

DEVELOPMENT OF "GREEN GROWTH": A CONSERVATION PLANNING TRAINING
MODULE FOR URBAN PLANNERS IN NORTH CAROLINA

by
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TABLE OF CONTENTS

	Page
Introduction.....	3
Literature Review.....	5
Methods/Approach.....	18
Lessons Learned/Future Directions.....	23
Conclusion.....	27
References.....	28

Introduction

Over the past two decades, North Carolina has been one of the most rapidly growing states in the nation with the bulk of the population increase occurring in and around Piedmont urban centers. According to the U.S. Census Bureau (2005), North Carolina's population growth was listed as the 5th fastest in the nation. Furthermore, the Triangle region ranked as the 18th fastest growing region in the country (News & Observer, 2007; Triangle Business Journal, 2005). If not properly planned, this rapid development will degrade water quality, eliminate functional wildlife habitat, and diminish our quality of life. Since 2005, the North Carolina Wildlife Resources Commission's (NCWRC) Urban Wildlife Project has worked to steer suburban development away from priority wildlife habitats while encouraging infill elsewhere. Thus far, the Urban Wildlife Project has established relationships with and is providing technical guidance to urban planners in Chatham County, Wake County, and the Towns of Apex and Cary. Ideally, NCWRC would like to build capacity in urban planners across the Triangle so they do not need to rely on the Urban Wildlife Project for conservation-related technical guidance.

The Urban Wildlife Project has three overarching objectives: 1) to steer incompatible development away from important biological resources by providing technical guidance to local governments, developers, and other stakeholders; 2) to encourage private landowners to manage their property for wildlife habitat along target conservation corridors; and 3) to cultivate an appreciation for wildlife-related conservation issues among the urban public by promoting wildlife-related passive recreation opportunities. The purpose of this master's project was to develop a

conservation planning training module to build “biological capacity” among urban planners and other decision makers in the Triangle Region of North Carolina, which will help the Urban Wildlife Project achieve its goal of steering urban development away from important biological resources. Specific goals & objectives of the master’s project included:

Goal 1: To develop a training module that better equips urban planners to incorporate biological data and conservation priorities into land use planning processes.

Objective 1.1 : After completing the module, planners will be able to 1) identify sources of important biological data, and 2) explain what the presence of a biological element or priority conservation area means.

Objective 1.2: After completing the module, planners will begin to integrate biological data and associated conservation recommendations into land use plans and ordinances.

Objective 1.3 After completing the module, planners will begin to consult biological data sources when evaluating subdivision proposals, and will pass along sound conservation recommendations to developers based on an understanding of how to minimize impacts to sensitive biological elements.

Goal 2: To develop a training module that can be replicated by individuals and groups other than the Urban Wildlife Project.

Literature Review

Despite positive responses from planners to the Urban Wildlife Project, significant barriers remain to accomplishing project goals. Prior to developing the training module, a literature review was conducted to better understand such barriers.

The literature review specifically explored the following questions:

- 1) Why should local governments care about conservation science?
- 2) What barriers prevent the effective integration of conservation science and urban planning?
- 3) What lessons can be learned from the literature, and from other initiatives, that can help overcome these barriers?
- 4) What other initiatives around the country can serve as models for the development of this training module?

Why Should Local Governments Care About Conservation Science?

Many local governments use certain aspects of conservation science to protect water quality and prevent natural disasters. Yet, the use of biological data to prevent loss and fragmentation of wildlife habitat is severely lacking. Researchers have shown that in urban areas around the country, land use decision-making often occurs without adequately considering and minimizing impacts, particularly cumulative impacts, to biological resources (Azerrad & Nilon, 2006; Cohn & Lerner, 2003; Daly & Klemens, 2003; Environmental Law Institute, 2003). Conservation science is not well understood by elected officials and land use planners. Instead, those responsible for making urban planning decisions are well versed in community design and economic development strategies.

Local governments should care about conservation science as a way to sustain healthy ecosystems—and ultimately the human species—into the distant future.

