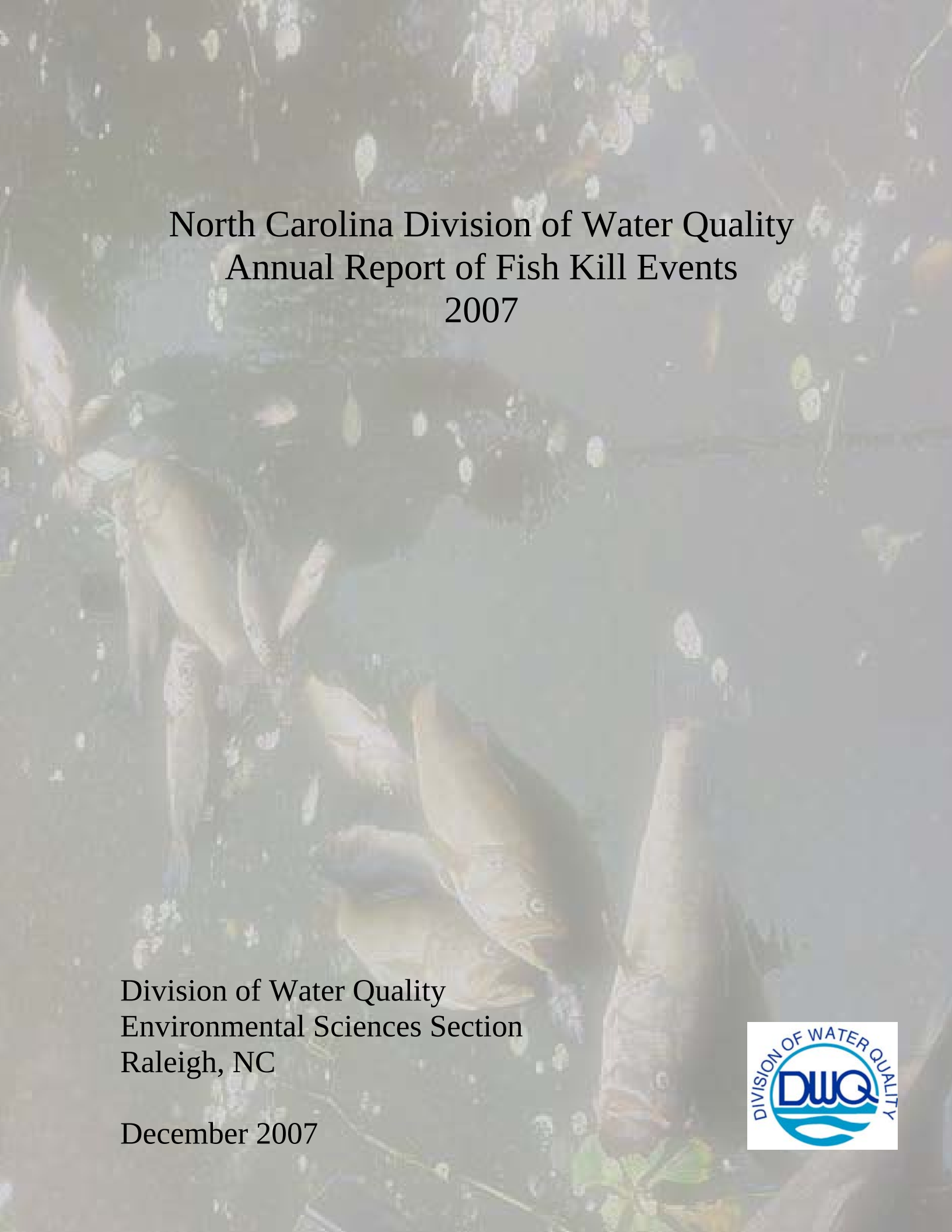


# North Carolina Division of Water Quality
# Annual Report of Fish Kill Events
# 2007

Division of Water Quality
Environmental Sciences Section
Raleigh, NC

December 2007

## Introduction

The investigation of fish kill activity across North Carolina currently involves protocols established by the North Carolina Division of Water Quality (DWQ) in 1996. The protocols were developed with assistance from DWQ Regional Office staff, North Carolina Wildlife Resources Commission biologists, and Division of Marine Fisheries personnel as a means to improve the tracking and reporting of fish kill events throughout the state. Fish kill and fish health investigation data are recorded on a standardized form and sent to the Division's Environmental Sciences Section (ESS) where the data are reviewed and compiled. Data from fish kill investigation forms, laboratory test results and supplemental information sent to the ESS are entered into a central database where the information can be managed, queried and reported. The procedure also requires the notification of appropriate state officials and scientists associated with the investigation of such events. The protocols have proven successful in standardizing reporting methods and enhancing the quality and quantity of information reported from kill events.

Fish kill information is posted weekly from June to November on the ESS website: http://h2o.enr.state.nc.us/esb/Fishkill/fishkillmain.htm. The following report will also be available at this website after submittal.

This document is a summary of fish kill events reported to the DWQ from January to early December, 2007. The report is mandated under Section 4 of Chapter 633 of the 1995 North Carolina General Assembly Session Laws.

