


Roanoke River Basin - Executive Summary



Basinwide water quality planning is a watershed-based approach to restoring and protecting the quality of North Carolina's surface waters. Basinwide water quality plans are prepared by the North Carolina Division of Water Quality (DWQ) for each of the 17 major river basins in the state. Each basinwide plan is revised at five-year intervals. While these plans are prepared by DWQ, their implementation and the protection of water quality entail the coordinated efforts of many agencies, local governments and stakeholders throughout the state.

The goals of basinwide planning are to:

- identify water quality problems and restore full use to Impaired waters,
- identify and protect high value resource waters, and
- protect unimpaired waters while allowing for reasonable economic development.

DWQ accomplishes these goals through the following objectives:

- collaborate with regional and local agencies to develop appropriate management strategies (This includes providing agencies information related to financial and funding opportunities.),
- assure equitable distribution of waste assimilative capacity,
- evaluate cumulative effects of pollution,
- improve public awareness and involvement, and
- regulate point and nonpoint sources of pollution where other approaches are not successful.

This document is the third five-year update of the Roanoke River Basinwide Water Quality Plan. The first basinwide plan for the Roanoke River basin was completed in 1996 and the second in 2001. The format of this third plan was revised in response to comments received during the first and second planning cycles. DWQ replaced much of the general information in the first two plans with more detailed information specific to the Roanoke River basin. For this plan, a greater emphasis is placed on watershed level information in order to facilitate protection and restoration efforts.

DWQ considered comments from local resource agency staff and citizens during draft plan development. This input will help guide continuing water quality management activities in the basin over the next five years.

Basin Overview

The Roanoke River begins in the Blue Ridge Mountains of northwestern Virginia and flows in a generally southeastern direction for 400 miles before emptying into the Albemarle Sound in eastern North Carolina (Figure i). By the time it reaches the fall line near Roanoke Rapids, it has captured water from nearly 8,000 square miles of land. From Roanoke Rapids to the coast, the river drains another 2,000 square miles, carrying more water than any other river in North

Carolina. The North Carolina portion of the basin (roughly 36 percent of the entire watershed) is composed of two major drainages: the Dan River and its tributaries in the western section; and the Roanoke River from Virginia to the Albemarle Sound in the eastern section (Figure ii and iii). The Roanoke River enters North Carolina through John H. Kerr Reservoir and then flows into Lake Gaston and Roanoke Rapids Lake before regaining its riverine form.

The upper Dan River is classified as trout waters and part of the area is also designated a State Water Trail by the NC Division of Parks and Recreation. The lower portion of the basin also includes large tracts of bottomland hardwood forests owned by the NC Wildlife Resources Commission, the US Fish and Wildlife Services, and The Nature Conservancy. The NC Wildlife Resources Commission has designated a portion of the river as an Inland Primary Nursery Area due to its great importance as spawning habitat for anadromous fish and world-class recreational fisheries for striped bass and hickory shad. Anadromous fish spawned in the Roanoke River migrate into the Atlantic Ocean, so the importance of the Roanoke River as a spawning and nursery area for these fish has wide reaching implications. This area is also an important habitat for black bear, bobcat, large populations of wild turkey, 14 species of waterfowl, as well as an additional 220 bird species.

There are 11 major reservoirs in the North Carolina portion of the basin. Most of them are located in the upper portion of the basin on tributaries of the Dan and Roanoke Rivers (notably Belews Lake, Hyco Lake and Mayo Reservoir). Three reservoirs, Kerr, Gaston and Roanoke Rapids, are impoundments of the Roanoke River mainstem. They are managed by Dominion and the US Army Corps of Engineers for electrical energy production and flood control. Flow from these reservoirs directly influences the quality of water in the lower Roanoke River.

Information presented in this basinwide water quality plan is based on data collected from September 1999 to August 2004. Maps of each subbasin are included in each of the subbasin chapters. Each subbasin has its own characteristics and water quality concerns. These are discussed in Chapters 1 through 10.

DWQ identifies the stressors of water quality impact as specifically as possible depending on the amount of information available in a watershed. Most often, the source of the stressor is based on the predominant land use in a watershed. In the Roanoke River basin, new development/construction activities, land clearing, agriculture, municipal and industrial point source and impoundments were all identified as possible stressors. These are discussed in detail in Chapter 13. Water quality decline can often be attributed to a combination of many stressors that lead to habitat and water quality degradation. In some way, every person, industry, landowner and municipality in the basin impacts water quality. Therefore, every resident of the basin should play a role in management strategies designed to protect and restore the streams, lakes and rivers of the basin.

Population Growth and Changes in Land Use

The Roanoke River basin encompasses all or portions of 15 counties and 42 municipalities. In 2000, the overall population in the basin (based on the percent of the county land area in the basin) was 344,638. The most populated areas are located north of the Winston-Salem/Greensboro area and around the larger municipalities in the basin, such as Roanoke Rapids, Eden, Williamston and Plymouth.

Population in Forsyth, Granville, Persons and Stokes counties is projected to increase 20-30 percent from 2000 to 2020. Between 1990 and 2000, the fastest growing county was Granville, which had an increase of 20.9 percent and is expected to grow by another 29.3 percent by 2020 for an estimated total population of 68,600 people. Population growth trends and the accompanying impacts to water quality are discussed in Chapters 12 and 13.

