

AGENDA
NATURAL RESOURCES COMMITTEE
Monday, February 1, 2010
2:00 p.m.
Executive Conference Room
Administration Building

Committee Members:
Paul Sommerville, Chairman
Jerry Stewart, Vice-Chairman
Steven Baer
Gerald Dawson
Brian Flewelling
William McBride
Stu Rodman

Staff Support: Tony Criscitiello

2:00 p.m. 1. CALL TO ORDER

2. TEXT AMENDMENT TO THE ZONING AND DEVELOPMENT STANDARDS ORDINANCE (ZDSO), ARTICLE XIII, SEC. 106-2729. STREET DESIGN STANDARDS (TO ESTABLISH CONSTRUCTION STANDARDS FOR UNPAVED ROADS AND TO PERMIT ACCEPTANCE OF UNPAVED ROADS BY THE COUNTY FOR MAINTENANCE OR OWNERSHIP WHEN APPROVED BY COUNTY COUNCIL) ([Text](#))
3. TEXT AMENDMENT TO THE BEAUFORT COUNTY COMPREHENSIVE PLAN, DEMOGRAPHICS (REPLACES IN-KIND) ([Text](#))
4. WATER BUDGET CONTRACT WITH SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES ([Memorandum](#))
5. UPDATE ON STATUS OF WORK AT FORT FREMONT / FRIENDS OF FORT FREMONT
6. CONSIDERATION OF REAPPOINTMENTS AND APPOINTMENTS
 - Construction Adjustments and Appeals Board
 - Forestry Commission

Over

A quorum of Council may be in attendance at all Committee meetings.
Please silence your cell phone during the meeting.

- Historic Preservation Review Board
- Northern Corridor Review Board
- Planning Commission
- Southern Corridor Review Board
- Stormwater Management Utility Board
- Zoning Board of Appeals
- Coastal Zone Management Appellate

7. EXECUTIVE SESSION

- Discussion of negotiations incident to proposed contractual arrangements and proposed purchase of property

7. ADJOURNMENT

County TV Rebroadcast	
Wednesday	9:00 a.m.
Thursday	4:00 a.m.
Saturday	11:00 p.m.

Natural Resources		
<i>Date</i>	<i>Time</i>	<i>Location</i>
March 1	2:00 p.m.	ECR
April 5	2:00 p.m.	ECR
May 3	2:00 p.m.	ECR
June 7	2:00 p.m.	ECR
No Meeting in July		
August 2	2:00 p.m.	ECR
September 7	2:00 p.m.	ECR
October 4	2:00 p.m.	ECR
November 1	2:00 p.m.	ECR
December 6	2:00 p.m.	ECR



MEMORANDUM

To: Natural Resources Committee of Beaufort County Council
From: Anthony Criscitiello, Planning Director
Subject: Amendment to the Zoning and Development Standards Ordinance, Sec. 106-2729
Date: January 21, 2010

EXCERPT OF PLANNING COMMISSION RECOMMENDATION from its draft January 7, 2010, meeting minutes:

Mr. Criscitiello briefed the Commission. He noted that this amendment was directed by County Council in order to assist affordable housing development.

Public Comment: None were received.

Discussion included a clarification that the development must put the crushed granite on the dirt road before the County will accept the road, a clarification that the County does not have to accept any unpaved road, and a clarification on the Habitat for Humanity request for the County to accept their unpaved road to their affordable housing development.

Motion: Mr. Thomas made a motion, and Mr. Semmler seconded the motion, to forward a recommendation of approval to County Council on the text amendments to the Beaufort County Zoning and Development Standards Ordinance (ZDSO), Article XIII, Section 106-2729. Street design standards -- that establish construction standards for unpaved roads and permits acceptance of unpaved roads by the County for maintenance or ownership when approved by County Council. The motion was carried unanimously (FOR: Chmelik, Hicks, Petitt, Riley, Semmler, Sutler and Thomas).

ZDSO Section – Sec. 106-2729 (Street Design Standards)

Summary of Proposed Amendment – This amendment specifies standards for unpaved roads and permits the County to take over ownership and maintenance of new unpaved roads with approval by County Council for affordable housing developments.

Justification – Habitat for Humanity is developing a 4.88-ac. tract on St. Helena Island off Ernest Drive, which is a paved, county-maintained road. The development plan includes a 620-ft. long, aggregate-surface roadway that will serve four residential lots. In order to maintain the affordability of the homes being built, Habitat for Humanity requested the County accept the new road and maintain it. Although the County presently maintains miles and miles of unpaved

roads. At its meeting on August 25, 2009, the Public Facilities Committee of County Council voted to recommend that the County accept ownership of the proposed road and directed staff to draft an amendment to the ZDSO to allow waivers to the road acceptance standards for affordable housing projects. The proposed changes are shown below. It is recommended that County Council approval be required before any new unpaved roads are accepted into the county system. Staff has also taken this opportunity to recommend construction specifications for unpaved roads.

Proposed Amendment (on page 2) – Proposed deletions are shown struck-through and additions are underlined.

ARTICLE XIII. SUBDIVISION AND LAND DEVELOPMENT STANDARDS

DIVISION 2. STREET STANDARDS

Sec. 106-2729. Street design standards.

(e) *Minimum construction specifications for, and County acceptance of, unpaved roads.* For the purposes of this article, unpaved road shall not mean dirt road, per se, but shall be referred to as “stabilized aggregate” road. Unpaved roads are to be utilized for residential, low volume traffic usage only. ~~For subdivision of land, low volume traffic shall mean that the highest traffic potential of traffic than can be generated based on the underlying zoning district.~~ All minor subdivisions of land, as long as no more than four lots are served by the proposed road, may utilize a stabilized aggregate, per county standards as follows: 6” of crushed granite or equal as approved by the County Engineer. All major subdivisions shall require paved roads, per county standards. Unpaved roads shall remain private roads and not be accepted by the county for maintenance or ownership unless specifically approved by County Council for an affordable housing development as defined in Sec. 106-2081(3)(a).

[Note: The following language is provided for information only.]

Sec. 106-2081(3)

a. *Below market.* The units are built with a local, state, or federal subsidy, or a private nonprofit sponsor for persons or families earning less than 80 percent of median income.



MEMORANDUM

TO: Natural Resources Committee of Beaufort County Council
FROM: Anthony Criscitiello, Beaufort County Planning Division
DATE: January 26, 2010
RE: Beaufort County Comprehensive Plan - Chapter 2: Population and Demographics

Please find enclosed Chapter 2: Population and Demographics of the Beaufort County Comprehensive Plan. This chapter has been revised to reflect comments made at the November 2 Natural Resources Committee meeting.

- Figure 2-3 on page 3 has been revised to compare historic growth in the planning areas to growth projections to the year 2025.
- On page 4, estimates of Average Daily Population reflecting the impact of tourists, seasonal residents and commuters have been added.
- Revised population and demographic estimates from the US Census' American Community Survey were made available for the year 2008. The document has been revised to reflect these changes.

It is important to note that since nine years have elapsed since the 2000 Census, the Planning Department will provide an updated document when data from the 2010 U.S. Census is made available.

