# SOUTH CAROLINA

Cheryl Matheny
Gloria Burns
James G. Titus
Andrew Hickok
Daniel Hudgens

The Likelihood of Shore Protection, Volume 2
February 2010.

The following document can be cited as:

Matheny, C, G. Burns, J. G. Titus, A. Hickok, and D.E. Hudgens. 2010. "South Carolina". In James G. Titus, Daniel L Trescott, and Daniel E. Hudgens (editors). *The Likelihood of Shore Protection along the Atlantic Coast of the United States. Volume 2: New England and the Southeast.* Report to the U.S. Environmental Protection Agency. Washington, D.C.



The primary referring page for this document is
http://risingsea.net/ERL/SC.html

# Chapter 3: SOUTH CAROLINA

Prepared by:

Cheryl Matheny*
Gloria Burns*
James G. Titus**
Andrew Hickok**
Daniel Hudgens**

Photos by Jim Titus

* Matheny and Burns prepared portions of the report through the section on stakeholder review, but were not involved with the final review which substantially changed the results.
** Titus, Hickok, and Hudgens undertook the final review and produced the final report.

## INTRODUCTION

The history and future of the state of South Carolina are closely tied to its location on the Atlantic Ocean. With more than 190 miles of coastline and 600,000 acres of tidal wetlands, the state has long relied on its beaches and coastal communities for recreational opportunities, commercial port access, unique natural habitats, and commercial fisheries, and as an anchor for its burgeoning tourism economy. This bountiful access to the coast has proven a key influence on the development patterns and economic vitality of the state. Unprecedented growth within its coastal environs, coupled with the implications of projected sea level rise, poses heightened concerns and challenges for the state and its coastal and inland communities in the years to come.

Although numerical projections for sea level rise vary among scientists and researchers, it is widely recognized that levels are rising. Recent projections for sea level rise estimate that over the next century the sea will rise an average of 1 foot every 50 years. Based on scientific modeling and the recorded rise in ocean levels over the last century, these estimates project an erosion rate of 200 meters along the coasts of the Carolinas given a 1-meter rise in sea level.[1] However, increased rises in global temperatures could contribute to a significant acceleration of sea level rise over the same period.

South Carolina is particularly vulnerable to the impacts of sea level rise because of a combination of low-lying topography, high storm frequency, increasing population density, and rising property values and built investments. Mounting development pressures and the race to keep pace with infrastructure needs currently command center stage for many state agencies and local governments in South Carolina. As development escalates along the coastal region, however, the combination of sea level rise and the continuation of current land use patterns will pose serious economic implications for the Palmetto State. Since 1975, 21 hurricanes and tropical storms have passed within 100 miles of the state's coastline, wielding varying degrees of impact on its coastal communities. In 1989, Hurricane Hugo dramatically increased awareness among state residents and officials of the potential risks and substantial costs associated with current growth patterns. Coastal communities along the state's entire Atlantic seaboard were barraged with flooding from a storm surge that reached 20 feet at the point of impact and was accompanied by sustained winds of 135 miles per hour. The Category Four storm left more than $6 billion in damages and the loss of 17 lives in its wake, with local recovery efforts that continued into the mid-1990s.[2]

Erosion is another costly problem that will continue to impact South Carolina beaches. Nearly $100 million has been spent to renourish and widen the state's beaches over the last decade. Estimates reveal the need for an additional $70 million in renourishment efforts for South Carolina beaches over the next five years.[3] Predictions of more active storm seasons and growing pressures to protect newer, higher-end developments along the shore will fuel the need for expanded renourishment efforts. Federal movement to shift a greater share of the funding burden for renourishment to state and local governments will present additional fiscal challenges to coastal communities.

The long-term effects and potential costs associated with sea level rise warrant proactive consideration in local and regional planning processes and extend beyond the issue of land use. Additional problems—such as increased beach erosion and flooding, migration and loss of marshes and wetlands, saltwater intrusion into coastal aquifers and water systems, and greater susceptibility to storm surge—

[1]James G. Titus, "Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners," *Maryland Law Review*, 1998.
[2]This figure includes timber losses.
[3]"Beaches Built on Shifting Sand," Sammy Fretwell, *The State Newspaper*, May 2001.

threaten the physical assets and natural amenities that contribute to the overall quality of life in our coastal communities and make them such desirable places in which to live, work, and visit. State and local response and preparation for changes in sea level will have lasting environmental, social, and economic impacts that extend well beyond our coastal communities and ultimately affect all South Carolinians.

## PURPOSE OF THIS STUDY

The purpose of this study is to develop an understanding of the anticipated local future response to sea level rise among South Carolina communities. This assessment is part of a national project in which the U.S. Environmental Protection Agency (EPA) is examining local and state policy approaches to sea level rise. By working with state and county officials, the study draws on local perspectives to identify areas that are likely to be protected from inundation as sea levels rise. Ultimately the research effort will reveal a deeper understanding of local land use policies and trends, promote an enhanced awareness among local and state decision-makers of the effect of coastal development and conservation policies and practices, and identify opportunities for policy development to address sea level rise and associated issues.[4]

The accompanying analysis generally identifies coastal areas in South Carolina considered likely to be protected from sea level rise under three distinct response scenarios. Although the study focuses on the need for local governments to assume a more proactive stance in planning for sea level rise, the study should also serve as a catalyst to engage state and private entities in planning and preparing for these changes.

The intended audience for this report ranges from EPA researchers and state policy-makers to local planners and elected decision-makers. The information presented in this report is intended as a starting point for communities, jurisdictions, and other stakeholders to initiate discussion on the implications of sea level rise and the consideration of appropriate local responses. Many of the concerns associated with sea level rise can be addressed in a more cost-effective manner if initiated before the problem becomes imminent. Land use planning and regulations—coupled with conservation efforts, capital improvements planning, and other practices that influence growth patterns—will be key in mitigating the long-term costs associated with protecting developed areas. Additional efforts that involve more detailed research, public education, and discussion forums are warranted as local jurisdictions look to identify specific resources and lands for protection and consider policies and strategies. These follow-up efforts must actively engage broad representation from diverse stakeholder groups to achieve a sea level rise response strategy that effectively and fairly balances both public and private interests.

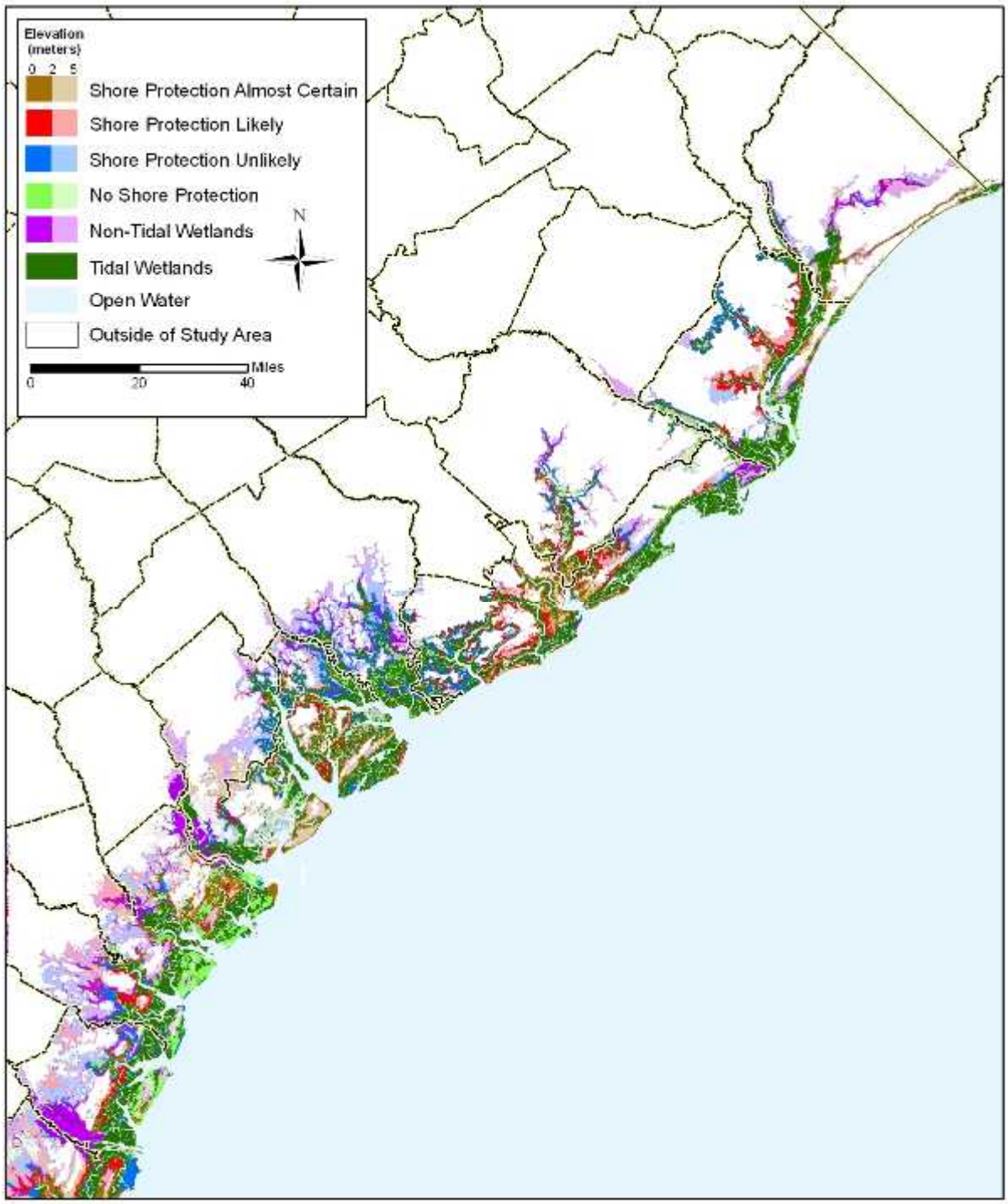
Table 1 shows the area of land vulnerable to sea level rise in South Carolina. The county-specific sections include maps displaying the area vulnerable to sea level rise. Map 1 shows the statewide results of this study.

[4]Jim Neumann, "Project Description," Industrial Economics, Inc., May 2001.

**Table 1. Area of Land Close to Sea Level by County**
**(square kilometers)**
**Elevations (m) above spring high water**

| County | 0.50 | 1.00 | 1.50 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 5.00 |
|---|---|---|---|---|---|---|---|---|---|---|
| Beaufort | 81.1 | 112.8 | 159.8 | 351.2 | 403.0 | 447.8 | 514.9 | 560.5 | 609.1 | 707.0 |
| Berkeley County | 21.7 | 38.4 | 61.6 | 100.4 | 123.2 | 147.3 | 166.5 | 215.5 | 245.2 | 291.9 |
| Charleston | 108.6 | 175.5 | 223.0 | 305.5 | 344.2 | 421.8 | 464.9 | 587.2 | 684.4 | 858.2 |
| Colleton | 58.9 | 122.8 | 157.3 | 218.9 | 296.5 | 342.3 | 391.9 | 464.2 | 513.6 | 571.0 |
| Georgetown | 32.4 | 47.6 | 78.9 | 97.7 | 140.3 | 170.6 | 221.2 | 256.3 | 394.6 | 549.6 |
| Horry | 16.3 | 48.1 | 64.4 | 100.3 | 123.3 | 167.7 | 210.1 | 265.2 | 327.9 | 429.0 |
| Jasper | 80.7 | 104.6 | 160.4 | 221.6 | 266.6 | 389.1 | 475.4 | 531.9 | 646.8 | 711.4 |
| Dorchester | 3.6 | 3.9 | 5.3 | 9.9 | 15.0 | 21.5 | 43.0 | 71.0 | 95.5 | 126.6 |
| Florence | 0.0 | 0.0 | 0.2 | 2.9 | 4.4 | 11.4 | 15.5 | 21.9 | 27.8 | 34.0 |
| Hampton | 0.8 | 1.9 | 2.5 | 5.4 | 15.3 | 20.1 | 25.5 | 33.8 | 39.1 | 43.9 |
| Marion | 0.3 | 0.3 | 0.6 | 2.7 | 4.0 | 17.3 | 22.5 | 50.3 | 55.0 | 91.0 |
| Williamsburg | 0.4 | 0.7 | 1.2 | 8.4 | 30.2 | 40.5 | 52.1 | 74.2 | 98.7 | 123.3 |
| Total | 404.6 | 656.7 | 915.1 | 1424.9 | 1766.1 | 2197.2 | 2603.5 | 3131.8 | 3737.6 | 4536.9 |

Source: Source: Titus et al. 2009. State and local governments plan for development of most land vulnerable to rising sea level along the U.S. Atlantic Coast. Environ. Res. Lett. **4** (2009) 044008 (7pp), based on the procedures in Titus J.G., and J. Wang. 2008. Maps of Lands Close to Sea Level along the Middle Atlantic Coast of the United States: An Elevation Data Set to Use While Waiting for LIDAR. Section 1.1 in: *Background Documents Supporting Climate Change Science Program Synthesis and Assessment Product 4.1*, J.G. Titus and E.M. Strange (eds.). EPA 430R07004. U.S. EPA, Washington, DC.




Map 1. Likelihood of Shore Protection in South Carolina.

METHOD

This study had three distinct phases:

*Initial Effort*. We met with state and local officials, created our original draft maps, and prepared a stakeholder review draft.

*Stakeholder Review*. We met with the local officials a second time and obtained their revisions to the maps, and documented the review.

*Final Review*. In response to the EPA project manager's review, we briefly contacted the counties and made map and text revisions to ensure methodological consistency with similar studies of other states.

**Initial Effort**

This assessment of sea level rise response in South Carolina's seven coastal counties is designed to yield three alternative scenarios that broadly indicate the lands and resources that are likely to be protected. Probable responses under each scenario are founded on existing and proposed policies, development patterns, regulations, legislation, and plans of local governments within the study area and those of relevant state agencies. It is important to note that when considering areas to be protected, the feasibility and cost of protection strategies were not explicitly considered.

To establish a common benchmark for mapping purposes and define a broad criterion for identifying potentially vulnerable lands, all land areas less than 20 feet in elevation were considered as part of the scenario mapping effort. Key resources and assets—including significant economic, residential, recreational, institutional, community facilities, natural, cultural, and historical resources—that fall under the 10-foot contour, and in some cases the 20-foot contour, are identified and briefly described under each county profile. These resources represent significant public and private investments and will warrant consideration in future local and state dialogues on response options.[5]

The responses outlined in this study were modeled under three decision-making scenarios that are assumed to occur within three distinct regulatory, political, and developmental climates:

- Under ***Scenario One***, the continued enforcement of existing plans, regulations ,and policies is assumed. The maps for Scenario One reflect existing development patterns, coupled with enforcement practices for current federal, state, and local policies. In essence, the scenario depicts all lands that "could" be protected. For the purposes of this study, federal and state wildlife refuges and preservation areas are not shown as protected from sea level rise unless there is an established precedent for protection. Because South Carolina has a history of protection measures in its state parks system, however, park lands in the study area have been included in the protected lands. Beaches are also assumed to be protected under Scenario One, based on state policy that has allowed, and encouraged, beach renourishment efforts and other soft protection measures. Areas

[5]Editor's Note: Use of the 20-foot NGVD contour does not contemplate a 20 foot rise in sea level. In South Carolina, most USGS 7.5-minute maps have 5-foot contours; but a section of the state, including Horry County and parts of adjacent counties, have only 20-foot contours, necessitating use of the 20-foot contour for the whole study to ensure consistency. EPA's approach in this project has generally been to err on the side of inclusion; as better elevation data become available, the maps created by this project can be used to analyze a subset of the study area.

that were identified through plans and interviews as offering no possibility for development, such as large expanses of riverine wetlands, were not included under the protected lands delineation.

- ***Scenario Two*** builds on the criteria of the first scenario and is modified by current and anticipated future development patterns and regulatory modifications. This scenario depicts all lands that "would" be protected. This response does not include areas identified through land use maps and plans and discussions with planning staff as sparsely developed and populated or predominantly agricultural. Areas indicated as likely to be protected include current and future development areas, major infrastructure systems (i.e., water treatment and sewer plants, ports, electric generation plants, and airports), employment centers, and culturally and historically significant areas. The initial concept of value—whether economic, environmental, or cultural—is introduced into the response model under this scenario.

- ***Scenario Three*** is driven by the hypothetical consideration of heightened values and a greater priority placed on the protection of cultural, historical, and environmental resources. Scenario Three exemplifies the concepts of "setback" and "rolling easement" in which development may be allowed in areas vulnerable to sea level rise, but where property owners who build will not be permitted to erect measures to impede rising shorelines.[6] In essence, wetlands will be allowed to migrate as sea level rises. To illustrate this concept, a theoretical buffer, or setback, was formulated that extends 150 feet landward of all identified estuarine wetlands in the study area. Areas of future development that fall below the 20-foot contour and within a generalized 150-foot buffer of estuarine wetlands are shown as unprotected in the scenario maps. For the purpose of this scenario, current development is defined as lands where development has occurred, is in the process of being built, or development plans have been introduced for activity within the next few years. Future development is that which is either anticipated in the comprehensive development plan, has the appropriate zoning designation, or has been discussed as having development potential within the next decade.

These scenarios and the types of information used to develop the accompanying maps are summarized in Table 2. Initially, we generated a map for each of the three scenarios. After the initial interviews for this study were completed, the EPA project manager realized that for some purposes it would be more useful to display all three scenarios on a single map rather than expect readers to hold the maps next to each other to observe differences. The documentation of our original effort follows the three-scenario format that the analysis actually followed. The final product, however, can be depicted using either approach. The bottom of Table 2 lists the corresponding colors used to distinguish the scenarios in the single-scenario maps.[7] The distinction between these two approaches is further discussed in the report's final section on stakeholder review.

---

[6]James G. Titus, "Rising Seas," *Maryland Law Review*, 1998.

[7]Editor's Note. Three scenarios in which land either is or is not protected would potentially result in 8 different colors (i.e. $2^3$ ) possibilities. EPA eventually realized that four of those combinations can be ignored: lands that are only protected in Scenario Three, Scenarios One and Three, scenario Two, and Scenarios Two and Three. Those scenarios are ignored for two reasons: Land that is not protected in Scenario One will not be protected in any scenario; and land protected in Scenario Three will be protected in Scenario Two. Let us examine each issue:

When we first began this study, we were under the impression that some lands not protected in Scenario One might be protected in Scenarios Two and Three; that is, there might be some areas that cannot be protected under existing policies but that—realistically—will be protected. Were we to focus solely on shoreline armoring, that would undoubtedly be the case. Nationwide (albeit not necessarily in South Carolina), property owners often get variances that enable them to construct seawalls in areas where seawalls are prohibited by law. We gradually learned, however, that beach nourishment is allowed in apparently all areas where hard structures are prohibited for beach preservation, and hard structures are allowed wherever wetland regulations prohibit fill. Therefore, all lands protected in Scenarios Two or Three will be protected in Scenario one.

**Table 2. Sea level Rise Scenario Descriptions and Data Needs**

| | ***Scenario 1*** | ***Scenario Two*** | ***Scenario Three*** |
|---|---|---|---|
| Scenario Description | Provides snapshot of existing state and local policies and practices. May not reflect what is practical or feasible and assumes static land use. | Combines existing regulatory climate with information on future development trends. Assumes practical administration of regulations and local planning insight and practices. | Builds on Scenario Two by incorporating additional consideration of areas with natural, cultural, and historic value. Assumes a higher value placed on such resources. |
| Types of Data and Information Used | State, county, and municipal comprehensive plans, zoning, land development regulations, building codes, and beachfront and wetlands management policies. | Economic trends and development patterns, population growth rates, infrastructure and community facilities plans, property values, and other indicators of likelihood of property protection. | Areas of environmental concern, wetlands maps, critical habitats, unique cultural and historical sites, inventory of lands held in conservation trusts, wildlife management areas, research sites, and other sensitive lands. |
| Color in Single-Scenario Map of Lands Protected in this Scenario | Blue, red, and brown | Red and brown | brown |
| Color of Lands Not Protected | Light green | Light green, blue | Light green, blue, red |

---

The definition of Scenario Three has evolved because of the difficulty some planners have had applying it in the original formulation. Originally, the difference between Scenarios Two and Three was that Scenario Three was an alternative policy scenario. For the most part, the alternative policy involved protecting less land in areas where the expected level of protection might cause environmental harm; but it also included a few cases of increased protection, where an imperiled community will probably be lost but perhaps ought to be protected (for example) because of cultural reasons. The latter instances have been rare—and many planners found the former instances to be difficult to identify because of the difficulty of imagining the abandonment of land for the sake of environmental protection. When we rephrased the issue as a question of probability, however, some of these planners have found it easier to distinguish lands that are certain to be protected from those that will probably be protected. The rare case of a cultural asset that may not be protected is generally addressed by coloring such areas red as well, with an explanation that the cultural asset makes it a possible candidate for protection in spite of unfavorable economics. In effect, the color red has come to signify both those lands where protection is less certain and lands where protection is more certain under the old Scenario Three than under the old Scenario Two, because in both cases the study articulates reasons for why the land might protected and might not be protected.

The information outlined in this report and the accompanying maps is derived from a combination of interviews with key state and local government representatives; reviews of existing plans, regulations, and documents; the compilation of available geographic information system data; and research into additional statistical and reference resources. Interviews on state policies and priorities relative to sea level rise were conducted with the Office of Ocean and Coastal Resource Management (OCRM) of the South Carolina Department of Health and Environmental Control (SCDHEC), the South Carolina Department of Natural Resources (SCDNR), the South Carolina Department of Parks, Recreation and Tourism (SCPRT), the South Carolina Department of Transportation (SCDOT), and the South Carolina Department of Archives and History. These interviews, policies, plans, and regulations are summarized in the section on State Agency Policies and Approaches.

Additional information and data were collected from nongovernmental entities that play a growing role in shaping state, local, and private response to development in coastal communities. These groups included The Nature Conservancy of South Carolina, the South Carolina Coastal Conservation League, and other significant conservation trust organizations and landholders operating in the coastal region. This information is summarized in the section on Nongovernmental Approaches.

Information and observations from on-site interviews with local government staff provided the foundation for developing the alternative response scenarios for each jurisdiction. Interviews were conducted with the planning and development director of each of the seven counties, along with additional discussions with zoning administrators, building officials, and other key staff as needed. These county-by-county findings are summarized in narrative form and illustrated in GIS maps in the Study Area Profiles section. A listing of key contacts and staff interviewed is included at Appendix B.

The digital data used for generating the graphic depiction of key resources areas and potential response for this report were developed using multiple sources. Shoreline data were derived from the Digital Shoreline of the United States files developed by the National Oceanic Atmospheric Administration (NOAA) Coastal Services Center. The data were originally presented in decimal degrees and referenced to the NAD83 datum, and was projected to UTM (Universal Transverse Mercator) for study purposes. Road centerlines, hydrology, and county and municipal boundaries were obtained from the South Carolina Department of Commerce and are based on 1997 TIGER files. The data projection for these sites is UTM. Estuarine wetlands were derived from the National Wetlands Inventory (NWI) data developed by the SCDNR for the U.S. Fish and Wildlife Service (USFWS). Estuarine wetlands are tidal wetlands in low-wave energy environments where the water salinity is greater than 0.5 parts per thousand. The NWI data was obtained from U.S. Geological Survey (USGS) 1:24,000 scale, 7.5-minute topographic quadrangle maps.[8] The data were collected at 1:24,000 scale and projected to the UTM coordinate system. The wetland data GIS layers used in this report are available through the SCDNR data clearinghouse[9] The clearinghouse site also includes digital representations of the outlines of natural resource areas in the state (e.g., the Frances Marion State Forest, near Charleston). These natural resource area outlines were used in the construction of Scenario One; details are provided in the individual county descriptions.

Our method for generating maps of protected areas under Scenarios Two and Three relied heavily on the delineation of county comprehensive plan areas in all of the coastal counties in the study area. These plans under the 1994 Planning Enabling Act were required between 1994 and 1999 and are being updated at five-year intervals. In general, our approach relies on the comprehensive plans developed between 1994 and 1999. When we generated the initial scenario maps (2001), we were unable to obtain digital representations of county comprehensive plans from any of the counties.

[8]The South Carolina portion of the NWI data was produced in 1989.
[9]See http://www.dnr.state.sc.us/water/nrima/gisdata/ (accessed April 1, 2004).

Therefore, in all counties we worked with the county planning staff to develop a paper version of the delineation of the relevant comprehensive plan area outlines, and then transferred this information manually to GIS files.[10]

The maps depicting Scenarios Two and Three relied on an interpretation of comprehensive plan areas as indicators of current and future land use. Each county uses a different designation scheme for plan areas—details are provided in the sections on scenario map development under each county description. The project team worked with county planning officials in each interview to identify areas that are likely to be protected (Scenario Two). In general, these lands are either currently developed or likely to be developed in the future, according to the comprehensive plan and the planners' personal knowledge of the areas in their county. The areas excluded from protection under Scenario Two are largely undeveloped and rural in character, and many have little or no current development infrastructure (e.g., paved road access, utility service). Although we tried to provide the most objective, unbiased assessment possible given the data and resource limitations of the project, when in doubt, we tended to err on the side of classifying areas as likely to be protected under a given scenario.[11]

We developed Scenario Three in much the same way as Scenario Two. For the most part, the primary distinction from Scenario Two involved identifying areas where development is planned, but not inevitable. Identifying land not protected under Scenario Three involved somewhat more planning judgment on the part of planners than identifying all land protected in Scenario Two. The 20-foot contours illustrated in this report were derived using two different data sets—digital line graph (DLG) and digital elevation models (DEM)—both produced by the USGS and obtained from the SCDNR data clearinghouse.[12] Contour data for Beaufort, Berkeley, Charleston, Colleton, and Jasper counties were developed from DEM. Because of numerous inconsistencies and widespread errors in the DEM data for Georgetown and Horry counties, DLG data were used to produce the 20-foot contours for these jurisdictions. It should be noted, however, that inconsistencies and errors were found throughout the DEM data. Although DEM data were used to generate contours for counties south of Horry and Georgetown, DLG data were also considered in questionable areas when identifying potential areas of impact and developing the accompanying text for this report.

It should be further noted that 7.5 minute series DEMs exhibit Level 1 or Level 2 horizontal and vertical accuracy that is dependent on the spatial resolution, source data quality, data collection and processing procedures, and digitizing systems. Level 1 elevation models are derived from scanning National Aerial Photography Program (NAPP) or acceptable equivalent photography, while Level 2 DEMs are smoothed for consistency and to remove systematic errors. These data often are derived

[10]We identified polygons on hard copies of the comprehensive plan maps while at the county offices. Cheryl Matheny converted the resulting polygons into digital form at her office in Columbia. Where possible, the boundaries of the polygons were geographical, political, or infrastructure (e.g., roads) already found in available GIS layers. Where polygon boundaries did not coincide with features available digitally, she mouse-edited (using the edit feature in ARCView) a boundary by eye. The mouse-editing generally was undertaken with reference to nearby geographical features. Matheny and Burns did not report the scale of their maps. As outlined in the Final Review section of this document, we concluded that their maps scale is no worse than 1:600,000, and often better, based on an overlay comparison of their polygons with the Berkeley County data, where the map error was less than 3/16th mile more than 90 percent of the time. Matheny and Burns were certain that their polygons were more precise for Beaufort, Charleston, Georgetown, and Horry counties, and no worse for the other counties.

[11]Note that the 150-foot estuarine wetland buffer area used in Scenario Three was digitally drawn in ArcView.

[12]DEMs are sampled arrays of elevation values for a series of ground positions at regularly spaced intervals. The SCDNR DEM data is 7.5 minute and corresponds to the standard 1:24,000 scale. Files are projected to the UTM coordinate system and the datum is NAD27. Topographic quads in this set were produced from 1989 to 1996.

from digitization of hypsographic and hydrographic DLG or photogrammetry data and edited for consistency. The majority of the DEMs on the SCDNR GIS data clearinghouse are only at Level 1 accuracy.

DLGs are digital representations of the features displayed on USGS topographic maps. DLGs of map features are converted to digital form from maps and related sources, collected as part of the National Mapping Program. The DLG data used for this project were derived from USGS 1:24,000 scale, 7.5-minute topographic quadrangle maps. The data were collected at 1:24,000 scale and are projected to the UTM coordinate system. DLG topographic quadrangle data were produced from 1987 to 1993. All DLG data distributed by the USGS are categorized as Level 3 (DLG-3), which means the data contain a full range of attribute codes, have full topological structuring, and have passed certain quality-control checks.

Data on the locations of significant resources were obtained from the South Carolina Department of Commerce and the University of South Carolina, and/or developed with the assistance of local officials. The data projection for significant resources is UTM.

The maps produced in this report are intended only to provide a broad illustration of possible local responses in land use to sea level rise. The maximum level of detail is 1:24,000 scale and is not parcel-specific. They are neither intended nor appropriate for use in developing or applying specific land use regulations, land acquisition efforts, or conservation programs. Additional study and more accurate mapping efforts will be required under such circumstances.

**Stakeholder Review**

The essence of this study is to create maps that make maximum use of what local planners know about projected land use and the likelihood of shore protection, rather than reflect our own expectations. Our original maps were designed to reflect those expectations. Nevertheless, only by returning to the counties and obtaining their feedback on the maps could we be certain that the maps accurately depicted their expectations.

**Final Review[13]**

We treated the original report and the stakeholder review as two separate projects. Daniel Hudgens of IEc revised the maps after the stakeholder review. As with most states, the EPA project manager revised the report to incorporate the stakeholder review while simultaneously reviewing our South Carolina study for methodological consistency with the other states.

During that review, he noticed that our approach to the area where protection is likely (but not certain) was different than the approach followed elsewhere. As with the New Jersey study, our original specification of Scenario Three had focused on identifying the best prospects for wetland migration, if policy makers were to decide that additional wetland migration is needed beyond that which can be expected under Scenario Two (i.e., if the blue and light green provide insufficient land for wetland migration).[14]

The state-specific studies that started after 2002 generally focused on identifying land for which protection is probable but not certain, which we color red. In theory, that approach does not change the

[13]This subsection was written by the EPA Project Manager, Jim Titus.
[14]See the methods section in the New Jersey report for a discussion of the even greater difficulty that study originally faced defining a meaningful Scenario Three, until they shifted to the approach of identifying land that will probably be protected.

definitions of the classifications: Lands identified for wetland migration in Scenario Three are all lands where protection is likely but not certain—"likely" because these lands are identified for protection in Scenario Two, and "not certain" because a wetland migration policy might be adopted. Conversely, lands that are likely (but not certain) to be protected are all areas where wetland migration might occur. The primary difference in approach is that the newer approach includes lands where natural shoreline migration is possible because (a) we are not certain that the land will be developed; (b) we are not certain that shore protection will be privately cost-effective or funded by governments; and (c) governments or conservancies might pursue policies to allow wetlands to migrate in these areas. The original approach of this study was to focus only on the last possibility. To be consistent with the other studies, the project manager asked us to identify any lands where future development or shore protection is uncertain.

## SOUTH CAROLINA PERSPECTIVES

### Geographic and Socioeconomic Overview of Coastal Area

The study area consists of the state's seven primary coastal counties: Beaufort, Berkeley, Charleston, Colleton, Georgetown, Horry, and Jasper (Figure 2). The land area for the study region covers more than 6,263 square miles, roughly the size of Connecticut and Delaware combined, and represents 21 percent of South Carolina's total land area.

Current population estimates for this area approach 885,000 residents—approximately 22 percent of the state's population base. As shown in Table 3, population increases in the study area over the last decade have ranged from a high of 40 percent in Beaufort County to a low of 5 percent in Charleston County. Population projections to 2015 reveal growth rates that range from a low of 22 percent in Charleston County to more than 69 percent in Beaufort County. Four of the seven counties in the study area—Beaufort, Jasper, Horry and Georgetown—currently rank among the top 10 fastest growing counties in South Carolina. This dramatic growth is fueled by the in-migration of retirees and the growing popularity of the South Carolina coast as a year-round destination.

**Table 3. 2000 Population in South Carolina Coastal Counties and Change from 1990**

| County | 2000 Population | Percent Change |
|---|---|---|
| Beaufort County | 120,937 | 39.9 |
| Berkeley County | 142,651 | 10.9 |
| Charleston County | 309,969 | 5.0 |
| Colleton County | 38,264 | 11.3 |
| Georgetown County | 55,797 | 20.5 |
| Horry County | 196,629 | 36.5 |
| Jasper County | 20,678 | 33.5 |
| State of South Carolina | 4,012,012 | 15.1 |

(Source: US Census Bureau, 2001)

In economic terms, the study area represents a growing portion of the state's total assessed value and nearly 22 percent of all jobs and 25 percent of employers. Tourism has emerged as South Carolina's primary growth industry at more than $15 billion annually, with the seven-county study region comprising approximately two-thirds of the state's annual tourism income. Capital investment in tourism has surpassed $1 billion, and state economic officials estimate that one job is created for every 120 visitors. Tourists to the Grand Strand, Hilton Head, and Charleston areas alone account for approximately $5 billion of the $9 billion spent by tourists in the state each year. These coastal destinations also bring in three-fourths of the state's accommodations tax revenue (nearly $23 million) and nearly two-thirds of its admissions tax revenue (more than $16 million). The largest share of the admissions tax is generated by golf, which has the strongest presence in the coastal region. These figures do not include the additional income to state and local governments generated through excise and property taxes. The future of the coastal region as an engine for the state's tourism industry is evidenced by notable increases in the tourism sectors that are well-represented along the coast—heritage tourism, wildlife areas, and historical homes and sites.[15] The rich coastal resource base of natural scenery and historic sites has also become a magnet for the state's growing film industry, with

[15]SC Department of Parks, Recreation and Tourism, *2000 SC Statistical Abstract*.

coastal communities such as Beaufort, Charleston, and Georgetown serving as frequent backdrops for numerous film and television productions.

Commercial seafood fisheries on the coast contribute more than $31 million in dockside values to the state's economy each year, and an additional $186 million is generated annually through commercial timber activities in the region.[16] The region is also home to three commercial ports, located in Charleston, Port Royal, and Georgetown. Collectively, ports activity at these facilities contributes more than $10 billion in sales and $2.6 billion in wages, generates $314 million in tax revenue, provides 83,000 jobs directly and indirectly, and processes more than 12.7 million tons of cargo with a dollar value of nearly $30 billion.[17]

**Resources and Assets**

The seven-county region is home to significant natural, cultural, and man-made assets. Among these many resources are four federal military installations; two National Estuarine Research Reserve System (NERRS) sites; nine State Parks and two State Historical Sites; more than 200 National Register Sites, Districts, and National Historic Landmarks; three commercial ports; 115 miles of two Interstate highways; 45 municipalities; one National Forest with more than 250,000 acres; nine colleges and universities; two international jetports; 23 State Heritage Preserve Sites totaling more than 56,500 acres; and vast archeological resources. Many of these assets fall either entirely or partially below the 10- and 20-foot contours developed under this study and are considered potentially vulnerable to sea level rise. These resources are identified and further detailed within the individual county profiles presented in the Study Area Profiles section.

**Development Trends**

South Carolina ranks as the tenth fastest growing state in the nation. Although it is only 40th in total land area, the state has experienced a 15 percent increase in population over the last 10 years. The annual number of residential building permits increased by more than 62 percent statewide during the 10-year period from 1989 to 1999. Within the study area, permit activity for both residential and commercial construction continues to escalate at rates greater than the state averages.

In past decades, geography and natural features such as unfavorable soil conditions and wetlands restricted growth in certain regions of the state, especially along the coastal zone and coastal plain. Almost one-fourth of the state is considered wetlands. Only four other states have a higher percentage of wetlands than South Carolina—Alaska, Florida, Louisiana, and Maine. South Carolina's 4.5 million acres of wetlands constitute nearly 12 percent of the total wetland area of the southeastern United States. However, increased development pressures have resulted in the destruction of significant portions of sensitive wetland areas. Of the total wetland losses tallied in the last two decades, 84 percent have occurred in the southeastern states. From the mid-1970s to mid-1980s alone, South Carolina lost an estimated 61,000 acres of wetlands. Increased efforts to protect and enhance the state's wetlands resources have slowed this decline with a goal of no net loss of wetland area. Ninety percent of the state's wetlands are freshwater, and the remaining 10 percent are saltwater or brackish marshland.

[16]Figure reflects delivered value of timber in seven-county region. *SC Statistical Abstract*, 2000–2001.
[17]"Fact Sheet: South Carolina's Ports, FY2000," South Carolina Ports Authority, 2001.

The expansion of water, sewer, and transportation infrastructure, however, has alleviated many of the historical limitations to development in many areas of the state. The unchecked migration of new development into environmentally sensitive areas poses new threats to the state's historic and natural heritage. South Carolina continues to lose farmland and open space at a rate far greater than the rate of population growth. Recently released studies on land use planning and open space/farmland protection in South Carolina reveal that the state ranks among the lowest in the nation in the protection of open space, wildlife habitat, and prime farmlands.

These statewide development trends are magnified along the coastal region. For instance, in the Berkeley-Charleston-Dorchester planning region, population growth will be outpaced by an increase of urban land use of nearly 250 percent, with the Charleston metropolitan area projected to eventually surpass the size of the current Charlotte, North Carolina, metropolitan area.[18] With easy access to I-26 and I-95 and the nation's fourth largest and most active port on the eastern seaboard, the region is home to diverse cultural and tourism activity, manufacturing and shipping interests, and higher education, military, and medical facilities. Despite economic losses due to military downsizing, the three-county region is anticipated to experience a 22 percent increase in population and a 50 percent rise in employment opportunity by 2015.

Dramatic residential and commercial growth will also continue to characterize the Waccamaw and Lowcountry planning regions and further transform South Carolina's coastal landscape. Traversed by the north-south I-95 corridor, the Lowcountry region has long been a destination for tourists and retirees. As growth from Hilton Head Island spills over to the mainland and residential development expands outward from the Beaufort area, this area will become the second fastest growing region in population at 35 percent. The region will also lead the state in employment growth, along with the neighboring Berkeley-Charleston-Dorchester region, at 50 percent from 1995 to 2015. Beaufort and Jasper counties represent two of the state's 10 fastest growing counties, ranking first and fourth out of the 46 counties, respectively.

The Waccamaw Planning Region encompasses the northeastern coastal area of the state, which includes Myrtle Beach and the port city of Georgetown. The region is dominated by the tourism-rich 60 miles of beaches collectively known as the Grand Strand. Horry and Georgetown counties represent two of the fastest growing counties in the state, currently ranking second and eighth out of the 46 counties, respectively. Population in the region is projected to increase by 41 percent with employment gains of 32 percent through 2015.

**Legal Foundations of State Policies and Regulatory Oversight**

> It has been clearly demonstrated that the erosion problems in South Carolina are caused by a persistent rise in sea level, a lack of comprehensive beach management planning and poorly planned oceanfront development, including the construction of hard erosion control structures.
>
> 1988 SC Beachfront Management Act

Coastal development in South Carolina is influenced by multiple federal and state laws. At the national level, various legislation, including the Coastal Barrier Resources Act of 1982, the Coastal Barrier Improvement Act of 1990, the Clean Water Act (Section 404), the 1985 Food Security Act, the 1990

[18]Strom Thurmond Institute, "Charleston 2030 Urban Growth Study," 1997.

Food Agriculture, Conservation and Trade Act, and the River and Harbors Act (Section 10), provide the foundation for federal and state regulatory efforts to protect coastal and wetland environments. Recognizing the uniqueness and value of its coastal resources, South Carolina has enacted additional legislation to shape development in its sensitive coastal areas. The 1977 Coastal Zone Management Act and the 1988 Beachfront Management Act have been instrumental in the state's effort to promote responsible development along its coastline.

The South Carolina Coastal Zone Management Act was enacted in 1977 to provide for the protection and enhancement of the state's coastal resources. In the face of rising development pressures and the growing popularity of South Carolina's beaches, however, the act proved to be ineffective in preventing the location of structures too close to the eroding shoreline. With increased vulnerability to storms and high tides, affected property owners promptly applied for permits to construct seawalls and revetments. As these hard erosion control devices proliferated, they began to measurably contribute to increased erosion, a lowering of the beach profile and a decrease in the ability of the beach/dune system to protect upland properties from storms and high tides, further exacerbating the problem.

In response to the problems and concerns raised under implementation of the 1977 act, the South Carolina Beachfront Management Act was passed by the South Carolina General Assembly in 1988. It was subsequently amended and strengthened in 1990 to expand the state's jurisdiction over coastal development. The goals of the 1988 act include:

- Protection, preservation, restoration, and enhancement of beach and dune systems;
- Implementation of a retreat policy;
- Improvement of public access;
- Protection of endangered species habitat;
- Development of an organized disaster response plan;
- Improvement of the coastal processes database; and
- Enhancement of public awareness on coastal issues

The 1988 act, as adopted, prohibited all new construction seaward of the established baseline. This provision, however, soon became the focal point of the 1992 landmark Lucas takings case (Lucas vs. South Carolina Coastal Council), which resulted in a relaxing of the state's 1988 ban on all new construction seaward of the baseline. The U.S. Supreme Court reversed an earlier S.C. Supreme Court ruling in favor of the South Carolina Coastal Council, the initial agency established to enforce the Beachfront Management Act provisions. In a concurring opinion, however, Justice Kennedy noted that "coastal property may present such unique concerns for a fragile land system that the State can go further in regulating its development and use than the common law of nuisance might permit…."[19] The subsequent shift in enforcement focused more on the prohibition of seawalls and other hard erosion control structures and less on the prohibition of all structures seaward of the baseline. The 1990 amendment allowed the construction of structures seaward of the baseline, while incorporating size restrictions on structures and requiring owner removal or relocation of new structures should the baseline move inland.

Today, the 1977 Coastal Zone Management Act, as amended, rejects the construction of new erosion control devices and adopts retreat and renourishment as the basic state policy toward preserving and restoring South Carolina's beaches. The state's beachfront jurisdiction has been scientifically linked to erosion rates and dune lines, with areas of significant vulnerability subject to greater setbacks. The

[19]Bradford Wyche, "Lucas vs. South Carolina Coastal Council: Hard Facts, Bad Law," November 1992.

regulations now allow new construction, but limit the size of buildings within the predicted erosion zone, with proposals reviewed on a case-by-case basis.

Ironically, the most recent legal challenge to the state's enforcement of the Beachfront Management Act has emerged from conservation and environmental groups. The state agency tasked with enforcement of the Act, the Office of Ocean and Coastal Resource Management (OCRM), has traditionally viewed groins as permissible under the Beachfront Management Act and exempt from the prohibition of hard structures, traditionally defined as seawalls, bulkheads, and other hard measures constructed parallel to the shoreline. The perpendicular groin structures were commonly viewed as part of the nourishment effort along many of the state's beaches. A recent ruling by the State Court of Appeals However, ruled in favor of the SC Coastal Conservation League and the Sierra Club and reversed OCRM approval for the refurbishment and construction of groins on Hilton Head Island. The decision concludes that groins are prohibited structures under the Beachfront Management Act.[20] This case overturned previous rulings by the SC Administrative Law Judge, the Coastal Zone Management Appellate Panel, and the State Circuit Court, which upheld the OCRM permit approvals. If the new ruling stands, it will have significant effect on current beach renourishment policies and practices along the state's public and private beaches. At present, there are 150 groins along the South Carolina coast, most of them constructed in the 1980s. Critics charge the prohibition of groins will result in more frequent and costly renourishment efforts, while advocates of the groin ban cite potential problems created by erosion on beaches below the groin structures and the impediment of the natural accretion of sands. The OCRM is anticipated to appeal the decision, and local and state officials are pursuing legislative remedies to allow groins.

