Chapter 7
Water Quality Stressors and Sources of Impairment in the White Oak River Basin

7.1 Stressor Identification

7.1.1 Introduction and Overview

Human activities can negatively impact surface water quality, even when the activity is far removed from surface waters. The many types of pollution generated by human activities may seem insignificant when viewed separately, but when taken as a whole can result in significant cumulative impacts on the aquatic ecosystem. Water quality stressors are identified when impacts have been noted to biological (fish and benthic) communities or water quality standards have been violated. Stressors apply to one or more use support categories and may be identified for Impaired waters, as well as Supporting waters with noted impacts.

Identifying stressors is challenging because direct measurements of the stressor may be difficult or prohibitively expensive. DWQ staff use field observations from sample sites, special studies and data from ambient monitoring stations, as well as information from other agencies and the public to identify stressors and their potential sources. The Division of Environmental Health Shellfish Sanitation Section collects data and information regarding potential sources of water quality stressors to shellfish growing areas. It is important to identify stressors and potential sources of stressors so that water quality programs can target limited resources to address the stressor.

Stressors to recreational use include pathogenic indicators, such as fecal coliform bacteria *escheria coli* (*E. coli*) and *enterrococci*. In the fish consumption category, mercury is typically the noted stressor. Other substances may also result in the issuance of a fish consumption advisory or advice by the NC Division of Health and Human Services (NCDHHS).

Most stressors to the biological community are a complex grouping of many different stressors that individually may not degrade water quality or aquatic habitat, but together can severely impact aquatic life. Sources of stressors are most often associated with land use in a watershed, as well as the quality and quantity of any treated wastewater that may be entering a stream. During naturally severe conditions such as droughts or floods, any individual stressor, or group of stressors, may have more severe impacts to aquatic life than during normal climatic conditions. The most common source of stressors is from altered hydrology.

7.1.2 Stressor Sources

Pollutants that enter waters fall into two general categories: *point sources* and *nonpoint sources*. Point sources are typically piped discharges and are controlled through regulatory programs administered by the state. All regulated point source discharges in North Carolina must

Point Sources

Piped discharges from:

- Municipal wastewater treatment plants
- Industrial facilities
- Small package treatment plants
- Large urban and industrial stormwater systems

apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit from the state.

Nonpoint sources are from a broad range of land use activities. Nonpoint source pollutants are typically carried to waters by rainfall, runoff, and snowmelt. Sediment and nutrients are most often associated with nonpoint source pollution. Other pollutants associated with nonpoint source pollution include fecal coliform bacteria, heavy metals, oil and grease, and any other substance that may be washed off the ground or deposited from the atmosphere into surface waters. Unlike point source pollution, nonpoint pollution sources are diffuse in nature and occur intermittently, depending on rainfall events and land disturbance. Given these characteristics, it is difficult and resource intensive to quantify nonpoint contributions to water quality degradation in a given watershed.

Nonpoint Sources

- Construction activities
- Roads, parking lots and rooftops
- Agriculture
- Failing septic systems and straight pipes
- Timber harvesting
- Hydrologic modifications

DWQ identifies the source of a stressor, point or nonpoint, 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. Stressors sources identified in the White Oak River basin during this assessment period include urban or impervious surface runoff, construction sites, road building, agriculture, and forestry. Point source discharges are also considered a water quality stressor source. In addition to these sources, many impacts originate from unknown sources.

7.1.3 Overview of Stressors Identified in the White Oak River Basin

The stressors noted below are summarized for all waters and for all use support categories. Figure 14-17 identifies stressors noted for Impaired waters and those with noted impacts in both miles and acres. The stressors noted in the figure may not be the sole reason for the impairment or noted impacts. For specific discussion of stressors to the impaired or noted waters, refer to the subbasin chapters. Stressor definitions and potential impacts are discussed in the remainder of this chapter.

