

**North Carolina Division of Water Resources
Annual Report of Fish Kill Events
2016**

North Carolina Department of Environmental Quality
Division of Water Resources
Raleigh, NC

October 2016

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2016 Fish Kill Overview

As of October, 2016, the Division of Water Resources (DWR) received 33 reports of fish kill sightings across North Carolina. Seven of these events were formally investigated by DWR staff. The remaining 26 reports were received from public sources but could not be confirmed or investigated by qualified DWR or cooperating agency staff members (Figure 1). Confirmed and unconfirmed kill activity was reported during the year in 11 of the state's 17 major river basins and in 20 counties.

Fish kill information for the current year is posted weekly from June to November on the DWR fish kill website: <http://portal.ncdenr.org/web/wq/ess/fishkillsmain>. This report will also be available on the DWR website after approval.

• Total Reported Events for 2016	33
• Confirmed Kill Events investigated by DWR	7
• Kill Events Reported by Public	26
• River Basins with Reported Kill Activity	11 (of 17)
• Counties with Reported Kill Activity	20

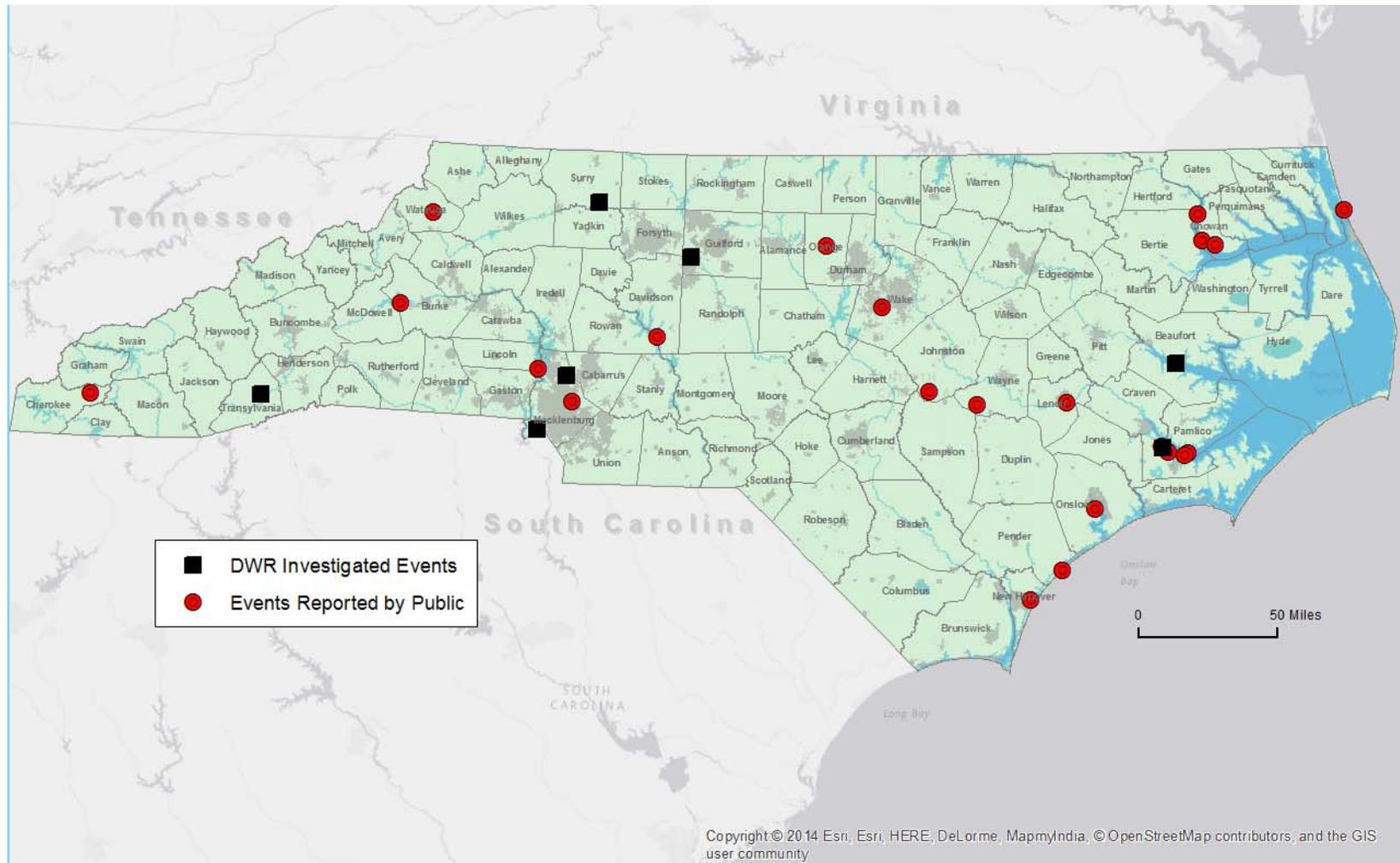
Fish Kill Investigations

The reporting of fish kill activity across North Carolina is based on protocols established by the North Carolina Division of Water Resources (DWR, formerly Division of Water Quality) in 1996. The protocols were developed with assistance from DWR 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 DWR's Water Sciences Section (WSS) where the data are compiled and reviewed. Fish kill investigation forms, laboratory test results, and supplemental information regarding fish kill events are sent to the WSS and entered into a central database where the information can be managed 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 fish kill events.

During 2016 DWR staff developed a mobile app that can be used by the general public to report fish kill activity across the state (see Appendix 2). The app can be accessed through a smart phone, tablet, or PC running Android or iOS platforms. It was developed so that the public could easily report locational and anecdotal information to DWR. Improved widespread reporting of kill events will hopefully assist DWR staff with gaining a better understanding of the scale and magnitude of annual activity and thus result in a more complete response. The app is not meant to replace current DWR fish kill investigation procedures nor does it serve as a tool for the proper assessment of kill events. Information submitted via the app is to be passed to the appropriate regional office for follow up or further investigation under existing DWR fish kill investigation protocols. A link to the app is located on the DWR home page and the Water Sciences Section home page:
<https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page>.

This document is a summary of fish kill events reported to the DWR from January to October, 2016. The report is mandated under NC General Statutes §143B-279.7 (c).

Figure 1: Fish kill events and public sightings reported to DWR during 2016



DWR Fish Kill Investigations.

DWR investigators confirmed details from seven events during 2016 (Figure 1, Appendix 1). The largest events occurred in the Neuse and Tar-Pamlico estuaries, and involved at least 10,000 fish each. Affected species included menhaden, striped bass, flounder and croaker. The lower Neuse and Pamlico estuaries have historically experienced adverse environmental conditions for fish populations such as low dissolved oxygen, high water temperatures, and fluctuating salinities. Consequently, these areas often produce some of the more severe kills events reported annually.

The remaining DWR investigations occurred in central and western regions of the state within relatively small lakes, ponds, and streams. Fish mortality for these events was minimal (3000 fish or less) and most often attributed to low dissolved oxygen during the warm months.

Citizen Reports to DWR

At least 26 reports of fish kill activity were received from citizens during 2016, most often through the use of the DWR mobile app. Reported events occurred statewide from June to October. DWR and cooperating agency personnel were unable in most cases to confirm anecdotal information provided by citizens through app reporting. The lack of DWR follow-up investigations in these instances is a result of staffing and resource constraints at the regional level. Proper investigations could therefore not occur or were performed too long after the event was reported.

A number of unconfirmed reports of fish kills were received from areas along the Neuse and Tar-Pamlico rivers in the wake of Hurricane Matthew. Reports indicated that many events involved fish becoming dispersed in areas during the storms massive flooding and then trapped as the waters receded in the following days/week. Again, DWR investigators were unable to verify any specific details of these events. No formal reports of fish die-offs related to Matthew have been received as of the writing of this report.

Harmful Algal Blooms Associated With Fish Kills

Algal samples were collected by investigators in conjunction with a number of fish kill events during 2016. Results indicated all algal species identified by DWR staff were typical for local estuarine and freshwaters during the summer season and none were cited as a major factor in any kill events. Some forms of algae in North Carolina waters have the potential to produce toxins capable of harming aquatic life. None of the fish kill events were attributed to algal toxins in North Carolina during 2016.