2

Beaufort County Comprehensive Plan Population and Demographics



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Introduction

In less than 30 years, Beaufort County has more than doubled in population. In 1980, the U.S. Census reported that the County had 65,364 persons. The most recent Census projections (2007~~8~~) estimates that the County's population now exceeds ~~143,000~~ 146,000. The sheer magnitude of this population growth and the likelihood that it will continue into the future has tremendous policy implications on the provision of public facilities, the transportation network, the availability of affordable housing, natural resources, water quality and cultural resources. Population growth has brought about many changes in the County's demographics. Much of the recent growth has been a result of people moving to Beaufort County from other parts of the country or from other countries for retirement or to seek economic opportunities. Compared to 1980, on average, today's population is older, lives in smaller households, is better educated and is wealthier. However, these demographic trends do not apply evenly to all population subgroups or across geographic regions of the County.

The purpose of this chapter is to analyze historic and current population and demographic trends; and to provide reasonable projections of future population growth to help guide policy decisions through the lifespan of this plan (2025). Each of the following chapters of this plan utilize these projections to help shape their recommendations. It is important to note that nine years have elapsed since the 2000 Census. This chapter uses 2007~~8~~ U.S. Census estimates and information compiled in the 2005~~6~~-2007~~8~~ American Community Survey (also conducted by the U.S. Census Bureau). When the County receives data from the 2010 U.S. Census, this chapter will be updated to reflect this data.



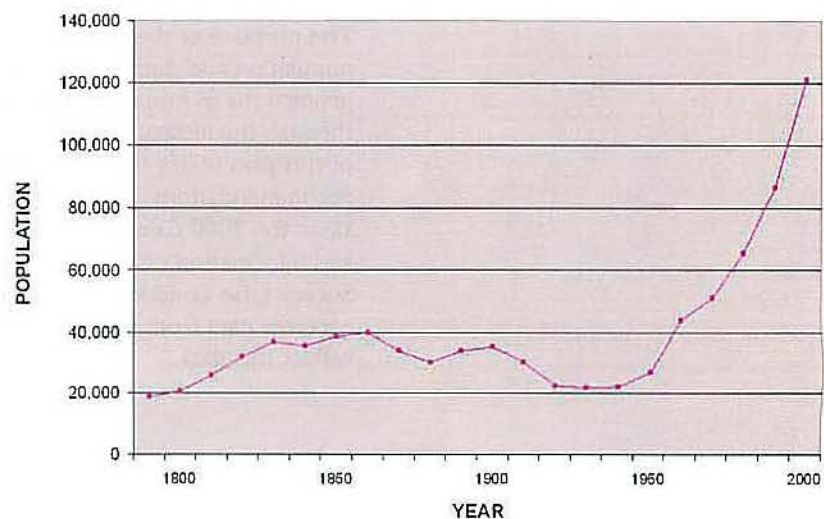
Historic, Current, and Projected Growth Trends

Beaufort County Population Growth – 1790-2000

Year	Population
1790	18753
1800	20428
1810	25887
1820	32199
1830	37032
1840	35794
1850	38805
1860	40053
1870	34359
1880	30176
1890	34119
1900	35495
1910	30355
1920	22269
1930	21815
1940	22037
1950	26993
1960	44187
1970	51136
1980	65364
1990	86425
2000	120937

Beaufort County's rapid growth rate is a relatively recent phenomenon in its 240-year history. The County was established in 1769 when South Carolina was still a British Colony. Over 200 years of census data reveal that Beaufort County's growth rate began to consistently trend upward after the 1950 census. Two events helped to spur this growth. In Northern Beaufort County the establishment of the US Marine Corps Air Station in 1955 eventually brought thousands of military and civilian jobs to the region. In Southern Beaufort County, the construction of a bridge to Hilton Head Island in 1956 spurred the development of the County's tourism and retirement based infrastructure.

Figure 2-1: Historic Population Growth Trends 1790-2000¹



¹ Beaufort County's original boundaries included present-day Hampton and Jasper Counties. Two historic downward growth trends can be explained by the establishment of Hampton County in 1877 and Jasper County in 1912.

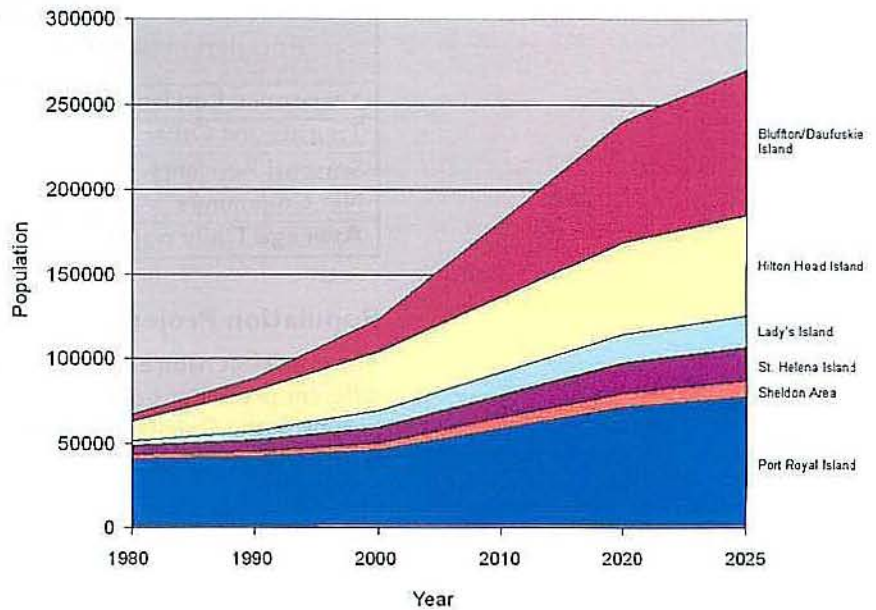
Current Year-round Population

The US Census estimates that Beaufort County's current population (July 2007²) is ~~143,421~~ 146,743. This figure represents a ~~11.9%~~ 12.5% increase in population since 1980. This is a dramatic increase compared to population increases in South Carolina and the United States during the same period (Figure 2-2). Figure 2-3 helps to illustrate that this growth has occurred and will continue to occur unevenly across the County with the greatest increases occurring in Bluffton, Hilton Head Island and on Lady's Island.

Figure 2-2: Comparison of Growth Rates 1980-2007²

	Beaufort County	South Carolina	United States
1980	65,364	3,122,814	226,545,805
1990	86,425	3,486,703	249,639,692
2000	120,937	4,012,012	281,421,906
2007 ²	143,421 <u>146,743</u>	4,330,933 <u>4,403,175</u>	298,757,310 <u>301,237,703</u>
%change 1980-2008	119.4% <u>124.5%</u>	38.7% <u>41.0%</u>	31.9% <u>32.9%</u>

Figure 2-3: Comparison of Growth by Planning Area 1980-2000 2025



² US Census estimate as of July 1, 2007.