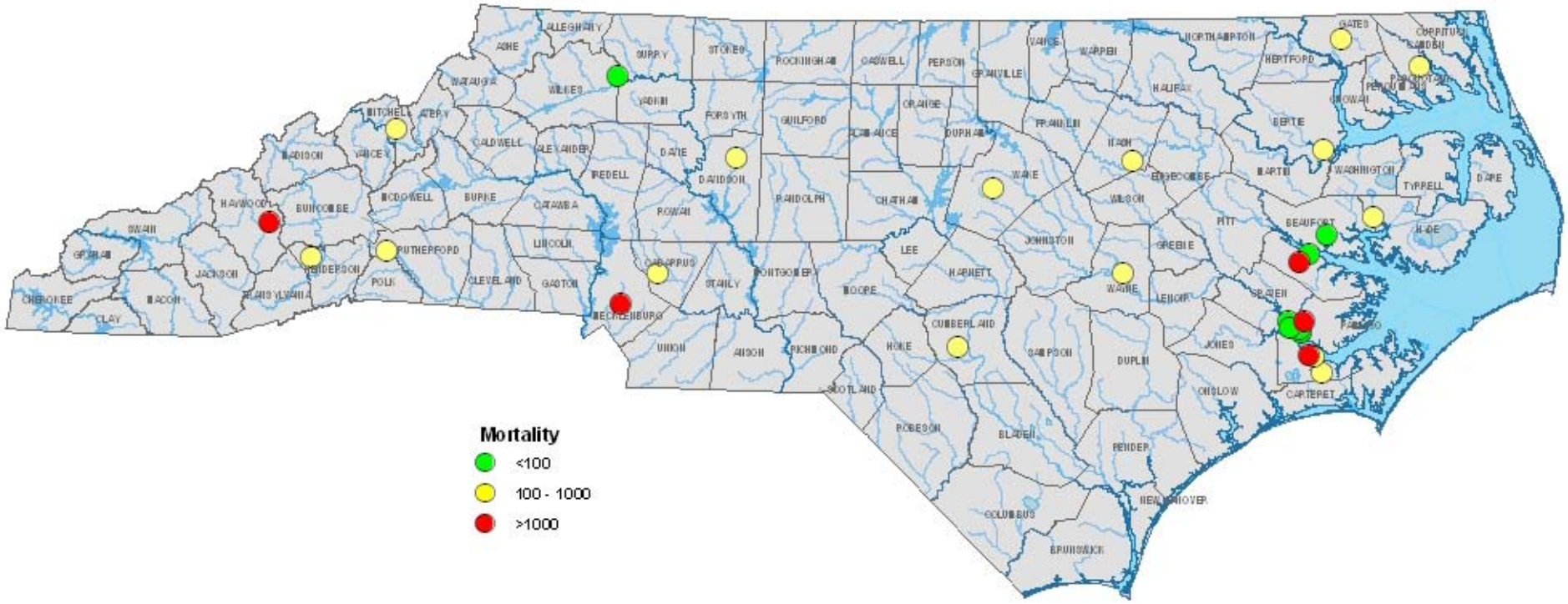
**2007 Fish Kill Event Summary**

Field investigators reported 27 fish kill events from March to October, 2007. Kill events were reported from coastal waters as far west as Haywood County. Kill activity was documented during the year in 10 of the state's 17 major river basins. The ESS records fish kill events when at least 25 fish are affected and the event is confirmed by trained investigators from regional offices and cooperating agencies.

The cumulative fish mortality for all 2007 reports was 137,285 individuals. This figure represents an increase over mortality reported in 2006 but remains far below the peak total reported in 2003 (3.5 million). Mortality counts for individual events ranged from 31 to 100,000. The majority of events were observed in fresh waterbodies, however, the bulk of the year's fish mortality was reported from events occurring in estuarine waters.

| | |
|---|---|
| • **Total Kill Events for 2007** | **27** |
| • **Freshwater Kills** | **18** |
| • **Estuarine Kills** | **9** |
| • **Cumulative Mortality for 2007** | **137,285** |
| ▪ ***Estuarine*** | ***107,185*** |
| ▪ ***Freshwater*** | ***30,100*** |
| • **Report Mortality Range** | **31 to 100,000** |
| • **River Basins with Activity** | **10 (of 17)** |

**Figure 1 : Fish Kill Events and Observed Mortality Reported to NCDWQ During 2007**



## Basin Activity

Investigators reported fish kill events in 10 of the state's 17 major river basins during 2007 (Figure 1, Table 1). Kill activity was most frequent in the Neuse Basin, with all but two of the events in the basin occurring within the lower watershed below New Bern. The lower Neuse, as well as the lower Pamlico estuary, have historically been plagued by adverse environmental factors such as low dissolved oxygen, high water temperatures, and fluctuating salinities. These factors have played a significant role in the frequency of events reported annually from the two areas. Activity in other river basins across the state remained relatively light or absent throughout the 2007 season. Since 1996, annual totals of statewide events peaked in 2001 with 77 reports, but have since decreased and remained relatively low over the last six years (Table 1).

**Table 1: Fish kill reports by basin, 1996 – 2007**

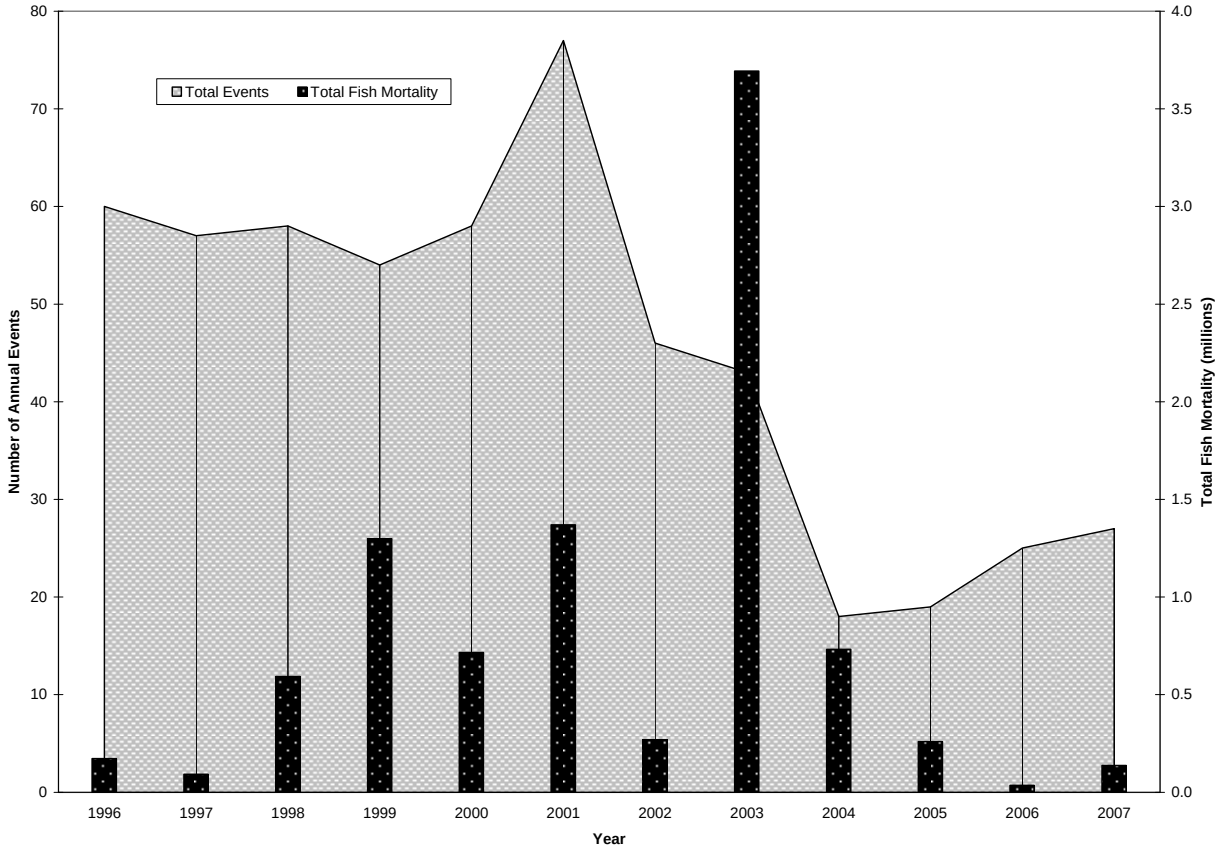
| | YEAR | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **River Basin** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **Basin Total** |
| Broad | None | None | None | 1 | None | None | None | None | None | None | 1 | 1 | **3** |
| Cape Fear | 21 | 16 | 23 | 14 | 12 | 5 | 8 | 3 | 1 | 2 | 5 | 1 | **111** |
| Catawba | None | 3 | 1 | 3 | 2 | 4 | 1 | None | None | None | 2 | 2 | **18** |
| Chowan | 2 | 2 | 1 | 1 | None | 1 | 2 | 2 | 1 | 1 | None | 1 | **14** |
| French Broad | None | 2 | 3 | 1 | None | None | 1 | 1 | None | None | None | 3 | **11** |
| Neuse | 14 | 12 | 8 | 16 | 23 | 37 | 9 | 21 | 8 | 9 | 10 | 10 | **177** |
| Lumber | 4 | 3 | 5 | None | 2 | None | None | 2 | 1 | 1 | 2 | None | **20** |
| Pasquotank | 10 | 2 | 8 | 2 | None | 1 | 6 | 2 | None | 2 | None | 1 | **34** |
| Roanoke | 2 | None | 1 | None | None | None | None | 2 | 1 | 1 | 2 | 1 | **10** |
| Tar/Pamlico | 3 | 6 | 5 | 11 | 14 | 23 | 8 | 6 | 2 | 1 | 2 | 5 | **86** |
| New/Watauga | None | None | None | 1 | None | None | None | 2 | None | None | None | None | **3** |
| White Oak | 3 | 3 | 1 | 3 | 3 | 3 | 3 | None | None | 1 | None | None | **20** |
| Yadkin | 1 | 10 | 2 | 1 | 2 | 3 | 8 | 2 | 3 | 1 | 1 | 2 | **36** |
| **Yearly Totals** | **60** | **59** | **58** | **54** | **58** | **77** | **46** | **43** | **17** | **19** | **25** | **27** | **543** |

