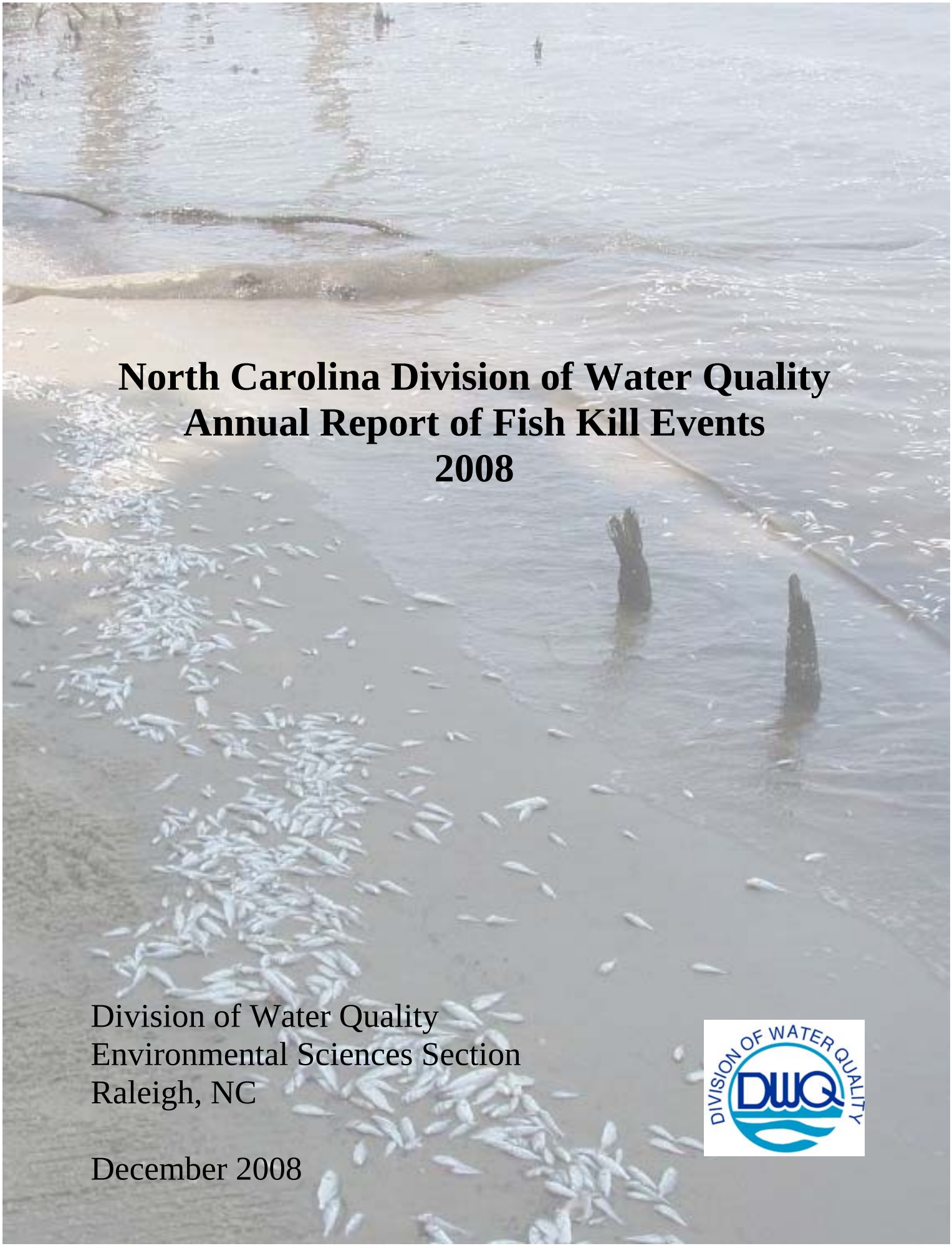


North Carolina Division of Water Quality
Annual Report of Fish Kill Events
2008

Division of Water Quality
Environmental Sciences Section
Raleigh, NC

December 2008

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. Kill reports for the current year are now available in a new interactive format using Google Earth software. The new format provides better visual representations of current fish kill activity across the state and allows the user more control in the visualization process. The following report will also be available at the ESS website after submittal.

This document is a summary of fish kill events reported to the DWQ from January to early December, 2008. The report is mandated under Section 4 of Chapter 633 of the 1995 North Carolina General Assembly Session Laws.

2008 Fish Kill Event Summary

Field investigators reported 61 fish kill events from January to December, 2008 (Figure 1). Kill events were reported from coastal waters and westward across the state to Transylvania County. Kill activity was documented during the year in 8 of the state's 17 major river basins with the heaviest activity occurring in the lower Neuse and Tar/Pamlico basins (Figure 2). 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 2008 reports was 7,554,458 individuals. This figure represents a sharp increase over mortality reported in the previous four years and is the highest total for the state since DWQ protocols were implemented in 1996. Mortality totals for individual events in 2008 ranged from 25 to over 3.9 million. Fresh and estuarine waters experienced near equal number of events, however, the bulk of the year's fish mortality was reported from events occurring in estuarine systems.

• **Total Kill Events for 2008**	**61**
• **Freshwater Kills**	**29**
• **Estuarine Kills**	**30**
• **Ocean Kills**	**2**
• **Cumulative Mortality for 2008**	**7,554,458**
▪ ***Estuarine Mortality***	***7,380,580***
▪ ***Freshwater Mortality***	***173,678***
• **Report Mortality Range**	**25 to 3,969,520**
• **River Basins with Kill Activity**	**8 (of 17)**

Figure 1 : Fish kill events and observed mortality reported to NCDWQ during 2008

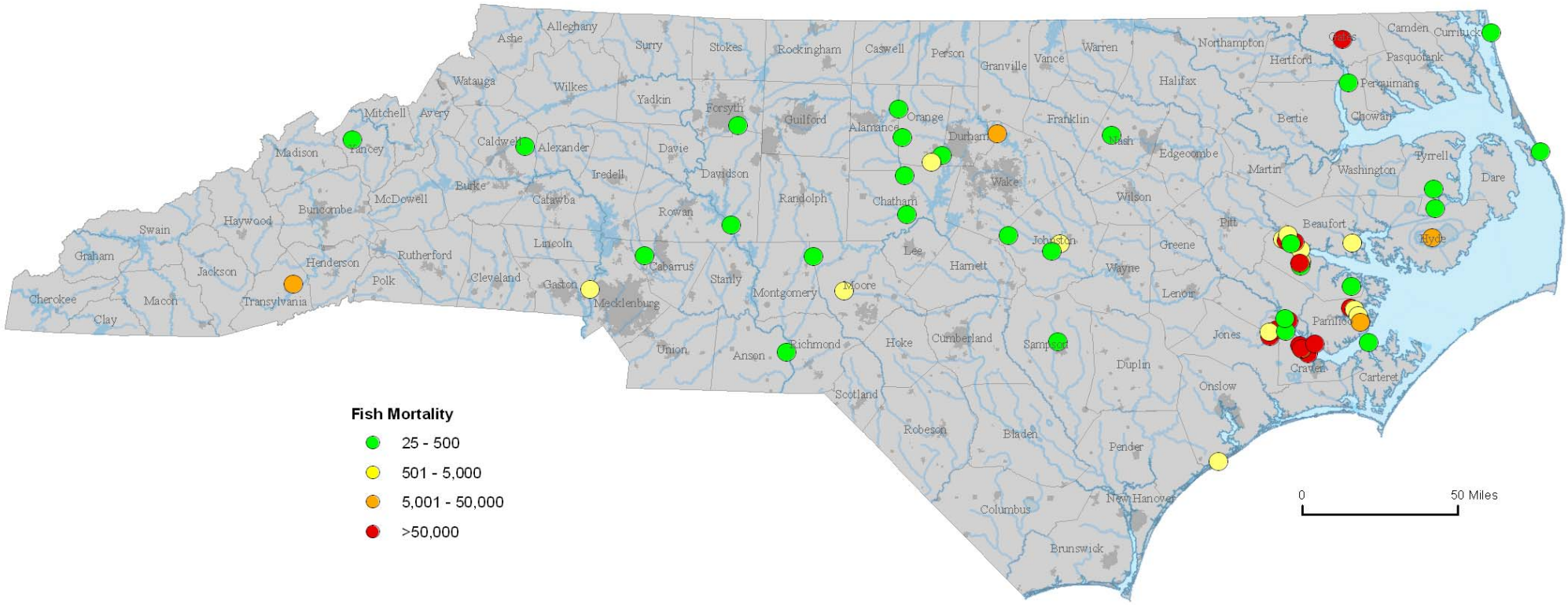
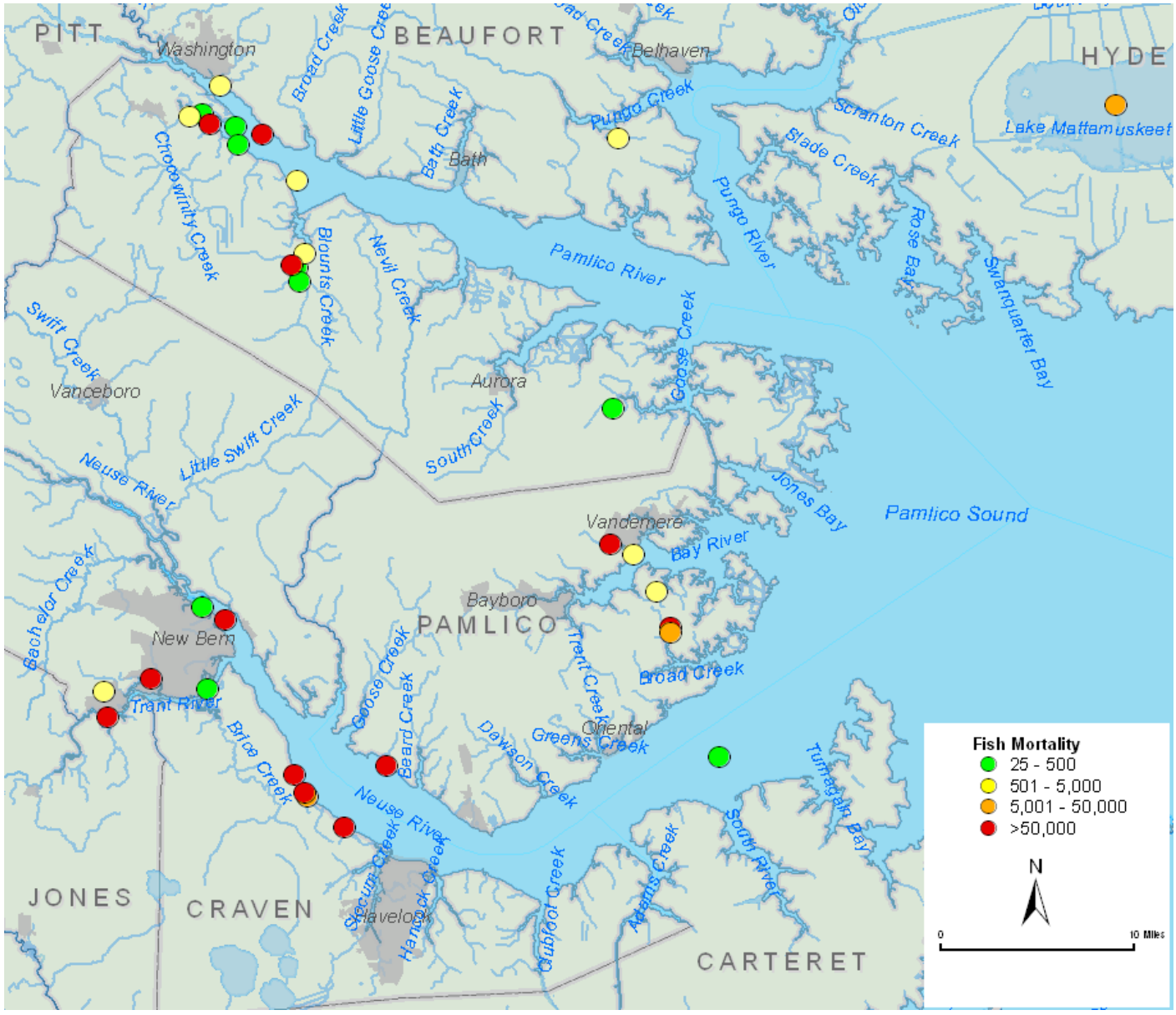