“Conservation science” is biological information that can be used to make informed decisions about the protection of urban ecosystems. Conservation biologists, or scientists that study ecosystems and generate data on measures that can be taken to protect ecosystems, agree that urbanization poses major threats to “biodiversity.” According to McElfish (2004), biodiversity is “the variety of living organisms and their populations, the genetic differences among them, and the natural communities and ecosystems in which they occur.” Many scientists believe the world is now in the midst of an extinction crisis, and maintaining biodiversity is necessary to prevent the degradation and elimination of life on earth (Cohn & Lerner, 2003; Johnson & Klemens, 2005).

Among the many human activities that cause loss of biodiversity, suburban development “frequently eliminates the large majority of native species...and is often more lasting than other types of habitat loss” (McKinney, 2002). Yet it is not necessarily development by itself that causes the decline of species. More accurately, the pattern of unplanned growth is the primary driver behind biodiversity loss. Even well-intentioned planned growth and many “smart growth” efforts, when uninformed by biological data, do not adequately protect functioning urban ecosystems. Losing intact ecosystem processes to urban development has the potential to sever the biological processes upon which human life depends. On the other hand, using conservation science to protect a functioning network of plant and wildlife habitats can prevent what some scientists are calling “the sixth great wave of extinction” (Bryant, 2006).

Local governments also should care about conservation science because maintaining open space and functioning urban ecosystems can have positive economic

impacts on a community. Residential properties adjacent to greenways or urban parks have a higher market value than similar, non-adjacent properties (Savard et al, 2000). When open space is conserved, it allows the adjacent property values to increase revenues without adding costs associated with additional services and infrastructure (Renkow, 2001). In addition, communities with healthy, functioning ecosystems and plentiful open space attract new industries looking to relocate to areas with high quality of life. Finally, healthy ecosystems provide valuable and “free” ecosystem services such as water filtration, flood control, and clean air. The cost of re-creating these ecosystem services, such as creating wetlands for flood control, is approximately “100 times” more expensive than protecting open space (Hitchcox, 2001).

Just as local governments should care about conservation science, conservation biologists should care about communicating their scientific findings to local governments. Conservation science has been used successfully to influence federal and state regulations that will protect some level of biodiversity, yet conservation biologists are beginning to realize that these regulations alone are insufficient to protect ecosystem integrity. At the same time, environmental groups are beginning to recognize that land acquisition is not the only solution to protecting lands of conservation value (Cohn & Lerner, 2003). Because land use is regulated at the local level, conservation biologists can make better use of the local land use planning process to integrate conservation science into land use regulation.

Barriers to Integrating Conservation Science & Urban Planning

After reviewing the literature, I identified four primary obstacles that inhibit local governments from effectively utilizing conservation science. First, legal limitations

inhibit the integration of conservation science and planning. Second, urban planners and conservation biologists are motivated by different scales and priorities. Third, urban planners do not possess knowledge of conservation biology, and conservation biologists are not knowledgeable of urban planning concepts. Fourth, political barriers limit the integration of conservation science and land use planning. In the paragraphs that follow, each of these barriers will be discussed, and strategies that can be adopted to surmount these obstacles will be identified.

Obstacle # 1: Legal limitations inhibit the integration of conservation science and urban planning.

Local governments in North Carolina are somewhat limited by law in their authority to regulate land use (Nolon, 2003). While local governments in states like Maine, New Jersey, and New York possess constitutional authority to regulate land use (also known as “home rule”), cities and counties in North Carolina do not. Therefore, the courts in North Carolina “have uniformly concluded that municipalities and counties are created by the state and can exercise only those state powers that have been delegated to them by the General Assembly” (Owens, 2000). At the same time, while cities and counties in North Carolina do not have *constitutional* home rule status, they do have *statutorily provided* home rule status (Owens, 2000). This means that land use can be regulated as long as the particular regulation is in compliance with North Carolina law.

Local governments’ authority to regulate land use in North Carolina has been justified on the grounds of the state constitution, which establishes protection of the environment as a proper function of local governments (Owens, 2000). In addition, NC Gen. Statutes give local governments “statutorily provided” authority to undertake smart

growth programs (Owens, 2000). Despite such enabling authority, urban planners and conservation biologists possess uncertainty over the extent to which the law will allow them to regulate land use for the purpose of environmental protection. Owens (2000) points out that as local governments begin to use new “smart growth tools,” judicial interpretation of the scope of local governments’ land use authority will be required. To avoid lawsuits, however, local governments will likely remain hesitant to experiment with new “smart growth” tools.