Average Daily Population

In addition to Beaufort County's permanent population, tourists and other visitors, seasonal residents, and a net influx of daily commuters increases the County's population by 19% on an average day. This increase has a significant impact on the County's roadways, other public facilities and the provision of public services such as law enforcement, fire protection, and emergency medical services. Figure 2-4 summarizes the County's estimated average daily population.

- **Tourists and Other Visitors:** According to estimates from the Hilton Head Island Chamber of Commerce and estimates based on accommodations tax receipts, Beaufort County had approximately 2,961,285 visitors in 2008. This translates to 8,112 visitors on an average day. This number peaks in July at 10,411 visitors a day.
- **Seasonal Residents:** Based on the 2000 Census and estimates for 2008, there are 14,206 seasonal dwellings in the County. Assuming that one third of seasonal dwellings are occupied on any given time, there are 10,702 seasonal residents on an average day.
- **Net Influx of Commuters:** Based on the 2000 Census and estimates for 2008, there is net influx of 8,993 commuters daily in Beaufort County.

Figure 2-4: Beaufort County Population Estimates from its Transportation Model

Population Segment	Estimated 2008 Average Daily Population
Year-round Residents	146,743
Tourists and Other Visitors	8,112
Seasonal Residents	10,702
Net Commuters	8,993
Average Daily population	174,550

Population Projections

The imperfect nature of population projections results in a number of different predictions of future growth in the County. For planning purposes, the County utilizes the projections employed in its transportation model.

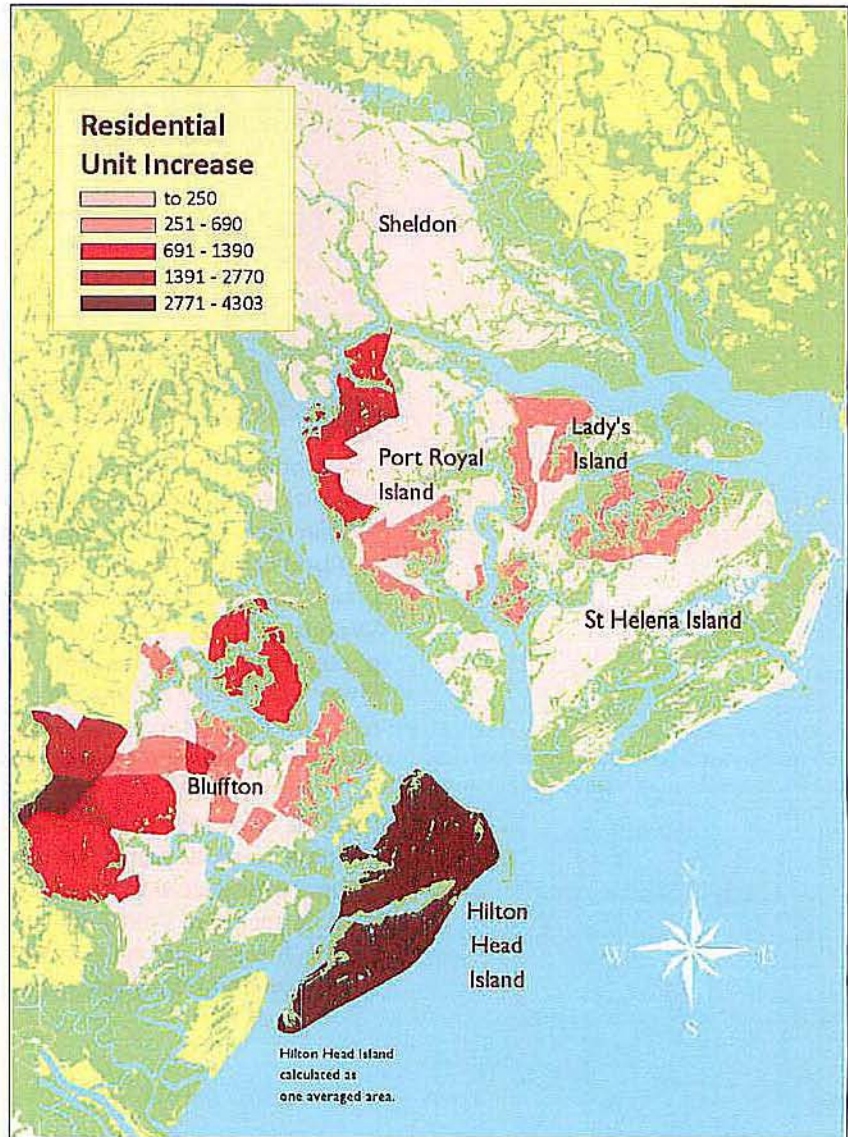
Figure 2-4: Beaufort County Population Estimates from its Transportation Model

Planning Area	2006 Dwelling Units	2006 Population	2025 Dwelling Units	2025 Population
Port Royal I.	19,875	50,244	30,587	76,299
Sheldon	2,123	5,266	3,696	9,203
Lady's I.	4,855	11,918	7,430	18,911
St. Helena I.	7,599	13,190	8,937	19,119
Greater Bluffton Area	17,510	36,864	39,291	83,616
Hilton Head I.	28,299	39,985	38,692	60,000
Daufuskie I.	170	340	315	630
TOTAL	80,431	157,807	128,948	267,778

The model utilizes projections compiled by the County's planning staff that divides the County into 124 Transportation Analysis Zones (TAZ). Within each TAZ, historic growth rates, planned development patterns, and land capacity are used to predict future growth. Other sources of population forecasts include the SC Budget and Control Board and Woods and Poole Economics, Inc. It is important to note that population estimates derived from national and state sources tend to be lower than locally derived data. Large area sampling methodologies tend toward conservative averaging, while local, area-specific transportation modeling tends toward maximal accounting.

Map 2-1 helps to illustrate where future growth is likely to occur over the next 15 to 20 years. The western portion of southern Beaufort County is projected to receive the greatest number of dwelling units as existing approved subdivisions build out in those areas. Additional growth is forecasted on Port Royal Island in the vicinity of Habersham and Clarendon Plantation, and in northern Lady's Island. Based on

Map 2-1: Projected Residential Unit Increase by
Transportation Analysis Zone: 2005-2025



current projections, southern Beaufort County (south of the Broad River) is anticipated to surpass northern Beaufort County in year-round population in 2012 or 2013. This population shift will have implications on County Council representation in future years.



