

Chapter 11

Changes in Our Coastal Communities

-Population Growth, Development and Water Quality

11.1 Our Changing Waterfronts and Loss of Public Access

Waterfronts in North Carolina are changing. Historic landmarks for those that have been born and raised on the waterfronts are disappearing; as are fish houses and fishing fleets. These historic uses of waterfronts are being replaced with “urban waterfronts”. Many waterfronts are redeveloping into waterfronts more like Wilmington’s waterfront – the state’s only designated “urban waterfront”. Redevelopment projects on historically working waterfronts include activities such as restaurants, condominiums and mixed-use buildings. Fishing fleets are being replaced by yachts, charter boats or sport fishing boats. Property values are soaring making it a challenge for historic waterfront business to stay in operation, when selling the business and property is more profitable. Reports of median selling prices for soundside lots on Hatteras Island jumping from \$82,000 in 1998 to \$412,000 in 2005 are not uncommon. Profits like these are hard to turn down, but with these selling prices comes a change of community structure and history. Even smaller coastal communities are feeling the brunt of coastal redevelopment for residences and businesses near the water. While land closest to the ocean has seen the first wave of development, the second and third waves of development on the sound and tidal creeks are already here.

Loss of Access to Public Use of Coastal Waters

North Carolina citizens and elected officials are concerned about the loss of working waterfronts, as fewer marinas and fishing piers are available for public access. The North Carolina Marine Fisheries Commission (MFC) recently passed a resolution asking that state leaders “recognize the vital importance of public access to State estuarine and marine fisheries and waters”. A resolution was also created and signed by scientists, authors and educators to preserve “the cultural integrity and economic significance” of the commercial fishing industry in the state. These resolutions were presented to the Joint Legislative Commission on Seafood and Aquaculture for further action in 2006.

The Coastal Resources Commission (CRC) attempts to not only protect Public Trust Waters as provided for by the Coastal Area Management Act (CAMA), but also attempts to encourage public access to these waters. Recognizing the demand for residences along coastal waters and seeing the threat of loss of public access to these waters, the CRC at its March 2006 meeting requested that a resolution be sent supporting the Joint Legislative Commission on Seafood and Aquaculture efforts to identify ways to ensure public access to coastal waters is preserved. The resolution calls for the creation of a Waterfront Access Study Committee to support efforts to preserve the cultural integrity and character of eastern North Carolina.

The Waterfront Access Study Committee was to study the degree of loss and potential loss of the diversity of uses along the North Carolina coastal shoreline, and how these losses impact access to the public trust waters of the state. The Committee asks for the cooperation of municipalities, public agencies, resource and facility-development granting entities, coastal developers, businesses, and other coastal resource users to recognize and integrate enhanced waterfront-use diversity and increased public access as beneficial factors and/or criteria in their decision making. The Committee supports the use of limited public funds to achieve enhanced water

quality, protection of natural and cultural/maritime heritage sites and resources, and maintaining or advancing waterfront-use diversity and public access. A final committee report is available online at: www.ncseagrant.org/waterfronts.

11.2 Population Growth and Development

North Carolina's coastal counties are some of the fastest growing areas in the state and the associated development is impacting water quality. Three of the ten counties in the basin are expected to experience growth rates in excess of thirty-five percent by 2020 (Table 25). As the counties in the Pasquotank River basin continue to grow there will likely be a loss of natural areas and an increase in the amount of impervious surface associated with new homes and businesses. Impacts are quickly felt with population increases resulting in an increase in runoff from roads and new developments, increase in wastewater treatment options, a change in the shoreline fronts from fish houses to condominiums, reduced public access to waterfronts, beach closures and a decline in our freshwater, estuarine and marine resources. Between 2003-2006, DEH Recreational Water Quality Monitoring Program in the Pasquotank Basin reported 1,259 postings of beach closure days.

County population data present projected county growth estimates based on Office of State Planning information (June and September 2004) (Table 25). Counties with the highest expected growth are associated with the largest municipal areas and the most densely populated subbasins in the basin.