To effectively overcome such legal limitations, conservation biologists and urban planners must become educated about the legal extent to which they can incorporate biological priorities into land use planning processes. Conservation biologists should work to develop conservation recommendations that are realistic and respect the limitations of local governments’ land use authority. In addition, changes in state policy could motivate local governments to better integrate conservation science and biodiversity data. For example, Washington recently enacted a statewide Growth Management Act that requires cities and counties to develop local regulations to help sustain habitat for state-listed fish and wildlife species (Azerrad & Nilon, 2006). This law further requires that all land use regulations incorporate the “Best Available Science” into local ordinances. In response, local governments are depending on conservation scientists in state resource agencies to help them meet their legal obligations.

Obstacle #2: Urban planners and conservation biologists are motivated by different scales and priorities.

Conservation biologists tend to think on a landscape scale, while urban planners think at smaller, site-specific scales (Azerrad & Nilon, 2006). When asked how their

data is influencing planning efforts, conservation biologists often point to statewide conservation plans such as North Carolina's Wildlife Action Plan or regional plans like the Triangle Greenprint. Yet many local planners remain unaware of conservation plans and do not understand how to integrate them with local land use plans. As a result, land use plans and conservation strategies often are not effectively connected. For example, although conservation professionals in the Triangle Region of North Carolina understand the Triangle Greenprint, and all of the local governing boards in the Triangle have endorsed the Greenprint, this conservation plan is not being effectively implemented through local planning departments. Perhaps if the plan's landscape-scale recommendations were translated to the site-specific level at which urban planners make decisions, the plan could be implemented more effectively.

A similar problem is that urban planners and conservation biologists have different professional priorities. Urban planners need to incorporate conservation guidelines into a local planning framework that may not place an emphasis on conserving priority species of plants and animals. Alternatively, conservation biologists work in a professional world where understanding and conserving intact ecological systems are the highest priority. Operating in these different professional contexts poses a significant barrier to use of biological data in the urban planning world.

To transcend these differences in scale and priorities, conservation biologists must begin to convert landscape-scale conservation plans into town- and county-specific documents. State, regional, and local conservation plans should make specific, prescriptive recommendations on how to implement such plans. Moreover, scientific recommendations need to be translated into implementation procedures, expressed in

layman's terms (Theobald et al., 2000). A recent survey of planners in Washington State revealed that planners desperately need habitat conservation guidelines and recommendations for site-scale planning projects as opposed to more general, landscape level recommendations (Azerrad & Nilon, 2006). In fact, the key recommendation from Azerrad & Nilon's (2006) study of planners was "the need for a participatory approach to planning that incorporates both species and habitat conservation and the practical needs of planners" (p. 261).

Obstacle # 3: Urban planners do not possess knowledge of conservation biology, and conservation biologists are not knowledgeable of urban planning concepts.

The knowledge gap between urban planners and conservation biologists presents a third obstacle to integrating biological data and urban planning. After interviewing a group of Swedish urban planners, Sandstrom et al. (2006) determined that "shortage of relevant knowledge was the main factor" inhibiting the implementation of biodiversity policies in urban landscapes. Many urban planners are aware of the importance of maintaining greenspace in urban areas, but this awareness does not necessarily reflect an understanding of how greenspace systems should be designed to maintain biodiversity (Sandstrom et al, 2006; McElfish, 2004). Many communities feel they have done a good job of protecting natural resources through mechanisms such as large-lot zoning, but in reality these tools can create ecologically dysfunctional landscapes (Klemens & Johnson, 2005). For example, in an attempt to protect environmental resources, a new land use plan in Chatham County proposed to institute large-lot zoning, which limits developers to placing one dwelling unit on every 5 acres. Instead of

conserving biodiversity, this type of zoning would spread development across the landscape, which interrupts wildlife travel corridors, fragments habitat, and increases the need for roads (McElfish, 2004; Cohn & Lerner, 2003).

