EVALUATING ALTERNATIVES FOR COASTAL DEVELOPMENT

Patricia McIntosh[1/]
Jill Huntington[2/]
Nancy Cofer-Shabica[3/]
Amanda Rutherford[3/]

AUTHORS: [1/]Georgia Conservancy: 428 Bull Street, Savannah, GA 31401; [2/]Georgia Coastal Management Program: One Conservation Way, Suite 300 Brunswick, GA 31520-8687; [3/]Perot Systems Government Services (PSGS) onsite contractor at NOAA Coastal Services Center: 2234 South Hobson Avenue, Charleston, SC 29405-2413
REFERENCE: *Proceedings of the 2005 Georgia Water Resources Conference*, held April 25-27, 2005 at the University of Georgia. Kathryn J. Hatcher, editor, Institute of Ecology, The University of Georgia, Athens, Georgia.

Abstract. Providing for residential growth, fostering economic development, and protecting natural resources of coastal lands requires a balance between the built and non-built environment. A variety of factors come into play, including land values, the abundance of natural resources, real estate market trends, local ordinances, and community character. Tools that allow communities to analyze and visualize how such factors may play out are needed to help foster discussion and informed local decision making for managing coastal development.

The "Alternatives for Coastal Development" Web site is one such tool, illustrating three hypothetical designs for a single development site in coastal Georgia. This collaborative project is designed to serve as an educational tool that the NOAA Coastal Services Center's state-level partners can share with local constituencies. Included are conventional, new urbanist, and conservation development scenarios for the project site and a comparative analysis of selected components of each scenario produced with geographic information system (GIS)-based planning and visualization software.

In the project Web site, GIS maps and a triad of environmental, economic, and social indicators measure differences among the alternatives presented. The indicators allow users to consider the overall benefits and costs associated with selected components of the three site designs, while the maps and three-dimensional representations help users visualize the impacts of various design components.

INTRODUCTION

Coastal management programs are charged with balancing coastal economic growth and the conservation of natural resources for the benefit of all residents. Coastal population growth fuels growth management issues including dramatic increases in the number of new residential subdivisions. Local governments exert, or have the potential to exert, enormous influence on local and regional development patterns. However, many are unequipped to deal with the magnitude of current development pressures. Through this project partnership, state level organization such as the Georgia Coastal Management Program and Georgia Conservancy will provide local officials and citizens with needed tools for understanding and encouraging low impact development practices in their communities.

Working collaboratively, and with input from a variety of experts, the National Oceanic and Atmospheric Administration's Coastal Services Center, the Georgia Conservancy and the Georgia Coastal Management Program (CMP) developed three hypothetical development alternatives for a residential area in coastal Georgia. Economic, environmental, and social indicators were calculated and compared for each scenario in an effort to capture many of the costs and benefits associated with various development design components. The complete project is available on-line1 and aims to provide specific examples of how alternative development options can impact environmental, economic, and social factors. The Web site also includes project maps and 3-D graphics to help users visualize how alternative design components might look.

BACKGROUND

In Coastal Georgia, local governments are tied to development through zoning, planning processes and other regulatory hooks designed to help local officials guide growth within their jurisdictions. As coastal counties experience continued population growth, many local officials are seeking resources to assist with low-impact growth planning.

During the last five years, the Georgia CMP has documented a one hundred percent increase in permits issued for community dock facilities. These permits are often associated with waterfront or marshfront residential

[1] Available at www.csc.noaa.gov/alternatives

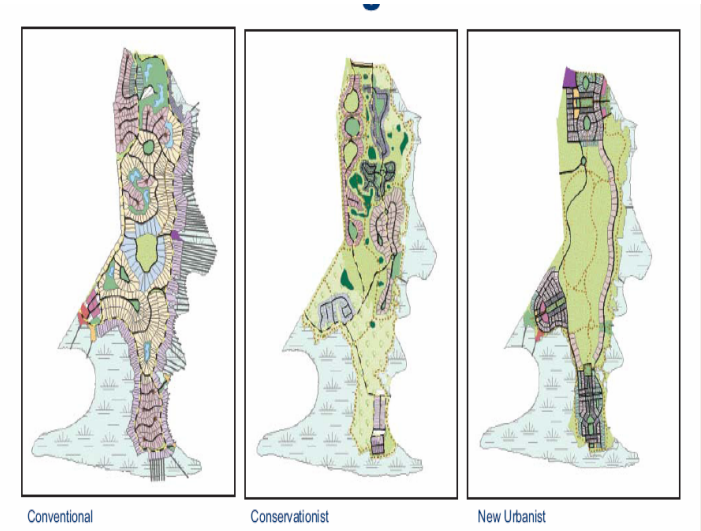
developments. Such developments usually involve large tracts of land that have been under single private ownership or commercial timber harvest. Many smaller parcels of land are also important because they are adjacent to or potentially impact sensitive natural resources like saltmarshes. With these types of residential developments, the program's jurisdiction is primarily limited to structures built on or adjacent to the marsh, i.e., boardwalks, docks, bridges and bulkheads, or to structures built next to dynamic dune fields. Permitting programs provide limited potential for influencing the final impact of a coastal development. Therefore, the coastal program is promoting low-impact design and construction alternatives to help balance the need for residential housing with the need for resource conservation.

PROJECT METHODOLOGY

The team worked to define the project conceptually and to select appropriate software to carry out the scenario comparisons. Early on, an audience analysis helped the group to better define end products and to ensure that project outputs would meet the needs of coastal resource managers and others working to address coastal growth issues.