The Beachfront Management Act clearly regards the management of South Carolina's beachfront areas as a shared responsibility between local governments and the state. Local governments are encouraged to develop beachfront management plans that complement and assist in implementing the policies of the Beachfront Management Act. These individual plans are incorporated into the 10-year State Beachfront Management Plan. The legislation states that for a local government to be eligible for beach renourishment funds, it must develop and implement a local beachfront management plan. Local plans must address the following 10 elements:

- An inventory of erosion rate data and processes;
- An inventory of public access points, parking, and a plan for improving access and parking;
- An inventory of all structures located seaward of the setback line;
- An inventory of turtle nesting sites and other important habitats of the beach/dune system and protection strategies;
- A conventional zoning ordinance and land use plan;
- An analysis of erosion control alternatives;
- A drainage plan for the area seaward of the setback zone;
- A post-disaster plan;
- A detailed strategy for achieving the legislative goals of the act by the end of the 40-year retreat period; and
- A detailed strategy for achieving the goal of preservation of public access to assure full and complete enjoyment of all residents of this state

The act also requires that beachfront communities develop a policy of limiting the size of structures and encouraging siting away from the beachfront by reducing front yard setback requirements,

[20]SCELP Updates, "Port Royal Plantation," 2001 and SC Judicial Department Opinion 3358, June 2001.

increasing rear yard (oceanfront) setbacks, limiting the size of accessory structures in the setback zone, limiting the size of the primary building footprint, and restricting the use of impervious surfaces.

The ability of local counties and municipalities in South Carolina to direct and regulate development is based on planning enabling legislation. Local government planning authority is now derived from the South Carolina Local Government Comprehensive Planning Enabling Act. The 1994 act consolidated existing planning legislation, previously found in a scattered and often conflicting series of legislation, into a single reference in the State Code of Laws. The Planning Act also updated planning practice and methods and mandated local compliance with state planning requirements by May 1999. As a result, all local governments, both county and municipal, were required to prepare or update their comprehensive development plans to retain legal validity as a basis for zoning and other land use regulations. Of particular benefit to this study is that all plans for the counties that comprise the study area are relatively new—having been completed between 1997 and 1999. Facilitation of the sea level rise discussion in South Carolina is timely in that all local comprehensive plans in the study area will be up for review and revision within the next three to five years.

## State Agency Approaches

Interviews on state policies and priorities relative to sea level rise were conducted with the Office of Ocean and Coastal Resource Management (OCRM) of the South Carolina Department of Health and Environmental Control (SCDHEC), the South Carolina Department of Natural Resources (SCDNR), the South Carolina Department of Parks, Recreation and Tourism (SCPRT), the South Carolina Department of Transportation (SCDOT), and the South Carolina Department of Archives and History (SCDAH). The sections that follow provide a summary of these interviews and discussions with key state agency officials, coupled with reviews of legislation, plans, and other resources that influence the enforcement, financing and maintenance of development and resources within the state's coastal environs.

### *South Carolina Office of Ocean and Coastal Resource Management (OCRM)*

The OCRM operates under the umbrella of the SCDHEC. The office is tasked with administering and enforcing the provisions of the Beachfront Management Act and has been granted authority over the state's beaches and critical coastal environs. Critical areas include coastal waters, tidelands, beach/dune systems, and beaches. As such, OCRM is currently considered the state's lead agency for sea level rise and associated issues. Rob Mikell, manager of the Federal Certification Section of OCRM, and Bill Eiser, staff oceanographer with the Beachfront Management office, were interviewed on current policy directions and potential response to sea level rise. OCRM staff also provided additional written plans and policy information that outlined the role and position of the office in coastal management and development.

OCRM is divided into regulatory and planning divisions. The regulatory division oversees beach renourishment and monitoring, State Coastal Zone Management Certification, freshwater certification, stormwater permits, critical area permitting, and Federal Coastal Zone Management Certification. The office processes approximately 3,500 permit actions annually in the areas of Critical Area Permitting, Stormwater Permitting, and State and Federal Coastal Zone Consistency Certification. Permitted projects range from roads, bridges, marinas, and bulkheads to malls, subdivisions, and industries.

The office maintains multiple permitting processes for projects within the coastal zone to address both beachfront and tidal development. Before any state or federal permit is issued for a development

project in the coastal zone, OCRM must certify the project as consistent with state coastal zone management policies. The Coastal Zone Consistency Certification process is required of any project in South Carolina's eight coastal counties. Critical area permitting occurs in defined tidelands, coastal waters, beaches, and dune systems and is defined by salt marsh. Actions requiring permits within the critical area include the construction of docks, marinas, bulkheads, and ramps, and dredging and fill efforts.

As part of its beachfront management jurisdiction, the office establishes its jurisdictional line based on an analysis of erosional data. The baseline is set at the crest of the primary dune. Where the dune system has been altered through man-made or natural means, DHEC must calculate the baseline based on available scientific and historical data. The setback is then set landward of the baseline at a distance that is 40 times the documented average erosion rate, but not less than 20 feet. Under this formula, the state's more stable beaches could have as little as a 20 foot setback, while more dynamic beaches that experience marked erosion can have a setback of 400 feet. The original intent of the 1988 act was to prohibit construction forward of the baseline. The loss of the Lucas case, however, contributed to the dilution of the state's 40-year retreat policy. Now, the DHEC must limit its active enforcement to restricting the size of the structure and its location within the lot.

OCRM is also tasked with freshwater wetland protection within the coastal region. The basic policy emphasizes the avoidance of development in or alteration of wetland areas. Wetlands of less than one acre can be altered, however, provided that other larger areas on the property are protected through buffering or other mitigation efforts. At present, the state wetlands jurisdiction is established at the "critical line" where wetlands end, with no setback requirement to allow for natural dynamics of migration. As such, Scenario Three of the sea level rise study is highly dependent on major shifts from current state wetlands policy concerning the erection of property protection measures. Should the State adopt a stronger stance that allows for migration of wetlands inland as sea level rises, however, it is anticipated that this policy would entail the use of fluid setbacks and baselines similar to those used by OCRM for beachfront areas.

OCRM also administers the stormwater management programs of the state's coastal counties. The coastal stormwater management program requires the submission and implementation of sediment control plans for all new developments to prevent silt and mud from entering surrounding wetlands and water bodies.

In addition to regulatory enforcement, OCRM carries out mandated and special planning activities. In accordance with the 1988 act, the State Beachfront Management Plan is prepared by the DHEC and incorporates each local beachfront management plan. The plan covers a 10-year period and is subject to review and amendment every 5 years. Under the planning requirements, local governments must include provisions in land use plans, zoning ordinances, building codes, and subdivision regulations that address structure abandonment and removal from the setback zone. Communities are encouraged to develop policies that limit the size of buildings and encourage siting away from the beachfront. At present, 15 community plans are on record for Horry County, Pawley's Island, Myrtle Beach, Sullivan's Island, Georgetown County, North Myrtle Beach, Isle of Palms, Surfside Beach, Edisto Beach, Beaufort County, Hilton Head Island, Atlantic Beach, Folly Beach, Seabrook Island, and Kiawah Island. Participation in the beachfront planning effort is required of all jurisdictions that receive state funding for beach nourishment and access improvement efforts.

The South Carolina Beach Restoration and Improvement Fund was established under the Beach Restoration and Improvement Trust Act to:

- Provide matching funds to qualifying municipal and county governments for the restoration of eroded public beaches and the improvement and enhancement of public beach access;
- Restore beaches and protective sand dunes on an emergency basis after significant storm damage; and
- Monitor and evaluate annual erosion rates and hazard areas for all state beaches

Coastal Access Improvement Grants are administered through OCRM to support access improvements for South Carolina beaches. Local governments must identify and inventory all public access points in preparation of local beachfront management plans. State policy provides a necessary link between public access and beach renourishment funding eligibility. The competitive grant program provides matching funds to local governments for projects intended to improve public access. Privately owned beaches are not eligible for funding support. In addition, the Town of Hilton Head Island has become relatively self-sufficient in renourishment funding through the designated allocation of A-Tax (accommodations and admissions tax) revenue allocations to beach improvement efforts.

***South Carolina Department of Natural Resources (SCDNR)***

The SCDNR is tasked with stewardship of the state's rich natural resource base through the pursuit of policies and programs for the conservation, management, utilization and protection of these natural resources. The department administers multiple programs that affect coastal resources under three main divisions: the Marine Resources Division; the Wildlife and Freshwater Fisheries Division; and the Land, Water and Conservation Division. The Marine Resources Division manages programs that include endangered species, fisheries management, and marine research. The Wildlife and Freshwater Fisheries Division is tasked with management of SCDNR lands, wildlife diversity programs, and the SC Heritage Trust Program. The Land, Water and Conservation Division has responsibility for the GIS data clearinghouse, NWI mapping, the National Flood Insurance Program (NFIP) and the SC Flood Mitigation Program. SCDNR resources and programs will be instrumental in developing local and state responses and addressing the interrelated issues associated with sea level rise. Michael Criss, assistant director for Planning and Policy at SCDNR, was consulted for additional planning insight into agency resources.

As part of its formal consultation process with OCRM, the SCDNR provides review and comment on OCRM permit actions in coastal counties. Also of significance to future sea level rise response and particularly the issue of wetland migration, the SCDNR operates a system of State Heritage Preserves that are managed under its Wildlife Diversity Section. More than a third (24) of the state's 62 Heritage Preserves are found within the seven-county coastal study area and cover more than 56,500 acres. These Heritage Preserves are intended to protect endangered or threatened species, but occasionally include historic sites, and are either under direct DNR ownership or are managed through easements and agreements with private landowners and other groups. Because such sites are protected from further development, these lands (when identified through plans or interviews) are shown as unprotected in the scenario maps. Each preserve is detailed in the individual county profiles in this report.

***South Carolina Department of Archives and History (SCDAH)***

The SCDAH is the state agency responsible for promoting the identification and preservation of the South Carolina's vast historical and cultural resources. In addition to providing technical assistance to local governments and other community groups in historic site identification, restoration, and planning, SCDAH administers a small grants program to support the preservation of historically significant properties. Because of the significant number of cultural and historic resources within the study area

that fall within the 20-foot contour, Archives and History staff were consulted for possible state responses to sea level rise and the potential impact on historic properties. Nancy Brock, Review and Compliance program coordinator, noted that sea level rise is not a current issue in agency planning and programming, but that there is a growing emphasis on protection of historic resources from the threat of natural disasters such as storm surge and flooding from hurricanes and storms. Although not a part of planning at this time, the implications of sea level rise on historic preservation efforts are likely to emerge as a consideration as specific properties and sites become threatened and the prioritization of resources for protection becomes necessary. The SCDAH participates in OCRM's formal review and consultation process on permit actions.

### *South Carolina Department of Parks, Recreation and Tourism (SCPRT)*

There are nine state parks and two state historic sites within the seven-county study area. The Department of Parks, Recreation and Tourism recently completed a new strategic plan that outlines guiding principles for the management of South Carolina's 45 operational parks and 8 historic properties. Based on discussions with Tony Bebber, planning manager at SCPRT, the department's policy is driven by the principles of sustainability and stewardship. Using an ecosystem-based approach, "parks will no longer be managed as discrete parcels of land" and impacts on entire ecosystems and surrounding environs will be considered when implementing sustainable practices.[21] Under this policy, SCPRT will most likely employ only soft abatement measures in its coastal properties. Renourishment on state park beaches in South Carolina has been a standard practice, with the use of groins commonly included as part of the stabilization effort. The department has not specifically addressed sea level rise in its long-range planning process to date, but anticipates incorporating sea level rise strategies in future park management plans on an individual park-by-park basis as the need becomes more evident.

### *South Carolina Department of Transportation (SCDOT)*

More than 1,500 miles of primary and 4,600 miles of secondary state highway system roads serve the seven coastal counties in this study. The state's Department of Transportation has not considered sea level rise and has no plans to address the issue as a part of infrastructure planning. Discussions with Ron Altoff, assistant director of Planning at SCDOT, predict that chronic, short-term concerns over adequate funding and prioritization for routine maintenance and replacement of roads and bridges will continue to take precedence and relegate long-term planning concerns such as sea level rise to the back burner. As bridges and roads are scheduled for replacement and significant upgrades, the prerequisite extensive engineering work will identify floodplain, wetland, and water level changes and the issue will be addressed on a case-by-case basis.

## Nongovernmental Approaches

When examining response to sea level rise in South Carolina, it is important to consider nongovernmental entities that are playing a growing role in shaping state, local, and private response to development in coastal communities. These groups include The Nature Conservancy of South Carolina, the South Carolina Coastal Conservation League, the SC Waterfowl Association, and other significant conservation trust organizations and landholders operating in the coastal region. Currently nine recognized land trusts are operating in the coastal region of the state: the Beaufort County Land Trust, Edisto Island Open Land Trust, Hilton Head Island Land Trust, Kiawah Island Natural Habitat

[21]SC Parks Strategic Plan, State Parks: The Vision for the 21st Century, SCPRT, 2001.

Conservancy, Lord Berkeley Conservation Trust, Lowcountry Open Land Trust, Palmetto Conservation Foundation, South Carolina Battleground Preservation Trust, and the South Carolina Nature Conservancy.[22] The Nature Conservancy of South Carolina manages 15 preserves and has protected 173,000 acres of the state's wetlands, forests, and coastline through direct purchase, easements, and partnership development. Public and private conservation efforts within the state's coastal region are further augmented and coordinated through a system of focus area task forces, the most notable of which is the ACE Basin Task Force. These task forces are comprised of representatives from public and private interests that include the USFWS, the US Forest Service, SCDNR, corporate and individual landowners, and nonprofit land trusts. Such organizations will continue to be particularly valuable in future efforts to protect sensitive lands from development and in the acquisition and management of areas necessary for wetland migration.

**Summary of Federal, State, and Local Responsibilities**

The level of involvement and the roles of federal, state, regional, and local government agencies, along with key nonprofit and private groups, are summarized in Table 4.[23] Each entity is listed with areas of responsibility indicated as follows:

- MGT–Management of Sensitive Lands
- REG–Regulation and Permitting
- RST–Restoration and Creation of Wetlands and Sensitive Habitats
- ACQ– Acquisition of Lands and Easements
- RES–Research and Data Collection
- DEL–Delineation and Inventory
- PLN–Planning

**Table 4. Coastal Beach and Wetlands Activity by Federal, State, and Local Agencies and Selected Nongovernmental Organizations in South Carolina**

| ***Agency/Organization*** | ***Organizational Role*** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ***MGT*** | ***REG*** | ***RST*** | ***ACQ*** | ***RES*** | ***DEL*** | ***PLN*** |
| ***Federal*** | | | | | | | |
| USDA | | ✓ | ✓ | | ✓ | ✓ | |
| NOAA | ✓ | ✓ | | | ✓ | | |
| US Army Corps of Engineers | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| US Fish & Wildlife Service | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| US Forestry Service | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| US Geological Survey | | | | | ✓ | | |
| US National Park Service | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| EPA | | ✓ | | | ✓ | ✓ | ✓ |
| ***State*** | | | | | | | |
| SC Department of Natural Resources | ✓ | | ✓ | | ✓ | ✓ | ✓ |
| SC Dept. of Health & Environmental Control | | ✓ | | | | | |
| Office of Coastal Resource Management | | ✓ | | | | ✓ | |

[22]Land Trust Alliance, Listing of Land Trusts in South Carolina, 2001.
[23]Adapted from *County of Charleston Comprehensive Plan*, Table 6.1.6, 1999.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SC Parks, Recreation and Tourism | ✓ | | ✓ | ✓ | | | ✓ |
| SC Department of Transportation | ✓ | | ✓ | ✓ | ✓ | | |
| SC Forestry Commission | ✓ | | | | | | ✓ |
| SC Land Resources Commission | ✓ | | | | | ✓ | |
| SC Water Resources Commission | | ✓ | | | | ✓ | |
| SC Heritage Trust Program | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| State Research Universities (USC/Clemson) | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| ***Local*** | | | | | | | |
| Municipalities | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Counties | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| Regional Councils of Government | | | | | | | ✓ |
| ***Private and Nonprofit*** | | | | | | | |
| SC Coastal Conservation League | | | | | ✓ | | ✓ |
| Nature Conservancy of South Carolina | ✓ | | ✓ | ✓ | | | ✓ |
| Ducks Unlimited | ✓ | | ✓ | ✓ | | | |
| SC Waterfowl Association | ✓ | | ✓ | ✓ | | | |
| Local and Regional Land Trusts | ✓ | | ✓ | ✓ | | | |

**Study Area Profiles**

Each county in the study area is profiled in the narrative that follows with an overview of geographic conditions, social and economic trends, development patterns, and growth projections. A brief inventory of key resources and assets of each county that fall below the 10- and 20-foor contours and are potentially impacted by sea level rise has also been included. These resources are summarized in four categories:

- Economic Resources
- Cultural, Historic and Natural Resources
- Community Facilities and Infrastructure
- Resort and Residential Assets

Both the real and perceived value of these resources will play a key role in state and local decisions relative to sea level rise and the protection of lands. Each profile concludes with an overview of the local planning and regulatory climate and a discussion of the three response scenarios to sea level rise. Also following each county profile narrative and scenario discussion is a series of 2 maps: a location map that depicts county boundaries, municipalities, major river systems, military installations and state parks; a county outline map showing land areas below the 20-foot contour. The shore protection scenario maps are depicted in the Stakeholder review section.[24]

[24]The draft report had three maps corresponding to the three shore protection scenarios, but the county reviewers chose to comment on the all-scenario maps rather than the single scenario maps, so the authors followed their lead and display only the all-scenario maps.

## HORRY COUNTY

### Geographic and Socioeconomic Profile

Located in the northeastern corner of the state, Horry County is the largest of the state's 46 counties in total land area, covering nearly 1,134 square miles—larger than the entire state of Rhode Island. The county boasts 35 miles of beachfront, collectively known as the Grand Strand. The county is bounded by North Carolina to the north, Georgetown County to the south, and the Lumber, Little Pee Dee, and Great Pee Dee rivers to the west and southwest. The eastern segment of the county is separated from the remainder of the county by the Intracoastal Waterway. The topography is predominantly level to gently sloping, with elevations ranging from sea level to 100 feet.

Horry is South Carolina's second fastest growing county, with a current population of more than 196,600 residents. County growth rates have consistently outpaced state averages by more than double. During the height of its tourist season, however, an additional 400,000 to 500,000 visit the county, with the majority of both residents and tourists concentrated in the eastern half of the county near the coastline. Projections show an estimated seasonal peak day of 890,000. With a population density of more than 173 persons per square mile, the county is one of only nine Metropolitan Statistical Areas (MSA) in the state. The county has been consistently recognized as the second fastest growing metropolitan region in the nation.

Of the county's eight municipalities, five are located on the coastline. The largest incorporated municipality in the county is the City of Myrtle Beach, which has a permanent population that exceeds 22,750 residents and 10 miles of beachfront. The City of North Myrtle Beach is the second largest municipality with a population of slightly under 11,000. Other incorporated beach communities include the historically black Town of Atlantic Beach with 351 residents, the Town of Briarcliffe Acres with a population of 470, and the City of Garden City with more than 9,350 residents. Known as the "River City," the inland City of Conway has a population of 11,788 and serves as the county seat. The Conway area experienced severe flooding problems following Hurricanes Floyd and Fran. Flood mitigation and property acquisition efforts have centered around Conway in areas adjacent to the Waccamaw River.

Tourism is the dominant industry of the county, with more than 13.4 million visitors and $20 million in accommodations and admissions tax revenue generated locally each year. Accordingly, the trade and services sectors dominate the employment base. The center of economic activity is the tourist mecca of Myrtle Beach, which contributes nearly 50 percent of all retail sales and jobs and 62 percent of service jobs. (See Photos 1 to 3.) Manufacturing represents a much smaller portion of the economy than the state as a whole. Although agriculture represents a declining force in the county's economy, it continues to make a notable contribution. The value of the county's tobacco harvest ranks fourth highest among all 580 tobacco-producing counties in the nation. Horry also leads the state in the value of commercial timber harvests, with a delivered timber value of $50.4 million in 1999. Nonindustrial private forests are 76 percent of the forestlands. Timber ranks second behind tobacco as the primary cash crop in the county.

**Photos 1 to 3. Myrtle Beach.** These photos show the Atlantic beach at 43rd, 34th, and 24th streets (north), respectively. April 2004.

**Key Resources and Assets**

The county's key assets and resources range from industrial sites and unique habitats to resort and tourism centers. The most significant of these resources, which have been identified as potentially affected under the proposed sea level rise scenarios and lying within the 20-foot contour boundary, are summarized in the sections that follow.

*Economic Resources.*

Excluding governmental employment, the county's largest single employers include only one manufacturer, three hospitals, and two resort developments. Manufacturer AVX provides 2,223 jobs, Ocean Dunes Resort employs 935, and Kingston Plantation employs 600 in the peak season. The Grand Strand Medical Center and the Conway Hospital each employ approximately 800 residents. In the governmental sector, the City of Myrtle Beach employs 700, and Horry County government employs more than 1,500.

*Cultural, Historic, and Natural Resources*

The county has two National Register Historic Districts (the Conway Downtown Historic District and the Waccamaw River Warehouse District) and 19 buildings, structures, and sites on the Register. The majority of these sites are located in the Conway area, west of the waterway. More than additional 420 properties have been identified as potentially eligible for National Register designation. More than 400 archaeological sites have been identified in the county.

The South Carolina Natural Heritage program has identified as endangered or threatened three plant and four animal species, along with 44 other species of special concern. Horry also has an extensive network of Carolina Bay formations: 300 have been identified and 200 have been placed under protection through easements and acquisition. Horry County has four State Heritage Preserve sites totaling 21,846 acres. Cartwheel Bay (568 acres) comprises a network of Carolina bays that provides habitat for rare plant species, including orchids and Venus flytraps. Lewis Ocean Bay (9,393 acres) is a vast complex of 20 Carolina bays with diverse species habitat. The Little Pee Dee Preserve (6,538 acres) protects 17 miles of river frontage along the Little Pee Dee River. The preserve hosts cypress-gum swamps, hardwood forests, and sand ridges. The Waccamaw River Preserve (5,347 acres) follows the Waccamaw River from the North Carolina state line southward to Red Bluff. The preserve is characterized by bottomland hardwood forests and sandy beaches. The Bucksport Wildlife Management Area (7,661 acres) is located in the southeast section of the county and provides managed hunting activity.

In addition to these areas, the USFWS is proposing the acquisition of nearly 50,000 acres of coastal floodplains between the Great Pee Dee and Waccamaw rivers in Horry and Georgetown counties. The proposed Waccamaw National Wildlife Refuge would protect endangered species, provide managed habitat for migratory birds, and provide additional recreational and educational opportunities. Additional efforts are under way to protect the Waites Island area located in the Little River inlet near the county's border with North Carolina. Waites is one of the last undeveloped, but accessible, barrier islands offering 800 acres protected to some degree by its designation under the Coastal Barriers Resources Act.

Commercial fishing activity consists primarily of the harvesting of whole fish and crabs. Horry ranks third among the coastal counties in seafood fish landings and dockside values. Recreational and subsistence fishing also includes shellfish harvesting in tidal flats. (See Photo 4.)

**Photo 4. Shellfish Harvesting near the M Junter Taylor Bridge west of Garden City.**

*Community Facilities and Infrastructure*

Community facilities and key infrastructure potentially affected under the proposed scenarios include an electric generating station, landfill, wastewater treatment facilities, higher education institutions, and an airport. More than 340 road miles of primary state highway system run through Horry County, including US 17, US 501, US 378, and SC 9. These highways provide main hurricane evacuation routes and are the primary access routes for tourists entering the Grand Strand area. Myrtle Beach International Airport is located within the city limits of Myrtle Beach on the former Myrtle Beach Air Force Base. The airport enplanes nearly 500,000 passengers each year.

The county is home to two state institutions of higher education—Horry-Georgetown Technical College (HGTC) and Coastal Carolina University (CCU). HGTC is a two-year community college with an enrollment of more than 4,000 and the fastest growing public postsecondary institution in the state. HGTC maintains three campus sites, in Conway, Myrtle Beach, and Georgetown. CCU is a four-year state-supported institution with an enrollment of nearly 5,000 students and a 244-acre campus with 24 buildings.

*Residential, Resort, and Recreational*

The Grand Strand is characterized by a proliferation of hotels, beach homes and condos, and resort developments along the coastline. There are 39,000 hotel rooms and 31,000 vacation rental units in the county. In addition to these numerous beachfront and golf course developments, Myrtle Beach State Park is one of most used state park facilities, offering 312 acres on the Atlantic and public beach access to the south Strand. Additional public beach access points are maintained at numerous points at North Myrtle Beach, Cherry Grove Beach, Ocean Drive, Crescent Beach, Windy Hill, Atlantic Beach, Myrtle Beach, Surfside Beach, and Garden City Beach. (See Photos 5 and 6.)

**Photos 5 and 6. Garden City.** Photo 5 shows a typical sign directing visitors to public access. Photo 6 shows the pier at Garden City. Homes here are closer to the water's edge than at Myrtle Beach. April 2004.

**Development Trends**

Most of the population, commercial, and residential growth in previous decades was concentrated along the coastal communities of Myrtle Beach, North Myrtle Beach Briarcliffe Acres, Atlantic Beach, and Surfside Beach. As these areas approach build-out, however, and as beach property costs escalate, many developers and residents seeking more affordable housing options have focused on areas along and west of the waterway. Future development is anticipated to concentrate in the eastern half of the county between Conway and the beaches. Most of the western part of the county will remain primarily rural, dominated by agricultural and forestry uses.

Housing in Horry County is generally more costly than the state average. More than one-fifth of the housing stock is devoted to tourism. This housing sector represents a declining portion of the county housing market, however, with steady increases in the construction of year-round housing. The number of housing units is projected to rise by 175 percent between 1990 and 2020.[25] Residential growth will be strongest in the east Conway (279 percent), Little River (194 percent), and Myrtle Beach (191 percent) areas during this time period. Growth will also continue in the Bucksport and Socastee communities located in the southeastern section of the county. The largest increase will be the addition of single-family, detached housing units. This trend is exhibited in new residential and mixed-use developments such as Carolina Forest in the southeastern part of the county and Palmetto Dunes located north of Myrtle Beach. Carolina Forest is planned to include 37 subdivisions, 8 golf courses, and 5 million square feet of commercial space. At completion, the development will be home to 50,000 residents. The proposed Carolina Bays Parkway will also spur additional growth in the unincorporated areas of eastern Horry County.

Development in more rural areas of the county not currently served by water and sewer systems will be limited by the flat topography and erodible soils that characterize a large portion of the county. Eighty-eight percent of county soils have severe septic tank limitations, making the provision and extension of sewer service a key tool to shape and direct future growth within the unincorporated parts of the county. Twenty-four percent of the county land area is within the 100-year tidal and nontidal floodplains and 0.4 percent of lands lie within the 100-year coastal high hazard area floodplain.

[25] *Horry County Comprehensive Plan*, 1999.

## Local Policies and Regulations

Interviews with local planning staff included interviews with Danny Taylor, the director of Planning for Horry County; David Fuller and Diane Moskow-McKenzie, planners for the City of Myrtle Beach; and Joyce Rowley, planner with the City of North Myrtle Beach.

The County adopted a new comprehensive plan in March 1999. The plan charted the county's growth patterns and development strategies through 2020 and replaced the earlier 1995 plan. The strategies included the direction of land development away from sensitive and rural areas, the concentration of future growth along existing transportation and infrastructure corridors, and the adoption of shoreline and riparian buffer requirements along waterways and tidal wetlands. As recommended in the plan, the County adopted a countywide zoning ordinance earlier in 2001 that extended zoning to all unincorporated parts of the county. Before the adoption of the new ordinance, only the eastern portion of the county was zoned.

Horry County was one of the first counties in South Carolina to become a Certified Local Government (CLG). The program, administered by the state's Department of Archives and History, provides access to additional funding to support historic preservation efforts. The County established a Board of Architectural Review and enacted a Historic Preservation Ordinance in 1987. In 1997, the County augmented its preservation efforts with a local property tax incentive program for the rehabilitation of historic structures and sites in unincorporated areas.

Horry County is frequently threatened by hurricanes, including seven during the 1990s. Four of these prompted mandatory evacuations, with three resulting in Presidential Disaster Declarations—Hurricanes Fran (1996), Bonnie (1998), and Floyd (1999). The County was a participating community in FEMA's Project Impact and launched several efforts aimed at reducing vulnerability to natural disasters. In an effort to mitigate the vulnerability of the sewer system to disasters, a number of the county's lift stations are being retrofitted to provide continued operational capability during floods and power outages. The County has also completed a GIS-based Hazards Assessment that is being used to analyze and prioritize mitigation efforts; it also launched an acquisition program to purchase properties in the Waccamaw River floodplain that have been substantially damaged during flooding that accompanied Hurricane Floyd. The Horry County Flood Damage Prevention and Control Ordinance addresses construction in flood hazard areas. New construction in these areas is required to elevate the lowest floor a minimum of 1 foot above the base flood elevation. At present, only two jurisdictions are CRS Communities: the City of Myrtle Beach (entry 1991) and the City of North Myrtle Beach (entry 1991).

## Draft Maps

Based on the preceding information, we developed three draft maps that depicted the shores that would be protected under each of the three scenarios. Because all three scenarios are shown in a single map the Stakeholder Review section, we do not reproduce those maps here; but we do describe the results of the three scenarios.

*Response Scenario One*

Protected areas under Scenario One include all areas below the 20-foot contour with the exception of a portion of Waites Island, owned and operated by Coastal Carolina University as a barrier island research site subject to a conservation easement that would probably would preclude beach

nourishment[26] The island is also protected to some degree from development by its designation under the Coastal Barrier Resources Act. Under current South Carolina coastal wetlands management policy, private property owners are allowed to employ hard protection measures such as bulkheads with no setback requirement from the critical line of wetlands. Therefore, Scenario One assumes that all nonbeachfront properties, both developed and undeveloped, could be protected through a combination of public and privately funded measures.

*Response Scenario Two*

Scenario Two excludes from shore protection all areas that are not protected in Scenario One. This scenario is largely based on current and anticipated future development patterns delineated in the county's recent comprehensive plan as part of the designated Urban Services Area, Township, or Rural Corridor Districts. Lands within these three planning categories are either developed or are likely to be developed in the future, and assumed protected in Scenario Two. Lands designated as part of the county's Rural Service Area have sparse or no development and are excluded from protection in this scenario. Although the portion of Waites Island under university ownership will not be protected, other portions of this island will almost certainly be protected with privately funded beach nourishment, necessitated by the prohibition of federal subsidies under the Coastal Barrier Resources Act.

*Response Scenario Three*

In Horry County, the land areas likely to be developed in the future that would be affected by a 150-foot buffer on estuarine wetlands are limited to the northeast portion of the coast. These affected areas include the eastern portion of Waites Island (not owned by Coastal Carolina University) and a large area of the Little River Neck located to the north of Waites Island. Although flood insurance is not available for property on Waites Island, a developer is considering pursuing a large-scale development on the Little River Neck tracts that would use an easement on Waites to provide beach access for residents. The extent of allowable future development on Waites Island remains unclear at this time; however, development on the adjacent Little River lands is considered likely in the next few years.

[26]According to the university's web page devoted to Waites Island, "In 1992, a total of 1,049 acres on the island and the adjoining uplands of Tilghman Point was donated to the Coastal Education Foundation, Inc. The gift has been protected with a perpetual conservation easement through The Nature Conservancy of South Carolina. It was the wish of the late Anne Tilghman Boyce that the property she left to a charitable trust be maintained "in essentially a wilderness state". See http://www.coastal.edu/cmws/waites/island.html (accessed April 1, 2004).

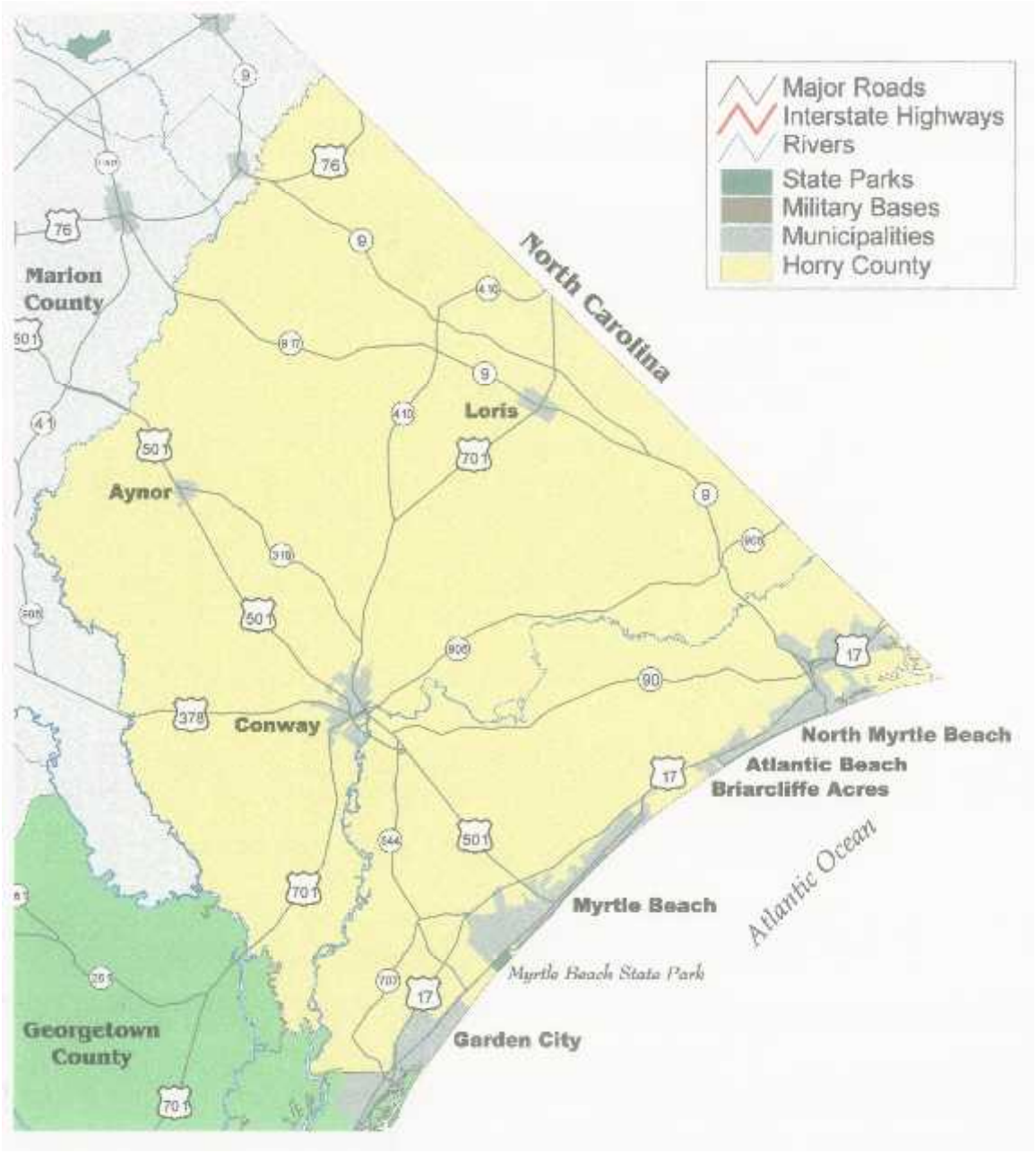



**Figure 2: Map of Horry County boundaries, municipalities, major river systems, military installations and state parks.**

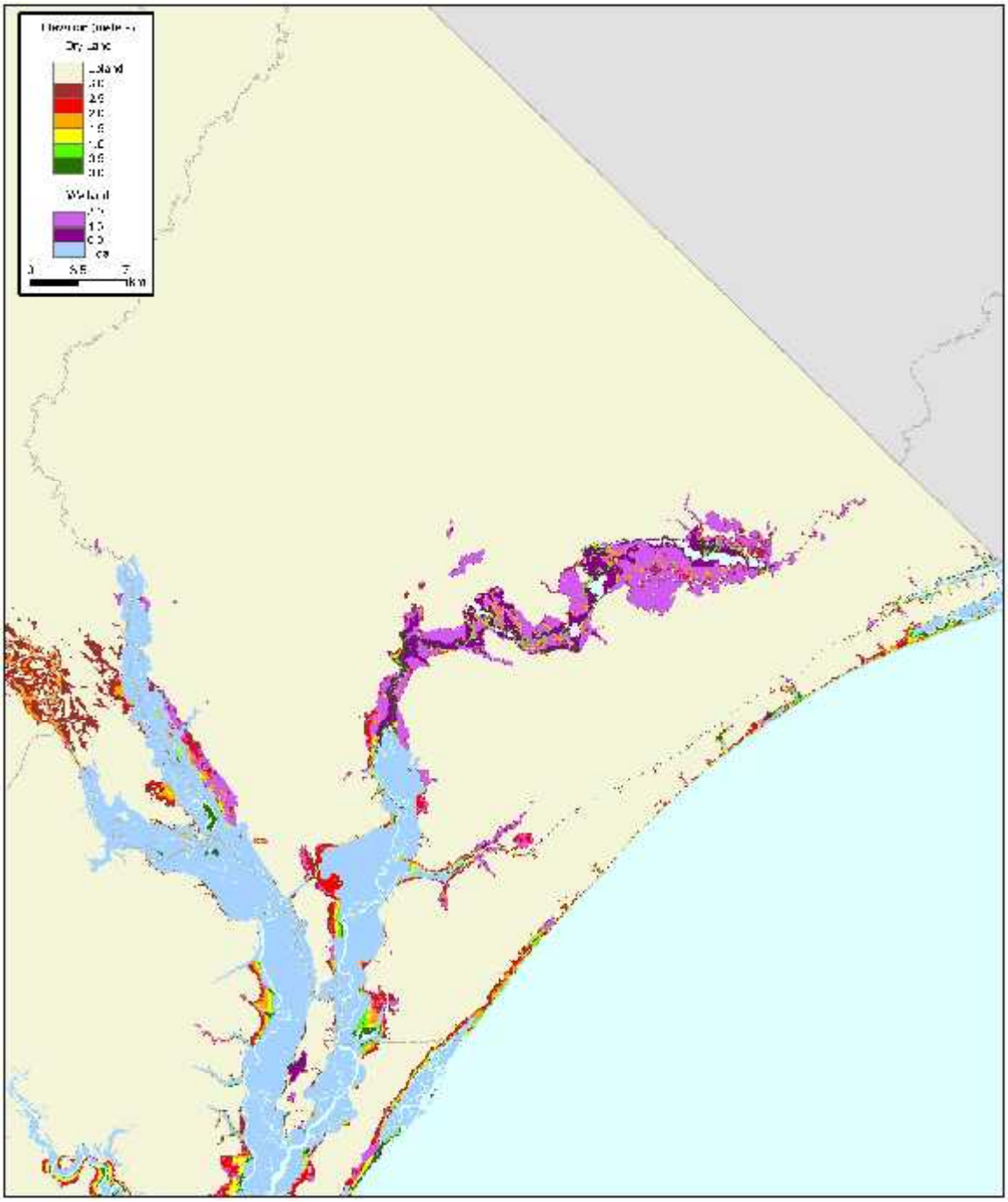


**Figure 3: Lands within approximately three meters (ten feet) above spring high water Horry County.** Source: See Table 1.

## GEORGETOWN COUNTY

### Geographic and Socioeconomic Profile

Georgetown County is located in the upper third of the South Carolina coastline, extending nearly 60 miles along the Atlantic between Horry and Charleston counties. The county serves as the terminus of five rivers into the Atlantic Ocean at Winyah Bay. These five major rivers traverse the county and contribute to frequent coastal and inland flooding. Extensive areas of tidal marshlands are present and extend as far as 20 miles up into the larger rivers. Almost one-half of the county lies within the 100-year floodplain. Of Georgetown's three municipalities, two are located on the coastline. Elevation in the county ranges from sea level to 35 feet above mean sea level. For the most part, the county is flat with gradual changes in elevation with a terrain that is characterized by marshlands and low-lying areas. Seventy percent of the county's land area is less than 25 feet above sea level. Georgetown County has 35 miles of beaches, with 40 percent accessible to the public. All of the beachfront access is located along the coast of the Waccamaw Neck, a peninsula that extends from Winyah Bay to the Horry County line. The neck is flanked by the Atlantic Ocean on the east, Winyah Bay to the south, and the Intracoastal Waterway on the west. Below Winyah Bay lies the vast Santee Delta with more than 20 square miles of interconnected rivers, streams, and marshes—the largest delta on the eastern coast.[27]

As the state's eighth fastest growing county, Georgetown has a population of more than 55,700 and a land area of 814 square miles. The population density is 69 residents per square mile, with more than 21 percent of county residents concentrated in the Waccamaw Neck area, which primarily consists of beach resort, commercial, and residential golf course development. As the center of the county's residential resort, golf course, and beachfront development, the Waccamaw Neck accounts for 73 percent of county property tax revenue. Forty-two percent of the county's population is located in and around the historic port City of Georgetown, also the county seat. The county's population swells to more than 175,000 during the peak tourist season of April to September. A significant number of the population are retirees living in higher density, coastal resort developments.

Tourism constitutes a significant part of the local economy, contributing more than $2 million in accommodations and admissions tax revenues each year. The major economic product of the county is lumber and lumber products. There are 104 square miles of commercial forests in the county, with commercial timber holdings representing 28 percent of Georgetown's forest lands. Commercial timber harvests yield more than $31.6 million annually, ranking Georgetown fifth among the state's counties in timber production. The county ranks first in commercial seafood landings and dockside values for fish and third for oysters, shrimp, and clams. The total cash value of harvested seafood exceeds $6.3 million. The top private employers in the county represent the lumber and lumber product industry, steel and wire production, and detergent auxiliaries. There are five employers of more than 250 employees located within the county. Although manufacturing dominates the economic base, the county's emergence as a popular tourist destination has fueled an increase in the services sector. As this trend continues, employment in the retail and services sectors will outpace manufacturing jobs during the next decade. County economic development efforts have also begun to focus on diversifying the local economic base with higher-tech, higher-wage employment opportunities for residents.

[27]Walter Edgar, **South Carolina: A History**, University of South Carolina Press, Columbia,1998.

**Key Resources and Assets**

The county's key assets and resources range from industrial sites to unique habitats to culturally significant settlements. The most significant of these resources, which have been identified as potentially affected under the proposed sea level rise scenarios and lying within the 20-foot contour boundary, are listed and summarized in the sections that follow.