Figure 14 Stressors identified in Impaired waters, Saltwater Acres

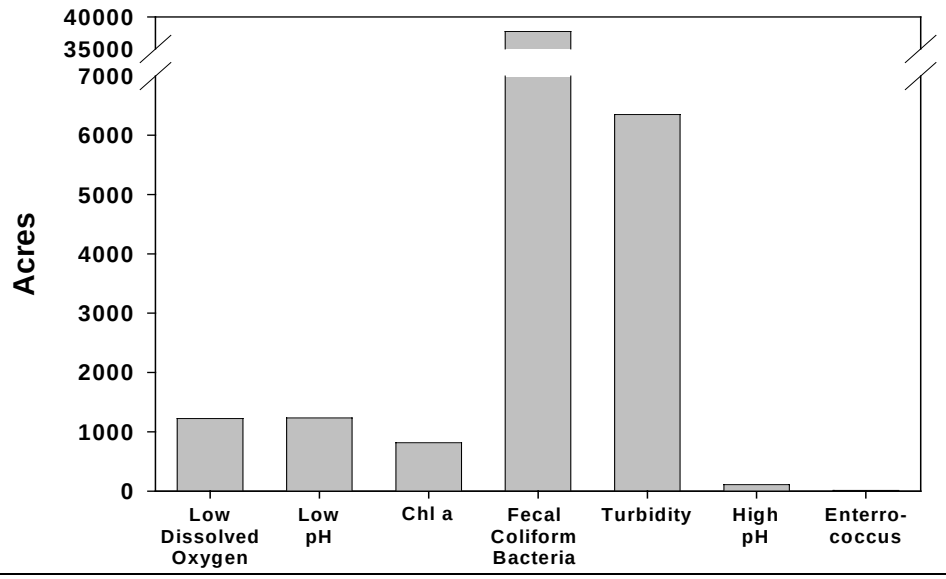


Figure 15 Stressors identified in Impaired waters, Saltwater Miles

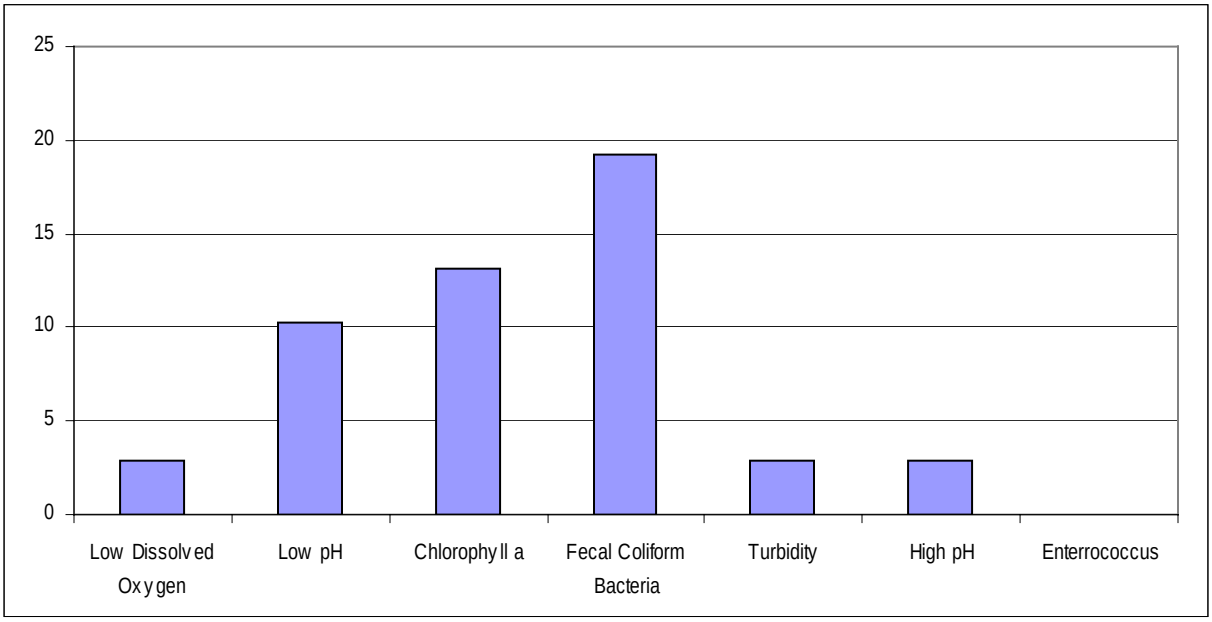