Just as planners lack knowledge of biology, conservation biologists do not adequately understand the intricacies of land use tools like zoning, subdivision design, and land use ordinances. In addition, biologists often are “reluctant to embark on the interdisciplinary work required to undertake land use planning” (Daly & Klemens, 2005). Such hesitancy exists because scientific data is most often incomplete and complex. In addition, biologists rarely know how to communicate effectively with nonscientists (Daly & Klemens, 2005; Environmental Law Institute, 2003). As a result, conservation biologists do not often translate their findings into usable recommendations for planners. Unfortunately, “by not promoting the use of even partial knowledge...land use decisions—even the most well intentioned—are being made completely uninformed by science” (Environmental Law Institute, 2003).

For biological data to become a greater part of the planning process, the knowledge and communication gaps that separate conservation biologists and urban planners must be bridged. Conservation biologists must do a better job of providing planners with the most recent biological data and explaining what their data means (Miller et al, 2005). In Washington and New Jersey, researchers found that urban planners want state agencies to provide training workshops on how to effectively implement habitat conservation guidelines in their day-to-day work (Azerrad & Nilon, 2006; Miller et al., 2005). Planners also have suggested that workshops and trainings could be conducted

directly with planning boards, as an agenda item on regularly scheduled meetings (Miller et al., 2005).

In addition to training workshops, more consistent lines of communication should be established between these two groups of professionals. In response to planners' request for better communication, Washington Dept. of Fish and Wildlife has developed a newsletter specifically for urban planners (Azerrad & Nilon, 2006). In the future, NC's Urban Wildlife Project could pursue development of a newsletter to facilitate better communication between biologists and urban planners.

Obstacle # 4: Political barriers limit the integration of conservation science and land use planning.

Even if conservation biologists communicate well and translate their science, political barriers still can prevent conservation science from being properly integrated into land use plans. Staff, elected officials, or the general public may not believe conservation of biological resources is important. Developers and local government officials often believe that conservation is antithetical to development because it will reduce their jurisdiction's tax base and prevent economic growth. Moreover, the general public often is not convinced that conservation of biological resources is necessary (Cohn & Lerner, 2003).

To challenge such political barriers, conservation biologists must better articulate why conservation and economic development are compatible. Biologists should use case studies to assist planners, elected officials, and the public in understanding the value of biodiversity conservation to their community's long-term health. For example, Miller et al. (2005) suggest conducting a "biodiversity loss impact assessment" that

could be used in the same way that build-out scenarios, based on various development and zoning options, are used to aid planners in envisioning the future.

Useful Tools from Model Initiatives

North Carolina is not the only state that is working to educate local governments on conservation planning issues. Most states appear to possess some type of landscape level conservation planning effort, and a few states are working to provide technical guidance to local governments on conservation issues. Unfortunately, I was unable to locate an initiative that possessed all of the same goals as this project. Instead, most initiatives seemed to be landscape-level conservation planning efforts, and I could not find one single initiative that had developed a replicable training module to provide site-specific conservation recommendations to local governments.

The initiative that seemed to most closely meet the goals of this project was the “Beginning with Habitat” (BWH) project, a cooperative effort of conservation agencies and organizations in Maine. BWH is administered through Maine’s Department of Inland Fisheries and Wildlife, and has been in existence since 2002. BWH was established to provide technical guidance to individual towns on how they can protect sensitive environmental resources through land use planning and land protection. BWH conducts training workshops for municipal planners, elected officials, and conservation boards. Prior to each workshop, BWH develops a series of “habitat maps” for the individual municipality. Once the maps are complete, BWH holds a 3 hour evening presentation where they: 1) discuss landscape ecology basics, 2) walk participants through the habitat maps, and 3) describe case studies where other municipalities in Maine are successfully using these maps. BWH staff also provide workshop

participants with binders containing relevant publications and “packaged” data sets (Walker, 2007, personal communication).

Aspects of BWH that informed the development of this training module were their approach to packaging data, their map-based workshops, and their binder materials. BWH staff have found that providing local governments with “packaged data sets” that integrate all available conservation data from different agencies has been critical to their success. Before BWH came along, municipalities were not seeking data from disparate sources on their own (Walker, 2007, personal communication). From personal experience, this similar problem exists in North Carolina. Although the NC Natural Heritage Program provides periodic data updates to planners, there does not appear to be one “master” biological data set that incorporates data from NCNHP, USFWS, NCWRC, and others. Therefore, this training module provided participants with packaged biological data on CDs. In addition, this training module 1) used maps as teaching tools, 2) presented participants with binders containing necessary references such as sample ordinances, checklists, and contact lists.