*Employment and Economic Resources*

The Port of Georgetown is the second largest of South Carolina's three commercial ports and serves as the state's dedicated breakbulk and bulk facility, specializing in steel, salt, cement, aggregates, and forest products. The port handles more than 1.6 million tons of cargo annually. Two of the county's largest manufacturing employers are International Paper Company and Georgetown Steel, employing approximately 1,000 and 680 residents, respectively. Located adjacent to the port and the Georgetown Central Business District, these two industries are major contributors to the local economy. The second largest employer in the county is the Georgetown Memorial Hospital with nearly 800 employees.

*Cultural, Historic, and Natural Resources*

The magnitude of the county's historical and natural resource base was recently underscored when *National Geographic Adventure Magazine* named Georgetown as one of the nation's top 10 outdoor adventure sites.[28] Georgetown County has 34 individual sites listed on the National Register of Historic Places. A significant number of historic sites and structures are located in and around the City of Georgetown. The Georgetown Historic District includes both the central business district of the city and adjacent residential areas. Located in the heart of the Waccamaw Neck, the Pawley's Island Historic District consists of 21 beach and marshfront properties. (See Photo 7.) Additional historic sites consist of numerous plantations and relics of the rice culture that once dominated the region's economy. These sites are scattered along the banks of the county's major river systems and include Hopsewee Plantation, a National Historic Landmark and home of Declaration of Independence signer Thomas Lynch, Jr.

Located on the northern border of Georgetown County, Sandy Island is the largest freshwater island in the eastern United States. The 12,000-acre island is home to approximately 100 Gullah residents, who are direct descendants of freed and escaped slaves who settled on the island during and following the Civil War. Accessible only via water, Sandy Island was purchased by the state Department of Transportation as a wetlands mitigation bank. The island is protected from further development by conservation easements, habitat management, and the active involvement of a diverse partnership of public and nonprofit organizations. Located just north of Sandy Island, Bull Island is under the ownership of The Nature Conservancy. As the nation's first public sculpture garden, Brookgreen Gardens is located on 300 acres within a 9,100-acre coastal preserve that spans the northern section of the Waccamaw Neck from the beach to the Intracoastal Waterway. Brookgreen is recognized as one of the top five public gardens in the South.

Farther south, the 17,500-acre Hobcaw Barony houses the Belle W. Baruch Institute and research operations of both of the state's senior universities in the areas of marine biology, coastal ecology and forest science. Another 12,000 acres constitute the North Inlet/Winyah Bay National Estuarine Research Reserve Site (NERRS)—one of only two NERRS sites in South Carolina. Farther south are the Yawkey Wildlife Preserve and the Santee Delta and Santee Coastal Reserve Wildlife Management

[28] *Nation Geographic Adventure Magazine*, "Top Ten Adrenaline Meccas," August 2001.

Areas. The Yawkey Wildlife Preserve, consisting of three islands at the mouth of Winyah Bay, is an 18,000-acre Heritage Trust under management by the state Department of Natural Resources as a dedicated waterfowl habitat. The Yawkey Preserve is one of only two State Heritage Preserves in the county. The second preserve is the North Santee Bar (1 acre)—a small shoal located at the mouth of the North Santee River that provides nesting habitat for seabirds. The nearly 6,300 acres of the Santee Delta and Santee Coastal Reserves are formed by the convergence of the North and South Santee rivers with the Atlantic Ocean at the border of Georgetown and Charleston counties.

*Community Facilities and Infrastructure*

The historic port City of Georgetown is South Carolina's third oldest city. With a population of more than 8,900, Georgetown serves as the county seat. The city is anchored by an expansive residential historic district and a waterfront central business district. The Village of Murrells Inlet, population 3,300, is located on the county's northern border with Horry County. Although Murrell's Inlet is not incorporated, the community has a distinct character and identity strongly linked to commercial fishing and seafood restaurants. Commercial growth is on the rise in the Murrells Inlet area as development pressures spill over from neighboring Horry County beaches. The inlet is one of the state's prime shellfish harvesting areas. Increased pollution from stormwater runoff in developing areas, however, has forced the frequent closure of these beds. The Town of Pawley's Island encompasses Pawley's Island and a small, adjacent area on the mainland. The town has a year-round population of 200 residents. The island has 3.5 miles of beachfront and has undergone extensive renourishment over the years, especially after Hurricane Hugo. Since the 1940s, groin fields have been maintained on the island to counteract periodic storm damage and beach erosion.

Community facilities and key infrastructure potentially impacted under the proposed scenarios include an electric generating station, landfill, detention center, water supply canal, and wastewater treatment plant. The Winyah Electric Generating Station is the largest single generator of electricity in South Carolina. The plant, operated by the nation's fourth largest publicly owned utility, is a coal-fired steam generating facility located near the City of Georgetown on the Sampit River. The Winyah station supplies power to a significant portion of the state's middle and upper coastal regions. Georgetown County operates a solid waste landfill located west of the City of Georgetown. The landfill site is located on 400 acres and has a current life expectancy of 14 years. The County also operates a 67,000 square foot Detention Center adjacent to the landfill site. The center houses approximately 200 inmates and processes 36,000 inmates annually. The IP Canal provides the primary water supply for the City of Georgetown. The canal directs fresh water from the northern section of the Pee Dee and Black rivers south into Georgetown for municipal and industrial use. The City of Georgetown's sewage treatment plant provides wastewater treatment for the city and is undergoing significant expansion to handle treatment loads for the Town of Andrews and the remainder of the county.

*Residential, Resort, and Recreational Resources*

Public beach access points are maintained on Pawley's Island, Litchfield Beach (See Photo 8), and Huntington Beach. Pawley's Island has more than three miles of beachfront and is less than a mile wide. Groin fields were constructed in the late 1940s to counteract erosion and damage by storms. The middle portion of the Pawley's beach has some of the state's highest dunes. The island suffered extensive damage and required emergency beach renourishment following Hurricane Hugo in 1989. Huntington Beach State Park is a 2,500-acre state park offering marshland and beachfront public access. Huntington has been voted one of the top five beaches in the South. The erosion rate on Huntington Beach is considered to be stable in the long term. Although under private ownership as part

of the DeBordieu Colony development and not accessible to the general public, Debidue Beach is located between North Inlet and Pawley's Island, forming the southernmost of the Grand Strand beaches. A continuous 4,500-foot long bulkhead armors the central section of the beach. The undeveloped, southern portion of the beach below the bulkhead experiences a substantial erosion rate of between 8 and 12 feet per year. The beach underwent its most recent renourishment in 1998 using private funds.

**Photo 8. Litchfield Beach.** Views of the same block of houses from the beach and the boardwalk over the dunes. IM 636-638.

Higher end residential and resort construction is concentrated primarily on the Waccamaw Neck. (See also Photos 9 and 10.) Oceanfront developments such as North Litchfield Beach, DeBordieu Colony, and Prince George represent extensive private investments in residential structures and amenities. There are 13 golf courses on the neck alone. Single-family home prices on Litchfield Beach average $512,000 and on Pawley's Island average $856,000. In developments such as Debordieu and Prince George, housing prices can venture into the millions. Additional concentrations of residential development are found to the south and northwest of the City of Georgetown and around the Town of Andrews. Plans are also under way for a 760-acre, neotraditional development called Harmony, located along the banks of the Sampit River, that will house an estimated 5,000 residents on completion.

**Photos 9 and 10. Inlet Harbor.** This community is just south of Garden City. Photo 9 shows entrance to the community at south end of South Waccamaw Drive. Photo 10 shows navigable waterways along homes in the community. April 2004.

## Development Trends

Population growth in Georgetown County has been centered in the Waccamaw Neck area. Between 1970 and 1990, the county's population increased by 38 percent, while the neck area grew by an astounding 207 percent. From 1990 to 2000, Georgetown County grew by another 20.5 percent to more than 57,000 residents. The unincorporated areas around the City of Georgetown and the Town of Andrews have also experienced increases, but to a much lesser extent, at 25 percent and 43 percent, respectively. Long-range growth projections for 1995 to 2015 for Georgetown County range from a countywide rate of 47 percent to more than 88 percent for the popular Waccamaw Neck area.

More than 64,370 acres of county land are under state and federal ownership. Twenty-two percent of the county's land area is considered prime farmland. Much of these lands are in commercial timber operations. Industrial development will be focused near Georgetown and Andrews, especially along the US 521 corridor, with the planned location of the county's new Industrial Park near Andrews. Residential and commercial growth will continue in the Waccamaw Neck and, to a lesser extent, around the City of Georgetown and the Town of Andrews. Poor drainage and low topography, however, coupled with the presence of five major river systems that flow through the county, have made relatively large land areas unsuitable or too costly for development. Future land use patterns in the county will continue to be influenced by wetlands, terrain, and soil conditions.

## Local Policies and Regulations

Interviews with local planning staff included on-site meetings with Allen Burns, the county's director of Planning and Economic Development, and Susie Shoman, grants administrator and Interim Project Impact Manager. The Department of Planning and Economic Development includes the planning, zoning, building codes and inspections, GIS, grants, and economic development functions for Georgetown County.

Georgetown County adopted its first countywide comprehensive plan in 1976 and completed its most recent Comprehensive Development Plan update in 1997. The County adopted its first zoning ordinance in 1974 in response to rapid growth in the coastal Waccamaw Neck area, applying land use controls only in the eastern third of the county. The ordinance is basically Euclidean in nature, with a few performance standards. The Town of Pawley's Island and the City of Georgetown have separate zoning ordinances in place to regulate lands within their incorporated areas.

County officials are exploring the expansion of the zoned area to encompass the recently widened US 521 corridor. This four-lane highway connects Georgetown and Andrews and serves as the primary east-west route to I-95 from Georgetown. This area includes the new industrial park. Other projected growth areas that are under study for possible zoning are 1) the US 701 corridor that links the cities of Georgetown and Conway, the Horry County seat, to the north; and 2) the Santee community, located south of the Georgetown on US 17. The US 701 area is under study, in large part because of the proposed routing of the Carolina Bays Parkway that would link the bypass with US 701 just north of the Georgetown County line. This route option is under consideration by the state Department of Transportation and, if selected, is expected to generate a significant increase in traffic volume by providing an alternative tourist route to the South Strand.

Land development regulations (subdivision regulations) were initiated in 1981, and the County is currently preparing an update to address emerging development issues. Georgetown County has adopted countywide building codes, using the Southern Standard Building Code. The County is slated to adopt the International Building Code later this year, however, pending a projected state mandate for all local governments. The International Building Code incorporates more stringent standards for construction in hurricane and earthquake prone areas.

In compliance with the Beachfront Management Act of 1988, the County adopted a Beachfront Management Plan in 1992. OCRM recently contacted all coastal jurisdictions in South Carolina to initiate a required periodic update, and the Georgetown County Plan will be evaluated for revision and update in the coming year.

The National Wildlife Federation notes that Georgetown is one of the nation's top 200 communities for total flood insurance payments made to repetitive loss properties. In 1999, Georgetown County launched the development of a Flood Hazard Mitigation Plan. Through the planning process, the County identified and mapped 262 repetitive loss structures to date—all located on the Waccamaw Neck. The plan describes natural disaster histories in the county, explores general mitigation tools, describes current hazard mitigation policies, and recommends mitigation measures needed to further reduce risks. Plan objectives include the 1) evaluation of environmental interventions that reduce community vulnerability such as seawalls, levees, and other engineering measures; and 2) the development of nonstructural mitigation measures to include the revision of building and development ordinances.

The County Planning and Economic Development Department also conducted a Hazards Vulnerability Assessment mapping project in the mid-90's to identify areas susceptible to hurricane storm surge and flooding under different intensity and impact scenarios. More recently, the County successfully applied for funding under the state's Project Impact initiative – part of FEMA's national effort to reduce the effects of natural disasters and build disaster-resistant communities. Despite the recent announcement that the Project Impact initiative has been canceled by FEMA, Georgetown County plans to continue many of the efforts introduced under the project. Planned initiatives include the restoration and protection of wetlands and watersheds.

The County is also working on a Community Rating System (CRS) Plan to encourage greater awareness of flood issues among residents and to reduce insurance premiums for property owners. The plan will address prevention, property protection measures, protection of natural resources, emergency services, structural projects, and public information. Georgetown is one of 27 CRS communities in South Carolina.

**Draft Maps**

Based on the preceding information, we developed three draft maps that depicted the shores that would be protected under each of the three scenarios. Because all three scenarios are shown on a single map in the Stakeholder Review section, we do not reproduce those maps here; but we do describe the results of the three scenarios.

*Response Scenario One*

Under the first response scenario, all properties below the 20-foot contour, both developed and undeveloped, are assumed to be protected from sea level rise, except natural resource areas and beachfront properties that fall within the narrow setback zone of OCRM's beachfront management

jurisdiction. Natural resource areas where shore protection would not occur because of existing federal and state policy guidelines include the extensive federal and state lands in the North Inlet/Winyah Bay NERRS site and the Santee Delta and Santee Coastal Reserves. Huntington Beach State Park, however, is identified as protected because of the established precedent of beach renourishment by the state Department of Parks, Recreation and Tourism for this property. The county's other major public beach access points at Litchfield and Pawley's Island are eligible for beach renourishment under state coastal management guidelines as well, with publicly and privately funded renourishment efforts long established at those beaches and at the privately owned Debordieu beach.

Under current South Carolina coastal wetlands management policy, private property owners are allowed to employ hard protection measures such as bulkheads with no setback requirement from the critical line of wetlands. Therefore, it is assumed that all nonbeachfront properties, both developed and undeveloped, could be protected through a combination of public and privately funded measures.

*Response Scenario Two*

Scenario Two excludes from shore protection all areas that are not protected in Scenario One. This scenario is largely based on current and anticipated future development patterns delineated in the County's recent comprehensive plan. Projected residential development will be concentrated in the Waccamaw Neck area, the areas south and northwest of the City of Georgetown, and along US 701 north. Commercial and industrial development will be focused along the US 521 corridor, with additional commercial and service sector growth occurring near Georgetown and on the Waccamaw Neck. Sandy Island is included as part of the Scenario Two protected lands because of planned capital investments by the state, using CDBG and USDA funding, for basic infrastructure to serve the island's residents in the form of road improvements and water service. Conservation and development restrictions that have been placed on the island will, however, limit growth beyond the current number of residents and residential structures.

Throughout Georgetown County, future development will continue to be hampered by extensive wetlands, poor drainage, and low topography. These natural characteristics, when coupled with state and federal requirements for septic systems, stormwater drainage and wetlands protection, make large areas of the county unsuitable to accommodate construction.

*Response Scenario Three*

Scenario Three is predicated on the assignment of greater value to the county's natural resources in which coastal waters and tidal wetlands are protected, or allowed to migrate unhampered, as sea levels rise. When a higher priority is placed on the protection of the county's diverse natural resource base, the third scenario focuses on the significant wildlife habitat and natural resource areas that comprise the eastern and southern portions of Georgetown County. Based on discussions with local planning staff, however, this scenario is considered highly unlikely. Such an emphasis on allowing the migration of coastal waters in the Winyah Bay area and tidal wetlands upland into the county's major river systems would occur at the expense of significant cultural and historical resources. The vast cultural and historical sites placed at risk under this scenario include the City of Georgetown Historic District, the Pawley's Island Historic District, Sandy Island, and numerous rice plantations that flank the county's major river systems along the Pee Dee, Waccamaw, Santee, and Black rivers. There are 35 plantation sites along these rivers.

In Georgetown County, the only land area likely to be developed in the future that would be affected by a 150-foot buffer on estuarine wetlands is the western area of Debordieu, located on the southern coastal area of the county.

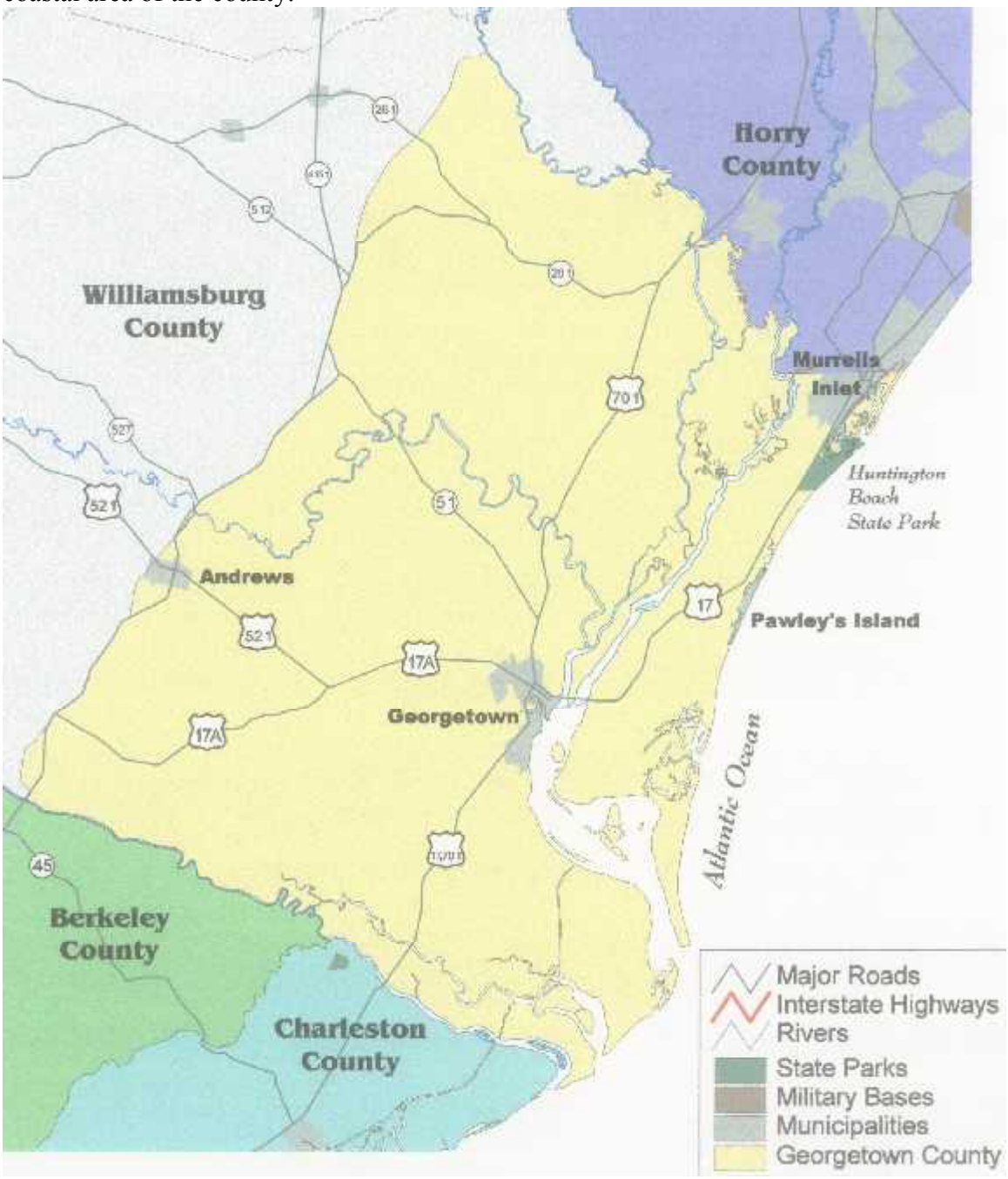



**Figure 4: Map of Georgetown County boundaries, municipalities, major river systems, military installations and state parks.**

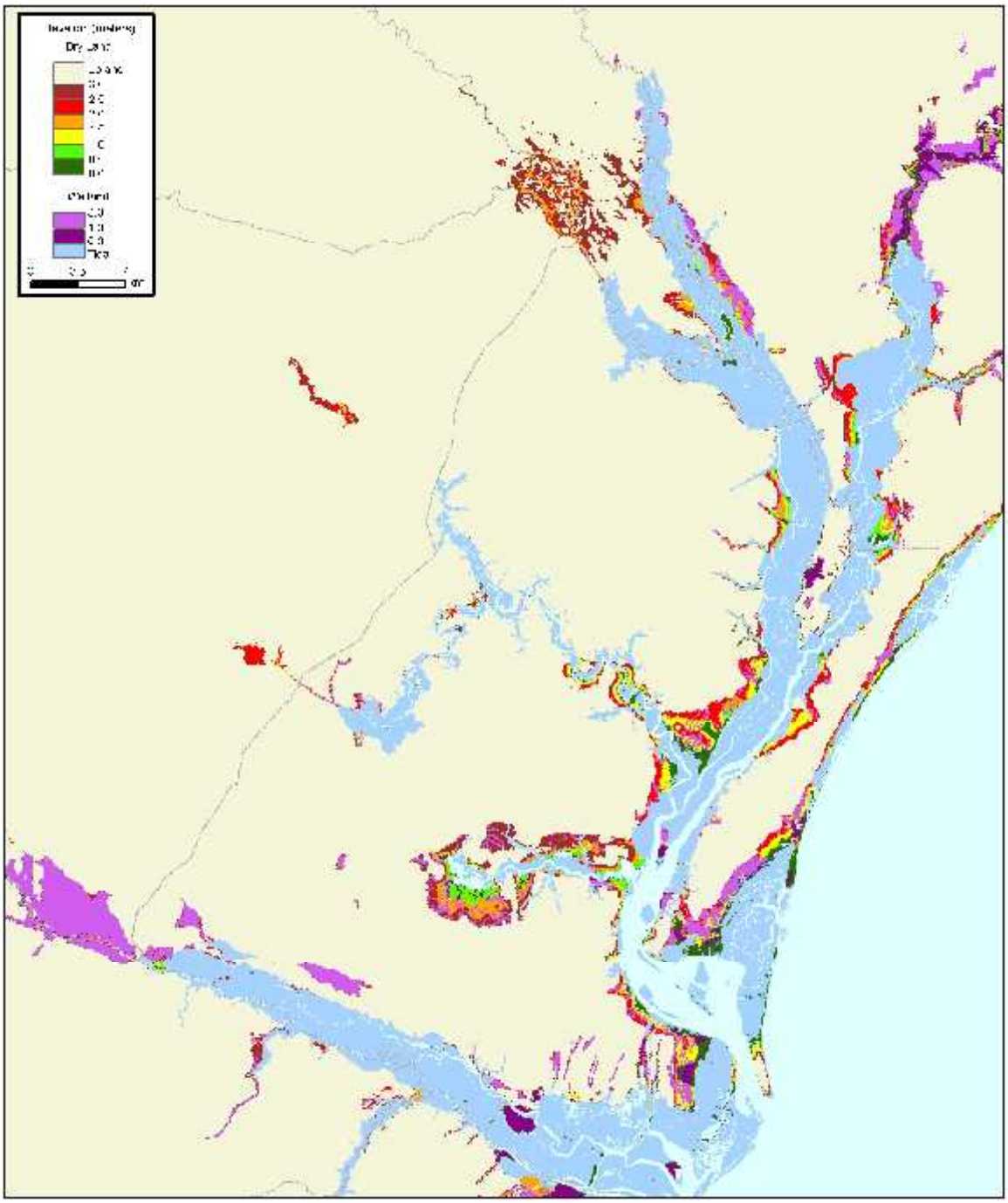


**Figure 5. Lands within approximately three meters (ten feet) above spring high water: Georgetown County.** Source: See Table 1.

## BERKELEY COUNTY

### Geographic and Socioeconomic Profile

Berkeley County is located between Charleston and Georgetown counties. With a total land area of more than 1,100 square miles, and a population of 142,651, the county ranks as the state's third largest in land area. Population density in the county is more than 130 persons per square mile, slightly under the state density of 133 persons per square mile. Elevations range from sea level at Daniel Island to 105 feet in the upper portion of the county. The county is bounded by Georgetown County and the Santee River to the north, Charleston County to the east and south, and the inland counties of Dorchester, Orangeburg, and Clarendon to the west. The county's access to coastal waters is limited to a small, but strategically positioned peninsula at the convergence of the Wando and Cooper rivers into the Charleston Harbor. Despite limited coastal access, however, Berkeley County enjoys abundant water resources in the form of the Santee Cooper lakes, wetlands, and the Cooper, Santee, and Wando rivers.

The county experienced an 11 percent population increase from 1990 to 2000. Most of this growth was in the Goose Creek and Hanahan area, the Cainhoy Peninsula, and along the Cooper River corridor. State projections reveal an estimated county growth rate of 52 percent through 2015; other studies have indicated a possible increase of 75 percent over the same period. There are six incorporated municipalities in the county: Bonneau (population 354), Goose Creek (population 24,692), Hanahan (population 13,176), Ladson (population 13,264), Jamestown (population 97), Moncks Corner (population 5,952), and St. Stephen (population 1,697). All of these, with the exception of St. Stephen, fall either entirely or partially within the 20-foot contour. Portions of the City of Charleston and the Dorchester County City of Summerville also extend into neighboring Berkeley County. Despite unprecedented growth and development in the southern portion of the county, the remainder of the county to the north remains rural, with farms and forests constituting a large portion of the landscape. More than 80 percent of the county land is classified as agricultural land or forest.

Manufacturing has emerged as a key economic sector in the county over the last decade. The construction of the Mark Clark Expressway (I-526) has opened the Cainhoy Peninsula for rapid residential and industrial development. The proximity of the Port of Charleston and the construction of the Wando terminal on the Berkeley side of Charleston Harbor have sparked significant and sustained economic growth in the area. More than $3.6 billion in capital investments were announced during the 1990s, with manufacturing now comprising 21 percent of the local employment base. Manufacturing interests constitute 37 percent of the county's assessed value—more than residential, commercial, and nonmanufacturing industrial combined. Unlike its coastal neighbors, tourism is not a major economic factor in Berkeley. Accommodations and admissions tax revenues totaled $271,000, the lowest of the coastal counties and indicative of the county's lack of beachfront lands. Although agriculture represents a declining force as the county's economy diversifies, nonindustrial forests generated more than $13 million in delivered harvest value in 1999. Nonindustrial private forests currently are only 32 percent of Berkeley's forestlands, with timber ranking as the county's primary cash crop.

### Key Resources and Assets

The county's key assets and resources range from industrial sites and unique habitats to expansive forests and historic properties. The most significant of these resources, which have been identified as

potentially affected under the proposed sea level rise scenarios and lying within the 20-foot contour boundary, are summarized in the sections that follow.

*Economic Resources*

Industrial uses constitute less than 3 percent of the county's total land area. Most major employers and industrial sites are located within the 20-foot contour, with a significant concentration of industry in the southern third of the county along the Cooper River corridor. Among the employers in the area are Bayer Corporation with 1,000 employees, Nucor Steel with 550 employees, Mikasa with 502 employees, and Blackbaud with 719 employees. Industries in the county are now encouraged to earmark substantial portions of their site acreage for open space protection and habitat management. Three corporate wildlife habitats have been established in partnership with area industries. The Amoco Chemical Company site includes 6,000 acres managed for habitat enhancement and environmental education. The Bayer Corporation site has devoted 1,000 of its 1,600 acres to wildlife habitat and species management. The Dupont Company site includes marshland, swamp, and forests managed for wildlife habitat and species enhancement.

It was noted by planning staff that even if sea level rise did not affect specific developed areas or industrial sites because of protection measures, there would remain concern over the impact of rising water levels on industrial discharge points and water quality. In Berkeley County, as in other Lowcountry jurisdictions, many rivers and streams have reached, or are approaching, discharge/assimilative capacity. This is a particular concern within the Cooper River corridor.

*Cultural, Historic, and Natural Resources*

There are 5 designated National Historic Landmarks, 23 National Register properties, 3 Historic Districts, and 30 additional sites that have been inventoried and concluded as being eligible for National Register listing. All but one of the National Historic Landmark sites lie within the 20-foot contour. Eligible properties in the nomination process include the Francis Beidler Forest and the Cooper River Historic District. Mepkin Abbey is an active Trappist monastery housed on an old plantation overlooking the Cooper River. The plantation is the former home of Henry Laurens, the first president of the Continental Congress. The Cooper River basin contains significant concentrations of historic and archeological sites, perhaps the best in the state. As currently proposed, the district covers more than 30,000 acres, 212 archeological sites, and 150 above-ground structures. The west branch of the Cooper River has also been designated as an Underwater Heritage Trail for scuba exploration. The 2-mile trail features submerged vessels and artifacts from several periods in the state's history.

Berkeley County is part of three major watersheds—the Ashley-Cooper, the Santee, and the Edisto. Tidal marshlands and freshwater swamps comprise 107,000 acres of undeveloped county lands. Major swamp ecosystems include the Huckhole Swamp, Hell Hole Swamp, Wassamassaw Swamp, and Four Holes Swamp. The County manages the 175-acre, black cypress swamp known as Cypress Gardens as an educational and recreational area.

Six identified endangered and threatened species are documented in the county. State Wildlife Management Areas consist of 210,000 acres under management by the SCDNR in cooperation with private landowners, the state Public Service Authority, and the National Forest Service. The Francis Marion National Forest comprises 250,000 acres with 143,000 acres located within Berkeley County. The Audubon Society's Francis Beidler Forest spans both Berkeley and neighboring Dorchester County with a total of 10,700 acres. Approximately 6,000 acres of the forest are within the western portion of Berkeley. In addition, the state Heritage Trust program has identified three sites in the

county that warrant preservation—the Bird Island Rookery, Stoney Landing, and the Westvaco Eagle site. Both the Stoney Landing and Westvaco sites lie within the 20-foot contour.

Undeveloped agricultural land totals 30 percent of the land area, and agricultural uses with residential structures accounts for another 32 percent of county lands. The Lord Berkeley Conservation Trust is a local initiative launched in 1992 to preserve cultural, historic, and traditional land uses throughout the county. To date, the trust has executed two agreements protecting 1,400 acres.

*Community Facilities and Infrastructure*

Most of the county's water and sewer infrastructure investment has been directed to the southern and central portions of the county. These areas fall within the 20-foot contour. Twenty-two miles of Interstate highways (I-26 and I-526) run through Berkeley, as well as 237 miles of the state primary highway system.

As the nation's fourth largest container port, the state Ports Authority is pursuing a sizable expansion of port facilities across the Wando River to Daniel Island. Although Daniel Island falls within Berkeley County, it is part of the incorporated area of the City of Charleston. The expansion has proved controversial among some local groups and will be shaped by further debate.

*Residential, Resort, and Recreational Resources*

More than a third (34 percent) of the county land area is devoted to residential use. Residential development is concentrated in the southern and central portion of the county. These areas consist mostly of older and newer suburban residential areas. The County is encouraging and directing development to the area between Summerville and Goose Creek, where extensive infrastructure investments have been made. Significant portions of developed and proposed residential areas are located at or below the 20-foot contour. There is no beachfront access in the county.

**Development Trends**

Areas in the county closest to the Charleston urban area are experiencing the greatest development pressures. For instance, the Goose Creek/Hanahan area experienced a 649 percent increase in population from 1990 to 2000. Following the construction of the Mark Clark Expressway (I-526), the Cooper River Corridor has emerged as a major industrial area. This improvement also opened the Cainhoy Peninsula for residential development. From 1990 to 2015, the Wando area is projected to lead the county in population growth with an anticipated increase of 261 percent.[29] The Moncks Corner area will follow with a 158 percent increase in population.

Physical and natural features will continue to shape future development patterns in Berkeley. More than 313,800 acres are under state and federal ownership, the highest amount of any of the 46 counties and 14 percent of all state and federal lands in South Carolina. Most of this land is part of the Francis Marion National Forest. The state Public Service Authority also holds significant acreage as part of the Santee-Cooper Lakes area.

[29]County representatives now believe that this figure probably overstates population growth in the Wando area. Madelyn Robinson, zoning administrator. Telephone conversation with Andrew Hickok of Industrial Economics. October 1, 2004.

## Local Policies and Regulations

Interviews were held with Harold LeaMond, planner with the Berkeley County Department of Planning and Zoning, and Debbie Lieu, planner with the City of Goose Creek. Additional consultation was made with Christopher Morgan, planner with the City Of Charleston, on the city's efforts on Daniel Island.

Rapid growth in the county and the Charleston metropolitan area have prompted concerns by local officials about the impacts of continued growth and development patterns on transportation, community identity, and the provision of community services. The Berkeley County Comprehensive Plan was adopted in 1999 and included several strategies that targeted the need to balance growth with the protection of the county's rich natural and historic resource base. The county's new Comprehensive Development Plan calls for the continued concentration of suburban development in those areas where extensive infrastructure investments have already been made. The county's planning process also focused on identifying and linking corridors of natural and cultural resources and protecting river corridors from encroachment. The use of land trusts and conservation easements emerged as a key strategy in the effort to protect historic and environmentally significant properties. Much of the lands designated as Resource Conservation Districts are considered undevelopable, such as marshlands, swamp, and river floodplains. These areas border or include the Santee River, Lakes Marion and Moultrie, the Cooper River, and the Wassamassaw Swamp, Four Holes Swamp, Dean Swamp areas. Several larger plantations have also been classified as Resource Conservation areas in locations primarily along the Santee and Cooper rivers. The County has expressed an interest in developing local incentive programs to protect rural and sensitive natural areas to possibly include a purchase of development rights program.

The County adopted a zoning ordinance that affected only a portion of the county in 1987 and subsequently expanded it to include the entire county in 1997. The ordinance is basically Euclidean in nature and includes three "flex" zones: a "residential only" zone, a residential and commercial zone, and a zone that basically allows all uses. Plans for all new development must be submitted for approval. The 1997 revision included a zone with a minimum lot size of 15 acres in the rural areas, with a maximum of three residential units allowed on each lot. A special county ordinance requires that any new development proposed near a National Register site must obtain a special area permit that considers effects on historic and cultural assets. Current land use regulations also require a 50-foot vegetative buffer along river corridors and other waterways.

## Draft Maps

Based on the preceding information, we developed three draft maps that depicted the shores that would be protected under each of the three scenarios. Because all three scenarios are shown in a single map in the Stakeholder Review, we do not reproduce those maps here; but we do describe the results of the three scenarios.

### *Response Scenario One*

Protected areas under Scenario One include all land areas below the 20-foot contour with the exception of the portion of the Francis Marion National Forest that lies within the City of Charleston and is

federally owned and therefore not eligible for future development. Under current South Carolina coastal wetlands management policy, private property owners are allowed to employ hard protection measures such as bulkheads with no setback requirement. It is assumed that all nonbeachfront residential, commercial, industrial, agricultural, and institutional uses will be protected through a combination of public and privately funded measures.

*Response Scenario Two*

Scenario Two excludes from shore protection all areas that are not protected in Scenario One. This scenario is largely based on current and anticipated future development patterns delineated in the county's recent Comprehensive Plan as part of the designated Industrial, Office/Light Industrial, Residential Growth Area, Rural Settlement or Rural Village districts. Lands within these planning categories are either developed or likely to be developed in the future. Protected areas would also include all lands within municipal boundaries. Lands designated as part of the county's Agricultural or Resource Conservation districts have sparse or no development and are excluded from the protected lands maps. The portion of the Francis Marion National Forest within the City of Charleston that is under federal ownership is also excluded under this scenario.

*Response Scenario Three*

In Berkeley County, the land areas likely to be developed in the future that would be affected by a 150-foot buffer on estuarine wetlands are limited to a small portion of the City of Hanahan that is currently undeveloped but is expected to be developed in the future and the undeveloped areas within Berkeley County portion of the City of Charleston that are depicted in the City's Daniel Island Plan as areas of future development, which includes the proposed port expansion site.

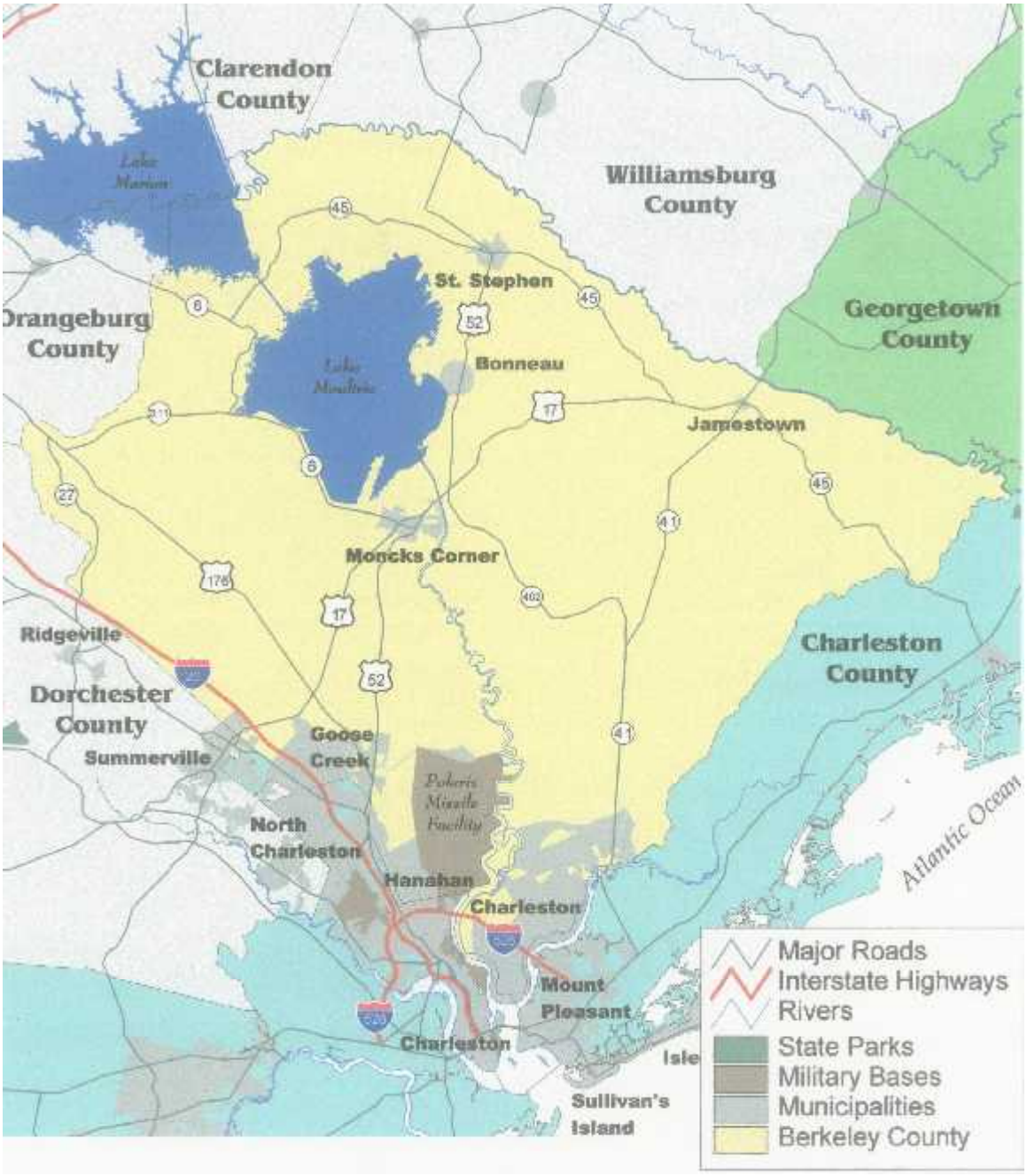



**Figure 6: Map of Berkeley County boundaries, municipalities, major river systems, military installations and state parks.**

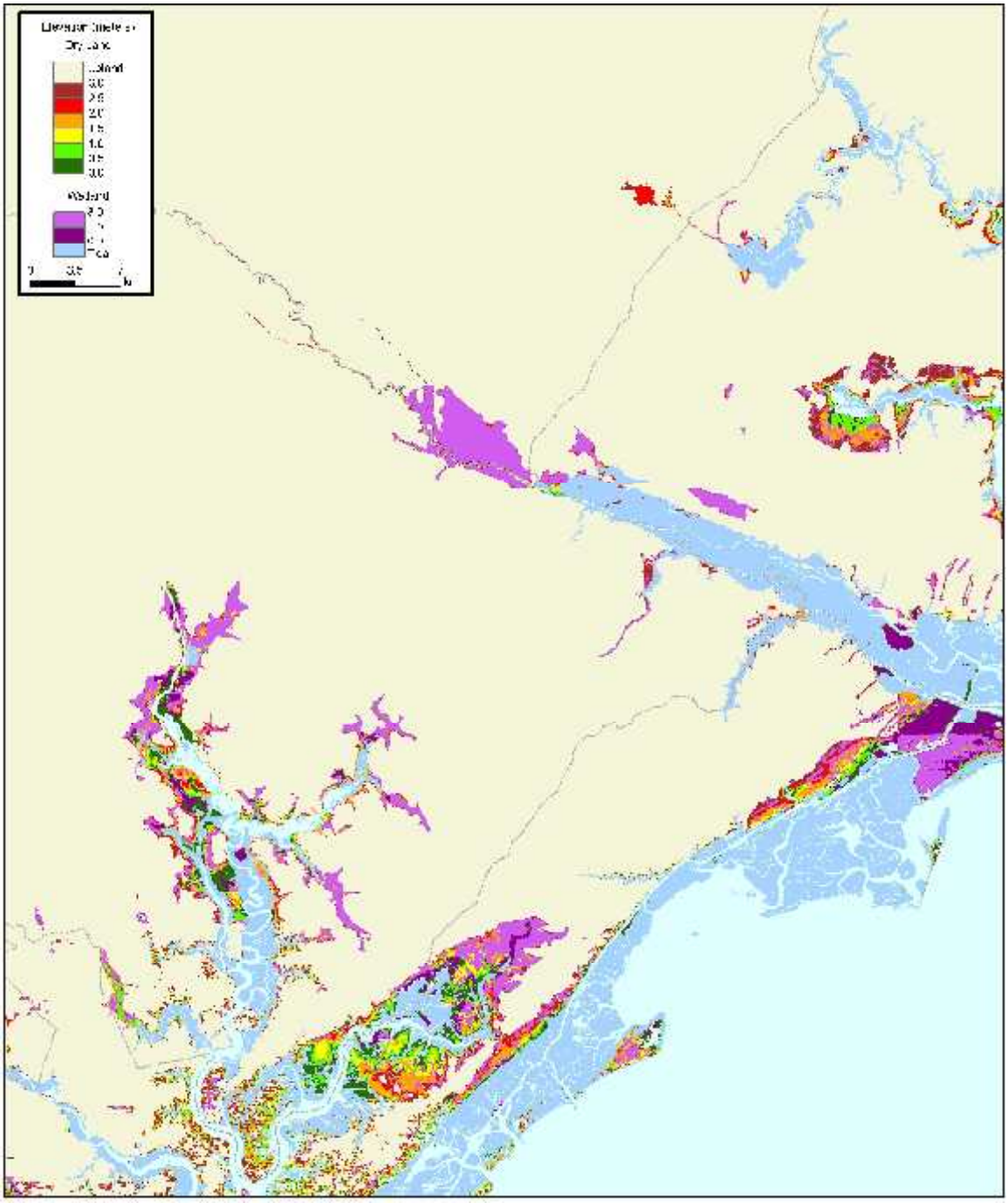


**Figure 7: Lands within approximately three meters (ten feet) above spring high water: Berkeley County.** Source: See Table 1.

