptions of districts
  – Table of uses
Zoning – Municipalities in NC

- Municipalities may zone forestry, farming, and horticulture activities
  - Can define – and allow or not allow
  - May include forestry with farming uses or leave out

- Municipalities do not have the authority to exempt “bona fide farm purposes” from their zoning
  - Some municipalities do exempt
Zoning – Counties in N.C.

- Counties in North Carolina must exempt “bona fide farm purposes” from zoning
  - Farming and forestry could still be in zoning ordinance if a bona fide farm purpose
  - Zoning researched even if forestry exempt

- Some counties do not exempt

- Some counties do exempt, but do not define according to state statute

Data Issues

- Finding URLs for local governments
  - No URL
  - Expired URL
  - Website but no information
  - Directed to Chamber of Commerce’s site with no ordinance information – or link to local government site

- External websites
  - Dead links
  - Pages only working in Internet Explorer
  - Broken JavaScript functions
  - Frames
Data Issues

- Contact information
- Ordinance availability
- Obtaining ordinances
- Data entered for local governments when available or default page used

Website Development - Constraints

- All functions to work properly on university hosted space
- Easy to maintain without special software and with minimal code editing capabilities
- Change styles for website easily (CSS)
- Small number of pages (files) to update
  - Uses a flat file database
- Minimal number of links to avoid “link rot”
Website Development - Constraints

- Multiple ways to find information using the site
- Information to be easily indexed by search engines
- Easily view and print information for a given local government (PHP)
- University, state, and federal accessibility requirements to be met
- Accessible over low-speed internet connections and on low-cost or older computer systems

Website Development - Framework

- XHTML – Extensible Hypertext Markup Language
  - Newer version of HTML, which allows well-formed code to be used
  - Results in valid pages and less errors in browsers
  - Recommended at the time and still compatible with the newer HTML 5
Website Development - Framework

• Cascading Style Sheets (CSS)
  – Styles applied to various parts of webpage
    • Text, links, tables, images
  – Verses attributes applied to everything on the page (E.g. <font style="Arial">)

• Allows changes for entire site with one file

Framework for Website Content

• Main Links
  – Home page
  – State and federal laws
  – Disclaimer
  – Resources

• Database Page
  – Contact Information
  – Links
  – Indications
  – Citations
Future Website Issues

• Maintaining website content and — code and structure
  – Ordinance information changes constantly
  – State statutes amended
  – Additional local bills passed
  – Website code may require updating
Future Website Issues

• Solutions
  – Funding for research and updates
  – Cooperation with other institutions and local governments to research this information
    • UNC Chapel Hill School of Government
    • Councils of Government
  – Interface for updating content via web browser
    • Coding and security issues

Project Outcomes - Website

• Used by local governments, Cooperative Extension, citizens

• Search terms used to find website
  – “tree ordinances”
  – “wilmington nc tree ordinance”
  – “town of cary noise ordinance”
  – “charlotte nc ordinance outdoor clotheslines” (#4 in Google)
Other Land Use Implications

- Alternative energy
  - Wind
  - Solar
  - Biofuel production – and availability

- Local food and fiber production
  - Livestock ordinances (E.g. backyard chickens)
  - Land availability

Resources for Data Collection

- North Carolina League of Municipalities
- North Carolina Association of County Commissioners
- University of North Carolina at Chapel Hill, School of Government
- N.C. Department of Commerce, Division of Community Assistance
- N.C. Department of Environment and Natural Resources
Resources for Website Creation

- W3C – Markup Validation Service

- A List apart


- php.net