Figure 2 : Fish kill events and observed mortality reported to NCDWQ during 2008 – LowerTar/Pamlico and Neuse River detail



Basin Activity

Investigators reported fish kill events in 8 of the state's 17 major river basins during th 2008 season (Figure 1, Table 1). Kill activity was most frequent in the Neuse Basin, a trend that has continued nearly every year since systematic reporting was implemented in 1996. Frequent kill activity was also reported in the Tar/Pamlico and Cape Fear basins. 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 2008 season. Since 1996, the annual total of statewide events peaked in 2001 with 77 reports, then decreased to relatively low numbers through 2007. The annual total for 2008 represents another sharp increase in the number of reported events and a return to the range of totals reported prior to 2001 (Table 1, Figure 3).

Table 1: Fish kill reports by basin, 1996 – 2008

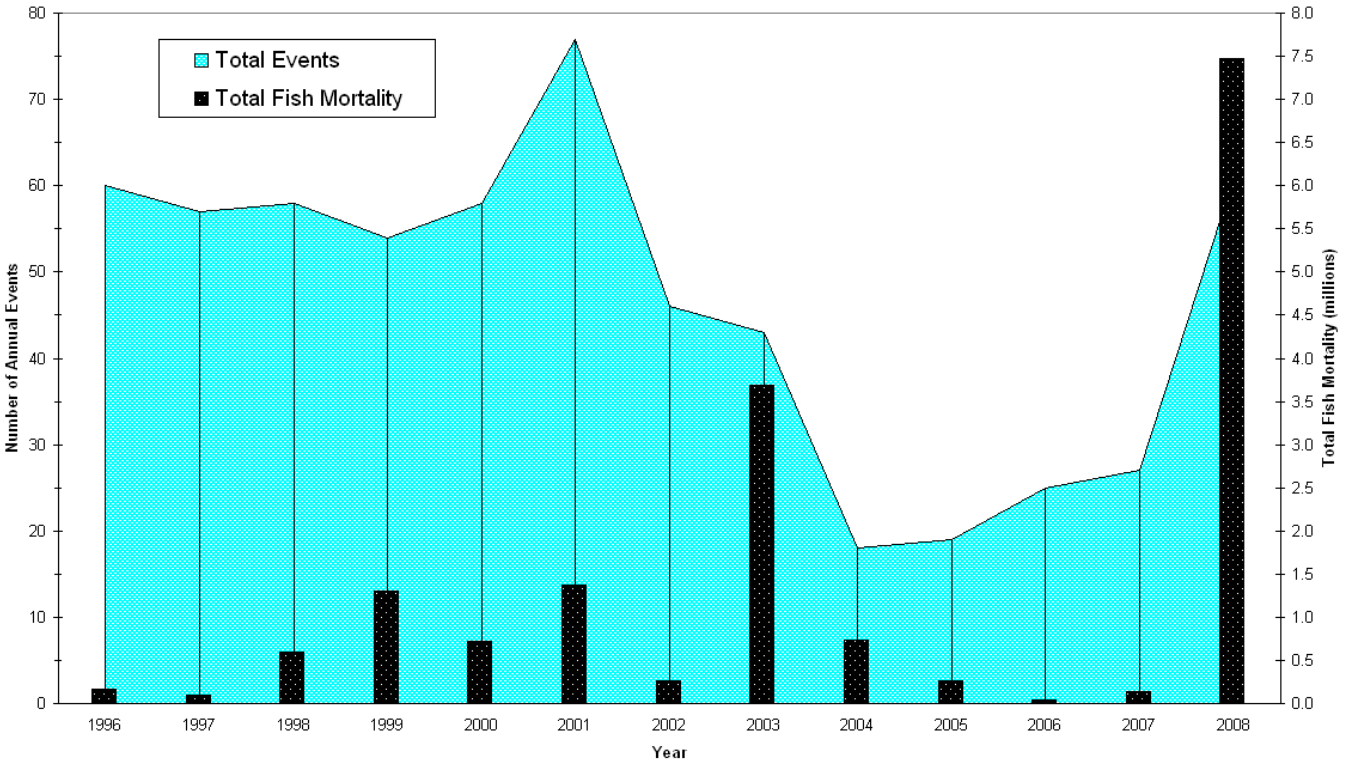
Year	Broad	Cape Fear	Catawba	Chowan	French Broad	Neuse	Lumber	Pasquotank	Roanoke	Tar/Pamlico	New/Watauga	White Oak	Yadkin	Annual Totals
1996	None	21	None	2	None	14	4	10	2	3	None	3	1	**60**
1997	None	16	3	2	2	12	3	2	None	6	None	3	10	**59**
1998	None	23	1	1	3	8	5	8	1	5	None	1	2	**58**
1999	1	14	3	1	1	16	None	2	None	11	1	3	1	**54**
2000	None	12	2	None	None	23	2	None	None	14	None	3	2	**58**
2001	None	5	4	1	None	37	None	1	None	23	None	3	3	**77**
2002	None	8	1	2	1	9	None	6	None	8	None	3	8	**46**
2003	None	3	None	2	1	21	2	2	2	6	2	None	2	**43**
2004	None	1	None	1	None	8	1	None	1	2	None	None	3	**17**
2005	None	2	None	1	None	9	1	2	1	1	None	1	1	**19**
2006	1	5	2	None	None	10	2	None	2	2	None	None	1	**25**
2007	1	1	2	1	3	10	None	1	1	5	None	None	2	**27**
2008	None	10	2	2	2	21	None	4	None	16	None	None	4	**61**
Total	**3**	**121**	**20**	**16**	**13**	**198**	**20**	**38**	**10**	**102**	**3**	**20**	**40**	**604**

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

Fish Mortality

The 2008 season produced a fish mortality total of over 7.5 million individuals. (Figure 3). The 2008 total is the highest since reporting began in 1996 and represents a sharp increase from mortality figures reported during the previous four years. As has been the case in prior years, the majority of the annual mortality for 2008 was reported from a few events located in estuarine waterbodies. Just four events in the lower Neuse and Tar/Pamlico basins produced over 80 percent of the year's total.

Figure 3: Reported annual fish kill events and mortality, 1996 to 2008



Finfish and Other Species Reported

Fish kill events in 2008 involved at least 44 species of fish in estuarine and freshwaters (Figures 4 and 5). Estuarine species most frequently reported included Atlantic menhaden, spot, flounder and croaker. Freshwater species most frequently observed included sunfishes, shad, catfish, and largemouth bass. Atlantic menhaden and sunfish were also reported in greater numbers than other species in addition to frequency.

Non-finfish species were observed at ten events during 2008. These included blue crab, shrimp, mussels, clams, snails, and water snakes. The failure of the Burnsville wastewater treatment plant in April was a factor in a die-off of the Appalachian elktoe mussel (a federal endangered species) in a section of the Cane River (Yancey Co).

Historically, the frequency and numbers of non-finfish species reported in association with fish kills has remained relatively low.