***** *No fish kill reports have been received from the Hiwassee, Little Tennessee., and Savannah basins since 1996.*

## Fish Mortality

The 2007 season produced a fish mortality total of over 135,000 individuals reported in 27 events. (Figure 2). Reported events continued to increase from a low of 18 during 2004, however the 2007 mortality total is one of the lowest since reporting began in 1996 and far below the maximum of 3.6 million observed in 2003. Reports since 1996 have shown that the majority of the annual mortality is often the result of a few events. During 2007 nearly 75% of those fish reported killed were observed in just one event in the Pamlico River watershed near Blounts Bay.

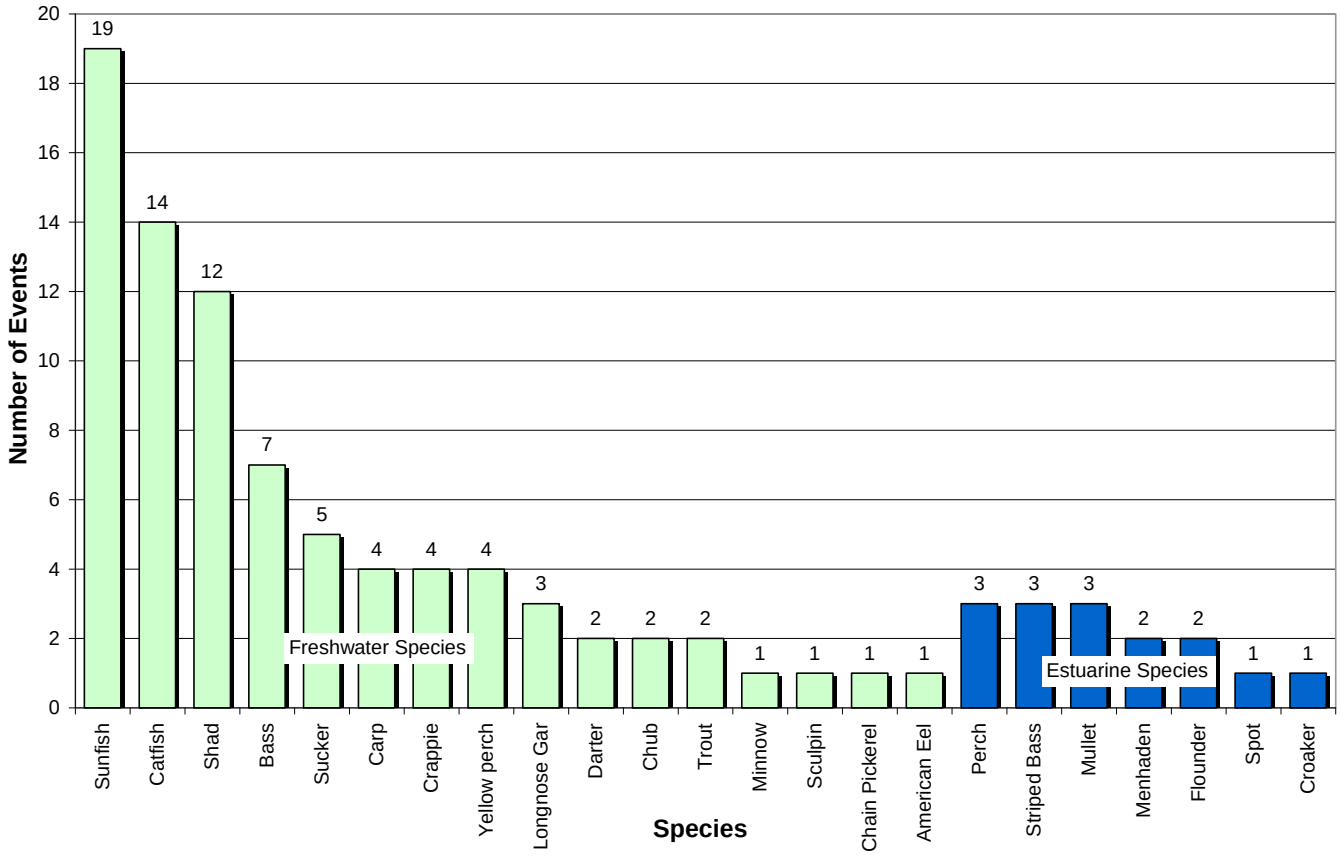
**Figure 2: Reported annual fish kill events and mortality, 1996 to 2007**




## Finfish and Other Species Reported

Fish kill events in 2007 involved over 23 different species of fish in both estuarine and freshwaters (Figure 3). Freshwater species were most frequently observed during investigations included sunfishes, catfish, and shad. Estuarine species most frequently reported included perch, striped bass and mullet and menhaden. Non-finfish species were observed in six events during 2007. These included amphibians, macroinvertebrates, crayfish, clams, and blue crab.

**Figure 3: Finfish observed during 2007 fish kill events**




## Suspected Causes of 2007 Events

Specific causes of fish kill events may or may not be obvious to investigators depending on a number of factors. Causes are often identified, but others remain unconfirmed or unclear due to an investigation occurring hours or days after the actual event. Kill events often result from many environmental factors, and sorting out the major reason(s) why a fish kill occurs is frequently a difficult and often subjective task. Investigators generally monitor environmental conditions surrounding an event and are encouraged to submit this information on reports along with observations regarding a suspected cause. This information aids in evaluating potential water quality trends and problems, and assists scientists and decision-makers with formulating future courses of action. Reported causes should not be viewed as a definitive label for a particular event.

Reported causes of 2006 kill events are listed in Table 2 in order of frequency. Those events where no specific causes could be determined were reported as “unknown”.

**Table 2: Major causes reported for 2007 fish kill events**

| Reported Cause | Number of Events |
|---|---|
| Dissolved Oxygen Depletion | 10 |
| Unknown | 9 |
| Spills | 5 |
| Bycatch | 3 |

*Dissolved Oxygen Depletion*: Low dissolved oxygen (DO) was cited as a factor in ten kill events during 2007. DO depletion was reported as a likely cause in two large estuarine events observed during the summer in the Pamlico and Neuse estuaries. Estuarine fish kills have historically been associated with upwelling of hypoxic water from the river bottom or a depletion of DO in warm shallow areas, especially during the season's warmest months. Low DO was also a factor in a large freshwater event on the Pigeon River (Haywood Co.) and was attributed to ongoing severe drought conditions throughout the state (see Notable Events).