## CHARLESTON COUNTY

### Geographic and Socioeconomic Profile

Situated at the midpoint of the Carolina coast, Charleston County is bordered by Georgetown County to the north, Berkeley and Dorchester counties to the west, and Colleton County to the south. Water dominates the county's landscape and has shaped development patterns. The Cooper, Ashley, Santee, Wando, Edisto, and Stono rivers flow through the county on their way to the Atlantic, weaving an intricate tapestry of marshlands, fresh and saltwater wetlands, tidal bays, and sea islands. Forty percent of the county is classified as wetlands. More than 52 percent (125,000 acres) of the wetland area is considered estuarine.

The county population increased by 5 percent from 1990 to 2000 to reach 309,969 residents. Population density in the county is 377 persons per square mile, almost triple the statewide density of only 133 persons per square mile. There are 15 municipalities within the county, all of which are entirely or partially affected by the 20-foot contour delineation. The City of Charleston is the largest municipality at 96,650 residents and is South Carolina's second largest city. The City of North Charleston (population 79,641) is the county's second largest municipality, and together with the City of Charleston constitutes the Charleston urban area. The urban area harbors the greatest population density and the largest concentration of county jobs and economic activity. The towns of Mt. Pleasant (population 47,609), McClellanville (population 333), and Awendaw (population 1,195) are located east of the Cooper River. The county has several incorporated barrier island communities that are vulnerable to storms and coastal erosion, including Folly Beach (population 2,116), Sullivan's Island (population 1,911), Seabrook Island (population 1,250), Kiawah Island (population 1,163), and the Isle of Palms (population 4,583). The Town of Rockville (population 137) is the only incorporated municipality on Wadmalaw Island. The Town of Lincolnville is located in the northernmost tip of the county and has a population of 716. The remaining incorporated towns are located in the less developed southwestern portion of the county and include the Town of Ravenel (population 2,214), the Town of Hollywood (population 3,946), and the Town of Meggett (population 1,230).

Charleston County hosts diverse economic assets that include the medical, governmental, military, tourism, services, and manufacturing sectors. The trade, service, and government sectors employ 78 percent of the county's workforce combined. As home to the nation's fourth largest commercial container port, Charleston and the surrounding region reap significant economic benefits from the international shipping industry and a growing manufacturing base. Charleston is also one of the state's dominant tourist destinations, offering a vast array of cultural, historical, recreational, and environmental attractions. The area's strong tourism market share is reflected in its accommodations and admissions tax revenues, which totaled nearly $9 million in 1999. Tourism also generates more than 40,000 jobs in the region. Agricultural activity has experienced significant decline in recent decades as the county continued its rapid growth. The substantial loss of prime farmlands and forests to new development is a concern of county residents and officials alike. Timber ranks as the county's second most valuable cash crop, bringing in $9 million in delivered value in 1999. Nonindustrial private forests are 57 percent of the forested lands in Charleston County. Charleston County ranks first in commercial seafood landings and dockside values for oysters, clams, and shrimp, and second for fish and crabs. The total annual cash value of harvested seafood approaches $15 million.

**Key Resources and Assets**

The county's key assets and resources range from beachfront resort developments and military installations to medical centers and commercial port facilities. It should be noted that nearly all of county's land area lies below the 20-foot contour. The most significant of these resources, which have been identified as potentially affected under the proposed sea level rise scenarios, are summarized in the sections that follow.

*Economic Resources*

Major employers in the County include the Port of Charleston, the tourism industry, hospitals, military installations, and manufacturing. *The Port of Charleston* is the nation's fourth largest container port. The port is planning the expansion of its operations, which includes the construction of a new terminal on Daniel Island. Despite the closure of the Charleston Naval Base in the 1990s, the military maintains a significant presence in the region. The Charleston Naval Complex remains operational and includes the Charleston Naval Hospital, the Naval Nuclear Weapons School, NOAA, the Border Patrol, the US Coast Guard, and other federal operations. The Charleston Air Force Base is one of the state's last two remaining Air Force installations, following the closure of the Myrtle Beach AFB.

*Cultural, Historic, and Natural Resources*

Historic inventories of Charleston County reveal more than 1,100 historic and archaeological sites. (See Photo 11) Nearly 50 percent of the sites located in the unincorporated part of the county are found on Edisto Island, Wadmalaw Island, Johns Island, and James Island. The McClellanville area has the greatest concentration of sites (87). A Special Area Management Plan was prepared for the Ashley River Corridor to address the growing threat posed by development on the area's unique cultural and natural resources.

**Photo 11. The Charleston Battery.** Originally part of the city's military fortification, this structure now acts as a flood wall during moderate storm surges. April 2004.

More than 143,000 acres are under state and federal ownership in Charleston County. Charleston County contains eight State Heritage Preserves covering 1,930 acres. Capers Island (1,203 acres) is a barrier island that provides a variety of habitats and rare species. Dungannon Plantation (643 acres) contains a freshwater reserve and rice fields that provide nesting habitats for the endangered wood stork and other valuable bird species. Fort Lamar (14 acres) is documented as the state's second most significant Civil War site. Snee Farm (12 acres) is part of a larger land holding—once the home of Col. Pinckney, a signer of the US Constitution—that was donated to the National Park Service to form the Charles Pinckney National Historic Site. Bird Key (20 acres) is a small island located at the mouth of the Stono River that is home to one of the largest brown pelican rookeries on the East Coast. In addition to these sites, Crab Bank (22 acres) and Deveaux Bank (15 acres) are sandy shoals that provide important nesting sites for a variety of seabirds. The county's smallest Heritage Preserve, Buzzard's Island (1 acre), is the site of a prehistoric shell ring, providing the earliest evidence of coastal dwellers in South Carolina.

Portions of the ACE basin are located on Edisto Island and the western portion of Charleston County. Formed by the Ashepoo, Combahee, and Edisto rivers, the basin is a vast and rich area offering significant habitat and ecological diversity. The ACE basin drains approximately 20 percent of the state. Among numerous designations, the basin is a National Estuarine Research Reserve Site, a priority habitat protection region under the North American Waterfowl Management Plan, and one of 35 sites in The Nature Conservancy's Last Great Places Program. Multiple conservation tools have been employed to protect this area within a partnership of private landowners, environmental organizations, and the public sector. Approximately 7,000 acres of Charleston County land is included in the basin inventory. In the eastern portion of the County, the Cape Romain National Wildlife Refuge contains 60,000 acres of salt marsh wetlands. The Francis Marion National Forest comprises 250,000 acres, with more than 55,000 acres located within Charleston County.

*Community Facilities and Infrastructure*

Education and health providers lead area employment in the governmental sector. The medical sector provides an estimated 16,000 jobs in the Charleston area and a $1 billion annual economic impact. The Medical University of South Carolina (MUSC) is the focal point for health care, with six colleges and numerous specialized care, health research, and state-of-the-art facilities in the downtown Charleston area. Several other hospitals anchor the health care sector in Charleston, including Roper, East Cooper, Charter, Trident, Charleston Memorial, the VA Hospital, and the Charleston Naval Hospital.

In addition to MUSC, numerous other public and private universities and colleges are based in Charleston. The College of Charleston is a state-supported, four-year institution, and The Citadel is one of the country's two remaining military colleges. Charleston Southern University is a private, four-year liberal arts institution and Trident Technical College is a two-year community college with satellite campuses located throughout the region.

Thirty-two miles of Interstate highway run through Charleston County. I-26 terminates in the City of Charleston and the recently constructed I-526 allows travel around the Charleston Peninsula. The county also has nearly 250 miles of state primary highway system roads. US 17 also traverses the county from north to south, connects I-26 and I-526, and is the only route to provide such access in the county.

The Charleston International Jetport serves 1.5 million domestic and international passengers each year. The runway and navigational support systems are under the ownership and maintenance of the US Air Force in conjunction with Charleston Air Force Base.

Other community facilities potentially impacted under the 20-foot contour include detention, solid waste landfill, and wastewater treatment facilities. The County Detention Center is South Carolina's largest nonstate correctional facility, housing up to 1,200 inmates.

*Residential, Resort, and Recreational Resources*

Charleston County has numerous barrier and sea islands that are home to higher-end residential and resort development. Seabrook Island, Kiawah Island, Folly Island, the Isle of Palms, and Sullivan's Island all feature upscale enclaves with resort amenities such as golf. Approximately half of all new residential construction has been centered in the East Cooper area that includes Mt. Pleasant and the Isle of Palms. One-fourth of new residential activity has occurred in the Johns Island area that includes Kiawah and Seabrook islands. All of these high-growth, high-value residential developments are within the 20-foot contour.

**Development Trends**

Based on growth projections presented in the county's recently adopted comprehensive plan, the Mt. Pleasant/East Cooper area will lead the county in population (98 percent) and housing (82 percent) growth in the coming decade. The Johns Island/Seabrook/Kiawah area will follow close behind at population and housing growth rates of 95 percent and 74 percent, respectively. Additional growth will occur in the Edisto and Wadmalaw area and the James Island/Folly Beach area. Growth will slow in North Charleston, Charleston Peninsula, and rural eastern portion of the county.

**Local Policies and Regulations**

Charleston County adopted its comprehensive plan in 1999 in compliance with the requirements of the South Carolina Local Government Comprehensive Planning Act of 1994. The plan represents the first countywide development plan for the unincorporated area of Charleston County. Previous planning effort had been isolated and focused only on James Island, Johns Island, Edisto Island, Wadmalaw Island, and the Highway 61 corridor.

The County is in the process of enacting new land development regulations, which focus on establishing development densities in the rural portions of the county as well as prescribe site development guidelines. The County is seeking to encourage more compact growth patterns and infill development, and direct more intensive uses along targeted corridors. The protection of the county's remaining natural resource and rural areas is emphasized, especially the preservation of water resources—creek and river fronts, beaches, and waterways. Farmland preservation through public and private efforts such as conservation easements, acquisition, and the enforcement of density restrictions is a guiding strategy in this effort. Passage of the new regulations has stalled at this time, because the ordinance has become the center of debate between the county and a private property rights group staunchly opposed to the proposed changes. Although the ordinance still awaits final approval, the County is currently acting under the pending ordinance doctrine.

Wadmalaw Island is covered under a special Planned Development Ordinance adopted by County Council as a supplement to the county's existing Land Development Regulations. The special ordinance restricts land use and densities with the goal of preserving the island's rural character.

Charleston County is a Project Impact participating community. (See Photos 12 and 13.) The County has forged an active partnership with all 15 municipalities to develop and implement disaster mitigation measures. Local participation in the Community Rating System is strong. In addition to Charleston County (entry 1995), CRS communities include the Town of Awendaw (entry 2000), the City of Charleston (entry 1993), Town of Folly Beach (entry 1996), the City of Isle of Palms (entry 1994), the Town of McClellanville (entry 2000), Town of Mt. Pleasant (entry 1994), the Town of Ravenel (entry 1996), and the Town of Seabrook Island (entry 1995).


**Photos 12 and 13. Warning Signs along US-17 near Awendaw Creek. IM672 674. April 2004.**

Most of the major rivers and marsh systems are subject to storm surge. Nearly all areas of the county not subject to storm surge are affected by the 100-year floodplain. The County enforces a Flood Damage Prevention Ordinance that requires new structures in designated coastal flood zones to be elevated to a base flood elevation.

## Draft Maps

Based on the preceding information, we developed three draft maps that depicted the shores that would be protected under each of the three scenarios. Because all three scenarios are shown in a single map in Part 3, we do not reproduce those maps here; but we do describe the results of the three scenarios.

*Response Scenario One*

Protected areas under Scenario One include all land areas below the 20-foot contour with the exception of natural resource areas, including the Cape Romain and ACE Basin National Wildlife Refuges; the Santee Coastal Preserve; and the Bird Key, Capers Island, Fort Johnson, and Deveaux Bank Heritage Preserves. Because South Carolina coastal wetlands management policy allows private property owners to employ hard protection measures such as bulkheads with no setback requirement, this scenario assumes that all nonbeachfront residential, commercial, industrial, agricultural, and institutional uses will be protected through a combination of public and privately funded measures.

*Response Scenario Two*

Scenario Two excludes from shore protection all areas that are not protected in Scenario One. This scenario is largely based on current and anticipated future development patterns, which we delineated using information provided by the county's comprehensive plan, the City of Charleston's Century V Plan, a GIS compilation of the comprehensive plan data for all the jurisdictions within the county that was done by the Coastal Conservation League in conjunction with the 1998 Charleston Area Growth Model project, and 1994 urban area data developed for a Twenty-year Coastal Urban Change Study conducted by a team of researchers that included the University of South Carolina, BCD Council of Governments, and SCDNR. Lands within those delineated areas are either developed or are likely to be developed in the future. Protected areas would also include most of the lands within municipal boundaries. Lands designated as part of the county's Rural Agricultural or Conservation Management Districts have sparse or no development and are excluded from the protected lands maps. Natural resource areas not included as protected areas in Scenario One are also excluded under this scenario.

*Response Scenario Three*

A large percentage of Charleston County is affected by estuarine wetlands. Therefore, the land areas likely to be developed in the future that would be affected by a 150-foot buffer on estuarine wetlands are more abundant than in most of the other coastal counties. The most significant areas affected by the buffer on tidal wetlands are located in northern Mt. Pleasant along the Wando River, in the northern area of the West Ashley area along both the Ashley and the Stono rivers, in northeastern James Island and western Johns Island on the Stono River, and a small area located between Johns Island and Seabrook Island along the Kiawah River.


**Figure 8: Map of Charleston County boundaries, municipalities, major river systems, military installations and state parks.**

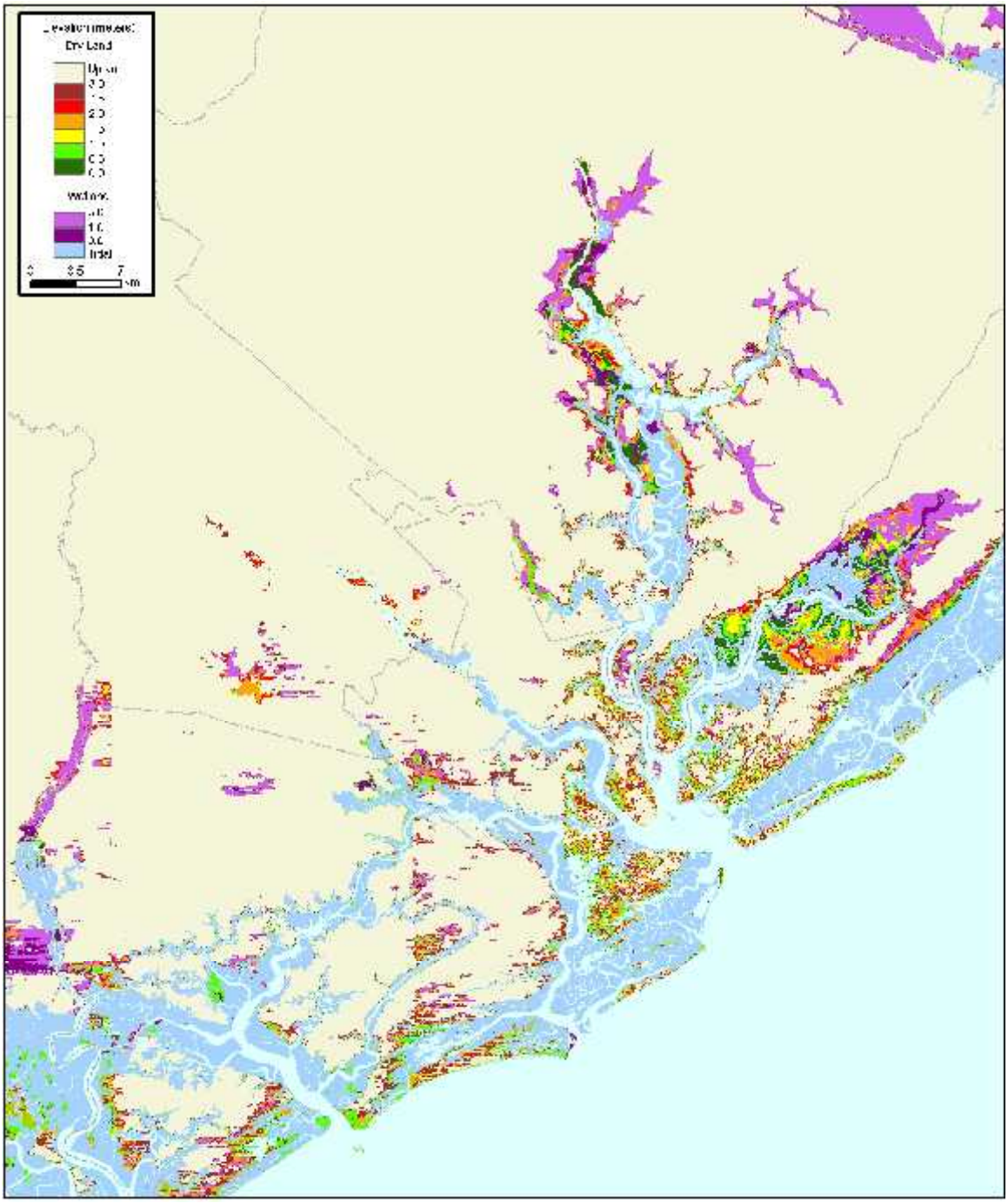


**Figure 9: Lands within approximately three meters (ten feet) above spring high water: Charleston County.** Source: See Table 1.

## COLLETON COUNTY

### Geographic and Socioeconomic Profile

Colleton County lies in the southeastern corner of South Carolina, between Beaufort and Jasper counties. The county covers more than 1,132 square miles with a population density of fewer than 36 persons per square mile—the sixth lowest in the state. Water is a dominant feature of the county's landscape in the form of major river systems, streams, and marsh areas. Beachfront lands in Colleton are limited to the Town of Edisto Beach, which lies on the Charleston side of the Edisto River and is noncontiguous with the remainder of the county. Nearly one-quarter of the county is classified as wetlands. The Edisto River forms the county's eastern boundary and the Combahee and Salkehatchie rivers serve as the western boundary with Dorchester and Charleston counties. The southern section of the county consists largely of a series of islands separated by salt-water estuaries.

The county has a total population of 38,256 and is the state's fifth largest county in land area. More than 54 percent of the county's population is concentrated within the Walterboro area. The number of county residents grew by 11.3 percent from 1990 to 2000. County growth estimates predict an increase of more than 17 percent in population during the next decade. This growth will occur primarily in the Walterboro, Cottageville, and Green Pond census divisions, while the remainder of the county will realize little to no growth. Only 2 percent of the total Colleton land area is classified as urban/developed, with forested and nonforested wetlands making up nearly 25 percent of the total land area. Upland forests comprise 41 percent of county lands, with 128,000 acres devoted to major pine plantations. Only 10 percent of lands are in active agriculture and cropland, as agriculture continues to decline as a contributor to the local economy.

The creation of local employment opportunities remains at the forefront of county development goals. Local unemployment consistently exceeds the state average and one-fifth of the county's families live in poverty. More than 25 percent of county workers are employed in the manufacturing sector, and another fifth are employed in the retail/wholesale trade sectors. Nearly 27 percent of county residents commute to jobs outside Colleton County. Tourism is not the key economic force in Colleton as in neighboring coastal counties. The county brings in $385,000 in annual accommodations and admissions tax revenue, most of which is generated by visitors to Edisto Beach or from interstate traffic at the Walterboro interchanges. Forestry is a key industry in Colleton, with more than 60 percent of the county's total land area designated as commercial forest. Timber harvests yielded more than $46 million in local cash receipts in 1999, with Colleton ranking second among the state's 46 counties in timber production. Concurrently, the county has a greater proportion of residents employed within the agriculture, forestry, and fishing industries than the state as a whole. Commercial fisheries contribute more than $1 million to the local economy each year, with Colleton County ranking fourth in commercial seafood landings and dockside values for shrimp.

**Key Resources and Assets**

Although most of the development in Colleton County has been concentrated in the northern part of the county that lies above the 20-foot contour, a few major facilities and resources are potentially impacted under long-term sea level rise scenarios. These assets that fall below the 20-foot contour are discussed in the sections that follow.

*Economic Resources*

A 28-mile section of I-95, the primary route connecting Florida and the Northeast, runs through Colleton County. US 17, a heavily traveled coastal route linking the Grand Strand with Savannah, also traverses the southern portion of the county through the ACE basin. The county has approximately 250 miles of state primary highway system roads. Only a small segment of I-95 falls below the 20-foot contour, while the entire Colleton County segment of US 17 is affected.

*Cultural, Historic, and Natural Resources*

A countywide inventory of historic and archeological sites revealed some 1,500 structures and properties of significance. These sites include several rice plantations, including the county's largest, Cherokee Plantation, located on the banks of the Combahee River. Several of these larger plantations under private ownership have recently entered into conservation easement agreements.

The largest natural asset in the county is the ACE basin. Formed by the Ashepoo, Combahee, and Edisto rivers, the basin is a vast and rich area offering significant habitat and ecological diversity. The ACE basin drains approximately 20 percent of the state. Among numerous designations, the basin is a National Estuarine Research Reserve Site, a priority habitat protection region under the North American Waterfowl Management Plan, and one of 35 sites in The Nature Conservancy's Last Great Places Program. Multiple conservation tools have been employed to protect this area within a partnership of private landowners, environmental organizations, and the public sector.

Colleton County is home to two State Heritage Preserves. The Colleton County Cowbane Preserve (32 acres) is a significant site for the federally endangered plant Canby's dropwort. The St. Helena Sound Preserve spans both Beaufort and Colleton counties, with most of its acreage (7,537 acres) in Colleton. Located at the south end of the ACE basin, the preserve is made up of six islands, which serve as the focal point of the National Estuarine Research Reserve System site.

*Community Facilities and Infrastructure*

Major community facilities and infrastructure, with the exception of roads and highways, are located above the 20-foot contour study area and are concentrated in the area surrounding Walterboro, Cottageville, and I-95. The Fairfield Ocean Ridge Resort operates a water treatment facility on Edisto Beach, providing service to only part of the town.

*Residential, Resort, and Recreational Resources*

The Town of Edisto Beach has a year-round population of 641 residents. The town is part of the larger Edisto Island and must be accessed through Charleston County. Development in the town is characterized by low density, single-family beach homes, with the exception of the Fairfield Ocean Ridge planned development. Two additional developments proposed for the island would add another 50 housing units. Development on Edisto, however, has been limited because of the reliance of most

town residences and commercial establishments on individual septic systems. Public beach access is provided at several points in the town and through neighboring Edisto Beach State Park. The park covers 1,225 acres and is located within Charleston County portion of the island. Two miles of Edisto Beach in Colleton County were renourished in 1995 at a cost of $1.5 million.

**Development Trends**

Most of the county's new growth has and will continue to be concentrated in the Walterboro and Cottageville areas—both are located above the 20-foot contour. County economic developers are directing industrial development to the airport industrial park in Walterboro and along the county's two interchanges on I-95. Development pressure is also beginning to intensify toward the Edisto River near the Cottageville area.

Colleton County does not provide water and sewer service. Existing public water and sewer service is available primarily through the Town of Walterboro. Water is available on a smaller, more limited scale through the communities of Edisto Beach, Smoaks, Williams, and Bells. The availability of water and sewer will continue to shape future development patterns and densities in the county.

Development in the southern portion of the county is precluded for the most part by the extensive wetlands and conservation areas that dominate the area. Existing regulations by the US Army Corps of Engineers, SCDHEC, and OCRM for wetlands protection, drainage, and septic systems significantly affect development patterns and potential in these sensitive areas. Westvaco is a significant landholder in the undeveloped areas of the county, owning approximately 100,000 acres. The company, along with other major timber interests, will be instrumental in shaping county development patterns and potential in sensitive environs. An additional 33,000 acres of county lands are under state and federal ownership.

**Local Policies and Regulations**

An interview was conducted with Ted Kinard, director of Planning for Colleton County. The County adopted its comprehensive plan in 1999 in compliance with the requirements of the South Carolina Local Government Comprehensive Planning Act of 1994. The plan replaced the county's earlier 1986 Land Use and Development Plan. The 1999 plan basically divides the county into Urban Development, Rural Development, and Resource Conservation districts. The Urban Development District encompasses most of the developed land and projected growth areas located in the northern section of the county near Walterboro, Cottageville, and I-95. This district will be the focal point for new infrastructure investments, community facilities, and other capitol improvements to accommodate new development. The Resource Conservation District covers the southern third of the county, including the coastline, and is designed to protect the county's environmentally sensitive resources—wetlands, marshes, beaches, dune systems, and rivers. This district also encompasses the ACE basin and the Town of Edisto Island. To afford greater protection to the county's sensitive water resources, the new Land Development Ordinance adopted in 1999 requires a 40-foot riparian buffer. The new ordinance also provides for development in rural and resource conservation areas under a Planned Unit Development District. The PUD standards are designed to accommodate larger, low density, upscale developments.

Colleton County does not maintain a beachfront management plan because the only beach is located on Edisto Island. The Town of Edisto Beach maintains a plan and will be subject to the recent OCRM directive to provide an updated plan. The Town of Edisto Beach has been a participating CRS jurisdiction since 1992.

**Draft Maps**

Based on the preceding information, we developed three draft maps that depicted the shores that would be protected under each of the three scenarios. Because all three scenarios are shown in a single map in Part 3, we do not reproduce those maps here; but we do describe the results of the three scenarios.

*Response Scenario One*

Under current South Carolina coastal wetlands management policy, private property owners are allowed to employ hard protection measures such as bulkheads with no setback requirement from the critical line. Therefore, it is anticipated that the existing, limited nonbeachfront residential, commercial, industrial, agricultural, and institutional uses in the county, and those areas with development potential for these purposes, will be protected through a combination of public and privately funded measures..

*Response Scenario Two*

Scenario Two excludes from shore protection all areas that are not protected in Scenario One. This scenario is largely based on current and anticipated future development patterns. With the exception of the Town of Edisto Beach, most of the land area under the 20-foot contour is undeveloped or sparsely developed. Protected lands under Scenario Two include those that fall within the Urban Development and Community Commercial land use districts of the county's comprehensive plan. Community commercial areas represent smaller crossroads communities as well as limited commercial uses. Areas below the 20-foot contour having little to no development were not included in the shaded area. .

*Response Scenario Three*

There are no identified areas of future development in Colleton County under the 20-foot contour that are impacted by the modeled migration of estuarine wetlands. Therefore, Scenario Three was the same as Scenario Two.

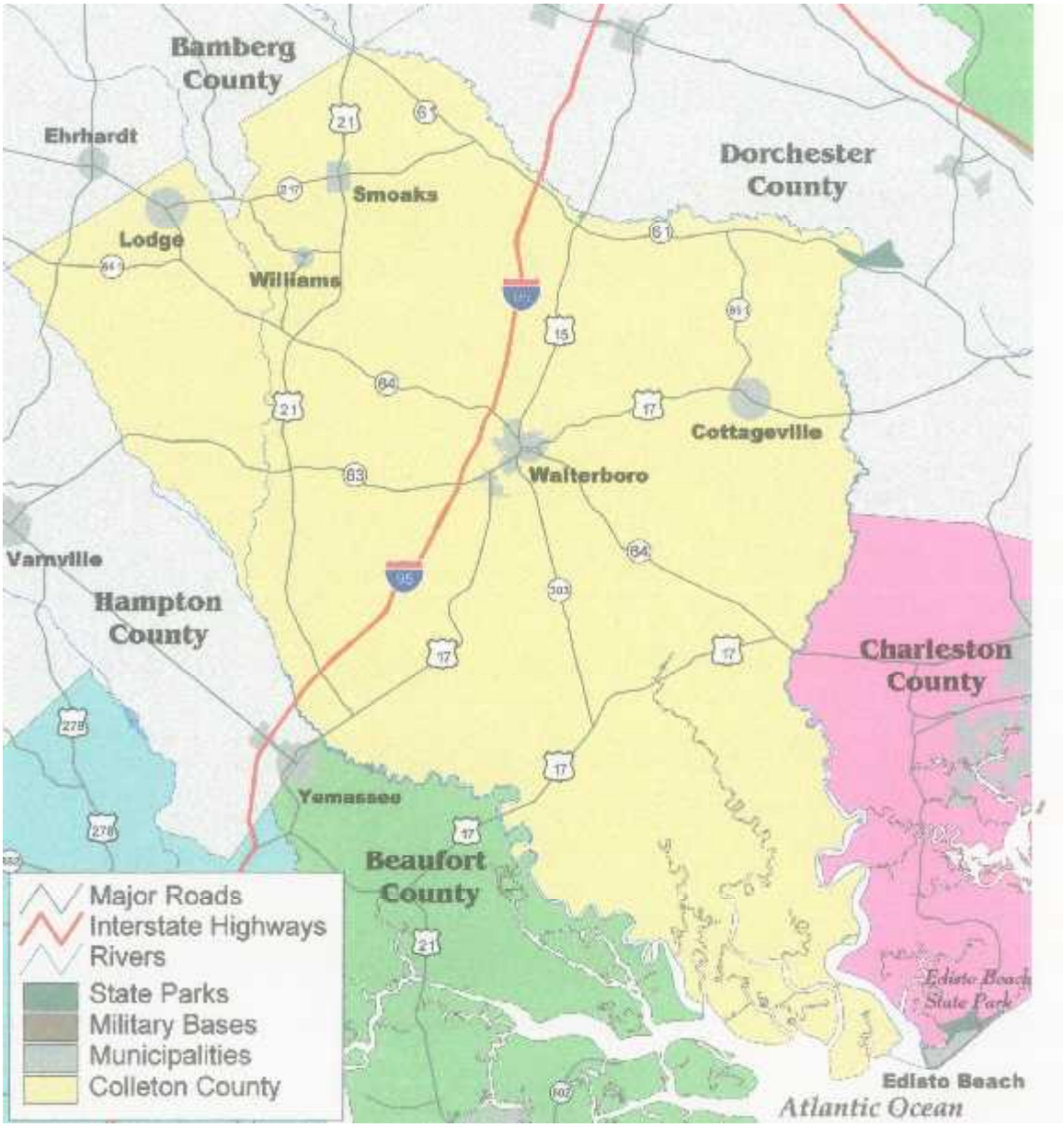



**Figure 10: Map of Colleton County boundaries, municipalities, major river systems, military installations and state parks.**

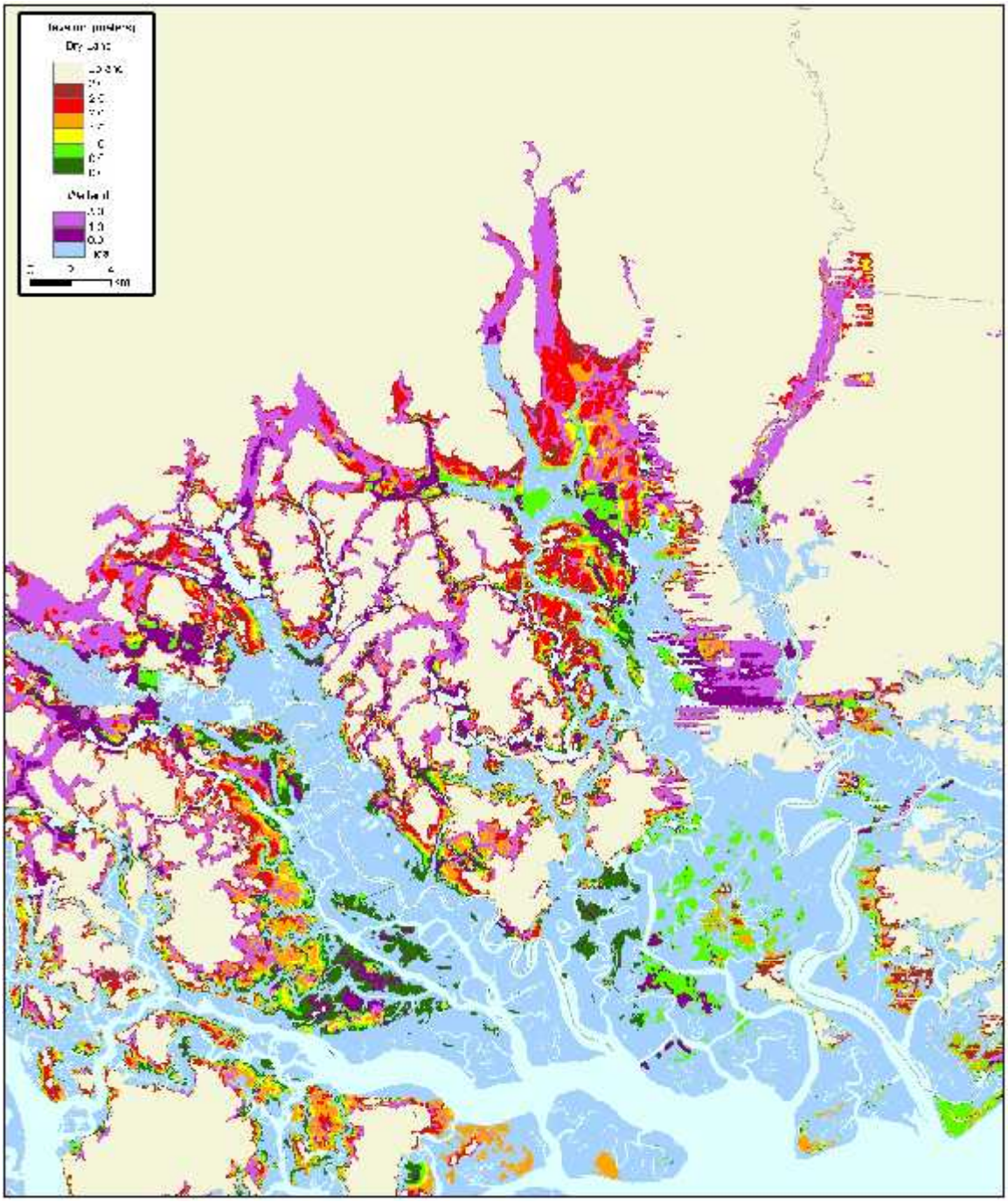


**Figure 11: within approximately three meters (ten feet) above spring high water: Colleton County.** Source: See Table 1.

## BEAUFORT COUNTY

### Geographic and Socioeconomic Profile

With a population of 120,937 residents, Beaufort County serves as the growth center for the Lowcountry region of South Carolina. The county is bordered on the north by Colleton County and on the west by Jasper County. Beaufort covers 587 square miles in land area. More than half of the land area consists of water in the form of bays, rivers, and estuaries, and another 14 percent are freshwater wetlands. Prominent water features include the Combahee River, St. Helena Sound, Port Royal Sound, Calibogue Sound, the May River, and the New River. The county is divided into three basic areas—the mainland, the coastal plain salt marsh, and the barrier islands. The major barrier islands in Beaufort include Fripp, Harbor, Hilton Head, and Daufuskie islands. Population density in the county is 206 persons per square mile, significantly greater than the statewide density of only 133 persons per square mile.

**Photo 14 and 15.** Brighton Beach. The May River is in the Background. April, 2004

Beaufort is the state's fastest growing county, experiencing a population growth rate of nearly 40 percent between 1990 and 2000. There are five incorporated communities in the county. The Town of Hilton Head, with a population of 33,862 year-round residents, is the largest. The historic City of Beaufort, the state's oldest city, ranks second with 12,950. The remaining three incorporated areas are the towns of Bluffton (population 1,275), Port Royal (population 3,950), and Yemassee (population 807).

Retirement and resort development, coupled with tourism, are the main contributors to the local economic base. The added presence of three military installations also generates significant economic impact to the region. The Marine Corps Air Station, Parris Island, and the Beaufort Naval Hospital comprise more than 50 percent of the economic base for the northern half of the county. Accommodations and admissions tax revenues from tourist activity totaled $7.6 million in 2000. Although agriculture represents a declining force in the county's economy, Beaufort generated $11.6 million in timber harvests in 1999. Seventy percent of the forestlands in the county are under nonindustrial private ownership. Timber ranks as the county's primary cash crop. Union Camp Corporation is the largest commercial forest interest, with more than 27,000 acres. Among the state's coastal counties, Beaufort County ranks first in commercial seafood landings and dockside values for

crabs and second for oysters, clams, and shrimp. The total annual cash value of harvested seafood exceeds $8 million. The county is responsible for one-third of the state's total commercial seafood harvest.

**Key Resources and Assets**

Beaufort County's key assets and resources range from military installations to unique habitats to culturally and historically significant structures and settlements. The most significant of these resources, which have been identified as potentially affected under the proposed sea level rise scenarios and lying within the 20-foot contour boundary, are summarized in the sections that follow.

*Economic Resources*

The county's economy has become centered on the retirement community industry and tourism. This activity has been focused primarily on Hilton Head and adjacent mainland areas. It is poised, however, to spread to other portions of Beaufort County and the neighboring counties of Colleton and Jasper. Heritage tourism is strong around the City of Beaufort and St. Helena. As a result of growth in the tourism industry, the retail and services sector leads the area in employment growth.

Jobs associated with the county's three military installations account for 22 percent of the local employment base providing approximately 10,000 jobs (civilian and military). Parris Island is home to the Marine Corps Eastern Recruiting Region, where new recruit training is conducted for all males Marines east of the Mississippi and all female recruits nationwide. More than 19,000 Marines are trained at the installation each year. The annual economic impact of the facility, the Beaufort Naval Hospital, and the adjacent Marine Corps Air Station constitutes more than half of the total economic base of northern Beaufort County. The Naval Hospital provides medical care for all active-duty and retired military and family members in the southeastern South Carolina and northeastern Georgia service areas, totaling 31,000 individuals.

Another key economic asset is the Port of Port Royal, one of the state's three commercial cargo ports facilities. The Port Royal facility provides specialized breakbulk handling and processed 336,000 tons of cargo in 2000.

*Cultural, Historic, and Natural Resources*

Beaufort County has 56 Historic Register sites, two Historic Districts, and two National Historic Landmark Districts (Beaufort Historic District and the Penn Center). (See Photos 16 and 17.) The Bluffton Historic District was most recently added to the Register. The entire area of Daufuskie Island is included in a listing in the National Register. The unique Gullah culture of the sea islands is kept alive at the Penn Center on St. Helena. More than 1,700 archeological sites have been identified within the county that include prehistoric, Revolutionary War, and Civil War resources.

**Photo 16. Waterfront of the Beaufort Historic District**. April 2004.

**Photo 17. Wetlands and Historic Homes along the Beaufort River.** Taken from the US-29 bridge, looking east. April 2004.

The SCDNR has identified 25 rare, threatened, and endangered plant species in the county, along with 14 animal species. Hunting Island State Park covers 5,000 acres and offers three miles of public beach. The park is one of the state's most popular and most visited, with more than a million visitors each year. The site is also home to the Hunting Island Lighthouse. The beach provides a nesting ground for loggerhead turtles and serves as a hatchery site for the preservation and study of the turtle.

Nine of the state's Heritage Preserves, protecting a total of 6,151 acres, are located within Beaufort County. Daw's Island (1,866 acres) is the site of four shell rings of the Late Archaic Period and another 23 sites that range in date from 10,000 BC to 500 AD. Fort Frederick (3 acres) is a British fortification constructed on the Beaufort River in the 1700s. Green's Shell Enclosure (3 acres) is an earthen and shell remnant of a fortified Indian village from the Mississipian Period and the only known ground feature of its type to exist in South Carolina. Old Island (400 acres) provides a rich variety of salt and freshwater wetland habitats in an undisturbed island environment. Victoria Bluff (1,111 acres) provides rare habitat for pine, saw palmetto, and pond spice. Bay Point Shoal (1 acre) and Joiner Bank

(1 acre) both provide important nesting and resting sites for seabirds. Joiner Bank is the focus of reclamation efforts after the shoal disappeared under water recently. Stoney Creek Battery (1 acre) contains Confederate coastal fortifications.

Several portions of lands in the northern section of the county are included within the ACE basin. Formed by the Ashepoo, Combahee and Edisto rivers, the basin is a vast and rich area offering significant habitat and ecological diversity. The ACE basin drains approximately 20 percent of the state. Among numerous designations, the basin is a National Estuarine Research Reserve Site, a priority habitat protection region under the North American Waterfowl Management Plan, and one of 35 sites in The Nature Conservancy's Last Great Places Program. Multiple conservation tools have been employed to protect this area within a partnership of private landowners, environmental organizations, and the public sector.

*Community Facilities and Infrastructure*

There are 137 miles of state primary highway system miles in Beaufort. Primary routes include US 278, US 17, and US 21. Significant portions of each route are affected by the 20-foot contour.

Beaufort County has already begun to experience problems associated with saltwater intrusion into the water supply. Increased pumping to accommodate new growth has resulted in the movement of salt water into the main aquifer. Individual wells have also become brackish. Sea level rise will exacerbate these conditions.

*Residential, Resort, and Recreational Resources*

The upscale retirement residential market has mushroomed in Beaufort County during the last decade. Island. (See Photos 18 and 19.) In addition to existing resort and retirement communities on Hilton Head, a proliferation of new development is occurring on the adjacent mainland sections of southern Beaufort County. One of the largest is the Del Webb Sun City development near the Bluffton area, which will eventually house up to 14,000 residents. Resort island development has also flourished in the northern section of the county on Fripp, Dataw, and Harbor islands.

**Photo 18. Juniper Lane, Hilton Head Island**. April 2004.


**Photo 19. Bayberry, Hilton Head Island**. April 2004.

**Development Trends**

The county will continue to face strong development pressures as more people move into coastal areas that have limited supplies of developable land. Nearly 48,000 acres of county land is under state and federal ownership. The county also has limited capacity to accommodate new growth because of severe development limitations on 95 percent of county soils. Through an extensive planning process, the County has identified three basic areas for investment and growth – Priority Investment Areas, Transitional Investment Areas, and Rural Investment Areas. Priority Investment Areas include urbanized and developing areas that will receive the bulk of community infrastructure expansions. Transitional Areas are those slated to accommodate more moderate growth rates and densities, but that may be upgraded to Priority Areas in 10 to 15 years. Rural Areas are those where development is discouraged and are the target of purchase or transfer of development rights, conservation easements, and other programs designed to divert development pressures away from these lands.

Most of the new growth in the coming decades is projected to occur in the southern Beaufort area that includes Hilton Head, Bluffton (See Photo 20), and Daufuskie Island. This area is anticipated to grow by more than 188 percent from 1990 to 2020. More than one-half of all new development will occur in the Bluffton area. Northern Beaufort County in the vicinities of Beaufort, Port Royal, Lady's Island, and Sheldon will continue to grow, but at a slower rate of only 38 percent over the same time period.

**Photo 20. Wetlands between Myrtle Island and the Mainland.** This area is within two miles of the Blufton. April 2004.

**Local Policies and Regulations**

Interviews were held with Cindy Bower-Camacho, assistant planning director for Beaufort County, and Teri Norris, long range planner with the Beaufort County Planning Department. Additional mapping data were obtained from Dan Morgan, GIS coordinator.

Beaufort County adopted its most recent comprehensive plan in 1999 in compliance with the requirements of the South Carolina Local Government Comprehensive Planning Act of 1994. The County adopted a county-wide, performance-based zoning ordinance in 1990. This is a consolidated ordinance, which also deals with land development regulations. The County adopted an update of the ordinance on April 20, 1999, which was developed with the assistance of planning consultants Lane Kendig and Dwight Merriam. The ordinance implements many of the recommendations of the comprehensive plan. They have formed two corridor review boards (one for citizens north of the Broad River and one for citizens south of the Broad River) that deal with signage, landscaping, and design issues in corridor zones along major roads. The County has also developed 14 Community Preservation Areas, within which residents have the power to enact additional regulations that are suited to the individual needs of their area. The ordinance also requires that natural resources must be considered and preserved in all new developments. The problem of sprawl is also addressed through the downsizing of rural densities from two units per acre to one unit per 3 acres. Open space and clustering are also encouraged through incentives.