Figure 4: Estuarine/Ocean finfish and frequencies observed during 2008 fish kill events

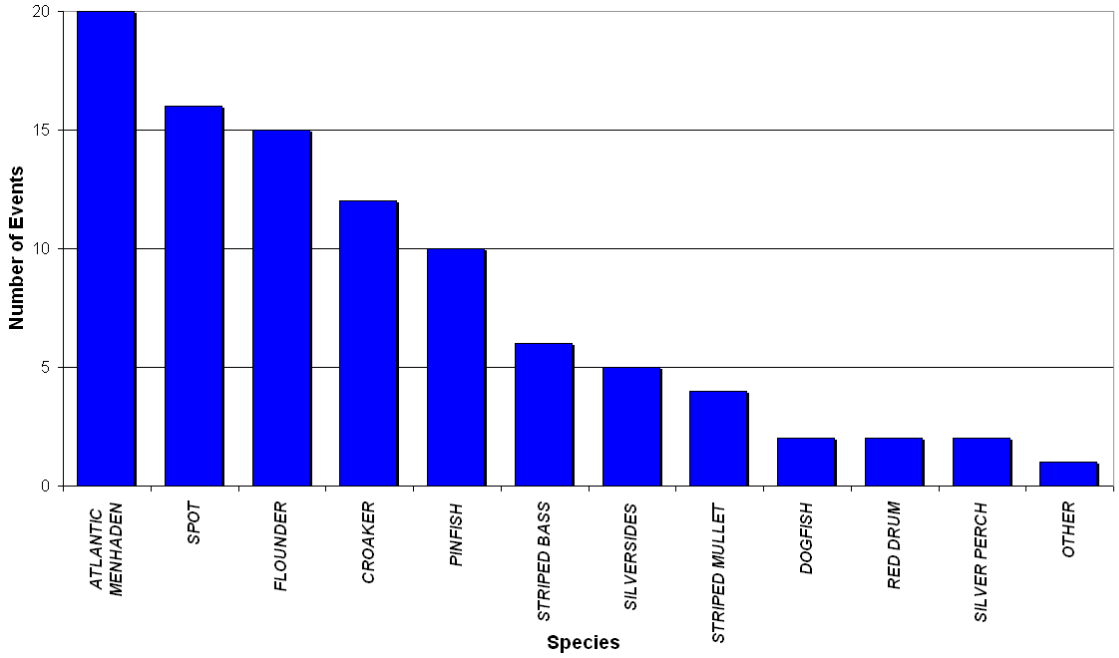
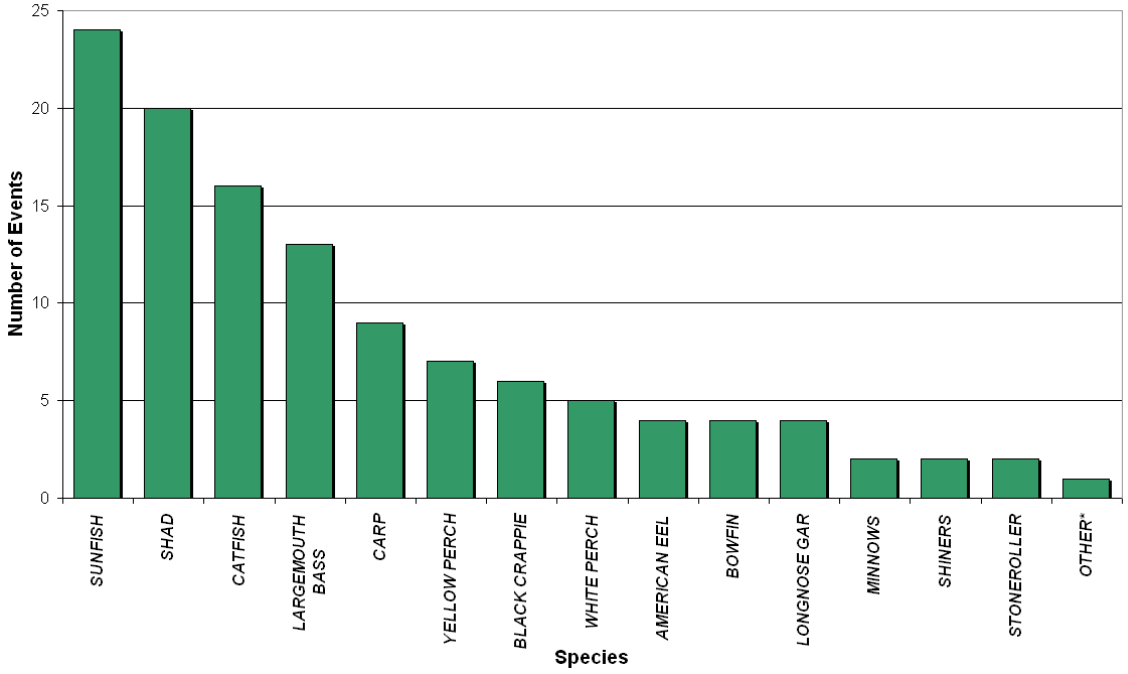


Figure 5: Freshwater finfish species and frequencies observed during 2008 fish kill events



Reported Causes of 2008 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 2008 kill events are listed in Table 2 in order of frequency. The statewide fish mortality associated with each cause category is also shown.

Table 2: Reported causes, frequencies, and associated fish mortality for 2008 fish kill events

Reported Cause	Events	Mortality
Dissolved Oxygen Depletion	28	6,951,349
Unknown*	14	438,520
Spills	6	25,111
Algal/Phyto Blooms	6	132,554
Bycatch	5	1,494
Other*	2	5,430

** "Unknown" causes were reported for those events where no specific causes could be determined "Other" fish kills included temperature and disease induced events.*

Dissolved Oxygen Depletion: Low dissolved oxygen (DO) was, by far, the most frequently reported cause for fish kill events during the 2008 season. DO stress was cited as a factor in nearly half of the years events and associated with over 90 percent of the year's fish mortality. DO depletion was reported as a likely cause in most large events in the lower Neuse and Tar/Pamlico 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. Water quality measurements taken prior to (and during) fish kills in these areas also suggest that low DO conditions were often associated with an upstream shift in saline waters as a result of lingering drought conditions and low flows experienced in 2007 (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 14 of the year's events. Kills with unknown causes occurred in both fresh and estuarine waters and included several large events in the lower Neuse basin.

Spills: Toxic spills may deplete DO levels in receiving streams or induce kills outright through physical or chemical toxicity. During 2008, investigators reported six events where the release of toxic substances induced a fish kill. These substances included wastewater (sewage), algaecide, industrial chemicals, and sludge waste. The largest spill induced event occurred on the Davison River (Transylvania Co.) and affected over 22,000 fish. The event occurred as contract engineers were working to drain and remove waste storage tanks at the Ecusta Paper plant site near Brevard. The leaked substance included sodium hydrosulfide according to the North Carolina Department of Public Health. Spill induced kills all occurred in freshwaters and mainly in the western counties of the state.

Algal Blooms: Algal bloom activity was a reported factor in six kills during 2008, and these events included at least 13 algal species in both fresh and estuarine waters (Table 3). Several algal species known in academic literature as capable of producing toxins were found in samples collected during 2008 investigations. These species included the filamentous bluegreens *Cylindrospermopsis* and *Aphanizomenon*, the dinoflagellates *Gyrodinium instriatum* and *Karlodinium*, and the flagellated raphidophytes *Heterosigma* and *Chattonella*. 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 season in the areas where observed. Algae and other phytoplankton negatively affect water quality when excessive growths impair aquatic systems through physical and chemical means.

Table 3: Algal species collected during 2008 fish kill events and identified by ESS staff.

Species	Waterbody Type
Karlodinium	Estuary
Scrippsiella	Estuary
Chaetoceros	Estuary
Heterosigma	Estuary
Chattonella	Estuary
Gyrodinium instriatum	Estuary
Psuedanabaena	Estuary
Cylindrospermopsis	Estuary
Diatoms	Estuary
Oscillatoria	Freshwater
Trachelomonas	Freshwater
Cylindrospermopsis	Freshwater
Aphanizomenon	Freshwater

ESS staff members 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.

Bycatch: Discarded fish from nearby fishing activity was reported as a cause in five events during the year. All bycatch events were reported from estuarine or ocean locations, were relatively small (1000 fish or less), and were apparent from net marks or injuries visible on the fish carcasses.

Other Causes: Two events reported during 2008 were believed to have occurred as the result of temperature stress and disease. The largest occurred on Falls Lake (Wake Co.) over an extended period and was attributed a combination of spawning activities and high water temperature which may have allowed a bacterial infection to sicken weakened fish. The event affected 5400 fish most of which were channel catfish.

Notable Events

Investigators reported 13 events where fish mortality exceeded 50,000 individuals (Table 4). Nearly all of these large events were located in estuarine waters within the Neuse and Tar/Pamlico basins. Low dissolved oxygen stress played a significant role in most of the large kills.

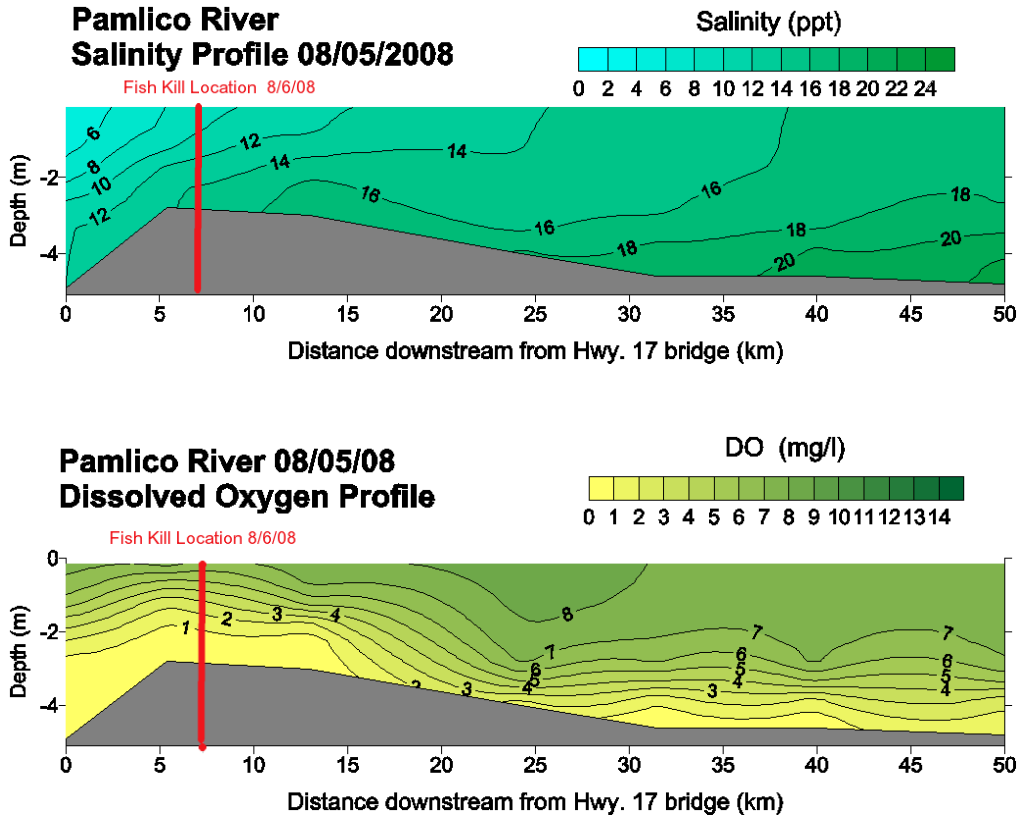
Table 3: Large (Mortality > 50,000) fish kill events reported during 2008