U*nknown Causes*: Causes for kill events are reported as unknown when investigators fail to cite specific reasons for an event. Investigations may not provide definitive causes when they are conducted too long after an event and no clear factors are determined, or when causes are suspected but not confirmed. Investigations for such events yielded few clues and environmental conditions or water quality measurements were often reported as normal by the time personnel arrived on scene. Investigators failed to cite or confirm causes for nine of the year's events. Events with unknown causes were relatively small (<1000 fish) and occurred most frequently in freshwaters.

*Spills*: Toxic spills may deplete DO levels in receiving streams or induce kills outright through physical or chemical toxicity. During 2007 investigators reported five events where the release of toxic substances induced a fish kill. These substances included pesticides, bleach, sewage, and an industrial degreaser. Spill induced kills all occurred in freshwaters and mainly in the western counties of the state.

*Bycatch*: Discarded fish from nearby fishing activity was reported as a cause in three events during the year. All bycatch events were reported to be small (<200 fish) and were apparent from net marks or knife injuries visible on the fish carcasses.

*Algal Blooms*: Although evidence of algal blooms was noted during several investigations in 2007, no such activity was determined to be a direct factor in any of the year's kill events. Phytoplankton species associated with kills and identified by ESS staff included the dinoflagellates *Karlodinium, Peridiniella,* the chrysophyte *Paulinella,* the filamentous bluegreen *Cylindrospermopsis,* and the flagellated raphidophyte *Heterosigma*. It should be noted that the presence of these species alone does not infer toxicity or environmental concerns. These assemblages may be typical for the summer in the areas where observed. Algae and other phytoplankton begin to negatively affect

water quality when excessive growths impair aquatic systems through physical and chemical means.

ESS staff routinely examine water samples associated with kills for the presence of harmful species. Samples that contain significant amounts potentially harmful algae are often sent to research laboratories throughout the state. The Center for Applied Aquatic Ecology in Raleigh has the ability to examine samples under scanning electron microscopy. Laboratories at the University of North Carolina at Greensboro and the National Oceanic and Atmospheric Administration laboratory in Beaufort can examine samples with molecular probes. Laboratories at UNC-Chapel Hill and UNC-Wilmington provide valuable taxonomic expertise. Algal samples and results are collected, exchanged, and discussed between labs.

**Notable Events**

*Blounts Creek (Beaufort Co.), August*: Investigators recorded multiple species fish kill along a 2 mile stretch in the headwaters of Blounts Creek adjacent to the Cotton Patch Landing. Official total numbers were from 50,000-100,000 fish affected. The event coincided with a previous strong wind and rain event in the area. The storm event exhibited north winds up to 65 mph gusts, and large amounts of rainfall. Real-time data near Channel marker 5 indicated surface salinity changes from 12 % to 0 % coinciding with DO drop to zero and a water level increase of 5 feet in less than 12 hours. Low DO and a sudden drops in salinity were cited as factors in the event. The area near Blounts Creek was also the site for a major kill in 2006. A multispecies kill of was observed after a sudden drop in DO occurred following a period of hot, calm weather.

*Little Sugar Creek (Mecklenburg Co.), September:* The kill in the area around the Carolina Medical Center involved multiple species including catfish, and sunfish as well as amphibians. The mortality count for the event was reported at 15,000. Investigators reported a runoff of degreaser (Orange Tough 90 used to power wash concrete) into the storm drain system and Little Sugar Creek. The DWQ Mooresville Regional Office initiated an enforcement action against the responsible party.

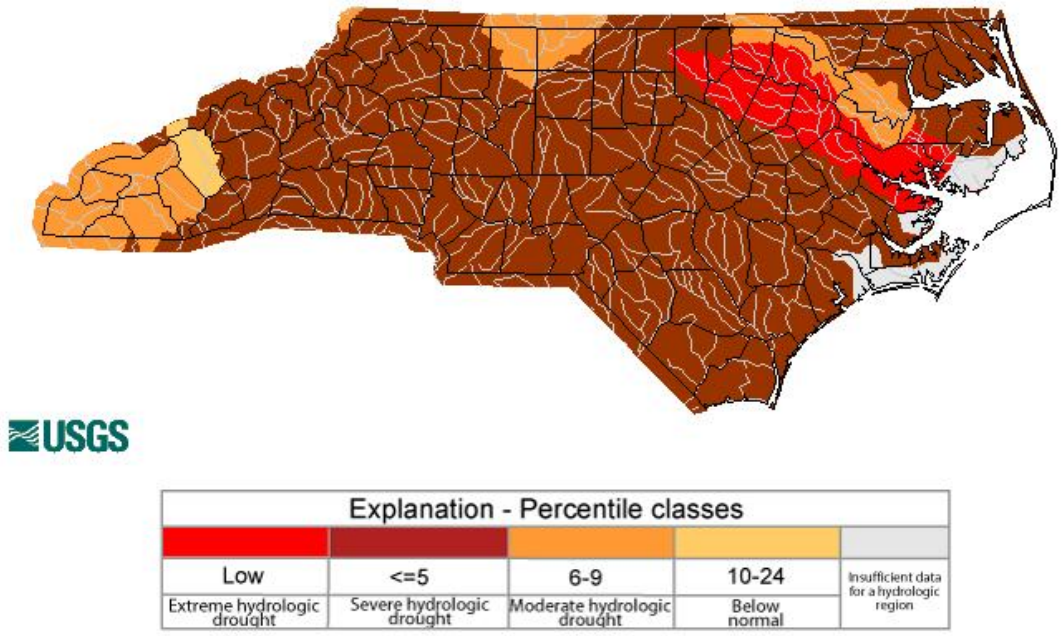
*Neuse River (Craven Co.), July:* A multispecies kill of over 6,600 individuals was observed for nearly a mile along the Neuse River near Carolina Pines. There was no indication of an algal bloom and no lesioned fish were observed. The fish kill appeared to have taken place approximately 12 hours prior to the investigation, coinciding with an observed upwelling event. DWQ staff review of water quality data from the nearby marker 11 water quality monitor indicated an upwelling event had occurred during the early morning hours. The upwelling event was characterized by a considerable decrease in DO and increase in salinity in surface water at the monitor location.

*South Fork Mills River (Henderson Co.), July*: Investigators suspected a kill of 1000 fish, mainly rainbow trout, was related to pesticide application in adjacent tomato fields. DWQ water samples showed the presence of Chlorothalonil in field runoff and samples collected from the river. The event occurred after heavy rain following pesticide

application. The event also had significant effects on the aquatic insect population. The affected area of the South Mills River supports a documented population of the federally listed Appalachian elktoe mussel (Alasmidonta raveneliana), an endangered species. A follow up survey conducted at the end of July indicated that all located mussels were in good condition.