Tools from other initiatives that further informed the development of this module were 1) local government checklists developed by Minnesota’s Department of Natural Resources, and 2) Washington’s “Priority Habitat and Species” publications. Minnesota’s DNR has prepared checklists to assist local governments in “integrating natural resource conservation into local planning” (Minnesota DNR, 2007). For example, one checklist presents local governments with a list of questions that can help them properly structure conservation ordinances to benefit biological communities.

Maine's Beginning with Habitat program successfully adapted many of these checklists to their state's needs.

Finally, some aspects of Washington's "Priority Habitat and Species" (PHS) publications were used to guide initial development of conservation recommendations for different guilds of species living in North Carolina. NCWRC's Urban Wildlife Project is working on a separate endeavor to develop a series of recommendations on ways local governments can minimize the secondary and cumulative impacts of development on guilds of priority terrestrial species in urbanizing areas of North Carolina. This document is being modeled after NCWRC's (2002) *Guidance Memorandum* on minimizing impacts to aquatic species. To facilitate learning in this training module, the recommendations within both of these documents were presented in a more user-friendly format. Local governments have expressed frustration with the lengthy format of the NCWRC's (2002) *Guidance Memorandum*, and bulleted fact sheets seem to be a useful complement to the longer documents. Washington's PHS publications provided a useful model for such fact sheets. The next section will describe in more detail how the lessons that were learned through this literature review informed development of the training module.

Method/Approach

This project's general approach was to develop a training module for urban planners in urbanizing areas of North Carolina. A draft of the module was developed in several stages, and then was piloted with planners from the Chatham County Planning Department. As a first step, I held a few informal discussions with planners from Chatham and Wake counties to determine what information would be useful to include in the module, and what structure would be most appropriate.

Second, I compiled and manipulated appropriate GIS data layers, created a series of conservation maps using these layers, and organized this information onto GIS Data CDs. Symbology was created for all shapefiles, and layer (.lyr) files were saved to ensure this symbology would be retained when used by planners. Statewide layers were clipped to display information for the Triangle Region (Orange, Durham, Wake, Johnston, Chatham, and Lee counties).

The data layers were divided into three categories and organized into separate folders based on those categories. The categories were: 1) Base layers, 2) Level 1 Conservation Priorities, and 3) Level 2 Conservation Priorities. Level 1 conservation priorities are data layers that have been created through a GIS mapping effort, and the boundaries of the shapefile have also been "groundtruthed" through field surveys. Level 2 conservation priorities are data layers that have been created through a mapping effort, but the boundaries have not been verified by field surveys. Through the training workshop, planners were told that level 2 conservation priorities are meant to guide landscape-level land use planning efforts and land acquisition efforts. Planners were also told that level 1 conservation priorities are meant to be used in development review

activities. For a complete listing of all layers in each category, see the “Conservation Maps” section in the draft handbook.

After creating the CDs, a draft version of the handbook was assembled. The draft handbook contains four sections. The first section, “Using GIS Data,” consists of a GIS Data Guide that is intended to be used alongside the data on the GIS data CD. This section also contains maps that display the layers described in the GIS data guide, and a “site review checklist” that is intended to streamline use of GIS data in planning processes.

The second section, called “Minimizing Cumulative and Secondary Impacts,” consists of a checklist that presents a series of conservation recommendations in a user-friendly format. This checklist is a condensed version of NCWRC’s (2002) *Guidance Memorandum to Address and Mitigate Secondary and Cumulative Impacts to Aquatic and Terrestrial Wildlife Resources and Water Quality*. The checklist also presents a few recommendations that are not yet included in this guidance memorandum. These new recommendations include recommended buffer widths for wetlands and suggested land development patterns that are most compatible with wildlife habitat protection. In the coming months, NCWRC will complete an official “addendum” to the 2002 version of their *Guidance Memorandum*. This addendum will include the wetland and land development recommendations, in addition to other guidance that will more fully address impacts to terrestrial species. The checklist in the handbook will be expanded to include these recommendations at that time.