Date	Waterbody	Location	Fish Mortality	Cause
8/6/08	Pamlico River	Swan Point	3,969,520	DO depletion
10/1/08	Brown Creek	near Whortonsville	1,125,800	DO depletion
9/30/08	Smith Creek	near Vandemere	650,000	DO depletion
8/5/08	Neuse River	Flanners Beach	531,500	DO depletion
9/9/08	Neuse River	near Fisher Landing Point	274,000	Unknown
8/8/08	Neuse River	New Bern	164,200	DO depletion
6/8/08	Neuse River	Near Fisher Landing Point	161,500	DO depletion
9/9/08	Neuse River	Kennels Beach	129,000	Unknown
8/12/08	Merchants Millpond	Entire pond	125,000	DO depletion
8/1/08	Blounts Creek	Cotton Patch Landing	83,900	DO depletion
8/2/08	Chocowinity Bay	Cypress Landing Docks	77,500	DO depletion
9/22/08	Cypress Lake	near Wilson Creek	75,000	Bloom
9/6/08	Trent River	near Island Creek,River Bend	53,130	DO depletion

Water quality measurements taken around the large events often revealed a drop in dissolved oxygen throughout the water column. Often the drop was observed in conjunction with high water temperatures and salinity levels that induced water column

stratification. Drought conditions that were prominent during 2007 persisted in the Spring and early Summer of 2008. Saltwater intrusion that developed in the estuaries and tributaries during low flow conditions in 2007 remained in 2008 and contributed to stressful environmental conditions for fish. Water column conditions just prior to the year's largest kill on the Pamlico River near Swan Point are a good example. Salinity and DO profiles of the Pamlico River in early August reveal an infusion of high salinities, water column stratification, and an apparent drop in DO levels at the location of the massive kill (Figure 3). Conditions such as these have been repeatedly documented prior to and during many events in the Neuse and Tar/Pamlico estuaries.

Figure 4: Salinity and dissolved oxygen (DO) profiles of the Pamlico River prior to a large fish kill event near Swan Point, August 6, 2008.



2008 Summary

Investigators reported fish kill events in 8 of the state's major river basins during 2008. Kill activity was documented statewide but was heaviest in historical trouble spots within the lower Neuse and Tar/Pamlico basins. The number of fish kills reported during the year totaled 61, a sharp increase from the previous four years and in the range of numbers seen prior to peak activity seen during 2001. Total fish mortality was reported at over 7.5 million. When compared to annual totals since 1996, the 2008 fish kill season was one of the most active both in number of events and fish mortality.

Through feedback from investigators and review of fish kill reports, several factors become evident that may explain the sharp increase in fish kill activity during the 2008 season. Severe hydrologic conditions that developed during the 2007 drought persisted well into the Spring and Summer of 2008. As a result, a hydrologic "reset" of flows, salinity, DO, temperature, etc. to more normal (favorable) conditions failed to occur or did so to a lesser extent. Investigators reported low flows, low DO levels, elevated temperatures, and an upstream shift of saline waters into estuaries and tributaries at the onset of the 2008 season. In general, many of the poor environmental conditions that had developed during 2007, and are known to induce fish kills, were still in place in early 2008.

Given that both the 2007 and 2008 fish kill seasons experienced drought conditions as a backdrop, how can the relatively light kill activity in 2007 and the sharp increase in activity during 2008 be explained? Investigators point to several other environmental factors that may help shed light on the difference. Through repeated observations investigators have come to realize the significant role severe and often localized meteorological events play in fish kill activity. These events include strong winds, heavy precipitation, and high air and water temperatures. These meteorological factors were reportedly more prevalent during the 2008 season and may have interacted with already poor conditions discussed above to induce higher fish kill activity. Secondly, investigators reported that periods of calm weather and elevated temperatures were more pronounced during 2008 when compared to 2007 observations. These extended calm periods allowed water column stratification, high water temperatures, and subsequent DO depletion to develop more frequently and to greater extremes.

DWQ investigators will continue to build upon the data and observations discussed above in efforts to better understand the essential driving forces behind fish kill activity in North Carolina.

Appendix: 2008 Fish Kill Events (by County)

Total 2008 Fish Kills: 61

Total 2008 Fish Mortality: 7554458

Date	Kill Number	Waterbody	Location	Mortality	Comments
Alamance					
6/4/2008	RA08003	Stormwater Pond	near Mebane	200	Oxygen depletion primary cause of fish kill, due to excessive temperatures, high sediment loading in retention pond and stagnant water.
					Total Kills for County: 1 **Total Mortality for County: 200**
Anson					
4/15/2008	FA08001	Blewett Falls Lake	Lakewide	250	Kill composed of mainly smallmouth buffalo. Bacteria infection observed on gills.
					Total Kills for County: 1 **Total Mortality for County: 250**
Beaufort					
1/2/2008	WA08035	Blounts Creek	Cotton Patch Landing	176	PRRT staff responded to a fish kill call Wednesday, January 2nd. A citizen observed dead catfish Monday December 31st, in Blounts Creek upstream of Cotton Patch Landing. Staff calculated 170 white catfish, 3 carp, 2 blackfish, and 1 bream. These fish were partially decayed and spanned over 2.2 miles of shoreline from the Landing to the headwaters of Blounts Creek. The highest concentration of fish (floating on surface and laying on bottom) were closest to the headwaters near its confluence with Nancy Run. Physical parameters taken in transects revealed high salinities near 14 ppt. Some water column stratification occurred towards the headwaters of the creek, possibly due to recent precipitation. Dissolved oxygen values followed a decreasing trend near the creek bottom. Lowest values (from 2.5 - 5.0 mg/L) were observed closest to the headwaters where the highest concentration of dead fish were observed. Recent rain activity (Sunday -Monday) may have had a more profound influence upon the headwaters of this creek, as indicated by stratification in salinity and decreasing dissolved oxygen in the water column. Based upon the possible time of death (3-4 days ago), precipitation may have brought in a sudden pulse of freshwater and organics from adjacent wetlands, thus lowering dissolved oxygen. Salinities and DO values were 14 ppt, 10.5 mg/L, respectively downstream of the fish kill.
1/17/2008	WA08037	Campbell Creek	near headwaters	65	PRRT staff responded to a fish kill call, January 17 2008. A citizen observed dead bowfin (Black fish) in a ditch that drains into the headwaters of Campbell Creek. Staff counted 65 dead bowfin (average length 600 mm). The area of the kill was confined to the upstream portion of the ditch. Hydrolab data revealed salinities of 13 ppt and dissolved oxygen values of 3.8 mg/l. There was no indication of algal bloom activity. No samples were taken. No lesions were observed. Staff observed several lethargic bowfin on site. High salinities and low DO most likely combined to stress these freshwater fish.

Date	Kill Number	Waterbody	Location	Mortality	Comments
5/5/2008	WA08003	Blounts Creek	near Cotton Patch Landing	41	A resident phoned in a fishkill found approximately 1.5 miles upstream of Cotton Patch Landing in Blounts Creek, May 5th at 10:00 a.m. PRRT observed 30 Gizzard Shad, 1 Bowfin, and 1 Gar floating along a 1/2 mile stretch. The fish averaged around 300 mm in length and had no visible lesions. Real-time data indicated a change in wind direction from ENE to N around 2:30 a.m, accompanied by slightly stronger winds (10-15 mph). Approximately 1/4" to 2" of rainfall was received in some areas around Blounts Creek in the early morning. Water quality data were recorded at the fishkill location. Reference data were also recorded upstream and downstream of the event. Salinities were fairly consistent, from 5 ppt to 7 ppt (surface to near 4 meters, resp.). Salinities decreased slightly to 4.3 ppt upstream of the fishkill location. DO values were low at the kill site, with surface values of 2.2 mg/L and 0.19 mg/L near 5 meters. Upstream DO reference data were slightly lower (1.0mg/L and 0.18 mg/L, resp.) Downstream reference DO values increased to approximately 6.5 mg/L (surface), 0.21 mg/L (bottom). Bottom DO values did not rebound until staff reached Cotton Patch Landing. Local residents observed the waters pushed up several inches before staff arrival. Wind direction may have kept salinities elevated in the headwaters of the creek. Local rainfall and subsequent organic runoff could have combined with the stratified water column, exacerbating low DO conditions. No samples were collected.
6/3/2008	WA08004	Pamlico River Canal	Wichards Beach	280	PRRT staff were alerted of a fishkill during their routine WQ monitoring along the Pamlico River on June 3, 2008. Approximately 279 fish were counted at the head of a canal in Whichards Beach. An area resident indicated to staff that the fishkill was first discovered Sunday, June 1st. Around 90% of the fishkill was made up of juvenile menhaden (50 mm length). The rest comprised of juvenile bream, spot, pinfish, and croaker (50 mm). Five carp and one silver perch were found to be near 650 mm in length. No lesions were observed. Dissolved oxygen readings at the kill were 4.4 mg/L at the surface and 0.34 on the bottom (1.2 m). Surface DO transects towards the river showed increasing DO values to 7.5 mg/L. Corresponding bottom DO readings only reached 2 mg/L. Salinity values were similar to adjacent ambient sites, with surface readings near 4.5 ppt and 5.5 ppt at 1.2 meters. These fish most likely succumbed to hypoxic conditions.
6/13/2008	WA08007	Chocowinity Bay	near Sidney Creek	355	PRRT investigated a fish kill on June 13, 8:00 a.m on Chocowinity Bay. Over 350 fish were found along the headwaters of Chocowinity Bay, Crawford Creek and Sydney Creek. Over 50% of the fish were Flounder and Bluegill, ranging from 100 to 500 mm in length. A smaller percentage was comprised of Catfish, Sunfish, Yellow Perch, Croaker, Spot, Striped Bass, Largemouth Bass, Eel, Shad and a few Blue Crab. Many of these fish were fairly decayed (> 3 days) and found above the waterline. Water levels may have dropped 6-8 inches since this kill occurred. An organic surface foam and film were observed throughout the area. Physical data show water temperatures over 28 degrees C. Surface DO values were 3.5 mg/L. Subsurface DO values were 0.5 mg/L at 1 meter and remained near zero to 4 meters. Salinity values were over 7 ppt throughout the water column. Wind tides may have pushed saltier water into the headwaters of the bay, resulting in DO stress. Real time monitors in the area show high DO % saturation on a daily basis. Bloom decomposition may have also be played a role with DO stress.
6/23/2008	WA08009	Blounts Creek	Crisp Landing	730	PRRT staff investigated a multiple species fishkill near the upper reaches of Blounts Creek Monday June 23rd. Approximately 726 decaying fish were observed over a 3 mile stretch from Crisp Landing to the headwaters of the creek. A majority of these fish were bream (150 mm). The rest comprised of catfish, gizzard shad, croaker, pinfish, menhaden, bass spp, perch, flounder and gar. Surface DO readings were less than 1.0 mg/L for 2.5 mile stretch from the headwaters to Sheppard Run tributary. DO values increased to 6.9 mg/L downstream of Crisp Landing. Salinity values remain near 7 ppt at the creek's headwaters and near 9 ppt downstream of Crisp Landing. Salinities recorded from a fish kill last month in this area ranged from 5 to 7 ppt. Nutrient samples were collected near the headwaters of the creek.