The county ordinance designates a Beach Development Overlay District (BDOD) to preserve vegetation and dune stability and assure public access to beaches. The Flood Hazard Overlay District (FHOD) is designed to limit development densities in critical flood zones. A Historic Protection Overlay District (HPOD) protects identified historic and cultural properties. The Beaufort County River Protection Overlay District (BCRPOD) is currently under development and is intended to protect waters designated as Outstanding Resource Waters by the State. This overlay district has been extended to all saltwater bodies regardless of classification.

The County is in the process of refining its zoning ordinance to address development on barrier islands. Planners are also focusing on developing measures to protect tidal creek resources by establishing boundaries based on land use types in areas of impact. The County currently requires a 50-foot buffer along riparian areas, but planners are proposing an increase to a 100-foot minimum buffer. They are also exploring standards for application to existing developed areas where the expanded buffer requirement could not be met. They are also looking at addressing the issue of restricting potential bulkhead construction behind the setback lines currently regulated by OCRM under the Beachfront Management Act.

The County Planning Department has hired a staff biologist to delineate wetlands and work on a study that will classify and set priorities regarding the county's natural resources. The planning staff has also inventoried protected lands and easements. The Beaufort County Land Trust was established by county ordinance to direct the acquisition of sensitive lands that have been identified as priority areas for protection. The County passed an Archaeological and Historic Impact Assessment Ordinance in 1995 to protect archeological sites from development.

Beaufort County is a Community Rating System jurisdiction (1991), along with the City of Beaufort (1992), the Town of Hilton Head Island (1991), the Town of Kiawah Island (1996), and the Town of Meggett (1996). The Community Rating System is an initiative of the National Flood Insurance Program (NFIP), and was implemented to recognize community floodplain management activities.

In compliance with the Beachfront Management Act of 1988, the County maintains a Beachfront Management Plan. OCRM has recently contacted all coastal jurisdictions in South Carolina to initiate a required periodic update, and the Beaufort County Plan is being evaluated for revision and update.

**Draft Maps**

Based on the preceding information, we developed three draft maps that depicted the shores that would be protected under each of the three scenarios. Because all three scenarios are shown in a single map in the Stakeholder Review section, we do not reproduce those maps here; but we do describe the results of the three scenarios.

*Response Scenario One*

Protected areas under Scenario One include all land areas below the 20-foot contour with the exception of natural resource areas, including Pritchard's Island (USC Beaufort's Center for Coastal Ecology), Daws Island, Williman Islands, Victoria Bluff, and the Pinckney Island National Wildlife Refuge. Because under current South Carolina coastal wetlands management policy private property owners are allowed to employ hard protection measures such as bulkheads with no setback requirement, it is also assumed that all nonbeachfront residential, commercial, industrial, agricultural, and institutional uses will be protected through a combination of public and privately funded measures.

*Response Scenario Two*

Scenario Two excludes from shore protection all areas that are not protected in Scenario One. This scenario is largely based on current and anticipated future development patterns which have been delineated in the county's comprehensive plan as part of the designated Community Preservation, Regional Commercial, Research and Development, Residential/Light Commercial, Transitional Areas, Incubator Development, Planned Unit Development (PUD), Rural Residential, and Military Properties

and Airport districts. Lands within those delineated areas are either developed or are likely to be developed in the future. Protected areas would also include the lands within municipal boundaries. Lands designated as part of the county's Rural Conservation or Rural Service districts have sparse or no development and are excluded from the protected lands maps. Natural resource areas not included as protected areas in Scenario One are also excluded under this scenario.

*Response Scenario Three*

A large percentage of Beaufort County is affected by estuarine wetlands. Therefore, the land areas likely to be developed in the future that would be affected by a 150-foot buffer on estuarine wetlands are more abundant than in most of the other coastal counties. Areas of future development are designated in the county's comprehensive plan as Transitional Overlay Zones and overlay underlying areas within the Rural and Rural Residential districts. Within the Town of Bluffton, the majority of the vast 17,900 acre Palmetto Bluff tract that is being developed by the Crescent Development Group will also be an area of future development, with the northern portion of the tract very close to construction and therefore classified as current development. The most significant areas of future development affected by the buffers on tidal wetlands are portions of Port Royal Island along inlets of the Broad and Morgan rivers and Albergotti Creek and portions of the Palmetto Bluff Tract along the May, New, and Cooper rivers.


**Figure 12: Map of Beaufort County boundaries, municipalities, major river systems, military installations and state parks.**

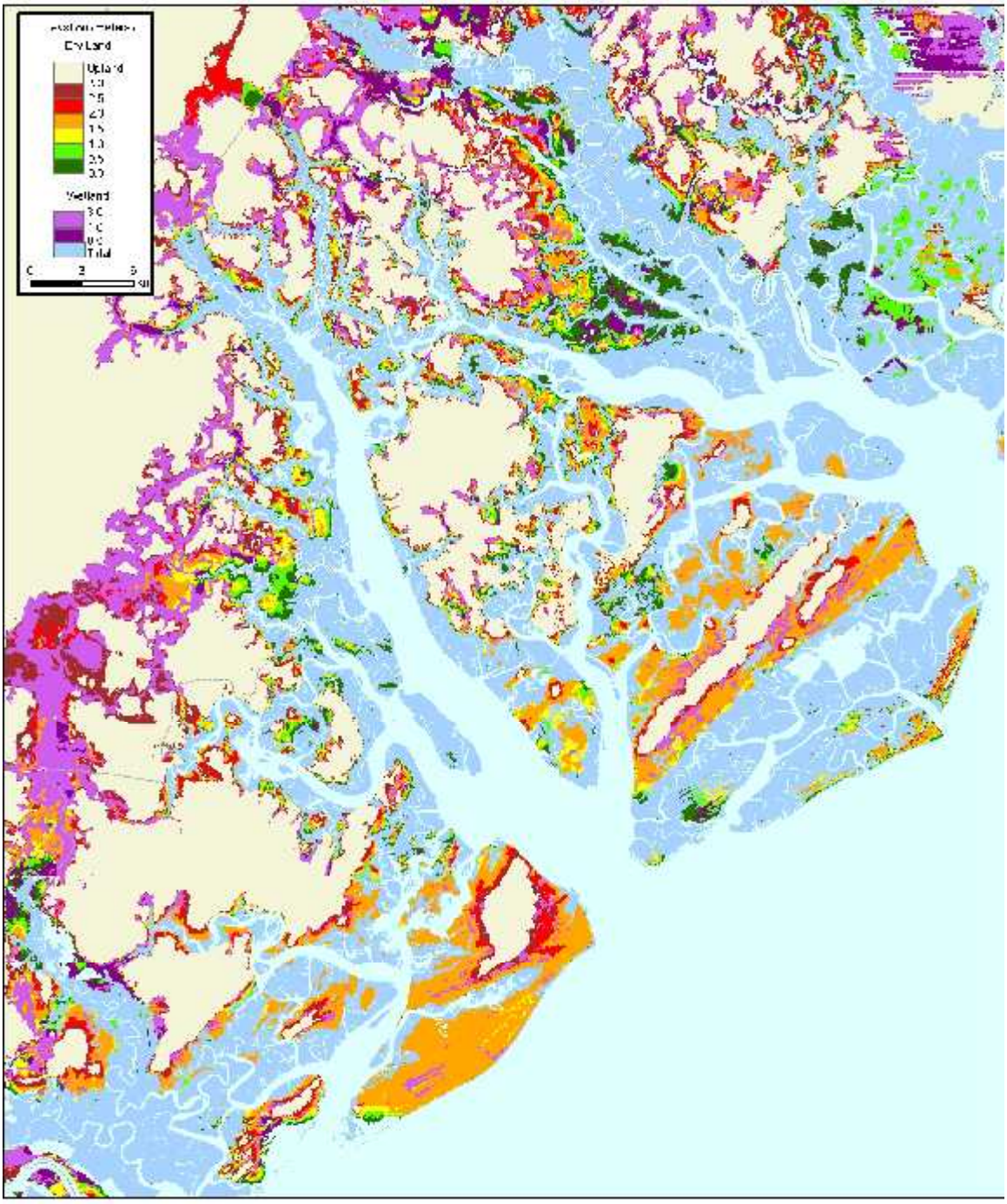


**Figure 13: Lands within approximately three meters (ten feet) above spring high water: Beaufort County.** Source: See Table 1.

## JASPER COUNTY

### Geographic and Socioeconomic Profile

Jasper County forms the southernmost tip of South Carolina in the Lowcountry region. The county is bordered on the west by Georgia, by Hampton County to the north, and by Beaufort County to the east. The county is strategically located on the South Carolina/Georgia border, between the fast-growing regions of Savannah and Beaufort County. This location will greatly influence future development patterns and growth rates. At present, Jasper has one of the lowest population densities in the state: just under 32 persons per square mile compared to the significantly higher state density of 133 persons per square mile. There are only two incorporated municipalities in the county – Hardeeville with a population of 1,793 residents and the county seat of Ridgeland with a population of 2,518. Because of the lack of concentrated urban development, the Census has classified the county as 100 percent rural. Total county population is 20,678 residents, representing a 33.5 percent increase between 1990 and 2000. Jasper now ranks as the fourth fastest growing county in the state.

Multiple river corridors that include the Coosawhatchie, Tullifinny, Pocotaligo, Broad, Savannah, and New rivers form the county boundaries. Twenty-two percent of the county land area is classified as wetlands, and the southern half of the county lies at an elevation of 20 feet or less. Elevations countywide range from sea level to 103 feet above sea level in the northern parts of the county.

Agricultural and forestry represent significant sectors of the Jasper County economy. Seventy-five percent of county lands are forested. The county ranks 14th in the state for timber receipts at more than $23.5 million in 1999. Nonindustrial private forests are 65 percent of the forestlands, with timber ranking as the number one cash crop. The commercial fisheries sector is less active than in other coastal counties, generating less than $1 million in harvests. Jasper ranks fifth in commercial seafood landings and dockside values for shrimp and fourth for crabs. Tourism is a small, but growing sector of the local economy. Accommodations and admissions tax revenues totaled $235,000 in 2000. Local leaders are moving to develop the county as a base for the region's growing nature-based tourism industry.

### Key Resources and Assets

Jasper County's key assets and resources range from unique habitats and wetlands to vast commercial forests and historic structures. The most significant of these resources, which have been identified as potentially affected under the proposed sea level rise scenarios and lying within the 20-foot contour boundary, are summarized in the sections that follow.

*Economic Resources*

With the exception of the Low Country General Hospital (120 employees), no private businesses or industries with more than 100 employees are located within the county. The largest nongovernmental employers in the area are the hotels located at the county's two interchanges on I-95. Many Jasper residents commute to neighboring Savannah or Beaufort County for employment opportunities.

*Cultural, Historic, and Natural Resources*

Jasper has five listings on the National Register, four of which are at or below the 20-foot contour. In all, 24 additional properties have been catalogued as eligible for National Register listing.

Nearly 26,000 acres are under state and federal ownership. The SCDNR has identified 28 animal and 39 plant species as rare, threatened, or endangered in Jasper County. The Savannah River National Wildlife Refuge contains 25,608 acres along the county's southern border with Georgia; 6,000 of these acres are in Jasper, with another 728 acres recently added. The Refuge provides valuable migratory waterfowl habitat. Turtle Island is a barrier island consisting of 1,750 acres owned and managed by the SCDNR for rare plant species. Jasper County contains one State Heritage Preserve site. Tillman Sand Ridge (963 acres) is home to the state's largest population of the endangered gopher tortoise. The preserve is located in the northwestern section of the county above the 20-foot contour.

Land trusts currently operating in the county include the Lowcountry Open Land Trust, The Nature Conservancy of South Carolina, Ducks Unlimited, and the Beaufort County Open Land Trust. Several large plantations have entered into conservation easements.

*Community Facilities and Infrastructure*

Major community facilities and infrastructure, with the exception of roads and highways, are located above the 20-foot contour study area and are concentrated in the area surrounding I-95. Jasper County has 34 miles of Interstate highway (I-95), more than any other coastal county. The county also has 177 miles of State Primary Highway system miles, with I-95 and US 17 providing the primary access routes to and from the county. Scattered segments of both I-95 and US 17 are impacted by the 20-foot contour.

Several newer and planned facilities are also potentially affected and include a new hospital, a regional wastewater treatment plant, and a new power generation station to be built by South Carolina Electric and Gas (SCE&G).

*Residential, Resort, and Recreational Resources*

The Del Webb Sun City development is partially located in Jasper County. Approximately 1,600 of the 8,600 homes to be built in the development are located on the Jasper side. Major water and sewer improvements have been made to serve this area and accommodate the residential growth. Union Camp also has long-term plans in place to develop portions of its extensive land holdings northeast of Hardeeville. Proposed development includes a mix of commercial, residential, and light industrial uses.

**Development Trends**

Areas of strongest growth are anticipated for the southern and eastern portions of the county. Approximately 70 percent of soils in Jasper have severe limitations for building, septic systems, and roads. The availability of water and sewer will continue to shape future development patterns and densities in the county. Development in the southern and eastern portions of the county is precluded in many areas by the extensive wetlands that dominate the area. Existing regulations by the US Army Corps of Engineers, SCDHEC, and OCRM for wetlands protection, drainage and septic systems significantly affect development patterns and potential in these sensitive areas. Another factor affecting future development potential is that two-thirds of the county is under large-scale ownership by commercial timber interest and hunt clubs. More than 80 percent of land is part of tracts that are 2,000 acres or larger.

The majority of new growth is slated for the Cherry Point area, an area east of Hardeeville along the county's border with Beaufort County. This growth is being fueled by the continued spillover of

development from Hilton Head Island into the Bluffton area toward Jasper County. Existing and announced development in this area include a new satellite campus of the University of South Carolina (USC-New River), the Okaitie Center, the New River mixed-use development, Sun City, and medical facilities. Additional growth will occur in the Hardeeville, Ridgeland, and Point South areas that flank the Interstate.

**Local Policies and Regulations**

Interviews were conducted with Chris Philips, assistant county administrator, and Hal Jones, director of Building and Planning Services. Jasper County adopted its comprehensive plan in 1999 in compliance with the requirements of the South Carolina Local Government Comprehensive Planning Act of 1994. This update replaced the county's earlier 1986 plan. Under the plan, county officials have classified all county lands into three basic districts for development: the Development District, the Community Village District, and the Rural Resource District. Development Districts encompass lands with an existing concentration of development and infrastructure where future growth can be readily accommodated with developable land. Of the four areas designated as Development Districts, three are either partially or entirely within the 20-foot contour – Hardeeville, Cherry Point, and Point South.

The County adopted its first Development Standards Ordinance in 1988. The current DSO addresses the subdivision of land, site development standards, setbacks, and bufferyards. However, based on recommendations of the new comprehensive plan, the ordinance has been revised to include full performance standards and is being considered for adoption by County Council. The County also maintains a Floodplain Ordinance.

**Draft Maps**

Based on the preceding information, we developed three draft maps that depicted the shores that would be protected under each of the three scenarios. Because all three scenarios are shown in a single map in the Stakeholder Review section, we do not reproduce those maps here; but we do describe the results of the three scenarios.

*Response Scenario One*

Protected areas under Scenario One include all land areas below the 20-foot contour with the exception of the Savannah River National Wildlife Preserve. Because under current South Carolina coastal wetlands management policy private property owners are allowed to employ hard protection measures such as bulkheads with no setback requirement, it is also assumed that all nonbeachfront residential, commercial, industrial, agricultural, and institutional uses will be protected through a combination of public and privately funded measures.

*Response Scenario Two*

Scenario Two excludes from shore protection all areas that are not protected in Scenario One. This scenario is largely based on current and anticipated future development patterns delineated in the county's comprehensive plan as part of the designated Development and Community Village districts. Lands within these planning categories are either developed or are likely to be developed in the future. Protected areas would also include all lands within municipal boundaries. Lands designated as part of the County's Rural Resource District have sparse or no development and are excluded from the

protected lands maps. The Savannah River National Wildlife Preserve is also excluded under this scenario.

*Response Scenario Three*

In Jasper County the land areas likely to be developed in the future that would be affected by a 150-foot buffer on estuarine wetlands are limited to the Knowles Island Area in the northeast corner of the county. Although the portion of the island located across Boyd's Creek is already developed, the area inland is not yet developed but is expected to develop in the future.

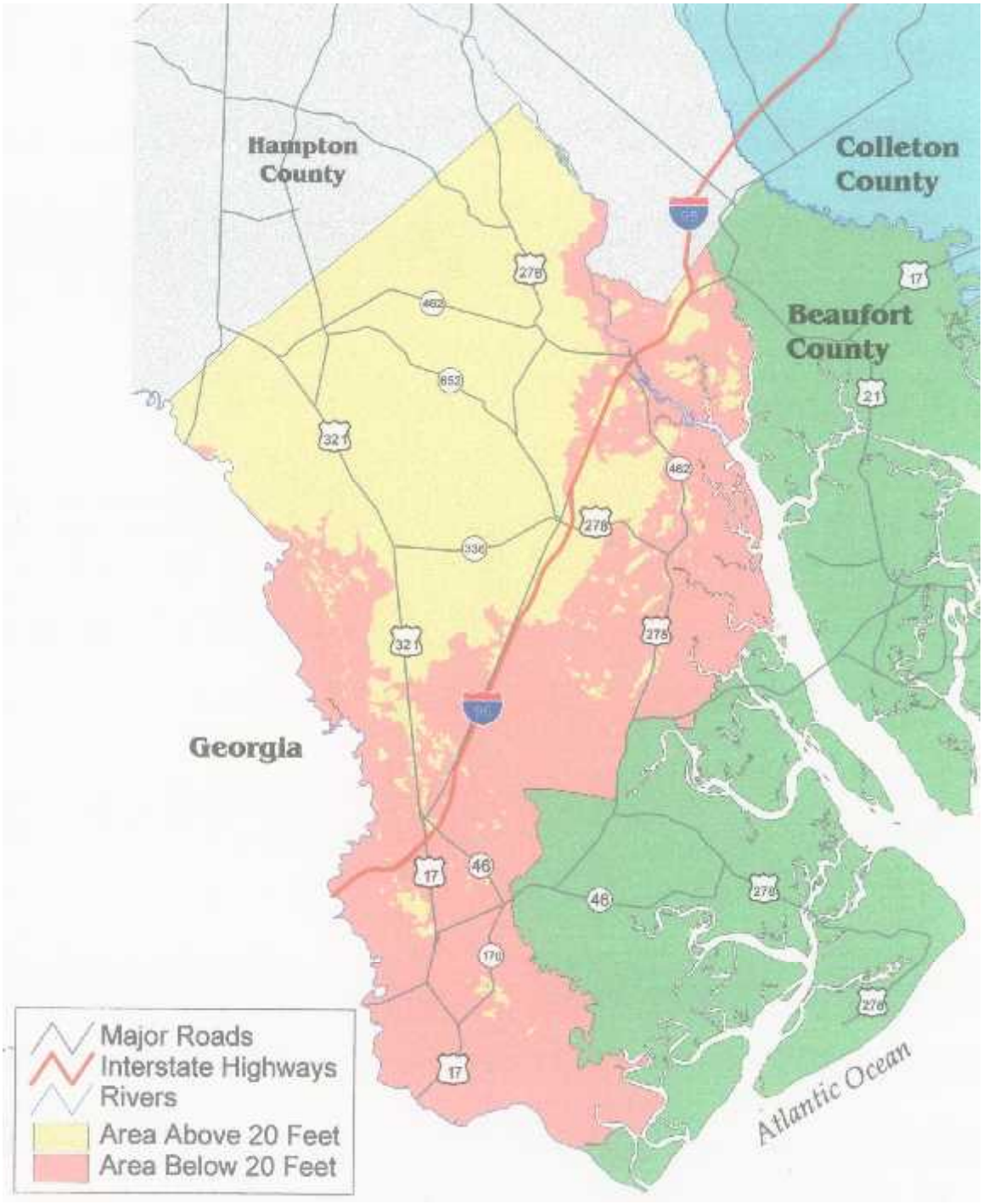


**Figure 14: Map of Jasper County boundaries, municipalities, major river systems, military installations and state parks.**

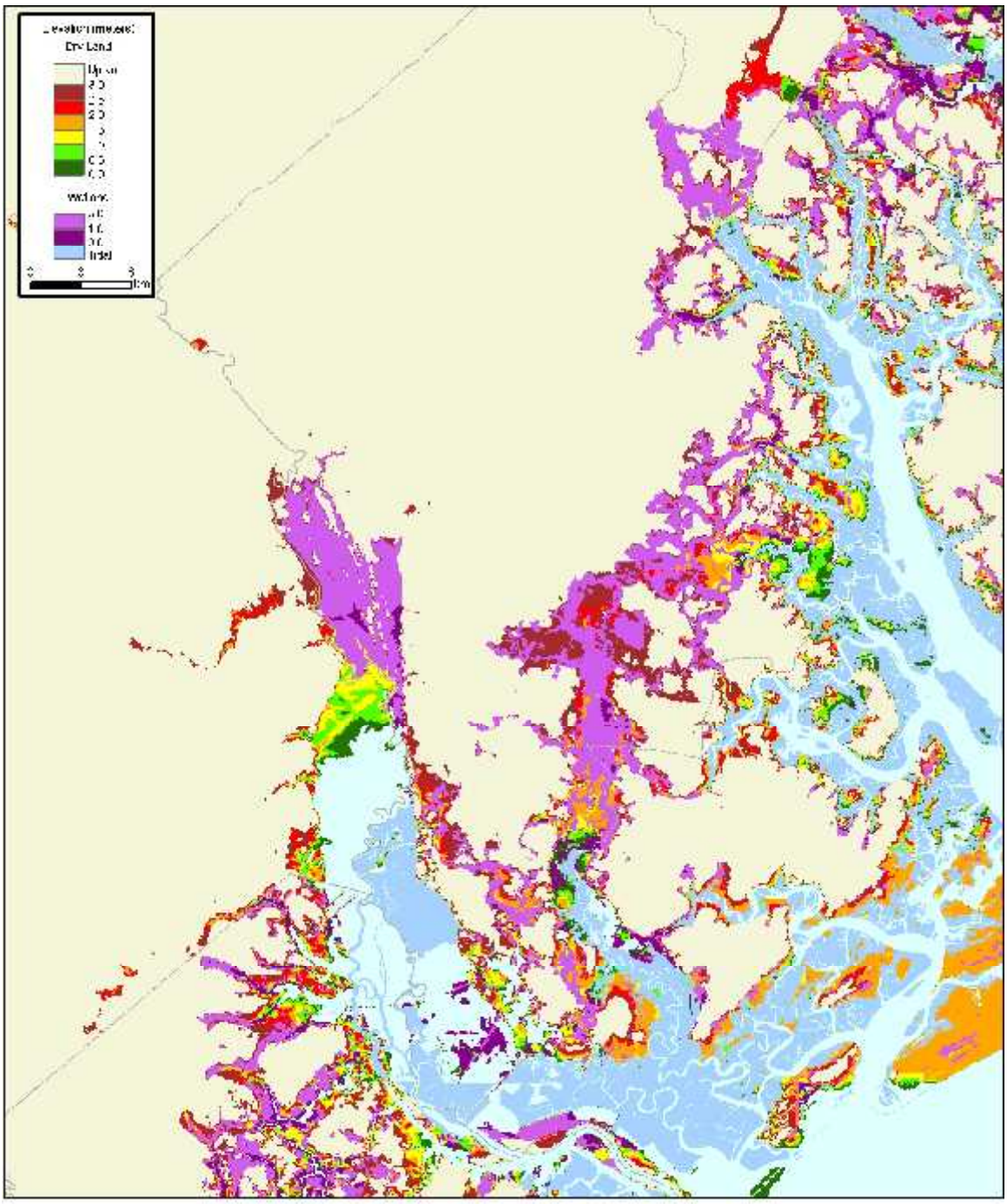


**Figure 15: Lands within approximately three meters (ten feet) above spring high water: Jasper County.** Source: See Table 1.

## STAKEHOLDER REVIEW

We conducted follow-up interviews with planning representatives from the seven coastal counties that constitute this study. At the outset, we reminded all participants that (1) this South Carolina study is part of a national assessment of responses to sea level rise in coastal states conducted by EPA's Office of Air and Radiation; (2) the purpose of the project is to determine those coastal areas that are likely to be eroded or submerged by the rising sea or protected through intervention; (3) the study results have no legal or regulatory significance; and (4) the resulting maps represent only general expectations relative to shoreline protection and are created for general research, planning, and public awareness efforts.

Site visits were scheduled with each County to review maps and collect verbal and written feedback from representatives on the accuracy of study maps and study narrative. Additional, more generalized comments on the study or related issues were noted under the "Other" comments section. Key personnel changes through retirement and replacement resulted in changed contacts for three of the seven counties in the study area. For Horry, Colleton, and Jasper counties, these changes resulted in a new planning staff member participating in the follow-up review than had previously participated in the original study process completed a year earlier. These individuals are listed in Appendix B.

The following sections discuss each of the seven counties we visited, with review comments summarized by map, narrative, or other. All meetings were conducted between August 1 and September 30, 2002.

### Horry County

The Horry County follow-up interview was conducted at the Horry County Courthouse with Kevin Wheeler, senior planner, and Janet Carter, deputy county attorney/interim planning director. Former Planning Director Danny Taylor participated in the original study; however, neither Mr. Wheeler or Ms. Carter participated at that time. The comments below reflect feedback received both during the meeting and through subsequent calls. Because the county staff did not receive the necessary review materials and instructions before our meeting, additional comments may come from the County planning staff after submittal of this report and will be forwarded directly to Industrial Economics.

**Map Comment.** We provided the County with the map of the County's assessment of the likelihood of shore protection based on our initial meeting. After reviewing the map, the County suggested one change: The Bucksport area, a predominantly African-American community located near the southeastern border of Horry County, was added as a protected area and changed from blue to brown.[30] Figure 16 shows the likelihood of shore protection after we made the requested change.

**Narrative Comments.** Narrative comments were not available at the meeting. The planning staff continued their review of the narrative after the meeting and reported that they had no additional comments or revisions to the narrative in a follow-up call.

**Other Comments.** Planning staff requested the Sea Level Rise project GIS shapefile(s) to overlay with their GIS files and provide additional edits after receiving the draft report during the first review process. Unfortunately, the County received no response from the request and the requested files were not sent to Horry County for review. During the September 4, 2002, interview with the Matheny-Burns

[30] This area is the brown circular polygon surrounded by blue, near the southern end of the blue area.

Group they again requested the GIS shapefile(s). The request was forwarded to Daniel Hudgens, who promptly sent the digital file on September 6, 2002. In a follow-up contact on September 23, 2002, Horry County Senior Planner Kevin Wheeler indicated that they would need more time to review the maps.

Concern was expressed by staff about the release of the maps publicly at the individual county scale. They predicted pressure from the development community to respond with local policy. They do plan to incorporate Sea Level Rise project information and data into their upcoming comprehensive plan revision on a limited basis.

However, staff expressed concern that the county's municipalities were not formally included in the project. The outgoing county planning director had forwarded the SLR draft report to the City of Myrtle Beach for review and comment. The city's planning staff comments were included in a letter to Industrial Economics on August 29, 2002.

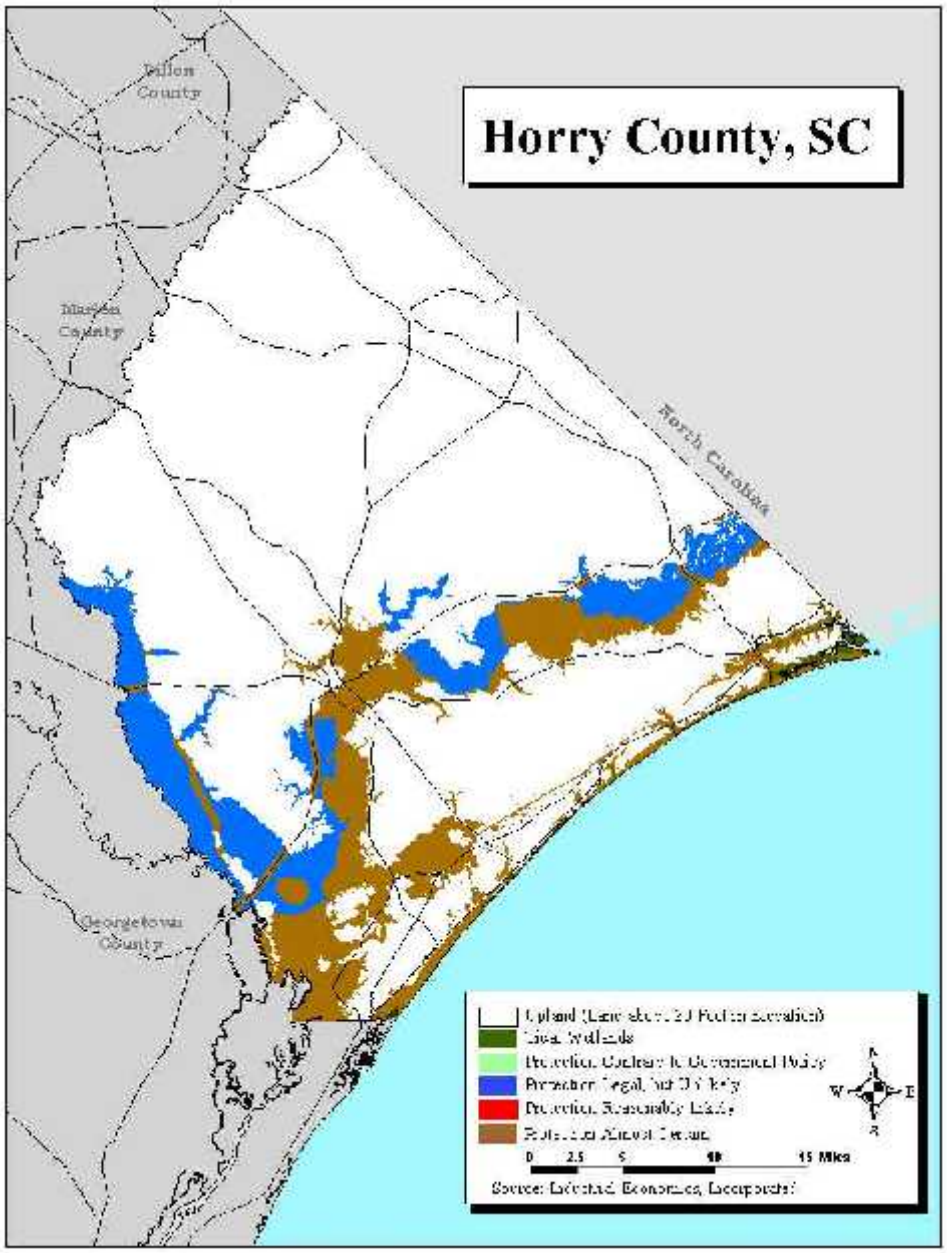



**Figure 16: Horry County: Likelihood of Shore Protection**. Draft map incorporating stakeholder review . This map is based on assumptions suggested by county planners at the initial meeting, with one revision from the stakeholder review: Bucksport is certain to be protected.

**Georgetown County**

The Georgetown County follow-up interview was conducted with Allen Burns, director of Planning and Economic Development for Georgetown County. The comments below reflect feedback received during the meeting.

**Map Comments.** Figure 17 shows the County's assessment of the likelihood of shore protection based on our initial meeting and revisions from the stakeholder review. After reviewing the original draft map, the County's only suggested change was to assume that the areas on either side of South Carolina Highway 51 is certain (rather than unlikely) to be protected. Development is expected along this corridor, which is designated as a major hurricane evacuation route and is certain to be protected.

**Narrative Comments.** There were no changes recommended for the narrative portion of the study.

**Other Comments.** The planning director strongly suggested a change in the "Blue" Scenario wording—eliminating the word "Legal" and replacing it with "Allowed." This change would make the "Blue" Scenario description read "Protection ***Allowed***, but Unlikely."[31]

There was also some concern over the release of individual county maps to other counties in which county maps could be used to subvert economic recruitment efforts among competing counties and states. There was a strong preference that the coastline map of South Carolina serve as the public release map, not the individual county maps.[32]

**Berkeley County**

The Berkeley County follow-up interview was conducted at the Berkeley County Administration Complex with Harold LeaMond, county Planner. The comments below reflect feedback received both during the meeting and through subsequent calls.

**Map Comments.** Figure 18 shows the County's assessment of the likelihood of shore protection based on our initial meeting and revisions from the stakeholder review. After reviewing the map, the County suggested one change: The map should be amended to include the location of Medway Plantation, a 7,000-acre historic site under a long-term conservation easement. Part of the easement's intent is to preserve and perpetuate a mature pine ecosystem. Thus, unlike many conservation easements, shore protection would be necessary to fulfill the intent of the easement. Therefore, we changed the site from blue to brown.

**Narrative Comments.** There were no suggested changes to the narrative other than to change the title of Mr. LeaMond from "Planning Director" to "County Planner" in Appendix B and to correct the date of the adoption of the County's zoning ordinance on page 36, paragraph 2 under "Local Policies and Regulations" from "1980" to "1987."

**Other Comments.** Mr. LeaMond was comfortable with the format and scale of the Berkeley County map.

[31]Comments like this from several states led EPA to shorten this designation to "shore protection unlikely."
[32]Editor's Note. The documentation of this report includes county-specific maps because that is the scale at which the study has been conducted. A state-specific map is included in all studies as well. EPA also intends to make the maps available in a GIS format for other researchers.

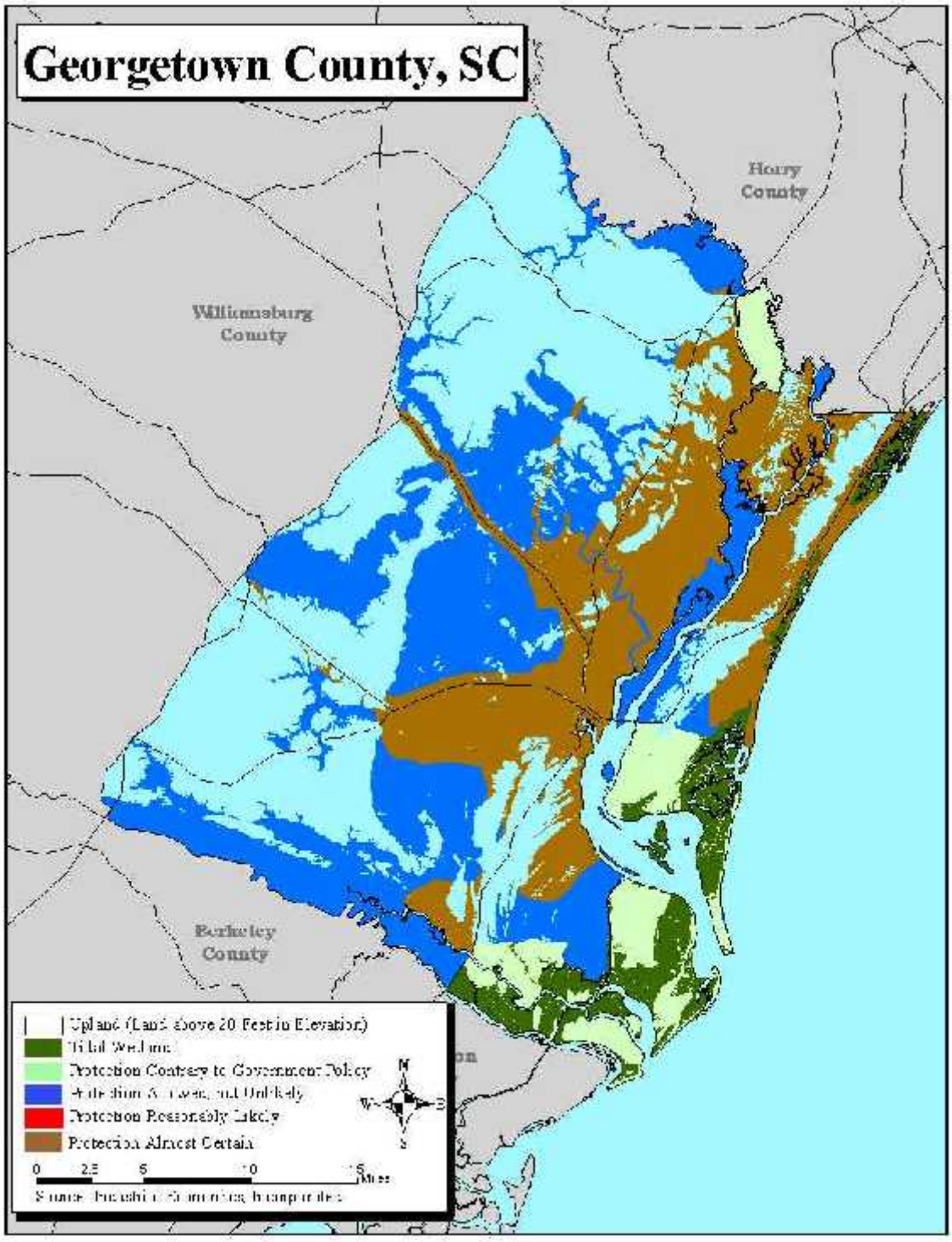



**Figure 17. Georgetown County: Likelihood of Shore Protection.** Draft map incorporating stakeholder review. This map is based on assumptions suggested by county planners at the initial meeting, with one revision from the stakeholder review: The SC-51 corridor is certain to be protected.

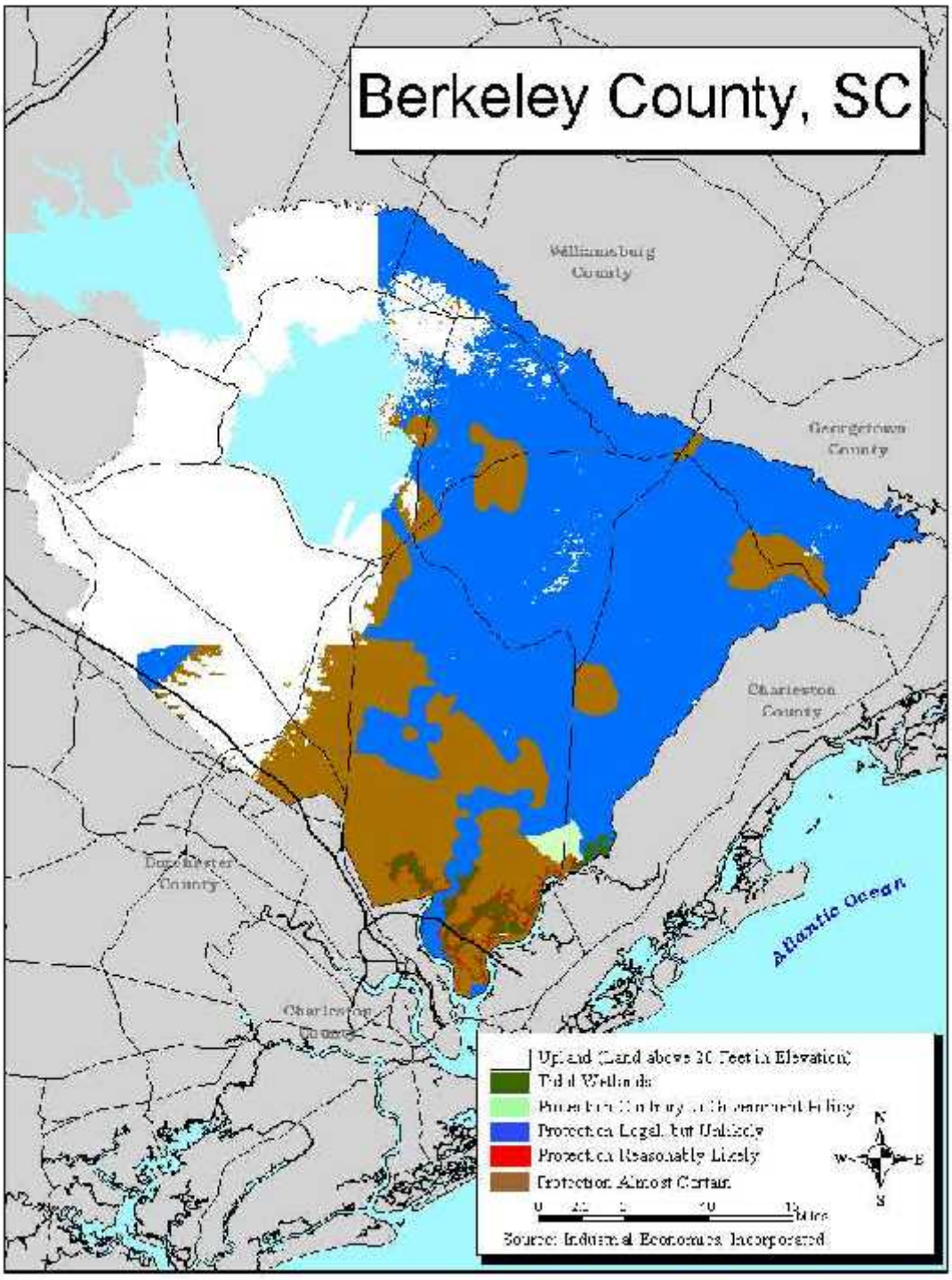



**Figure 18: Berkeley County: Likelihood of Shore Protection.** Draft map incorporating stakeholder review. This map is based on assumptions suggested by county planners at the initial meeting, with one revision from the stakeholder review: the Medway Plantation is almost certain to be protected.

**Charleston County**

The Charleston County follow-up interview was conducted at the Charleston County Public Services Building with Jennifer Miller, planning director; Dan Pennick, AICP, assistant director of planning; Brana Rerig, project officer III; and John Carillo, planner III (engineer for the Planning Department). The comments below reflect feedback received both during the meeting and through subsequent calls. Because the county staff did not receive the necessary review materials and instructions before our meeting, additional comments may emerge by the county planning staff after submittal of this report and will be forwarded directly to Industrial Economics.

