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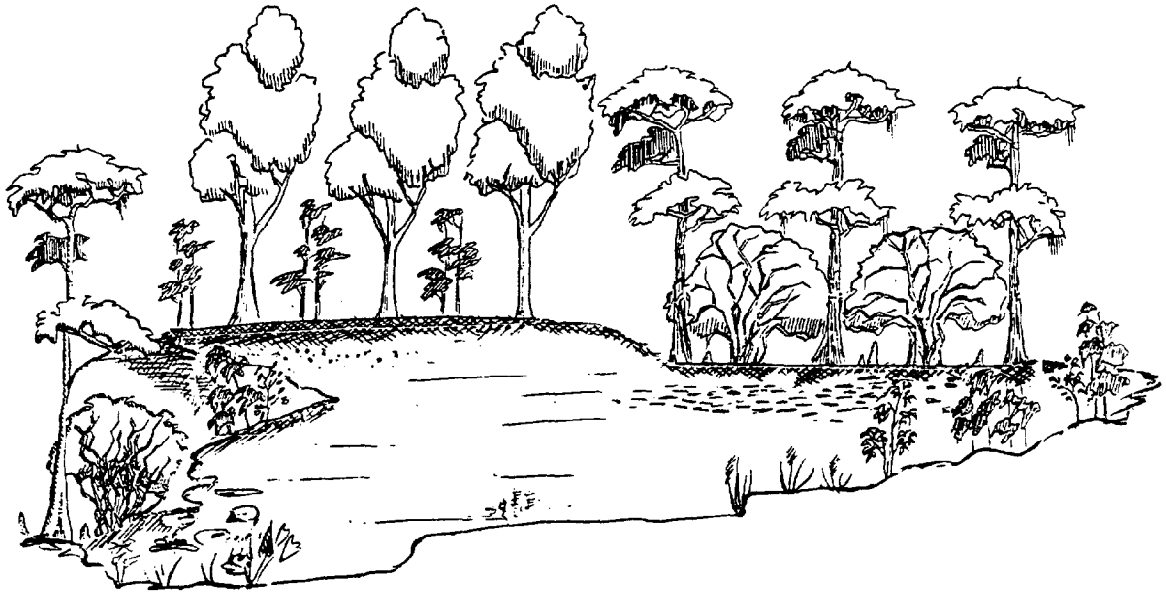
May 23, 1991

1990 ALGAL BLOOM REPORTS

APRIL 1991

NORTH CAROLINA DEPARTMENT OF ENVIRONMENT,
HEALTH AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL MANAGEMENT
WATER QUALITY SECTION



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NORTH CAROLINA DEPARTMENT OF ENVIRONMENT, HEALTH
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WATER QUALITY SECTION

This report has been approved for release _____

Ken Eagleson
Assistant Water Quality Section Chief

Date 5/3/91

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INTRODUCTION

The water quality algal bloom program was initiated in 1984 to document suspected algal blooms with actual biovolume and density estimates, provide water quality data on surface waters not included in the ambient network, aid in fish kill investigations, and detect problem dischargers or other sources of nutrient enrichment in surface waters. Although information collected and analyzed is limited in scope, it can often be useful in documenting the effect of excessive nutrients.

Reported algal blooms have been increasing yearly from 16 in 1984 to 87 in 1989. During 1990 approximately 78 reports of algal blooms were received with algal counts conducted on 134 samples. Since 1984, bloom reports have come from all seven regional offices with blooms occurring predominately in the coastal plain and piedmont regions from ponds, creeks, rivers and estuaries. Figure 1 illustrates the location of all documented algal blooms in North Carolina during 1990. The Neuse and Pamlico River algal blooms are depicted more precisely in Figures 2 and 3 since the majority of algal samples were collected from this area.

Information obtained from the algal bloom program functions as a useful aid in resource management. Algal bloom data are derived primarily from regional personnel. Continued cooperation by regional staff has added to compilation of bloom data, although additional coverage and documentation in some problem areas are greatly needed. This information is necessary to assess water quality conditions and to determine those waterbodies potentially requiring nutrient controls.

Phytoplankton populations are dependent upon nutrient availability and other ecological factors as light, temperature, salinity, organic matter, grazing and currents. Maximum algal growth occurs with an optimum of these conditions. Accelerated eutrophication often stems from anthropogenic sources. When abundant nutrients are introduced into a system, algal growth is accelerated, resulting in algal blooms, causing degredation of water quality, creating taste and odor problems and fouling recreational areas. In addition, some species of dinoflagellates or blue-green algae may be toxic. Dominance by large numbers of nuisance blue-green algae can cause discolored or foul smelling water, often interrupting the food chain by displacing more desirable types of algae. At night, respiration of large numbers of algae results in oxygen deficient waters, creating a stressful environment for aquatic organisms. Furthermore, when large populations of algae die off,

bacterial decomposition and respiration often deplete the water of oxygen sometimes resulting in fish kills.

Frequently algal blooms occur without visible signs. Using metered data, these blooms can be detected by high pH and dissolved oxygen in the photic zone. During the day, oxygen is produced by photosynthetic algae resulting in high daytime dissolved oxygen levels. Conversely, at night, during algal respiration, oxygen is consumed resulting in low photic zone dissolved oxygen levels. Elevated pH in the photic zone is a result of a shift in the carbonate cycle during photosynthesis.

The algal bloom reporting procedure entails collection of phytoplankton, nutrients, chlorophyll, physical/chemical data and a completed 'Algal Bloom Report Form' (Appendix 1) along with a map marking the bloom location.

The 1990 Algal Bloom Report contains a summary of each bloom report arranged by river basin, along with phytoplankton information. Bloom discussions include dominant species when relevant, algal biovolume and density estimates and possible reasons for the bloom's occurrence. Following each bloom summary, an assessment was made as to whether or not actual bloom conditions existed, based on biovolume, density and chlorophyll-a concentrations. Usually, an algal sample with a biovolume larger than 5,000 mm^3/m^3, density greater than 10,000 units/ml or chlorophyll-a concentration approaching 40 ug/l (the North Carolina state standard) constitutes a bloom.

Table 1 contains nutrient, chemical, physical and phytoplankton data. Appendix 2 includes an overview of all bloom reports received since 1984, along with pertinent algal bloom data including phytoplankton biovolume and density estimates, chlorophyll-a concentrations and type of bloom. We can also provide further information on algal blooms and exact locations if requested at (919) 733-6946. Appendix 3 summarizes several algal classes which are frequently mentioned in the report.

As the Division of Environmental Management moves to managing water quality problems from a basinwide approach, information from algal bloom reports will be furnished in whole basin reports rather than in end of the year algal summary reports. Memorandums concerning algal blooms will continue to be furnished to the individual data collecters when requested.