Date	Kill Number	Waterbody	Location	Mortality	Comments
7/1/2008	WA08008	Sidney Creek	Chocowinity Bay	1360	PRRT staff investigated a multiple species fish kill in the headwaters of Sydney and Chocowinity Creeks July 1st. Over 1300 fish succumbed to what was most likely low DO and high salinity some time between Saturday and Sunday. An NC Wildlife official was first on scene and noticed large schools of gar eating the fish early Sunday morning. The majority of the fish affected were sunfish (150 mm), catfish (450 mm), and bream (170 mm). The rest comprised of bass, shad, perch, and crappie. Juvenile croaker and spot were also counted. Salinity values near the kill area were approximately 8.7 ppt, with DO values less than 1.0 mg/L throughout the water column. Salinity values measured 1 mile downstream at the mouth of the creek were near 9.0 ppt, with DO values greater than 7.0 mg/L. Staff observed several fish swimming in this area. No samples were taken.
7/22/2008	WA08011	Blounts Bay	near Gilead Shores	630	PRRT staff found over 600 dead juvenile menhaden along a 2.5 mile stretch across Blounts Bay during routine ambient monitoring of the Pamlico River. The fish were approximately 70 mm in length and were no more than 12 hours old. Areas around the anal pore were decayed on 50% of the fish which may have been the result of lesion or injury. Water temperatures were over 29 degrees C. Dissolved oxygen ranged from 6-8 mg/L. Corresponding salinity values were from 8-10 ppt. There was no indication of algal bloom activity during the investigation, although staff did observe bloom activity several miles upstream of this event. Samples were sent to the Environmental Sciences Section in Raleigh for analysis. Some crabs observed swimming at surface. Samples submitted to ESS showed the most common taxa were small round diatoms and the flagellated raphidophyte Heterosigma. All taxa seen in the sample are typical in local estuarine rivers during summer.
8/1/2008	WA08036	Blounts Creek	Cotton Patch Landing	83900	Pamlico Response Team staff investigated a fish kill in Blounts Creek near Cotton Patch Landing. PTRF Riverkeeper Heather Jacobs was notified by a local resident. Staff calculated over 83,900 juvenile menhaden (40-70 mm) along a one mile stretch upstream of the landing. Less than one percent of this total comprised of gizzard shad and mullet (> 150 mm). Physical data showed low DO values 0.49 mg/L at the surface near the kill. Values dropped to 0.15 mg/L at 3 meters. Corresponding salinity values seemed well mixed from 9.0 - 9.1 ppt. Water temperatures were near 30 degrees C. No lesions were observed. Staff observed a few menhaden at the surface, gulping for air. Several dolphin were observed eating the fish. Nutrient and phytoplankton samples were collected and will be sent to the Raleigh lab for further analysis. Low DO, high salinity, and above average water temperatures may have combined to create a high stress environment for these small menhaden. This event was the 4th fish kill in the Blounts Creek area since early May. Phytoplankton samples sent to ESS showed a dense bloom of small round diatoms with the dinoflagellate Peridinium. The taxa found in this sample are common in local estuarine rivers during summer.
8/2/2008	WA08012	Chocowinity Bay	Cypress Landing Docks	77500	PRRT staff responded to a fish kill call Saturday morning, August 2nd. Over 77,500 fish were estimated across 1.5 miles of Chocowinity Bay. Night time and morning observations from the Cypress Landing Dockmaster places this event to have occurred some time after 5 p.m. Friday. This was a multiple species fish kill, spanning sizes from juvenile menhaden, anchovy, silversides, spot, croaker, flounder (20-60 mm) to larger sized catfish, bluegill, eels, flounder, bass, sunfish, perch, mullet, hog choker, pinfish, trout, goby, ladyfish, shrimp, and blue crab. No lesions were observed. Physical data recorded around the kill site indicated DO values less than 5.0 mg/L and salinities from 8 - 9 ppt. Upstream reference data showed DO dropping to 1.3 mg/L at 1 meter, salinity near 9 ppt. Downstream data showed higher DO values near 7 mg/L. DO began to drop to 0.5 mg/L at 1.8 meters where salinity values reached 12 ppt. Although there was no bloom activity during the investigation, water temperatures and % DO began to climb near 2:00 p.m. Bloom samples were collected and sent to ESS for further analysis. Water temperatures over 31 degrees were recorded. High temperatures, low DO, and increasing salinities most likely combined to create an extremely stressful environment for these fish. Sample submitted to ESS indicated a dense bloom of small round diatoms and the filamentous bluegreen Psuedanabaena. The dinoflagellate Scrippsiella and the raphidophyte Heterosigma were also present. The algal taxa found in the samples were common for local estuarine rivers during summer.

Date	Kill Number	Waterbody	Location	Mortality	Comments
8/6/2008	WA08014	Pamlico River	Swan Point, Edgewater Beach	3969520	The PTRF Riverkeeper and several residents phoned in to Pamlico Response Team hotline indicating a large fishkill near Swan Point on August 6th, 12:00 p.m. The Pamlico Response Team investigated this fishkill from the mouth of Broad Creek to Edgewater Beach that afternoon. Staff calculated over 3.9 million juvenile menhaden, spot, and croaker (50 mm) along a 3.7 mile long stretch near Swan Point, extending to over 3/4's the width across the Pamlico River (1.2 miles). Only a few menhaden had lesions near the anal pore. The spot and croaker showed no lesions. Physical data at the time of the investigation indicated DO values dropping from 8.0 mg/L at the surface to 0.4 mg/L at 1.5 meters. Corresponding salinity values were 10 ppt (surface) to 15 ppt (1.5 meters). Staff collected bloom samples, as there were elevated % DO levels (>120%) near Swan Point. Surface water temperatures were over 31.5 degrees. Phyto and water samples were sent to Raleigh for further analysis. The condition of the fish seemed to be less than 12 hours old, placing the time of the event to be late in the evening August 5th, to early Aug. 6. Phyto samples submitted to ESS contained round diatoms, the filamentous bluegreen Psuedanabaena, and the dinoflagellate Karlodinium veneficum. All taxa seen in the sample are typical in local estuarine rivers during summer.
8/15/2008	WA08016	Pamlico River	Washington, Washington Park	1000	PRRT staff investigated a fishkill on the Pamlico River shoreline near Washington Park , August 15th. A resident noticed dead menhaden around 8:00 p.m. August 14th. Staff were on scene the next morning and counted 968 juvenile menhaden (50 mm) and one yellow perch along a one-third mile stretch. No lesions were observed. Menhaden were observed swimming in the area. Physical data was recorded from a transect across the River from the shoreline. Surface DO values were from 10-12 mg/L. These values dropped to approximately 6 mg/L at 1 meter. DO fell below 2 mg/L at 2 meters. DO percent saturation values were over 160%. Staff collected bloom samples and sent to the Environmental Sciences Section for further analysis. Real-time data located upstream from Washington Park indicated bloom activity during the afternoon on the 14th. The southwest winds during that time were no more than 10 mph. It is likely that a drop in DO resulted from a small, localized algae bloom, while the SW wind pushed these fish to shore. Water samples submitted to DWQ/ESS indicated a bloom of small round diatoms and the dinoflagellates Karlodinium and Scrippsiella. All taxa seen in the sample are typical in local estuarine rivers during summer.
9/16/2008	WA08038	Pamlico River	near Fisher Point	100	PRRT staff were notified of a 2-day old fish kill from a resident near Chocowinity on September 16th. Staff observed approximately 100 Flounder and Gizzard Shad floating adjacent to bulkhead walls. The kill extended approximately 0.6 miles from Fisher Point to Cals Creek on the south side of the Pamlico River. Physical data at that time did not indicate anything out of the ordinary. No samples were taken due to advanced decay. No lesions were observed.
9/19/2008	WA08024	Pond	near Jacks Creek	816	PRRT staff investigated a fish kill that took place in a pond with connectivity to Jacks Creek, a tributary of of Pungo Creek. PRRT staff observed gizzard shad, menhaden, spot, croaker, pinfish and silverside minnows that appear to be two days old. DO levels at the time of investigation were low but not at lethal levels. Fish probably were exposed to low DO levels two to three days prior to investigation and were not able to escape the pond.
					Total Kills for County: 14 Total Mortality for County: 4136473
Cabarrus					
10/2/2008	MO08002	Coddle Creek Reservoir	near Highway 73	50	Fish kill was attributed to lake turnover. Low DO numbers of less than 2mg/l were reported through the first 15 feet of the water column prior to dead fish being observed. No signs of dying/distressed fish were observed at the time of the investigation. Only the odor persisted, which prompted a citizen complaint.
					Total Kills for County: 1 Total Mortality for County: 50