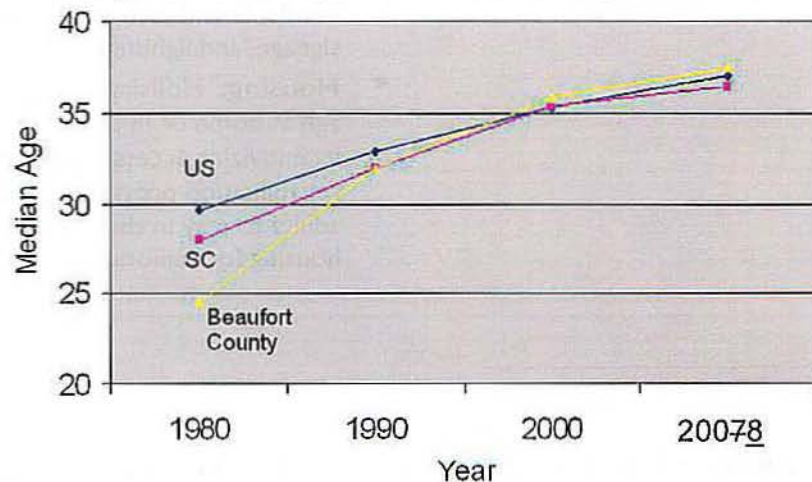
Characteristics of Population

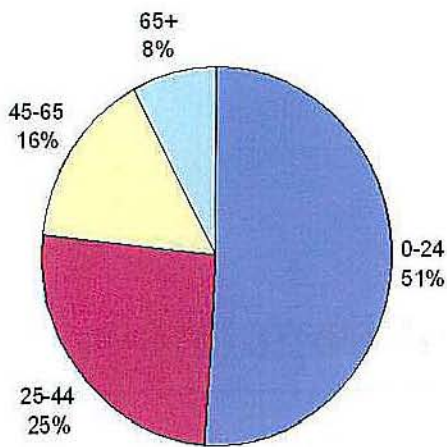
This section explores various attributes of Beaufort County's population including age, household size, race and ethnicity, educational attainment, and income. There are two noteworthy demographic trends in Beaufort County. One trend is the increased proportion of residents over 65 years of age. The other trend is the significant growth of the County's Hispanic community. In many ways, these two trends stand in contrast to each other. For example, the median age of the County's Hispanic population is 12 years younger than the County average. Hispanic households are, on average, 1.35 persons larger than the County average while elderly residents tend to live in smaller households. While these two demographic trends reflect national trends, they are amplified in Beaufort County by the region's popularity as a retirement destination and its relative prosperity over the last 15 years, which has attracted in-migration.

Age

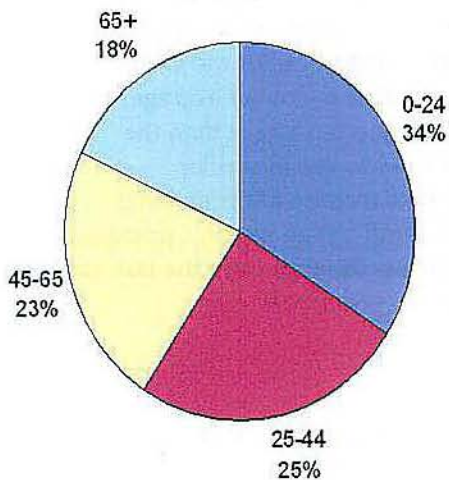
The age of Beaufort County's population has changed significantly since the 1980 census. In 1980, the median age was 24.5, much lower than both state and national median ages (see Figure 2-5).

Figure 2-5: Comparison of Median Age 1980-20078





1980 distribution of population among age groups.



2007 distribution of population among age groups.

In 2007, Beaufort County's median age grew to 37.5, slightly higher than the state and the nation. Another significant statistic is the growth of the 65-year and older age cohort. In 1980, this group only made up 8% of the County's population. In 2007, it was estimated that nearly over 18% of County residents were 65 years or older (see sidebar).

Beaufort County's aging population can be attributed to several factors; primarily the County's popularity as a retirement destination. Other factors include the advance of the Baby Boom generation and improvements in the standard of living as Beaufort has transformed from a poor rural county to a relatively prosperous urbanizing county.

In 2011, the first Baby Boomers will turn 65. The US Census predicts that the 65 and older population will grow from 34.9 million (one in eight Americans) to 53.7 million (one in six) by 2020. This national demographic trend is anticipated to have a significant impact and policy implications on Beaufort County and the surrounding region. The Atlanta Regional Commission (ARC), through a series of public meetings, developed a set of strategies to deal with the issue of an aging population. The ARC "Lifelong Communities" program was set up with the goal to develop communities where older adults can age in place. Many of these strategies have land use, housing and transportation components and are very relevant to Beaufort County. The following is a summary of some of the "Lifelong Communities Strategies and Solutions":

- **Land Use Issues:** Strategies are aimed at developing walkable communities to eliminate the need for older adults to drive; and to develop land use policies that promote a diversity of housing choices so that older adults can live near children and grandchildren.
- **Transportation:** Transportation strategies include enhancing public transportation options to better serve older adults; Integrating modifications to new and existing roadways to reduce accidents and assist older drivers (left hand turn lanes, improved signage, and lighting); and improving sidewalk infrastructure.
- **Housing:** Housing strategies are aimed at allowing older adults to age at home or in proximity to their families. Strategies include incentivizing accessory dwelling units; expanding housing rehabilitation programs, including weatherization, to help older adults to stay in their houses; and providing incentives to develop housing for seniors³.

³ Atlanta Regional Commission. "Lifelong Communities: A Regional Approach to Aging: Strategies and Solutions," http://www.atlantaregional.com/documents/ag_llc_solutions_strategies_5_13_08.pdf

These strategies will be addressed further in the Land Use, Transportation, Housing and Energy chapters of this plan.

Household size

An average household in Beaufort County in 2007~~8~~ contained ~~2.43~~ 2.41 persons compared to 2.84 in 1970. This reduction in household size mirrors the national trend of a growing number of smaller families, single parent households and an aging population. This downward trend will likely continue as the County's population ages.

Figure 2-6: Comparison of Persons per Household 1980-2007~~8~~

	1980	1990	2000	2007 8
United States	2.75	2.63	2.59	2.61
South Carolina	2.93	2.68	2.53	2.52
Beaufort County	2.84	2.59	2.51	2.431

Race and ethnicity

Population growth over the last 30 years has brought about several changes to the racial and ethnic makeup of the County. From 1980 to 2007~~8~~, Beaufort County's white population grew by ~~45%~~ 155% while the black population grew by only ~~42%~~ 39%. In 1980, one third of all Beaufort County residents were African-American compared to ~~24%~~ 21% in 2007. This demographic change is largely due to the influx of new residents, including retirees, from other parts of the county.

Figure 2-7: Racial Trends 1980-2007~~8~~

	1980	1990	2000	2007 8
White	42,454	59,843	85,451	106,414 <u>108,366</u>
Black	21,504	24,582	29,005	30,573 <u>29,864</u>
Asian, Pacific Islander	610	813	1,016	1,372 <u>1,196</u>
Native American	161	251	321	313 <u>254</u>
Other	635	936	4,823	4,749 <u>7,063</u>

Another significant trend is the growth of Beaufort County's Hispanic community. Nationally, the Hispanic population is the fastest growing demographic segment. Until the early 1990s, Hispanic immigration was largely limited to southwestern states, and a handful of other states including Florida and Illinois. Since the early 1990's, there has been a significant growth in Hispanic immigration to other parts of the country including the southeast. For example, between 1990 and 2000, South

Carolina's Hispanic population grew by 211% from 30,551 to 96,178. Within South Carolina, Beaufort County has the second largest Hispanic community (Table 2-8).