2016 Summary

DWR staff were able to investigate a limited number of fish kill events during the 2016 season. Two large events were reported in the Neuse and Tar-Pamlico estuaries involving mainly menhaden. Other events were recorded in the central and western regions of the state in smaller fresh waterbodies. Anecdotal and locational information on a number of other fish kill sightings was also provided to DWR through the use of a new mobile app available to the public. Unfortunately, regional staff and resource constraints prevented trained investigators from following up on these events with formal assessments and documentation.

DWR fish kill protocols require investigation of events by trained staff members of recognized state agencies. The protocols are designed to standardize reporting methods and enhance the quality and quantity of information reported. The intent of the procedures is also to minimize the dissemination of inaccurate or anecdotal observations historically associated with kill events. Although locational and anecdotal information provided by citizens is useful in placing events and notifying DWR staff, it cannot be used to derive statistical or trend comparisons with previous yearly data. Since a majority of the 2016 fish kill sightings could not be confirmed by trained staff, the year's formal statistics regarding event numbers, fish species, mortality totals, etc., are not presented nor compared to previous annual data. The absence of data reported by trained personnel using DWR protocols prevents an accurate and comparable assessment of kill activity for 2016. Previous annual totals and trends excluding 2016 are provided in Appendix 3 through 5.

The introduction of a mobile fish kill reporting app was apparently well received by DWR staff and the general public. The app provides a simplified means to accurately locate and report basic information associated with an event. As such, the fish kill information produced via the app must be addressed using additional regional time, staff, and resources. State agency responses to fish kills must include formal assessments under DWR protocol to verify and further document event details and to insure meaningful comparisons between yearly events.

Appendix 1: Summaries of Confirmed 2016 Fish Kill
Events Listed by County

2016 Confirmed Fish Kill Events (by County)

Date	Kill Number	Waterbody	Location	Mortality	Comments
Beaufort					
8/23/2016	WA16002	Pamlico River	Sparrow Bay	10,000	EMT staff investigated a fish kill on the Pamlico River August 23. The kill area extended approximately 3 miles paralleling the shoreline near Crystal Beach/Sparrow Bay. Most of the species affected were menhaden. Blue crabs and live schooling menhaden were observed in the area at the time of the investigation. Bloom conditions were ongoing in this area during the investigation. Green water was not observed, however the dissolved oxygen fell to zero just below the photic zone around 2 meters depth. Citizens reported the kill late Friday afternoon. Strong thunderstorms came through the Pamlico river the previous evening. this may have caused some overturn in the hypoxic bottom waters. The Pamlico River has experienced strong sun, high water temperatures, and heavy precipitation during the summer. Bloom samples were taken to DWR's chemistry lab for analysis. Samples contained <i>Cylindrospermopsis</i> and <i>Anabaena spiroides</i> . All species were typical for North Carolina estuaries during the summer months.
Total Kills for County: 1 Total Mortality for County: 10,000					
Craven					
6/16/2016	WA16001	Neuse River	Fisher Landing	10,000	Fish kills observed by Lower Neuse River Keeper in early June and again in July near Fisher Landing.
Total Kills for County: 1 Total Mortality for County: 10,000					
Guilford					
7/28/2016	WS16002	Oak Hollow Lake	Near Intake	600	Hot, dry weather preceding and during event. Water temperature was measured above 94F. Low dissolved oxygen detected in deeper cooler water. Surface film observed on water - reddish brown color.
Total Kills for County: 1 Total Mortality for County: 600					
Mecklenburg					
8/1/2016	MO16002	Dream Lake	Charlotte	30	A large population of Canada Geese observed at pond, droppings were abundant along the east half of the lake. This nutrient load may have contributed to the algal bloom and subsequent hypoxia in the pond. Low dissolved oxygen observed below surface. The algal bloom was much reduced two days later.
8/4/2016	MO16001	Private pond	Charlotte	2,600	Fish reported as gasping at surface. Kill in progress at time of investigation.