Expanding populations are typically characterized by a loss of natural areas and an increase in impervious surfaces. Based on the most current land cover information provided by the National Resources Inventory (USDA-NRCS, 2001), there was a 136 percent increase in Urban and Built-up areas adding 74,700 acres to this land cover category in the Roanoke River basin from 1982

to 1997. Uncultivated cropland also increased by 22,200 acres (89.5 percent), while cultivated croplands decreased by 97,000 acres (20.4 percent). Forest and pastureland cover significantly decreased by 7,000 (0.5 percent) and 24,000 (21.5 percent) acres, respectively. Most land cover change is accounted for in the lower Roanoke River. Land cover tables and statistics are included in Appendix III.

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. The impacts on rivers, lakes and streams can be significant and permanent if stormwater runoff is not controlled. Just as demand and use increases, some of the potential water supply is also lost (Orr and Stuart, 2000).

Roanoke River Basin Statistics (North Carolina Portion)

Total Area: 3,503 sq. miles
Freshwater Stream Miles: 2,213
No. of Counties: 15
No. of Municipalities: 42
No. of Subbasins: 10
Population (2000): 344,638
Pop. Density (2000): 98
persons/sq. mile*

Water Quality Statistics

Aquatic Life

Monitored Streams: 37.8%
Supporting: 30.0%
Impaired: 5.7%
Not Rated: 4.2%

Recreation

Monitored Streams: 10.5%
Supporting: 8.1%
Impaired: 2.0%
Not Rated: 4.3%

Identified Water Quality Stressors

Habitat Degradation: 223 miles
Fecal Coliform Bacteria: 87.4 miles
Low Dissolved Oxygen: 70.4 miles
Turbidity: 58.6 miles
Toxic Impacts: 25.5 miles

* Estimated based on % of county land area that is partially or entirely within the basin, not the entire county population.

Water Quality Standards and Classifications

All surface waters in the state are assigned a *primary* classification that is appropriate to the best uses of that water. In addition to primary classifications, surface waters may be assigned a *supplemental* classification. Each primary and supplemental classification is assigned a set of water quality *standards* that establish the level of water quality that must be maintained in the waterbody to support the uses associated with each classification. The Primary classifications and best uses in the Roanoke River basin are; Class C, aquatic life propagation/protection and secondary recreation; Class B, primary recreation and all Class C uses; and WS I-V, water supply (the classification is based on specific land use characteristics). Chapter 11 further describes the water quality standards and classifications and includes a

map showing the designated Water Supply (WS) watersheds, and the supplemental classifications of High Quality Waters (HQW) and Outstanding Resource Waters (ORW) (Figure 16).

HQW and ORW are supplemental classifications to the primary freshwater classification placed on a waterbody. Special management strategies are often associated with the supplemental HQW and ORW classification and are intended to prevent degradation of water quality below present levels from point and nonpoint sources of pollution. Two creeks in subbasin 03-02-01 (Archies Creek and Peters Creek) received an excellent aquatic life use support rating which make them eligible for reclassification to HQW or ORW. In the Roanoke River basin, there are currently only two small segments making up a total of 1.6 stream miles in subbasin 03-02-01 that are classified as ORW.

Use Support Summary

Use support assessments based on surface water classifications form the foundation of this basinwide plan. Surface waters are classified according to their best-intended use. Determining how well a waterbody supports its use (*use support* rating) is an important method of interpreting water quality data and assessing water quality.

Use support methods were developed to assess ecosystem health and human health risk through the development of use support ratings for five categories: aquatic life; fish consumption; recreation; shellfish harvesting; and water supply. These categories are tied to the uses associated with the primary classifications applied to North Carolina rivers, streams and lakes discussed in the previous section. There are no shellfish harvesting waters located in the Roanoke River basin.

Biological, chemical and physical monitoring data collected between September 1999 and August 2004 were used to assign use support ratings in the Roanoke River basin. A total of 832.4 stream miles for aquatic life, 230.6 stream miles for recreation and 49.4 stream miles for fish consumption were monitored within the Roanoke River basin. Of these, 124, 43 and 49 stream miles were impaired respectively. Table *i* presents the totals of all the streams, lakes and sound monitored and gives a summary of those Impaired and Supporting. Table *ii* lists all of the monitored Impaired waters in the Roanoke River basin. Use support summary tables, which also identify potential stressors and their sources as well as maps showing the current ratings, are presented in each subbasin chapter (Chapters 1-10). Current status and recommendations for restoration of water quality for each Impaired segment is also discussed in each subbasin chapter.

Use support methodology has changed significantly since the 2001 revision of the *Roanoke River Basinwide Water Quality Plan*. The 2002 *Integrated Water Quality Monitoring and Assessment Report Guidance* issued by the U.S. Environmental Protection Agency (EPA) requests that states no longer subdivide the Impaired category. In agreement with this guidance, North Carolina currently rates waters as Supporting (S), Impaired (I), Not Rated (NR) or No Data (ND). NR is used to identify those waters that had inconclusive data. These ratings refer to whether the classified uses of the water (e.g., water supply, aquatic life, primary/secondary recreation) are being met. Detailed information on use support methodology is provided in Appendix IX.