Figure 16 Stressors Identified for Waters with Noted Impacts, Saltwater Acres

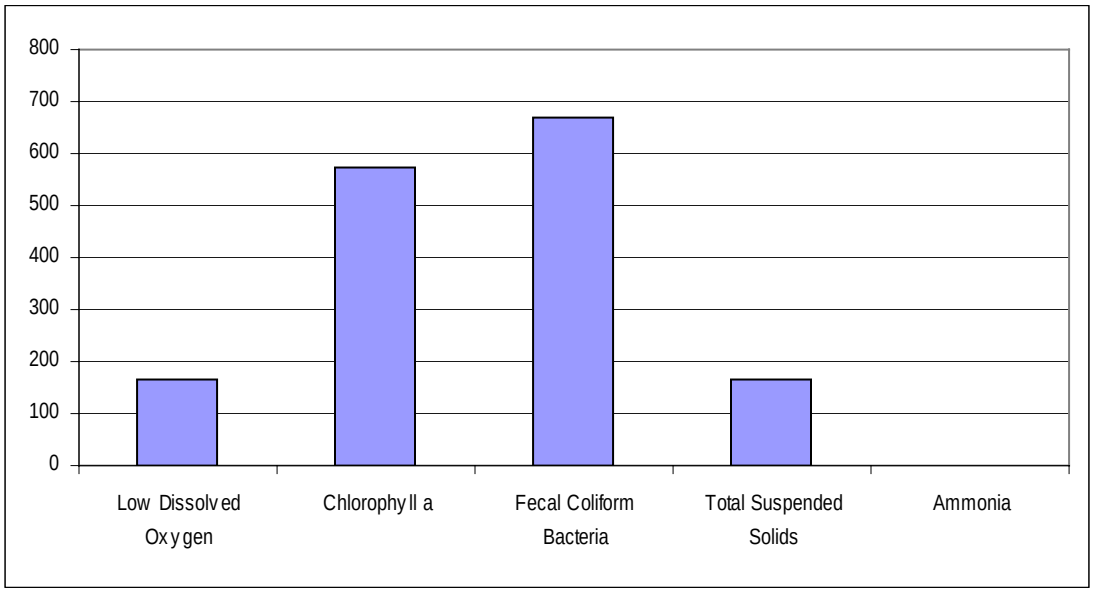
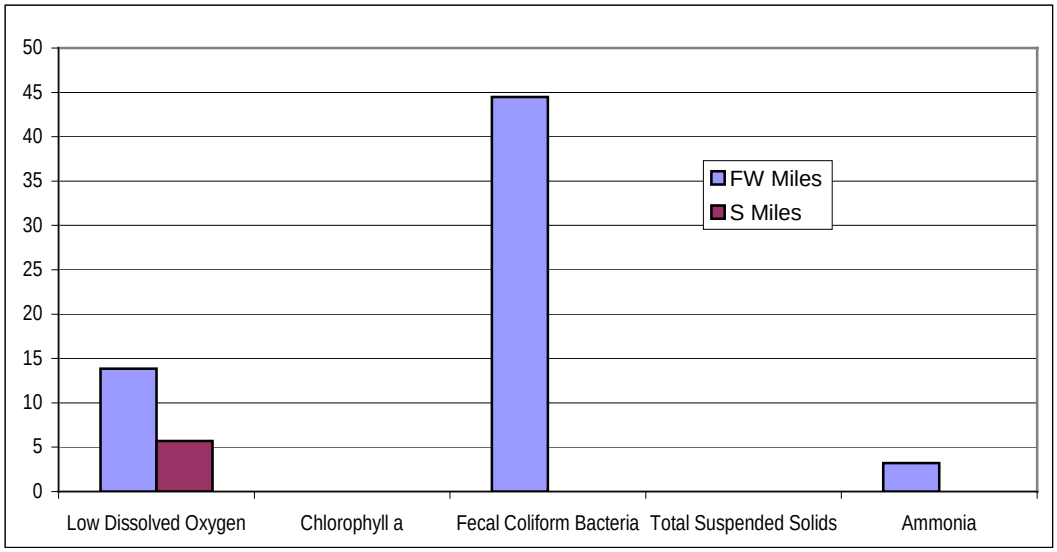


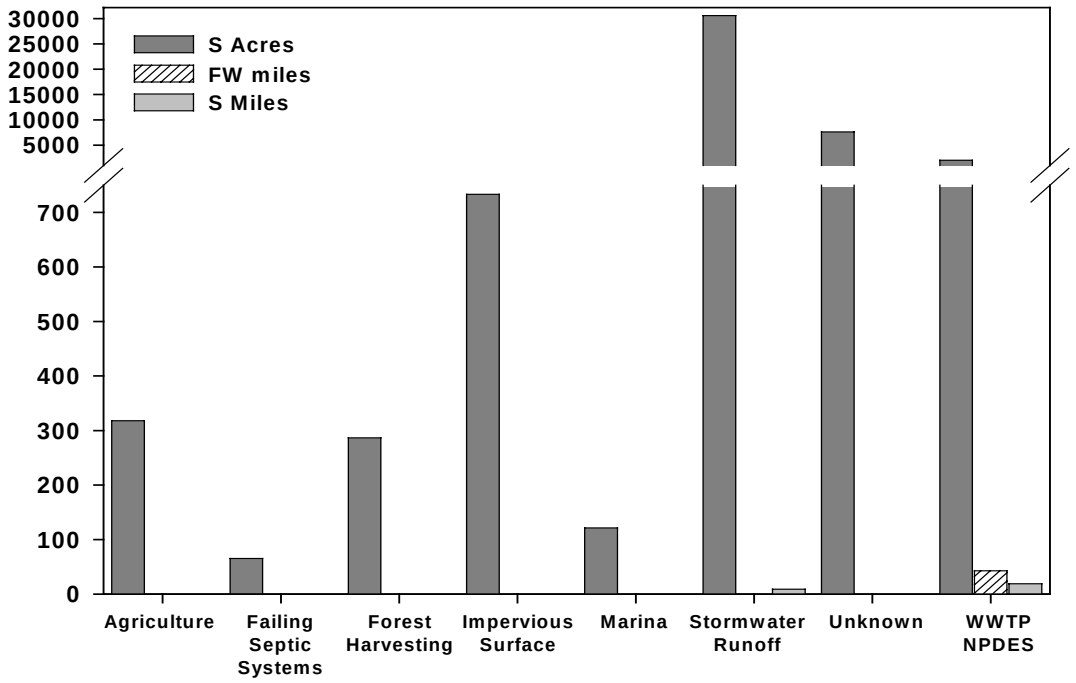
Figure 17 Stressors Identified for Waters with Noted Impacts, Freshwater & Saltwater Miles