**Map Comments.** Figure 19 shows the County's assessment of the likelihood of shore protection based on our initial meeting. After reviewing the map, the County requested five changes, all of which converted blue areas to brown.

| | |
|---|---|
| Change 1: | Area coding change from blue to brown (Town of Awendaw and immediately surrounding area). |
| Change 2: | Area coding change from blue to brown (Area surrounding new Wando High School location north of Mt. Pleasant). |
| Change 3: | Area coding change from blue to brown (All portions of John's Island not already brown). |
| Change 4: | Area coding change from blue to brown (Area adjacent and westward of the Town of Edisto Island). |
| Change 5: | Area coding change from blue to brown (Parker's Ferry Community). |

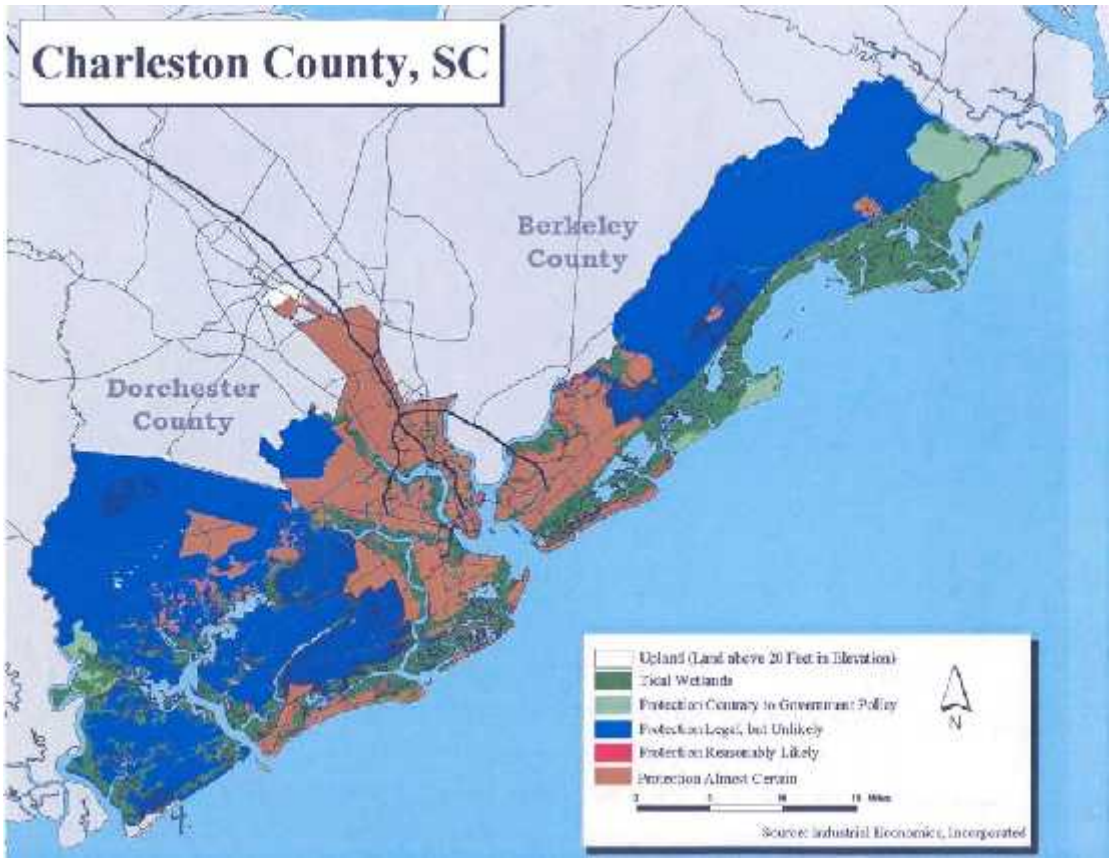



**Figure 19: Charleston County draft map before incorporating stakeholder review**.

Figure 20 shows the likelihood of shore protection after we made those corrections.

**Narrative Comments.** The planning staff had no comments or changes to the narrative.

**Other Comments.** The staff also suggested that the edges of the mapped areas in the county-level map be less harsh and more rounded, generalized—as typical for areas shown in a comprehensive plan map—so that specific properties cannot be identified.

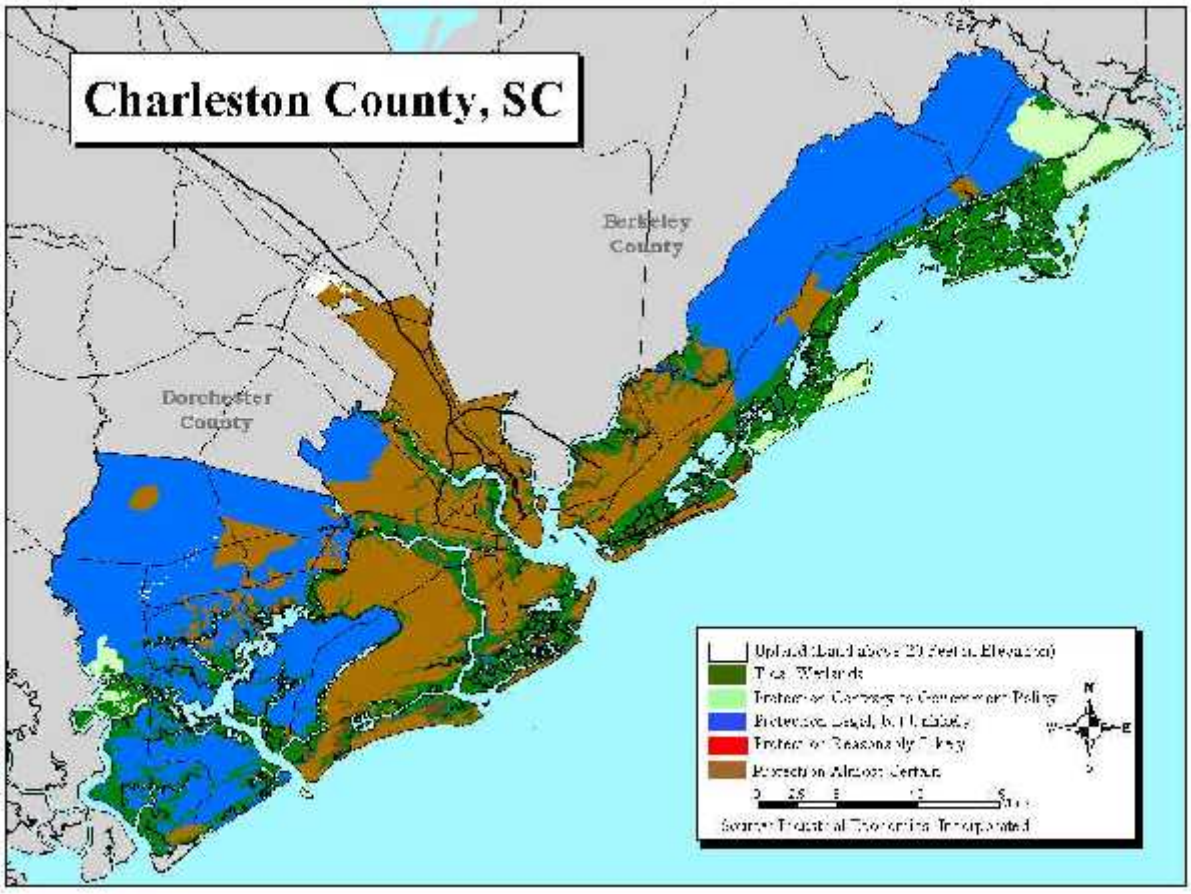



**Figure 20: Charleston County: Likelihood of Shore Protection, Including Stakeholder Revisions.** Draft map incorporating stakeholder review. **This map is based on assumptions suggested by county planners at the initial meeting, with five revisions from the stakeholder review.**

**Colleton County**

The Colleton County follow-up interview was conducted at the Colleton County Planning Office with Kevin Griffin, AICP, planning director. Mr. Griffin became the planning director following the retirement of the previous director, and therefore was not a participant in the previous study. The comments below reflect feedback received both during the meeting and through subsequent calls.

**Map Comments.** Figure 21 shows the County's assessment of the likelihood of shore protection based on our initial meeting. After reviewing the map, the County's planning director suggested seven changes, all of which were either blue to brown or brown to blue. Changes are summarized below and numerically keyed to the Colleton County map in Appendix C.

| | |
|---|---|
| Change 1: | Area coding change from brown to blue (mostly nontidal wetlands). |
| Change 2: | Area coding change from blue to brown (Hendersonville area). |
| Change 3: | Area coding change from blue to brown (Neil's Crossroads community). |
| Change 4: | Area coding change from blue to brown (Bonniedoon). |
| Change 5: | Area coding change from brown to blue (wetlands and timber). |
| Change 6: | Area coding change from blue to brown (Jacksonboro Road area). |
| Change 7: | Area coding change from brown to blue (sparsely populated/low density Bennet's Pointe area in southern portion of County). |

Figure 22 shows the likelihood of shore protection after we made those corrections.

**Narrative Comments.** Mr. Griffin had no recommendations or changes on the narrative portion of the draft.

**Other Comments.** There were no other comments.

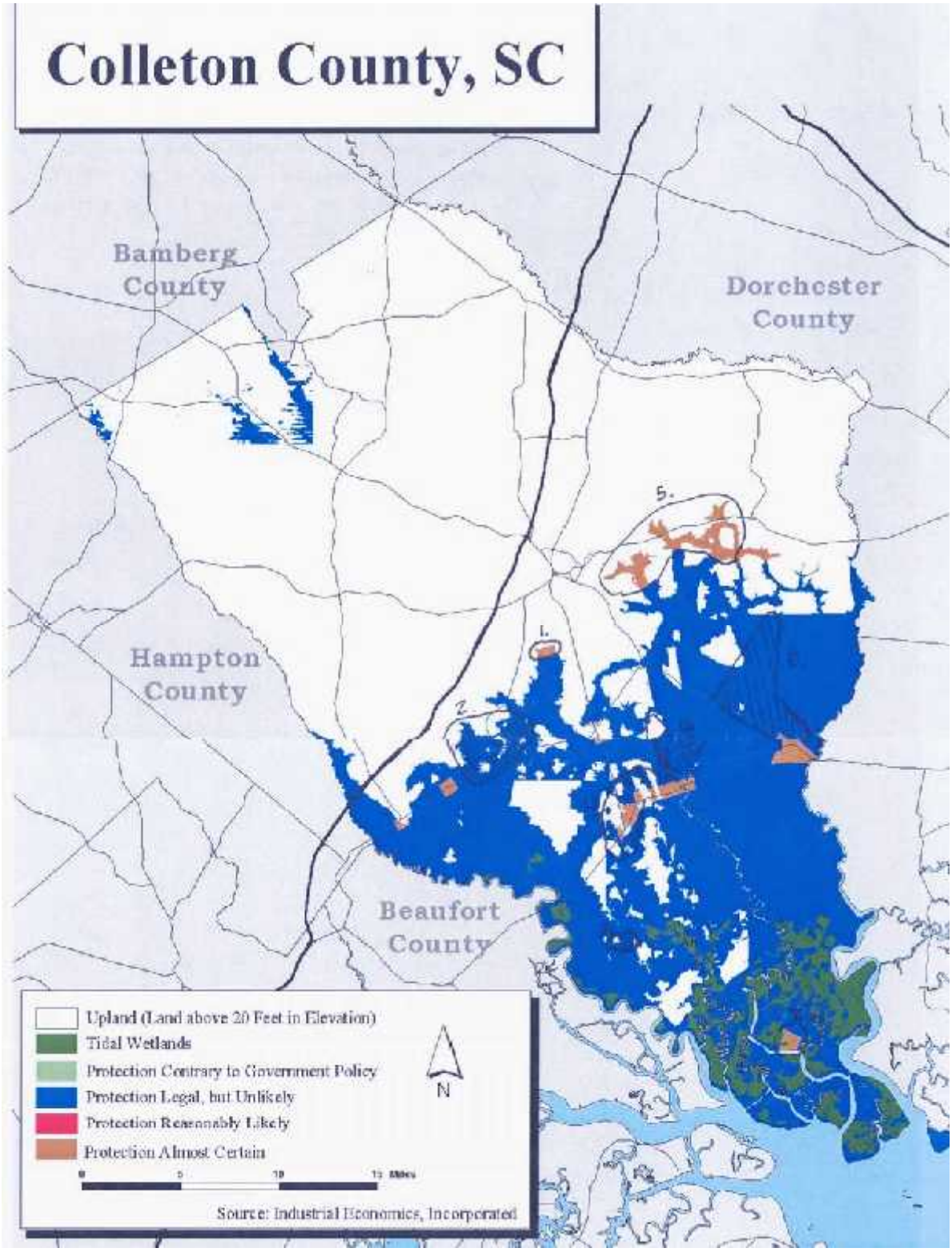



**Figure 21: Colleton County draft map before incorporating stakeholder review**

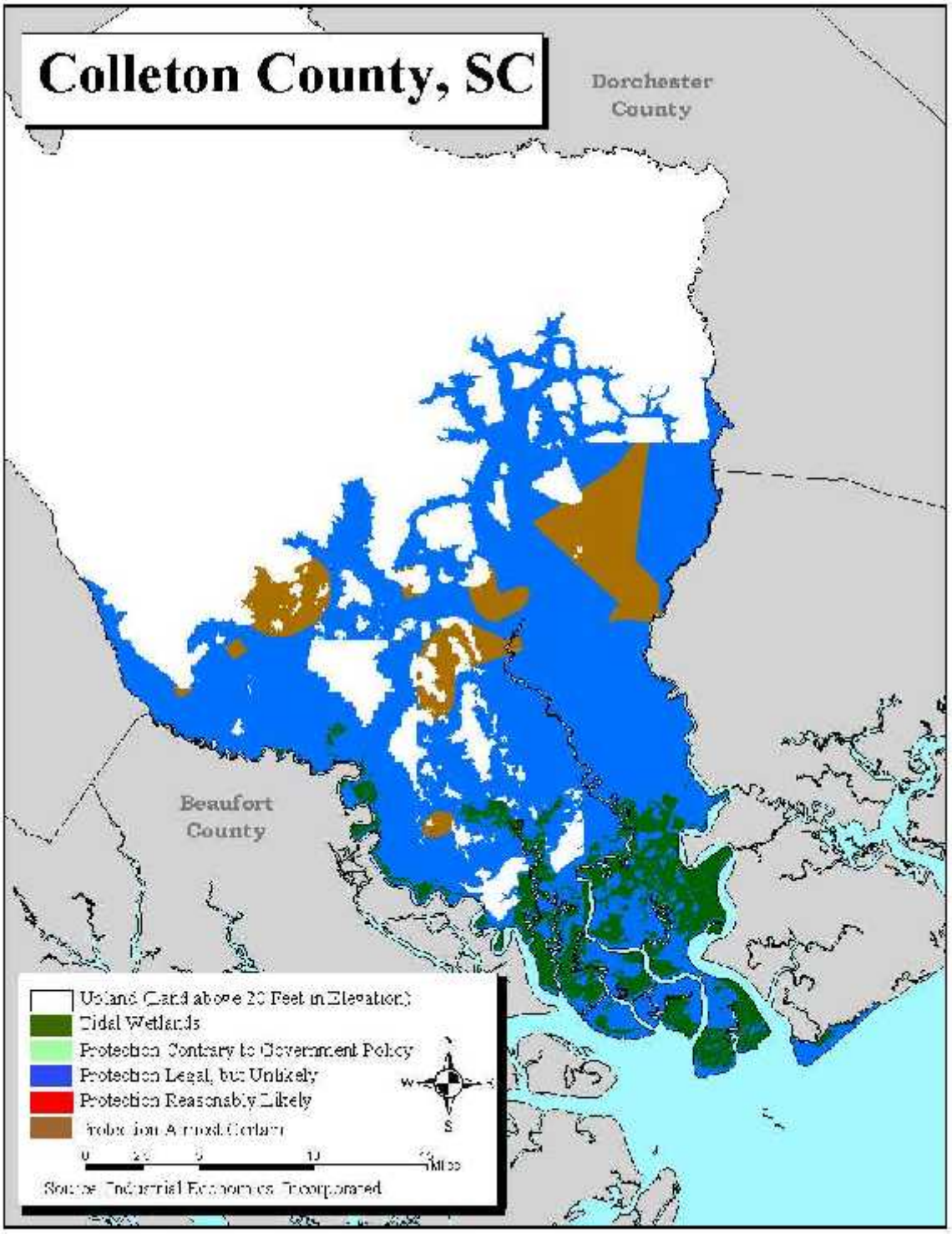



**Figure 22: Draft Map 7. Colleton County: Likelihood of Shore Protection, Including Stakeholder Revisions.** Draft map incorporating stakeholder review. This map is based on assumptions suggested by county planners at the initial meeting, with five revisions from the stakeholder review.

**Beaufort County**

The Beaufort County follow-up interview was conducted at the Beaufort County Government Complex with Cindy Bower-Camacho, assistant planning director, and John Holloway, Jr., natural resources planner. The comments below reflect feedback received both during the meeting and through subsequent calls and e-mails. Because the county staff did not receive the necessary review materials and instructions before our meeting, additional comments may come from the county planning staff after submittal of this report and will be forwarded directly to Industrial Economics.

**Map Comments.** Figure 23 shows the County's assessment of the likelihood of shore protection based on our initial meeting. After reviewing the map, the planning staff suggested 18 map changes. These changes are summarized below and numerically annotated in Figure 23.

Change 1: The Gardens Corner area should be shown as brown. It is developed and will be protected.

Change 2: The North and South Willimen islands are state-owned, with no upland areas (very minimal—should be light green). Because the area is tidal wetlands (estuary), all of the blue should be changed to dark green.

Change 3: On Chisolm Island, the circled area is tidal wetlands and should be indicated as dark green.

Change 4: Morgan Island is state-owned. Most of the island should be dark green (tidal wetlands), with the small circle in the middle shown as light green.

Change 5: On Lady's Island, the blue areas on the northern end of the island are developed and should be changed to brown.

Change 6: The Seabrook area in northern Port Royal Island is developed and should be brown.

Change 7: This is a Beaufort County boundary correction.

Change 8: On Hogs Neck Island, the circle in the center should be blue, and the hatched area is tidal wetlands and should be dark green.

Change 9: On Dawes Island, the white area around the island is not above the 20-foot contour and should be portrayed with dark green with a small speck inside shown as light green.

Change 10: The brown "bar" area is an error and should be dark green.

Change 11: Small brown areas should be changed to light green.

Change 12: The blue areas are errors and should be changed to dark green.

Change 13: The brown areas should be changed to light green. It is unlikely that they will be developed or protected. These are highly erosional beaches.

Change 14: Blue areas should be changed to brown, since this is developed area on Hilton Head Island.

Change 15: Pinckney Island is NWR, therefore all blue area should be changed to dark green (tidal wetlands).

Change 16: Blue area is developed and should be brown.

Change 17: Palmetto Bluff: The cross hatched area should be blue and the circled area along the river is developed and should remain brown.

Change 18: The southern boundary of Beaufort County only encompasses a marsh island south of Daufuskie Island. The remainder of area noted is in neighboring Jasper County.

Figure 24 shows the likelihood of shore protection after we made those corrections.

**Narrative Comments.** Five narrative changes were requested by the planning staff, all of which were made to the final report.

**Other Comments.** Beaufort County planning staff are interested in participating in any additional effort associated with the Sea Level Rise project. They have been active in securing grants and participating in inter-agency partnerships on numerous related projects in the region. Among the current and recently completed initiatives are studies involving the Urban Land Institute (ULI), NASA, FEMA, and the state Department of Natural Resources. Two separate land use change models (each unique in scope and objectives) are currently being developed, one in conjunction with the Strom Thurmond Institute of Clemson University and the other as a joint project with the University of South Carolina and NASA. Beaufort County is also in the process of completing an All Hazards Plan that will include a coastal hazard mitigation plan component and is anticipated to serve as a model for coastal jurisdictions in South Carolina and other states.

The planning staff interviewed noted that these studies have yielded a wealth of data which would strongly complement future Sea Level Rise project efforts in Beaufort County. They will have 1 foot contour data for the county available soon through a federal grant project.

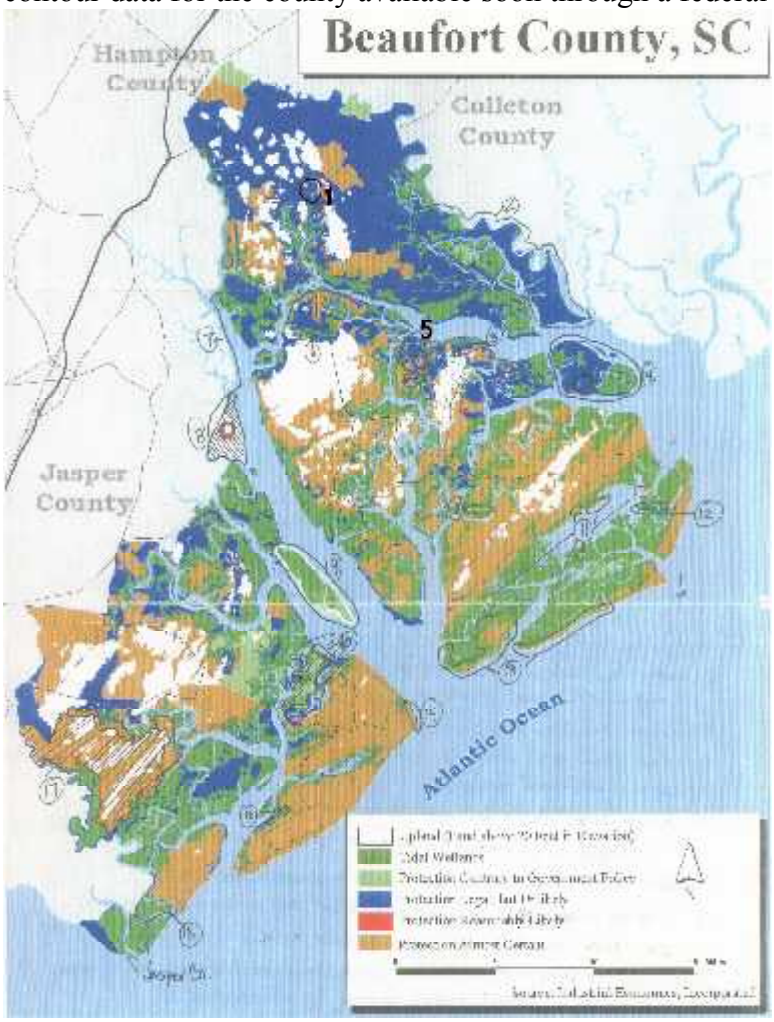



**Figure 23: Beaufort County: Likelihood of Shore Protection According to Initial Draft Map Provided to County Officials for Stakeholder Review.**

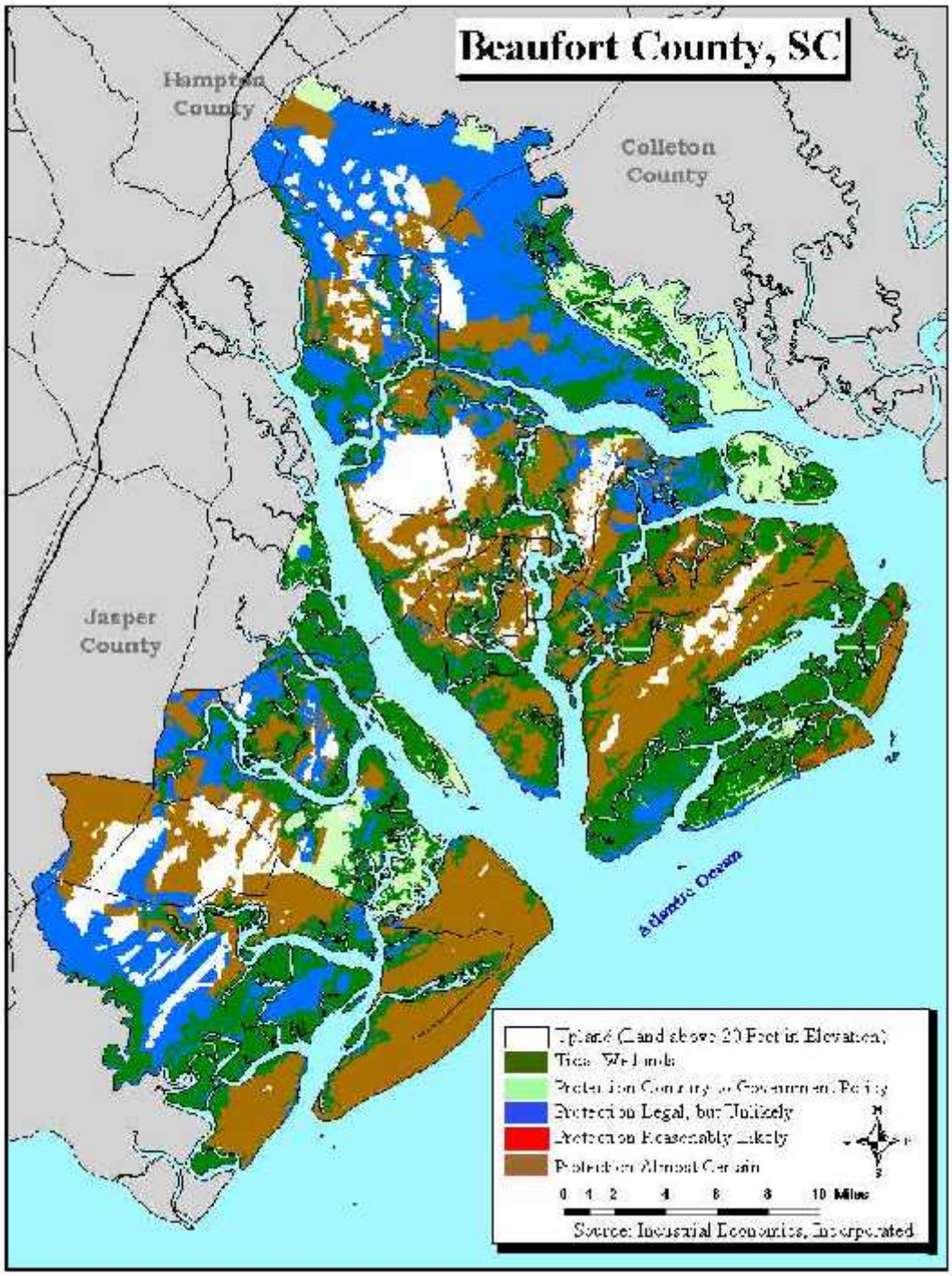



**Figure 24: Draft Map 9. Beaufort County: Likelihood of Shore Protection, Including Stakeholder Revisions.** Draft map incorporating stakeholder review. This map is based on assumptions suggested by county planners at the initial meeting, with five revisions from the stakeholder review.

**Jasper County**

The Jasper County follow-up interview was conducted via phone and e-mail with Hal Jones, director of Planning and Building Services. Because of the scheduling constraints of Mr. Jones, a site visit could not be arranged and a phone interview was determined to be mutually conducive to reviewing the draft study information. Mr. Jones assumed the planning responsibilities previously assigned to Chris Phillips, who recently left to take another position. However, as director of Planning and Building Services, Mr. Jones had participated in the original study. The comments below reflect feedback received both during the phone meeting and through subsequent contact. We provided him with the same information that we discussed with the other counties. He had no comments or changes to the narrative or the map, nor did he have any other comments.

Figure 25 shows the County's assessment of the likelihood of shore protection based on our initial meeting.

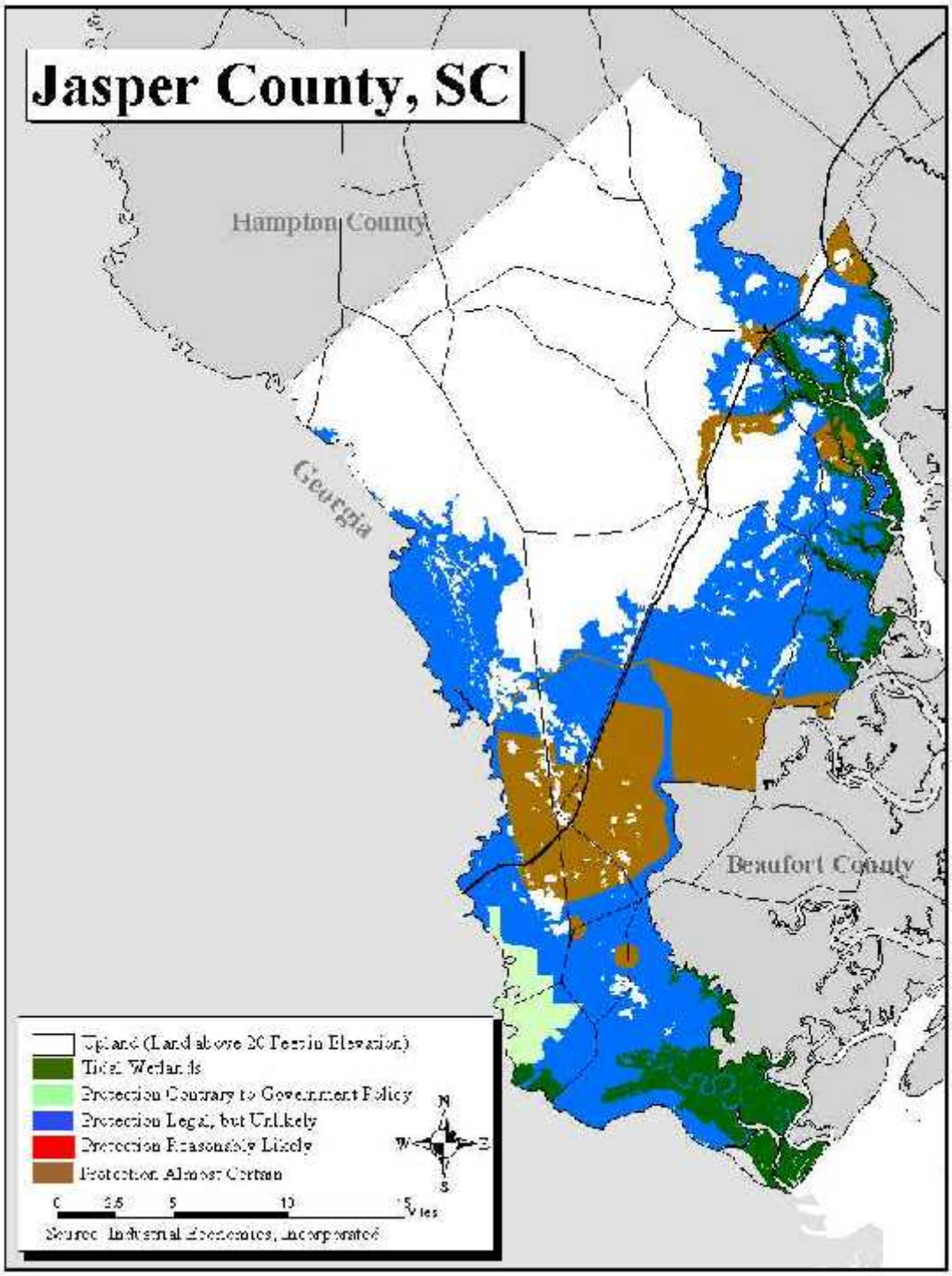



**Figure 25: Draft Map 10. Jasper County: Likelihood of Shore Protection According to Initial Draft Map Provided to County Officials for Stakeholder Review.** The County sought no changes during the stakeholder review.

## FINAL STAKEHOLDER REVIEW[33]

### Background

*Purpose*

While revising the report to incorporate the stakeholder review, Jim Titus (the EPA Project Manager) noticed that the approach followed by this study to identify areas where protection is likely (but not certain) was different than the approach followed elsewhere. As with the New Jersey study, our original specification of Scenario Three had focused on identifying the best prospects for wetland migration, if policy makers were to decide that additional wetland migration is needed beyond that which could be expected under Scenario Two (i.e., if the blue and light green provide insufficient land for wetland migration).

The state-specific studies that started after 2002 generally focused on identifying land for which protection is probable but not certain, which we color red. In theory, that approach does not change the definitions of the classifications: Lands identified for wetland migration in Scenario Three are all lands where protection is likely but not certain—"likely" because these lands are identified for protection in Scenario Two, and "not certain" because a wetland migration policy might be adopted. Conversely, lands that are likely (but not certain) to be protected are all areas where wetland migration might occur. The primary difference in approach is that the newer approach includes lands where natural shoreline migration is possible because (a) we are not certain that the land will be developed; (b) we are not certain that shore protection will be privately cost-effective or funded by governments; and (c) governments or conservancies might pursue policies to allow wetlands to migrate in these areas. The original approach of this study was to focus only on the latter possibility. To be consistent with the other studies, we revisited the analysis to identify any lands where future development or shore protection is uncertain. This section summarizes this final review.

*Approach*

We spoke with representatives from the seven coastal counties in this study. Titus met with planners from Horry, Charleston, and Beaufort counties between April 27 and April 29, 2004, and obtained their suggested changes to the maps. Hickok spoke with representatives of Georgetown, Berkeley, Colleton, and Jasper counties over the phone between September 23 and November 5, 2004.[34]

During Titus' visit to the state, which included a drive through all of the coastal counties, it also became evident that conservation lands were not adequately distinguished from other areas where development is possible but unlikely. From SC-DNR's website, we obtained data layers for wildlife refuges, military reservations, and state parks. Following the rules developed for other coastal states, we depict wildlife refuges as light green, military reservations as red, and state parks used primarily for recreational purposes (as opposed to wildlife management or conservation) as blue. We also added a federal forest data layer, which we downloaded from the USDA Forest Service website.[35] Publicly owned forestlands in the coastal counties are represented as light green. The Francis Marion National Forest encompasses large areas of Berkeley and Charleston counties.

[33] This section was written by Jim Titus, EPA project manager, and Andrew Hickock.
[34] County representatives included planners (Jasper, Colleton, and BCD COG), a zoning administrator (Berkeley), and a stormwater manager (Georgetown County).
[35] http://www.fs.fed.us/r8/fms/forest/Services/gis.html

**Table 5**

**SUMMARY OF GIS DATA USED IN MAP CHANGES DURING FINAL REVIEW[1]**

| Data Name | Application in Study | Source/ Year Published |
|---|---|---|
| Wetlands | Location of tidal and non-tidal wetlands as well as open water. | National Wetlands/ 1971–1992[2] |
| Surface water | Open water within study area. Scale: 1:100,000 | U.S. Bureau of the Census/ 2000[1] |
| Federal Forests | Federally-owned forest lands within study area (Francis Marion National Forest). Scale: 1:24,000 | USDA Forest Service/ 2003 |
| Military Installations | Boundaries of military installations within study area. Scale: 1:24,000. | South Carolina Department of Natural Resources/ 1999 |
| State Parks | National, state, and local parks and other managed lands within study area. Scale: 1:24,000. | South Carolina Department of Natural Resources/ 1999 |
| Refuges | Boundaries of wildlife refuges within study area. Scale: 1:24,000. | South Carolina Department of Natural Resources/ 1999 |
| Wildlife Management Areas | Boundaries of SCDNR-managed Wildlife Management Areas within study area. Digitized at a scale of 1:300,000 or better. | Digitized from SCDNR Wildlife Management Area Map – (Game Zones 6 & 11)/ 2003–2004 |
| Roads | Interstate highway, state highways, major roads, and all other roads within study area. Scale: 1:100,000 | U.S. Bureau of the Census/ 2000[1] |
| Conservation easements | Properties under conservation easement in Berkeley County. Scale: 1:4,800 | Berkeley Charleston Dorchester Council of Governments (BCD COG)/ 2004 |
| Future Development | Shore protection response map: identifies lands designated for future development within study area. Approximate scale is 1:600,000. | County Planning Data used or digitized in this study |
| Draft Shore Protection Response | Draft shore protection response map. Approximate scale of 1:600,000. | Results of this study |
| Berkeley County Future Land Use | Future land use areas such as residential growth area, rural village, and industrial. Approximate scale is 1:50,000 | BCD COG/ 2004 |
| Delorme Road Atlas | Extent of developed area around Georgetown city, Georgetown County. Scale: 1:150,000 | Delorme/ 1998 |

Notes:

1. Tiger/Line data layers downloaded from website of Environmental Systems Research Institute.
2. ICF Incorporated provided a seamless layer of tidal and nontidal wetlands.
3. Digitized with a screen resolution of 1:24,000. Care was taken to ensure that the hand-edited lines always had an error less than ¼ inch. The hand-edited lines had an error less than 1/4 inch, implying that they are valid at scale of 1:300,000.
4. Matheny and Burns did not report the scale of their maps. We conclude that their maps are valid at a scale of 1:600,000 or better, based on an overlay comparison of their polygons with the Berkeley County data, where the map error was less than 3/16 mile more than 90 percent of the time. Matheny and Burns were certain that their polygons were more precise polygons for Beaufort, Charleston, Georgetown, and Horry counties, and no worse for the other counties. The stakeholder review used maps with a scale of 1:300,000 or better.

**Table 6**

**CHANGES TO SHORE PROTECTION PLANNING MAPS [1]**

| **Land Area** | **Protection Likelihood** | **Data layer[2]** |
|---|---|---|
| Wetlands | | Wetlands |
| Berkeley: Privately Owned Plantations | Protection Unlikely[3] | Conservation Easements |
| Federally Owned within National Forest Boundary | No Protection | Federal Forests |
| Military Installations | Uncertain[4] | Military Installations |
| Wildlife Refuges | No Protection | Refuges |
| State Park Lands | Protection Unlikely | State Parks |
| Wildlife Management Areas | No Protection[5] | Wildlife Management Areas |
| Changes Suggested By County Planners | As Suggested | See County-Specific Discussions[6] |
| Lands where development is expected | Likely | Future Development[7] |
| Rural areas with potential for future development | Likely[8] | Berkeley County Future Land Use |
| Areas Shown as Protection Almost Certain by Draft Maps | Almost Certain | Draft Shore Protection Response This Study |
| Areas Shown as Protection Likely by Draft Maps | Likely | Draft Shore Protection Response This Study |
| Areas Shown as Protection Unlikely by Draft Maps[8] | Unlikely | Draft Shore Protection Response This Study |
| Areas Shown as Protection Contrary to Government Policy by Draft Maps | No Protection | Draft Shore Protection Response This Study |

Notes:

1. In cases where land areas overlap, classifications higher in the table take precedence.
2. See Table 5 for information about each of the data layers listed.
3. Conservation easements generally identified areas that were already depicted as blue. This data source identified one plantation, the Bonneau Ferry, that is owned by The Nature Conservancy. We depicted this property as light green. We were unable to obtain comparable digital conservation easement data outside of Berkeley County.
4. Our general approach is to depict secured installations as red, unless the County indicates that the land is certain to be protected even if the base were to close.
5. Our general approach is to depict WMAs as light green, unless the county indicates that an area might be removed from the protected status, or that the function of the WMA may require shore protection..
6. For Charleston County, these changes were marked on a 1:100,000 scale USGS map and digitized with a pen digitizer. Although errors in digitizing occur, many of the boundaries were road and wetland features that were available at a 1:24,000 scale. Therefore these corrections are better than 1:100,000 scale. In the case of Beaufort County, changes were generally made on an island-by-island basis and thus have a scale of better than 1:100,000. Changes to Berkeley, Colleton, Georgetown, and Jasper counties were based on final comments made by county representatives and were digitized with the screen resolution set at an approximate scale of 1:24,000. Digitizing errors were kept to less than ¼ inch, implying a scale of 1:300,000.
7. The maps created by Matheny and Burns had shown these polygons as protection certain. We discussed the possibility that all of these areas ought to be defined as protection likely, with planners from all counties except Horry and Beaufort, and provided the planners with maps that illustrated these areas. In most cases, the planners did not recommend a general rule of changing those areas from "certain" to "likely," although they did recommend such a change for specific polygons. In the case of Charleston the planners thought that most of these polygons ought to be changed from certain to likely, and then named the specific exceptions to that general rule. Like the other Matheny-Burns data, these polygons generally had a scale of approximately 1:600,000.
8. County representatives verified that certain areas identified as rural village, low density residential, and industrial (in rural areas) on the Future Land Use Map were sparsely populated and should be changed from brown to red.

Table 5 summarizes data incorporated into the map during the final review phase. Table 6 summarizes the changes made to the maps as a result of the final review to this report. The polygons from the data sets often overlap: wherever two data sets conflict, the data listed closest to the top take precedence. Our conservation layers show up at the top because they have a scale of 1 to 24,000 and thus are more accurate than the data originally used by Matheny and Burns or even the data provided by our stakeholder review comments.

**Comments and Map Changes by County**

**Horry County**

County Representative: James Bichard, senior planner. April 27, 2004.

Jim Titus met with James Bichard, senior planner, on April 27, 2004. Mr. Bichard did not participate in previous interviews for this project. Previous representatives of Horry County were Kevin Wheeler, senior planner, and Janet Carter, deputy county attorney/interim planning director, and former Planning Director Danny Taylor. The comments below reflect feedback received both during the meeting and through subsequent calls.

Titus initially explained that previous meetings with Horry County on this project had focused on Scenarios One, Two, and Three. Using colors to display all scenarios on a single map, the lands that are likely to be protected show up as red and brown; the lands that are not likely to be protected are blue and light green.

Titus further indicated that during previous meetings with Bichard's predecessor, Matheny and Burns spent most of their effort distinguishing the lands that are likely to be protected from those that are not likely to be protected. According to the previous sections of this report, the counties had not been given the opportunity to distinguish the areas that are certain to be protected from those that are likely to be protected. Therefore, the primary objective of this visit was to distinguish those areas, i.e., the red from the brown. As a starting point, Titus brought the shore protection map as revised after the stakeholder review, except that a small number of areas of future growth were distinguished from currently developed areas. Titus indicated that as a general rule, the difference between red and the brown is that the red includes areas that

(a) are likely to be developed but for which development is not certain;
(b) are less densely developed so that the economics of shore protection may be less favorable;
(c) are along the ocean but may be ineligible for beach nourishment funding[36]; or
(d) are possible (but not probable) candidates for expansion of a nature reserve.

Nevertheless, Titus said he was interested in making any other changes that were warranted.

As discussed in the main report, the coastal zone of Horry County is growing rapidly. Outside of various nature preserves, the entire coastal zone is expected to be developed. Beach nourishment occurs regularly, and the public has access to these beaches. Thus, Bichard said that the map's depiction of almost universal protection was largely correct. He suggested the following changes::

a. Waites Island is the only portion of the ocean coast where protection is not certain. In addition to the portion covered by a conservation easement (which we kept as light green), the rest of the

[36] Either because they are part of the Coastal Barrier Resources Act system or lack public access to the beach.