Table 25 County Population and Growth Estimates

County	Percent of County in Basin [♦]	County Population 1990	County Population 2000	Estimated % Growth 1990-2000	Estimated Population 2020	Estimated % Growth 2000-2020
Camden	100	5,904	6,885	14.2	13,038	47.2
Chowan	33	13,506	14,150	4.6	15,154	6.6
Currituck	100	13,736	18,190	24.5	33,557	45.8
Dare	89	22,746	29,967	24.1	46,455	35.5
Gates	20	9305	10516	11.5	12962	18.9
Hyde	9	5,411	5,826	7.1	5,528	-5.4
Pasquotank	100	31,298	34,897	10.3	41,567	16.0
Perquimans	100	10,447	11,366	8.1	13,831	17.8
Tyrrell	100	3,856	4,149	7.1	4,492	7.6
Washington	68	13,997	13,723	-2.0	12,529	-9.5
Subtotals		130,206	149,669	109.5	199,113	180.6

♦ Source: North Carolina Center for Geographic Information and Analysis (CGIA), 1997.

Note: The numbers reported reflect county population; however, these counties may not entirely be within the basin. The intent is to demonstrate growth for counties located wholly or partially within the basin.

Urban growth poses one of the greatest threats to aquatic resources more than any other human activity. Greater numbers of homes, stores, and businesses require greater quantities of water. Growing populations not only require more water, but they also lead to the discharge and runoff of greater quantities of waste and pollutants into the state's streams and groundwater. Thus, just as demand and use increases, some of the potential water supply is lost (Orr and Stuart, 2000). The Pasquotank River basin municipal population and growth trends are reported in Table 26. Population fluctuations occur in developing coastal communities as seasonal changes bring time-

share and rental property residents creating an increased demand on municipality resources and natural resources. County, city and town planners need to account for these fluctuations and recognize that temporary residents may have less incentive to invest in sustainable community development efforts. Table 26 below presents population data from Office of State Planning for municipalities located wholly or partly within the basin. Data presented by municipality summarize information on past growth of urban areas in the basin.

Table 26 Municipal Population and Growth Trends

Municipality	County	April 1980	April 1990	April 2000	Percent Change (1980-1990)	Percent Change (1990-2000)
Columbia	Tyrell	758	836	819	10.3	-2.0
Creswell	Washington	426	361	278	-15.3	-23.0
Elizabeth City	Camden, Pasquotank	14,007	14,292	17,188	2.0	20.3
Hertford	Perquimans	1,941	2,244	2,070	15.6	-7.8
Kill Devil Hills	Dare	1,671	4,238	5,897	153.6	39.1
Kitty Hawk	Dare	849	1,937	2,991	128.2	54.4
Manteo	Dare	902	991	1,052	9.9	6.2
Nags Head	Dare	1,020	1,838	2,700	80.2	46.9
Roper	Washington	795	669	613	-15.8	-8.4
Southern Shores	Dare	520	1,447	2,201	178.3	52.1
Winfall	Perquimans	634	501	554	-21.0	10.6

As development in urbanizing areas consumes neighboring forests and fields, the impacts on rivers, lakes, and streams can be significant and permanent if stormwater runoff is not controlled (Orr and Stuart, 2000). As watershed vegetation is replaced with impervious surfaces in the form of paved roads, buildings, parking lots, and residential homes and driveways, the ability of the environment to absorb and diffuse the effects of natural rainfall is diminished. Urbanization results in increased surface runoff and correspondingly earlier and higher peak streamflows after rainfall. Flooding frequency also increases. These effects are compounded when small streams are channelized (straightened) or piped, and storm sewer systems are installed to increase transport of stormwater downstream. Bank scour from these frequent high flow events tends to enlarge urban streams and increase suspended sediment. Scouring also destroys the variety of habitat in streams, leading to degradation of benthic macroinvertebrate populations and loss of fisheries (EPA, 1999).

11.3 Changes in Land Cover

Land cover can be an important way to evaluate the effects of land use changes on water quality. Unfortunately, the tools and database to do this on a watershed scale are not yet available. Land cover information from the National Resources Inventory (NRI) published by the Natural Resource Conservation Service (NRCS) is presented only at an 8-digit hydrologic unit scale. This information is presented to provide a picture of the different land covers and developing land use trends in the Pasquotank River Basin, while noting that the data is outdated and does not reflect recent development along North Carolina's waterways.

Land cover information in this section is from the most current NRI, as developed by the NRCS (USDA-NRCS, June 2001). The NRI is a statistically based longitudinal survey that has been designed and implemented to assess conditions and trends of soil, water and related resources on

the Nation's nonfederal rural lands. The NRI provides results that are nationally and temporally consistent for four points in time -- 1982, 1987, 1992 and 1997. The USDA is working to provide updates to land cover data in the near future.