Date	Kill Number	Waterbody	Location	Mortality	Comments
Caldwell					
4/24/2008	AS08002	Private Pond	UT to McCrary Creek	125	Landowner applied an algaecide known to be toxic to fish, especially trout 24-48 hours before incident. Copper concentration (Active ingredient listed in Algaecide) at the time of investigation came back at 4 times the water quality standard in the pond with nothing in the tributary.
					Total Kills for County: 1 Total Mortality for County: 125
Carteret					
9/9/2008	WA08022	Neuse River	near South River	250	A small fish kill was discovered by the NRRT at station 170 on the Neuse River while conducting River Run ambient sampling event. Total mortality of the kill was estimated at 250 and included grey trout, croaker, pinfish, and spot. Fish were dead less than 6 hours and were likely a result of by-catch as several trawlers were observed actively trawling in the area.
					Total Kills for County: 1 Total Mortality for County: 250
Chatham					
3/28/2008	RA08002	Rocky River	South of Pittsboro	75	No dead fish were observed up or down stream of this area. The original call was made to WRC who them reported it to DWQ.
12/1/2008	RA08011	Private Pond	near Terrells	75	Event consisted of mainly large catfish. Scavengers had consumed parts of carcasses at time of investigation. Water quality parameters appeared normal and the pond was clear during investigation.
					Total Kills for County: 2 Total Mortality for County: 150
Chowan					
6/12/2008	WA08006	Dillards Millpond	Indian Creek	110	Fish kill was most likely caused by overnight hypoxia. Hot weather and water conditions over the previous week likely caused hypoxia event. Also, pond level was at least 1 foot below normal due to irrigation pumping. Approximately 100 additonal dead fish were observed by reporting party at another location of the millpond.
					Total Kills for County: 1 Total Mortality for County: 110
Craven					
6/8/2008	WA08005	Neuse River	Near Fisher Landing Point	161500	A fish kill on the Neuse River was reported approximately 6.5 miles downstream of New Bern on June 8, 2008 by the Lower Neuse Riverkeeper. Upon investigation, NRRT staff estimated 161,500 dead fish, primarily atlantic croaker, spot, and pinfish ranging in size from 1-5" in length. No fish were observed dying and active schools of menhaden were observed in the area at the time of investigation. No lesions were observed. Water and air temperatures were hot and an algal bloom was ongoing. Algal bloom samples were collected and sent to ESS for analysis. NRRT staff revisited the area on June 9, 2008 and did not observe any more dead or dying fish. Review of data from the real-time water quality monitoring platforms at CM 11 and Carolina Pines indicated a drop in dissolved oxygen throughout the water column, particularly at depth, the night of June 7, 2008. It is likely this kill was related to hypoxic conditions and high water temperatures. Samples submitted to ESS indicated a bloom of small round diatoms and the dinoflagellate Gyrodinium instriatum. The algal assemblage was typical of local estuarine rivers during spring and summer

Date	Kill Number	Waterbody	Location	Mortality	Comments
8/5/2008	WA08013	Neuse River	Flanners Beach	531500	The event was located between Otter Creek near Flanners Beach and Carolina Pines, a distance of 3 miles. Response Team staff estimated that 538,000 fish were involved in the fish kill. Multiple species of fish such as striped mullet, croaker, flounder, spot, menhaden, silversides, blue crab and shrimp were involved in the event. No lesions were observed on any of the fish involved, and schools of menhaden were observed swimming in the area of the kill. All finfish found were juvenile. Water column measurements indicated very high water temperatures and an algae bloom in the event area. Phytoplankton samples were collected for analysis by NC DWQ and NCSU's Applied Aquatic Ecology Laboratory. The age of the dead fish indicates that the fish kill event coincided with a drop in dissolved oxygen levels and very high water temperatures, which were measured on at least 2 separate monitoring stations in the area of the fish kill. Increasing southwest winds produced by a large thunderstorm coincide with the upwelling event that was recorded by both US Geological Survey and NC State University monitoring platforms. This meteorological event was likely related to the fish kill, possibly causing the upwelling of low dissolved oxygen water which trapped fish in shallow waters near the shoreline.
8/8/2008	WA08015	Neuse River	New Bern	164200	The Neuse River Response Team received a report of a fish kill at 15:15 on Friday 8/8/08. Investigation revealed multiple species were involved in the kill (80% spot, 10% pinfish, 10% Flounder, Bay Anchovy, Yellow Perch, Striped Bass and others) along a 2 mile section of the Neuse River at New Bern. Mortality from this event totalled 164,196 finfish. The event occurred along the western shoreline of the river, and was comprised of mostly juvenile fish. No lesions were found on any of the fish observed, and there were healthy fish in the event area during investigation. Physical measurements collected at the event site indicated an algae bloom. Samples were collected for phytoplankton and nutrients. The age of the event (indicated by fish decay progression) correlates with a drop in water levels that occurred the morning of 8/8/08 from 200 to 0300. This drop in water level also correlates with increased west winds in the New Bern area. These weather conditions could have played a role in a hydrologic event such as an upwelling. Water quality measurements recorded at Channel Marker 38 over the last 2 weeks indicate anoxic conditions below 4 feet in the Neuse River in the area where the fish kill occurred. Lack of dissolved oxygen along the western shoreline of the Neuse River in the fish kill area is the likely cause of this event. Samples submitted to ESS indicated a bloom of the filamentous bluegreen alga Psuedanabaena, small round diatoms, and the dinoflagellate Gyrodinium instriatum. All taxa found in the sample were typical for North Carolina’s estuarine rivers during summer.
8/27/2008	WA08019	Neuse River	near Fisher Landing Point	29000	The Neuse River Rapid Response Team investigated the event on August 27. The kill was exclusively juvenile Atlantic Menhaden and extended from Fisher Landing Point to Neuse Harbour (0.7 river miles). Total mortality was estimated at 29,000. It is likely the actual number of menhaden that died during this event is greater than the reported number as the investigation was conducted from shore due to inclement weather. As a result, open water counts were limited to 10 meters from the shoreline and did not include those extending beyond 10 meters from shore. No lesions were observed. There was no indication of an active bloom during the investigation (DO saturation 69%; pH 7.5) and large schools of Atlantic Menhaden were observed actively swimming in the area. Based on the state of fish degradation and eyewitness accounts, the kill occurred 24-36 hours prior to investigation. Data from a MODMON water quality monitor near the kill location indicated mild algal blooms in the vicinity in the days prior but otherwise normal water quality conditions throughout the water column. Algal bloom samples were collected and sent to ESS and various researchers for analysis. Samples contained a high amount of debris and a bloom of small round diatoms. Dinoflagellates were rare. All algae found in the sample are typical for North Carolina’s estuarine rivers during summer.

Date	Kill Number	Waterbody	Location	Mortality	Comments
9/4/2008	WA08034	Neuse River	near Glenburnie Park	44	NRRT received notification from the NRF Riverkeeper that a small fishkill was found at a park in New Bern. Upon investigation of the area, staff found 45 dead Longnose Gar and several Threadfin Shad. The appearance of the dead fish indicated that the event occurred approximately 12-24 hours prior to investigation. Species, and several net marks indicated that the cause of the event was most likely bycatch where the gar were discarded from a net as non-valuable catch; after which they washed ashore at the Glenburnie Park waterfront. No samples were collected during this investigation.
9/6/2008	WA08020	Trent River	near Island Creek ,River Bend	53130	The fish kill was reported by residents of the River Bend community, and was said to have occurred during and after Tropical Storm Hanna passed over the area. The kill included multiple species such as Atlantic menhaden, spot, striped mullet, flounder, and yellow perch. None of the fish observed showed any lesions. Water quality measurements collected during the investigation showed very low dissolved oxygen levels in the Trent River near River bend. Estimates of fish involved in the kill were 53,000. During investigation NRRT staff noted that all of the swamps and creeks adjacent to the kill area were draining into the Trent River as water levels fell in response to strong southwest winds. Low dissolved oxygen has been determined to be the cause of this event.
9/9/2008	WA08021	Neuse River	near Fisher Landing Point	274000	The kill covered approximately one river mile in the vicinity of Fisher Landing and included 274,000 fish. Approximately 95% of the fish involved with the kill were Atlantic menhaden while speckled trout, flounder, hickory shad, bluefish, pinfish, croaker, spot, and rays comprised the remaining 5%. No lesions were observed. It is estimated that the kill occurred 36-48 hours prior to investigation. Data from the nearest real-time water quality monitoring stations indicated normal (post tropical storm) conditions throughout the water column during the estimated time the event took place. During the investigation, water quality conditions appeared normal and several active large, dense schools of Atlantic menhaden were observed throughout the area. No samples were collected due to the age of the kill.
9/22/2008	WA08025	Cypress Lake	near Wilson Creek	75000	The Neuse River Response Team investigated a fish kill on the evening of September 21, 2008 and the morning of September 22, 2008. The kill area included Cypress Lake and a small section of an unnamed tributary to Wilson Creek that is connected to Cypress Lake. Approximately 75,000 finfish were counted during the investigation. One year old class Atlantic menhaden comprised 95% of the kill. The remaining 5% consisted of ten estuarine and freshwater finfish species. No lesions were observed. The kill began 48-64 hours prior to the initial investigation and was ongoing during investigation, although it is estimated the vast majority of fish died during the first 12 hours of the event. According to eyewitness accounts, an intense bloom as well as elevated water levels occurred in the lake around the time the event began. During the investigation, no bloom was indicated and lethal dissolved oxygen levels (<1 mg/L) were measured throughout the lake. Flounder and blue crabs were observed on the shoreline and multiple finfish species were observed at the surface gasping for air. Bloom samples were collected and sent to ESS in Raleigh for analysis. The bloom samples indicated a bloom of small round diatoms, the flagellated raphidophyte Heterosigma, the dinoflagellate Gyrodinium instriatum, and the filamentous bluegreens Psuedanabaena and Cylindrospermopsis. All taxa seen in the sample are common in local estuarine rivers during warm weather.