2016 Confirmed Fish Kill Events (by County)

Date	Kill Number	Waterbody	Location	Mortality	Comments
					Total Kills for County: 2 Total Mortality for County: 2,630
Surry					
3/15/2016	WS16001	Candiff Creek	near Shoals	90	Event started at 1400 and lasted two hours. By time of investigation water was clear with live fish observed. Rain last 24 hrs. temps in high 70s. Swine waste spill in the area from a vandalized pump.
					Total Kills for County: 1 Total Mortality for County: 90
Transylvania					
8/4/2016	AS16001	Kings Creek	Brevard Com College	150	Cause of event unknown. Water quality parameters measured within acceptable range. Some sewer work and construction activity in area but investigators could not tie directly to kill.
					Total Kills for County: 1 Total Mortality for County: 150

Appendix 2: DWR Fish Kill Report App



Report a fish kill to NC Division of Water Resources

Use this app to report a fish kill to Division of Water Resources staff for further investigation.

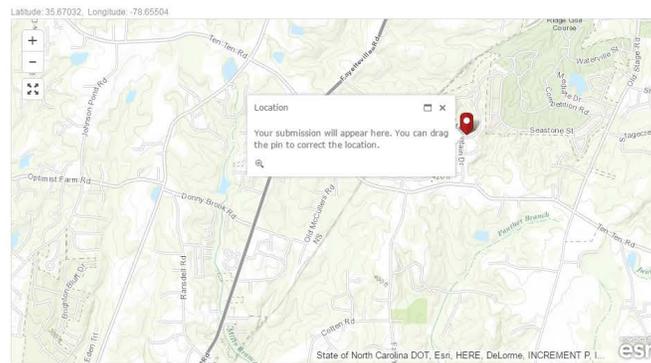
1. Enter Information

Your Name	<input type="text"/>
Optional	
How may we contact you?	<input type="text"/>
Optional	
Date of fish kill	<input type="text"/>
Waterbody where event occurred	<input type="text"/>
Nearest town or landmark	<input type="text"/>
County	<input type="text"/>
Approximate area (river miles, acres)	<input type="text"/>
How long did the event last?	<input type="text"/>
Any other comments	<input type="text"/>

2. Select Location

Specify the location for this entry by clicking/tapping the map or by using one of the following options.

Search	Lat/Lon	USNG	MGRS	UTM
<input type="text" value="Find address or place"/> <input type="button" value="Q"/> <input type="button" value="Locate Me"/>				



3. Complete Form

Add this information to the map.

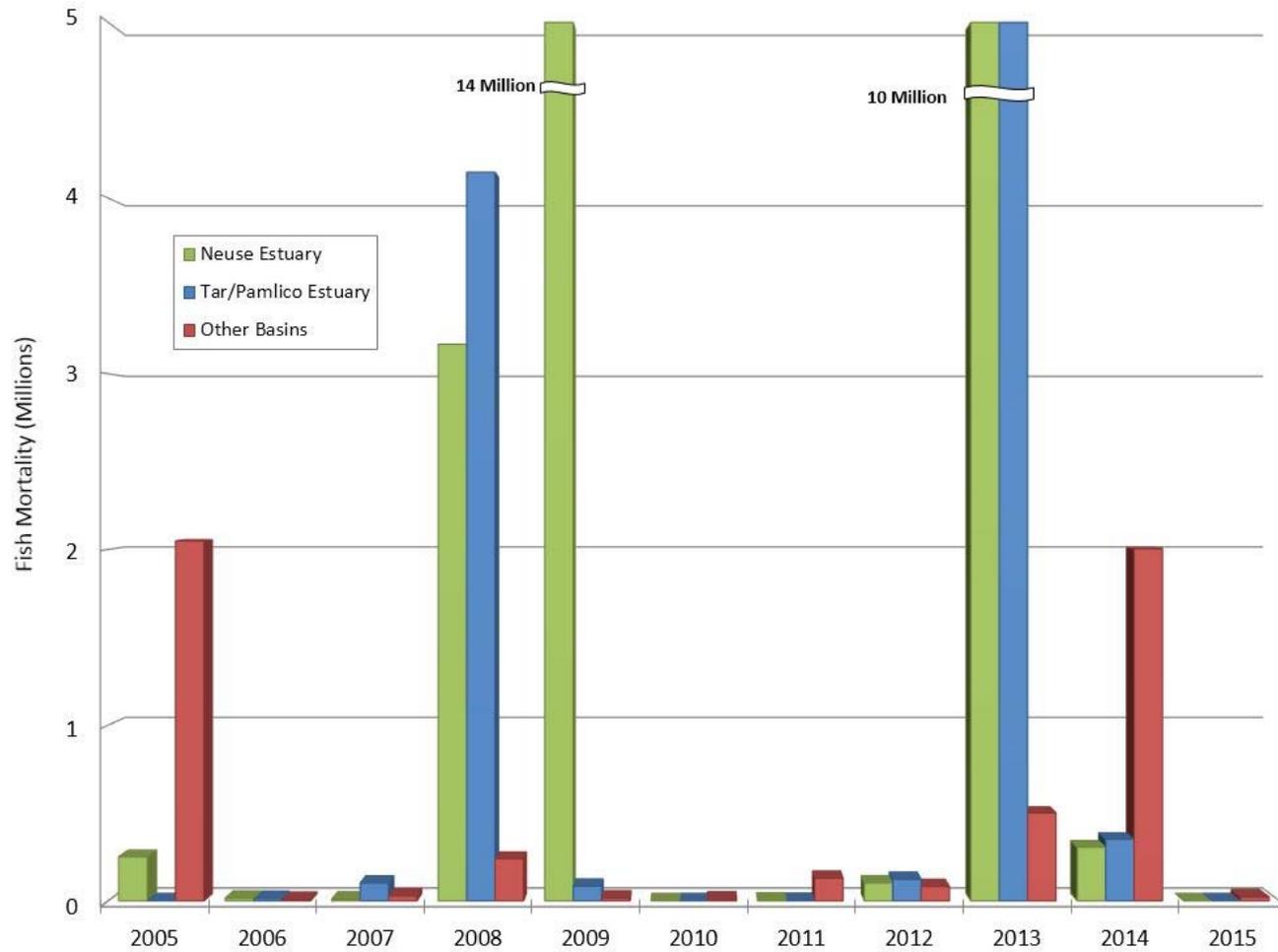
<input type="button" value="Submit Fish Kill Information"/>