7.1.4 Overview of Stressor Sources Identified in the White Oak River Basin

Stormwater runoff from a variety of land use practices is identified as the primary source of impairment to the surface waters in the White Oak River basin. Runoff from rain events carries the fecal coliform bacteria stressor that results in impairment of the shellfish harvesting use support category. Established development, new construction, animal waste (e.g., domestic pets, agricultural animals, and wildlife), and human waste from sewer overflows and failing septic systems are all contributing factors to compounding problems in stormwater runoff. Refer to the subbasin chapters for a specific discussion of sources by stream assessment unit number (AU#) or growing area. Figure 18 shows sources identified for both freshwater and saltwater.

Figure 18 Stressor Sources in Fresh and Saltwater in the White Oak River Basin



7.2 Sedimentation as a Stressor Related to Turbidity and Total Suspended Solids

Sedimentation is a natural process important to the maintenance of diverse aquatic habitats. Overloading of sediment in the form of sand, silt and clay particles fills pools and covers or embeds riffles that are vital aquatic insect and fish habitats. A diversity of these habitats is important for maintenance of biological integrity. Suspended sediment can decrease primary productivity (i.e. photosynthesis) by shading sunlight from aquatic plants, affecting the overall productivity of a stream system. Suspended sediment also has several effects on various fish species including avoidance and redistribution, reduced feeding efficiency, and therefore, reduced growth by some species, respiratory problems, reduced tolerance to diseases and toxicants, and increased physiological stress (Roell, 1999). Sediment filling rivers, streams and reservoirs also decreases their storage volume and increases the frequency of floods (NCDENR-DLR, 1998). Across the state, sediment overloading to many streams has reduced biological diversity to the point of the stream being Impaired for aquatic life.

Sediment comes from land-disturbing activities in a watershed. The cause of this form of sedimentation is erosion of land in the watershed. Land-disturbing activities such as the construction of roads and buildings, crop production, livestock grazing and timber harvesting can accelerate erosion rates by causing more soil than usual to be detached and moved by water.

Streambank erosion, caused by very high stormwater flows after rain events, is another source of sediment overloading. Watersheds with large amounts of impervious surfaces transport water to streams very rapidly and at higher volumes than occurs in watersheds with less impervious surfaces. In many urban areas, stormwater is delivered directly by storm sewers. This high volume and velocity of water after rain events undercuts streambanks causing bank failure and large amounts of sediment to be deposited directly into the stream. Many urban streams are adversely impacted by sediment overloading from the watershed as well as from the streambanks.

Sedimentation can be controlled during most land-disturbing activities by using appropriate BMPs. Substantial amounts of erosion can be prevented by planning to minimize the amount and time that land is exposed during land-disturbing activities and by minimizing impervious surface area and direct stormwater outlets to streams. Erosion can be controlled during most land-disturbing activities by using appropriate BMPs. In fact, erosion can substantially be prevented by minimizing the amount and time the land is exposed. DWQ's role in sediment control is to work cooperatively with those agencies that administer sediment control programs to maximize the effectiveness of these programs and to protect water quality. Where programs are not effective, as evidenced by a violation of instream water quality standards, and where DWQ can identify a source, appropriate enforcement action can be taken. Generally, this entails requiring the landowner or responsible party to install acceptable BMPs.

As a result of new stormwater rules enacted by EPA in 1999, construction or land development activities that disturb one acre or more are required to obtain a NPDES stormwater permit. An erosion and sediment control plan must also be developed and approved for these sites under the state's Sedimentation Pollution Control Act (SPCA) administered by the NC Division of Land Resources. Site disturbances of less than one acre are required to use BMPs, but an approved plan is not required.