Water Quality Stressors

Water quality stressors are identified when impacts have been noted to biological (fish and benthic) communities or water quality standards have been violated. Whenever possible, water quality stressors are identified for Impaired waters as well as waters with notable impacts.

Stressors identified during this assessment are briefly discussed below and in more detail in Chapter 13 as well as in each subbasin chapter (Chapters 1-10).

Certain stressors are associated with specific use support categories. For example, in the recreation category, violations of the fecal coliform bacteria standard are the reason for impairment; therefore, fecal coliform bacteria is the stressor for Impaired waters in this category. In the aquatic life category, Impaired waters result from violations of one or more numerical water quality standards or because a biological community sample (fish or benthic) did not meet use support criteria. Stressors to aquatic life can be numerical water quality standards that are violated, or a host of aquatic habitat quality indicators such as excessive sediment or lack of organic habitat. The following discussion summarizes stressors identified during this assessment period and possible sources of the stressors.

Table i – Summary of Monitored Waters in the Roanoke River Basin

Use Support Category	Units	Total Monitored Waters	Total Impaired Waters		Total Supporting Waters		Total Not Rated Monitored & Evaluated	Total No Data
		Miles/ Acres	Miles/ Acres	%	Miles/ Acres	%	Miles/ Acres	Miles/ Acres
Aquatic Life	Freshwater acres (impoundments)	36,485	0	0	3162	8.4	33,323	1058
Aquatic Life	Freshwater miles (streams)	834.4	124.7	5.7	661	30	91.4	1327
Aquatic Life	Estuarine acres	0	0	0	0	0	0	1476
Recreation	Freshwater acres (impoundments)	0	0	0	0	0	0	37543
Recreation	Freshwater miles (streams)	230.6	43	2	179	8.1	96	1886
Recreation	Estuarine acres	0	0	0	0	0	0	1476
*Fish Consumption	Freshwater acres (impoundments)	0	0	0	0	0	0	37543
*Fish Consumption	Freshwater miles (streams)	49.4	49.4	2.2	0	0	0	2155
*Fish Consumption	Estuarine acres	1476	1476	100	0	0	0	0

* Fish Consumption data is for Dioxin only. All waters within the Roanoke River basin are Impaired on an evaluated basis for mercury (37,543 freshwater acres, 2,204 freshwater stream miles and 1,476 saltwater acres).

DWQ identifies the source of a stressor as specifically as possible depending on the amount of information available in a watershed. Most often the source is based on the predominant land use in a watershed. Stressor sources identified in the Roanoke River basin during this assessment period include urban or impervious surface areas, construction sites, land clearing, agriculture and water impoundments. Because land disturbance is one of the main stressor sources, there has been increased funding to the Division of Land Resources to help address these source. Point source discharges are also a water quality stressor sources in the Roanoke River basin.

Habitat Degradation

One of the most noted water quality stressors is instream habitat degradation. Instream habitat degradation is identified where there is a notable reduction in habitat diversity or a negative change in habitat. Sedimentation, streambank erosion, channelization, lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and streambed scour are all associated with habitat degradation. These stressors are typically a result of increased flow of stormwater runoff due to land use changes or to sediment runoff from land-disturbing activities. In the Roanoke River basin, 60 stream miles are Impaired and another 163 stream miles were negatively impacted where at least one form of habitat degradation is the suspected stressor. Streams with noted habitat degradation are discussed in the subbasin chapters (Chapters 1-10).

To assess instream habitat degradation requires extensive technical and monetary resources. Although DWQ and other agencies are starting to address this issue, local efforts are needed to prevent further instream habitat degradation and to restore streams that have been impacted by activities that caused habitat degradation. As discharges become less of a source of water quality impairment, nonpoint sources that pollute water and cause habitat degradation need to be addressed to further improve water quality in North Carolina's streams and rivers.

DWQ recommends the use of careful planning to maintain riparian buffers and the use of good land use management practices during all land disturbing activities to prevent habitat degradation. In addition, watersheds that are being developed need to maintain management practices for long periods to prevent excessive runoff that is the ultimate source of the habitat degradation noted above.

Low Dissolved Oxygen

Maintaining an adequate amount of dissolved oxygen (DO) is critical to the survival of aquatic life and to the general health of surface waters. A number of factors influence DO concentrations including water temperature, depth and turbulence. Additionally, in the Roanoke River basin, a large swampy floodplain drainage system and flow management from upstream impoundments also influences DO. Oxygen-consuming wastes such as decomposing organic matter and some chemicals can reduce DO levels in surface water through biological activity and chemical reactions. NPDES permits for wastewater discharges set limits on certain parameters in order to control the effects that oxygen depletion can have in receiving waters.

In the Roanoke River basin during this assessment period, there were over 20 stream miles Impaired because of dissolved oxygen (DO) standards violations. This includes a portion of the Lower Roanoke River (Chapter 9 and 13). There were also over 18 stream miles where dissolved oxygen levels were low enough to be of concern, although this area has a supplemental classification of swamp waters (Sw) where low DO levels are possibly due to natural conditions.