FIGURE 1. ALGAL BLOOMS IN NORTH CAROLINA, 1990

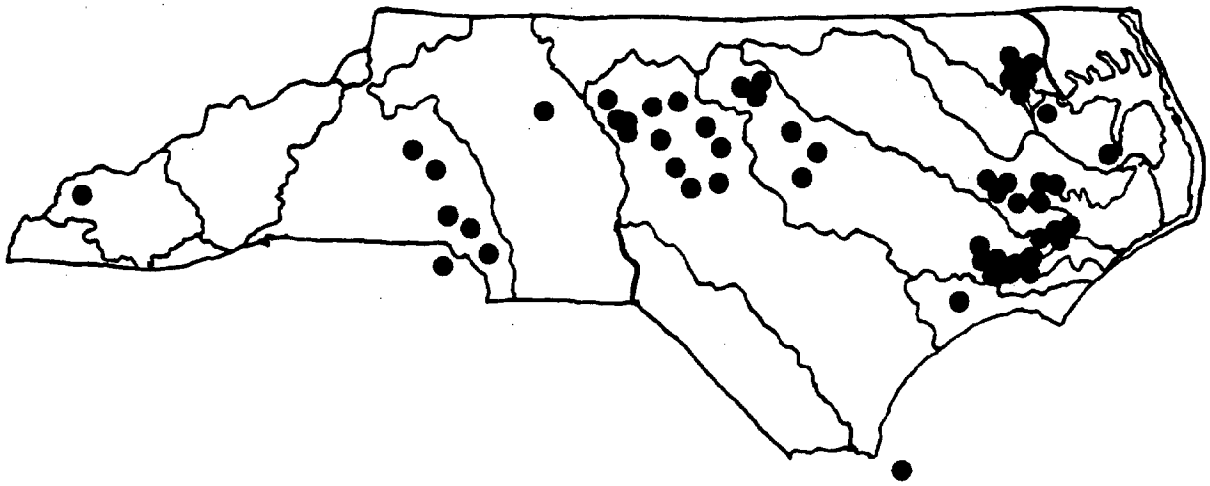


FIGURE 2. ALGAL BLOOM LOCATIONS ON THE LOWER NEUSE RIVER, 1990

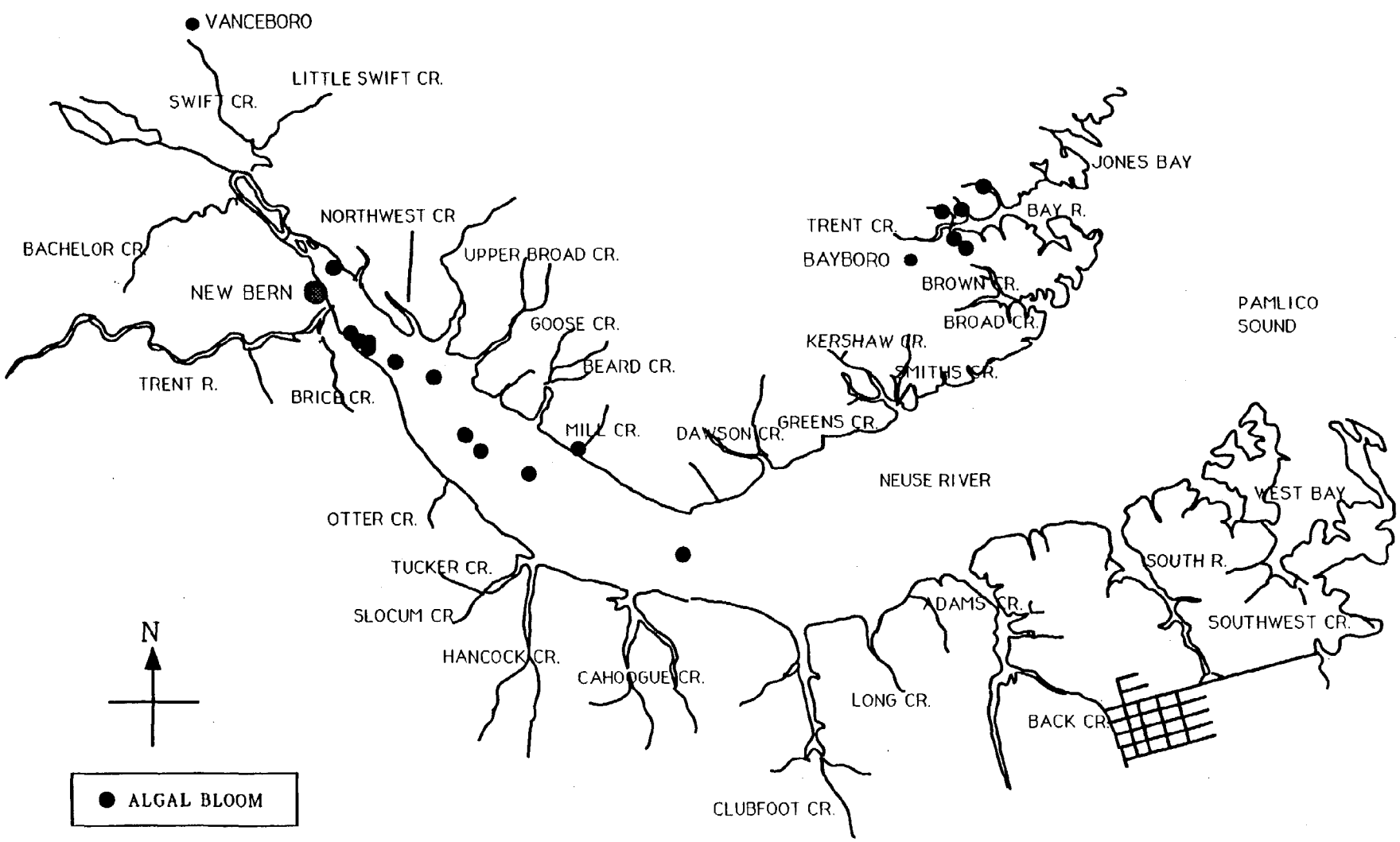


FIGURE 3. ALGAL BLOOM LOCATIONS ON THE LOWER PAMLICO RIVER, 1990

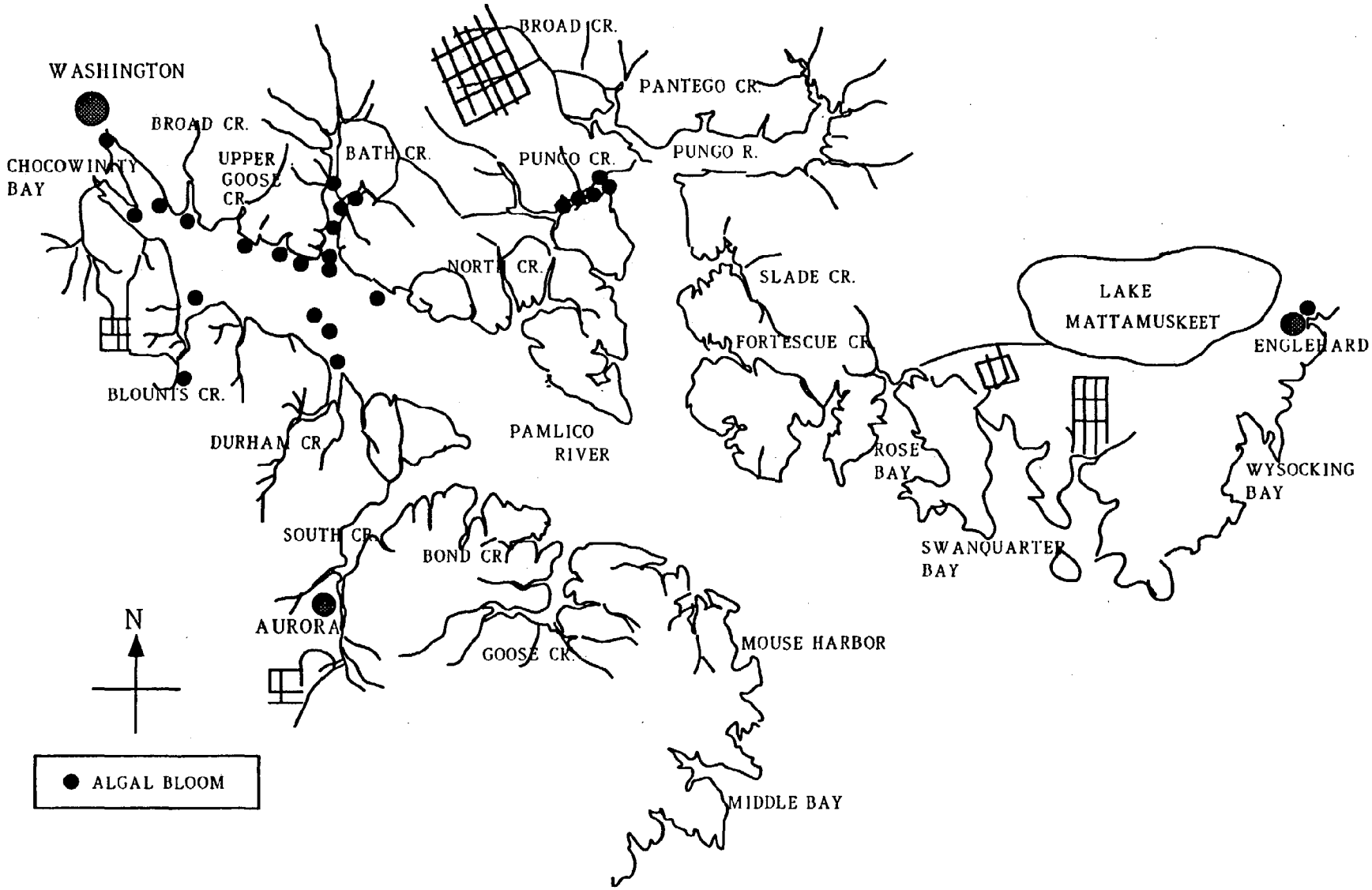


TABLE 1. ALGAL BLOOM SUMMARY FOR 1990

STATION	DATE	CHL-A	BIOVOLUME	DENSITY	NH3/4	TKN	NO2/3	TP	PO4	DO	pH	TEMP	CONDUCTIVITY	SALINITY	FISH KILL?	BLOOM TYPE
		ug/l	mm3/m3	units/ml	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	su	°C	umhos	ppt		
CAPE FEAR																
STEWART-1	900515	350	113537	73017	0.12	1.5	0.03	1.2	0.08	11	9.14	30.5				YES, TRAC VOL
STEWART-1	900802	6400	350745	85597	0.12	20	0.01	1.2	NS							YES, CYA-ANAB SPI, APHA FLO, ANAC CYA
STEWART-1	900809	400	N/A		0.23	3.9	0.04	0.55		11.8	8.6	27				YES, CYA-ANAB SPI,CHL, EUG
BACKGROUND-1	900802	37	10567	25854	0.05	0.7	0.01	0.08	NS							YES, CHL,EUG,BAC,CYA
H P CITY LAKE-	900705	NS	4464	17468	NS											YES, CYA-ANABS RAC, ANAB LEV
HIGH PT LAG-1	900705	NS	63388	32142	NS											YES, CHL-STAU, SCEN QUA
OAK HOLLOW-1	900705	NS	2518	55200	NS											YES, CYA-ANABS RAC, ANAB LEV
MBN-D2 (LATHA	900710	21	1134	2811	0.32	1.2	4.7	1.1		3.4/2.2	7.5	28.2	820			YES, FIL ALGAL MATS
DEEP-COL	900711	28	3503	8245	NS					6	7.3	31				NO, BUT CHL-CARTERIA SP
ROCKY-2A	900726	44	1889	13451	0.02	1.3	4.6	0.49	0.35	10.6/8.2	8.5/8.5	27/24.5	355/347			YES, CHL, CRY, BAC
ROCKY-1	900803	32	1662	6594	0.14	0.9	0.03	0.13	<.01	3.6	6.7	22.3	103			YES, CHL, CRY, CHR
ROCKY-2	900803	44	1250	5590	0.42	2	6.2	0.88	0.69	1.1	6.3	23.1	558			YES, CHR, CYA
ROBESON CR (2	900813	23	3324	25854	0.03	0.7	0.04	0.11	0.01	12.2/12	8.9/8.9	29.5/29.5	282/284			YES, CYA, CHL, CRY, BAC
NEW HOPE CR	900814	8	3211	5008	0.04	0.7	9.4	0.86	0.74	8.0/8.0	9.0/9.0	27.5/27.5	384/390			NO, BUT CYA
F MOSER POND	900821	NS	N/A		NS											YES, CYA-ANAB POR,SPI, BACTERIA
LAKE CEDAR HO	900828	NS														YES, CYA-ANAB SUB, OSCI SP
JORDAN (CPFD	900913	74	102611	499604	0.17	1	0.04	0.17	0.01	4.6/2.4	6.9/7.1	26.9/26.8	174/178			YES, CYA ANAC CYA, OSCI GEM, CHL,EUG
ATLANITC OCEA	900723	NS	N/A		NS											FIL CYA-OSCI ERYTHRAEA
CATAWBA																
BRAGG POND	900614	10	N/A		0.29	1.22	<.05	0.06			7.8	30.5/27	70		YES	YES, CHL-CLOSTERIOPSIS
GRANTS-1	900621	14	5037	4658	0.03	0.5	0.01	0.07		11.6/0.9	8.9	30	126			YES, EUG,CHL,CRY
WILSONS LAKE	900730	10	813	6201	<.01	0.3	0.01	0.03	<.01	10.0/12	5.7	30/26			YES	NO
STEELE CREEK	900801	5	3712	1572						3.5	7.6		330			NO, BUT CYA
SOUTH FORK P.	900820	1900	194116	1388760	0.08	8.8	0.04	2.5		20	8	33			YES	YES, CHL-CHLOROGONIUM EUCHLORUM
CROWD-15A	900905	35	12551	56948	0.02	0.6	0.01	0.11	0.01	12.3	31.1	8.9	177			YES, EUG, CYA-MER TEN
LAKE NORMAN-	901003	NS														YES, CYA-ANAC CYA
L NORMAN (DAV	901016	6	695	3668	0.05	0.2	0.08	0.01		8.4/8	8.5	24/22	61/62.5			NO
COMMSCOPE-1	901114	3500	1051475	38829	0.29	20	0.03	1.5	NS							YES, CYA-COELOSPHAERIUM NAEGELIANUM
CHOWAN																
CHOWAN-9	900612	4	305	1002	0.04	0.5	0.18	0.06	0.01	NS						NO
2053632	900612	2	279	681	0.03	0.4	0.23	0.05	0.01	6.9/6.9	6.8	23/25	73/75			NO
2053652	900612	3	666	1380	0.07	0.3	0.15	0.06	0.01	7.3/7.3	7	24/24	82			NO
ARROWHEAD-1	900619	15	11656	13695	0.02	0.5	0.07	0.07	<.01	8.8/6.1	7.8/7.3	28.3/24.8	78/72			YES CYA, CHL, CRY, BAC
CATHERINE-1	900619	24	5330	5066	0.02	0.5	0.04	0.08	<.01	9.2/1.9	7.5/6.4	29.1/24.3	67/83			YES, CYA
CHOWAN-14	900619	12	3034	5401	0.02	0.5	0.1	0.07	<.01	8.4/5.9	7.1/6.4	28.9/25.4	66/67			NO
INDIAN-2	900619	11	3390	5590	0.01	0.5	0.08	0.08	<.01	7.1/1.7	7.2/6.3	28.8/24.4	74/100			NO
ROCKYHOCK-1	900619	12	6857	10307	0.02	0.4	0.02	0.07	<.01	8.6/7.3	7.9/7.1	27.2/26.2	79			YES, CYA
205360615	900619	9	1684	2533	0.01	0.5	0.09	0.08	<.01	8.4/6.2	7.1/6.6	28.5/25.4	67/70			NO
2053632	900619	10	3475	4076	0.02	0.4	0.11	0.06	<.01	8.1/7	7.1/6.9	26.1/25.5	77/79			NO
205363575	900619	6	14765	12438	0.03	0.4	0.07	0.06	<.01	8.2/6.5	7.3/7	26.6/25.4	78/78			YES, CYA
2053652	900619	8	11552	8860	0.02	0.4	0.09	0.06	<.01	8.3/5.9	7.3/6.9	24.6/25.1	84/82			YES, CHLMD, CRY
2053652005	900711	NS	13095	3419	NS											YES, CYA-ANAB POR, CRY
CATHERINE-7	900712	350	32805	8122	NS											YES, CYA -ANAB POR
CHOWAN-5	900712	250	69869	15897	NS											YES, CYA -ANAB POR
INDIAN-8	900712	200	23698	6551	NS											YES, CYA -ANAB POR
2093632	900712	120	31330	8036	0.27	1	0.01	0.11	<.01	8.2/7.6	9.1	30/29	80/80			YES, CYA -ANAB POR
2093652	900712	17	3335	1910	0.18	0.5	0.02	0.08	<.01	7.3/6.5	7.5	29/28	85/90			NO
BENNETTS	900712	270	22603	6521	NS											YES, CYA -ANAB POR

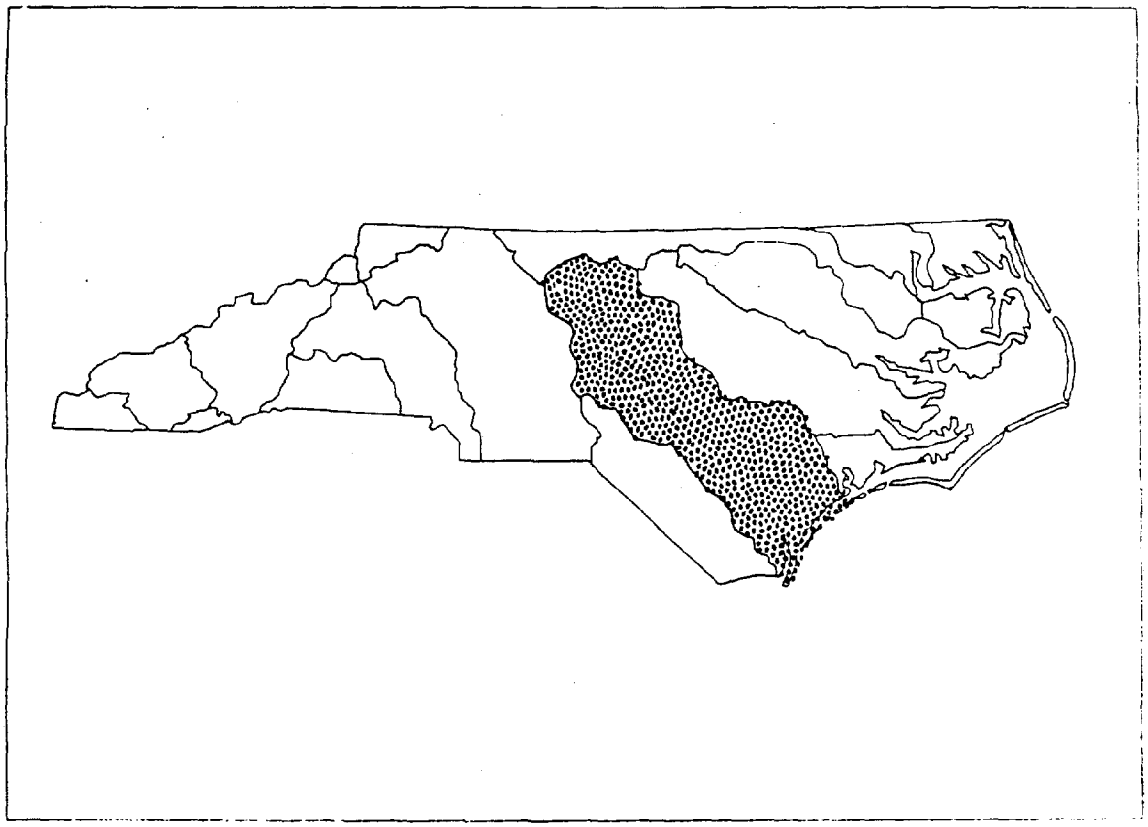
TABLE 1. ALGAL BLOOM SUMMARY FOR 1990

STATION	DATE	CHL-A	BIOVOLUME	DENSITY	NH3/4	TKN	NO2/3	TP	PO4	DO	pH	TEMP	CONDUCTIVITY	SALINITY	FISH KILL?	BLOOM TYPE
		ug/l	mm3/m3	units/ml	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	su	°C	umhos	ppt		
INDIAN-8	900726	35	7142	3474	0.29	0.9	0.06	0.09		7/0.1	7.1	30/28	108/143			YES, CYA -ANAB POR, CRY
2053632	900802	14	5179	2180	0.18	0.6	0.15	0.11	0.01	5/3.8	6	27/28	77/75			YES, CYA -ANAB POR, CRY
2053652	900802	16	6245	2725	0.14	0.6	0.06	0.07	<.01	6.1/5.8	6.4	27/28	77/75			YES, CYA -ANAB POR, CRY
CHOWAN-ROCK	900802	100	10923	2306	0.14	1.2	0.13	0.18	0.03	6.5/4.5	6.1	29/28	74/71			YES, CYA -ANAB POR, ANAC CYA
CHOWAN-3	900912	370	N/A		0.02	2.9	0.06	0.3	<.01	NS----------						YES, CYA -ANAC CYA
2053574	901016	6	5109	699	0.05	0.3	0.08	0.08	0.01	6.8/6.9	6.2	23/23	83/83			YES, CHLMD, CYA
205360615	901016	4	1388	256	0.04	0.4	0.09	0.08	0.01	6.9/6.8	6.3	23/23	83/83			NO
2053632	901016	6	3652	1077	0.05	0.4	0.11	0.09	0.02	5.6/5.3	6.1	23/24	62/61			NO
LITTLE TENNESSEE																
SANTEETLAH-1	900620	27	10780	2492	0.3	0.8	0.02	0.1	0.01	NS----------						YES, CYA-ANAB POR, ANAC CYA
LUMBER																
ECHO LAKE-1	900227	1	70	934	0.2	0.5	0.26	0.02	<.01	10	6.9	11	38			NO
LAKE PINEHURS	900718	3	710	833	0.03	0.3	<.01	<.01	NS----------							NO
NEUSE																
GARNER POND	900228	130	8306	4944	0.04	0.3	0.03	0.12	<.01	13.2	6.5	12.1	74			YES, EUG
GOBBLE POND	900315	17	N/A		0.05	0.4	0.02	0.05	<.01	8.6	6	19.3	86			FIL GREENS
WNDL-D2 (L WEI	900705	270	58404	13014	0.01	5.1	<.01	0.39		15.9/0.3	8.1	28	110			YES, CYA-ANAB, APHA FLO, ANAC CYA
VET S-1	900812	4800	96001	61722	NS----------					5/4.1	7.9/7.6	27.5/26.4	94/95		YES	YES CYA-ANAC CYA
VET S-2	900812	140	38055	24339	0.79	2.7	0.03	0.98	0.05	4.8/0.1	7.6/6.6	27.6/25.3	91/99		YES	YES EUG, CYA
VET S-3	900812	88	15001	18459	0.74	2.6	0.03	0.86	0.06	4.1	7.6	26.4	93/108		YES	YES EUG, CYA-ANAC CYA
ENO-1	900821	250	30120	6580	0.05	0.9	0.46	0.23		6.1/2.5	7.2/7.2	29.5/29.5	170/205			YES, EUG
ENO-2	900821	83	30325	6359	0.05	1.1	0.14	0.28		5.9/3.8	7.1/6.9	27.5	27.5	220/228		YES, EUG
NEU010	900912	33	5271	12578	0.02	0.7	0.06	0.11	<.01	8.6/0.2	7.1/6.4	28.8/25.5	185/205			YES, EUG, CYA
ALLIGATOR-5 (E	900315	140	35788	33191	<.01	1.3	<.01	0.09		17.6/10	8.8	20.6/16.5		9.0/10		YES DIN-PRO MIN
CHAPPEL-7 (BA	900315	71	12178	13364	<.01	0.8	<.01	0.06		11.2/11	7.4	22/22		7.7.2		YES DIN-PRO MIN, CRY
RACOON-2 (BAY	900315	56	7414	11005	0.13	0.8	<.01	0.08		9.8/9.6	7.1	22/22		7.5/7.5		YES DIN-PRO MIN, BAC
TRENT-1 (BAY	900315	110	25910	24980	<.01	0.9	<.01	0.06	<.01	9.3/0.4	7.1	17/13.5		9.2/10.2		YES DIN-PRO MIN
VANDEMERE-8 (	900315	7	1414	1834	0.07	0.7	0.25	0.03		9/0.2	6.7	24/13		5.5/9.8		NO
NEU139	900319	140	4954	19128	0.01	0.6	0.03	0.09	0.02	12/5.6	8.8	19/16	8400/17700	5.0/11		YES, DIN-PRO MIN, HET TRI, BAC-SKEL POT
NEU139	900524	25	1044	11398	0.01	0.4	<.01	0.06	0.01	10/5.9	8.7	23/22	7280/11660	5.0/7		YES, BAC-CYCL SP3, DIN PERI TRO
NEU131X	900524	120	4710	11049	0.01	0.5	0.01	0.07	0.01	9.6/5.7	8.7	23/22	3640/11130	2.0/7		YES, DIN-GYM NEL,GYR AUR,CRY
NEU131F	900627	16	1066	10365	0.02	0.6	0.1	0.06	0.01	9.8/0.2	8.3	29/28	3128/9400	2/5.5		YES, BAC-CYCL SP3, CRY,CHR
2092586	900627	27	13190	27077	0.01	0.5	<.01	0.07	0.02	9/.6	8	29/28	5520/8930	4.0/7		YES, XAN-OLIS CAR,CRY,CHR
ORIENTAL-LAG	900718	90	13773	19041	NS----------											YES, CHL-CHLLA, CYA ANABS RAC
NEU131X	900724	23	2957	18779	0.02	0.5	<.01	0.09	0.04	9.5/0.1	8.7	31/29	14960/28520	10.0/18		YES, DIN , CRY
NEU139	900724	21	8868	12578	0.02	0.4	<.01	0.1	0.05	8.7/2.4	8.6	30/29	20250/24380	13/16		YES, DIN , CRY, CYA-PHOR ANG
NEU131F	900725	34	2438	3756	0.02	0.6	0.06	0.15	0.03	8.7/0.1	8.3	29/28	9200/24440	9.0/15		YES, DIN-GYR AUR,BAC,CRY
NEUSE-12	900817	13	1046	3052	0.01	0.6	<.01	0.13	0.08	6.7/0	8.4	28/28	21000/28500	12.0/18	YES	NO
HART POND	900926	NS	N/A----------		NS----------					7.1	6.7	19	112		YES	YES, CYA - ANAB PORT
GREEN SPRINGS	900827	29	2223	13975	0.07	0.5	0.36	0.2	0.09	7.9/8	8.2	31/30	2900/3600	2.0/2.0		YES, XAN-OLIS CAR, CRY
GREEN SPRINGS	900827	26	11278	36102	0.06	0.3	0.34	0.21	0.1	7.9/8	8.2	31/30	2900/3600	2.0/2.0		YES, XAN-OLIS CAR, CRY
GREEN SPRINGS	900827	51	11984	35170	0.13	0.5	0.08	0.32	0.22	7.9/8	8.2	31/30	2900/3600	2.0/2.0		YES, XAN-OLIS CAR, CRY
NEUSE-2	900916	25	5409	66381	0.03	0.6	<.01	0.23	0.18	11.1/0.1	8.5	28/27	11280/16800	7.0/10	YES	YES, BAC-CYCL SP3, CYA
NEUSE-4	900916	25	4960	90488	0.03	0.6	<.01	0.22	0.14	10.4/4.2	8.8	28/27	18800/19200	12.0/12	YES	YES, BAC-CYCL SP2, CYA
NEUSE-7	900916	22	10416	84898	0.03	0.6	0.01	0.16	0.16	9.5/0.2	8.7	27/27	12000/15360	7.0/9.5	YES	YES, BAC-CYCL SP3,CRY
2092162	900926	39	2485	45419	0.03	0.8	0.29	0.17	0.08	10/1.5	8.3	22/22	7950/74310	5.0/9.0	YES	YES, DIN, BAC-CYCL SP2&3
NEU131F	900926	53	19670	129967	0.01	0.7	<.01	0.2	0.09	10.5/2.9	8.7	22/22	10600/16960	6/10.5	YES	YES, BAC-CYCL SP2
NEU131X	900925	16	5474	172591	0.02	0.4	<.01	0.16	0.1	10.4/2.8	8.7	22/23	15900/21840	10.0/14	YES	YES, BAC-CYCL SP2
MILL CR-B	901204	17	7776	9549	0.02	0.5	<.01	0.08	0.02	7.8	6.8	16		16		YES, DIN-PRO MIN