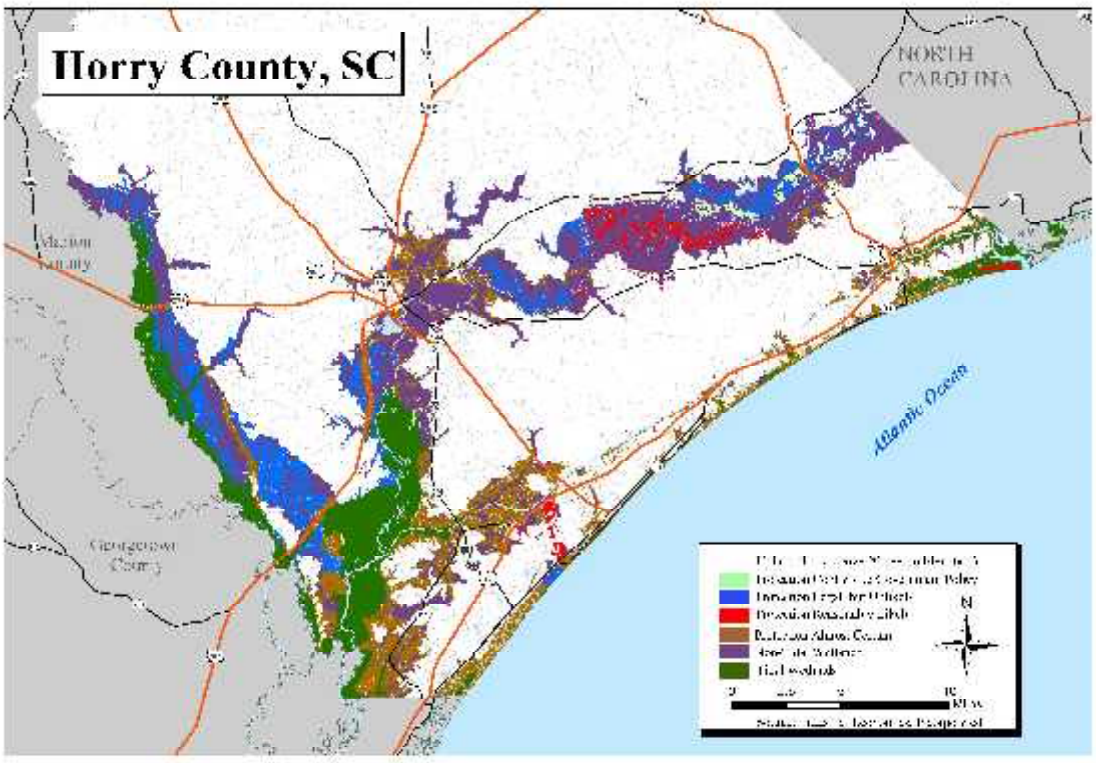
island to the east is still undeveloped; but development is expected. This island, however, is covered by the Coastal Barrier Resources Act and hence would be ineligible for beach nourishment and other subsidies. Therefore, protection is less likely than for other parts of the Grand Strand, and we changed this area to red.[37]

b. The lightly developed area along the Waccamaw River between the Lewis Ocean Bay Preserve and the Waccamaw River Heritage Preserve is not certain to be protected. SC-105 would be protected, and thus the revised map should show that road and those lots immediately along it as protected. Most of the other land here is likely to be protected. (See Photo 1.)

c. The county has numerous preserves that were omitted from the previous maps. The Lewis Ocean Bay Preserve and the Waccamaw River Heritage Preserve should show up as light green. Preserves also can be found south of Conway.

d. Moreover, there is a general movement to purchase lands south of Conway, albeit not all the way up to Conway.[38] Preserves are also being created along the border with Georgetown County. Development trends are so great that the only reason to have any blue on the map at all is the uncertainty about the boundary of future preserves: Just as red depicts areas that will probably—but not definitely—be developed, the primary function of blue in this county is to depict areas that probably—but not definitely—will become part of a preserve.

Map 2 shows the final results of the study for Horry County.




**Map 2. Horry County: Likelihood of Shore Protection.**

[37]The final-review map also showed a small area as unlikely to be protected, where the NC/SC border reaches the Atlantic Ocean. That island is actually a portion of Bird Island (North Carolina), whose western tip is at times within South Carolina. The island is now conservation land (see discussion of Brunswick County, North Carolina).
[38]The SC DNR web page provides the boundaries of these preserves.

**Georgetown County**

County Representative: Jeff McNesby, Department of Public Works. October 6, 2004.

Andrew Hickok spoke with Jeff McNesby, stormwater manager in the Department of Public Works, over the telephone on October 6, 2004. Mr. McNesby did not participate in previous interviews for this project. The previous representative of Georgetown County in this study was Allen Burns, director of Planning and Economic Development. The comments below reflect feedback received during the interview and through subsequent correspondence.

Hickok started out by explaining that we were concerned that the map had very little red, which implies that all lands that are likely to be protected are almost certain to be protected. We therefore focused primarily on whether some of the brown and blue areas ought to be depicted as red. To facilitate the discussion, we provided a map that was similar to the final map created by Matheny and Burns after the stakeholder review, except that areas where development is expected were depicted in red.[39] The future development lands would turn most of the brown areas in mainland Georgetown County and Waccamaw Neck to red.

Map 3 shows the final results of the study for Georgetown County.

*Waccamaw Neck*

Almost all new development on Waccamaw Neck is in the form of gated communities, unlike the new homes built in the 1970s. One private landowner, Lucille Pate (of the Vanderbilt family) owns approximately 10,000 acres in the Waccamaw Neck, and intends to develop subdivisions on one-quarter to one-third of the property very soon. OCRM regulations require new homes to be set back from wetlands and erosion-prone areas. With the exception of beach access points, nearly the entire ocean shore is fronted by private homes. Therefore, the County expects that any nourishment efforts outside the public access points would be privately funded. Local news reports indicate that Ms. Pate and her family-owned partnership, Mandalay Limited, plan to develop 3,500 acres on the eastern portion of her Arcadia Plantation property. Arcadia East Plantation "is bordered to the north and west by Alston Swamp Road and U.S. 17, bordering part of DeBordieu Colony in Georgetown County. A slim tract stretches east to touch the Atlantic Ocean."[40] The County believes that given the multi-million dollar values of these oceanfront properties, this area had been correctly depicted as shore protection certain.

Citing the same driving force of high property values, the County also anticipates that Debidue Beach, a private community located south of Pawley's Island, will almost certainly receive beach nourishment. According to Bill Eiser, residents "have found it difficult to tax themselves to pay for shore nourishment, and the one effort they did undertake was not well received by the community due to the dark color of the sand."[41] Nevertheless, Mr. McNesby indicated that the County expects Debidue

[39]The sea level rise response scenario GIS layer produced by Matheny Burns incorporated planning zones into the map. The Land Use Type field within this layer allowed us to identify areas designated by the County for future development. We depicted these polygons as red on the map we showed to the County Representative in the fall of 2004.
[40]"Construction ready to begin on Arcadia East development" in The Sun News (Myrtle Beach). January 17, 2004.
[41]EPA Project Manager Jim Titus spoke with Bill Eiser in July 2004.

Beach to make future efforts to nourish the shoreline. Therefore, Debidue Beach had also been correctly depicted as shore protection certain.

Mr. McNesby also told us that Pawley's Island is almost certain to receive beach nourishment, which would be privately funded. Mr. McNesby anticipates that the high value of ocean front properties in Pawley's Island will likely be the driving force in protecting these properties. According to Bill Eiser, oceanographer at the OCRM, however, there are some doubts about whether Pawley's Island could justify the high potential cost of shore protection, because of the narrowness of much of the island. (See Photo 22.) Given the uncertainty of the state expert in such matters, we depict Pawley's Island as red (shore protection likely).

**Photo 22. Pawley's Island.** A large part of this island has a single row of houses on one side of the street and marsh on the other side. April 2004**.**

*Sandy Island*

The previous draft had shown Sandy Island as mostly brown (shore protection certain) and dark green (wetlands). County staff indicated that no future development is likely to occur on Sandy Island, which is mostly owned by the South Carolina Department of Transportation. SCDOT purchased the land to mitigate wetlands lost to highway construction in neighboring Horry County.[42]

Sandy Island has two distinct land uses, as the home of a historic community and as a conservation area. The 100–200 residents of the Gullah community live in one village at the southeastern tip of the island.[43] Mr. McNesby told us that the southeastern corner of the island, in which the Gullah reside, should be shown as brown to reflect the certainty that the homes of this community will be maintained.[44] Therefore, the county representative told us that the rest of the dry land in our study area

[42]Source: http://www.dot.state.sc.us/Projects/CarolinaBays/sandyisland.html.

[43]Ed Frierson, a SCDOT official, indicated that SCDOT owns approximately 70 to 80 percent of Sandy Island in a phone conversation with Andrew Hickok on March 10, 2005. He also told us that the Gullah community live on privately owned land on the island.

[44]We reviewed 1994 aerial photography of Sandy Island and could not locate any buildings or paved roads on the portion of the island shown as blue in the response map. (Source: http://www.terraserver.microsoft.com.)

should be changed from brown to light green, to reflect SCDOT's commitment to preserving the island in its natural state.[45]

*Plantations*

All but one of the plantations in Georgetown County are privately owned. After the stakeholder review, most of the area along the Waccamaw River had been was depicted as brown. Because these lands were designated for future development in the land use data, we inquired whether it would be more accurate to say that shore protection is likely. Mr. McNesby stated that depicting all of the plantations as red would be appropriate, including plantations that are located amidst wetlands along the Great Pee Dee and Black rivers to the north of Georgetown.

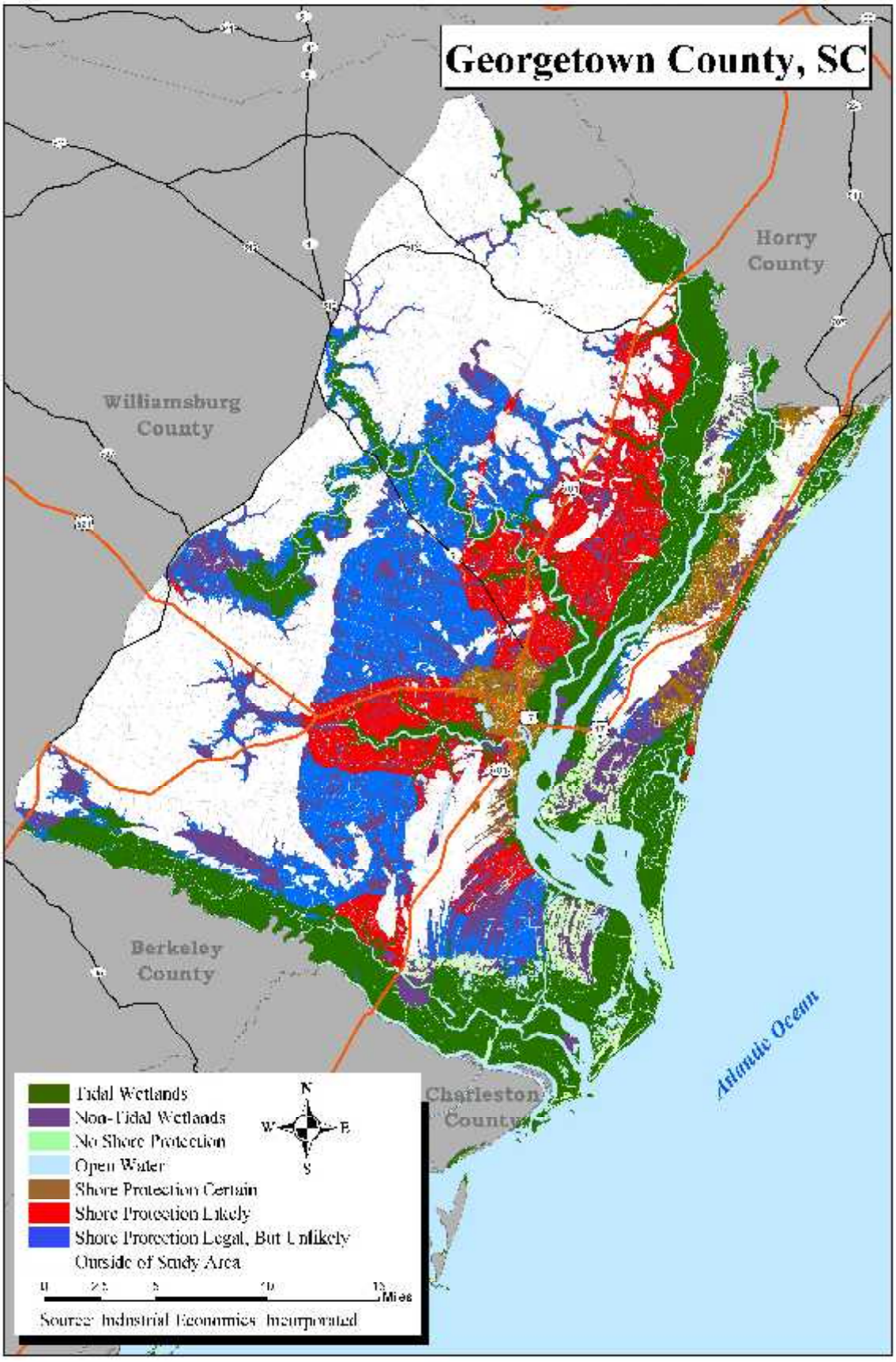
*Mainland*

The previous map had showed a large portion of the mainland as brown. Most of these lands were changed to red as a result of our discussions with county staff.

The county representative described how, in contrast to Waccamaw Neck, the mainland outside of Georgetown holds little infrastructure and many residents are poor. These lands had been designated as shore protection certain, not because they are developed but because they have been designated for future development.[46] Mr. McNesby indicated that it would be more appropriate to view these areas as likely to be protected. He also indicated that the brown areas should be confined to the cities of Georgetown and Andrews, and that the outlying future development areas remain as red. He suggested that development will probably proceed along the main transportation corridors, which are US-521 to the west and US-701 to the north and south. He remarked that the city of Georgetown is unlikely to expand beyond its relatively compact boundaries.

We approximated the brown area around Georgetown based on Mr. McNesby's comments and by examining the density and pattern of roads around the city of Georgetown.[47] The brown area extends northward toward the junction of US-701 and SV-51 and as far south as the airport and Secondary State Road 23. After having the opportunity to review this delineation, Mr. McNesby commented that property values along the riverfront have dramatically increased over the last two years, so these properties will almost certainly be protected.[48] Therefore, he agreed with our depiction of areas along the riverfront near Georgetown as shore protection certain.

[45]We added the Sandy Island Wildlife Management Area (WMA) to the map we presented for final review, reflecting the boundaries shown on the 2003/2004 South Carolina Wildlife Management Area Map. This changed the majority of Sandy Island from brown to light green. The small portion of Sandy Island that still appears as blue is outside of the WMA boundary, according to our data, but it is situated to the north of the area where the Gullah reside.
[46] Downtown Georgetown was classified as a cultural land use, rather than as a future development area.
[47] Information provided by Mr. McNesby in final review discussion on 10/06/04.
[48] Mr. McNesby provided this information in a follow up email on 1/19/05.




**Map 3. Georgetown County: Likelihood of Shore Protection.**

**Berkeley County**

County Representatives: Harun Rashid, GIS planner for Berkeley-Charleston-Dorchester Council of Governments (BCD COG). November 5, 2004. Madelyn Robinson, zoning administrator. October 1, 2004.

Andrew Hickok spoke with Harun Rashid, GIS planner for the Berkeley-Charleston-Dorchester Council of Governments (BCD COG), on November 5, 2004, over the telephone.[49] He also called Madelyn Robinson, the Berkeley County zoning administrator, on October 1, 2004. Neither Mr. Rashid nor Ms. Robinson participated in the previous stakeholder meetings. The County no longer employs the planner previously interviewed for this project, Harold LeaMond. The comments below reflect feedback received during these interviews and through subsequent correspondence.

Hickok started out by explaining that we were concerned that the map had very little red, which implies that all lands that are likely to be protected are almost certain to be protected. Their conversation therefore focused on whether some of the brown or blue areas ought to be depicted as red. To facilitate the discussion, we provided a map that was similar to the map that Matheny and Burns had created after the stakeholder review, except that areas where development is expected were depicted in red.[50] Hickok indicated that we were particularly interested in population growth in the Cainhoy Peninsula region, and the future of plantation lands in the Cooper River Historic District. He also indicated that our 20-foot elevation contour was probably not accurate in the northwest region of Berkeley County.

The BCD COG planning staff contributed two data layers: a GIS layer based on the 2004 Berkeley County Future Land Use Map and another layer depicting conservation easements in Berkeley County.[51] We integrated these layers into our sea level rise response map as described in the comments below.[52]

Map 4 shows the final results of the study for Berkeley County.

**Map Comments**

*Daniel Island*[53]

[49]This interview was conducted by Andrew Hickok of Industrial Economics.
[50]The sea level rise response scenario GIS layer produced by Matheny and Burns used the planning zones. The Land Use Type field within this layer allowed us to identify areas designated by the County for future development. We depicted these polygons as red on the maps we showed to the county representatives in the fall of 2004. Refer to Table 5 for information on shore protection response data.
[51]Refer to Table 5 for information on the Berkeley County Future Land Use data.
[52]The future land use layer classifies the county into the following land uses: growth (high, medium, or low density), no growth, resource conservation, rural settlement, and rural village. This layer serves as a guide in checking the accuracy of our shore protection response map. We considered the Resource Conservation classification as representing areas that are either currently conservation lands or likely to be conservation lands in the future. In contrast, our light green classification, "no shore protection," encompasses only lands that are currently conservation lands. We used the Conservation Easements layer to add a new light green area to the map. This land is located within the Cooper River Historic District.
[53]The wetlands area around Nobels Creek forms the boundary between Daniel Island and the Cainhoy Peninsula to the north.

Daniel Island, which lies at the southern tip of Berkeley County, had been depicted on the previous map as mostly brown, with one area of blue in the southeastern portion of the island.[54] Our data suggested, however, that most of the brown areas were depicted that way because development is expected in the future. Recently annexed into the City of Charleston, Daniel Island is rapidly undergoing planned commercial and residential development, however no gated communities are being developed on the island.[55]

The Berkeley County Zoning Administrator indicated that the southeastern tip of Daniel Island was state-owned property. The South Carolina State Port Authority planned to build a container port there that would have been one of the largest in the country, but strong opposition led to state legislation in 2002 that bars the building of a terminal on Daniel Island.[56] According to the BCD COG staff, the Port Authority is still using a portion of its land on Daniel Island to dump the dredged materials from Cooper and Wando rivers. The potential value of development there creates a market pressure to develop the island; the Port Authority has not yet decided what to do with this property.

We asked the county representative whether some of the undeveloped portions of the island should be depicted as red instead of brown. He told us, instead, that it would be more accurate to depict all of Daniel Island as brown, to reflect the high value of the state-owned land and development trends on the rest of the island. We changed our map so that the entirety of Daniel Island, with the exception of wetlands, appears as brown.

*Clouter Island*

Clouter Island, the small island to the west of Daniel Island bisected by I-526, is undeveloped and the County expects that it will probably remain so for the foreseeable future. A portion of Clouter Island is a US Navy Reservation. The nonwetland portion of the reservation is depicted as red, following our general approach for military lands. The Port Authority is still using most of the island to deposit dredged materials from the Cooper and Wando rivers. Mr. Rashid initially indicated that Clouter Island had been accurately depicted on our map as mostly blue. He also indicated, however, that no one he has spoken with has a definitive idea of how long dredged materials will continue to be deposited on this island. The Port Authority does not have other plans for the island.[57] Given that the County may continue using the island for dredge spoils, we changed the blue portion of the island to red, to reflect the ongoing elevation of the island. Although the island is not being elevated for the sake of protecting land or structures, the current use of the island inherently is a type of shore protection, and thus it is unlikely that wetlands will overtake the island within the time horizon of this study.

*Cainhoy Peninsula*

Most of the southern portion of the Cainhoy Peninsula between the Cooper and Wando rivers was depicted as brown on the previous map created by Matheny and Burns; areas farther inland to the north and east were shown as blue. The southern portion of the Cainhoy Peninsula had been depicted as brown because of expected development, not existing development. This was the only portion of the peninsula that had been designated as a low-density residential growth district on the 2004 Berkeley County Future Land Use map. County representatives told us that the shore protection response map

[54]The draft also had a 150-foot buffer depicted in red, which was barely discernible in a county-scale map.
[55]The historic City of Charleston is in Charleston County, but the city has annexed adjacent communities in other counties. Once annexed into Charleston, the residents of Daniel Island could also vote to become part of Charleston County, but so far they have opted to remain in Berkeley.
[56]"Daniel Island stays on list of port growth study sites" in *Charleston Post and Courier*, July 21, 2004.
[57]Email from Harun Rashid to Andrew Hickok January 27, 2005

should depict these low-density growth areas as shore protection likely, given the current lack of infrastructure and population.

The county representatives agreed that areas in the southern portion of the Cainhoy Peninsula shown as shore protection certain were accurately depicted. Just to the east of the aforementioned low-density areas, the rural areas of Cainhoy and Wando are currently experiencing growth.[58] Mr. Rashid indicated that a few warehouse businesses have recently sprung up near SC-41, in addition to one or two subdivisions that have been built adjacent to SC-41 along the Wando River. One of these consists of between 100 and 150 upscale homes on large size lots. The proximity to the river and marshes is important to the attractiveness of these subdivisions. Some of the new subdivisions closer to Charleston are linked to county sewage systems. The county representatives confirmed that this area is almost certain to be protected.

The southwest portion of the Cainhoy Peninsula, the area most accessible to Charleston and Daniel Island, had also been shown as certain to be protected in the original stakeholder review. This is the only portion of the peninsula designated for medium-density residential use on the 2004 Berkeley County Future Land Use map. County representatives confirmed the previous assessment that this area is almost certain to be protected.

County representatives emphasized that the northern portion of the Cainhoy Peninsula currently has little infrastructure or development. We pointed out that the areas shown as shore protection certain after the stakeholder review (all of which were located along the Cooper River) were designated on the 2004 Berkeley County Future Land Use map as either Industry or Rural Village. Despite these designations, the BCD COG planner told use that current trends imply that other areas in the county are more likely to see industrial development than the Cooper River area. He further added that even if this area is developed, it would be very sparse. As a result, Mr. Rashid told us that the areas east of the Cooper River should be changed from brown to red.

*Eastern Berkeley*

Sparsely populated eastern Berkeley County is far inland and dominated by Francis Marion National Forest. Based on the 2004 Berkeley County Future Land Use map, we told the county representatives that the brown areas from the previous map were designated as rural settlement areas. Citing the low population density and the low value of property in the eastern half of the county, the county representatives told us that the rural communities of Bonneau, Huger, Jamestown, St. Stephen, and Shulerville would be more accurately depicted as shore protection likely than shore protection certain. These communities are all surrounded by areas where shore protection is either unlikely or precluded by existing conservation policies. Therefore we changed these communities from protection almost certain to protection likely.

*Plantations*

[58]The BCD COG planner noted that Cainhoy and Wando are not incorporated towns, but rather are rural areas administered by Berkeley County. The 2004 Berkeley County Future Land Use map shows this as a Rural Village. Mr. Rashid indicated that this is where most growth in the peninsula is occurring.

The Conservation Easements data layer shows the location of several plantations in the Cooper River Historic District. Properties under easement in the study area are the following[59]: Blessing (Lowcountry Open Land Trust), Bluff Plantation (Nature Conservancy), Bonneau Ferry (Conservation Fund-owned), Kensington (LOLT), Medway (Ducks Unlimited, Historic Charleston Foundation), Middleburg (LOLT), Mulberry (Historic Charleston Foundation), NUCOR (Lord Berkeley Conservation Trust), South Mulberry (LBCT), and Wadboo North (LBCT). With the exception of the Bonneau Ferry tract, all properties are privately owned and under conservation easement. Although the easements severely limit the future development of these properties, there is no mechanism that explicitly prohibits shoreline protection. Therefore, areas remain depicted as blue. Following the original stakeholder review, we added a brown area to a portion of Medway plantation where historic buildings are located. For the remaining plantations, we do not have information on any buildings and presume that the lands are entirely open space; we therefore leave these properties as protection unlikely.

In March 2004, the paper company MeadWestvaco sold the Bonneau Ferry tract, a 10,637-acre parcel of land, to The Conservation Fund on behalf of SCDNR.[60] We changed this recently conserved tract of land from blue to light green to reflect the ownership by a conservation NGO. This property is located along the Cooper River and includes the remnants of the Comingtee Plantation.

Mr. Rashid told us that it is likely that other properties in the 30,000-acre Cooper River Historic District will be put into easements in the future. The Berkeley County zoning administrator does not expect future residential development within or surrounding the Cooper River Historic District. Most plantations are privately owned and thus would not receive public funding for shore protection measures. Therefore, the county representatives believe that areas in the Cooper River Historic District not under conservation easement are accurately depicted as blue.

*West of the Cooper River*

The County Representatives told us that the high-density growth corridor along US-52 between Goose Creek and Moncks Corner was accurately depicted as brown.[61]

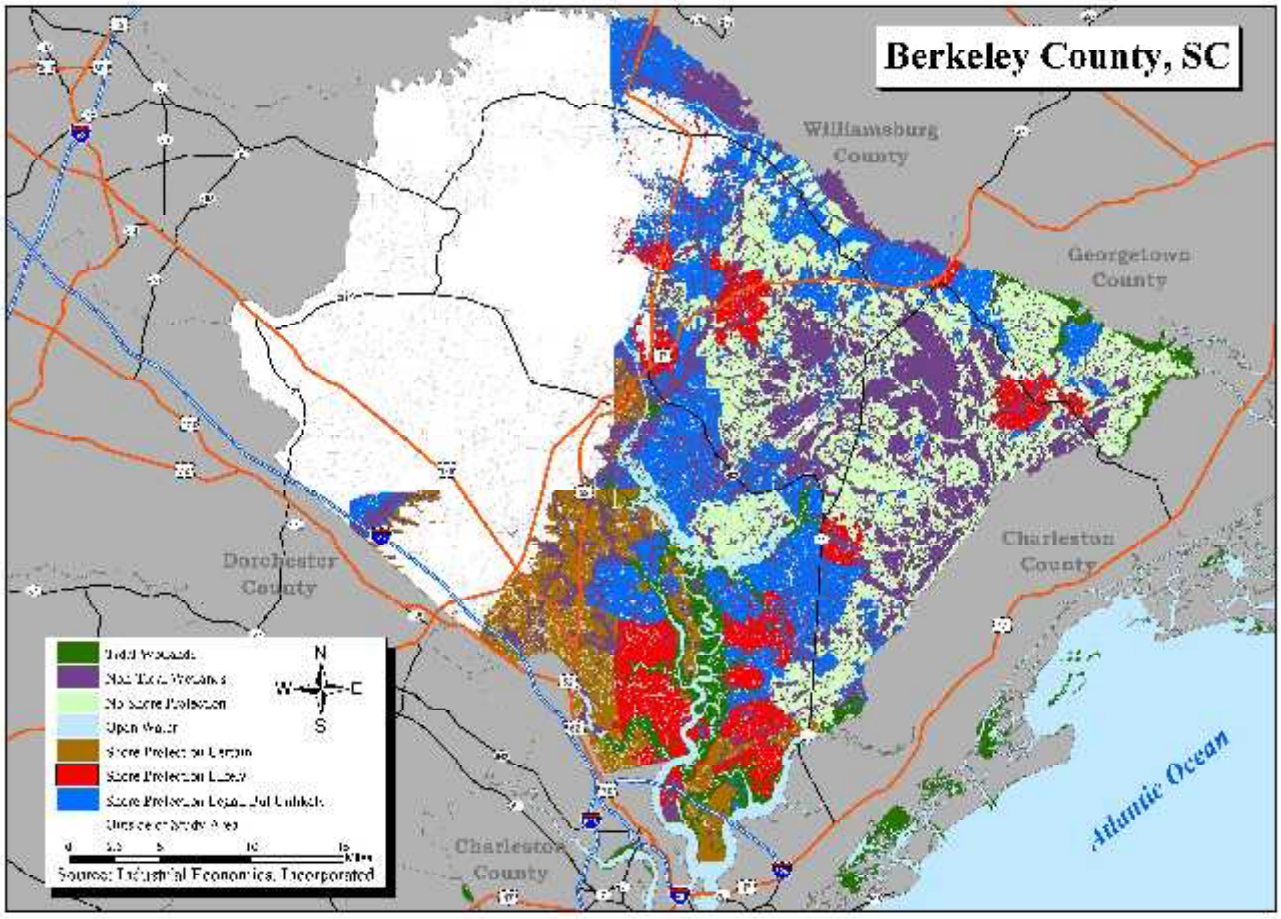
*Narrative Comments*

The zoning administrator sent us an edited version of the Berkeley County Profile (from the original version of this report) with a few minor corrections. These notes point out that the Cooper River Historic District covers 30,000 acres. Ms. Robinson questions the figure used in this report for the projected population growth of the Wando area. We edited the main body of the report accordingly.

[59]Mr. Rashid told us that these easements should be shown as light green since "not only (is) this area … dedicated for nature conservancy, it is also out of inundated areas shown in storm surge models." Email from Harun Rashid to Andrew Hickok, January 16, 2005.

[60]"Hopes pinned on Bonneau Ferry Tract" in *Charleston Post and Courier*, June 5, 2004.

[61]The county representatives reviewed the map Matheny and Burns created after the original stakeholder review, and agreed that this was the major growth area in Berkeley County.




**Map 4. Berkeley County: Likelihood of Shore Protection.**

**Charleston County**

Meeting With: Andrea Pietras and Brana Rerig. April 28, 2004.

Jim Titus visited Charleston County and met with Andrea Pietras, county planner, and Brana Rerig, project officer, on April 28, 2004. Ms. Rerig had participated in a stakeholder review meeting in September 2000. The comments below reflect feedback received both during the meeting and through subsequent calls.

Titus started out with the same background story as what he had provided to Horry County. At the outset, we examined a modification of the shore protection map with polygons where development is expected distinguished from other areas that had been depicted as shore protection certain. County staff thought that these polygons often would provide a useful distinction between areas that are certain to be protected and those areas where protection is likely, except for the barrier islands. Therefore, unless otherwise stated, the first alteration to the maps was to subdivide land protected in Scenario One into brown and red, by treating areas for future development as likely, but not certain, to be protected.

Map 5 shows the final results of the study for Charleston County.

We then discussed the map from east to west.

*Northeast of Charleston*

Titus said that as a newcomer to Charleston County, the most surprising aspect of the final review map was that Francis Marion National Forest (which comprises the eastern third of the study area) was depicted in blue rather than light green. Brana Rerig said that such a depiction would have been reasonable when the original map was created. The City of Charleston was starting to annex land in Berkeley County with plans to continue annexing east into Charleston County. The county's planners had expected USDA to oppose such annexation, but the federal government was neutral as the county designated these areas for possible growth. Timber companies in the area sold land, some of which was developed, and USDA considered land swaps. Although the majority of land was National Forest, the combination of land swaps with USDA and development of privately owned lands made it difficult to say that any particular parcel would remain undeveloped, even though the majority of land in the area clearly would remain undeveloped. Therefore, the stakeholder review maps had shown the entire area blue, except for some developed areas.

Since that time, however, the city has stopped the drive to annex lands, which leaves the area within the land use authority of the county. Therefore, it would now be more accurate to show national forest lands as green and most forest company lands as blue.

Aside from this change, the County noticed that the area around Awendaw was not quite correct. The entirety of the SC-432 loop has development that is certain to be protected, and lands in that vicinity will certainly be protected, as will the developed areas on the north wide of Awendaw Creek and developments in the Buck Hall area. The interior of the SC-432 loop, by contrast, is not yet developed and hence is depicted as red.

*Barrier Islands*

Dewees Island has no bridge connection to the mainland. Nevertheless, the county still believes that it is likely to be protected, given the moderate development that is expected to continue; protection applies primarily to the portion of the island with roads. The more densely developed Isle of Palms (Photo 23) and Sullivans Island (Photo 24) are almost certain to be protected. The only exception is the private golf course at the eastern end of Isle of Palms. This development appears to be worth protecting, but it would not be eligible for federal funding. Hence, if erosion were to accelerate substantially and/or available sand for nourishment was limited, it would have a lower priority for limited sand supplies than more densely developed communities that are open to the public.

**Photo 23. Isle of Palms.** 53rd Avenue and the Atlantic Ocean.

**Photo 24. Sullivans Island with Charleston in the Background.** April 2004.

South of the entrance to Charleston Harbor, Morris Island is still undeveloped and lacks road access. Thus, the planners do not believe that one should assume that this island is certain to be protected. Nevertheless, development is sufficiently likely to assume that this island will probably be protected. Folly Beach (Photos 25, 26, 27) has received beach nourishment as compensation for erosion caused by navigation projects, but the county's understanding is that no additional funds will be forthcoming on that basis. Nevertheless, parts of this barrier island suburb of Charleston are densely developed and certain to be protected. Prospects for shore protection are somewhat less, they said, for the part of the island northeast of the washover (i.e., the narrow part of the island where storms occasionally wash over the road).

**Photos 25, 26, and 27. Folly Beach.** The first two photos show homes along East Arctic Avenue and East Ashley Ave, where officials view shore protection as certain. The third picture shows homes east of the washover, which officials view as shore protection likely. April 2004.

Seabrook and Kiahwah[62] are gated barrier islands closed to the public and hence ineligible for beach nourishment funding. The investment on these islands is greater than the cost of shore protection, hence these shores will probably be protected. In the unlikely event that sand supplies or environmental considerations limited the portion of the county that could be nourished, however, these islands would have a lower priority than Folly Beach, Sullivans Island, and Isle of Palms. Therefore the maps show Seabrook and Kiahwah islands as likely, but not certain, to be protected.

*Other Islands*

The County found the maps to be reasonable for James Island. More troubling was the County's reaction to the map of Johns Island. The original draft map had shown the Fenwick Crossing Area as brown and the rest of the island as blue. The stakeholder review changed the entire island to brown. The map we brought to this meeting showed the Fenwick Crossing Area as red because the data used to create our maps showed it as mostly undeveloped; but the Fenwick area was still brown as directed by the stakeholder review. The County's reaction to the map we showed was that for John's Island, we had reversed the red and brown. In retrospect, it is obvious that the Fenwick Crossroads Area is more developed than the rest of the island, given that is was depicted as protected in the original analysis, while the rest of the island was not shown as likely to be protected until stakeholder review. This experience, however, implies that we should have come to the meeting prepared to suggest that all of

[62]Just outside the gated entrance to Kiawah Island is a park that is open to the public. A single park would not make the entire island eligible for federal funding. Moreover, the park is only open on weekends outside of the peak season, and even during summer it closes well before sunset.

the map changes from the stakeholder review were candidates for being depicted as red.[63] On the other hand, it is at least somewhat reassuring to see that the planners noticed a problem with our maps that we might have noticed had we reviewed the previous map changes before meeting with the County. Thus, we continue to show the Fenwick Crossroads area as brown, while the remainder of Johns Island is red.

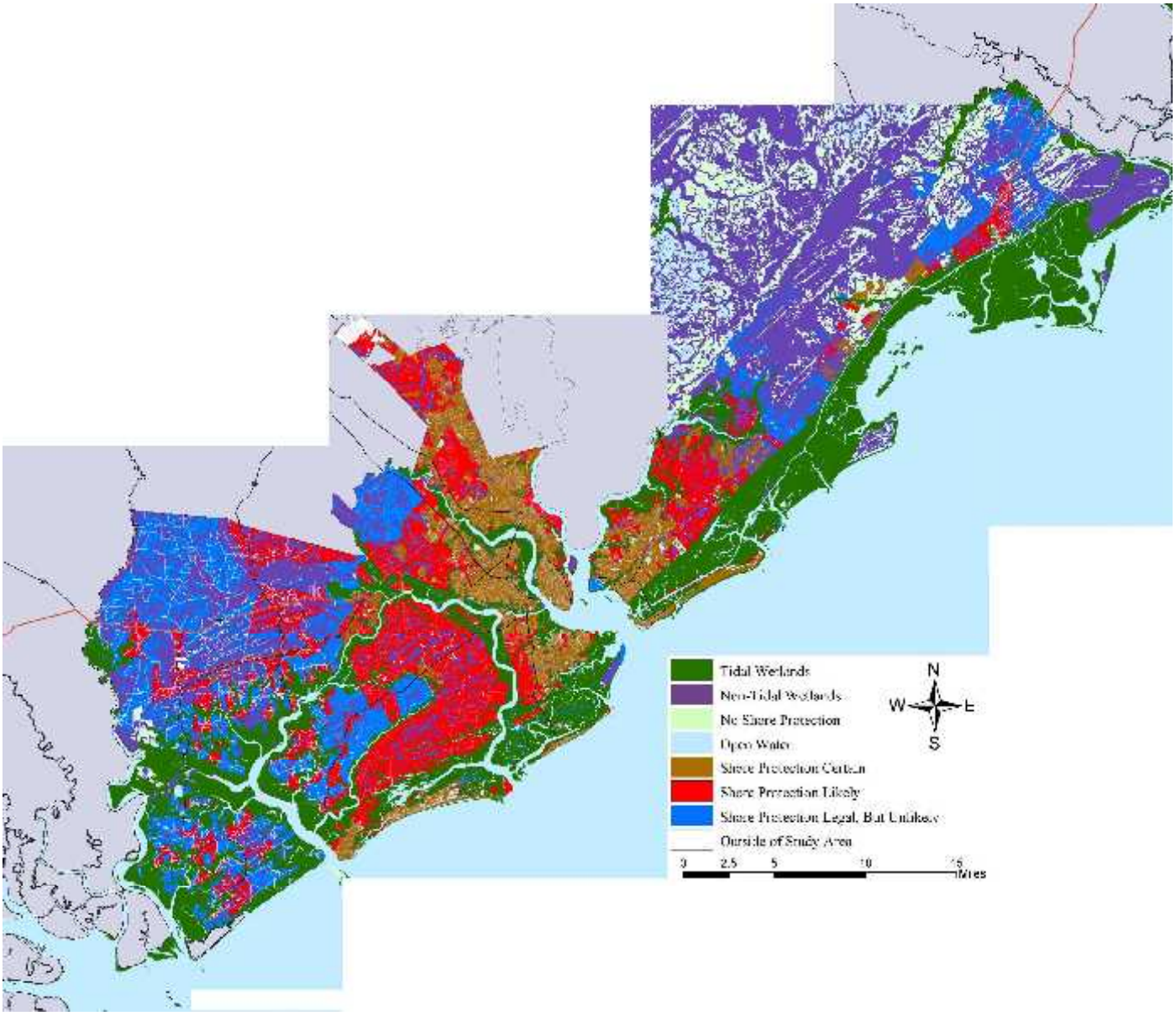
Equally problematic were the depictions of Wadmalaw and Edisto islands, which had been shown as unlikely to be protected except for small areas of land just across the bridges from Seabrook Island and Edisto Beach, respectively. Both of these islands are still mostly agricultural today. Much of Edisto Island is owned by the descendants of freed slaves, with large parcels often being jointly owned by several dozen people. To help clear title without divesting people of minor fractional ownership, the County allows land to be subdivided into parcels as small as one acre in many areas. These areas are known as "agricultural-residential" (AGR).

The County recently conducted a settlement area study, which mapped areas with existing and proposed AGR zoning. County planners suggested that we use the maps from that study to identify areas that will probably be developed for these two islands. The County indicated that they no longer have the digital files that underlay that mapping study, but they gave Titus a copy of the Charleston County Settlement Area Study (April 12, 2001) prepared for the Charleston County Council, which included 1:50,000 and 1:10,000 scale printed maps showing current and proposed AGR zoning. The planners pointed out specific areas that will probably be developed and protected, and Titus copied them onto a 1:100,000 scale USGS map. These changes are illustrated in Appendix C.

*Mainland West of Charleston*

The County generally agreed with the designations for the area immediately to the west of Charleston. Farther to the west, however, the maps overlooked the expectation of future development. As with Edisto and Wadmalaw islands, the County suggested that we use the Settlement Area Study, and we did so. The county also noticed that the previous version had mislocated the expected development around Parker's Ferry, which we corrected.[64]

[63]In theory, with sufficient time, the planners would hopefully reach the same conclusion regardless of the color we assigned to a particular area during our meeting. But because the focus of the meetings was distinguishing red from brown, areas depicted as red may have received more attention. Of the other four changes from the stakeholder review, the County (a) agreed with the red-brown distinction based on present and future development, while suggesting different boundaries; (b) agreed with designating the Whitehall Terrace area as brown; (c) indirectly suggested that the Parker's Ferry area should be depicted as red; and (d) agreed with classifying the area in the southwest portion of Edisto Beach as brown.
[64]The draft map had placed Parkers Ferry approximately halfway between its actual location and the Dorchester County line.




**Map 5. Charleston County: Likelihood of Shore Protection.**

## Colleton County

Conversation with Kevin Griffin, director of Planning and Development. October 12, 2004.

The Colleton County final review comments were provided by Kevin Griffin, AICP, planning director, over the telephone and via email to Andrew Hickok.[65] Mr. Griffin had also participated in the stakeholder review process. The comments below reflect feedback received both during the interview and through subsequent correspondence.

Hickok started out by explaining that we were concerned that the final map produced by Matheny and Burns after the stakeholder review had no visible red, which implies that all lands that are likely to be protected are almost certain to be protected. Through discussion with the planner we tried to identify areas where shoreline protection is less than certain.[66]

Map 6 shows the final results of the study for Colleton County.

### Map Comments

*ACE Basin*

Approximately 70,000 acres are public or private conservation lands in the ACE basin. Obtaining the improved conservation layer [67] enabled us to revise the map of Colleton County to depict publicly-owned conservation areas as light green (no shore protection). Conservation areas include two state-owned Wildlife Management Areas in the ACE basin, Donnelley, and Bear Island. The conservation areas also include state-owned Heritage Preserves, Refuges, and State Parks. [68]

Two privately owned plantations constitute more than one-third of the total area of the preserve. The Chehaw-Combahee Plantation at the confluence of the Chehaw and Combahee rivers protects approximately 23,000 acres. Ted Turner owns the Hope plantation, which conserves roughly 15,000 acres at the confluence of the Edisto and Ashepoo rivers. Because these owners have a legal right to protect the shore, the dry land in these plantations is depicted as protection unlikely.[69]

Development in the southern ACE basin is proceeding at a very slow pace. There has been no effort to put sewage infrastructure into place in any part of the preserve. A few years ago, a developer created a handful of lots on South Fenwick Island, but currently no one lives there. Our data show this island as almost entirely wetlands and conservation lands, with shore protection unlikely for the few areas

[65]This interview was conducted by Andrew Hickok of Industrial Economics.
[66]Unlike other counties in South Carolina, the response layer provided to us by Matheny and Burns did not include a future development land use classification. We also consulted a paper version of the Colleton County Official Zoning Map, dated 4/05/2002, which we believe was integrated into the response layer. Similarly, the zoning map does not include a future development classification.
[67]See Tables 5 and 6, and the accompanying text on Approach.
[68]SCDNR was the source of conservation data.
[69]Since these plantations do not appear in the SCDNR state conservation data layer or on the WMA maps, we did not change the depiction from blue. This follows the decision rule to show all plantations as blue.

outside of the conservation lands.[70] Our data also show approximately one hundred homes on North Fenwick Island around Bennetts Point, along with a marina and a few commercial establishments. This development is not growing and is confined to an area of two to three square miles. Because of the presence of state offices in Bennetts Point, the planning staff believes that shore protection there would be certain, reversing the County's prior judgment (during stakeholder review) that Bennetts Point was unlikely to be protected. Therefore we changed this area from blue to brown. Otherwise, our maps keep this area as blue because the County does not expect development in the foreseeable future.

The planner noted that the draft map incorrectly showed a brown area in the ACE basin about seven miles due south of Green Pond. He is not aware of any significant existing or planned development there. As such, he suggested that we change this area from brown to blue.

*Edisto Beach*

The stakeholder review maps had depicted this island as unlikely. The community of Edisto Beach is completely built out, however, though this area is not characterized by the high-rise, dense development of Myrtle Beach. Real estate prices have soared in recent years, with an average beachfront home costing $1.5 to $5 million and an average inland home on Edisto Island costing $100,000 to $300,000.[71] Because the island is a gated community, it is not eligible for publicly funded beach nourishment. The planner was unaware of any plans for privately funded beach nourishment on Edisto Beach. Nevertheless, given the high value of this land and the mix of private homes, the county has no doubt that residents would raise the funds for beach nourishment, as occurs with other gated communities in South Carolina. Therefore, our maps changed Edisto Beach from blue to brown.