Establishing, conserving and managing streamside vegetation (riparian buffer) is one of the most economical and efficient BMPs. Forested buffers provide a variety of benefits including filtering runoff and taking up nutrients, moderating water temperature, preventing erosion and loss of land, providing flood control and helping to moderate streamflow, and providing food and habitat for both aquatic and terrestrial wildlife (NCDENR-DWQ, 2004). To obtain a free copy of DWQ's *Buffers for Clean Water* brochure, call (919) 733-5083, ext. 558.

Channelization refers to the physical alteration of naturally occurring stream and riverbeds. Although increased flooding, bank erosion and channel instability often occur in downstream areas after channelization has occurred, flood control, reduced erosion, increased usable land area, greater navigability and more efficient drainage are frequently cited as the objectives of channelization projects (McGarvey, 1996). Direct or immediate biological effects of channelization include injury and mortality of benthic macroinvertebrates, fish, shellfish/mussels and other wildlife populations, as well as habitat loss. Indirect biological effects include changes in benthic macroinvertebrate, fish and wildlife community structures, favoring species that are more tolerant of or better adapted to the altered habitat (McGarvey, 1996). Channelization has occurred historically in parts of the White Oak River basin and continues to occur in some watersheds, especially in small headwater streams.

7.3 Water Quality Stressors Impairing Surface Waters Recreational Uses

Bacteria live in the digestive tract of warm-blooded animals (humans as well as other mammals) and are excreted in their waste. Fecal coliform bacteria do not actually pose a danger to people or animals. However, where fecal coliform are present, disease-causing bacteria may also be present and water that is polluted by human or animal waste can harbor other pathogens that may threaten human health.

Sources of Fecal Coliform in Surface Waters

- Urban stormwater
- Wild animals and domestic pets
- Improperly designed or managed animal waste facilities
- Livestock with direct access to streams
- Improperly treated discharges of domestic wastewater, including leaking or failing septic systems, straight pipes and WWTP overflows.

The presence of disease-causing bacteria tends to affect humans more than aquatic creatures. High levels of bacteria can indicate high levels of sewage or animal wastes that could make water unsafe for human contact (swimming). Fecal coliform bacteria and other potential pathogens associated with waste from warm-blooded animals are not harmful to fish and aquatic insects. However, high levels of bacteria may indicate contamination that increases the risk of contact with harmful pathogens in surface waters. Pathogens associated with fecal coliform bacteria can cause diarrhea, dysentery, cholera and typhoid fever in humans. Some pathogens can also cause infection in open wounds.

A number of factors beyond the control of any state regulatory agency contribute to elevated levels of disease-causing bacteria. Therefore, the state does not encourage swimming in surface waters. To assure that waters are safe for swimming indicates a need to test waters for pathogenic bacteria. Although bacteria standards have been used to indicate the microbiological quality of surface waters for swimming for more than 50 years, the value of this indicator is often questioned. Evidence collected during the past several decades suggests that the coliform group may not adequately indicate the presence of pathogenic viruses or parasites in water. The

detection and identification of specific pathogenic bacteria, viruses and parasites such as *Giardia*, *Cryptosporidium* and *Shigella* are expensive, and results are generally difficult to reproduce quantitatively. Also, to ensure the water is safe for swimming would require a whole suite of tests for many organisms, as the presence/absence of one organism would not document the presence/absence of another. This type of testing program is not possible due to resource constraints.

7.3.1 Recreation Issues Related to Coastal Swimming Beaches

In addition to DWQ sampling of freshwaters as part of the ambient monitoring grogram, the DEH Recreational Monitoring Program has established quality objectives and criteria "…to protect the public health by monitoring the quality of North Carolina's coastal recreational waters and notifying the public when bacteriological standards for safe bodily contact are exceeded". Specific objectives are:

- To identify swimming areas/beaches and classify them based on human recreational usage.
- To identify monitoring stations exceeding the enterococci geometric mean and single-sample maximum criteria using the Enterolert MPN method for enumeration.
- To evaluate the public health significance of approximately twenty (20) ocean storm drains.
- To document trends in coastal bacteriological water quality.

Swimming advisory signs are posted and press releases issued for Tier I swimming areas/beaches (swimming areas used daily) when a minimum of five samples, equally spaced over 30 days, exceed a geometric mean of 35 enterococci per 100 ml or, when a single sample exceeds 500 enterococci per 100 ml. The public is notified only by press release, without an advisory sign when a single sample exceeds 104 enterococci per 100 ml and is less than 500 enterococci per 100 ml. If a second sample exceeds 104 enterococci per 100 ml, an advisory is posted and the public will be notified by press release. An advisory will also be issued when at least two of three samples from a monitoring site exceed 104 enterococci per 100 ml. The swimming advisory is not lifted until two consecutive weekly samples meet the standard of 35 enterococci per 100 ml. For an advisory to be rescinded, the station must have two consecutive samples below 35 enterococci per 100 ml.