TABLE 1. ALGAL BLOOM SUMMARY FOR 1990

STATION	DATE	CHL-A	BIOVOLUME	DENSITY	NH3/4	TKN	NO2/3	TP	PO4	DO	pH	TEMP	CONDUCTIVITY	SALINITY	FISH KILL?	BLOOM TYPE
		ug/l	mm3/m3	units/ml	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	su	°C	umhos	ppt		
MILL CR MAR	901204	140	88369	79133	0.02	1.3	<.01	0.21	0.03	7.8	6.8	16		16		YES, DIN-PRO MIN
PASQUOTANK																
ALBEMARLE-A	900417	NS	N/A		NS											FIL CHL-CLADOPHORA SP
ROANOKE-B	900417	NS	N/A		NS					7.5/7.4	6.5	18/16	91/94			FIL BAC-MELOSIRA VAR, CHL SPIROGYRA, U
ALB BEACH	900706	NS	N/A		NS							28.5				FIL CYA-TOLYPOTHRIX SP
2081185 (KEND	900712	NS	30400	2030	0.01	0.6	0.02	0.15	0.02	7.8	7.3	30	117			YES, CHLMD, CRY
208117810	900820	14	4456	14761	0.02	0.5	0.02	0.05	0.01	8.9/2.2	7.3	31/30	3036/4500	2.0/3.0		YES, XAN-OLIS CAR,CRY,CYA
ROANOKE																
ROANOKE NETS	900314		N/A	NS												FIL BAC - MELOSIRA ITA TE
TAR-PAMLICO																
GREENVILLE UT	900719	NS	N/A		NS											FIL CYA-LYNG NANA, OSCI CHL,OSCI GEM
GREENVILLE UT	901008	NS	N/A		NS						7.2	23	198			FIL CYA-LYNG NANA, OSCI SP, CHL-CHLA S
CHOCO-1	900305	52	17393	26028	0.02	0.4	0.04	0.12	<.01	13/12.4	8.7	12.0/11	227/243			YES, BAC-SKEL COS
BACK CR-92	900525	NS	6085	30046	NS					8.9/8	7.8	23/23		1.5/1		YES, DIN
MBC	900525	NS	2000	33190	NS					9.2/7.8	7.7	24/23		1.5/1.5		YES, XAN,BAC,CRY
MBB	900525	NS	641	10132	NS					9.8/7.7	8	24/23		1.5/1.5		YES, XAN,BAC,CHL
PAM-BATH CR	900525	NS	1897	28474	NS					9.2/6.5	7.2	22/22		1/2.5		YES, BAC,CRY
TAR057G	900604	23	9955	46641	0.02	0.5	0.06	0.11	0.02	10/4.6	8.7	26/23	1029/9360	0.5/6		YES, DIN, BAC,CRY
TAR057G085	900604	15	713	26727	0.02	0.6	<.01	0.13	0.01	9.8/4.4	8.9	27/24	134/6630	0.5/4		YES, BAC-CYCL SP2
2084534	900604	34	13577	88217	0.05	0.5	<.01	0.12	0.03	9.4/7.6	8.7	27/26	2976/3087	2/1.5		YES, XAN-OLIS CAR,BAC-CYCL SP2
CHOCO-1	900604	31	2996	70224	0.01	0.7	0.01	0.16	0.01	9.5/9.8	8.7	26/26	147/147			YES, BAC-CYCL SP3, CRY
ENGLEHARD	900612	25	5780	97126	NS					10/9.5	8.3	16		18.5		YES, BAC - CYCLOTELLA SP 2 & 3
TAR057G	900718	62	6602	7017	0.04	0.5	0.01	0.65		8.2/1.7	7.2	30/27		6.4/7		YES, DIN,CYA,CRY
PAM-WASH	900718	50	N/A		0.02	0.6	0.08	0.11		12.0/5	8.4	36/34				YES, CYA-MER TEN BREAKING UP
PAM-2A	900724	20	21354	29347	0.03	0.06	<.01	0.18		8.2/7.1	7.9	29/29		5/5.9	YES	YES, DIN,CYA
PAM-4B	900724	27	3739	11412	0.02	0.6	<.01	0.15		8.3/0.2	7.5	29/28		5.8/9.2	YES	YES, DIN,CYA
PAM-5C	900724	36	13414	21225	0.03	0.6	<.01	0.1		8.5/0.2	8	29/28			YES	YES, DIN,CYA
PAM-7D	900724	23	3414	24980	0.02	0.5	<.01	0.12		7.8/0.3	8.2	30/27		5.5/11.8	YES	YES, DIN,CYA
PAM-10E	900724	85	36260	25875	0.02	0.6	<.01	0.3		9.8/6.2	8.6	31/28		7.2/7.2	YES	YES, DIN,CYA
PAMLICO-R ACR	900726	NS	N/A		NS										CRAB KILL	FIL RHOD-COMPSOPOGON COERULEUS
PUNGO CR-2	900801	62	11405	14616	0.02	0.7	<.01	0.09		7.5/3.5	7.9	30/28		7/7.5	CRAB KILL	YES, DIN,CRY,CYA
PUNGO CR-5	900801	28	2559	12985	0.01	0.6	<.01	0.07		8/0.1	8.1	29/27		7.9/13.1	CRAB KILL	YES, DIN,CRY,CYA
PUNGO CR-8	900801	27	2634	10248	0.02	0.6	<.01	0.06		8.7/0.6	8.5	29/28		6.5/10.2	CRAB KILL	YES, DIN,CRY,CYA
PUNGO CR-9	900801	51	14505	12461	0.02	0.6	<.01	0.07		8.5/0.1	8.3	30/27		5.2/11.5	CRAB KILL	YES, DIN,CRY,CYA
2084519505	900802	8	1394	13844	0.04	0.7	0.02	0.06		7.7/2.4	6.8	29/28		5.2/6.2		YES,XAN,CYA,DIN,CHR,BAC
BROAD CREEK	900815	NS	N/A		NS											MACRO ALGAE-NITELLA SP.
PAMLICO-5	900827	60	15517	47515	0.04	0.7	<.01	0.25		11.3/7.8	8	29.7/28.2		4.3/4.2	CRAB KILL	YES,DIN,CYA,BAC
PAMLICO-6	900827	32	4393	33278	0.02	0.6	<.01	0.37		8.7/0.1	8	29.3/27.2		8/12.3	CRAB KILL	YES,DIN,CYA,CRY
SUMMER-A1	900827	NS	4766	30134	NS						7.9				CRAB KILL	YES,DIN,CRY,BAC,CYA
PUNGO-1	900829	31	2375	38780	0.01	0.7	<.01	0.11		9.5/0.3	8	31/28		7.0/12	YES	YES,DIN,CYA,BAC
HERRING-A	901219	21	6057	2853	0.09	0.7	0.01	0.15		2.5/1.5	6.8	14/13		9.5/10.6		YES, DIN-OXY MAR
WHITE OAK																
209317585	901002	44	1461	7570	0.16	0.5	0.04	0.24	0.14	0.4	7.2		29000	7		YES, CHR-OCHR SP, BAC-MELOSIRA VAR
YADKIN																
DUTCHMAN-1	900201	16	82	442	NS											NO
HANES-1	900725	90	3265	20962	0.14	6.4	<.01	3.1		0.8	7.2	27.5				YES, CHL-ANKI FAL MI
HANES-2	900725	18	2684	1922	0.04	0.7	<.01	0.08		10.1	8.6	27.5				NO, BUT ENRICHED

CAPE FEAR RIVER BASIN



Stewart and Background Ponds, Randolph County
Sampled by S. Knight 900515, 900802, 900809

Water quality samples were collected from Stewart Pond during May and August in response to a complaint from the landowner. This pond receives discharge from an upstream wastewater treatment plant.

During sampling in May, high DO (11.0 mg/l) and pH (9.1) levels were detected. The elevated dissolved oxygen represented supersaturated conditions which result when photosynthetic activity is increased in the presence of large numbers of algae.

Phytoplankton analysis confirmed the presence of an algal bloom with elevated biovolume and density estimates comprised of 99% euglenophytes. A ubiquitous euglenoid, Trachelomonas volvociña, which is commonly found in ponds, dominated the sample. Large numbers of euglenoids are often indicative of organic enrichment. A similar euglenophyte bloom occurred in Stewart Pond in September of 1988.

During August, water quality samples were again collected because of the presence of persistent algal blooms. On August 2, an algal bloom dominated by Anabaena spiroides and Aphanizomenon flos-aquae, both cyanophytes, occurred in Stewart Pond. Another buoyant blue-green, Anacystis cyanea, was also prevalent in the pond sample. These buoyant algae created a bluish-green scum covering the pond's surface. On the same date, Background Pond, which is located near Stewart Pond, was sampled for comparison since it does not receive wastewater discharge as does Stewart Pond. Background Pond contained algal bloom levels dominated by several classes of algae including chlorophytes, bacillariophytes, euglenophytes, and cyanophytes.

A week later, Stewart Pond was sampled after rainfall events. The sample contained a massive bloom of cyanophytes, dominated by Anabaena spiroides. Chlorophytes, and euglenophytes were also abundant.

Water quality samples collected during May and August show that Stewart Pond supported algal bloom levels of algae along with astronomical levels of chlorophyll-a (350-6400 ug/l) and excessive nutrient concentrations. Total nitrogen levels ranged from 1.53 to 20.01 mg/l while total phosphorus measured 0.55 to 1.2 mg/l. Although Background Pond also contained algal bloom conditions, they were not nearly the magnitude that was found in Stewart Pond.

The close proximity of the upstream wastewater discharge above Stewart Pond or possibly non-point source runoff may be contributing nutrient inputs to which the phytoplankton were responding. Unless the source of nutrients is controlled, recurring algal blooms are probable.

Stewart Pond 900515

Total Biovolume	= 113,537 mm^3/m^3
Total Density	= 73,017 units/ml.
Chlorophyll-a	= 350 ug/l
Algal Bloom	= Yes

Stewart Pond 900802

Total Biovolume	= 350,745 mm^3/m^3
Total Density	= 85,597 units/ml.
Chlorophyll-a	= 6,400 ug/l
Algal Bloom	= Yes

Background Pond

Total Biovolume	= 10,567 mm^3/m^3
Total Density	= 25,854 units/ml.
Chlorophyll-a	= 37 ug/l
Algal Bloom	= Yes

High Point City Reservoirs, Forsyth County
Sampled by D. Molnar 900707

Three reservoirs near High Point were sampled because of an apparent algal bloom. Blue-green algal blooms dominated by Anabaenopsis raciborskii and Anabaena levanderi occurred at High Point City Lake and Oak Hollow Reservoir, while High Point Lagoon contained high numbers of green algae.

High Point City Lake

Total Biovolume	= 4,464 mm^3/m^3
Total Density	= 17,468 units/ml.
Chlorophyll-a	= not sampled
Algal Bloom	= Yes

High Point Lagoon

Total Biovolume	= 63,388 mm^3/m^3
Total Density	= 32,142 units/ml.
Chlorophyll-a	= not sampled
Algal Bloom	= Yes

Oak Hollow Reservoir

Total Biovolume	= 2,518 mm^3/m^3
Total Density	= 55,200 units/ml.
Chlorophyll-a	= not sampled
Algal Bloom	= Yes

Latham Lake (MBN-D2) Alamance County
Sampled by G. Price 900710 1325

Algal bloom samples were collected from Latham Lake during ambient lakes monitoring. Thick algal mats were prevalent on the lake's surface. During sampling at midafternoon, low dissolved oxygen concentrations ranging from 3.4 mg/l on the surface to 2.2 mg/l at 1.5 meters depth were found. An elevated conductivity of 820 uhmos was also present. The town of Mebane's wastewater treatment plant is located approximately one mile upstream. Similarly, elevated conductivities are often associated with wastewater treatment plant operations.

Quantitative phytoplankton counts revealed moderately low algal biovolume and density estimates. The corresponding chlorophyll-a concentration was moderate at 21 ug/l. Phytoplankton growth was perhaps being limited by shading or some other factor.

Nutrient levels in Latham Lake were excessive with total nitrogen, total phosphorus and ammonia/ammonium reaching 5.9, 1.1, and 0.32 mg/l, respectively.

Because of hypereutrophic conditions in Latham Lake, Mebane will not be able to expand its treatment plant facilities. In order to expand in the next few years, the town plans to drain Latham Lake.

Total Biovolume	= 1,134 mm^3/m^3
Total Density	= 2,811 units/ml.
Chlorophyll-a	= 21 ug/l
Algal Bloom	= Yes

Deep River above dam at Coleridge, Randolph County
Sampled by S. Knight 900711

A run of the river impoundment on the Deep River was sampled for algal blooms prompted by complaints of reddish colored water.

A quantitative algal count was conducted and the phytoplankton sample's biovolume, density and chlorophyll-a concentration were found to be approaching bloom levels. The algal sample was dominated in biovolume by 87% chlorophytes with Carteria spp. dominating the sample. This algae may have been responsible for the reddish colored water observed.

Total Biovolume	= 3,503 mm^3/m^3
Total Density	= 8,245 units/ml.
Chlorophyll-a	= 28 ug/l
Algal Bloom	= No

Rocky River, Chatham County
Sampled by E. Williams 900726 1630

The Rocky River was sampled because of a pea-green color. A bloom of chlorophytes, bacillariophytes and cryptophytes occurred in this slow flowing portion of the river. Excessively high nutrient levels were feeding the algae. The high corresponding chlorophyll-a concentration confirmed algal bloom conditions.

Total Biovolume	= 1,889 mm^3/m^3
Total Density	= 13,451 units/ml.
Chlorophyll-a	= 44 ug/l
Algal Bloom	= Yes

Rocky River, Chatham County
Sampled by K. Lynch, C. Smith 900803 0630

The Rocky River was sampled after citizens expressed concern that Siler City's wastewater treatment plant was adversely affecting the Rocky River and contributing to algal blooms. The wastewater treatment plant discharges into Loves Creek which enters the Rocky River approximately a quarter of a mile below US Highway 64. Bloom samples were collected above and below the discharge. Nutrient analyses revealed elevations in total phosphorus at both sites sampled, while high levels of total nitrogen and ammonia/ammonium were found at Rocky-2, below the confluence with Love's Creek.

Moderate phytoplankton densities were found at both stations. Because of the slow-flowing nature of the Rocky River during the summer, free-floating phytoplankton populations were allowed to build up more than would be expected in a faster flowing creek.

At the upper site, Rocky-1, algal classes were dominated by chlorophytes, chrysophytes and cryptophytes.

Downstream at Rocky-2, chlorophytes, chrysophytes and cyanophytes dominated the sample. The filamentous blue-green, Oscillatoria chlorina, which comprised 29% of the biovolume is a pollution tolerant algal species.

In addition, high chlorophyll-a concentrations were detected at both sites.

Rocky-1

Total Biovolume	= 1,662 mm^3/m^3
Total Density	= 6,594 units/ml.
Chlorophyll-a	= 32 ug/l
Algal Bloom	= Yes

Rocky-2

Total Biovolume	= 1,250 mm^3/m^3
Total Density	= 5,590 units/ml.
Chlorophyll-a	= 44 ug/l
Algal Bloom	= Yes

Robeson Creek, Chatham County
Sampled by K. Lynch, C. Smith 900803 0630

Robeson Creek was sampled due to an obvious algal bloom signified by elevated surface pH (8.9) and dissolved oxygen concentrations (12.2 mg/l). The dark green color also indicated algal bloom conditions.

The algal sample contained a bloom dominated by bacillariophytes, chlorophytes, cryptophytes and cyanophytes. The greenish colored water may have been caused by the high density of Oscillatoria geminata, a small filamentous blue-green alga. This species is widespread in eutrophic waterbodies across North Carolina. Similar algal blooms have been documented in past years (1986, 1987) in Robeson Creek.

Total Biovolume	= 3,324 mm^3/m^3
Total Density	= 25,854 units/ml.
Chlorophyll-a	= 23 ug/l
Algal Bloom	= Yes

New Hope Creek (02097314), Durham County
Sampled by E. Williams 900814 1350

New Hope Creek was sampled during low flow conditions. An elevated pH (8.98) and discolored water indicated a possible algal bloom. Algal biovolume, density and chlorophyll-a were moderately low. Anabaena spiroides, a cyanophyte, comprised 79% of the biovolume and may have been responsible for the greenish appearance of the water.

Very high levels of nutrients were present in New Hope Creek, with total nitrogen reaching 10.1 mg/l and total phosphorus measuring 0.74 mg/l. With the high nutrient concentrations and moderate algal growth, evidentally some factor was limiting phytoplankton productivity.

Total Biovolume	= 3,211 mm^3/m^3
Total Density	= 5,008 units/ml.
Chlorophyll-a	= 8 ug/l
Algal Bloom	= No

F. Moser Pond, Alamance County
Sampled by E. Galamb 900821 1120

Algal bloom samples were collected in response to a complaint investigation. A small pond had colorful red and white floating mats of algae. Cyanophytes, chlorophytes, and euglenophytes were found in the surface sample. The red and white floating mats were likely caused by the dominant alga, Anabaena portoricensis, which like other cyanophytes produces such colors upon senescence.

Lake Cedar Hollow, Guilford County
Sampled by A. Hagstrom 900828 1100

Algal bloom samples were collected after a resident complained of discolored water in the lake. Wind had apparently blown and concentrated algae in the upper end of the lake where the sample was collected. The sample contained a massive bloom of Anabaena subcylindrica which was in the process of deteriorating, and therefore formed green and white surface scums. Anabaena subcylindrica, a filamentous cyanophyte is commonly found in eutrophic waters during the warmer months.

Although nutrients were not collected, the lake's tributaries traverse horse and cattle farms, which input nutrients into the lake.

B. Everett Jordan Reservoir (CPF081A1C), Chatham County
Sampled by K. Trumbower 900913 1030

An algal sample was collected on the New Hope arm of Jordan Reservoir after green, turbid water was observed. The sample contained a bloom comprised of 71% cyanophytes. Anacystis cyanea, a colonial alga that forms surface blooms and Oscillatoria geminata, a small filamentous alga, were the dominant cyanophytes. Other

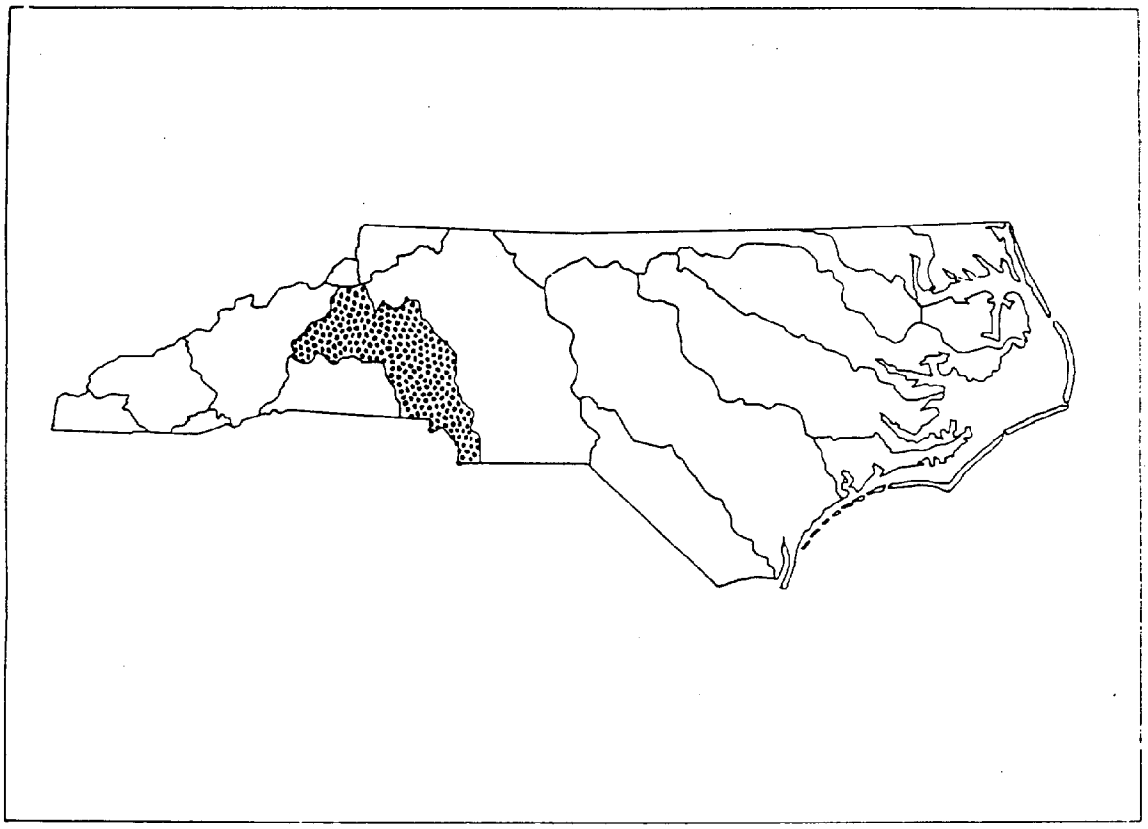
dominant algal classes include euglenophytes, chlorophytes and bacillariophytes. The high algal biovolume and density estimates were exemplified by the elevated corresponding chlorophyll-a concentration of 74 ug/l. Nutrient levels including ammonia/ammonium (0.17 mg/l) and total phosphorus (0.17 mg/l) were also elevated.