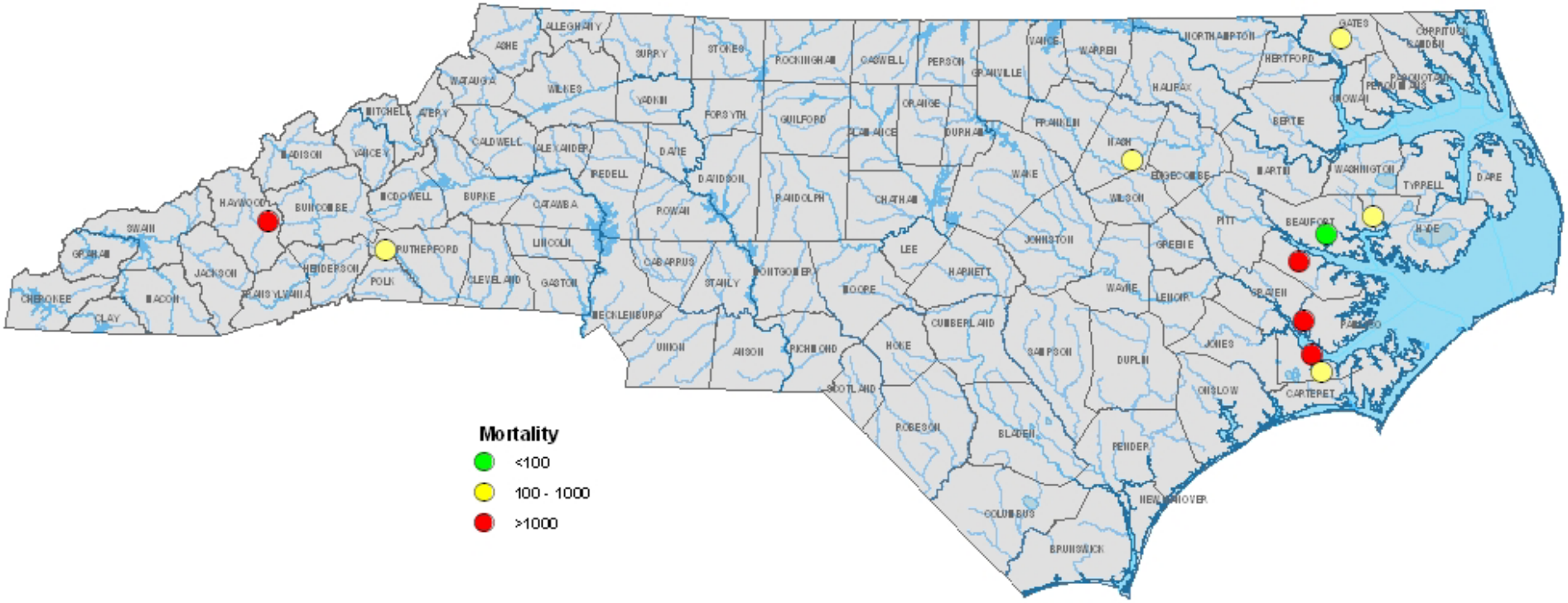
*2007 Drought Conditions:* North Carolina entered yet another period in 2007 marked by severe drought conditions statewide. During the course of the 2007 fish kill season the majority of monitored streams across the state reached severe to extreme hydrologic conditions, meaning they were at 5 percent or less than normal flow for that time of year (Figure 4, www.ncwater.org). Similar conditions were last observed across the state in 2002-2003 when streams reached 10 percent of normal flow.

**Figure 4: Below normal 7-day average streamflow compared to historical streamflow, November-December 2007**




Drought conditions were evident in nearly a third (10) of fish kill reports submitted by investigators during 2007 and may have been a factor in the year's largest events (Figure 5). Reports from the coastal areas of the state often mentioned low dissolved oxygen levels associated with low river flows and subsequent stagnation or sudden changes in DO and salinity following periods of low flow and calm weather. Coastal investigators also observed areas with high salinities due to the lack of freshwater inflow. Inland investigations revealed fish kills occurring simply from a lack of water where the absence of flow trapped fish without adequate oxygen levels.

**Figure 5: Drought related fish kill events reported to DWQ during 2007**



**2007 Summary**

Investigators reported fish kill events in 10 of the state's major river basins during 2007. In general, kill activity in basins across the state was light when compared to yearly activity reported since 1996. The number of fish kills reported during the year totaled 27, an increase from 2006 but a figure consistent with low totals reported for the last six years. Total fish mortality was reported near 130,000. This count is also slightly higher than the 2006 figure but remains well below the peak mortality figure reported in 2003.

Given the severe hydrologic conditions associated with the current drought, the modest number of kill events and associated fish mortality reported to DWQ for 2007 was unexpected. While drought conditions were observed over a majority of the state and suspected in nearly a third of the year's kills, including some of the largest events, they did not result in catastrophic die-offs throughout the state.

The frequency and intensity of fish kill activity over recent years remains relatively subdued compared to activity seen in the 1990's and into the early part of this decade. Reasons for the decrease remain unclear based on reported data. Results from investigations continue to suggest that a majority of North Carolina's annual kill activity (or lack thereof) may depend on crucial environmental conditions in key areas of the state, namely, the coastal basins and estuaries. Reports indicate that DO depletion continues to play a key role in the bulk of the state's kill activity. While occurring statewide in any given year, low DO levels are more common in coastal trouble spots such as the Neuse and Tar/Pamlico estuaries. Environmental conditions that determine DO levels in these areas (even in a drought year) may therefore be significant drivers of fish kill activity.