The third section of the handbook is called “Greening Ordinances,” and consists of a handout identifying eight issues that could be addressed to improve environmental

protections in local ordinances. The handout identifies sample ordinances from actual communities both within and outside of North Carolina. Copies of relevant sections of these ordinances are also included. This section was created through a preliminary search of ordinance databases online, and is still a work in progress.

The fourth section is called “Additional Resources,” and consists of handouts identifying and describing listed and priority wildlife species in Chatham County and North Carolina. A key contacts list, which provides contact information for a select group of biological experts, also is included.

After completing a draft, “pilot” versions of the handbooks were printed and bound. Together, the GIS Data CDs and handbooks formed a working draft of a “conservation toolbox” for urban planners. To present this information effectively, a three hour workshop was designed and tested. Because I have established solid working relationships with Chatham County through ongoing work as the Urban Wildlife Biologist, I selected the Chatham County Planning Department to participate in the pilot. Planners expressed interest in participating, and the date was scheduled.

The workshop itself consisted of a one hour powerpoint presentation, followed by a two hour field trip. Informal, evaluative discussions of the module were facilitated throughout the presentation and field trip. In addition, a formal evaluation form was sent to planners via email after completion of the workshop.

During the powerpoint presentation, I explained how to use the GIS Data CDs and the handbooks. The presentation displayed information on each section of the presentation, and any questions were answered. Because this was a “pilot” workshop,

time during the presentation also was devoted to discussing strengths and weaknesses of the materials provided.

The goals of the field trip were 1) to practice using the concepts discussed during the presentation, and 2) to provide an unstructured time for participants to learn about timely environmental issues in a hands-on fashion. Chatham County has been exploring opportunities to establish appropriate buffer requirements for wetlands, so I designed the field trip component to teach participants about the wildlife value of wetlands, as well as the lack of appropriate wetland protections in North Carolina. I selected an appropriate location for a field trip on Jordan Game Land, and visited the site prior to the workshop to search for any reptiles and amphibians living on site. I met with NCWRC's herpetologist for the Piedmont region, and he agreed to help facilitate the field component of the workshop. During the actual "pilot," the following specific topics were covered in an unstructured fashion:

- Valuable environmental features on site were identified, particularly the wetland areas.
- A "wetland complex" was identified, defined, and described.
- The point was made that the wetlands we visited did not appear on National Wetland Inventory maps, so they would only be identified through field visits.
- The wetlands were discussed in the context of the US Army Corps of Engineers 404 permitting process.
- Measures that would ensure proper protection of this site were discussed.

- The value of wetlands to semi-aquatic species was described, particularly that they need both wet areas and adjacent upland areas to survive.
- The life history and habitat requirements of all snakes, frogs, and salamanders discovered were discussed.

The 30 minute return drive from the field trip site to the planners' office was used to informally evaluate the field trip. Planners were asked a series of leading questions designed to gather helpful feedback to improve future versions of the training module. Planners were also sent a follow-up evaluation via email. Feedback gathered from both forms of evaluation will be used to revise the module. Specific information gleaned from the evaluations is described in the next section.

Lessons Learned and Future Directions

General Lessons Learned

“Piloting” a draft version of this training module with a group of urban planners was one of the original goals of this master’s project. The feedback received during this “pilot” phase was extremely informative, and will be critical to the future success of this effort. In general, the Chatham County Planning Department said they both “enjoyed” the training workshop and “learned a lot.” When asked if this type of training module was more or less helpful than providing technical guidance on a case-by-case basis, planners indicated that both were equally important. They all agreed that providing them with this information up front was important, and they would certainly use some of the information in their planning efforts. At the same time, they pointed out that significant obstacles would prevent effective implementation of the recommendations in the handbook. In particular, the county does not have ordinances in place that enable them as planners or requires developers to follow these recommendations, which will inhibit implementation.

Given this constraint, planners thought it would be useful for elected officials, citizen boards (such as their Environmental Review Board), and developers to participate in a similar workshop. The original intent of this training module was to create a model workshop that could be tailored for these audiences. In the future, after revising and finalizing this training module targeting planners, a version that targets these other audiences will be developed and administered.