Total Biovolume	= 102,611 mm^3/m^3
Total Density	= 499,604 units/ml.
Chlorophyll-a	= 74 ug/l
Algal Bloom	= Yes

Atlantic Ocean, Brunswick County
Sampled by unknown fisherman 900723

A fisherman collected a water sample after observing small filaments floating in discolored water. The sample was collected approximately fifty miles offshore from Bald Head Island. The algae was identified as Oscillatoria erythraea, a filamentous brackish water cyanophyte, commonly referred to as 'sea sawdust' because of its scalelike appearance. This alga annually forms vast areas of discolored water in the open sea during warm weather. Although no fish kill was observed in this instance, either toxic compounds released when these algal cells lyse or gill clogging caused by the high density of cells have been reported to cause fish kills. (Humm, 1980)

CATAWBA RIVER BASIN



Bragg Pond, Mecklenburg County
Sampled by M. Durham, Mecklenburg County Environmental Protection Laboratory 900614 1457

Algal bloom samples were collected from Bragg Pond following a fish kill. The algal sample was dominated by chlorophytes (Closteriopsis longissima tropica) and euglenophytes, which may have been responsible for the observed reddish colored water. The algal sample was unpreserved and slightly deteriorated, therefore it was not counted. The corresponding chlorophyll-a value of 10 ug/l signified minimal algal growth.

Low DO concentrations (4.8 mg/l on the surface to 3.3 mg/l at one meter depth) found during the fish kill may have contributed to the death of the fish. During sampling on June 14, water quality parameters were normal.

Grants Pond, Gaston County
Sampled by T. McManus, K. Haynes 900621 1400

Grant's Pond was sampled on June 21 in response to a landowner's complaint of speckled pea-green water. This small pond also contained elevated surface pH and DO measurements which was likely a result of algal photosynthesis that is greatest around mid-day.

Quantitative phytoplankton counts confirmed a minor algal bloom consisting of 76% euglenophytes by biovolume. Euglenophytes, predominately, Trachelomonas smiewiki, were probably responsible for the observed flecks and discoloration of the water. In addition, cryptophytes and chlorophytes were also dominant by density estimates.

The pond's biovolume reflects borderline bloom conditions or the presence of a minor algal bloom.

Total Biovolume	= 5,037 mm^3/m^3
Total Density	= 4,658 units/ml.
Chlorophyll-a	= 14 ug/l
Algal Bloom	= Yes

Wilson's Lake, McDowell County
Sampled by J. Reid 900731 1430

On July 30, algal bloom samples were collected following a fish kill at Wilson's Lake. A high dissolved oxygen concentration (10.0 mg/l) was found on the lake's surface.

A diversity of algal classes were dominant in the pond including bacillariophytes, chlorophytes, chrysophytes, cyanophytes, dinoflagellates and euglenophytes. The total algal biovolume of 813 mm^3/m^3 and density of 6,201 units/ml were not excessively high. Furthermore, the corresponding chlorophyll-a of 10 ug/l represented little algal growth. Phytoplankton apparently were not responsible for the fish kill.

Total Biovolume	= 813 mm^3/m^3
Total Density	= 6,201 units/ml.
Chlorophyll-a	= 10 ug/l
Algal Bloom	= No

Steele Creek, Mecklenburg County
Sampled by M. Durham, Mecklenburg County Environmental Protection Laboratory 900801 1400

Steele Creek was sampled August 1 because of complaints of turbid, green water. Although fish did not appear stressed, surface DO was low at 3.5 mg/l.

The phytoplankton biovolume of 3,712 mm^3/m^3 was slightly elevated with the stagnant conditions in Steele Creek. The phytoplankton sample was dominated by cyanophytes including Anabaena species and Aphanizomenon flos-aquae, which probably tinted the water a greenish color. The accompanying chlorophyll-a value of 5 ug/l was low.

Total Biovolume	= 3,712 mm^3/m^3
Total Density	= 1,572 units/ml.
Chlorophyll-a	= 5 ug/l
Algal Bloom	= No

South Fork Pond, Gaston County
Sampled by T. McManus 900709 1100

South Fork Pond, created by the backwaters of the South Fork Catawba River, was sampled in response to a fish kill. The fish kill and apparent algal bloom were detected after warm, dry weather. As early as 11:00 a.m, a supersaturated D.O. concentration was observed. Although the surface D.O. was elevated, waters below the surface may have been depleted of oxygen as a result of evening respiration and decomposition of dead algae, which probably contributed to the fish kill.

A large bloom comprised of 99% chlorophytes occurred in South Fork Pond. These backwaters which had been isolated from the river, created optimum conditions for phytoplankton growth. Phytoplankton numbers increased to astronomical proportions due to the lack of flushing.

The sample's dominant species, Chlorogonium euchlorum, a chlorophyte, is commonly found in swamps, shallow ponds and aquariums.

An exceedingly high chlorophyll-a value (1,900 ug/l) accompanied the sample. Even with the high amount of algal growth, nutrient levels were extremely elevated with total nitrogen values reaching 8.84 mg/l while total phosphorus measured 2.5 mg/l. Evidentally a nutrient source is fueling the algal growth, which is accelerated by the stagnant conditions in South Fork Pond.

Total Biovolume	= 194,116 mm^3/m^3
Total Density	= 1,388,760 units/ml.
Chlorophyll-a	= 1,900 ug/l
Algal Bloom	= Yes

Crowders Creek, York County, S.C.
Sampled by K. Lynch, T. McManus 900905 1530

A reddish orange algal bloom was found in upper Crowders Creek during a special study of Lake Wylie. While euglenophytes caused the reddish surface film, pea-green water below the surface was probably due to the high density of Merismopedia tenuissima, a colonial cyanophyte. Elevated DO (12.3 mg/l) and pH (8.9) levels were also indicative of algal bloom conditions. This upper arm of Lake Wylie is shallow and receives high levels of nutrients which are recirculated and are therefore available for phytoplankton utilization.

Total Biovolume = 12,551 mm^3/m^3
Total Density = 56,948 units/ml.
Chlorophyll-a = 35 ug/l
Algal Bloom = Yes

Lake Norman, Catawba, Iredell Counties
Sampled by M. Parker 901003 1340
Sampled by K. Colson 901016 1530

Phytoplankton samples collected for identification from Lake Norman on October 3, confirmed the presence of a blue-green algal bloom. The light green suspended flecks observed throughout the water column were identified as Anacystis cyanea, a colonial cyanophyte, which forms surface blooms. Extended warm weather combined with a low rate of flushing in the cove of the lake probably spurred the algal bloom. In October 1985, nutrients were recirculated during fall turnover causing blooms of A. cyanea in other coves in Lake Norman. High corresponding chlorophyll-a concentrations accompanied those samples.

Lake Norman was again sampled on October 16 at a different location after reports of excessive algal growth. A diversity of algal classes were represented in the sample. Nutrient, chlorophyll, and phytoplankton numbers were all low, and were not indicative of algal bloom conditions.

Total Biovolume = 695 mm^3/m^3
Total Density = 3,668 units/ml.
Chlorophyll-a = 6 ug/l
Algal Bloom = No

Commscope Lake, Catawba County
Sampled by K. Haynes 901114 1420

Commscope Lake was sampled on November 14, because of the presence of large spherical flecks of algae throughout the water column. The sample contained Coelosphaerium naegelianum, a colonial cyanophyte which consists of large globular colonies of cells that can easily be seen with the unaided eye. C. naegelianum is an important component of water blooms, is widespread and often occurs in abundance in lake phytoplankton during the summer.

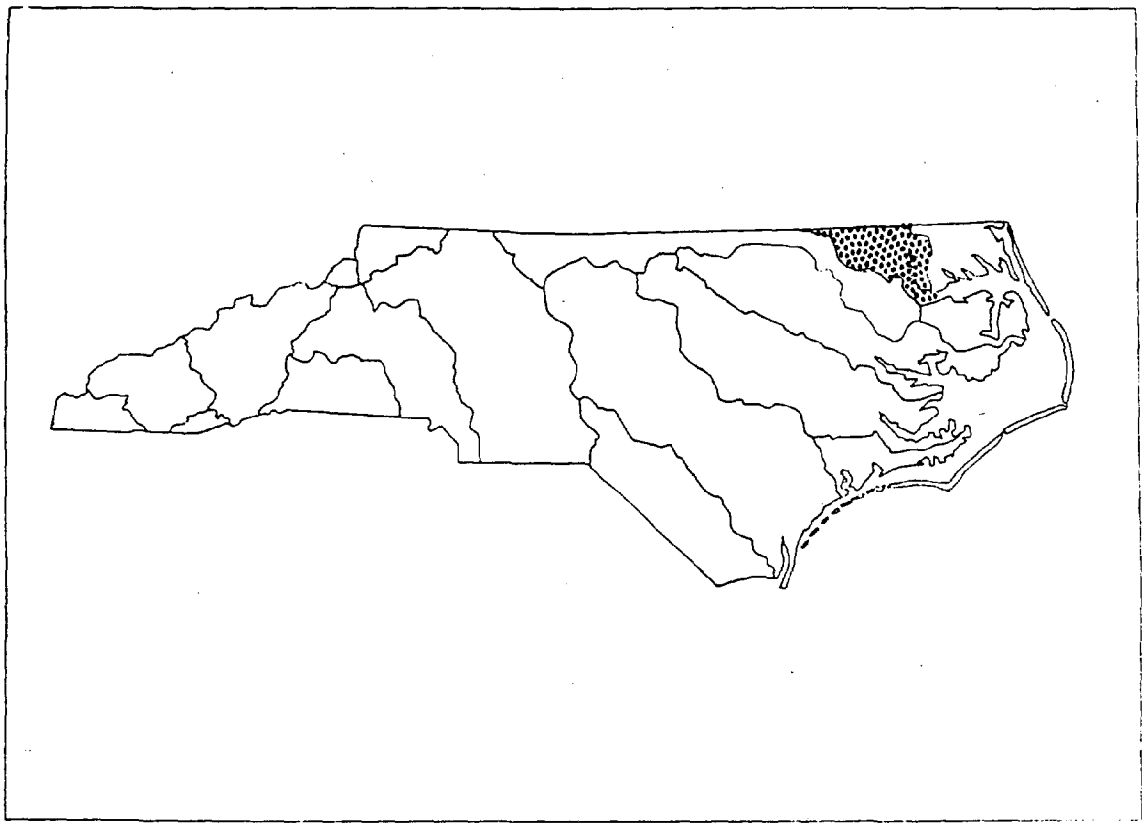
This cyanophyte comprised 100% of the sample and contained an excessively large biovolume and density. The corresponding chlorophyll-a concentration of 3,500 ug/l further confirmed the severity of the algal bloom.

Very high levels of nutrients were present fueling the algal growth. Total nitrogen, total phosphorus and ammonia/ammonium measured 20.03, 1.5 and 0.29 mg/l, respectively.

There are two facilities with permitted discharges into Commscope Lake. One facility discharges cooling water, while Commscope Inc. discharges wastewater. According to Commscope's self monitoring reports, this company has had numerous standards violations during the past year.

Total Biovolume	= 1,051,475 mm^3/m^3
Total Density	= 38,829 units/ml.
Chlorophyll-a	= 3500 ug/l
Algal Bloom	= Yes

CHOWAN RIVER BASIN



Chowan River (02053632, 02053652, Chowan-9), Bertie County
Sampled by M. Yount, K. Cratch 900612 1040

Algal samples were collected after green flecks were observed in the water column. Samples collected from Colerain (02053632), Edenhouse (02053652) and from near channel marker #9 above Colerain contained very little algal growth along with low corresponding chlorophyll-a concentrations.

Chowan-9

Total Biovolume	= 305 mm^3/m^3
Total Density	= 1,001 units/ml.
Chlorophyll-a	= 4 ug/l
Algal Bloom	= No

02053632

Total Biovolume	= 279 mm^3/m^3
Total Density	= 681 units/ml.
Chlorophyll-a	= 2 ug/l
Algal Bloom	= No

02053652

Total Biovolume	= 666 mm^3/m^3
Total Density	= 1,380 units/ml.
Chlorophyll-a	= 3 ug/l
Algal Bloom	= No

Chowan River, Bertie, Chowan, Hertford Counties
Sampled by K. Lynch, B. Robinson 900619 0950-1330

Water quality samples were collected from the Chowan River and its tributaries after large green flecks were reported in the river. The bloom was visible from the Edenhouse bridge to above Holiday Island. Field identification of the large flecks present near the surface confirmed the presence of Anacystis cyanea, a colonial cyanophyte and Anabaena portoricensis, a large filamentous cyanophyte, both of which are commonly found in Chowan River blooms. Quantitative algal counts confirmed high phytoplankton biovolume and density estimates from the Edenhouse bridge upstream to Arrowhead Beach.

Arrowhead-1

Total Biovolume = 11,656 mm^3/m^3
Total Density = 13,695 units/ml.
Chlorophyll-a = 15 ug/l
Algal Bloom = Yes

Catherine-1

Total Biovolume = 5,330 mm^3/m^3
Total Density = 5,066 units/ml.
Chlorophyll-a = 24 ug/l
Algal Bloom = Yes

Chowan-14

Total Biovolume = 3,034 mm^3/m^3
Total Density = 5,401 units/ml.
Chlorophyll-a = 12 ug/l
Algal Bloom = No

Indian-2

Total Biovolume = 3,390 mm^3/m^3
Total Density = 5,590 units/ml.
Chlorophyll-a = 11 ug/l
Algal Bloom = No

Rockyhock-1

Total Biovolume = 6,857 mm^3/m^3
Total Density = 10,307 units/ml.
Chlorophyll-a = 12 ug/l
Algal Bloom = Yes

0205360615

Total Biovolume = 1,684 mm^3/m^3
Total Density = 2,533 units/ml.
Chlorophyll-a = 9 ug/l
Algal Bloom = No

02053632

Total Biovolume = 3,475 mm^3/m^3
Total Density = 4,076 units/ml.
Chlorophyll-a = 10 ug/l
Algal Bloom = No

0205363575

Total Biovolume = 14,765 mm^3/m^3
Total Density = 12,438 units/ml.
Chlorophyll-a = 6 ug/l
Algal Bloom = Yes

02053652

Total Biovolume	= 11,552 mm^3/m^3
Total Density	= 8,860 units/ml.
Chlorophyll-a	= 6 ug/l
Algal Bloom	= Yes

Chowan River (02053652005), Chowan County
Sampled by S. Mitchell 900711

Algal samples collected on July 11 confirmed the presence of an algal bloom dominated by the blue-green alga, Anabaena portoricensis.

Total Biovolume	= 13,095 mm^3/m^3
Total Density	= 3,419 units/ml.
Chlorophyll-a	= not sampled
Algal Bloom	= Yes

Chowan River, Chowan County
Sampled by M. Yount 900712 1120-1345

On July 12, algal bloom samples were collected from the mouth of Bennetts Creek downstream to ambient site 02053652, near Edenhouse. Algal samples were collected as "surface grab samples" (collected at 0.15 meters). A blue-green algal bloom occurred from Bennetts Creek to downstream near Colerain (02053632). Six of the surface grab samples contained algal blooms and all were comprised of over 93% cyanophytes by biovolume. The dominant species in every sample was the blue-green alga, Anabaena portoricensis, which is commonly found in eutrophic ponds, lakes, and slow flowing rivers throughout the state. The accompanying chlorophyll-a concentrations ranged from 17 to 350 ug/l.

Catherine-7

Total Biovolume	= 32,805 mm^3/m^3
Total Density	= 8,122 units/ml.
Chlorophyll-a	= 350 ug/l
Algal Bloom	= Yes

Chowan-5

Total Biovolume	= 69,869 mm^3/m^3
Total Density	= 15,897 units/ml.
Chlorophyll-a	= 250 ug/l
Algal Bloom	= Yes

Indian-8

Total Biovolume	= 23,698 mm^3/m^3
Total Density	= 6,551 units/ml.
Chlorophyll-a	= 200 ug/l
Algal Bloom	= Yes

02053632

Total Biovolume	= 31,330 mm^3/m^3
Total Density	= 8,036 units/ml.
Chlorophyll-a	= 120 ug/l
Algal Bloom	= Yes

02053652

Total Biovolume	= 3,335 mm^3/m^3
Total Density	= 1,910 units/ml.
Chlorophyll-a	= 17 ug/l
Algal Bloom	= No

Bennetts

Total Biovolume	= 22,603 mm^3/m^3
Total Density	= 6,521 units/ml.
Chlorophyll-a	= 270 ug/l
Algal Bloom	= Yes

Indian Creek, Chowan County
Sampled by K. Miller 900726 1505

On July 26, Washington regional personnel surveyed the Chowan River after receiving reports of algal blooms. Because of northeast winds, much of the reported blooms had been dispersed. Surface grab samples collected from Indian Creek because of a visible surface bloom were comprised of cyanophytes (Anabaena portoricensis) and cryptophytes (Cryptomonas erosa, Chroomonas minuta and C. caudata). An elevated chlorophyll-a of 35 ug/l accompanied the sample.

Total Biovolume	= 7,142 mm^3/m^3
Total Density	= 3,474 units/ml.
Chlorophyll-a	= 35 ug/l
Algal Bloom	= Yes

Chowan River (02053632, 02053652, Chowan-Rock),
Chowan, Bertie Counties
Sampled by M. Yount, K. Cratch 900802 1110

The blue-green algal bloom persisted and was again sampled on August 2, during ambient monitoring. Three samples were collected, from Colerain (02053632), from near Rockyhock Landing (Chowan-Rock), and from the Edenhouse bridge (02053652). The three samples contained bloom levels of algae and were again dominated by greater than 87% cyanophytes (Anabaena portoricensis). Cryptophytes (Cryptomonas erosa and Chroomonas minuta) were also codominant by density.

While the two ambient samples (02053632 and 02053652) were collected from the photic zone (approximately one meter) using a labline, Chowan-Rock was collected as a "surface grab sample" resulting in higher phytoplankton numbers and chlorophyll-a values. Likewise, the corresponding chlorophyll-a sample for this station measured 100 ug/l.