Date	Kill Number	Waterbody	Location	Mortality	Comments
9/30/2008	WA08026	Smith Creek	near Vandemere	650000	The Neuse River Rapid Response Team investigated a fish kill near the headwaters of Smith Creek, a tributary to Bay River, on September 30, 2008. The kill covered 0.7 river miles and included approximately 650,000 fish, exclusively juvenile Atlantic Menhaden (75 mm). Fish were approximately 12 hours old at the time of investigation. No lesions were observed. During the investigation, dissolved oxygen (DO) at the upper reach of the kill was at potentially lethal concentrations (around 1.0 mg/L) and menhaden were observed gasping for air. DO concentrations at the lower reach of the kill were normal (8.6 mg/L) and active gamefish and schools of baitfish were observed in the area. The highest concentration of dead menhaden was in the upper 0.3 miles of the kill area. It is likely the majority of the menhaden involved in this event died in the upper reach of the kill and some drifted down with the falling water levels. There was no physical indication of an active bloom in the upper reach of the kill area (pH 6.7, DO 13% saturation), although the water did appear brown in color and had a secchi depth of 0.4 m. A mild bloom was indicated at the lower end of the kill (pH 7.6, DO 120% saturation). Algal bloom and fecal coliform samples were collected from both the upper and lower reach of the kill and sent to the DWQ's state laboratory for analysis. Extra sample water was also collected for interested researchers. DWQ samples showed blooms of small round diatoms. Cryptomonads were also prevalent at the site. All of the algae seen are common in local estuarine waters.
10/1/2008	WA08029	Ball Creek	near Whortonsville	2420	The Neuse River Rapid Response Team (NRRT) investigated a fish kill on October 1, 2008 that included 2,420 juvenile Atlantic Menhaden (65-80 mm). The kill covered a 500' section of stream at the headwaters of Ball Creek. Fish died 24-36 hours prior to investigation. Small schools of baitfish were observed swimming in the area and there was no indication of a bloom (6.9 pH, 53% DO saturation). The timing and species composition of this kill correlates with the Smith Creek and Brown Creek kills that were also investigated by the NRRT. No samples were collected.
10/1/2008	WA08030	Unamed Lake	near River Bend	600	The River Bend Police Dept. contacted NRRT about a fishkill in an unnamed pond along Shoreline Drive in River Bend. NRRT staff investigated and observed 601 dead decayed fish of mixed freshwater species at the downstream side of a culvert passing under Shoreline Drive. The fish appeared to have washed up against a rock dam between two lakes. Fish appeared to have been dead approximately 48 hours. During the investigation water quality measurements appeared normal, and fish were observed swimming in the area of the kill. Heavy rains early on 9/30/08 may have played a role in the kill.
10/8/2008	WA08031	Trent River	near Brice Creek, Trent Woods	294	The Neuse River Rapid Response Team (NRRT) investigated a fish kill on October 8, 2008 on the Trent River near Trent Woods. NRRT staff counted 294 spot, flounder, bluegill, white perch, silverside, yellow perch, Atlantic menhaden, and blue crab. Spot, flounder, and bluegill accounted for 265 of the 294 total. No lesions were observed. Fish were approximately 24-48 hours old at the time of investigation and do not appear to have died simultaneously. Physical measurements indicated an active algal bloom in the area during the investigation (pH 8.1, DO 145% saturation). Samples were collected for phytoplankton, chlorophyll, and nutrient analysis and sent to DWQ/ESS. The most numerous algae in the samples were small round diatoms and the chain forming diatom Chaetoceros. The dinoflagellate Karlodinium was prevalent along with the raphidophytes Heterosigma and Chattonella. All algae seen in the sample are common in local estuarine waters.
					Total Kills for County: 12 Total Mortality for County: 1941688
Currituck					
1/9/2008	WA08001	Atlantic Ocean	Corolla	100	PRRT staff received an phone call from a citizen on commute to work on 1/09/2008 about a report of washed up dogfish on the high tide mark near Penny Hill N of Corolla, NC. Fishing reports and DMF data suggest a large number of dogfish sharks are in vicinity and being caught by both recreational and commercial fisheries. Commercial striped bass beach seining had been on-going and was suspected. Dead dogfish were reported appearing on local beaches.

Date	Kill Number	Waterbody	Location	Mortality	Comments
					Total Kills for County: 1 Total Mortality for County: 100
Dare					
1/10/2008	WA08002	Atlantic Ocean	Nags Head	100	PRRT staff received an email from Shellfish Sanitation on 1/10/2008 about a report of washed up dogfish on the high tide mark near Outer Banks Pier. Fishing reports and DMF data suggest a large number of dofish sharks are in vicinity and being caught by both recreatioal and commercial fisheries. Commercial Striped Bass Beach Seining has been on-going and are suspected, as a result of by-catch, to add to the numbers of dead dogfish appearing on local beaches.
					Total Kills for County: 1 Total Mortality for County: 100
Davidson					
8/14/2008	WS08001	Tuckertown Reservoir	High Rock Dam to Flat Creek	25	Investigators observed low dissolved oxygen levels throughout the reservoir during the investigation. A surface film was observed at some locations and phyto samples were submitted to DWQ/ESS for analyses. Filamentous blue greens, primarily Cylindrospermopsis and Psuedanabaena, dominated the samples representing more than 80% of the total density. Cylindrospermopsis and Pseudanabaena are two of the most common forms of algae found during the summer in North Carolina's piedmont lakes. Although some strains of Cylindrospermopsis are know to produce toxins, no adverse human health effects have been reported in North Carolina. The event primarily affected snails resulting in more than 1000 killed.
					Total Kills for County: 1 Total Mortality for County: 25
Forsyth					
9/25/2008	WS08002	Fiddlers Creek	near Winston Salem	200	Sewer overflow caused the kill event. Winston Salem utilities stopped the spill as soon as was possible. DWQ staff members did not investigate the event until the next day.
					Total Kills for County: 1 Total Mortality for County: 200
Gates					
8/12/2008	WA08018	Merchants Millpond	Entire pond	125000	Investigators observed hundreds of dead fish of larger sizes. Dissolved oxygen readings ranged between 0.08 and 0.30 mg/L. Event preceded by relatively high water temperatures, a recent die-off of parrotfeather and no recent rainfall events. Event attributed to the reduction of dissolved oxygen due to the decomposition of parrotfeather. The observed majority of the dead fish were comprised of larger sized largemouth bass, bluegill, and channel catfish with fewer numbers of redear sunfish, warmouth, creek chubsucker and black crappie
					Total Kills for County: 1 Total Mortality for County: 125000
Hyde					
10/16/2008	WA08033	Lake Mattamuskeet	Hwy 94 Causeway	10000	Algal bloom likely contributed to fish kill. Juvenile white perch and juvenile gizzard shad comprised the majority of dead fish, although spot,larger gizzard shad, larger white perch, striped bass,flounder, black crappie, yellow perch and carp were also observed. Fish appeared to have been dead for some time. With SW winds, the fish may have drifted and the fish kill may have occurred to the west of the causeway. Dead fish on the east side of the lake were likely pushed through the canals and shored up on the shoals along with mats of wind blown vegetation. Samples submitted to ESS indicated blooms of the filamentous bluegreen algae Cylindrospermopsis and Aphanizomenon. They are both common in the state's freshwater lakes during summer and fall. These taxa are known in the academic literature to include potentially toxic strains but there have been no health reports concerning bluegreen algae in North Carolina.

Date	Kill Number	Waterbody	Location	Mortality	Comments
					Total Kills for County: 1 Total Mortality for County: 10000
Johnston					
6/6/2008	RA08005	Stormwater Pond	Smithfield	2000	The incident likely happened in the early moring of 6/6/08. At the time of investigation, the event seemed completed. Field parameters showed high temperature and low DO. There seemed to be no signs of algal blooms.
6/6/2008	RA08004	Private Pond	near Willow Springs	350	The incident happened on 6/5/08, the owner of the pond reported on 6/6/08. At the time of investigation, the event seemed completed. Field parameters were normal, except for high surface water temperature. There were no signs of algal blooms. Nightime oxygen depletion is suspected as the reason for this incident.
7/8/2008	RA08008	Holts Lake	near Dam	300	This fish kill was reported by the Wildlife Resource Commission. Causes suspected as being related to temperature change or other factors during the severe thunderstorms over previous days.
					Total Kills for County: 3 Total Mortality for County: 2650
Mecklenburg					
5/30/2008	MO08001	Catawba River, Lake Wylie	near Mt Holly	2000	Fish Kill was originally called in by Rowboat Dock and Dredge which was building a dock at the end of Riverfront Pkwy in Mt Holly. Approx. 2,000 fish (carp, catfish, shad, bluegill, bass, crappie and one snake) were observed dead and bloated on 5/30/08. Live fish were noted on 5/30/08 so kill most likely occurred night of 5/28 and morning of 5/29. Water quality readings on 5/30/08 were within normal levels. From stormwater inspection of 6/3/08 DWQ found chemicals in Clariant West Facility Outfall 006 that may have been released during rain storm on afternoon/evening of 5/28. Both products that could have been discharged were highly toxic to fish with LC50 values of 0.1-1.0 mg/L. Chemicals included Genamin T 100, and Genamin LA302 D.
					Total Kills for County: 1 Total Mortality for County: 2000
Moore					
5/16/2008	FA08002	Lake Sequoia	Seven Lakes	1000	Investigators suspected an application of copper sulfate as a possible cause. A copper level of 11ug/L was detected at the lake spillway.
10/6/2008	FA08004	Hayes Pond	near Dover	185	Brownish water and low dissolved oxygen observed in pond at time of investigation. Investigators also reported a dark red scum around pond banks.
					Total Kills for County: 2 Total Mortality for County: 1185
Nash					
9/19/2008	RA08009	Boddies Mill Pond	near Corinth	26	About 25 largemouth bass were reported by Bill Collart- Wildlife Commission. DWQ invested the fish kill on 9-19-2008. DWQ observed dead largemouth bass and brim near the mill dam. The dead fish were mostly large in size (>12"). Recent heavy rains most likely caused the pond to turn over causing the fish kill. DO taken was 0.2 mg/L, Temp 22.4 C, pH 6.4, conductivity 118. Readings were taken on 9-19-2008 at 12:00 pm.
					Total Kills for County: 1 Total Mortality for County: 26