Figure 2-8: Hispanic Population

	1980	1990	2000	2007
# of Hispanics	1,329	2,168	8,208	13,280 14,122
% of total population	2.0%	2.5%	6.7%	9.3% 9.6%

Mexicans make up approximately 57% of the County's Hispanic population with Puerto Ricans (8.5%) making up the second largest group. Over 33% are from various countries in Central and South America. It is likely that the actual numbers and percentages of Hispanic residents are significantly higher than reported census data and estimates. National and regional evidence supports that this population is undercounted.

The recent growth of Beaufort County's Hispanic community poses several challenges to public policy makers. One challenge is the language barrier. According to recent data, 57% of foreign-born Hispanics in the southeast do not speak English or do not speak it fluently.⁴ This barrier presents a challenge to public service providers, public safety officials and teachers. Another concern is health care. Approximately 66% of Hispanics in the United States, who primarily speak Spanish, do not have a regular doctor; 45% have no insurance; and 33% use only public health services.⁵

Educational attainment

Another significant change over the last 30 years in Beaufort County's population is educational attainment. From 1980 to present, Beaufort County went from having nearly 30% of its population lacking a high school diploma to exceeding state and national averages in terms of the percentage of high school and college graduates (Figure 2-9). In 2000, 40% of Beaufort County's residents that were 65 years or older had a college degree compared to the only 33% of the general population. This statistic indicates that some of the improvements in educational attainment are a result of an influx of educated retirees.

⁴ "The Growing Hispanic Population in South Carolina: Trends and Issues ", Richard D. Young, Institute of Public Service and Policy Research, University of South Carolina, 2005

⁵ "Uninsured Hispanics with limited English face formidable barriers to health care", The Commonwealth Fund, 2003

Figure 2-9: Comparison of Educational Attainment: 1980-2007

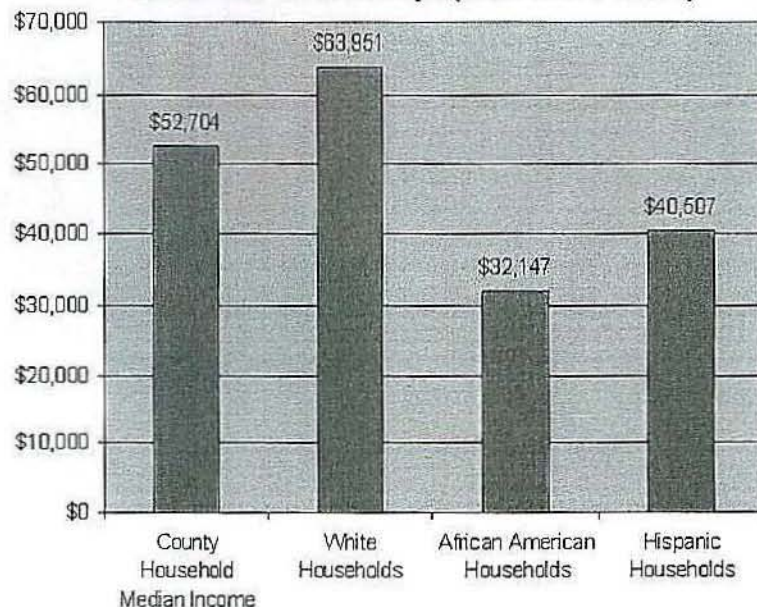
	1980	1990	2000	2007
No High School Diploma	28.0%	16.6%	12%	9.8%
High School Graduate	50.1%	56.8%	54.6%	53.9%
4-year College or greater	21.9%	26.5%	33.2%	36.2%

Income

In terms of per capita and median income, Beaufort County is the wealthiest in South Carolina. However, the County is unique in that only 56% of household income is derived from actual wages. A large percentage (30.6%) of personal income comes from interest, dividends and rent. This is indicative of the County's large retiree population. Beaufort County's median income was estimated to be ~~\$62,367~~ \$65,150 in 2007. This is slightly higher than the national median income (~~\$60,374~~ \$63,211) and 20% ~~19%~~ higher than the state average (~~\$51,954~~ \$54,710). At the same time, statewide average weekly wages (\$668) exceed the County's average (\$595) by 12%. This data begins to indicate that Beaufort County's wealth does not evenly benefit all segments of the County's population.

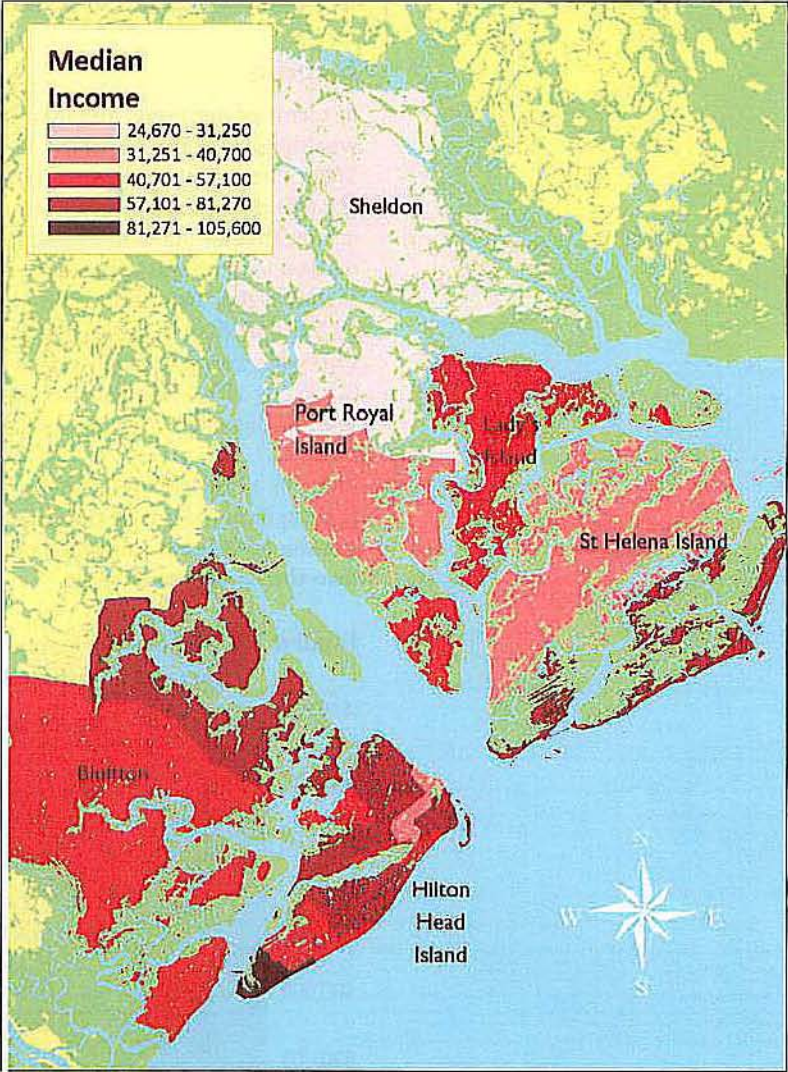
There is a disparity of income among racial and ethnic groups and among geographical regions of the County. Figure 2-10 shows that the median income for African American and Hispanic households is significantly lower than the County as a whole.