02053632

Total Biovolume	= 5,179 mm^3/m^3
Total Density	= 2,180 units/ml.
Chlorophyll-a	= 14 ug/l
Algal Bloom	= Yes

02053652

Total Biovolume	= 6,245 mm^3/m^3
Total Density	= 2,725 units/ml.
Chlorophyll-a	= 16 ug/l
Algal Bloom	= Yes

Chowan-Rock

Total Biovolume	= 10,923 mm^3/m^3
Total Density	= 2,306 units/ml.
Chlorophyll-a	= 100 ug/l
Algal Bloom	= Yes

Chowan River (Chowan-3), Bertie County
Sampled by M. Yount, K. Cratch 900912 1030

On September 12, algal samples were collected from the western shore of the Chowan River, near Mount Gould Landing when bright green flecks appeared in the water. Again, the blue-green algae, Anabaena portoricensis and Anacystis cyanea dominated along with the chloromonadophyte, Vacuolaria virescens. An accompanying chlorophyll-a concentration of 370 ug/l confirmed the algal bloom conditions.

Chowan River (02053632, 0205360615, 02053574), Bertie County
Sampled by M. Yount, K. Cratch 901016 1030-1125

On October 16, during ambient sampling, green flecks in the water column were found to be the blue-green algae, Anacystis cyanea and Anabaena subcylindrica. Although the algal growth was observed from above Holiday Island to downstream near Colerain, only the uppermost station, 02053574, contained bloom levels of algae dominated by cyanophytes and the chloromonadophytes, Gonystomum semen and Vacuolaria virescens. Chlorophyll-a concentrations were low, ranging from 4 to 6 ug/l.

02053574

Total Biovolume	= 5,109 mm^3/m^3
Total Density	= 699 units/ml.
Chlorophyll-a	= 6 ug/l
Algal Bloom	= Yes

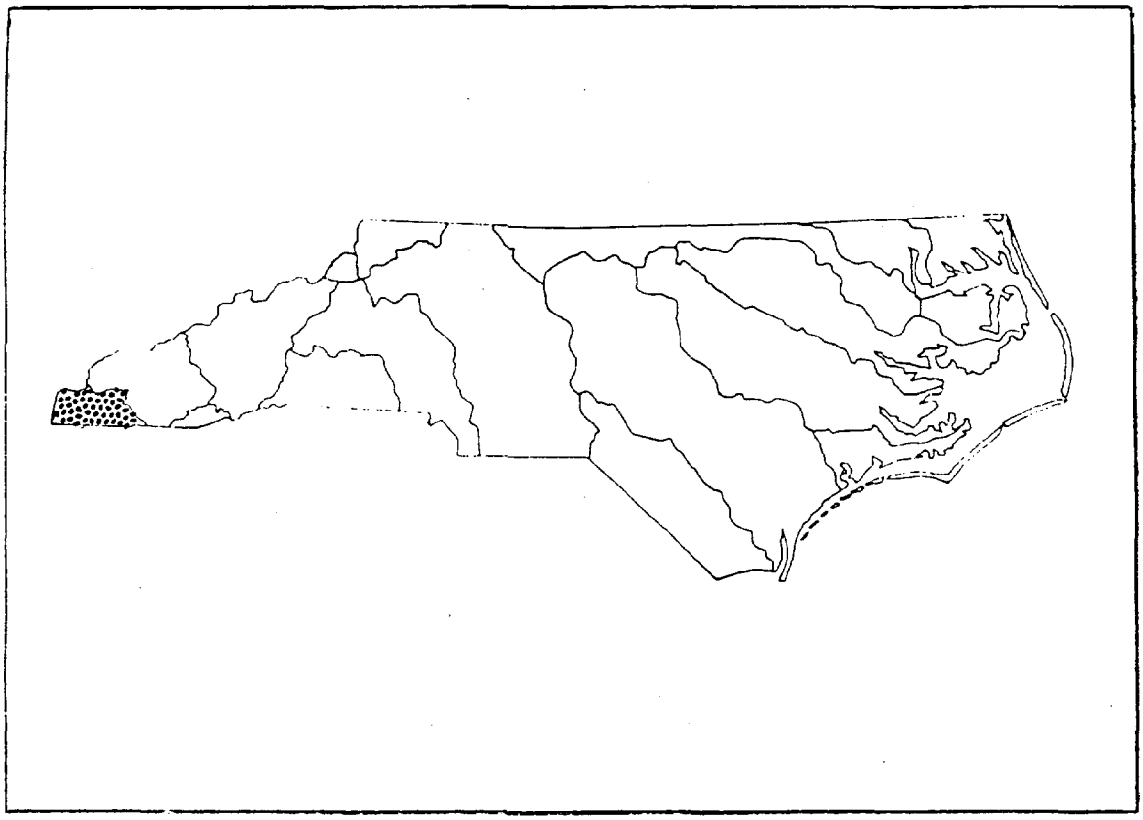
0205360615

Total Biovolume	= 1,388 mm^3/m^3
Total Density	= 256 units/ml.
Chlorophyll-a	= 4 ug/l
Algal Bloom	= No

02053632

Total Biovolume	= 3,652 mm^3/m^3
Total Density	= 1,077 units/ml.
Chlorophyll-a	= 6 ug/l
Algal Bloom	= No

LITTLE TENNESSEE RIVER BASIN



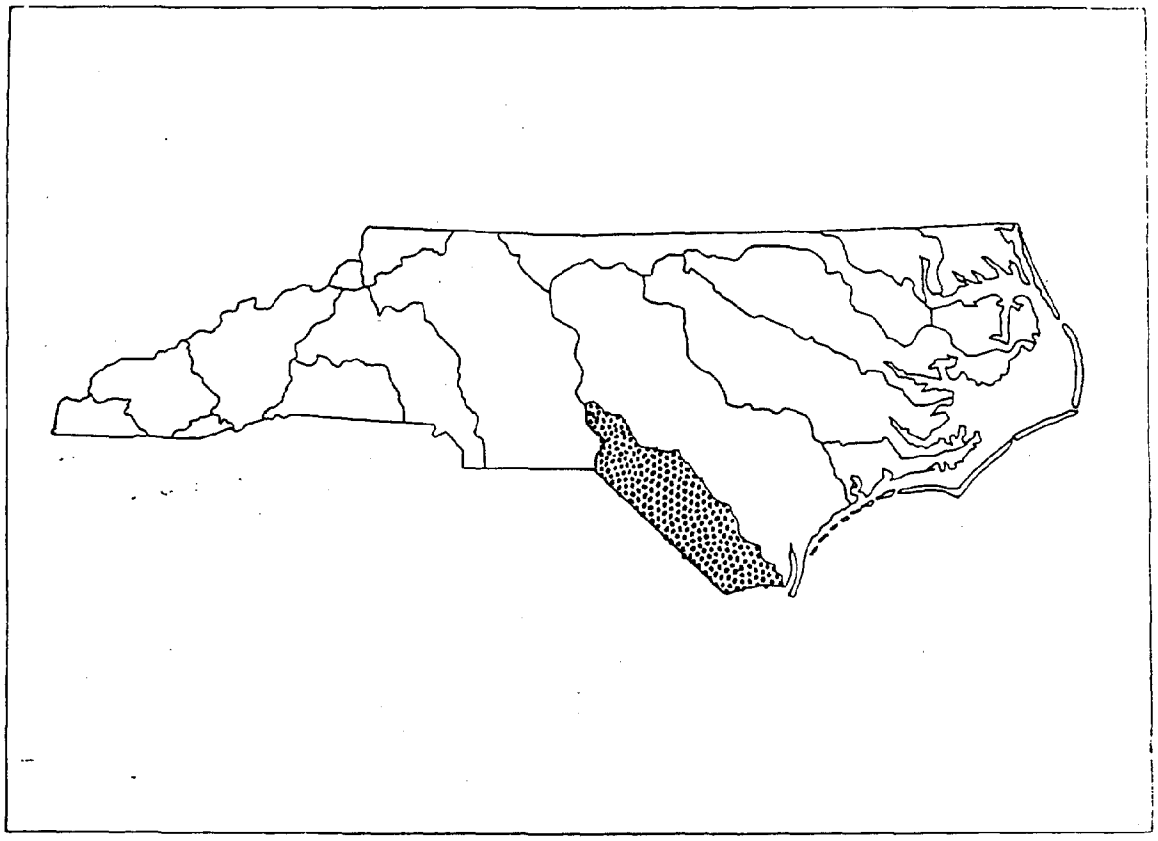
Santeetlah Lake, Graham County
Sampled by C. Smith 900620 1000

An algal bloom sample was taken in response to complaints of pea-green water at the Little Buffalo Creek arm of Santeetlah Lake. Elevated algal populations along with a moderately high chlorophyll-a concentration confirmed algal bloom conditions. Cyanophytes dominated the algal sample with Anabaena portoricensis, a large filamentous alga, and Anacystis cyanea, a colonial alga, dominating the biovolume and density estimates. Both algal species commonly form blooms in warm, nutrient enriched waters.

Several trout farms located on Little Buffalo Creek may be contributing nutrients to which the phytoplankton were responding.

Total Biovolume	= 10,780 mm^3/m^3
Total Density	= 2,482 units/ml.
Chlorophyll-a	= 27 ug/l
Algal Bloom	= Yes

LUMBER RIVER BASIN



Echo Lake, Moore County
Sampled by R. McLamb 900227 1100

Phytoplankton, chlorophyll-a and nutrient data were collected from four sites on Echo Lake after the lake manager expressed concern about greenish colored water. Echo Lake is one of 'Seven Lakes', a recreational and residential complex.

The phytoplankton sample from station #1 near the boat ramp was analyzed and contained typical seasonal phytoplankton assemblages. Very low numbers of algae were found in the sample along with low chlorophyll-a concentrations ranging from 1 to 2 ug/l at all stations, indicating very little algal growth.

Nutrient concentrations were analyzed and were not found to be excessively high, although wintertime nutrient levels are generally higher, as phytoplankton populations are supressed and are not utilizing nutrients. Total nitrogen concentrations ranged from 0.45 to 0.92 mg/l while total phosphorus ranged from below the detection limit to 0.02 mg/l at the four sites.

Total Biovolume	= 70 mm^3/m^3
Total Density	= 934 units/ml.
Chlorophyll-a	= 1 ug/l
Algal Bloom	= No

Lake Pinehurst, Moore County
Sampled by M. Jaynes 900718

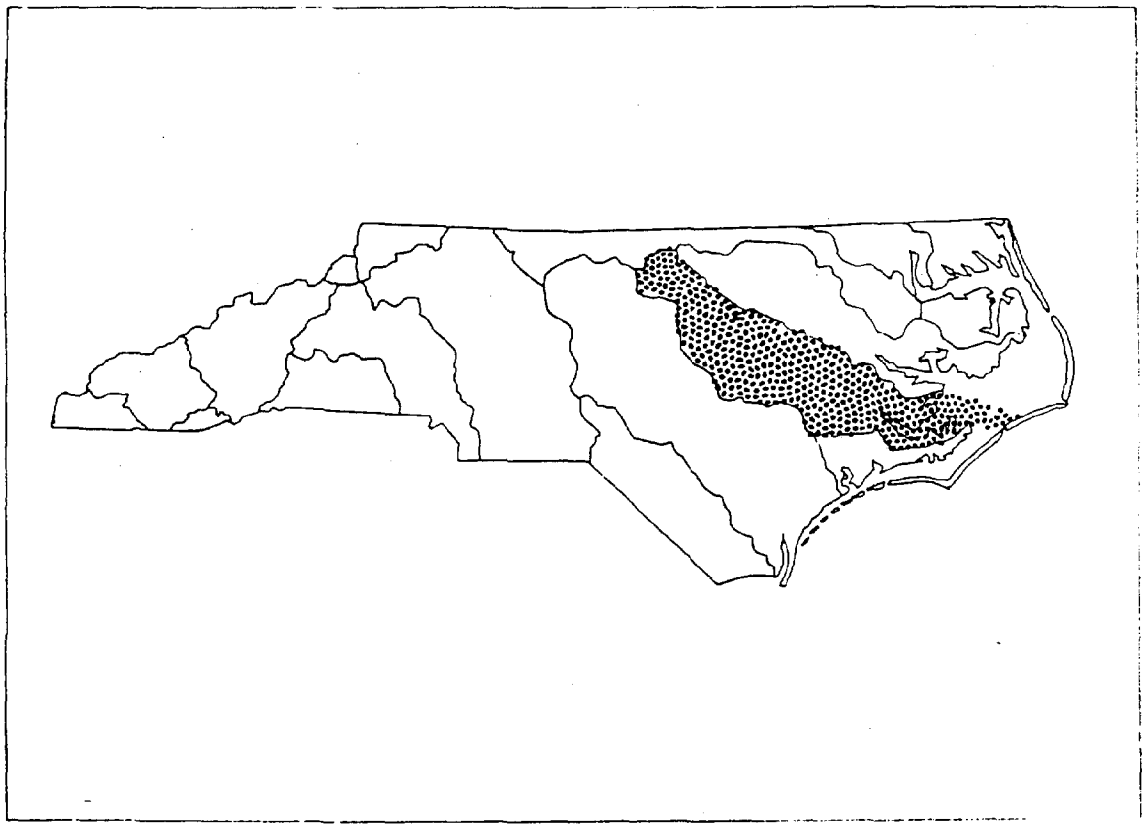
Water quality samples were collected from three stations on Lake Pinehurst during a complaint investigation because of suspected leaking septic tanks.

A quantitative algal count was conducted on LP-1, the station located nearest to the dam. Typical lake phytoplankton assemblages were found in the sample including chlorophytes, dinoflagellates, chloromonadophytes, chrysophytes and cryptophytes. The sample's total biovolume and density estimates were low and were not representative of algal bloom conditions.

Low nutrient levels and corresponding chlorophyll-a concentrations (2-4 ug/l) collected from the three stations reflected the oligotrophic condition of Lake Pinehurst.

Total Biovolume	= 710 mm^3/m^3
Total Density	= 833 units/ml.
Chlorophyll-a	= 3 ug/l
Algal Bloom	= No

NEUSE RIVER BASIN



Garner Farm Pond, Wake County
Sampled by K. Lynch 900228 1530

A small farm pond which drains a large portion of Garner's wastewater spray irrigation system was sampled to assess its trophic condition. The owner had expressed concern that excessive runoff during 1989 had adversely affected his pond.

Physical measurements including conductivity, water temperature, dissolved oxygen and pH levels all fell within normal ranges.

The sample was comprised of several classes of phytoplankton, predominately Euglenophyceae (61%), Chloromonadophyceae (20%), and Cryptophyceae (13%). Such high numbers of euglenoids (Euglenophyceae) often indicate organic enrichment. The pond was found to contain an elevated algal biovolume particularly for winter sampling.

The accompanying chlorophyll-a concentration of 130 ug/l was elevated, reflecting excessive algal growth.

Total Biovolume	= 8,306 mm^3/m^3
Total Density	= 4,944 units/ml.
Chlorophyll-a	= 130 ug/l
Algal Bloom	= Yes

Gobble Pond,Wake County
Sampled by S. Mitchell 900315 0930

A small farm pond was sampled after the pond's owners expressed concern because of excess filamentous growth covering about one half of the pond. Filamentous green algae including Spirogyra species and Microspora species were apparently responding to fertilizer that had washed down from an upstream pond. Both algal species are seasonal and inhabit quiet waters of ponds and lakes, often forming large mats. The chlorophyll-a concentration of 17 ug/l was moderate.

Lake Wendell (WNDL-D2), Johnston County
Sampled by G. Price 900705 1010

Lake Wendell was sampled because of greenish colored water and the presence of algal mats. Elevated dissolved oxygen (15.9 mg/l) and pH levels measured on the water's surface at 10:10 in the morning also signified algal bloom conditions.

A massive bloom of cyanophytes which comprised over 96% of the sample's biovolume and density was found. Anabaena spiroides contracta was the dominant cyanophyte present while other buoyant blue-greens such as Aphanizomenon flos-aquae and Anacystis cyanea were also included in the sample. These species are indicative of nutrient enrichment.

Similar blue-green blooms have been documented in past summers (1989 and 1987) with high accompanying chlorophyll levels ranging from 130 to 230 ug/l.

Excessive nutrients were present with total nitrogen and total phosphorus concentrations reaching 5.1 and 0.39 mg/l, respectively. Until nutrient inputs from the upstream discharger are controlled, algal blooms will continue to plague Lake Wendell.

The town of Wendell is studying alternative sites for their wastewater treatment plant discharge which currently discharges into Buffalo Creek, upstream of Lake Wendell.

Total Biovolume	= 58,404 mm^3/m^3
Total Density	= 13,014 units/ml.
Chlorophyll-a	= 270 ug/l
Algal Bloom	= Yes

Vet School Pond,Wake County
Sampled by S. Mitchell, R. Ferrell, J. Overton 900812 1100

Algal samples were collected following a fish kill at the NCSU vet school involving sunfish, bass and carp. Phytoplankton analyses and high accompanying chlorophyll-a levels confirmed a blue-green surface bloom of Anacystis cyanea (station VS-1) with euglenophytes (Trachelomonas spp.), greens and blue-greens found at 0.15 meters. Nearly anoxic conditions present below the surface by 11:00 a.m.

suggested that oxygen was even further depleted in the evening hours during phytoplankton respiration. These low dissolved oxygen levels could have contributed to the fish kill.

VS-1

Total Biovolume	= 96,001 mm^3/m^3
Total Density	= 61,722 units/ml.
Chlorophyll-a	= 4,800 ug/l
Algal Bloom	= Yes

VS-2

Total Biovolume	= 38,055 mm^3/m^3
Total Density	= 24,339 units/ml.
Chlorophyll-a	= 140 ug/l
Algal Bloom	= Yes

VS-3

Total Biovolume	= 15,001 mm^3/m^3
Total Density	= 18,459 units/ml.
Chlorophyll-a	= 88 ug/l
Algal Bloom	= Yes

Eno River, Durham County
Sampled by E. Williams 900821 1100

Two algal bloom samples were collected from the Eno River after visible surface scums were observed. Flourescent green flecks were present near the confluence of the Eno and the Flat Rivers (station Eno-1) while the Eno River near the headwaters of Falls Lake (Eno-2) contained reddish surface flecks. Both samples exhibited algal bloom conditions consisting of greater than 80% euglenophytes by biovolume. Euglenophytes commonly cause surface scums of varying colors as observed here. Large numbers of this type of algae often signify organic enrichment.

Corresponding chlorophyll-a concentrations at both sampling locations were high, indicating excessive algal growth. Nutrient levels were somewhat elevated, even with the high algal growth.