In a case where a station under advisory is subject to triplicate sampling, two of the three samples must be under the single-sample maximum of 104 enterococci per 100 ml. If two of the three samples are above the single-sample maximum of 104 enterococci per 100 ml, an advisory will be put into place. The advisory will be rescinded when two of the three resamples are under the single-sample level, as long as the running geometric mean has not been exceeded.

Beaches that violate the single-sample maximum criteria are resampled at the time of the public notification and/or sign posting, depending on the level of the exceedance. If the resample is satisfactory, the advisory may be lifted as soon as 24 hours from the time of the initial advisory notification or posting. If the resample is unsatisfactory but the geometric mean is not exceeded, the advisory sign remains posted. If the resampling causes the exceedance of the geometric mean, then the geometric mean criteria apply.

The timeframe for posting swimming advisory signs at Tier I beaches, based on the enterococci geometric mean, runs from the beginning of May through the end of September. Weekly

sampling of Tier I beaches is from April to October. During April and October, advisories at all Tier 1 monitoring sites are based on the single-sample maximum for Tier II beaches/swimming areas (276 enterococci per 100 ml.).

Tier II and Tier III beaches/swimming areas are sampled twice monthly from April to October, with the advisories based entirely on the single sample maximum criteria. For Tier II sites (areas are used infrequently and usually by watercraft), public notification and a swimming advisory sign are posted when a single sample exceeds 500 enterococci per 100 ml. A public notification without the advisory sign occurs when a single sample exceeds 276 enterococci per 100 ml but is less than 500 enterococci per 100 ml. If a second sample exceeds 276 enterococci per 100 ml, an advisory is posted and the public is notified. Weekly sampling of the site continues until the enterococci counts are less than 276 enterococci per 100 ml.

Tier III beaches/swimming areas, because of infrequent use, do not receive public notification or advisory signs until the second sample exceeds 500 enterococci per 100 ml. If the second sample exceeds 500 enterococci per 100 ml, an advisory sign and public notification are issued. Weekly sampling of the site will continue until the enterococci counts are less than 500 enterococci per 100 ml.

Other swimming advisories will be posted as precautionary measures when the following activities occur:

- Pumping of floodwaters between the primary dune and the ocean beaches.
- Storm drains with discharges into ocean beaches. Storm drains that have flow that may be able to reach ocean recreational waters are posted with advisory signs.
- Disposal of dredge material from closed shellfishing waters on ocean beaches.

These swimming advisories are lifted 24 hours after visible discharge into the ocean ceases. Swimming advisories are not posted from November through March; however, all sampling stations are sampled once per month during the non-swimming season.

In 2003-2005, DEH Recreational Water Quality Monitoring Program in the White Oak Basin reported 283 postings of beach closure days.

7.3.2 How DWQ Assesses the Recreation Use Support Category Based on DEH Program Recommendations

The recreation category is a human health related category intended to evaluate waters for the support of primary recreation activities such as swimming, water-skiing, skin diving, and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis. Waters of the state designated for these uses are classified as Class B, SB and SA.

The use support ratings applied to this category are currently based on the state's fecal coliform bacteria water quality standard where ambient monitoring data are available or on the duration of local or state health agencies posted swimming advisories. The advisories are based on the state's enterococcus bacteria standards.

DWQ conducts monthly ambient water quality monitoring that includes fecal coliform bacteria testing. The Division of Environmental Health (DEH) tests coastal recreation waters (beaches)

for bacteria levels to assess the relative safety of these waters for swimming. The Recreational Beach Monitoring Program determines the quality of coastal waters and beaches for suitability for bodily contact activities. Shoreline surveys of potential sources of pollution that could affect the area are also conducted. Swimming advisories are posted when bacteriological standards are exceeded or point source discharges are found. If an area has elevated bacteria levels, health officials will advise that people not swim in the area by posting a swimming advisory and by notifying the local media and county health department. Water samples are collected and analyzed for fecal coliform bacteria from numerous sampling stations located throughout the coastal area for both the shellfish and recreational programs.

Water quality standards for fecal coliform bacteria are intended to ensure safe use of waters for recreation (refer to Administrative Code Section 15A NCAC 2B .0200). The North Carolina fecal coliform standard for freshwater is (1) 200 colonies/100ml based on the geometric mean of at least five consecutive samples taken during a 30-day period and (2) not to exceed 400 colonies/100ml in more than 20 percent of the samples during the same period. In the White Oak River basin, there are 140.2 acres of where this standard was exceeded, causing these waters to be rated as Impaired for recreation. In 14.2 stream miles fecal coliform bacteria are the noted stressor because annual screening criteria were exceeded but did not lead to listing the waterbody as Impaired for recreation. These waters were not intensively sampled to assess the standard as described above, but had either a geometric above 200 colonies/100ml and/or 20 percent of samples exceeded 400 colonies/100ml over the five-year assessment period. These waters are discussed in the subbasin chapters.