Date	Kill Number	Waterbody	Location	Mortality	Comments
Orange					
1/2/2008	RA08001	Private Pond	Meadowmont Village Chapel Hill	30	Cold weather and recent drop in temperature suspected as cause. Brown fungi and/or bacteria observed on fish. Swans and herons observed on pond with no signs of stress.
6/9/2008	RA08006	Private Pond	Southern Village near Chapel Hill	2500	Approximately 500 dead Bluegill (brim) were observed by DWQ. Many fish were grasping for air at the surface. Sam Williams of Triangle Pond Management noted that he had already cleaned up most of the dead fish, which he estimated to be about 2000. The hot air temperatures, high water temperatures, and extremely low DO were major factors in this fish kill. Other potential factors include sources of chemicals and nutrients from fertilizer applied to the grass on the banks of the stormwater pond, stormwater runoff from the street, and a soccer field located across the street. Williams added a dark blue colorant dye to the pond in an allempt to provide shade and to prevent additional fish from dying. It's unclear what effect the dye had on the remaining fish. Mr. Williams suggested an aeration fountain be installed to add enough oxygen to the water to prevent future fish kills in this stormwater retention pond.
9/21/2008	RA08010	Private pond	near Orange Grove	26	Sludge was applied to fields by pond prior to event followed by a rainy period. Investigators suspected fish kill was due to the rain and runoff from the fields.
					Total Kills for County: 3 **Total Mortality for County: 2556**
Pamlico					
9/9/2008	WA08023	Neuse River	Kennels Beach	129000	The kill covered approximately 2.8 river miles in the vicinity of Kennels Beach and included 129,000 Atlantic menhaden. No lesions were observed. It is estimated the kills occurred 36-48 hours prior to investigation. Data from the nearest real-time water quality monitoring stations indicated normal (post tropical storm) conditions throughout the water column during the estimated time the event took place. During the investigation, water quality conditions appeared normal and several active large, dense schools of Atlantic menhaden were observed throughout the area. No samples were collected due to the age of the kill.
9/30/2008	WA08027	Bay River	near Vandemere	1000	The Neuse River Response Team discovered a fish kill on the Bay River near Vandemere on September 30, 2008. Approximately 1,000 silver perch, croaker, and spot were involved in this kill. Fish were dead less than six hours. The NRRT observed trawling activities earlier in the day in the same area the fish were discovered. Fish appeared to have died as a result of bycatch. No samples were collected.
10/1/2008	WA08028	Brown Creek	near Whortonsville	1125800	The Neuse River Rapid Response Team (NRRT) investigated a fish kill near the headwaters of Brown Creek, a tributary to Lower Broad Creek, on October 1, 2008. The kill was exclusively juvenile Atlantic Menhaden (75 mm) and covered approximately one stream mile. Total mortality was estimated at 1,126,000. No lesions were observed. Based on the state of fish degradation and eyewitness accounts, the kill occurred 24-36 hours prior to investigation and lasted less than six hours. The estimated time of the kill coincided with a period of elevated water level. During the investigation, dissolved oxygen (DO) at the upper reach of the kill was at potentially lethal concentrations (around 0.6 mg/L) but increased to 6.4 mg/L at the lower reach of the kill. There was no physical indication of an active bloom throughout the kill area (pH 6.7-7.2, DO 8-90% saturation), although the water in the upper reach did appear brown in color and had a secchi depth of 0.4 m. The timing, species, species size, physical measurements, geomorphologic location and lesion prevalence, were similar to the kill investigated on September 30, 2008 on Smith Creek. Algal bloom and fecal coliform samples were collected from the upper reach of the kill and sent to the DWQ's state laboratory for analysis. Extra sample water was also collected for interested researchers. DWQ sample indicated a bloom of small round diatoms. The flagellated raphidophyte Heterosigma was also

Date	Kill Number	Waterbody	Location	Mortality	Comments
					prevalent. All of the algae seen are common in local estuarine waters.
10/9/2008	WA08032	Brown Creek	near Whortonsville	46060	The Neuse River Response Team investigated a fishkill in Brown Creek off of Lower Broad Creek on 10/9/08. The fish kill was located in the same area as a fish kill on 10/1/08. The kill was comprised of 50-70mm Atlantic Menhaden which had no lesions. The age of the fish kill was determined to be around 36 hours old. Water quality measurements recorded high oxygen levels at the surface due to algae bloom conditions, and low oxygen levels at the bottom near 1 meter. These conditions were recorded approximately 36 hours after conditions when the event occurred. Samples were collected for phytoplankton and nutrients. Samples indicated a very dense bloom of small round diatoms. All of the algae observed in the sample are common in local estuarine waters.
					Total Kills for County: 4 Total Mortality for County: 1301860
Pender					
7/18/2008	WL08001	Private pond	North Topsail Island	950	Canal is being used as an impoundment for the gated community on Ashe Island behind N. Topsail Island. Canal gate was closed and mullet were jumping out of the blocked/gated culvert. The DO on the Roger's Bay side was between 5mg/l and 4.45mg/l. Mats of algae found in approx. 10 percent of canal. Samples sent to ESS. Phytoplankton samples indicated an algal bloom of small round diatoms and the flagellated raphidophytes Heterosigma and Chattonella. All of the taxa enumerated in the sample are common in local estuaries during summer. Algal mat samples were mainly composed of the filamentous green alga Pithophora with some of the filamentous bluegreen alga Oscillatoria. These taxa often bloom in North Carolina's ponds and lakes during summer.
					Total Kills for County: 1 Total Mortality for County: 950
Sampson					
6/12/2008	FA08003	Braint Lake		200	Samples submitted to the Environmental Sciences Section showed the filamentous blue green Oscillatoria and the euglenoid, Trachelomonas. The algae found in the sample are common in lakes and ponds throughout the North Carolina. An algal bloom was suspected as a factor in the kill.
					Total Kills for County: 1 Total Mortality for County: 200
Transylvania					
5/29/2008	AS08003	Davidson River	Downstream Ecusta Paper Plant	22700	The event was caused by a waste spill as contract engineers were working to drain and remove old waste storage tanks at the Ecusta Paper plant site. The leaked substance included sodium hydrosulfide according to the North Carolina Department of Public Health. A break underneath the plant property allowed the material to run into an underground stormwater system, into drainage ditches and the Davidson River. A civil penalty assessment of $13,608.00 was made against Davidson River Village LLC as a result of the spill.
					Total Kills for County: 1 Total Mortality for County: 22700
Tyrrell					
7/17/2008	WA08010	Alligator River	Northwest Fork	30	PRRT staff encountered the event while collecting salinity data for the NC Forestry Service. The DO values were very low in the area of the kill.
8/8/2008	WA08017	Alligator River	near Kilkenny	120	Fish were bloated and floating. Estimated fish were approximately 2 days old. No distressed fish were observed. No water quality data was taken. Low dissolved oxygen was observed in Alligator River from Cherry Ridge Landing to Northwest Fork of Alligator River on July 17, 2008.
					Total Kills for County: 2 Total Mortality for County: 150

Date	Kill Number	Waterbody	Location	Mortality	Comments
Wake					
5/29/2008	RA08007	Falls Lake	Sandling Beach	5400	DWQ Raleigh Regional Office received a call of a fish kill on Falls Lake in the area of Sandling Beach and Hwy 50 Boat Ramp at approximately 2:00 pm on Thursday, May 29, 2008. Approximately 100 channel catfish and 1 eastern gizzard shad about 8-13 inches long were observed at the locations of the Hwy 50 Boat Ramp and Sandling Beach. It was determined that there were no indicators of water quality problems and the event was essentially a one species fish kill. Brian McRae with the NC Wildlife Commission Staff indicated that they believed this is a natural event which is probably caused by a combination of spawning activities and high water temperature which may have allowed a bacterial infection to sicken weakened fish. On Saturday, May 31, 2008, Judy Garrett and Natalie Landry of the RRO and Susan Massengale the Public Information Officer with DWQ revisited the location of the fish kill. (DWQ received reports that the number of the fish had increased). Field staff observed about 1000 fish dead at the Hwy 50 Boat Ramp and Sandling Beach. All of the fish appeared to be channel catfish. Additionally WRC biologists counted around 1400 dead channel catfish on Friday, May 30, 2008 and had estimated the total number of dead fish in a 17 mile area of the lake to be around 5400. D.O., pH, and conductivity readings were taken at Sandling Beach and Hwy 50 Boat Ramp where there was a heavy fish kill and also at BW Wells where no dead fish were seen. The results appeared normal at all 3 locations. Phytoplankton samples showed no indications that algae played any role in the fish kill. Densities were below the 10,000 units/ml guideline to be considered a bloom and the assemblage structure was typical for the season. Only a few problematic blue green algae were present and their numbers were low (< 600 units/ml).
					Total Kills for County: 1 **Total Mortality for County: 5400**
Yancey					
4/22/2008	AS08001	Cane River	SR 1381 Bridge	60	Kill suspected as being related to recent upset and failure of Burnsville WWTP. Town WWTP reportedly experiencing slugs of low pH waste among other problems. Noticable chlorine, wastewater aroma observed in kill area.
					Total Kills for County: 1 **Total Mortality for County: 60**