ENO-1

Total Biovolume	= 30,120 mm^3/m^3
Total Density	= 6,580 units/ml.
Chlorophyll-a	= 250 ug/l
Algal Bloom	= Yes

ENO-2

Total Biovolume	= 30,325 mm^3/m^3
Total Density	= 6,359 units/ml.
Chlorophyll-a	= 83 ug/l
Algal Bloom	= Yes

Falls Reservoir (NEU010), Granville County
Sampled by K. Trumbower 900912 1240

Red and greenish colored water was observed at upper Falls Reservoir near ambient station NEU010. The sample contained a bloom of predominately euglenophytes and cyanophytes while chlorophytes and cryptophytes were also abundant. The euglenophytes, Euglena species C and Trachelomonas spp, were probably responsible for the discolored water. The dominant cyanophyte, Merismopedia tenuissima, forms plate-like colonies and has also been associated with greenish waters. Although nutrient levels were not excessively high, the corresponding chlorophyll-a concentration of 33 ug/l was elevated, supporting algal bloom conditions at upper Falls Reservoir.

Total Biovolume	= 5,271 mm^3/m^3
Total Density	= 12,578 units/ml.
Chlorophyll-a	= 33 ug/l
Algal Bloom	= Yes

Hart Pond, Granville County
Sampled by R. Hiers 900926 1030

Hart Pond was sampled several weeks after a large bloom was reported. Several thousand caged catfish died while other free swimming fish survived. The phytoplankton sample from Hart Pond contained a large filamentous cyanophyte, Anabaena portoricensis, which had previously covered the pond's surface. It is likely that anoxic conditions caused by deteriorating algal mats and evening algal respiration contributed to the suffocation of the catfish.

Bay River Area, Pamlico County
Sampled by K. Miller, C. Wilson 900315 1200-1615

Algal bloom samples were collected from five stations on tributaries to the Bay River because of elevated surface DO (up to 17.7 mg/l) and pH levels. Suspended particles were also apparent in the water column. All stations except Vandemere-8 contained algal bloom levels of a common winter dinoflagellate, Prorocentrum minimum. This algae was most likely responsible for the observed suspended flecks as well as the elevated chlorophyll-a levels.

Alligator-5

Total Biovolume	= 35,788 mm^3/m^3
Total Density	= 33,191 units/ml.
Chlorophyll-a	= 140 ug/l
Algal Bloom	= Yes

Chappel-7

Total Biovolume	= 12,178 mm^3/m^3
Total Density	= 13,364 units/ml.
Chlorophyll-a	= 71 ug/l
Algal Bloom	= Yes

Racoon-2

Total Biovolume	= 7,414 mm^3/m^3
Total Density	= 11,005 units/ml.
Chlorophyll-a	= 56 ug/l
Algal Bloom	= Yes

Trent-1

Total Biovolume	= 25,910 mm^3/m^3
Total Density	= 24,980 units/ml.
Chlorophyll-a	= 110 ug/l
Algal Bloom	= Yes

Vandemere-8

Total Biovolume	= 1,414 mm^3/m^3
Total Density	= 1,834 units/ml.
Chlorophyll-a	= 7 ug/l
Algal Bloom	= No

Neuse River (NEU139), Pamlico County
Sampled by M. Yount 900319 1305

Elevations in surface pH (8.8) and DO (12.0 mg/l) concentrations led to the sampling of this algal bloom. The algal sample was dominated by cool weather dinoflagellates (Prorocentrum minimum and Heterocapsa triquetra) and bacillariophytes (Skeletonema potamos and Cyclotella species 3).

The elevated biovolume, density and chlorophyll-a concentration confirmed algal bloom conditions.

Total Biovolume	= 4,954 mm^3/m^3
Total Density	= 19,128 units/ml.
Chlorophyll-a	= 140 ug/l
Algal Bloom	= Yes

Neuse River (NEU131X, NEU139), Pamlico County
Sampled by M. Yount, K. Cratch 900524 1240-1305

Algal bloom samples were collected during ambient monitoring because of high pH (8.7) and DO concentrations (9.6-10 mg/l). Both samples were dominated by dinoflagellates and cryptophytes, while NEU139 also contained an abundance of bacillariophytes. The upper station, NEU131X, exhibited a higher algal biovolume estimate and chlorophyll-a concentration.

NEU131X

Total Biovolume	= 4,710 mm^3/m^3
Total Density	= 11,049 units/ml.
Chlorophyll-a	= 120 ug/l
Algal Bloom	= Yes

NEU139

Total Biovolume	= 1,044 mm^3/m^3
Total Density	= 11,398 units/ml.
Chlorophyll-a	= 25 ug/l
Algal Bloom	= Yes

Neuse River (NEU131F, 02092586), Craven County
Sampled by M. Yount, K. Cratch 900627

Two algal samples collected because of high pH (8-8.3) and DO concentrations (9-9.8 mg/l) were found to be algal blooms. The uppermost station, NEU131F, contained a high density of a common bacillariophyte, Cyclotella species 3. At station 02092586, an xanthophyte, Olisthodiscus carterae, dominated biovolume and density estimates by greater than 70%.

NEU131F

Total Biovolume	= 1,066 mm^3/m^3
Total Density	= 10,365 units/ml.
Chlorophyll-a	= 16 ug/l
Algal Bloom	= Yes

02092586

Total Biovolume	= 13,190 mm^3/m^3
Total Density	= 27,077 units/ml.
Chlorophyll-a	= 27 ug/l
Algal Bloom	= Yes

Oriental's WWTP Lagoon, Pamlico County
Sampled by D. Denton 900718 1240

The town of Oriental's wastewater treatment plant lagoon was sampled because of greenish colored water. Treatment plant personnel had expressed concern because the treatment plant has had problems in the past with non-compliance. The algal sample was dominated by chlorophytes and cyanophytes. The dominant species, Chlorella species 2, a chlorophyte, and Anabaenopsis raciborskii, a cyanophyte, are typical of enriched waters and would be expected in a wastewater treatment lagoon. Moreover, the elevated biovolume, density and chlorophyll-a concentration are indicative of high algal growth.

Total Biovolume	= 13,773 mm^3/m^3
Total Density	= 19,041 units/ml.
Chlorophyll-a	= 90 ug/l
Algal Bloom	= Yes

Neuse River (NEU131X, NEU139, NEU131F),
Pamlico, Craven Counties
Sampled by M. Yount, K. Cratch 900724 1310,
900725 1015

Algal bloom samples were collected during ambient monitoring because of high pH (8.3-8.7) and DO concentrations (8.7-9.5 mg/l). The three stations were dominated by dinoflagellates, cryptophytes, and a small blue green alga, Phormidium angustissima, which is commonly found in North Carolina estuaries. Stations NEU139 and NEU131F also contained an abundance of bacillariophytes (Cyclotella species 3). Although station NEU131F did not reflect high levels of algal populations, the chlorophyll-a concentration of 34 ug/l was elevated so that it was considered to be an algal bloom.

NEU131X

Total Biovolume	= 2,957 mm^3/m^3
Total Density	= 18,779 units/ml.
Chlorophyll-a	= 23 ug/l
Algal Bloom	= Yes

NEU139

Total Biovolume	= 8,868 mm^3/m^3
Total Density	= 12,578 units/ml.
Chlorophyll-a	= 21 ug/l
Algal Bloom	= Yes

NEU131F

Total Biovolume	= 2,438 mm^3/m^3
Total Density	= 3,756 units/ml.
Chlorophyll-a	= 34 ug/l
Algal Bloom	= Yes

Neuse River near Flanner Beach (Neuse-12), Craven County
Sampled by L. Biles, K. Cratch 900817

Algal samples were collected following a fish kill which occurred the previous day. During sampling, a salt wedge was evident with higher salinity measurements and nearly anoxic DO concentrations on the river bottom. Moderate numbers of typical brackish water phytoplankton were found.

Total Biovolume = 1,046 mm^3/m^3
Total Density = 3,052 units/ml.
Chlorophyll-a = 13 ug/l
Algal Bloom = No

Neuse River at Green Springs, Craven County
Sampled by M. Yount, K. Cratch 900827 1140

Algal samples were collected from the Neuse River downstream of the Trent River after complaints of raw sewage in the river. The complainant runs Green Springs, a children's summer camp, and expressed concern since the children usually swim in the river. Three algal samples were collected from around the swimming area. Elevated algal densities ranging from 13,975 to 36,102 units/ml were found while algal biovolumes ranged from 2,223 to 11,984 mm^3/m^3. Olisthodiscus carterae, an xanthophyte, and Chroomonas minuta, a cryptophyte, were dominant throughout the three samples. Even with the elevated algal growth, high levels of total phosphorus were found ranging from 0.20 to 0.32 mg/l. Chlorophyll-a concentrations were somewhat elevated.

Previous sampling for fecal coliforms revealed fecal counts as high as 84,000/100 ml upstream in the Trent River. Although an exact source of pollution has not been determined, leaking septic tanks, waste water treatment plants, or runoff from the James City or New Bern area are possible culprits.

GREEN SPRINGS-A
Total Biovolume = 2,223 mm^3/m^3
Total Density = 13,975 units/ml.
Chlorophyll-a = 29 ug/l
Algal Bloom = Yes

GREEN SPRINGS-B
Total Biovolume = 11,278 mm^3/m^3
Total Density = 36,102 units/ml.
Chlorophyll-a = 26 ug/l
Algal Bloom = Yes

GREEN SPRINGS-C
Total Biovolume = 11,984 mm^3/m^3
Total Density = 35,170 units/ml.
Chlorophyll-a = 51 ug/l
Algal Bloom = Yes

Neuse River near New Bern, Craven County
Sampled by M. Yount, B. Adams 900916 1630-1845

Algal samples were collected from the Neuse River near the mouth of the Trent River in response to a menhaden fish kill. High pH and DO concentrations were found at all the stations. Bacillariophytes, cryptophytes, and small cyanophytes were dominant at most stations, with the bacillariophytes, Cyclotella spp. contributing to the algal high densities.

NEUSE-2

Total Biovolume	= 5,409 mm^3/m^3
Total Density	= 66,381 units/ml.
Chlorophyll-a	= 25 ug/l
Algal Bloom	= Yes

NEUSE-4

Total Biovolume	= 4,960 mm^3/m^3
Total Density	= 90,488 units/ml.
Chlorophyll-a	= 25 ug/l
Algal Bloom	= Yes

NEUSE-7

Total Biovolume	= 10,416 mm^3/m^3
Total Density	= 84,898 units/ml.
Chlorophyll-a	= 22 ug/l
Algal Bloom	= Yes

Neuse River (02092162, NEU131F, NEU131X), Craven County
Sampled by M. Yount, K. Cratch 900925, 900926 1000-1310

Algal bloom samples were collected during ambient monitoring because of high pH (8.3-8.7) and DO concentrations (10.0-10.5 mg/l). The three stations were dominated in density by the bacillariophytes, Cyclotella spp. Other dominant algae included typical brackish water phytoplankton such as dinoflagellates and small cyanophytes. While elevated algal densities occurred at all stations, highest chlorophyll-a levels were found at the two most upstream stations, 02092162 and NEU131F.

02092162

Total Biovolume	= 2,485 mm^3/m^3
Total Density	= 45,419 units/ml.
Chlorophyll-a	= 39 ug/l
Algal Bloom	= Yes

NEU131F

Total Biovolume	= 19,670 mm^3/m^3
Total Density	= 129,967 units/ml.
Chlorophyll-a	= 53 ug/l
Algal Bloom	= Yes

NEU131X

Total Biovolume	= 5,474 mm^3/m^3
Total Density	= 172,591 units/ml.
Chlorophyll-a	= 16 ug/l
Algal Bloom	= Yes

Mill Creek on the Neuse River, Pamlico County
Sampled by L. Biles 901204 1400

Algal bloom samples were collected from Mill Creek on the northern shore of the Neuse River because of reddish colored water, The sample contained a bloom dominated in biovolume by Prorocentrum minimum, a common dinoflagellate which proliferates during cool weather and causes reddish colored water. By density estimates, a ubiquitous cryptophyte, Chroomonas minuta also dominated both samples..

The sample collected from the Camp Seafarers Marina (Mill Cr Mar) contained excessive phytoplankton populations while the Mill Creek sample contained a minor bloom. Even with the excessive algal growth, elevated levels of total nitrogen (1.3 mg/l) and total phosphorus (0.21 mg/l) were found at the marina. The chlorophyll-a concentration from the marina was elevated at 140 ug/l while chlorophyll-a measured in the creek was moderate at 17 ug/l.

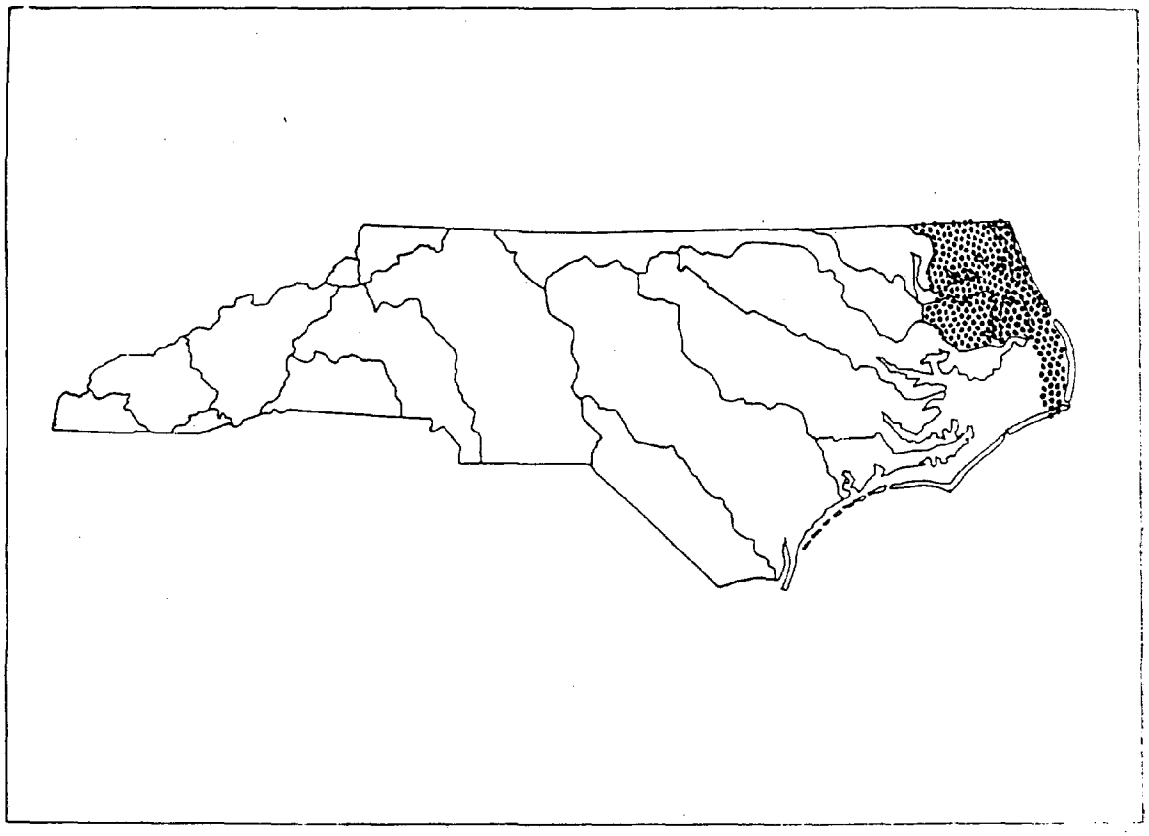
Mill Cr-B

Total Biovolume	= 7,776 mm^3/m^3
Total Density	= 9,549 units/ml.
Chlorophyll-a	= 17 ug/l
Algal Bloom	= Yes

Mill Cr Mar

Total Biovolume	= 88,369 mm^3/m^3
Total Density	= 79,133 units/ml.
Chlorophyll-a	= 140 ug/l
Algal Bloom	= Yes

PASQUOTANK RIVER BASIN



Albemarle Sound, Washington County
Sampled by M. Yount 900417 1220-1300

Filamentous algae were collected from fishermens nets in the Albemarle Sound for identification. The filaments were comprised of the green algae, Cladophora crystallina, Spirogyra species, Ulothrix species, and the filamentous bacillariophytes, Melosira varians and Fragillaria species. All species found are widely distributed and were likely responding to warmer weather and nutrient concentrations which had built up over the winter.

Albemarle Sound, Washington County
Sampled by L. Henry 900706

Tufts of algae were collected from the southern shore of the Albemarle Sound near Mackeys. The filaments were identified as Tolypothrix species, a fresh water cyanophyte. Tolypothrix usually grows in small clumps and can be free floating or attached to submerged wood or rocks.

Kendricks Creek (02081185), Washington County
Sampled by K. Cratch 900712 0835

Algal bloom samples were collected from Kendricks Creek on July 12, after green flecks were observed in the water column. A bloom of Gonystomum semen, a large unicellular flagellate, belonging to the class, Chloromonadophyceae, was found. This obscure class of algae retains characteristics of both dinoflagellates and euglenophytes. This species commonly occurs in the Pasquotank River basin, although usually not in such high numbers. Gonystomum is commonly found in bogs and ponds.

An elevated biovolume of 30,400 mm^3/m^3 and density of 2,032 units/ml was found. The high biovolume to low density ratio is attributable to the large size of the dominant species which comprised 97% of the biovolume.

Nutrient analyses revealed moderate levels of total nitrogen (0.62 mg/l) and elevated levels of total phosphorus (0.15 mg/l). Although a chlorophyll-a sample was not collected, it is likely that the corresponding chlorophyll would have been high as chloromonadophytes have been associated with high levels of chlorophyll-a in the past.