The AU being assessed for the five-year data window is Supporting in the recreation category if neither number (1) nor (2) of the standard are exceeded. The AU being assessed is Impaired in the recreation category if either number (1) or (2) is exceeded. Waters without sufficient fecal coliform bacteria data (five samples within 30 days) are Not Rated, and waters with no data are noted as having No Data.

DWQ does not directly use DEH Recreational Water Quality Monitoring Program data to assign use support ratings. Waters are Impaired when swimming advisories are posted for more than 61 days during the five-year assessment period. Waters with beach monitoring sites with advisories posted less than 61 days are Supporting. Other information can be used to Not Rate unmonitored waters. In the White Oak River basin, 8.0 estuarine acres are Impaired for recreation because of swimming advisories posted during the assessment period. Enterrococcus is the stressor in these waters.

Assessing the water quality standard requires significant sampling efforts beyond the monthly ambient monitoring sampling and must include at least five samples over a 30-day period. Decades of monitoring have demonstrated that bacteria concentrations may fluctuate widely in surface waters over a period of time. Thus, multiple samples over a 30-day period are needed to evaluate waters against the North Carolina water quality standard for recreational use support. Waters classified as Class SA, SB and B are targeted for this intensive sampling effort due to the greater potential for human body contact.
DWQ attempts to determine if there are any swimming areas monitored by state, county, or local health departments or by DEH. Each January, DEH, county, or local health departments are asked to list those waters which were posted with swimming advisories in the previous year.

7.4 Shellfish Harvesting Issues

7.4.1 DEH Classifications and Protocols

DEH is required to classify all shellfish growing areas as to their suitability for shellfish harvesting. Estuarine waters are delineated according to DEH shellfish management areas (e.g., Outer Banks, Area H-5), which include Class SA, SB and SC waters. DEH samples growing areas regularly and reevaluates the areas by conducting shellfish sanitation shoreline surveys every three years to determine if their classification is still applicable. DEH classifications may change after the most recent sanitary survey. Classifications are based on DEH bacteria sampling, locations of pollution sources, and the availability of the shellfish resource. Growing waters are classified as shown in Table 38.

Table 38 DEH Classification and Criteria

DEH Classification	DEH Criteria
Approved (APP)	**Fecal Coliform Standard for Systematic Random Sampling:** The median fecal coliform Most Probable Number (MPN) or the geometric mean MPN of the water shall not exceed 14 per 100 milliliters (ml), and the estimated 90th percentile shall not exceed an MPN of 43 MPN per 100 ml for a 5-tube decimal dilution test. **Fecal Coliform Standard for Adverse Pollution Conditions Sampling:** The median fecal coliform or geometric mean MPN of the water shall not exceed 14 per 100 ml, and not more than 10 percent of the samples shall exceed 43 MPN per 100 ml for a 5-tube decimal dilution test.
Conditionally Approved-Open (CAO)	Sanitary Survey indicates an area can meet approved area criteria for a reasonable period of time, and the pollutant event is known and predictable and can be managed by a plan. These areas tend to be open more frequently than closed.
Conditionally Approved-Closed (CAC)	Sanitary Survey indicates an area can meet approved area criteria for a reasonable period of time, and the pollutant event is known and predictable and can be managed by a plan. These areas tend to be closed more frequently than open.
Restricted (RES)	Sanitary Survey indicates limited degree of pollution, and the area is not contaminated to the extent that consumption of shellfish could be hazardous after controlled depuration or relaying.
Prohibited (PRO)	No Sanitary Survey; point source discharges; marinas; data do not meet criteria for Approved, Conditionally Approved or Restricted Classification.

7.4.2 Shellfish Sanitary Surveys and Program Protocols

The Shellfish Sanitation (SS) and Recreational Water Quality Section of the Division of Environmental Health is responsible for monitoring and classifying coastal waters as to their suitability for shellfish harvesting for human consumption, and inspection and certification of shellfish and crustacea processing plants.

The Shellfish Sanitation Program is conducted in accordance with the guidelines set by the Interstate Shellfish Sanitation Conference (ISSC) contained in the *National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish Model Ordinance*. The NSSP is administered by the US Food and Drug Administration (FDA). Classifications of coastal waters for shellfish harvesting are done by means of a Sanitary Survey, which includes: a shoreline survey of sources of pollution, a hydrographic and meteorological survey, and a bacteriological survey of growing waters. Sanitary Surveys are conducted for all potential shellfish growing

areas in coastal North Carolina and recommendations are made to the Division of Marine Fisheries of which areas should be closed for shellfish harvesting.