Figure 2-10: Comparison of Median Household Income among Racial and Ethnic Groups (2000 U.S. Census)



Map 2-2 indicates that wealth is not spread evenly countywide. Higher income households are generally concentrated in Southern Beaufort County. Rural communities, such as Sheldon and St. Helena Island have much lower household incomes than the County's median income.

Map 2-2: Median Income per Census Tract (2000 U.S. Census)





BEAUFORT COUNTY PUBLIC WORKS

120 Shanklin Road

Beaufort, South Carolina 29906

Voice (843) 470-6400 • Facsimile (843) 470-6418



To: Councilman Paul Sommerville, Chairman, Natural Resources Committee

Via: Gary Kubic, County Administrator *Gary Kubic*
David Starkey, CFO *DS*
Rob McFee, P.E. Director of Engineering & Infrastructure *RMCF*
Eddie Bellamy, Public Works Director *EB*
Robert Klink, P.E. County Engineer *REK*

From: Dan Ahern, P.E., Stormwater Manager *Dan Ahern*

Date: January 25, 2010

Subject: Water Budget Study by SC DNR

BACKGROUND.

The County has approved ordinance changes to control Stormwater (SW) volume from new developments. This effort and addressing "approved but not built" projects should stop future impacts to our receiving waters. The County will need to develop a "reasoned" approach to addressing impacts from SW Volume from existing development that has caused problems in many of our tidal headwaters. As part of this "reasoned" approach we need to know how much the existing development has changed our local hydrology and what the impacts of other practices, like well pumping and irrigation, is having on our hydrology. We also are concerned if the standard method of determining stormwater volume is being impacted by this additional application of water.

In order to better assess the impact of existing development on our local hydrology we contacted the South Carolina State Hydrologist and requested assistance in determining the hydrologic changes that are taking place in the headwaters of our tidal creeks.

Dr Bud Badr, Chief Hydrologist, of SC DNR and members of his staff have made three visits to the County. The first to meet with representatives of the county and the Town of Bluffton to hear concerns; another to tour sites in the May River to develop a study plan for tidal headwaters; and finally to discuss plans with the May River Technical Advisory Committee.

He has developed a proposal titled "Quantifying the Water Budget in the Headwaters of the May River". While this study will be done in the May River, it will develop models that can be used in tidal headwaters throughout the county. The agreement will have the county funding equipment and data collection (funding one technician) and the State supplying their time to analyze and prepare reports. It is estimated that the equivalent contracted support that the state will supply will be over \$200,000. It is expected that the study will be completed within one year of authorization if sufficient rainfall events are obtained. Preliminary findings may be available as early as six months.

The proposal has been presented to SW Utility Board for review as well as the May River Technical Advisory Committee. Since BJWSA might be impacted by the findings of this study, we have contacted them and they agreed to partner with the county on this study.

RECOMMENDATION.

Recommend that the Natural Resources Committee approve and recommend to County Council the acceptance of the SC DNR proposal called "Quantifying the Water Budget in the Headwaters of the May River" in the amount of \$115,878.



MEMBER
NATIONAL SAFETY COUNCIL



QUANTIFYING THE WATER BUDGET IN THE HEADWATERS OF THE MAY RIVER

A proposal from the South Carolina Department of Natural Resources

Land, Water and Conservation Division

Hydrology Section

Dr. Bud Badr, Chief Hydrologist



QUANTIFYING THE WATER BUDGET IN THE HEADWATERS OF THE MAY RIVER

Introduction

The South Carolina Department of Natural Resources (SCDNR), at the request of Beaufort County, is herein proposing a hydrologic study to determine a water budget for the headwaters of the May River Watershed. The purpose of the study is to assess the potential impacts of land development on the quantity of stormwater runoff into the May River and to aid in making informed decisions regarding stormwater-management practices.

In recent years, elevated fecal coliform counts in the May River have resulted in the closure of shellfish beds in the headwaters. One theory for the high counts is that the volume of freshwater entering the river has increased owing to increased runoff from new housing developments that have been built in the watershed. To address this issue, SCDNR proposes a network of surface- and ground-water monitoring stations strategically located within the watershed that will quantify precipitation, runoff, and changes in ground-water and pond storage. Potential evapotranspiration will also be estimated by using a temperature-based approach such as Thornthwaite (1948) or Hamon (1963). Information collected from the monitoring network will be the basis for developing a water budget for the study area.

A water budget is an accounting of the rates of water movement and the change in water storage in the atmosphere, on the land surface, and in the subsurface within a given watershed and is generally expressed as:

$$Q_{in} - Q_{out} = \Delta S,$$

where Q_{in} is the volume of water coming into the system (watershed) per unit of time, Q_{out} is the volume of water leaving the system per unit of time, and ΔS is the change in the volume of water in storage per unit of time.

Water enters the headwaters of the May River mainly in the form of precipitation. Other inputs include water that is imported into the watershed from a public-supply system for residential irrigation and water that is pumped from the Middle Floridan aquifer (500 feet deep) for golf course irrigation. Precipitation falling in the study area either runs over the land surface, infiltrates into the ground, or is evaporated. Most of the water that runs over the surface is discharged into the numerous detention ponds that were designed specifically to capture stormwater runoff. Some of the surface runoff also discharges

directly into Rose Dhu and Stoney Creeks, which are two of the major drainage features in the watershed. Once in the detention ponds the water evaporates, seeps into the surrounding subsurface, or is discharged to Rose Dhu and Stoney Creeks. Of the rainwater that infiltrates the ground, some discharges to the detention ponds or to local drainage creeks, some recharges the shallow water-table aquifer, and some is evaporated to the atmosphere either directly or via plants by transpiration.

Objectives

SCDNR's primary objective in the study is to assess the impacts of land development on the quantity of stormwater runoff into the May River. SCDNR strongly recommends that the town of Bluffton, Beaufort County, DHEC, or the USGS (or some combination thereof) be responsible for the water quality component of the study. Water quality parameters such as fecal coliform levels and salinity should be measured on a continuous basis at SCDNR's flow monitoring sites and at other appropriate locations. Results from both the water quantity and water quality studies will be used to help answer concerns and questions regarding stormwater management and water quality issues in the May River Watershed.

SCDNR's specific objectives of this study are to: 1) quantify the amount of precipitation falling in the watershed (P), 2) quantify the amount of water imported into the watershed for irrigation purposes for both residences and golf courses (Q_{ir}), 3) quantify the amount of water discharging into the May River as surface-water runoff (RO), 4) quantify the change in storage of the shallow water-table aquifer (ΔS_{wt}), 5) quantify the change in storage of the stormwater ponds (ΔS_{rp}), and 6) estimate the amount of water lost to the atmosphere by evapotranspiration (ET). The general water budget described above can be expressed in more detail for this study as:

$$(P + Q_{ir}) - (RO + ET) = \Delta S_{wt} + \Delta S_{rp}.$$

Water budgets will be computed on a monthly, seasonal, and annual basis. Water budgets will also be calculated for single storm events.