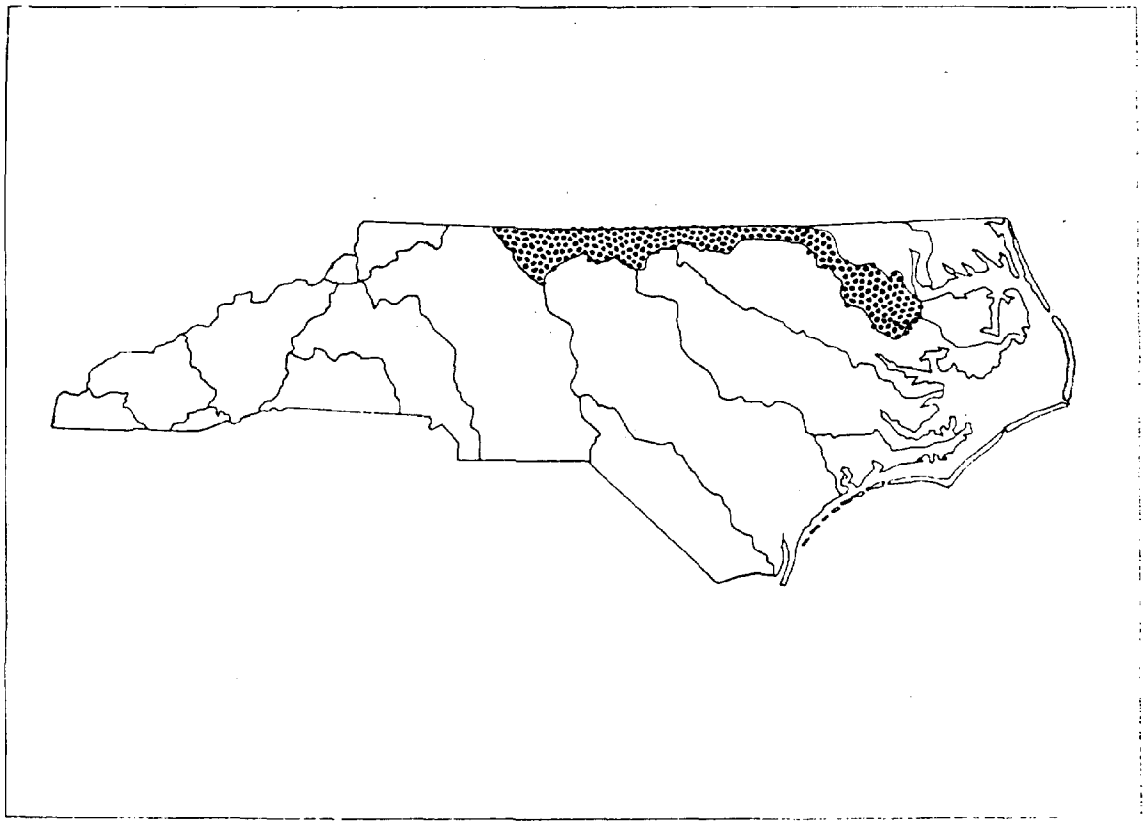
Total Biovolume	= 30,400 mm^3/m^3
Total Density	= 2,030 units/ml.
Chlorophyll-a	= not sampled
Algal Bloom	= Yes

Alligator River (0208117810), Tyrell County
Sampled by M. Yount, K. Cratch 900820 1130

An elevated surface dissolved oxygen reading led to the sampling of this algal bloom. A high density of Olisthodiscus carterae, a brackish water xanthophyte was found in the sample.

Total Biovolume	= 4,456 mm^3/m^3
Total Density	= 14,761 units/ml.
Chlorophyll-a	= 14 ug/l
Algal Bloom	= Yes

ROANOKE RIVER BASIN



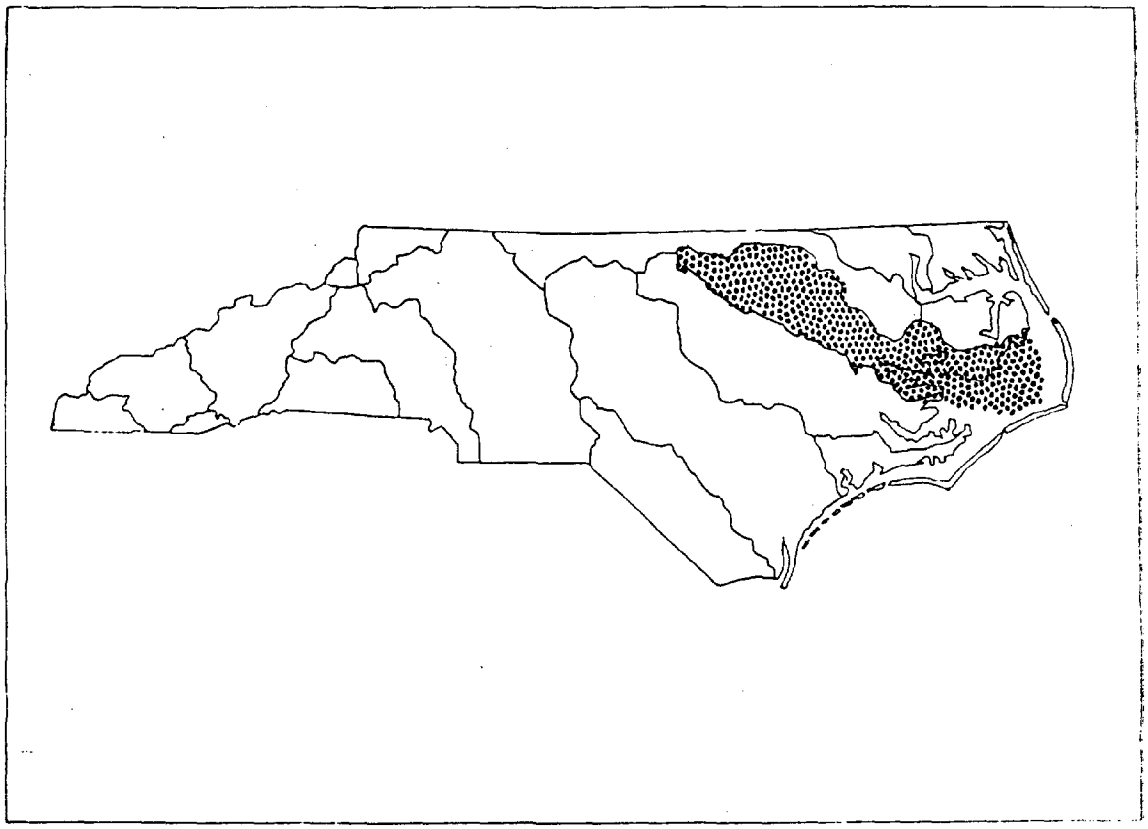
Roanoke River, Washington County
Sampled by M. Yount 900314 1010

Reports of filamentous algae adhering to fisherman's nets were received from the lower Roanoke River. Although filamentous samples were not collected directly from the nets, quantitative samples were examined for filamentous growths. Samples collected from Roanoke River ambient stations, 02081135, 0208114330, and 02081141 on March 14, contained very little algae, however some filaments of Melosira italica tenuissima, a chain forming bacillariophyte, were found which may have been the stringy material that was described growing on fishermens nets.

Epiphytic growths of algae have been reported in other bodies of water bodies in North Carolina during early spring in past years. This same species of Melosira was found at the Roanoke River at San Souci (02081141) in late March, 1985. In addition, filamentous samples collected from gill nets on the lower Cape Fear River in March 1986 contained filamentous growths of Melosira species.

It is likely that a combination of increased water temperatures and normal seasonal elevated nutrient concentrations spurred the filamentous algal growth. Bacillariophytes such as Melosira are most commonly found during cool seasons such as fall and early spring.

TAR-PAMLICO RIVER BASIN



Greenville Utilities Impoundment, Pitt County
Sampled by J. Chadwick 900719, 901008

Algal samples were collected from Greenville Utilities Presettlement Impoundments for identification. Floating clumps of the filamentous cyanophyte, Lyngbya nana were the most prevalent species encountered. This species is usually found on submerged rocks and probably floated into the impoundment.

Chocowinity Bay, Beaufort County
Sampled by M. Yount 900305 1030

A fresh water bloom of Skeletonema potamos, a chain-forming bacillariophyte, occurred in Chocowinity Bay. Several species of cryptophytes were also prevalent in the sample. The algal sample was collected during routine monitoring when elevated surface pH (8.7) and DO concentrations (13.0 mg/l) were detected. The elevated corresponding chlorophyll-a concentration of 52 ug/l confirmed bloom conditions.

Total Biovolume = 17,393 mm^3/m^3
Total Density = 26,028 units/ml.
Chlorophyll-a = 52 ug/l
Algal Bloom = Yes

Bath Creek and vicinity, Beaufort County
Sampled by J. Camp 900525 1127

Algal bloom samples were collected after reports of green flecks in Bath and Back Creeks. The algal bloom comprised of bacillariophytes (Cyclotella species 2), cryptophytes and xanthophytes was most concentrated in Back Creek, a tributary to Bath Creek.

Back Cr-92
Total Biovolume = 6,085 mm^3/m^3
Total Density = 30,046 units/ml.
Chlorophyll-a = not sampled
Algal Bloom = Yes

MBC (mouth of Bath Creek)
Total Biovolume = 2,000 mm^3/m^3
Total Density = 33,190 units/ml.
Chlorophyll-a = not sampled
Algal Bloom = Yes

MBB (Bath Cr between Back Cr and Pamlico R.)
Total Biovolume = 641 mm^3/m^3
Total Density = 10,132 units/ml.
Chlorophyll-a = not sampled
Algal Bloom = Yes

Pam-Bath Cr

Total Biovolume	= 1,897 mm^3/m^3
Total Density	= 28,474 units/ml.
Chlorophyll-a	= not sampled
Algal Bloom	= Yes

Pamlico River (02084534, TAR057G, TAR057G085, Choco-1), Beaufort County
Sampled by M. Yount, K. Cratch 900604 1035-1240

Elevated surface pH (8.7-8.9) and DO (9.4-10 mg/l) measurements led to the collection of algal bloom samples from Bath Creek (02084534), Chocowinity Bay (Choco-1) and from a transect across the Pamlico River. The four samples contained elevated algal densities attributed to high numbers of small bacillariophytes, Cyclotella spp. The samples were also dominated by chlorophytes, dinoflagellates and cryptophytes, while Bath Creek contained a high density of Olisthodiscus carterae, an xanthophyte, which likely contributed to its elevated chlorophyll-a concentration of 34 ug/l.

TAR057G

Total Biovolume	= 9,955 mm^3/m^3
Total Density	= 46,641 units/ml.
Chlorophyll-a	= 23 ug/l
Algal Bloom	= Yes

TAR057G085

Total Biovolume	= 713 mm^3/m^3
Total Density	= 26,727 units/ml.
Chlorophyll-a	= 15 ug/l
Algal Bloom	= Yes

02084534

Total Biovolume	= 13,577 mm^3/m^3
Total Density	= 88,217 units/ml.
Chlorophyll-a	= 34 ug/l
Algal Bloom	= Yes

Choco-1

Total Biovolume	= 2,996 mm^3/m^3
Total Density	= 70,224 units/ml.
Chlorophyll-a	= 31 ug/l
Algal Bloom	= Yes

Far Creek Canal near Englehard, Hyde County
Sampled by M. Vincent 900612 1530

An algal sample was collected following a crab kill which had occurred several days prior to sampling. A bloom of bacillariophytes (Cyclotella spp.) was present along with elevated surface pH and dissolved oxygen concentrations.

Total Biovolume	= 5,780 mm^3/m^3
Total Density	= 97,126 units/ml.
Chlorophyll-a	= 25 ug/l
Algal Bloom	= Yes

Pamlico River (TAR057G), Beaufort County
Sampled by K. Miller, J. Camp 900718 1205

A bloom sample was collected across from Bath Creek in the Pamlico River. A high DO concentration of 9.6 mg/l was noted at one meter depth indicating that the most algal activity was occurring just below the surface, possibly because of light inhibition at the water's surface. An algal bloom consisting of large dinoflagellates (Gyrodinium uncatenum, Gyrodinium aureolum), and small cyanophytes (Phormidium angustissima) occurred in the Pamlico River. The high chlorophyll-a concentration of 62 ug/l confirmed algal bloom conditions.

While total nitrogen levels were moderate at 0.51 mg/l, total phosphorous was elevated at 0.65 mg/l.

Total Biovolume	= 6,602 mm^3/m^3
Total Density	= 7,017 units/ml.
Chlorophyll-a	= 62 ug/l
Algal Bloom	= Yes

Pamlico River at Washington Waterfront, Beaufort County
Sampled by D. Denton 900718 1615

An algal sample was collected from the Pamlico River on the waterfront in Washington in response to a citizen's complaint. Greenish colored water was observed along with elevated surface DO (12.0 mg/l) and pH (8.4) levels. The sample contained a blue-green bloom of Merismopedia tenuissima, a colonial plate-forming algae that often tints the water a greenish color. The plates of cells were in the process of disintegrating, and therefore were not quantitatively countable. M. tenuissima is commonly found in the plankton of fresh and brackish water.

The excessive chlorophyll-a concentration of 50 ug/l confirmed algal bloom conditions on the Washington waterfront.

Pamlico River, Beaufort County
Sampled by K. Miller, L. Tison 900724 1125-1540

On July 24, five algal bloom samples were collected from Ragged Point to downstream at Bayview, in response to a fish kill. Dead menhaden, flounder, hog chokers, and spot were observed and were most concentrated around Hawkins Landing on the northern shore of the river.

Supersaturated surface DO measurements were found at most of the five sampling sites. Salinity and DO data illustrated the presence of a salt wedge at stations 4B and 7D with nearly anoxic conditions and higher salinity concentrations on the river bottom.

All five samples contained elevated phytoplankton growth and were considered to be algal blooms with the highest concentrations at Bayview (10E) and Hawkins Landing (2A). Dinoflagellates such as Peridinium trochoideum, Gymnodinium aurantium, Gyrodinium uncatenum and small filamentous cyanophytes, Phormidium angustissima dominated the samples.

Elevations in chlorophyll-a and total phosphorus concentrations were found in all samples.

Pam-2A

Total Biovolume	= 21,354 mm^3/m^3
Total Density	= 29,347 units/ml.
Chlorophyll-a	= 20 ug/l
Algal Bloom	= Yes

Pam-4B

Total Biovolume	= 3,739 mm^3/m^3
Total Density	= 11,412 units/ml.
Chlorophyll-a	= 27 ug/l
Algal Bloom	= Yes

Pam-5C

Total Biovolume	= 13,414 mm^3/m^3
Total Density	= 21,225 units/ml.
Chlorophyll-a	= 20 ug/l
Algal Bloom	= Yes

Pam-7D

Total Biovolume	= 3,414 mm^3/m^3
Total Density	= 24,980 units/ml.
Chlorophyll-a	= 23 ug/l
Algal Bloom	= Yes

Pam-10E

Total Biovolume	= 36,260 mm^3/m^3
Total Density	= 25,675 units/ml.
Chlorophyll-a	= 85 ug/l
Algal Bloom	= Yes

Pamlico River near River Acres, Beaufort County
Sampled by L. Tison 900726

Reddish colored filamentous algae was collected for identification from the northern shore of the Pamlico River near River Acres. The algae was identified as Compsopogon coeruleus, a red alga belonging to the class, Rhodophyta. This species is common to abundant in several creeks upstream of the Tar-Pamlico River estuary and is usually found during summer and fall. The branches of this alga vary in color from violet to blue and green.

Pamlico River, Beaufort County
Sampled by K. Miller, J. Camp 900801 1345-1645

Algal bloom samples were collected from Pungo Creek on August 1, following fish and crab kills. Dead crabs were found in pots near station Pungo Cr-8. A salt wedge was apparent (usually at 2 meters depth) in Pungo Creek and on the Pungo River the day of sampling.

The uppermost stations, (9 and 2) generally contained the highest concentration of algal growth and corresponding chlorophyll-a concentrations.

Dinoflagellates, cryptophytes and cyanophytes dominated all samples. Dinoflagellates including Peridinium trochoideum, Gymnodinium aurantium, Glenodinium danicans, Oxyrrhis marina and Gyrodinium aureolum comprised the majority of the biovolume, while small cyanophytes (Phormidium angustissima) and cryptophytes (Chroomonas minuta) were common dominants by density.

Pungo Cr-2

Total Biovolume	= 11,405 mm^3/m^3
Total Density	= 14,616 units/ml.
Chlorophyll-a	= 62 ug/l
Algal Bloom	= Yes

Pungo Cr-5

Total Biovolume	= 2,559 mm^3/m^3
Total Density	= 12,985 units/ml.
Chlorophyll-a	= 28 ug/l
Algal Bloom	= Yes

Pungo Cr-8

Total Biovolume	= 2,634 mm^3/m^3
Total Density	= 10,248 units/ml.
Chlorophyll-a	= 27 ug/l
Algal Bloom	= Yes

Pungo Cr-9

Total Biovolume	= 14,505 mm^3/m^3
Total Density	= 12,461 units/ml.
Chlorophyll-a	= 51 ug/l
Algal Bloom	= Yes

Pamlico River at the mouth of Broad Creek
(02084519505), Beaufort County
Sampled by K. Miller, J. Camp 900802 1345-1645

An algal bloom sample was taken during an investigation of deteriorating algal mats near the mouth of Broad Creek. No mats were found during the investigation. Algal biovolume and chlorophyll-a were low, although the presence of small cyanophytes, Phormidium angustissima, bacillariophytes, Cyclotella spp. and chrysophytes contributed to an elevated algal density estimate.

Total Biovolume	= 1,394 mm^3/m^3
Total Density	= 13,844 units/ml.
Chlorophyll-a	= 8 ug/l
Algal Bloom	= Yes

Mouth of Broad Creek, Beaufort County
Sampled by J. Camp, A. Hodge 900815 1100

Aquatic vegetation that had washed up in the mouth of Broad Creek was collected for identification. The sample was identified as Nitella species, a member of the division, Charophyta, more commonly known as stoneworts or brittleworts. Nitella is usually found in shallow water, protected from wave action and strong currents.

Pamlico River, Beaufort County
Sampled by J. Camp, M. Vincent 900827 1135-1230

Several algal bloom samples were collected from the Pamlico River after fishermen reported dead crabs in pots upstream from Core Point, which is located near Durham Creek. Phytoplankton samples were collected from Summerhaven on the north shore (Summer-A1), Blounts Bay (Pamlico-5), and from the mouth of Bath Creek (Pamlico-6).

All three samples contained 'bloom' levels of phytoplankton growth with elevated algal densities. In addition, Pamlico-5 contained an elevated biovolume of 15,517 mm^3/m^3 due to the presence of a large dinoflagellate, Gymnodinium nelsonii. Other species dominating the Blounts Bay sample include Cyclotella spp, a bacillariophyte, and Phormidium angustissima, a small, filamentous cyanophyte. A high chlorophyll-a concentration of 60 ug/l accompanied this bloom sample.

Downstream at the mouth of Bath Creek, dinoflagellates (Peridinium trochoideum, Gymnodinium aurantium), cyanophytes (Phormidium angustissima) and cryptophytes (Chroomonas minuta) were most prevalent. The accompanying chlorophyll-a concentration of 32 ug/l was indicative of increased algal activity.

At Summer-1, bacillariophytes (Cyclotella species 3), cryptophytes (Cryptomonas erosa reflexa) and dinoflagellates (Gymnodinium species 3) dominated the sample. The dominant algal species from these three samples are all commonly found in the Pamlico River estuary.

Water chemistry collected at the two lower sites revealed high concentrations of total phosphorus at Pamlico-5 (0.25 mg/l) and Pamlico-6 (0.37 mg/l). Total nitrogen concentrations were below 0.7 mg/l at both lower sites. Dissolved oxygen and salinity data indicated a salt wedge at the mouth of Bath Creek with a DO measurement of only 1.2 mg/l at one meter depth. A salt wedge which was probably more widespread previously, was most likely responsible for the crab deaths.