Turbidity

In the Roanoke River basin during this assessment period, there were 55 stream miles Impaired because of turbidity standards violations. All of the turbidity violations occurred in the western portion of the basin. Almost the entire North Carolina portion of the Dan River and the entire 5.1 stream mile portion of the Smith River are Impaired due to noted turbidity violations. In this same region of the basin, elevated turbidity levels were also seen in the Mayo River. These are discussed in detail in each of the subbasin chapters (Chapters 1-4). Only 14.2 stream miles of

the Dan River were impaired for turbidity during the last basin cycle. The turbidity violations during this assessment period were mostly associated with unknown nonpoint source pollution as well as with land clearing activities.

Fecal Coliform Bacteria

Water quality standards for fecal coliform bacteria are intended to ensure safe use of waters for recreational uses, therefore only class B waters are intensively sampled to assess the standard. In the Roanoke River basin there were 43 stream miles where the fecal coliform bacteria standard was violated, these waters are Impaired for recreation. As with turbidity, almost the entire North Carolina portion of the Dan River and the entire portion of the Smith River are Impaired due to fecal coliform bacteria violations. These are discussed in detail in each of the subbasin chapters (Chapters 1-4). These violations were mostly associated with unknown nonpoint source pollution.

Dioxin

The 36.1 mile stretch of the Roanoke River from Highway 17 bridge in Martin County to the Albemarle Sound, as well as 1,476 saltwater acres of the Albemarle Sound/Batchelor Bay are Impaired for fish consumption based on a dioxin advisory from the NC Department of Health and Human Services' (DHHS) for carp and catfish. This advisory also includes all of Welch Creek (13.3 miles) that flows into this section of the Roanoke River. This is discussed in Chapter 9.

The fish consumption Impairments are due to the NC DHHS fish consumption advisory posted in October 2001 for carp and catfish. It is advised that carp and catfish from these waters may contain low levels of dioxins. Swimming, boating, and other recreational activities present no health risks and are not affected by this advisory. For more information regarding fish consumption advisories, call (919) 707-5900 or visit the NC DHHS Division of Public Health website at <http://www.schs.state.nc.us/epi/fish/current.html>.

Mercury in Fish Tissue

The presence and accumulation of mercury in North Carolina's aquatic environment are similar to contamination observed throughout the country. Mercury has a complex life in the environment, moving from the atmosphere to soil, to surface water and into biological organisms. A dominant pathway of mercury in the environment is through the atmosphere. Mercury that has been emitted from industrial and municipal stacks into the ambient air can circulate across the globe. At any point, mercury may then be deposited onto land and water. Once in the water, mercury can accumulate in fish tissue and humans. Mercury is also commonly found in wastewater.

All waters within the Roanoke River basin are Impaired on an evaluated basis in the fish consumption category. This is based on a fish consumption advise from the NC Department of Health and Human Services. For more information on fish consumption advisories and advice, contact NC DHHS (see contact information above or see discussion in Chapter 13).

Agriculture and Water Quality

Excess nutrient loading, pesticide and/or herbicide contamination, bacterial contamination and sedimentation are often associated with agricultural activities, and all can impact water quality.

Chapter 16 provides information related to the impacts of agriculture on water quality. Impacts to water quality from agricultural sources may decrease over the next basin cycle due to substantial increases in urban/built-up areas throughout the river basin.

DWQ will identify streams where agricultural activities may be impacting water quality and aquatic habitat. This information will be related to local Division of Soil and Water Conservation (DSWC) and Natural Resources Conservation Service staff to investigate impacts in these watersheds and to reduce these impacts. The DSWC Ag Cost Share Program has spent over \$3 million on various management practices in the Roanoke River basin. DWQ recommends that funding and technical support for agricultural BMPs be continued and increased. Refer to Chapter 16 for specific BMP information and Appendix VIII for agricultural nonpoint source agency contact information.

Forestry and Water Quality

Based on land cover information provided by the North Carolina Corporate Geographic Database (CGIA) and the USDA-NRCS, 73 percent of land in the Roanoke River Basin consists of forest/wetland. Several stream miles were potentially identified as being impacted by stressors associated with forestry activities. Where forest harvesting is identified as a potential source of water quality impact, DWQ will notify the Division of Forest Resources (DFR) to investigate potential violations and the enforcement of management strategies. Chapter 17 presents more information related to the impacts of forestry on water quality.

Wastewater Treatment and Disposal

Currently, there are 77 permitted wastewater discharges in the Roanoke River basin with a permitted flow of approximately 188 MGD. Chapter 14 provides summary information (by type and subbasin) about the discharges. This chapter also provides guidance for permitting in various watersheds that may be water quality limited and also contains general information related to wastewater treatment disposal associated with registered animal operations. Maps of permitted facilities are provided in each subbasin chapter. For a complete listing of permitted facilities in the basin, refer to Appendix VI. The majority of NPDES permitted wastewater discharges into the waters of the Roanoke River basin are from major municipal wastewater treatment plants. Nonmunicipal discharges also contribute substantial wastewater into the Roanoke River basin.

There are 155 stream miles noted throughout this plan where point sources may have negatively impacted the water quality. Facilities, large or small, where recent data show problems with a discharge are discussed in each subbasin chapter. DWQ will determine if any violations are ongoing and address them using the NPDES permitting process. Many watersheds are adversely impacted by the cumulative effects of discharges and nonpoint source runoff.