In general, NRI protocols and definitions remain fixed for each inventory year. However, part of the inventory process is that the previously recorded data are carefully reviewed as determinations are made for the new inventory year. For those cases where a protocol or definition needs to be modified, all historical data must be edited and reviewed on a point-by-point basis to make sure that data for all years are consistent and properly calibrated. The following excerpt from the *Summary Report: 1997 National Resources Inventory* provides guidance for use and interpretation of current NRI data:

The 1997 NRI database has been designed for use in detecting significant changes in resource conditions relative to the years 1982, 1987, 1992 and 1997. All comparisons for two points in time should be made using the new 1997 NRI database. Comparisons made using data previously published for the 1982, 1987 or 1992 NRI may provide erroneous results because of changes in statistical estimation protocols, and because all data collected prior to 1997 were simultaneously reviewed (edited) as 1997 NRI data were collected.

The following Table 27 summarizes acreage and percentage of land cover from the 1997 NRI for the major watersheds within the basin, as defined by the USGS 8-digit hydrologic units, and compares the coverages to 1982 land cover.

Table 27 Land Cover in the Pasquotank River Basin: 1982 vs. 1997

MAJOR WATERSHEED AREAS*							
Land Cover	Albemarle Sound Watershed		1997 TOTALS		1982 TOTALS		% Change Since 1982
	Acres (1000s)	% of TOTAL	Acres (1000s)	% of TOTAL	Acres (1000s)	% of TOTAL	
Cultivated. Crop	437.1	21.3	437.1	21.3	493.2	24.0	-11.4
Uncultivated. Crop	0.1	0.0	0.1	0.0	0	0.0	10.0
Pasture	6.7	0.3	6.7	0.3	3.9	0.2	71.8
Forest	491.7	23.9	491.7	23.9	668.7	32.5	-26.5
Urban & Built-Up	68.7	3.3	68.7	3.3	36.9	1.8	86.2
Federal	271.8	13.2	271.8	13.2	69.1	3.4	293.3
Other	779.5	37.9	779.5	37.9	783.8	38.1	-0.5
Totals	2055.6	100	2055.6	100	2055.6	100.0	
% of Total Basin		100		100			
SUBBASINS	03-01-50 to 03-01-54						
8 – Digit Hydraulic Units	03010205						

* = Watershed areas defined by the 8-Digit Hydraulic Units do not necessarily coincide with subbasin titles used by DWQ.
Source: USDA, Soil Conservation Service – 1982 and 1997 NRI.

11.4 Managing Growth, Development and Stormwater Runoff

11.4.1 Assessment of Current Conditions

The DWQ, in its goals to assure that all waters of the state meet or exceed their designated uses began an assessment of the adequacy of the current North Carolina rules intended to protect shellfish waters. DWQ further intended to determine if there was a way to enhance the level of

protection provided to these waters if the current rules were deemed to be inadequately protecting this vital resource in North Carolina. Critical to this review was an assessment of the adequacy of North Carolina's stormwater rules.

North Carolina's current stormwater regulatory programs for coastal areas were adopted in the late 1980's as three primary coastal programs, the Coastal (State) Stormwater Program, Shellfishing (Class SA) Waters Program, and the Outstanding Resource Waters (ORW) Program. Each of these programs require engineered stormwater control structures for high density areas, but no engineered stormwater controls were required for low density projects. High density is defined as more than 24 percent built-upon area or more than two dwelling units per acre. Recent reviews of scientific literature show that stream degradation and impairment occurs to varying degrees when 10-15 percent impervious cover is established without structural stormwater controls result in water quality degradation.

In North Carolina, over 1,255 acres of Class SA, ORW waters have been closed to commercial shellfishing due to elevated levels of bacteria since 1990. The Division of Environmental Health Shellfish Sanitation Program notes that stormwater runoff is the primary cause of bacterial contamination in more than 90 percent of the shellfish areas sampled. In light of the increased acreage of areas closed to shellfish harvesting, DWQ embarked on a study of the current conditions and impacts to the state's shellfish waters. DWQ found that between 1988 and 2005, 73 percent of new impervious surfaces in coastal areas were constructed under low density provisions (<24 percent impervious surfaces) that do not require engineered stormwater control measures, but instead rely on practices such as swales for water quality protection. The use of swales for low density areas indicate only a 25 percent effectiveness rate in reducing bacterial contaminants and may actually contribute to bacterial loading by providing a conduit to increase runoff volumes and rates. In contrast, engineered stormwater control structures for high density areas include wet ponds and wetlands with 70 and 78 percent bacteriological removal rates respectively.