## Appendix: 2007 Fish Kill Events (by County)

**Total 2007 Fish Kills: 27**

**Total 2007 Fish Mortality: 137285**

| Date | Kill Number | Waterbody | Location | Mortality | Comments |
|---|---|---|---|---|---|
| **Beaufort** | | | | | |
| 5/29/2007 | WA07003 | Pamlico River | Crystal Beach | 31 | Upon investigation PRRT staff discovered over 30 badly decomposed mullet, bream and striped bass in a canal near the mouth of Nevil Creek and Crystal Beach Community Campground. Decomposition suggested these fish died during the weekend. This area sees large numbers of recreational fishermen, especially during memorial day weekend. Staff notice the bream heads were cut off. There were no net marks visible. Real-time data near the area showed some drops in dissolved oxygen, but none for a long period of time. PRRT staff agrees that these fish most likely died as a result of some aspect of recreational fishing. |
| 8/11/2007 | WA07009 | Blounts Creek | above Cotton Patch Landing | 100000 | Fish kill was reported by PTRF Riverkeep Heather Jacobs August 11th, 2007. PRRT's pager system was faulty and were not notified until August 13. On site, Riverkeeper 1st recorded multiple species fishkill along a 2 mile stretch in the headwaters of Blounts Creek adjacent to the Cotton Patch Landing. PTRF official total numbers were from 50,000-100,000. Their data indicated very low DO (2 mg/L) and salinities near 6%. PRRT staff arrived on scene 2 days later,August 13, approximately 10:45 a.m. Species affected included juvenile menhaden (80-200mm), striped bass (350 mm), shad, catfish (350 mm), mullet (300 mm), bluegill (200 mm), and perch (100mm). Water levels had dropped nearly 6-8 inches since the weekend. Fish were observed lying on shoreline banks. Count was not performed since most fish had decayed or were consumed within past days. PRRT transect data on August 13th showed salinities spanning from 3 % (headwaters) to 6 % (near Cotton Patch Landing). DO levels were from 3 mg/L (surface) to near 0 (bottom). An algae bloom was observed along the stretch of the kill area, however DO% saturation values were highest further upstream. Bloom samples were collected and sent to ESS for further evaluation. The kill event coincides with a previous strong wind and rain event in the area. The storm event exhibited north winds up to 65 mph gusts, and large amounts of rainfall. Real-time data near Channel marker 5 indicated surface salinity changes from 12 % to 0 % coinciding with DO drop to zero and a water level increase of 5 feet in less than 12 hours. These Northerly winds may have pushed waters levels up into Blounts Creek, while rainfall caused a pulse of freshwater in the system. Low DO and a sudden drops in salinity were cited as factors in the event . Water samples submitted to ESS showed a dense bloom of the raphidophyte flagellate Heterosigma. |
| 10/19/2007 | WA07016 | Tankard Creek | at Hunter's Bridge | 60 | The Pamlico Rapid Response Team investigated a fish kill that occurred in the headwaters of Bath creek (Tankard creek) on Friday October 19th. The kill extended 1.2 miles up Tankard creek from Bath creek. The fish, mostly freshwater, averaged 150 mm in length, consisted of catfish, crappie, perch, bluegill, and sunfish. Some of these fish were partially eaten and appeared to be at least 48 hours old. No lesions were observed. Chlorophyll A, nutrient and phytoplankton samples were taken in the kill area, as a remnant algal bloom surface film was evident. The current drought conditions most likely created higher salinity conditions (12-14 ppt) than typically observed in this area. Saltwater stress and low dissolved oxygen readings (0.8 mg/l surface and 0.5 mg/l bottom) combined to create stressful conditions for these resident freshwater fish. Water samples indicated there was a bloom of the dinoflagellates Karlodinium and Peridiniella at the site. Both algal taxa are common in the state's coastal estuarine rivers. Karlodinium is known to produce toxins but it is not known to kill fish in the open waters of North Carolina. |
| | | | | | **Total Kills for County: 3** **Total Mortality for County: 100091** |

| Date | Kill Number | Waterbody | Location | Mortality | Comments |
|---|---|---|---|---|---|
| **Bertie** | | | | | |
| 5/29/2007 | WA07004 | Private Pond | near Sans Souci | 500 | Upon investigation PRRT staff discovered several homeowners that have routinely dumped in copper sulfate in the pond for years to kill algae. This year the owners also noticed emergent, floating duckweed (lemna spp) and considered it to be a nuisance plant and were further considering eradicating it. PRRT staff pressed no dumping of herbicides into the pond since there is no natural outlet except evaporation. PRRT also suggested the owners consult with their local Agricultural Extension County Agency to document and clarify appropriate measure of herbicidal application. Over 500 fish species were killed, most likely as a result of chemical and biological oxygen demand increasing and ultimately diminishing any available dissolved oxygen. |
| | | | | | **Total Kills for County: 1 Total Mortality for County: 500** |
| **Cabarrus** | | | | | |
| 9/24/2007 | MO07003 | Coddle Creek | Near Concord | 150 | DWQ/MRO was not notified of the fish kill until 9/24/2007 at 10:43 a.m, (almost three days later). Instream dissolved oxygen (DO) and total residual chlorine (TRC) levels were measured by DWQ-MRO staff. TRC levels ranged from 66 ug/l (upstream of the PVC pipe) to 88 ug/I (directly below the location where the kids were playing and the majority of the dead fish were observed). In addition, DWQ-MRO staff did not detect any "bleach" odors. The instream DO levels ranged from 5.71 mg/l (same upstream TRC sampling site) to 5.9 mg/l (same downstream TRC sampling site). DWQIMRO staff performed a site inspection at the facility that owned the irrigation pipe. The facility was a pool chemical supplier with bulk sodium hypochlorite and sulfuric acid storage tanks (inside the building). A stormwater drain was observed at the loading/unloading area for these chemicals. The concrete driveway (adjacent to the stormwater drain) exhibited evidence of previous discharges/spills. Strong odors of sodium hypochlorite were detected in the stormwater drainage ditch (from the loading dock area) that discharges directly to Coddle Creek. The substrate in Coddle Creek adjacent to the outlet of the stormwater drainage ditch appeared dark red of unknown origin and was only observed in this immediate area of the creek. In addition, the soil throughout the stormwater drainage ditch was still damp from the previous discharges. Note: No discharges were observed to Coddle Creek by DWQIMRO staff during this site investigation. This Office will perform a follow-up inspection at this facility to ensure corrective actions have been incorporated. |
| | | | | | **Total Kills for County: 1 Total Mortality for County: 150** |

| Date | Kill Number | Waterbody | Location | Mortality | Comments |
|---|---|---|---|---|---|
| **Craven** | | | | | |
| 7/20/2007 | WA07006 | Neuse River | Carolina Pines | 6600 | The investigation was prompted by NRRT staff review of water quality data from the channel marker 11 real-time water quality monitor. Data from the channel marker 11 monitor indicated an upwelling event had occurred during the early morning hours. The upwelling event was characterized by a considerable decrease in dissolved oxygen (DO) and increase in salinity in surface water at the monitor location. The observed drop in DO (down to 0.7 mg/L) created hypoxic conditions favorable for a fish kill. NRRT staff discovered the fish kill upon arrival to the Carolina Pines area at approximately 09:30. The fish kill extended approximately 3/4 of a mile and included spot, croaker, menhaden, silver perch, trout, flounder and needlefish. Team members estimated 6,666 fish were killed during the event. There was no indication of an algal bloom and no lesioned fish were observed. The fish kill appeared to have taken place approximately 12 hours prior to NRRT arrival, coinciding with the observed upwelling event. Physical parameters were measured with a Hydrolab MS-5 equipped with an optical DO probe. Additionally, water quality samples, including phytoplankton, nutrients, and chlorophyll, were collected during the investigation. Measured DO concentrations were 7.1 mg/L at the surface and multiple species of fish were observed swimming in the vicinity of the fish kill during the investigation. Data from the Carolina Pines NCSU real time water quality monitor was utilized by NRRT staff following the onsite fish kill investigation to corroborate data from the channel marker 11 real time water quality monitor. Samples showed algal assemblages typical for summer and resembles the Neuse River samples collected earlier in the month during the ambient monitoring run. The dominant taxa were the flagellated chrysophyte Paulinella, the filamentous bluegreen Cylindrospermopsis, and the flagellated raphidophyte Heterosigma. |
| 7/23/2007 | WA07007 | Private Pond | near Fairfield Harbor | 52 | The groundskeeper at Fairfield Harbor contacted the Neuse River Rapid Response Team (NRRT) on July 23, 2007 regarding a fish kill in a private pond located at Fairfield Harbor. NRRT staff responded and counted 42 dead fish ranging in size from approximately 8" to 24". The fish kill consisted of multiple freshwater species including gizzard shad, grass carp, bluegill bream, yellow perch, largemouth bass, channel catfish, and american eel. During the investigation, pond water was blue/green in color and cloudy. Physical parameters were measured and did not indicate an algal bloom was in progress. Water samples were also collected for phytoplankton, chlorophyll, and nutrients. Fish appeared to have been dead at least 48 hours. It was difficult to establish the reason for the fish kill due to the state of decomposition and time lapse between the kill and the investigation. |
| 7/29/2007 | WA07008 | Fairfield Harbor Canals | | 98 | Mr. Mark Klipinger, resident of Fairfield Harbor, reported a fish kill on July 29, 2007 in the canal system at Fairfield Harbor. NRRT staff responded and counted 98 dead fish ranging in size from approximately 8" to 24". The fish kill consisted of three freshwater species; channel catfish (accounting for 91 of 98 dead fish), bream, and yellow perch. Dead fish associated with this fish kill were observed throughout the canal system although the majority were located in the northwest portion of the canal system (winds were out of the Southeast). Several species of estuarine fish were observed swimming in the canals during the investigation. Physical parameters were measured and did not indicate an algal bloom was in progress. Water samples were also collected for phytoplankton, chlorophyll, and nutrients. Fish appeared to have been dead at least 48 hours as evidenced by the state of decomposition. The algal assemblage in water samples was typical for the lower Neuse River during summer. The dominant algal groups were small chrysophyte flagellates, chain forming diatoms (Aulocoseira, Chaetoceros), and dinoflagellates (Karlodinium, Scrippsiella). |