Impacts from Stormwater Runoff

Stormwater runoff is rainfall or snowmelt that runs off the ground or impervious surface (e.g., buildings, roads, parking lots, etc.) instead of absorbing into the soil. In some cases, stormwater runoff drains directly into streams, rivers, lakes and oceans. In other cases, particularly urbanized areas, stormwater drains into streets and manmade drainage systems consisting of inlets and underground pipes, commonly referred to as a storm sewer system. Stormwater runoff is a primary carrier of nonpoint source pollution in both urbanized and rural areas. The impact of

stormwater runoff is particularly severe in developing areas where recently graded lands are highly susceptible to erosion. Water quality impacts are also evident in urbanized areas where stormwater runoff is increased by impervious surfaces and is rapidly channeled through ditches or curb and gutter systems into nearby streams. For more information on stormwater as it relates to growth and development, refer to Chapter 12.

There are many different stormwater programs administered by DWQ. One or more of these programs affect many communities in the Roanoke River basin. The goal of the DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. These programs try to accomplish this goal by controlling the source(s) of pollutants. These programs include NPDES Phase I and II, coastal county stormwater requirements, HQW/ORW stormwater requirements, and requirements associated with the Water Supply Watershed Program. Chapter 14 includes more information on the statewide stormwater programs and a list of Local governments that are or may be affected by these programs.

Water Resources

Chapter 18 presents information related to minimum streamflow requirements, interbasin transfers, water quality during drought conditions, and source water protection. The chapter also includes the federal cataloging units (commonly referred to as hydrologic units) as they relate to the state subbasin boundaries.

Significant Ecological Resources and Endangered Species

The Roanoke River basin is ecologically significant and diverse in numerous ways, and contains habitat for over 140 rare plant and animal species. The character of the basin as it enters North Carolina, contains some natural communities often associated with mountains. The Roanoke then flows about 100 miles through the Piedmont and the Coastal Plain. The Piedmont provides habitat for a number of rare fish and mussels, as well as small-anthered bittercress (*Cardamine micranthera*), a species only known to Stokes County and adjacent Hentry County, Virginia. This endemic plant requires small or intermittent streams and seepage areas, and is found in the wet soil and rocks along small stream banks in hardwood forest with intact forest cover. This species was presumed extinct, however it was rediscovered in 1985, nearly 30 years after it had last been seen. The Coastal Plain section of the Roanoke River contains high-quality examples of wetland communities such as Coastal Plain Bottomland Hardwoods and Cypress-Gum Swamps. Some of these natural communities are extensive, and the large blocks of habitat are excellent for wildlife. Finally, the Roanoke River is the major contributor of freshwater to Albemarle Sound.

The Natural Heritage Program has identified over 145 individual natural areas in the Roanoke River basin. Several of these areas are discussed in Chapter 19. A table of rare animals associated with aquatic habitats in the Roanoke River basin is also provided. There are 11 rare mollusks, five rare insects, one rare crustacean, and nine rare fish in the basin. The James Spiny mussel is a federally listed endangered species found in the Roanoke River subbasins 03-02-01 and 03-02-02. Some of these rare species are also noted in the individual subbasin chapters.

Water Quality Initiatives

Local organizations and agencies are able to combine professional expertise and local knowledge not present at the state and federal level. This allows groups to holistically understand the challenges and opportunities of local water quality concerns. Involving a wide array of people in water quality projects also brings together a wide range of knowledge and interests and encourages others to become involved and invested in these projects. Working in cooperation across jurisdictional boundaries and agency lines opens the door to additional funding opportunities and eases the difficulty of generating matching or leveraged funds. This could potentially allow local entities to do more work and be involved in more activities because funding sources are diversified. The most important aspect of these local endeavors is that the more localized the project, the better the chances for success.

The collaboration of local efforts is key to water quality improvements, and DWQ applauds the foresight and proactive response by locally based organizations and agencies to protect water quality. There are many excellent examples of local agencies and groups using these cooperative strategies throughout the state. Several local watershed projects are highlighted throughout the subbasin chapters (Chapters 1-10). Chapter 20 also summarizes monies spent by federal and state programs to help implement water quality improvement projects. Over \$48,000 was granted by the Clean Water Act Section 319 program for one project in this basin and over \$13 million was made available over the last several years through the Clean Water Management Trust Fund. This chapter also contains information about the Ecosystem Enhancement Program.

Waters on the North Carolina 303(d) List

For the next several years, addressing water quality impairment in waters that are on the state's 303(d) list will be a DWQ priority (Table *i*). Section 303(d) of the federal Clean Water Act requires states to develop a list of waters not meeting water quality standards or which have Impaired uses. The waters in the Roanoke River basin that are on this list are discussed in the individual subbasin chapters (Chapters 1-10). States are also required to develop Total Maximum Daily Loads (TMDLs) or management strategies for 303(d) listed waters to address impairment. EPA issued guidance in August 1997 that called for states to develop schedules for developing TMDLs for all waters on the 303(d) list within 8 to 13 years. Information regarding 303(d) listing and reporting methodology can be found in Appendix VII.

The rigorous and demanding task of developing TMDLs for each listed water during a 13-year time frame will require the focus of many resources. It will be a priority for North Carolina's water quality programs over the next several years to develop TMDLs for 303(d) listed waters. Roanoke River Basin TMDLs are discussed in the individual subbasin chapters. There are many new impaired segments in the Roanoke River basin. These are likely to be placed on the 2008 303(d) list and will require TMDL development for the next several years.