7.4.3 How DWQ Assesses the Shellfish Harvesting Category Based on DEH Program Recommendations

Use support assessment is conducted such that only the DEH classification is used to assign a use support rating for the shellfish harvesting category. By definition, Conditionally Approved-Open areas are areas that DEH has determined do not, or likely do not, meet water quality standards and these areas are rated Impaired, along with Conditionally Approved-Closed and Prohibited or Restricted areas. Only Approved areas are rated Supporting.

Within the Class SA waters of the White Oak River basin, there are 37,582 acres Impaired for shellfish harvesting and the stressor is fecal coliform bacteria. Additionally, 80,787 acres are Supporting for shellfish harvesting.

7.5 Fish Consumption Advice Related to Mercury

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 eventually, to biological organisms. Mercury circulates in the environment as a result of natural and human (anthropogenic) activities. A dominant pathway for mercury in the environment is through the atmosphere. Mercury emitted from industrial and municipal stacks into the ambient air can circulate around 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; however, mercury in wastewater is typically not at levels that could be solely responsible for elevated fish levels

Fish is part of a healthy diet and an excellent source of protein and other essential nutrients. However, nearly all fish and shellfish contain trace levels of mercury. The risks from mercury in fish depend on the amount of fish eaten and the levels of mercury in the fish. In March 2003, the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA) issued a joint consumer advisory for mercury in fish and shellfish. The advice is for women who might become pregnant, women who are pregnant, nursing mothers, and young children. Aside from being issued jointly by two federal agencies, this advisory is important because it emphasizes positive benefits of eating fish and gives examples of commonly eaten fish that are low in mercury. In the past, the FDA issued an advisory on consumption of commercially caught fish, while the EPA issued advice on recreationally caught fish.

By following these three recommendations for selecting and eating fish, women and young children will receive the benefits of eating fish and shellfish and be confident that they have reduced their exposure to the harmful effects of mercury. These recommendations are:

- **Do not eat shark, swordfish, king mackerel, or tilefish**. They contain high levels of mercury.
- Eat up to 12 ounces (two average meals) a week of a variety of fish and shellfish that are lower in mercury. Five of the most commonly eaten fish that are low in mercury are shrimp, canned light tuna, salmon, pollock, and catfish. Another commonly eaten fish,

albacore ("white") tuna, has more mercury than canned light tuna. So, when choosing your two meals of fish, you may eat up to 6 ounces (one average meal) of albacore per week.

- Check local advisories about the safety of fish caught by family and friends in your local lakes, rivers, and coastal areas. If no advice is available, eat up to 6 ounces (one average meal) per week of fish you catch from local waters. Don't consume any other fish during that week.

For more detailed information, visit EPA's website at http://www.epa.gov/waterscience/fish/ or the FDA's website at http://www.cfsan.fda.gov/seafood1.html The FDA's food information toll-free phone number is 1-888-SAFEFOOD.

The NC Department of Health and Human Services (NCDHHS) also issues fish consumption advisories and advice for those fish species and areas at risk for contaminants. NCDHHS notifies people to either limit consumption or avoid eating certain kinds of fish. While most freshwater fish in North Carolina contain very low levels of mercury and are safe to eat, several species have been found to have higher levels. More information regarding use support assessment methodology related to fish consumption advisories and advice can be found in Appendix IV. Due to high levels of mercury in seventeen saltwater and five freshwater fish species, the NCDHHS offers the following health advice (updated March 31, 2006).

Women of childbearing age (15 to 44 years), pregnant women, nursing women, and children under 15:

- **Do not eat** the following ocean fish: almaco jack, banded rudderfish, canned white tuna (albacore tuna), cobia, crevalle jack, greater amberjack, south Atlantic grouper (gag, scamp, red, and snowy), king mackerel, ladyfish, little tunny, marlin, orange roughy, shark, Spanish mackerel, swordfish, tilefish, or tuna (fresh or frozen).
- **Do not eat** the following freshwater fish: bowfin (blackfish), catfish (caught wild), chain pickerel (jack fish), or warmouth caught in North Carolina waters south and east of Interstate 85.
- **Do not eat** largemouth bass caught in North Carolina waters (statewide).
- Eat up to two meals per week of other fish. A meal is 6 ounces of cooked fish for adults or 2 ounces of cooked fish for children under 15.

All other people:

- Eat no more than one meal (6 ounces) per week of ocean and/or freshwater fish listed above. These fish are often high in mercury.
- Eat up to four meals per week of other fish. A meal is 6 ounces of cooked fish for adults or 2 ounces of cooked fish for children under 15.

For more information and detailed listing of site-specific advisories, visit the NCDHHS website at http://www.epi.state.nc.us/epi/fish/index.html or call (919) 733-3816.