| Date | Kill Number | Waterbody | Location | Mortality | Comments |
|---|---|---|---|---|---|
| 8/13/2007 | WA07014 | Hancock Creek | above Cherry Point MCAS | 118 | The Neuse River Rapid Response Team received a report of a fishkill at the headwaters of Hancock Creek on Monday August 13, 2007. Upon investigation, team staff found 118 dead catfish and panfish in an area encompassing approximately 0.6 river miles. Fish appeared to be 48-72 hours old and highly decomposed. At the time of investigation, dissolved oxygen (DO) concentrations were low, measuring 1.0 mg/L at the surface and 0.2mg/L at 1 meter bottom depth while salinity was relatively high, measuring 4.7 ppt at the surface and 11.7 ppt at 1 meter bottom depth. Water color and clarity were indicative of an algae bloom although pH and DO measurements were not characteristic of an active bloom at the time of investigation. Weather may have contributed to this fish kill event as a period of strong north winds and heavy rains coincided with the estimated time of the fish kill. Physical measurements recorded at the real-time water quality monitor at Channel Marker 9 indicated an increase in water level that would likely have created a rise in salinity in the headwaters of Hancock Creek. High salinity combined with low DO concentrations and high water temperatures provided stressful conditions that likely led to the fish kill. |
| 8/23/2007 | WA07010 | Neuse River | Marker 38 | 59 | During routine maintenance of the Neuse River CM38 continuous water quality monitors, Mr. Maverick Raber of the NRRT observed dead gar in the vicinity. Upon completion of maintenance activities, Mr. Raber and Mr. Ryan Rassmussen of the USGS investigated the area and discovered a total of 59 dead fish, primarily longnose gar, that had been dead 24-48 hours. Conditions at the CM38 water quality monitors did not indicate the presence of an algal bloom and several species of fish were observed swimming in the area. The kill area covered approximately 0.75 river miles. |
| 8/30/2007 | WA07012 | Neuse River | Hwy 70 Bridge | 36 | While commuting from the CM9 to CM38 continuous water quality monitors, Mr. Maverick Raber of the NRRT and Mr. Ryan Rasmussen of the USGS observed a total of 33 dead gizzard shad and 3 dead longnose gar just downstream of the Highway 70 Bridge in the Neuse River. Fish had been dead approximately 24 hours as noted by the state of degradation. The fish kill appeared to be the result of net fishing activities as net marks were observed on several of the fish. |
| 9/3/2007 | WA07013 | Upper Broad Creek | near Lee's Landing | 2200 | Live fish observed in the fish kill area appeared lethargic and a few may have been dying. None of the fish observed in the fish kill had lesions. Algal bloom samples were collected in the area of the fish kill although there were no signs of an active bloom. Recent drought conditions combined with strong northeast winds during the previous few days has resulted in relatively high salinity concentrations in the headwaters of Broad Creek. The drought has caused higher salinity waters to move farther upstream than normal. The northeast winds created a wind-generated tide that "pushed" higher salinity waters even farther upstream. NRRT team staff measured salinities in the fish kill area as high as 13 ppt, or nearly half the strength of sea water. Additionally, measured dissolved oxygen concentrations in the fish kill area were low, ranging from 0.4 mg/L to 1.6 mg/L. High salinity concentrations combined with low DO concentrations created highly stressful conditions to freshwater fish species and are the likely cause of this fish kill event. |
| 10/23/2007 | WA07015 | Slocum Creek | near mouth | 183 | The Neuse Rapid Response Team (NRRT) responded to a report of several dead longnose gar and other species in a pile at the mouth of Slocum Creek on October 23, 2007. Upon investigation, NRRT staff counted 183 dead fish, primarily longnose gar. The fish were located above the high water mark on a 15 square meter area of beach and appeared to have been dead less than 24 hours. This fish kill is apparently the result of gill net fishing activities as net marks were apparent on several fish. Several gill nets were observed set just outside the mouth of Slocum Creek on the Neuse River. Water quality samples were not collected for this fish kill event. |

**Total Kills for County: 8** **Total Mortality for County: 9346**

| Date | Kill Number | Waterbody | Location | Mortality | Comments |
|---|---|---|---|---|---|
| **Cumberland** | | | | | |
| 7/10/2007 | FA07001 | Private Pond | Fayetteville | 105 | Kill appeared to be due to oxygen depletion due to turnover of water column. Upon talking with landowner, it was noted that he thought the kill began after a hard rain approximately a week ago. DO was 5.3 on shallow side of pond and 3.5 on deeper side. He indicated at first that he thought the kill was due to herbicide application nearby that occured approximately a month ago. Pond was uphill of herbicide application site so it is not believed to be the cause. Live fish, turtles, and frogs were seen still alive in the pond. |
| | | | | | **Total Kills for County: 1** **Total Mortality for County: 105** |
| **Davidson** | | | | | |
| 8/1/2007 | WS07001 | Lake Tom-A-Lex | near Thomasville | 225 | Fish had no signs of disease, no visible parasites, sores, tumors, etc. Two fish that were still alive were floating belly-up. Investigators did not see anything to indicate there was anything dumped. Water described as pea green, possible algal bloom. |
| | | | | | **Total Kills for County: 1** **Total Mortality for County: 225** |
| **Gates** | | | | | |
| 6/8/2007 | WA07005 | Bennetts Creek | below Merchants Millpond | 400 | Low dissolved oxygen was cited as the cause and most likely due to the ambient conditions of low water, high air and water temperatures and presence of a dense mat of duckweed. During low water conditions, pools below millponds are subject to these fish kills. Nearby bridge project possibly contributed to the situation. |
| | | | | | **Total Kills for County: 1** **Total Mortality for County: 400** |
| **Haywood** | | | | | |
| 9/7/2007 | AS07004 | Pigeon River | below Canton | 8000 | Kill event attributed to low flow/DO and high water temperatures brought on by ongoing drought conditions. Investigators observed numerous live fish during the investigation. |
| | | | | | **Total Kills for County: 1** **Total Mortality for County: 8000** |
| **Henderson** | | | | | |
| 7/27/2007 | AS07003 | S.Fork Mills River | near Mills River | 1000 | Investigators suspected event was related to pesticide application in adjacent tomato fields. DWQ water samples showed the presence of Chlorothalonil in field runoff and samples collected from the river. The event occurred after heavy rain following pesticide application. Majority of affected fish were identified as rainbow trout. Event also had significant effects on the aquatic insect population. This area of the South Mills River supports a documented population of the federally listed Appalachian elktoe mussel (Alasmidonta raveneliana), an endangered species. A follow up survey conducted on July 29 indicated that all located mussels were in good condition. |
| | | | | | **Total Kills for County: 1** **Total Mortality for County: 1000** |