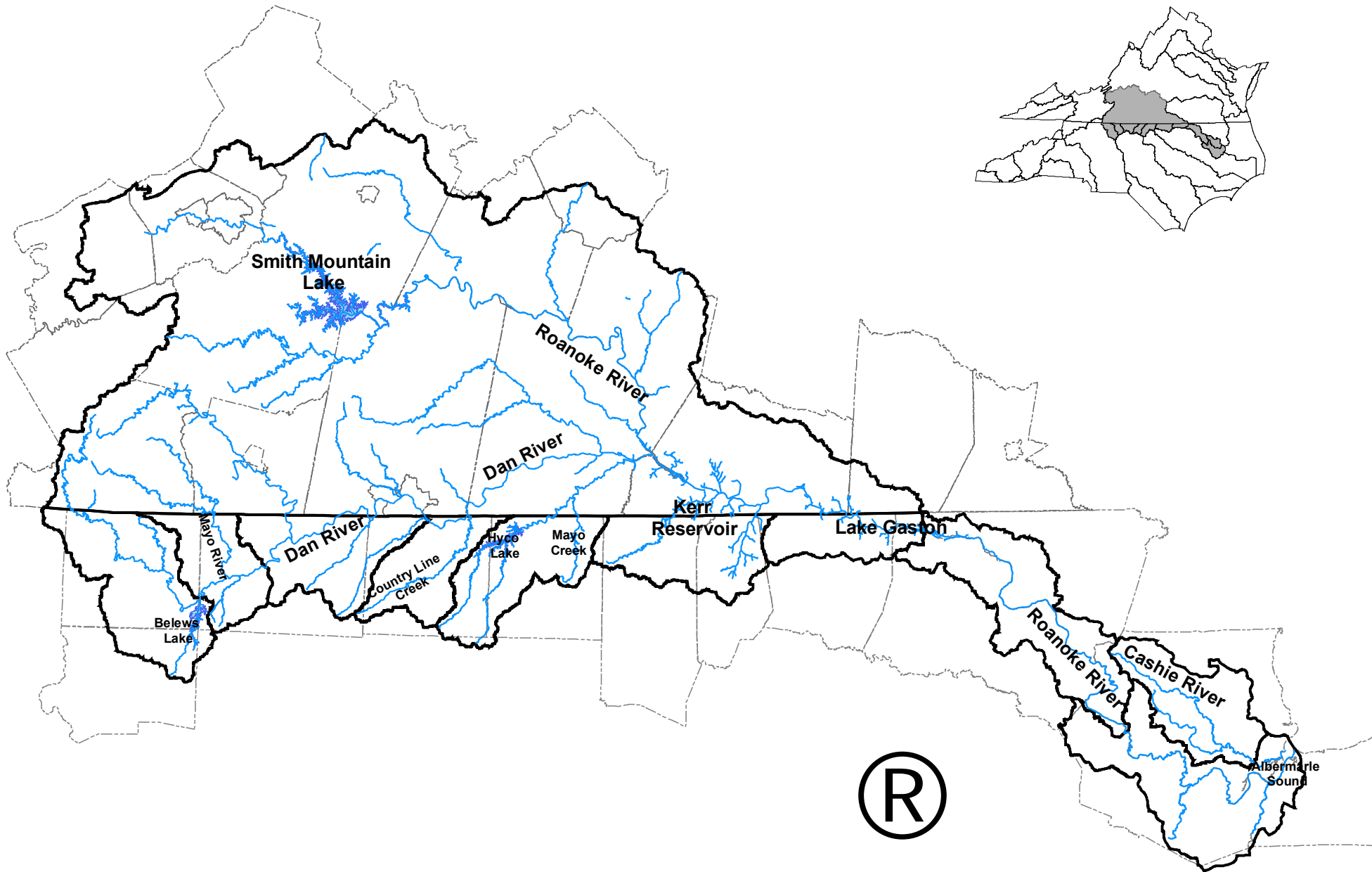
Challenges Related to Achieving Water Quality Improvements

To achieve the goal of restoring Impaired waters throughout the basin, DWQ will need to work closely with other state agencies and stakeholders to identify and control pollutants. The costs of restoration can be high, but several programs exist to provide funding for restoration efforts. These programs include the NC Clean Water Management Trust Fund (CWMTF), the NC