Methodology

The study area includes the headwaters of the May River Watershed (Fig. 1). Automatic flow recorders will measure discharge at seven locations to account for surface-water runoff into the May River. Three of the discharge sites will be located in the Rose Dhu sub-drainage basin. One of these will be located at the outfall of the 26-acre detention pond where surface-water runoff is discharged into Rose

Dhu Creek (Figure 2a). A second recorder will be located where surface-water runoff discharges into Rose Dhu Creek from detention ponds that predominantly capture runoff from the western side of the

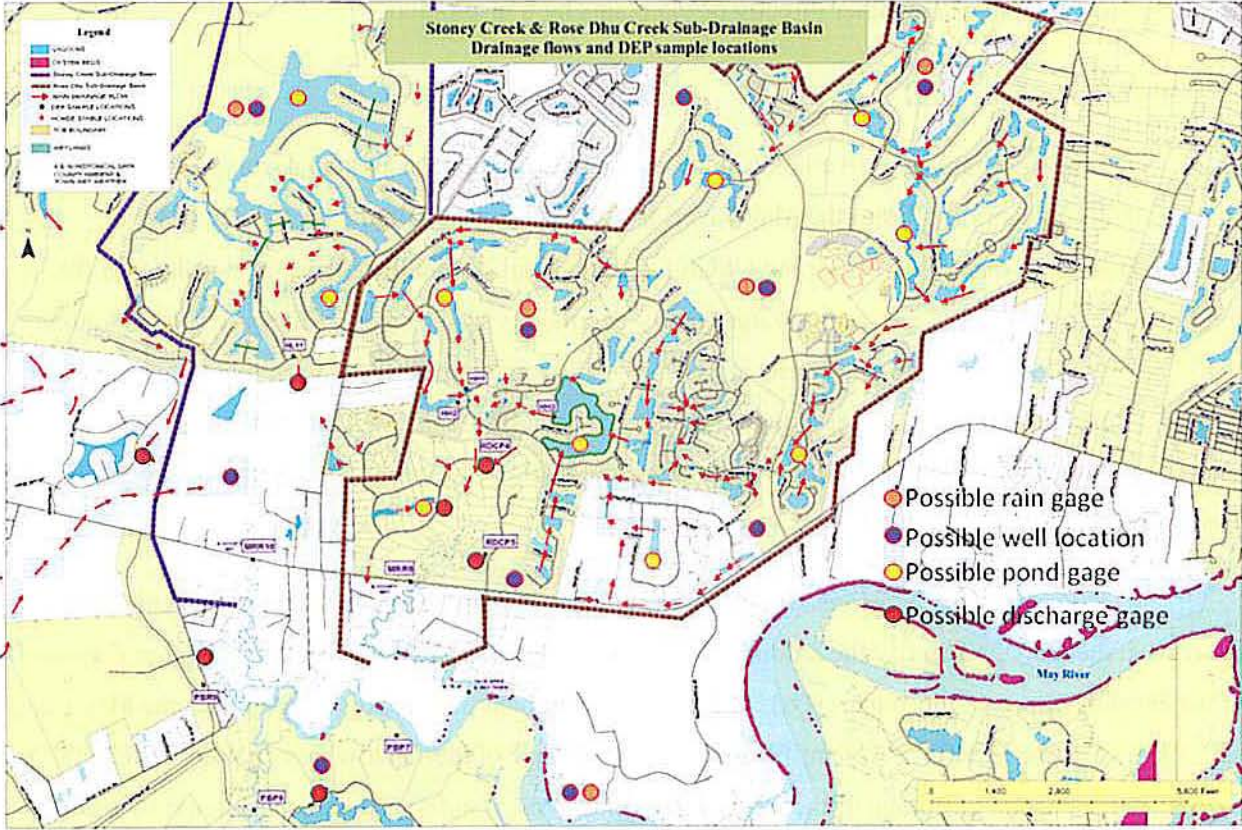


Figure 1. Study area and approximate locations of monitoring gages.



Figure 2. Potential sites where flow recorders will be installed in the Rose Dhu subbasin. The picture on the left is near the large 26-acre detention pond, and the picture on the right is near the horse farm at the south end of the basin.

basin; and a third recorder will be located near the horse farm at the south end of the basin where a portion of the surface-water runoff is regulated and routed through a small culvert that discharges into Rose Dhu Creek (Figure 2b). Other likely discharge sites will be in the Stoney Creek subbasin, where surface-water runoff is captured by a network of detention ponds and discharged into Stoney Creek, and at spillways of dams that impound freshwater ponds.

The flow devices that will be used in the project operate by using the ultrasonic Doppler principle to measure the velocity of particles and air bubbles in flowing water and can be programmed to compute discharges through various flow-control structures. These recorders will be installed in the appropriate pipes and culverts at the study site to measure storm runoff. Flumes or weirs may have to be constructed at some of these sites to channel flow and improve the accuracy of our measurements. Recorders will be programmed to measure discharge over short time intervals.

Precipitation will be measured at five sites in the watershed. Exact locations have not been determined but, in general, they will be distributed throughout the watershed in areas that are accessible, secure, and unobstructed. Tipping-bucket rain gages will each be coupled to a data logger that will record the date and time-stamp for each bucket tip. This will allow for rainfall volumes to be computed on temporal scales ranging from minutes to days, as well as provide measurements of rainfall intensity. One to two manual gages will also be installed for quality-control purposes. A temperature sensor will be installed at one or two of the sites for use in calculation of potential evapotranspiration.

Ten surface-water level loggers will be installed at selected stormwater detention ponds to monitor surface-water elevations and changes in surface-water storage. Each logger will be placed in a stilling well or similar structure located in each pond. Sensors will be of the pressure-transducer variety, which measure the water-column height above the pressure sensor. Water-column height above the sensor will be converted to water-level elevation referenced to a standard datum (NAVD88). Loggers will be able to record water levels on a continuous basis. Staff gages may also have to be installed in several ponds to measure pond elevations manually if it is determined that additional data are needed.

Ground-water level loggers will be installed in 10 monitoring wells that will be drilled at locations across the study area. These wells will be used to monitor water-table fluctuations and changes in ground-water storage in the shallow aquifer. Sensors will be of the pressure transducer variety to

measure the water-column height above the pressure sensor. Water-column height above the sensor will be converted to water-level elevation referenced to a standard datum (NAVD88). Loggers will be able to record water levels over short time intervals.

Monitoring wells will be constructed of 2-in diameter PVC pipe coupled to a 1-ft long section of slotted PVC well screen. Sediment/soil samples will be collected during the drilling and described in terms of lithology, mineralogy, grain size, sorting, and color. Wells will be gravel-packed around the well screen, grouted to land surface with bentonite, and purged with a hand bailer to ensure that they are free of sediment. Well casings will extend about 3 feet above land surface and will be protected by a 4-in square steel enclosure, a sanitary well seal, and a locking hinged cap. A well-identification plate will be affixed to each outer well casing to indicate the well depth, water level, and other pertinent information. Drilling may be subcontracted to an outside drilling company or agency. It may be possible to hand-auger some of the boreholes, but this may limit our ability to reach desired depths.