| Date | Kill Number | Waterbody | Location | Mortality | Comments |
|---|---|---|---|---|---|
| **Hyde** | | | | | |
| 8/25/2007 | WA07011 | Pungo River Canal | above Leachville | 778 | PRRT staff responded August 25th. A fisherman noticed dead catfish along the Pungo River August 24th. The fish kill began north of the Leechville Bridge near the confluence of Herring Run and extended approximately 3.5 miles to where the Piney Grove Landing area connects with the Pungo Canal. Over 778 catfish were counted. Sizes ranged from 100 to 250 mm in length. These fish were estimated from 24-48 hours old. No obvious lesions were observed. Staff observed heavy organic algal film along the surfacewaters over several miles although there was no indication of an algal bloom at present. Physical water quality data closest to the upstream portion of the kill indicated salinities from 4 to 5 parts per thousand from the surface to the bottom with DO values from 4 to 1 mg/L top to bottom respectively. Downstream data seemed to be more homogeneous with consistent salinities of 5 ppt and and DO values of 3 mg/L. This area had periods of heavy rainfall on August 22nd. The cause of this fishkill may have been a combination of previous algal bloom activity, low DO, and sudden pulses of rainfall into the system. **Total Kills for County: 1 Total Mortality for County: 778** |
| **Mecklenburg** | | | | | |
| 7/25/2007 | MO07001 | Stewarts Creek | Lawton Road, Charlotte | 40 | Fishkill due to sanitary sewer overflow from industrial property. Overflow reached Stewarts Creek. Overflow contained at least one type of dye with colored the water purple/blue. The overflow was stopped at the time MCWQP arrived at the site around 9:00am and may have been ongoing for some time before 8:00am. The event occurred at 701 Lawton Road in Charlotte NC. |
| 9/1/2007 | MO07002 | Little Sugar Creek | Charlotte | 15000 | Kill event caused by runoff of degreaser (Orange Tough 90) used to powerwash concrete areas at Carolina Medical Center in Charlotte. Product was entering the storm drain system and discharging into Little Sugar Creek. Degreaser had been applied for 11 hours beginning at 10:00 PM on 8/31/07. Enforcement action initiated by DWQ Mooresville office. **Total Kills for County: 2 Total Mortality for County: 15040** |
| **Mitchell** | | | | | |
| 5/1/2007 | AS07001 | Whiteoak Creek | near Bakersville | 250 | Sediment pesticide sample (organochlorine, organophosphorus, nitrogen) collected at most upstream site on White Oak Creek where dead fish observed. Pesticide sample collected due to Christmas Tree farm in the watershed. **Total Kills for County: 1 Total Mortality for County: 250** |
| **Nash** | | | | | |
| 9/17/2007 | RA07002 | Tar River Reservior | Sapony Creek Arm | 500 | The drought conditions were severe in this area and played a significant role in this fish kill. The Sapony Creek arm of the Reservior is stocked in the fall-winter yearly with fish. It would be unlikely that the water body could support fish life anytime in the near future, as the Reservior is almost completely dry with little to no moving water. An algal bloom may have occurred during the low flow conditions, worsening the situation. Possible sources of agricultural chemicals and nutrients are in the area, as many farms surround the Sapony Creek, but no evidence suggest this was a primary cause of the fish kill. **Total Kills for County: 1 Total Mortality for County: 500** |

| Date | Kill Number | Waterbody | Location | Mortality | Comments |
|---|---|---|---|---|---|
| **Pasquotank** | | | | | |
| 5/2/2007 | WA07002 | Knobs Creek | Elizabeth City | 100 | Low DO observed at time of investigation. Staff walked upstream of event taking hydrolab data. These data indicate DO levels increasing slightly, but the waters remained turbid and whitish in color. Further observation upstream indicated two prongs of this stream that split off. One prong was piped to the other side of highway 17 and seemed to have no riparian buffer and the other prong paralleled US 17 and had some buffer, although this stream 'ended' at a retention pond from Lowe's parking lot. This area is heavily urbanized. Water samples did not indicate algal bloom according to ESS staff. |
| | | | | | **Total Kills for County: 1 Total Mortality for County: 100** |
| **Rutherford** | | | | | |
| 8/29/2007 | AS07002 | Broad River | Below Lake Lure Dam | 100 | Kill was attributed to a dissolved oxygen sag below the Lake Lure dam. Event occurred following several weeks of drought conditions, hot weather and low flow. The event involved mostly suckers up to 12 inches in length. The event was first reported in the evening hours of 8/28/07. |
| | | | | | **Total Kills for County: 1 Total Mortality for County: 100** |
| **Wake** | | | | | |
| 3/26/2007 | RA07001 | Walnut Creek | Lake Johnson | 600 | Gizzard Shad kill throughout the entire lake. No other species noted. Park personnel stated water temps had risen significantly over the last few days (from 12.2 degrees C to 16.6 degrees C.) Water Temp was 18.7 degrees C at the time of investigation. |
| | | | | | **Total Kills for County: 1 Total Mortality for County: 600** |
| **Wayne** | | | | | |
| 4/24/2007 | WA07001 | Long Branch | Goldsboro | 100 | Approximately 100 fish were found piled on a hill by PRRT staff on April 24th, adjacent to the pond shoreline. These fish were mainly gizzard shad less than 20 cm in length with no visible sores or lesions. Residents revealed some bass that died and were collected and dumped on the side of the pond that was not observed by PRRT staff. The pond was around 2 acres and was apparently dug to serve as stormwater retention when the adjacent condominiums were built over 20 years ago. The pond receives baseflow in from Long Branch, which drains the southern portion of the city of goldsboro and discharges to Stoney Creek. The cause of the kill could be due to several factors. Pond overturn and strong temperature variations may have stressed resident fish. Nutrient inputs from previous northeaster may have also caused algal blooms, as instruments revealed very high DO % saturation values downstream towards the widest portion of the pond. The homeowner's association meeting indicated previous fish kills in the past and new construction is slated adjacent to the pond shoreline in the next few months. This information is being forward to SWPS' Chris Pullinger for further investigation of potential buffer violations. |
| | | | | | **Total Kills for County: 1 Total Mortality for County: 100** |