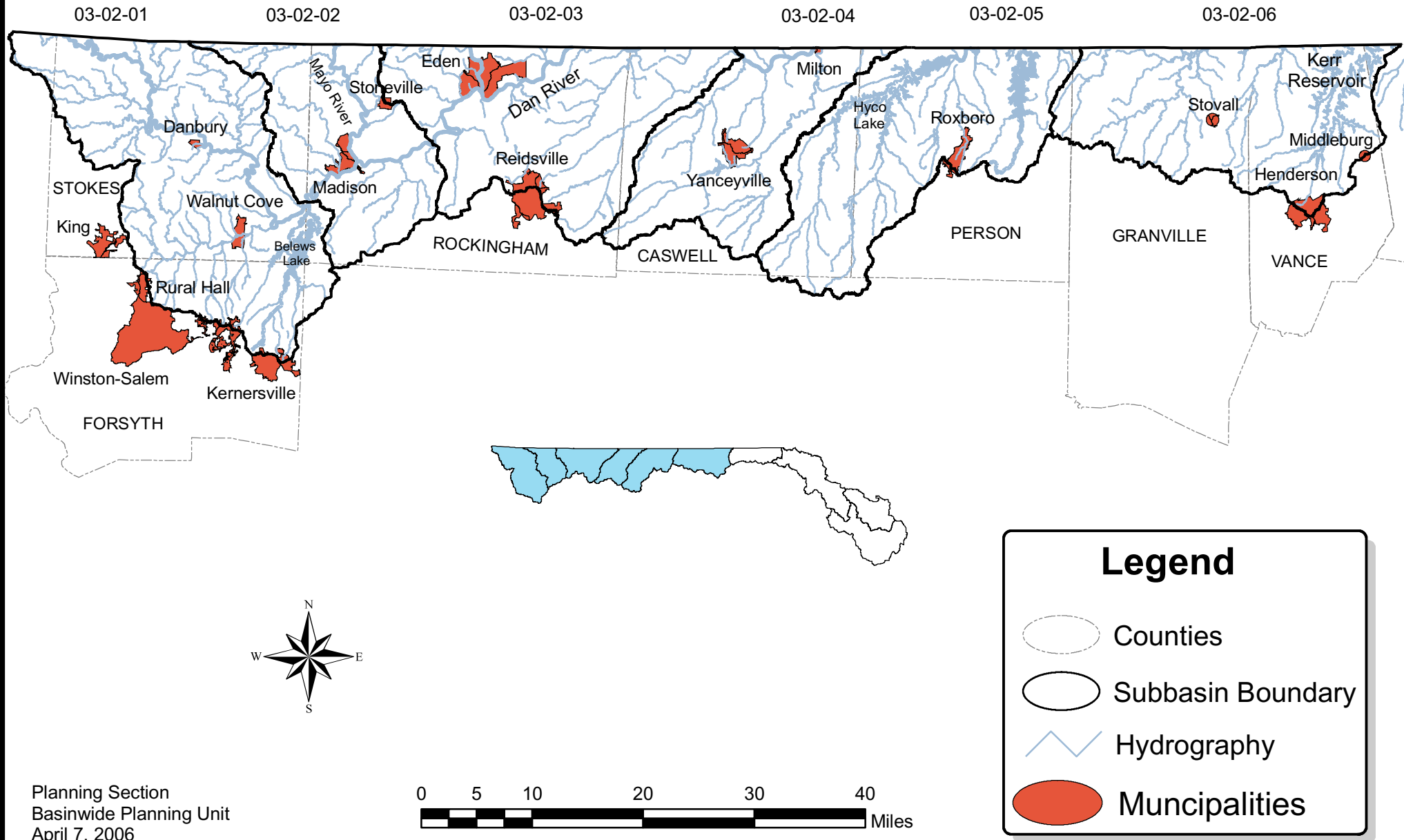
Agricultural Cost Share Program (NCACSP) and the Ecosystem Enhancement Program (NCEEP).

Balancing economic development and water quality protection will be a tremendous challenge. Point source impacts on surface waters can be measured and addressed through the basinwide planning process. Nonpoint source pollution can be identified through the basinwide plan, but actions to address these impacts must be taken at the local level. Such actions should include: development and enforcement of local erosion control ordinances; requirement of stormwater BMPs for existing and new development; development and enforcement of buffer ordinances; and land use planning that assesses impacts on natural resources. This basinwide plan presents many water quality initiatives and accomplishments that are underway throughout the Roanoke River basin. These actions provide a foundation on which future initiatives can be built.