Soil maps, such as shown in Figure 3, will be a major factor used in determining suitable well-location sites. One or two wells will be located within each of the four major hydrologic soil groups (HSG's). Wells will also be sited to optimize the distribution of wells across the study area, to afford accessibility, and to meet other study objectives as determined by personnel from DNR, and by personnel from Beaufort County and the town of Bluffton. Where possible, rain gages will be located near the wells to evaluate and correlate the relationship between precipitation and shallow ground-water levels.

Each monitoring gage deployed in the study will be surveyed to determine its latitude and longitude coordinates (NAD83) and its elevation (NAVD88). All of the measurements made during the course of the study will be referenced to a common datum allowing for computations of horizontal and vertical hydraulic gradients and other parameters.

Stormwater Management Modeling

We propose to develop a comprehensive stormwater-management model for the areas that drain to the headwaters of the May River. The proposed model is EPA's Storm Water Management Model (SWMM). SWMM is a dynamic rainfall-runoff simulation model used for single-event or long-term (continuous) simulation of runoff quantity from primarily urban areas. The runoff component of SWMM operates on a collection of subcatchment areas that receive precipitation and generate runoff and pollutant loads. The routing portion of SWMM transports this runoff through a system of pipes, channels, storage/treatment devices, pumps, and regulators. SWMM tracks the quantity and quality of runoff

generated within each subcatchment area as well as the flow rate, flow depth, and quality of water in each pipe and channel during a simulation period composed of multiple time steps.

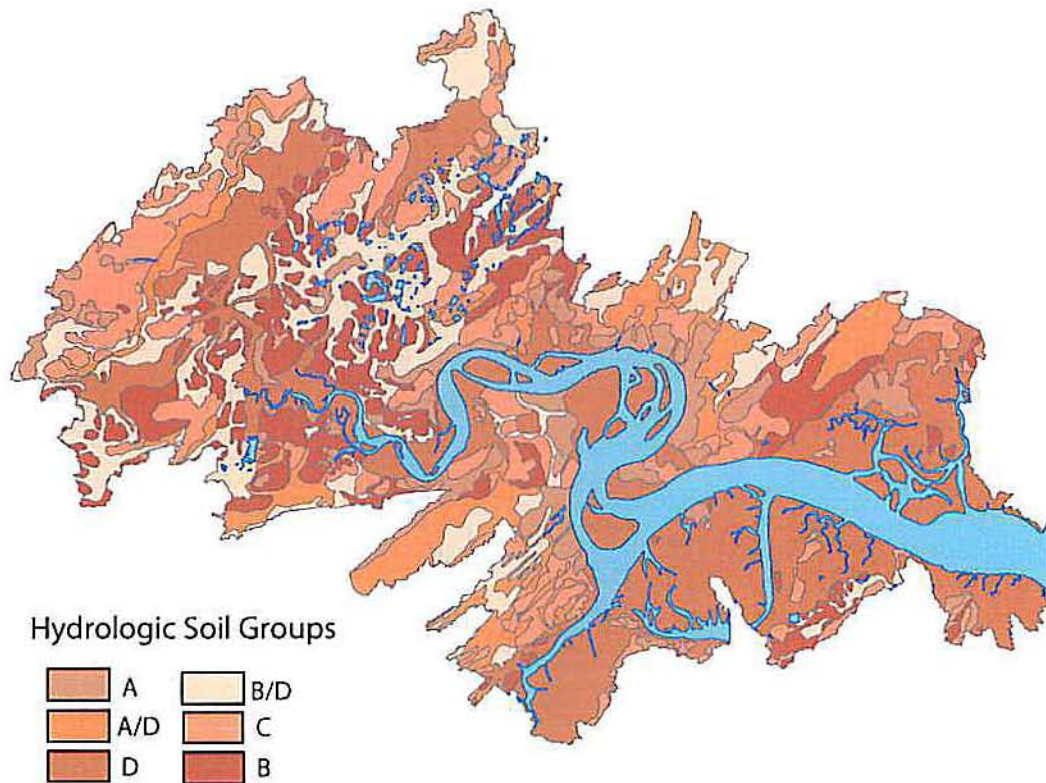


Figure 3. Hydrologic soil groups of the May River Watershed. Monitoring wells will be sited at each of the four soil groups in the study area.

The SWMM model will be calibrated for measured rainfall-runoff events. The calibrated model will be used to analyze the existing design of drainage-system components and detention facilities and to evaluate the effectiveness of existing and proposed best management practices. Along with the measured data, the model will help in understanding runoff formation and routing processes at practical scales of management. The model can be used to assess the effectiveness of stormwater ponds in controlling the volume and rate of stormwater runoff, and can also quantify the amount of stormwater entering the May River for various design storms.

Project Period

The project is scheduled to commence September 1, 2009, if an agreement has been reached by this time, and will continue for a period of one full year. Installation of the monitoring equipment and the construction of monitoring wells will probably require two months to complete. Upon completion of the

installation and well construction, data will be collected continuously until August 31, 2010. A six-month progress report and a final report will be provided to the County.

References

Hamon, W.R., 1963, Computation of direct runoff amounts from storm rainfall: International Association of Scientific Hydrology Publication, v. 63, p. 52-62.

Thornthwaite, C.W., 1948, An approach toward a rational classification of climate: The Geographical Review, 38(1), p. 55-94.

Budget

Equipment and Materials		Quantity	Unit cost	Cost
1	Rain gages	5	\$500.00	\$2,500.00
2	Pond gages	10	\$700.00	\$7,000.00
3	Stream gages	7	\$3,500.00	\$24,500.00
4	Well gages	10	\$700.00	\$7,000.00
5	Barologgers	2	\$400.00	\$800.00
6	Data acquisition computer	1	\$1,500.00	\$1,500.00
7	Temperature sensors	2	\$500.00	\$1,000.00
8	Computer	1	\$5,500.00	\$5,500.00
9	Pond construction materials	10	\$100.00	\$1,000.00
10	Stream construcion materials	7	\$100.00	\$700.00
11	Well construction materials	10	\$120.00	\$1,200.00
12	Miscellaneous (hardware, labor, tools)	1	\$3,000.00	\$3,000.00
TOTAL				\$55,700.00
Contractual Services		Quantity	Unit cost	Cost
1	Surveying	1	\$5,000.00	\$5,000.00
2	Well construction	10	\$500.00	\$5,000.00
TOTAL				\$10,000.00
Travel		Quantity	Unit cost	Cost
1	Vehicles	1	\$6,000.00	\$6,000.00
2	Lodging	50	\$85.00	\$4,250.00
3	Meals	100	\$25.00	\$2,500.00
TOTAL				\$12,750.00
Personnel		Quantity	Unit cost	Cost
1	Technician	1	\$24,000.00	\$24,000.00
2	Indirect costs	1	\$6,228.00	\$6,228.00
3	Fringe benefit	1	\$7,200.00	\$7,200.00
TOTAL				\$37,428.00
GRAND TOTAL				\$115,878.00

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