Appendix 3: Reported Fish Kill Events Summarized By Basin 1996 -2015

Year	Broad	Cape Fear	Catawba	Chowan	French Broad	Neuse	L. Tenn	Lumber	Pasquotank	Roanoke	Tar/Pam	New/Watauga	White Oak	Yadkin	Annual Totals
1996	None	21	None	2	None	14	None	4	10	2	3	None	3	1	60
1997	None	16	3	2	2	12	None	3	2	None	6	None	3	10	59
1998	None	23	1	1	3	8	None	5	8	1	5	None	1	2	58
1999	1	14	3	1	1	16	None	None	2	None	11	1	3	1	54
2000	None	12	2	None	None	23	None	2	None	None	14	None	3	2	58
2001	None	5	4	1	None	37	None	None	1	None	23	None	3	3	77
2002	None	8	1	2	1	9	None	None	6	None	8	None	3	8	46
2003	None	3	None	2	1	21	None	2	2	2	6	2	None	2	43
2004	None	1	None	1	None	8	None	1	None	1	2	None	None	3	17
2005	None	2	None	1	None	9	None	1	2	1	1	None	1	1	19
2006	1	5	2	None	None	10	None	2	None	2	2	None	None	1	25
2007	1	1	2	1	3	10	None	None	1	1	5	None	None	2	27
2008	None	10	2	2	2	21	None	None	4	None	16	None	None	4	61
2009	None	3	None	2	None	15	None	None	None	None	11	None	None	2	33
2010	None	7	5	1	1	2	None	None	1	None	1	2	1	1	22
2011	None	5	5	2	None	8	None	1	3	2	4	None	None	3	33
2012	None	2	3	None	None	2	None	None	None	None	7	None	1	1	16
2013	None	2	1	None	1	4	None	1	None	1	2	None	None	1	13
2014	None	None	7	None	None	4	None	1	None	None	2	None	1	3	18
2015	None	1	1	1	None	3	1	None	2	None	1	None	None	2	12
Total	3	141	42	22	15	236	1	23	44	13	130	5	23	53	751

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

Appendix 4: Reported annual fish kill mortality, 2005 to 2015



Appendix 5 : Fish Kill Event Density in North Carolina 1996 - 2015