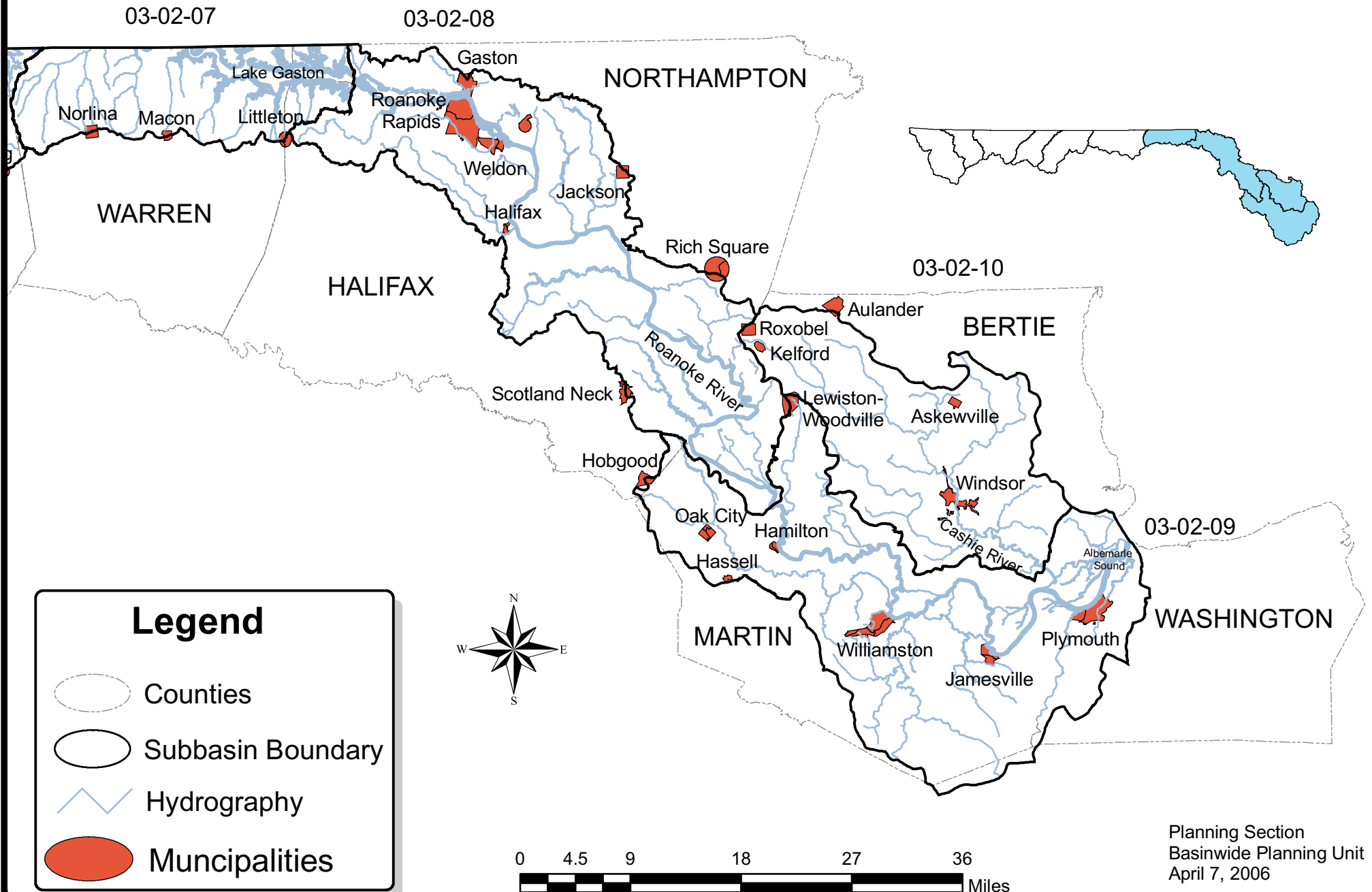
Figure i General Map of the Entire Roanoke River Basin



**Figure ii General Map of Western Portion
of the Roanoke River Basin in North Carolina**



**Figure iii General Map of Eastern Portion
of the Roanoke River Basin in North Carolina**



Monitored Impaired Waters in Roanoke River Basin

Subbasin	Stream Name	AU Number	Length/Area	Reason for Impairment
03-02-01	DAN RIVER (North Carolina portion)	22-(1)b	11.6 FW Miles	High Turbidity
03-02-02	DAN RIVER	22-(31.5)a	4.8 FW Miles	High Turbidity High Fecal Coliform Bacteria
03-02-03	DAN RIVER	22-(31.5)b	9.4 FW Miles	High Turbidity High Fecal Coliform Bacteria
03-02-03	DAN RIVER	22-(38.5)	0.6 FW Miles	High Turbidity High Fecal Coliform Bacteria
03-02-03	DAN RIVER (North Carolina portion)	22-(39)a	13.8 FW Miles	High Turbidity High Fecal Coliform Bacteria
03-02-03	Smith River	22-40-(3)	1.8 FW Miles	High Turbidity High Fecal Coliform Bacteria
03-02-03	Smith River	22-40-(1)	2.8 FW Miles	High Turbidity High Fecal Coliform Bacteria
03-02-03	Smith River	22-40-(2.5)	0.5 FW Miles	High Turbidity High Fecal Coliform Bacteria
03-02-04	DAN RIVER (North Carolina portion)	22-(39)b	9.6 FW Miles	High Turbidity High Fecal Coliform Bacteria
03-02-05	Hyc0 Creek (North Hyc0 Creek)	22-58-1	16.8 FW Miles	Fish Community Impaired
03-02-05	Marlowe Creek	22-58-12-6a	6.6 FW Miles	Benthic Community Impaired
03-02-06	Little Island Creek (Vance County)	23-4-3	11.8 FW Miles	Fish Community Impaired
03-02-06	Nutbush Creek (Including Nutbush Creek Arm of John H. Kerr Reservoir below normal pool elevation)	23-8-(1)b	1.6 FW Miles	Benthic Community Impaired Fish Community Impaired
03-02-07	Newmans Creek (Little Deep Creek)	23-10-2	6.1 FW Miles	Benthic Community Impaired
03-02-07	Smith Creek	23-10a	6.1 FW Miles	Benthic Community Impaired
03-02-07	Smith Creek	23-10c	3.0 FW Miles	Fish Community Impaired Benthic Community Impaired Low Dissolved Oxygen
03-02-09	ALBEMARLE SOUND (Batchelor Bay)	24	1,475.5 S Acres	Fish Consumption Advisory Dioxin
03-02-09	ROANOKE RIVER	23-(26)b3	17.8 FW Miles	Low Dissolved Oxygen
03-02-09	ROANOKE RIVER	23-(53)	18.3 FW Miles	Fish Consumption Advisory Dioxin
03-02-09	Welch Creek	23-55	13.3 FW Miles	Fish Consumption Advisory Dioxin