*Growth Areas*

The town of Green Pond, located in the north central region of the ACE basin, is the fastest growing community in Colleton County. Green Pond is rapidly being developed in one- to five-acre lots to house people commuting to Beaufort County. US-17 between Green Pond and Jacksonboro is not likely to be developed because of the presence of wetlands and conservation easements.

The County expects development to proceed along SC-303, which connects Green Pond with Walterboro to the north. Mr. Griffin notes that since growth is a relatively new trend in this area (in the last three years), it would be difficult to offer an average historic development trend.[72] He also indicates that growth will be constricted to the SC-303 corridor because most of the large plantation tracts adjacent to it are protected by some type of conservation easement or regulation. Given the uncertain pace of development and the geographic constraints, he suggested that a quarter-mile red buffer along this road would be an appropriate change to the map.

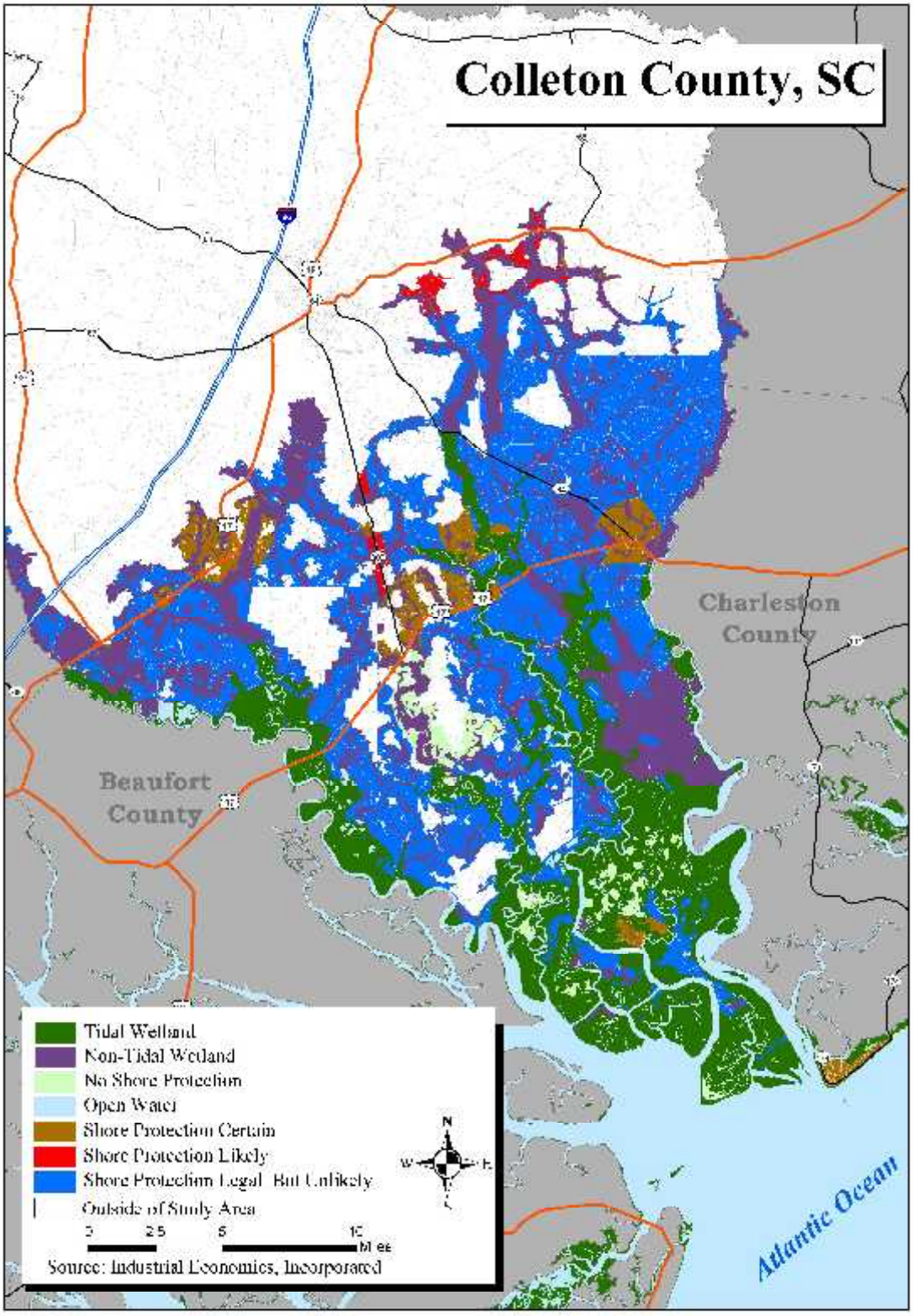
In contrast to Green Pond, the town of Jacksonboro is experiencing relatively little growth. The planner remarked that the brown area (from the previous map) representing Jacksonboro was largely overstated, and that much of the land to the northwest of the town lies undeveloped and is used for logging by the company MeadWestvaco. Those areas are unlikely to be developed for the foreseeable

[70]The southern portion of South Fenwick Island is part of the St. Helena Sound State Heritage Preserve, and was delineated using a 2003/2004 South Carolina Wildlife Management Area paper map.
[71]There are a few restaurants and one grocery store in the community of Edisto Beach.
[72]We had asked Mr. Griffin how many acres per year were developed. Email from Kevin Griffin to Andrew Hickok, January 26, 2005.

future and so should not be shown as brown. Mr. Griffin suggested that lands beyond two miles from the center of Jacksonboro be changed from brown to blue.[73]

The County expects growth along Alternate US-17 between Walterboro and Cottageville. The planner recommended that we assume that lands within two miles of either side of this section of highway are likely to be developed and protected. Current development in Cottageville mostly consists of mobile homes. Because it is one of the more densely populated places in Colleton County, the County confirmed that Cottageville was correctly depicted as certain to be protected.

[73]We defined the center of Jacksonboro as the junction of US-17 and Secondary State Route 30. We did not obtain any additional information from the planner on potential uncertainty about development within the Jacksonboro area.




**Map 6. Colleton County: Likelihood of Shore Protection.**

**Beaufort County**

Meeting with: John Holloway, planner, Beaufort County. April 29, 2004.

Jim Titus visited Beaufort County and met with John Holloway, natural resource planner, on April 29, 2004. Mr. Holloway had participated in a stakeholder review meeting during September 2002. The comments below reflect feedback received both during the meeting and through subsequent calls.

Titus started out with the same background as with the other counties he visited.[74] At the outset, we examined the polygons where development is expected in the data used in the original maps. All of those areas are certain to be developed and hence remain brown. We then discussed the barrier islands in Beaufort County. Map 7 shows the final results of the study for Beaufort County.

*Barrier Islands*

*Daufuskie Island* has long been populated by the descendants of freed slaves, but recently a number of resort developments have been constructed. The island is connected to the outside world via ferries to Hilton Head Island. The resorts no longer have public access, but most of the island is not part of a resort, and the public has access to most beaches. The island is correctly depicted as certain to be protected, given that it has received some beach nourishment in the past and the tendency for South Carolina resorts to pay for their own beach nourishment.

*Hilton Head Island* is largely developed with various resorts, although some of the traditional communities remain. Public access to the beach is poor. A number of communities along the Atlantic Ocean are gated, the largest being the Sea Pines Development at the southwestern tip of the island. (See Photo 28.) Automobile parking is prohibited in the vicinity of most public access paths to the beach.[75] As a result, Corps of Engineer funding will be unavailable. Nevertheless, the extremely high property values make shore protection almost certain. (See Photo 29.)

[74]See discussion of Horry County.

[75]The Town of Hilton Head is attempting to improve public access to the shore, according to John Holloway.


**Photo 28. Gated Entrance to Sea Pines.** April 2004.

**Photo 29. Dune Lane, Hilton Head Island.** The extremely high property values make shore protection almost certain. April 2004.

A number of preserves, however, are likely to remain in their natural state and hence can be shown as unlikely to be protected, if we are able to obtain the data on the boundaries of those preserves.

*Bay Point, St. Phillips, Capers, and Prichards Islands.* These islands are undeveloped, and are unlikely to become developed. Some of them have conservation easements.

*Fripp Island.* This island is a gated community and hence would not be eligible for federal funding for beach nourishment. It has, however, been nourished with private funds in the past and county planners

expect that such nourishment will continue in the future. This island also has hard shore-protection structures. Therefore, the county believes that it is certain to be protected.

*Hunting Island*. This island is largely undeveloped and has become a state park. A number of inholders have modest-sized homes known as “cabins”. (See Photo 30.) In the past, the island has been nourished on occasion, but it is currently eroding. (See Photo 31 and 32.) Given the very light development and existing erosion, this is the one island in the county where shore protection is most uncertain. Therefore, of all the barrier islands designated under Scenario One as likely to be protected in the original report, this is the one island that should be colored red.

**Photo 30. A Cabin on Hunting Island.** April 2004.

**Photo 31. Evidence of Shore Erosion on Hunting Island.** April 2004.

**Photo 32. Evidence of Overwash on Hunting Island.** Park authorities installed dune fencing in hopes of protecting the road at a narrow portion of Hunting Island. Nevertheless, storms and winds appear to be causing a small dune to form on top of the marsh on the landward side of the road

*Harbor Island*. This island has been accreting. Its only development is a gated community. If sea level rise were to reverse the accretionary trend, it would almost certainly be protected, given the relatively modest nourishment costs compared with Fripp Island.

*Other Islands*

Next we discussed other islands.

*Bull Island*. Although no bridge connects it to the mainland, this island has numerous logging roads, but has never been significantly developed. There are no plans to develop this island. The lack of an ocean beach limits its desirability for recreational purposes compared with Daufuskie Island. Hence protection is unlikely.

*Barataria Island*. Conservation easements limit prospects for development. Therefore, protection is unlikely.

*Military Lands: Paris and Port Royal Islands*. The stakeholder review drafts treated military lands as certain to be protected. Following the general approach of this study, Parris Island and the Beaufort Marine Corps Air Station on Port Royal Island are both classified as military lands, which are colored red.

*Port Royal Island (civilian portion).* Most of this island was already depicted in brown, given current development trends. The undeveloped areas along the northern end of the island, however, had been depicted as unlikely to be protected. Those areas are probably going to be developed. The military has been urging the County to prevent development there, however, to forestall complaints about noise from planes landing. It is possible that the area will not be developed because (a) the military may persuade the county to limit development; (b) the military might purchase the land as a buffer; and (c) development pressures are less than in areas closer to Beaufort Therefore, the undeveloped areas north of the base are designated as shore protection likely.

*Lady's Island*. Development is continuing, and the few areas depicted in blue should be depicted as red due to gradual development trends.[76]

*St. Helena Island*. County staff confirmed that development is expected to continue and that shore protection is certain for this island.

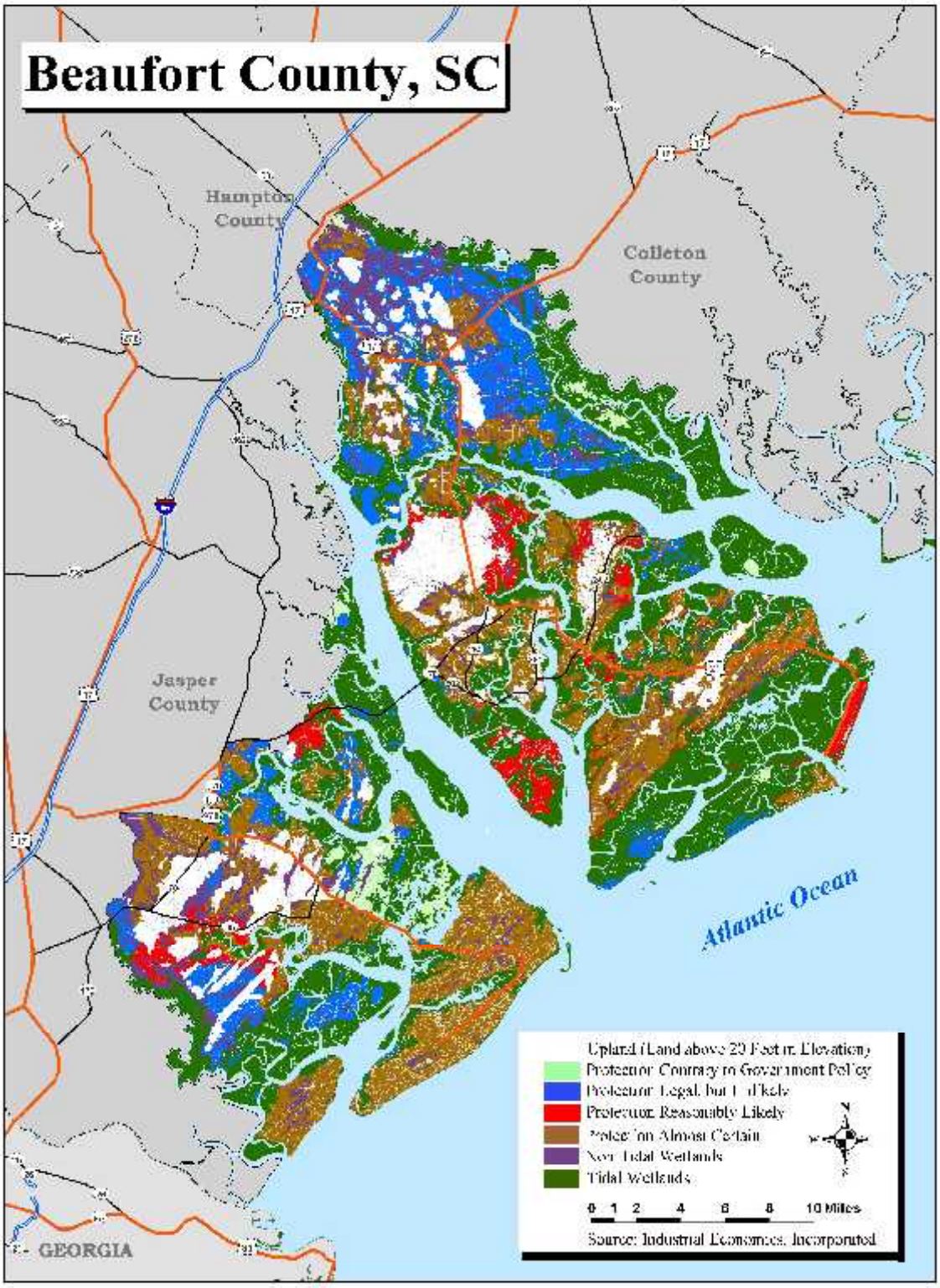
*Spring Island*. The mixture of blue and brown is correct. Throughout Beaufort County, numerous developments proceeded on the assumption that potential homebuyers are willing to pay for environmental preservations. Developers have voluntarily set aside substantial acreage for environmental preserves, which are protected by covenants enforceable by any property owner. This island includes trillium gardens, which would normally only be found substantially inland.

*Mainland*

The county planner identified two areas that needed to be changed from blue to red. First, the areas along SC-170 between Riverdale and Chelsea north of the Colleton River seemed likely to grow. Second, a large number of areas south of the May River and west of Palmetto Bluff could potentially grow.[77] Their status as rice fields, however, makes development unclear.

[76]County staff indicated that these areas should be red "at the very least". We depict them as red because depicting the area as brown would be to disregard the distinctions indicated in the planning data.
[77]This area had been changed from brown to blue during the stakeholder review.

We also discussed a number of areas depicted in blue, to make sure that they were properly characterized. Approximately five miles southwest of Palmetto Bluff, the lands depicted in blue are preserves where development is precluded. The areas depicted in blue between the Jasper County line and the Colleton River southwest of Chelsea are part of a county rural legacy type of fund to preserve agriculture and prevent development. Finally, the northern part of the county is part of the ACE Basin National Estuarine Research Reserve. Some areas within that reserve are already developed, and a few areas have already been acquired by the state. Most undeveloped areas, however, are potential targets for acquisition by nature reserves and have the lowest priority for development. Therefore, the county expects that a small portion of these areas will probably be developed, while the majority will remain in the natural condition. Because one can not yet identify which areas will be developed and which areas will become part of a reserve, the undeveloped privately held lands are all shown in blue.




**Map 7. Beaufort County: Likelihood of Shore Protection.**

**Jasper County**

County Representative: Hal (Harold) Jones, director of Planning and Building Services. September 23, 2004.

Andrew Hickok spoke over the telephone with Hal Jones, director of Planning and Building Services. He had also participated in the stakeholder review process. The comments below reflect feedback received both during the interview and through subsequent correspondence.

Hickok started out by explaining that we were concerned that the map had very little red, which implies that all lands that are likely to be protected are almost certain to be protected. We therefore focused primarily on whether some of the brown and blue areas ought to be depicted as red. To facilitate the discussion, we provided a map that was similar to the map produced by Matheny and Burns after the stakeholder except that areas where development is expected were depicted in red instead of brown.[78] The County agreed that our map ought to show some areas as red, but suggested different areas.[79]

Map 8 shows the final results of the study for Jasper County.

*Map Comments*

The planner told us that the map of Jasper County accurately depicted areas of development. All areas of major (ongoing) development, including Sun City and Cherry Point, were correctly shown. In a follow-up email, Mr. Jones indicated that development in the towns of Jasper and Chelsea is certain, remarking: "The assumed density in these two areas should equate to approximately 2 [dwelling units] per acre. There may also be scattered areas of multi-family uses near these areas with considerably higher densities."[80] The planner told us that these communities had been accurately depicted as shore protection almost certain.

Approximately 40 percent of the developable land in the county is located in the areas that our draft maps had depicted as shore protection unlikely, after the stakeholder review. The County expects that a moderate portion of this land will be developed in the next five to ten years. Although these areas are largely surrounded by wetlands, the planner remarked that there are "pockets of good soil" located about 14 to 18 feet above sea level that are considered developable. Mr. Jones told us the map would more accurately represent the county's "secondary projected growth front" by changing the area south of Hardeeville from blue to red. This new red area is bounded to the south of Hardeeville by US-17 on the west and SC-46 and Alternate SC-170 on the east. This red area occupies the triangle-shaped space between the brown areas of Hardeeville, Limehouse, and Levy, and is bounded to the south by Secondary State Road 34. The fact that lands in southwestern Beaufort County, directly to the east of this region, are depicted as either brown or red supports this map change.

[78]The sea level rise response scenario GIS layer produced by Matheny Burns incorporated planning zones into the map. The Land Use Type field within this layer allowed us to identify two areas designated by the County for future development. These areas, identified as Greater Ridgeland and Knowle's Island, are located to the north of Ridgeland, east of I-95. We depicted these polygons as red on the map we showed to the county representative in the fall of 2004.

[79]However, Mr. Jones did agree that the areas identified as Greater Ridgeland and Knowle's Island should be changed from brown to red.

[80]Email from Hal Jones to Andrew Hickok, September 29, 2004.

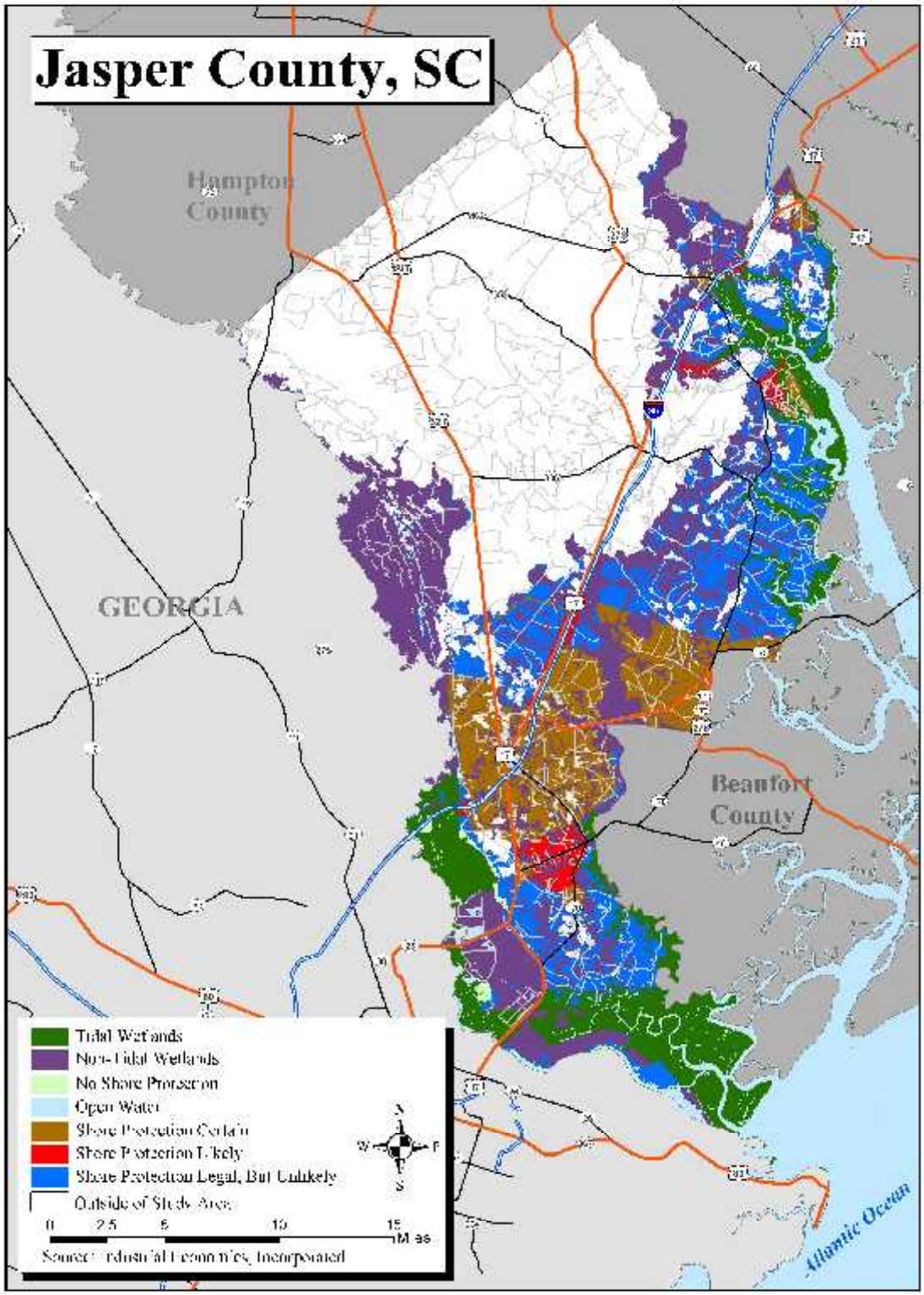
As the map already indicated and the planning staff confirmed, development in Jasper County is likely to proceed along the US-17/I-95 corridor.[81] Mr. Jones suggested that the county's "secondary projected growth front" would be accurately represented by a quarter-mile red buffer on either side of these highways.

The County anticipates an increase in the number of conservation easements, but could not specifically identify the probable locations of these. The planner does not expect a future expansion of the Savannah National Wildlife Refuge, a 10,000-acre preserve controlled by the U.S. Fish and Wildlife Service.

*Other Comments*

The planning staff noticed a possible error in the wetlands data we used. Along the Savannah River, tidal wetlands appear upriver from areas of nontidal wetlands.

[81] In the post-SHR map, I-95 passes through the center of the largest brown area, located around Hardeeville. Other brown areas along I-95 include Ridgeland and the smaller villages of Coosawatchie and Point South.




**Map 8. Jasper County: Likelihood of Shore Protection.**

## APPENDIX A. BIBLIOGRAPHY

### References

"Beaches Built on Shifting Sand," Sammy Fretwell, *The State Newspaper*, May 2001".

"Beach Projects Reviewed," Sammy Fretwell, *The Sun News*, May 27, 2001.

*Beaufort County Comprehensive Plan*, Beaufort County Planning Department, 1997.

*Berkeley County Comprehensive Plan*, Berkeley-Charleston-Dorchester Council of Governments, 1999.

*Century V City Plan*, City of Charleston Department of Planning and Urban Development, 2000.

"Charleston 2030 Predicted Urban Growth Study," Strom Thurmond Institute, 1997.

*Colleton County Comprehensive Plan*, Colleton County Council, 1999.

*County of Charleston Comprehensive Plan*, Charleston County Planning Department, 1999.

*Georgetown County Comprehensive Plan*, Waccamaw Regional Planning Council, 1997.

*Horry County Comprehensive Plan*, Horry County Planning Department, 1999.

*Jasper County Comprehensive Plan*, Jasper County Council, 1998.

"Project Impact Grant Application," Georgetown County, SC, July 2000.

"Project Impact Grant Application," Horry County, SC, July 2000.

*South Carolina: A History*, Walter Edgar, University of South Carolina Press, 1998.

*South Carolina's Beachfront Management Plan*, SC Coastal Council, December 1992.

"South Carolina's Coastal Zone Management Act: Coastal Tidelands and Wetlands, Chapter 39 of Title 48 of the 1976 Code, As Amended", October 1997.

*South Carolina Infrastructure Study*, SC Budget and Control Board, 2000.

*South Carolina Statistical Abstract*, SC Budget and Control Board, Office of Research and Statistics, 2000.

"State Marshes Moving Inland; Sea Also Rising" Kevin Wiatrowski, Knight Ridder Newspapers, *The Sun News*, 2001.

*State Parks: The Vision for the 21st Century*. SC Department of Parks, Recreation and Tourism, 2001.

"Strategy for Reducing Risks from Natural Hazards in Georgetown County, South Carolina" Georgetown County Planning and Development, 2000.

"Renourished Beaches Make Development Easier," Sammy Fretwell, *The State Newspaper*, May 2001.

Titus, J.G., 1998, "Rising seas, coastal erosion and the takings clause: How to save wetlands and beaches without hurting property owners," *Maryland Law Review* 57:1279–1399.

Titus J.G., and J. Wang. 2008. Maps of Lands Close to Sea Level along the Middle Atlantic Coast of the United States: An Elevation Data Set to Use While Waiting for LIDAR. Section 1.1 in: *Background Documents Supporting Climate Change Science Program Synthesis and Assessment Product 4.1*, J.G. Titus and E.M. Strange (eds.). EPA 430R07004. U.S. EPA, Washington, DC.

Titus, J.G., D.E. Hudgens, D.L. Trescott, M. Craghan, W.H. Nuckols, C.H. Hershner, J. M. Kassakian, C.J. Linn, P.G. Merritt, T.M. McCue, J.F. O'Connell, J. Tanski, and J. Wang. 2009. State and local governments plan for development of most land vulnerable to rising sea level along the U.S. Atlantic Coast. *Environmental Research Letters*. **4** (2009) 044008 (7pp).

**Web Sites**

Land Trust Alliance, www.lta.org

Federal Emergency Management Agency, www.fema.gov/nfip

NOAA, Digital Shoreline Data, http://www.csc.noaa.gov/products/sccoasts/html/

SC Department of Natural Resources, Data Clearinghouse, http://water.dnr.state.sc.us/water/nrima/gisdata/

SC Department of Natural Resources, Heritage Preserve Sites: http://water.dnr.state.sc.us/wild/heritage/hp/hpmap.html

South Carolina Environmental Law Project, www.scelp.org

SC Geological Survey, http://www.dnr.state.sc.us/geology/geohome.htm

SC Judicial Department, www.judicial.state.sc.us/opinions

SC Office of Coastal and Resource Management, http://www.scdhec.net/eqc/ocrm/

SC Office of Research and Statistics, www.ors.state.sc.us

South Carolina Ports Authority website, www.port-of-charleston.com

US Army Corp of Engineers, Charleston District, http://www.sac.usace.army.mil/welcome2.htm

US Census Bureau, www.census.gov

US Department of Fish and Wildlife, National Wetlands Inventory Center, http://www.nwi.fws.gov/download.htm

University of South Carolina, GIS Coverages (Including roads, hydrology, location of hospitals, higher education, state parks and military installations), http://www.cla.sc.edu/gis/dataindex.html

## APPENDIX B. LISTING OF KEY CONTACTS AND INTERVIEWS

| *Name* | *Title* | *Agency/Organization* | *Role* |
|---|---|---|---|
| ***Horry County*** | | | |
| Danny Taylor | Planning Director | Horry County | Original |
| Kevin Wheeler | Senior Planner | Horry County | Stakeholder Review |
| Janet Carter | Deputy County Attorney/Interim Planning Director | Horry County | Stakeholder Review |
| James Bichard | Senior Planner | Horry County | Final Review - April 27, 2004 |
| David Fuller | Senior Planner | City of Myrtle Beach | Original |
| Diane Moscow-McKenzie | Planner | City of Myrtle Beach | Original |
| Joyce Rowley | Planner | City of North Myrtle Beach | Original |
| ***Georgetown County*** | | | |
| Allen Burns | Director of Planning and Economic Development | Georgetown County | Original, Stakeholder Review |
| Susie Shoman | Grants Manager and Interim Coordinator, Project Impact | Georgetown County | Original |
| Jeff McNesby | Stormwater Manager, Department of Public Works | Georgetown County | Final Review - October 6, 2004 |
| ***Berkeley County*** | | | |
| Harold LeaMond | County Planner | Berkeley County | Original and Stakeholder Review |
| Madelyn Robinson | Zoning Administrator | Berkeley County | Final Review - October 1, 2004 |
| Harun Rashid | GIS Planner | BCD COG | Final Review - November 5, 2004 |
| Debbie Lieu | Planning Director | City of Goose Creek | Original |
| ***Charleston County*** | | | |
| Dan Pennick | Assistant Director of Planning | Charleston County | Original and Stakeholder Review |
| Christopher Morgan | Planner | Charleston County | Original |
| Jennifer Miller | Planning Director | Charleston County | Stakeholder Review – September 2002 |
| Brana Rerig | Project Officer III | Charleston County | Stakeholder Review – September 2002 and Final Review April 28, 2004 |
| John Carullo | Planner III (Engineer for the Planning Department) | Charleston County | Stakeholder Review – September 2002 |
| Andrea Pietras | Planner | Charleston County | Final Review – April 28, 2004 |
| Harun Rashid | GIS Planner | BCD COG | Final Review - August 2004 |
| ***Colleton County*** | | | |
| Ted Kinard | Planning Director | Colleton County | Original |
| Kevin Griffin | Director of Planning and Development | Colleton County | Stakeholder Review – September 2002 and Final Review October 12, 2004 |

| | | | |
|---|---|---|---|
| ***Beaufort County*** | | | |
| Cindy Bower-Camacho | Assistant Planning Director | Beaufort County | Original and Review |
| Teri Norris | Long-Range Planner | Beaufort County | Original |
| Dan Morgan | GIS Coordinator | Beaufort County | Original |

| | | | |
|---|---|---|---|
| John Holloway, Jr. | Natural Resources Planner | Beaufort County | Review – September 2002 and April 29, 2004 |
| ***Jasper County*** | | | |
| Hal Jones | Director of Building and Planning Services | Jasper County | Original and Review - September 2002 and September 23, 2004 |
| Chris Phillips | Deputy Administrator | Jasper County | Original |
| ***State of South Carolina*** | | | |
| Ron Althoff | Assistant Director of Planning | SC Department of Transportation | Original |
| Tony Bebber | Planning Manager | SC Department of Parks, Recreation and Tourism | Original |
| Nancy Brock | Review and Compliance Programs Coordinator | SC Department of Archives and History | Original |
| Michael Criss | Assistant Director for Planning and Policy | SC Department of Natural Resources | Original |
| Rob Mikell | Manager of Federal Certification Division | OCRM, SC Department of Health and Environmental Control | Original |
| Bill Eiser | Staff Oceanographer | OCRM, SC Department of Health and Environmental Control | Original and Review, July 2004 |
| ***Others*** | | | |
| Sam Passmore | Land Use Coordinator | SC Coastal Conservation League | Original |
| Caitlin Winans | National Issues Coordinator | SC Coastal Conservation League | Original |
| Dr. Terry Farris | Assistant Professor | Dept. of Planning & Landscape Architecture, Clemson University | Original |
| Kathy Thomas | Staff | SC Environmental Law Project | Original |

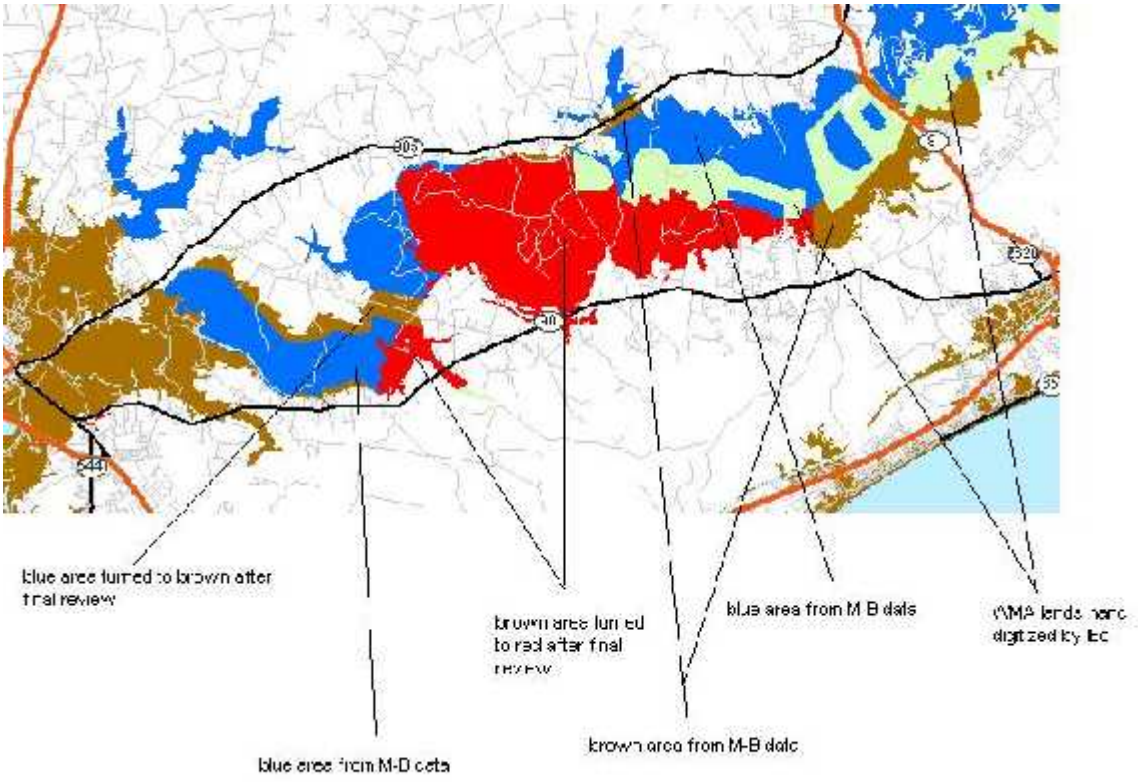
Note: In the "Role" column above, "Original" means that the individual helped us to produce the original maps or the original draft report documenting the basis for those maps. "Review" means that the individual reviewed the maps and documentation of the stakeholder review draft for a specific county, and provided maps and text changes, if any.

## APPENDIX C. MAPS DEPICTING SITE-SPECIFIC CHANGES MADE DURING THE REVIEW PROCESS

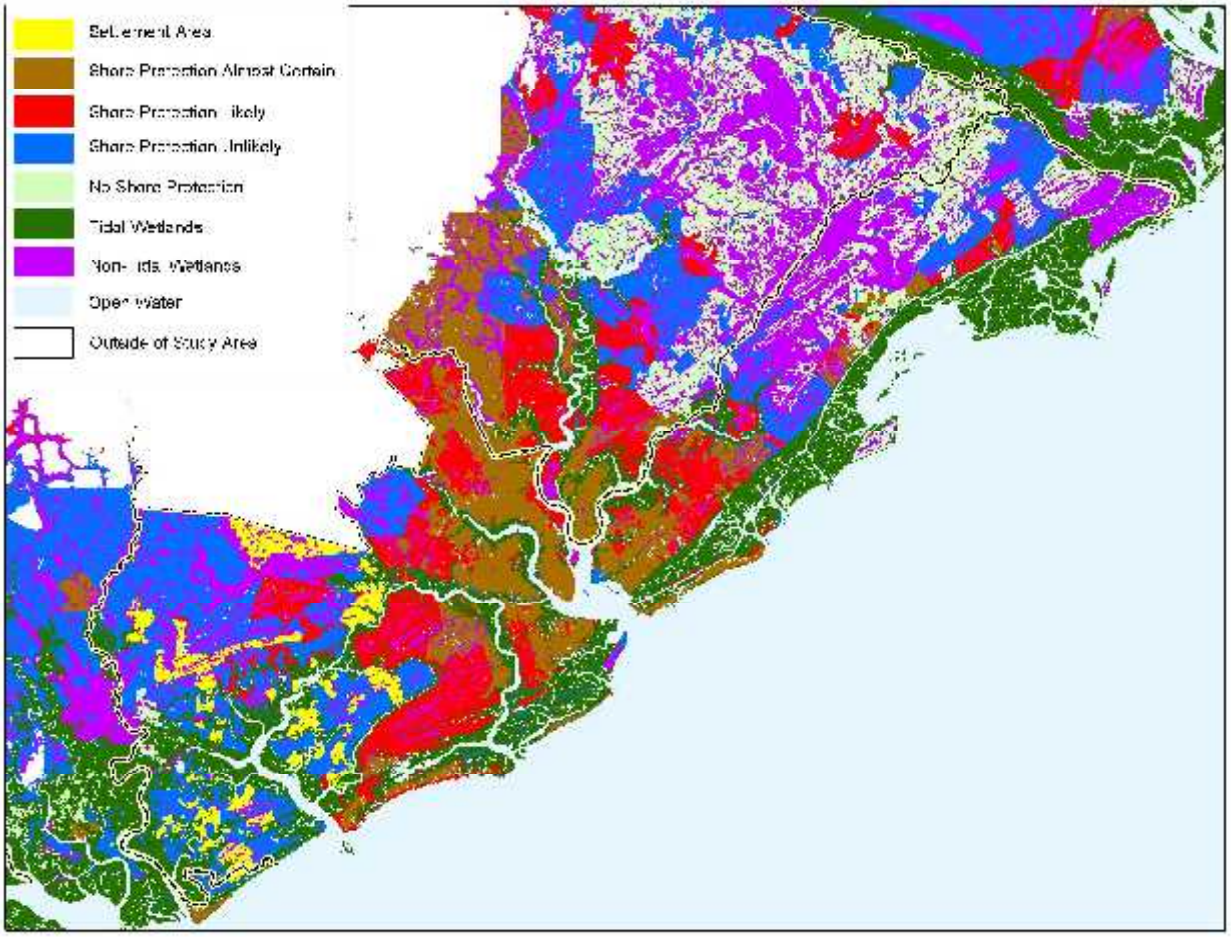
These maps depict those site-specific changes that were neither described precisely by the text nor based on a publicly available GIS data set.

C-1. Horry County: Summary of changes made due to Stakeholder and Final Review
C-2. Charleston County: Final Review Changes Based on Charleston County Settlement Area
C-3. Colleton County: Stakeholder Review Changes
C-4 Beaufort County: Stakeholder Review Changes

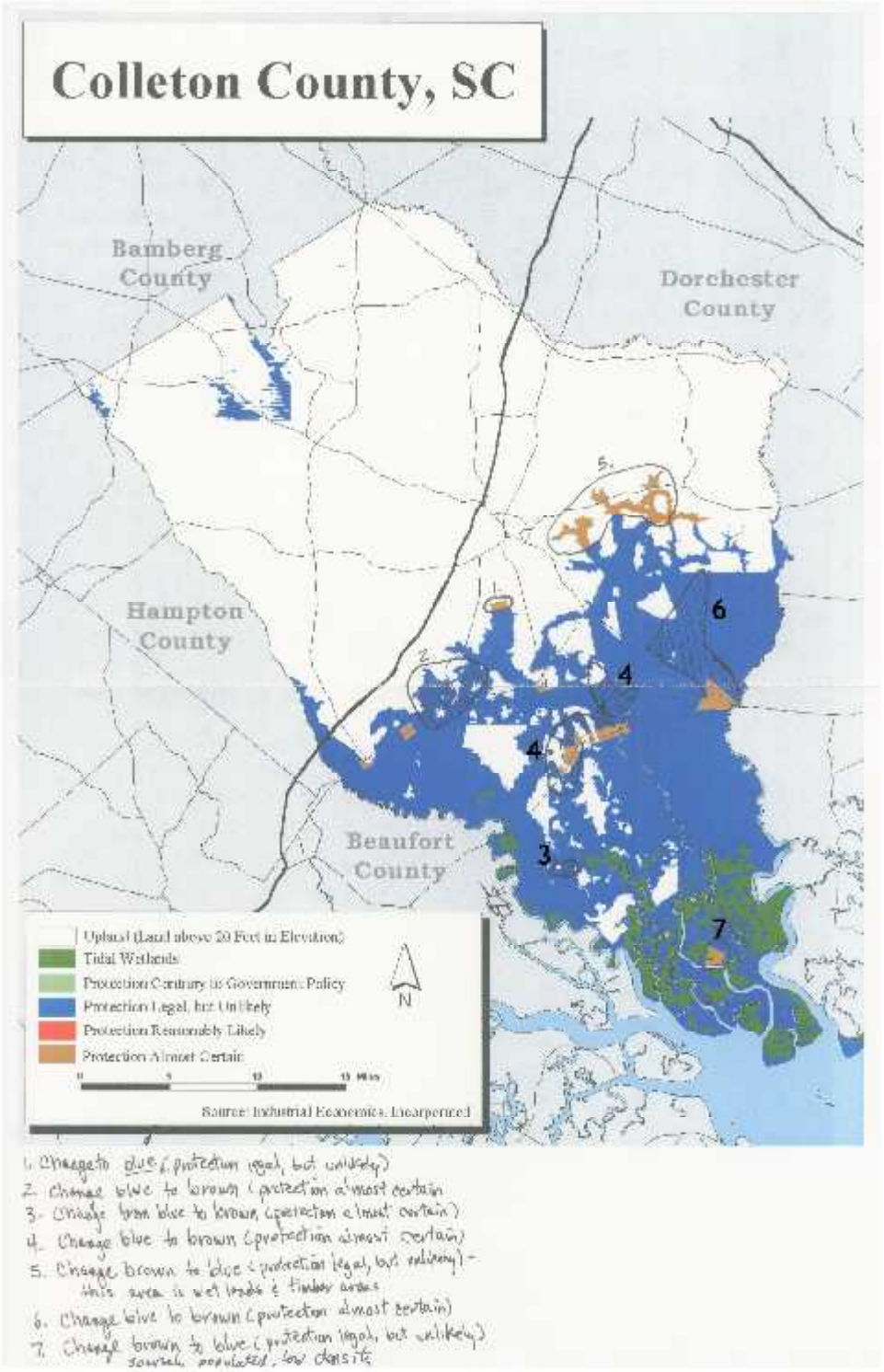
C-1. Horry County



## C-2 Charleston Settlement Area Study



C-3 Colleton County Stakeholder Changes



C-4 Beaufort County Stakeholder Review Changes.