A workshop setting was used to develop three hypothetical scenarios based on real development trends across the country and base layer geographic data for the coastal Georgia site. At the workshop, team members and additional invited experts broke into three groups and each group drafted initial conceptual design for one scenario. Each of the alternative scenarios highlight design components typical either conventional, conservation, or new urbanist development trends. None of the project designs represent actual development at the project study site in Georgia. Each scenario group developed a list of key features of their design and highlighted smart growth components included. As the initial designs were refined, these features were used by the team to select a final suite of indicators and to ensure that quantitative and qualitative comparison between the scenarios would be meaningful. Post workshop refinements were made based on review across teams and from knowledgeable outside reviewers. Once complete the hard-copy site designs were converted into digital format for use in ArcView GIS software.

The final indicators measured were chosen for their relevance to all three scenarios, their ability to highlight differences among the designs, and the availability of required inputs, including level of detail of the scenario designs. The team recognizes that there are many other important measures of comparison that were outside of the scope or feasibility of this project. The selected



indicators were calculated from direct measurement of features in the GIS files of each design using ArcView software and the CommunityViz® software extension. For indicator calculations requiring cost information, costs appropriate for coastal Georgia were incorporated as inputs. The indicator estimating pollutant runoff from each design was measured using GIS shapefiles in the SGWater module of the U.S. EPA's Smart Growth Index software. An indicator methodology section on the Web site allows users to view inputs, assumptions, and calculations for each measure.

The team also developed spatially referenced, photorealistic 3-D scenes and animations from selected portions of each scenario using Visual Nature Studio® 3D visualization software. GIS shapefiles from each alternative scenario were used to place roads, lots, and ecosystems within the landscape. The 3-D scenes supplement the scenario indicators and site maps by further illustrating differences in the character and feel of each of the three development alternatives, such as layout of the street network, land use, vegetation, relative density, and housing mix.

MEASURED RESULTS

Eleven indicators were grouped into a triad of categories: environmental, social, and economic. Some of the indicators are appropriate in more than one of the three categories, as shown in Table 1 below.

Environmental indicators were used to help measure the impacts to natural conditions estimated to result from each scenario. The open space indicator really helps illustrate the differences between the impacts from each of the scenarios. For example, approximately 71% of the conservation scenario was preserved as open space. Comparatively, the conventional design only preserved about 15% of the site for open space, and the new urbanist design preserved

Table 1. Project Indicators

Environmental	Economic	Social
Open Space	Cost of Infrastructure (Roads, Sewer and Water Lines)	Open Space
Vegetated Buffers	Cost of Paths, Trails, and Sidewalks	Dock (numbers)
Dock (length and area)	Cost of Land Clearing	Paths, Trails, and Sidewalks
Path, Trails, and Sidewalks (length and area)	Potential Net Revenue	Walkability
Water Consumption		
Impervious Surface		
Pollutant Runoff		

approximately 67% of the site. For the purposes of a more thorough indicator analysis, the project team also considered subcategories of the open space indicator, to account for lands that that are left in their natural state versus lands that are maintained or mowed.

Economic indicators were used to estimate variations in costs attributable to design differences in the three scenarios. Among the economic indicators are the unique costs to develop roads, sewers, and water based in each scenario based on its specific design. The conventional scenario resulted in the highest cost ($8,910,653) because of the wide road network comprised of many cul-de-sacs. The conservation scenario, which focused on a compact design and open space preservation, resulted in lowest costs ($6,750,070) due to the reduced total length of those services. The new urbanist scenario, which focused on high density compact design, resulted in costs in the middle of the range ($8,808,855). While the new urbanist scenario's gridded road system and inclusion of alleys caused the price of the roads alone to be higher than the conventional design, the compact design adjusts the water and sewer infrastructure needs so that the total infrastructure for this scenario costs less than the conventional design.

The social indicators measured aspects of the development designs that can enhance or detract from community life. The option of walking, rather than driving to work, errands, or recreation areas, benefits residents by providing alternative modes for children or the elderly who may not have access to vehicles. The walkability indicator in this project was defined as a distance of a quarter mile from residential parcels to open space and commercial parcels. Because the project study area is small, all three scenarios identified 100% of the study site as walkable to open space. Thirty percent of the conventional design is walkable between residential and commercial parcels, while the new urbanist and conservation results were 84% and 23%, respectfully.

CONCLUSIONS

When striving to find the delicate balance for residential growth, economic development, and natural resources, a variety of factors come into play, including land values, the abundance of natural resources, real estate market trends, demographics, local ordinances, and community character. Coastal communities need information and tools to help them analyze, visualize, and make decisions about growth and development in their communities. The "Alternatives for Coastal Development" project provides these through hypothetical designs, environmental, economic, and social indicators, and visualizations.

The Georgia Conservancy will utilize the project in its Blueprints for Successful Communities program, which provides technical assistance to help communities chart their future in ways that preserve community character and protect valued resources. Georgia Conservancy staff will use the project tools and educational materials as they conduct community visioning and design workshops that include a cross-section of community leaders, professional planners, architects, engineers and others, and that result in a strategic planning guide for the community.

The Georgia CMP will use this project as a tool which staff can offer to local officials through one-on-one contact and presentations at council and commission meetings. Interactive presentations of the website will help to link officials with on-line resources and examples of communities that are successfully coping with overwhelming growth pressures. The CPM also provides educational opportunities to public audiences via their 30-foot mobile classroom called the Coastal Ark. Mobile presentation of the Web site and project results at local programs, workshops, and at public festivals and events will offer a critical venue for building public support for low-impact design and development principles.

The NOAA Coastal Services Center maintains the project on its Web site as a resource to for use by the larger coastal resource management community. While the project site is specific to Georgia, the issues, results, and accompanying information are not. Coastal managers across the nation may use the site to help promote dialog between coastal managers, planners, local government officials, developers, and citizens and to help diverse stakeholders visualize what type of future development they would prefer to see in their area.