Participants also said providing local governments with a comprehensive set of “model ordinances” that follow North Carolina General Statutes would be particularly

useful. Such “model ordinances” would consist of language that could be tailored to different localities. Although the draft handbook does contain a “model ordinance” section, the ordinances contained therein are actual sample ordinances that exist in communities around North Carolina and the U.S. Planners thought that working with a lawyer to develop a set of “form model ordinances” would be more useful than providing these sample ordinances. The Urban Wildlife Project likely will pursue this as a project in the future as well, perhaps in partnership with other groups or individuals working to incorporate environmental issues into urban planning processes.

Improvements to Training Module Content

Before creating model ordinance language and developing an iteration of this workshop for developers and elected officials, improvements must be made to the existing training module. Participants in the pilot workshop gave useful feedback on ways in which the content could be improved. First, they said the GIS data itself was helpful, but giving every planner a GIS Data CD was perhaps not the best strategy. Many planners do not use ArcGIS software on their personal computers, so they would not be likely to use the data. Instead, they recommended working to integrate the conservation data with the county’s existing online GIS mapping system. This could be achieved by inviting staff in a jurisdiction’s GIS department to attend the training workshop, or by meeting separately with GIS department staff.

Planners also commented that the maps were too crowded, and suggested providing a more extensive series of maps with 1-2 conservation layers displayed on each map. Providing printed maps may be more useful because many planners do not use ArcGIS. Finally, planners requested a spreadsheet with more detailed reference

information for each of the data layers. Given this feedback, I plan to revise what is provided on the CDs. I will continue to provide the shapefiles since some planners do possess ArcGIS, but will also recommend that the data be integrated with the jurisdiction's online mapping system. I also will create less crowded maps and a data reference spreadsheet. Finally, I will include PDF files with more detailed information on each layer, such as the instructions provided by the Natural Heritage Program.

Planners also had useful feedback on the handbook. In general, they thought the information was helpful, particularly the county-specific species lists, and they did not think there was too much information. Participants also shared ideas on how to improve the handbook. Based on their suggestions, I plan to incorporate the following items into the next iteration of the handbook: 1) a list of all state natural resource agencies, along with descriptions of what each agency does, and 2) brief descriptions of state regulations that relate to conservation. In addition, they suggested providing an electronic PDF file of each section of the handbook so that it can be shared electronically over email.

Responses to Workshop

As far as the workshop itself, planners thought it would be helpful to more clearly articulate goals and present more justification on *why* incorporating this information into planning is important. In particular, they suggested framing the message in terms of how conservation will benefit "future generations."

Planners seemed to respond best to the field trip component of the workshop. Due to their positive response, I felt like it was the most successful aspect of the workshop. It was useful to discuss the concepts presented during the powerpoint

presentation in an outdoor setting. The ability to point out actual plants, animals, and wetland areas while trying to explain more abstract conservation recommendations was extremely valuable. The less structured atmosphere lent itself well to taking advantage of teachable moments, and the questions and discussion that evolved from those moments followed a natural progression that was almost more useful than the classroom portion of the workshop. In an online evaluation, planners mentioned that they would have enjoyed spending even more time on the field trip component. As the module is revised, I plan to explore whether or not expanding the field trip would be effective.

During the training workshop, I recommended that when planners are faced with a development application, they should review GIS data layers and conduct a site visit. Workshop participants expressed frustration with this recommendation. They did not feel they possessed the skills to identify important environmental features, and so could not conduct an effective site visit even if it were required in ordinance. One way to address this dilemma could be to expand the field trip component. Perhaps a series of afternoon workshops could be designed to improve planners' identification skills. On the other hand, biological experts with government agencies or consulting firms could be contacted to conduct site visits instead.

Conclusion

To counteract sprawl, and protect urban biodiversity, local governments in North Carolina need to begin incorporating biological data and conservation priorities into land use plans, ordinances, and subdivision review processes. The purpose of developing this conservation planning training module was to initiate a way to enable planners in urbanizing areas of North Carolina to create more effective means of protecting priority biological resources. Although widely administering the module was beyond the scope of this master's project, NCWRC's Urban Wildlife Project plans to do so after the module has been finalized. In addition, NCWRC hopes to tweak the module to develop a similar training series for developers and elected officials at some point in the future. Hopefully this training module will help county and city governments begin to see biodiversity as an important component of urban planning—one that will help to build more sustainable, higher-quality communities in North Carolina.

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