Stormwater runoff carries sediment particles from drainage ditches, streambanks, parking lots, and construction sites. These sediments bind to other pollutants such as bacteria and viruses. Binding to soil particles protects the bacteria from ultraviolet rays that can kill the organisms. Bacteria coated sediment accumulates in coastal shallow water bottoms, which can be easily agitated, allowing the sediments to go in and out of suspension. Under favorable conditions, fecal coliform bacteria can survive in bottom sediments for an extended period (Howell et al., 1996; Sherer et al., 1992; Schillinger and Gannon, 1985). Therefore, concentrations of bacteria measured in the water column can reflect both recent inputs as well as the resuspension of older inputs. In addition to the bacteria and pollutants, the sediment itself threatens the oyster beds by smothering them.

DWQ assessed recent data and information on acres of shellfish closures in six tidal creeks in New Hanover County in the Neuse River basin (Mallin, 2006). This research focused on a county whose population grew 25 percent between 1990 and 2000, and is expected to increase an additional 31 percent by 2020. This research found a strong correlation between bacteria levels and impervious surfaces in the watershed; the greater the amount of impervious surfaces, the greater the bacteria levels. This correlation has also been documented by other research in South Carolina's coastal tidal creeks (Holland et al., 2004). In addition, there is a strong association between turbidity and fecal coliform bacteria levels in these estuarine waters.

Sewer overflows and poorly designed and maintained septic systems contribute to bacteria problems. The research further notes that areas in South Florida have found that septic tanks in porous soils can readily pass through the soil and can enter coastal waters near the shore within hours (Paul et al., 2000). Sandy soils and high water tables appear to be unsuitable for septic systems, yet these systems are relied on heavily in eastern North Carolina for waste management. Ditching and draining appear to facilitate the flow of septic waste to surface waters. Further noted is that some areas have demonstrated that fecal bacteria counts are higher upon outgoing tides and in wetter years due to subsurface movement through saturated soils and increased runoff due to rain.

DWQ's assessment of research results show that the acreages of shellfish waters closed (approximately 4, 446 acres) to shellfishing has increased significantly between 1988 and 2005, and there have been new closures after the implementation of the current stormwater programs. North Carolina waters permanently closed to shellfishing have increased by approximately 19 percent since 1984. The reliance on no engineered stormwater controls for low density projects is the major identifiable shortfall in the current programs. Without changes to these programs, there will be continued degradation of shellfishing waters.

11.4.2 Assessment of Future Conditions

With this knowledge, DWQ will proceed to determine how shellfishing waters can be better protected from stormwater runoff and its associated spectrum of pollutants. It will be critical to adopt programs that require control structures to be used for more development activities in an effort to better control and treat stormwater runoff. To this effect, DWQ will be assessing options for lowering or removing the low density option waiver from engineered stormwater controls. Two new programs may provide these options.

The Phase II stormwater rule is one of these options. These rules meet the federal Phase II requirements and are contained in Session Law 2006-246. These new rules will commence in July 2007 and are in part intended to redefine low density to 12 percent and areas within ½ mile of "shellfish resource waters". In addition, there are more stringent stormwater design controls defined for high density projects.

The second option is the Universal Stormwater Management Program (USMP) developed by DWQ. This is a voluntary program that may be adopted by local government discretion. It is hoped that the USMP will become effective in early 2007. This program does not allow for a low density waiver.

The goal of these and other stormwater control programs and mechanisms is to point to the fact that new construction activities do not have to degrade water resources if controls and treatment of stormwater are put into place.

Planning for sustainable growth in the Pasquotank Basin requires awareness, understanding and implementation of sound design and management options. The coastal environment and natural resources contribute to our quality of life while supporting and promoting economic growth. Communities should anticipate growth while incorporating Low Impact Development technologies in their planning to promote long-term sustainability of our natural resources. The NC Division of Coastal Management with NC Sea Grant and NCSU College of Design developed *The Soundfront Series*, informational guides to assist property owners and community planners and managers. The guides are available in print and on the web. <http://www.ncseagrant.org/>.