Pamlico-5

Total Biovolume	= 15,517 mm^3/m^3
Total Density	= 47,515 units/ml.
Chlorophyll-a	= 60 ug/l
Algal Bloom	= Yes

Pamlico-6

Total Biovolume	= 4,393 mm^3/m^3
Total Density	= 33,278 units/ml.
Chlorophyll-a	= 32 ug/l
Algal Bloom	= Yes

Summer-A1

Total Biovolume	= 4,766 mm^3/m^3
Total Density	= 30,134 units/ml.
Chlorophyll-a	= not sampled
Algal Bloom	= Yes

Pungo Creek, Beaufort County
Sampled by J. Camp, L. Biles 900829 1524

A fish kill involving flounder, spot, silver perch and crabs was observed in Pungo Creek on August 29. A salt wedge was again apparent as surface DO was 9.5 mg/l, while at one meter, DO measured 0.5 mg/l. The phytoplankton sample was dominated by typical estuarine species, consisting of cyanophytes (Phormidium angustissima), dinoflagellates (Peridinium trochoideum) and bacillariophytes (Cyclotella species 3). Total algal density reached 38,780 units/ml primarily because of the high number of small cyanophytes. The accompanying chlorophyll-a concentration was indicative of an algal bloom.

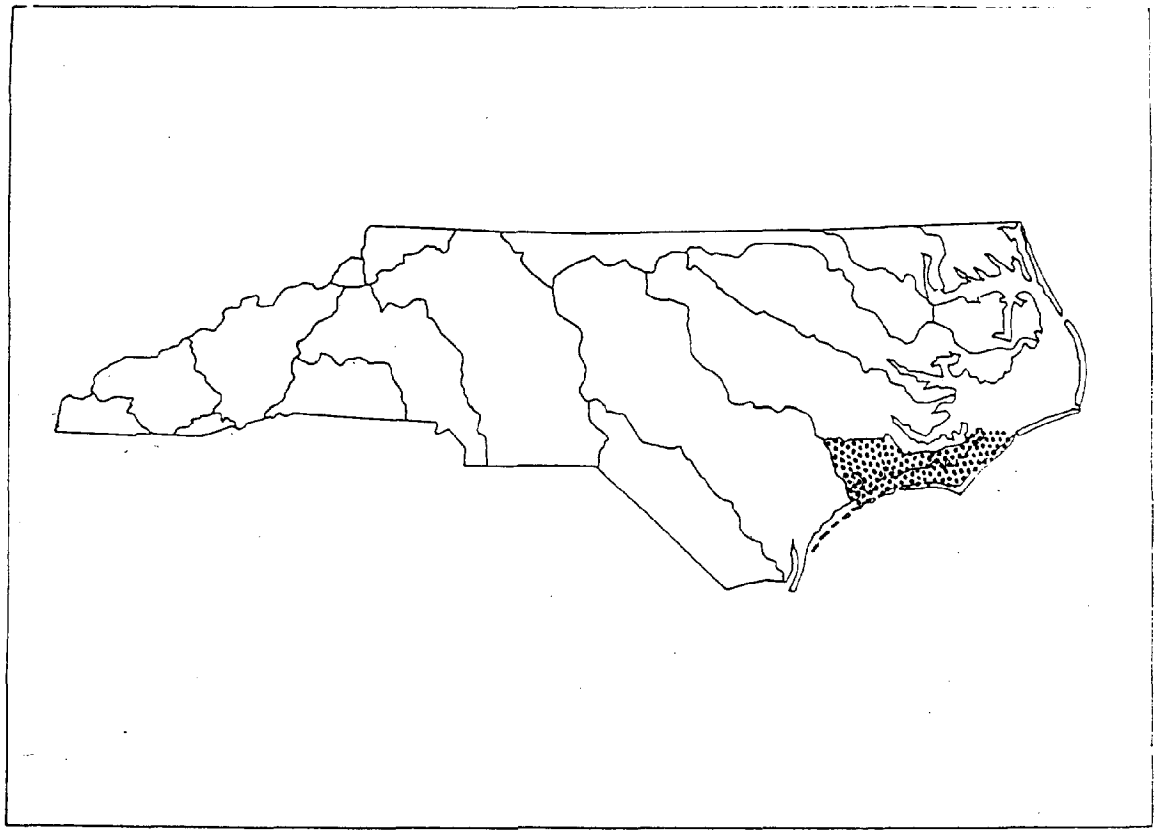
Total Biovolume	= 2,375 mm^3/m^3
Total Density	= 38,780 units/ml.
Chlorophyll-a	= 31 ug/l
Algal Bloom	= Yes

Herring Run, Beaufort County
Sampled by K. Miller 901219 1540

Algal samples were collected because of complaints of discolored water. A bloom of dinoflagellates, euglenophytes and cryptophytes was found. The dominant dinoflagellate, Oxyhurris marina may have been responsible for the observed yellow flecks in the water column.

Total Biovolume	= 6,057 mm^3/m^3
Total Density	= 2,853 units/ml.
Chlorophyll-a	= 21 ug/l
Algal Bloom	= Yes

WHITE OAK RIVER BASIN

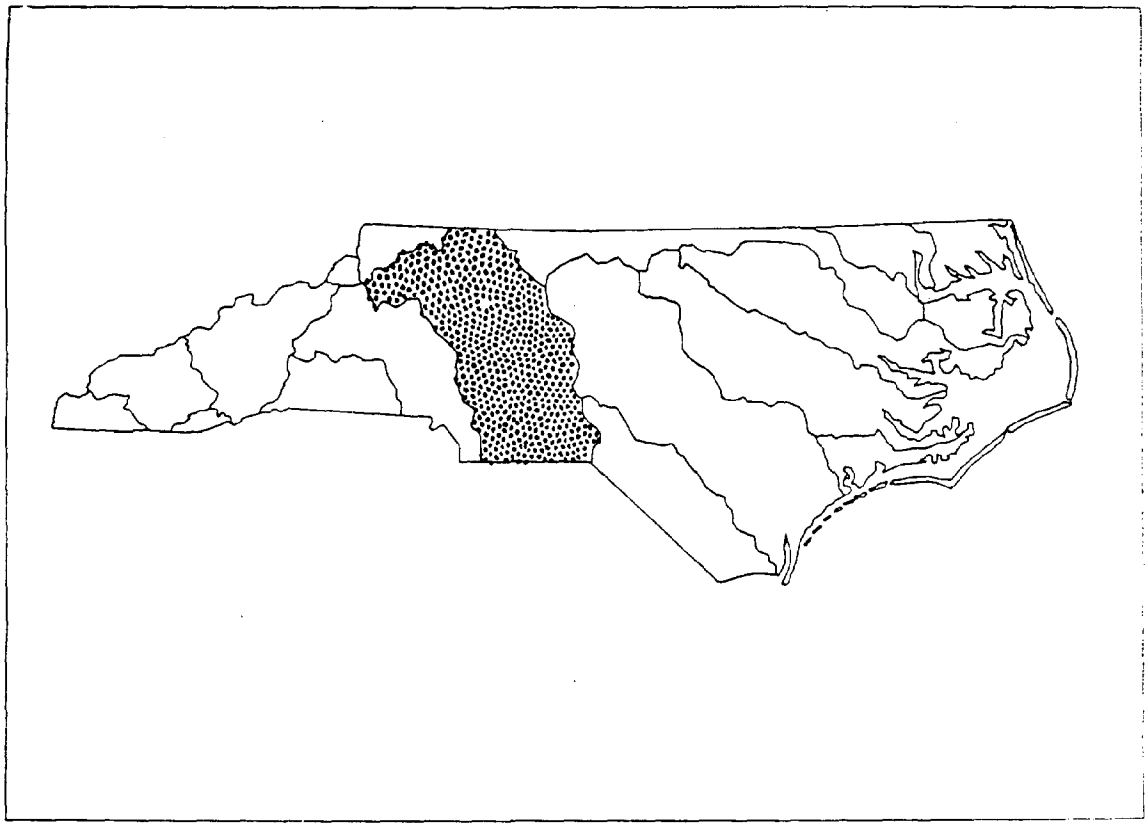


Little Northeast Creek (0209317585), Onslow County
Sampled by J. Gregson 901002

A phytoplankton sample was collected for analysis from an ambient station in Little Northeast Creek after a salinity level of 7 ppt. was discovered in this normally fresh water creek. The phytoplankton sample was comprised of chrysophytes and bacillariophytes. Dominant phytoplankton species include Ochromonas species, a chrysophyte, and Melosira varians, a large chain-forming bacillariophyte. Evidentally, these species tolerate low salinity waters.

The sample's algal biovolume and density were below the algal bloom threshold although an elevated chlorophyll-a concentration of 44 ug/l accompanied the sample. Nutrient analyses also revealed elevated levels of ammonia/ammonium (0.16 mg/l) and total phosphorus (0.24 mg/l).

YADKIN-PEE DEE RIVER BASIN



Unnamed tributary to Dutchman Creek, Davie County
Sampled by S. Knight 900201 1500

Algal samples were collected from a stagnant pond because of a greenish hue. Small phytoplankton populations consisting of bacillariophytes, chlorophytes, cryptophytes, euglenophytes and cyanophytes comprised the majority of the sample. Low numbers of phytoplankton and a moderately low chlorophyll-a concentration determined that this was not an algal bloom.

Total Biovolume	= 82 mm^3/m^3
Total Density	= 442 units/ml.
Chlorophyll-a	= 16 ug/l
Algal Bloom	= No

Hanes Ponds, Davie County
Sampled by S. Knight 900725 1130-1230

Water quality samples were collected from two ponds because of a citizen's complaint that nearby sludge application had increased nutrient loading to the ponds. The sludge was apparently applied using standard procedures. Surrounding land use is pastures, frequented by cows.

The downstream pond, Hanes-1, contained a bloom of Ankistrodesmus falcatus mirabilis, a chlorophyte, which comprised 94% of the sample's density. Members of this genus are often found in abundance in still, quiescent waters. Elevated algal density and a corresponding chlorophyll-a value of 80 ug/l further confirmed algal bloom conditions.

In addition, very high nutrient levels were found in Hanes-1. Total nitrogen, total phosphorus and ammonia/ammonium were 6.4, 3.1, and 0.14 mg/l, respectively.

The upper pond, Hanes-2, contained many floating algal mats and a moderately low amount of phytoplankton growth. Similarly, a moderate chlorophyll-a concentration of 18 ug/l was found in Hanes -2.

Algal bloom conditions, the presence of numerous aquatic weeds and very high nutrient levels in Hanes Pond-1 illustrate the eutrophic state of this pond. Lush aquatic growth and floating algal mats in Hanes-2 are also indicative of nutrient enrichment. Although little rainfall had occurred in the past few months, intermittent thunderstorms may have created nonpoint source runoff (either from the livestock or from land application) which fueled the profuse growth in the ponds.

Hanes-1

Total Biovolume	= 3,265 mm^3/m^3
Total Density	= 20,962 units/ml.
Chlorophyll-a	= 90 ug/l
Algal Bloom	= Yes

Hanes-2

Total Biovolume	= 2,684 mm^3/m^3
Total Density	= 1,922 units/ml.
Chlorophyll-a	= 18 ug/l
Algal Bloom	= No

SUMMARY

During 1990, the Biological Assessment Group received algal bloom reports from a diversity of waterbodies. Algal blooms occurred in creeks, ponds, lakes, rivers, and estuaries.

A large portion (50%) of bloom reports occurred within the Washington Region. This region also has the largest number of ambient stations. Furthermore, algal bloom coverage has increased on the Tar-Pamlico River and its tributaries because of the efforts of PERT (Pamlico Estuarine Response Team). Additional ambient sampling stations added within the Albemarle/Pamlico Estuarine Study area as part of the expanded ambient network have also increased coverage within this area. The sampling schedule for the Albemarle/Pamlico estuarine area will be reviewed and possibly revised after 1991.

Dinoflagellate blooms were a common occurrence on the Neuse and Pamlico River estuaries as in past years. Dinoflagellates commonly found in brackish water blooms include Peridinium, Prorocentrum, Gymnodinium, and Gyrodinium spp. Small blue-greens such as Lyngbya and Phormidium spp. and diatoms including Cyclotella, and Skeletonema often codominated. Algal blooms on the Neuse and Pamlico Rivers were often sampled as part of fish kill investigations, where hypoxia or low dissolved oxygen levels were a contributing factor to the fish kill. Low dissolved oxygen conditions often result when salinity stratified waters prevent vertical mixing of anoxic bottom waters. In the Pamlico River estuary, hypoxia was found to be short lived without serious consequences. (NCDEHNR, 1990)

The Chowan River experienced a blue-green bloom beginning in June and extended intermittently through September. The dominant algal species Anabaena spp. and Anacystis cyanea formed visible surface scums. The bloom mainly extended from above Holiday Island to as far as Edenhouse. Many slow moving tributaries to the Chowan also had thick surface growths of algae. Other major blue-green blooms last occurred on the Chowan in 1989, 1987 and 1983.

Eutrophic ponds and lakes in several river basins (Cape Fear, Catawba, Little Tennessee, Neuse, Tar-Pamlico, and Yadkin Pee-Dee) experienced blooms of cyanophytes, chlorophytes, or euglenophytes and exhibited elevated chlorophyll-a concentrations. Non-point source runoff was thought to have precipitated algal blooms in several of these ponds, lakes and creeks.

Blue-green algae continue to dominate Abbotts Creek arm of High Rock Lake as in past years. Samples were not quantitatively analysed this year since this arm has been identified as hypereutrophic, with no change in its trophic status. Chlorophyll-a

concentrations, often used as a meausre of productivity, demonstrate continued high values at two stations on Abbotts Creek, Cottongrove, and Southmont. Chlorophyll-a values measured from July through September averaged 48 ug/l at the two stations indicating algal bloom conditions.

Although not quantified, reports of filamentous algal growths were also documented in several river basins. In the Pasquotank and Roanoke River basins, filamentous chlorophytes and bacillariophytes prompted complaints from fishermen as excessive algal growths were adhering to fishing nets. Often filamentous algal growth is seasonal and occurs in response to abundant nutrients.

One potentially toxic bloom occurred in the Atlantic Ocean off the coast of Wilmington. Oscillatoria erythraea, a filamentous cyanophyte was collected by a fisherman after he noticed red patches in the water. Toxins from this algae have been reported to kill marine mammals and fish although no deleterious effects were observed here.

Numerous benefits have stemmed from Biological Assessment's Algal Bloom Reporting Program. Improvements in water quality have been reported from the 'phosphate detergent ban' which was initiated after blooms were documented statewide. This ban became effective January 1, 1988 and has been successful in reducing the quantity of phosphorus in N.C. surface waters (NCNRCD, 1989).

Other benefits derived from documentation of eutrophic water bodies include the "Nutrient Sensitive Waters" (NSW) designation, limiting nutrient inputs from industries and waste water treatment plants. Within NSW watersheds, non-point source inputs are controlled by use of 'Best Management Practices' which are agricultural erosion control measures. The Chowan, Neuse, and Tar-Pamlico River Basins and the B. Everett Jordan watershed in the Cape Fear River Basin are all designated NSW.

The New River watershed, near Jacksonville is protected under Administrative Code 15:2H 0404 statute, as a result of recurring blooms and a subsequent special study. This statute gives the division director the powers to limit dischargers within this nutrient enriched watershed.

Several other special studies or projects were conducted as a result of recurring blooms. Special studies were initiated on High Rock Lake (Yadkin-Pee Dee River Basin) and Lake Wylie (Catawba River Basin) after recurring algal blooms. Increased sampling efforts including special studies and an expanded ambient network in the Neuse and Pamlico estuaries have resulted because of numerous blooms and signs of enrichment. In addition, blue-green blooms in

Santeetlah Lake (Little Tennessee River Basin) have led to special studies on trout farms and their subsequent impact on waterbodies.

In conclusion, the algal bloom monitoring network established in 1984 has served as important water quality documentation statewide. This system is useful for revising the ambient monitoring network, identifying sources of enrichment, identifying waterbodies or watersheds needing potential nutrient controls, and determining if algal blooms are actually responsible for the observed symptoms.

REFERENCES

Humm, Harold J. and Suzanne R. Wicks. 1980. Introduction and Guide to the Marine Bluegreen Algae. John Wiley and Sons. New York.

North Carolina Department of Environment, Health and Natural Resources. DEM, DMF. 1990. Pamlico Environmental Response Team Report. Washington, N. C.

North Carolina Department of Natural Resources and Community Development. DEM. 1989 Water Quality Effects of the North Carolina Phosphorous Detergent Ban. Draft.

Smith, G.M. 1950. The Freshwater Algae of the United States. 2nd Ed. McGraw Hill Book Co, Inc. New York.

APPENDIX 1.

ALGAL BLOOM REPORT FORM

This form should be completed and sent to the D.E.M. Central Laboratory in Raleigh marked ATTENTION: Karen Lynch. Please send also **a chlorophyll sample, and one fresh and one preserved algal sample**. Nutrient samples are also helpful. One algal sample should be preserved with Lugol's solution at the rate of 2-3 ml. per 500 ml of sample (sample should be straw colored). No special containers are required, however, 500 ml of sample is preferred. The phytoplankton and chlorophyll samples should be taken concurrently or from the same labline sample. Please call if there are questions (733-6946). Ask for Karen Lynch, Dianne Reid or Cherri Smith. Any one of these people can send you Lugol's solution and report forms if your region needs more.

LAKE, RIVER or STREAM:_____ COUNTY:_____ TOPO MAP#_____
RIVER BASIN:_____ SAMPLER:_____
DATE & TIME:_____ _____

DESCRIPTION OF BLOOM: Draw or include a map to indicate exact location, nearest ambient station if applicable, and extent of coverage. Also include visual observations ie. color, floating or in water column, filamentous or planktonic (can it be picked up by hand, little green balls, flecks, threadlike, etc.). Is the water clear, dark, turbid, containing much suspended matter, etc? **How are the present and recent weather conditions**; especially wind and rainfall. Are there dead or struggling fish associated with the bloom? Why was the sample taken? (ie. obvious bloom, fish kill, taste and odor problem, etc)

PHYSICAL AND CHEMICAL DATA

D.O.	pH	Temp.	Cond. (corr to 25 ºC)	Salinity
SURFACE (.15 m.)				
(1.0 m.)				
(2.0 m.)				
(3.0 m.)				
(4.0 m.)				
(5.0 m.)				
(6.0 m.)				

Bottom Depth? (m.)_____

Please continue on additional sheet if necessary.

DO NUTRIENT SAMPLES ACCOMPANY THIS SAMPLE? YES___ NO___
CHLOROPHYLL SAMPLE(S) TAKEN? YES___ NO___

OTHER CHEMICAL ANALYSIS _____

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
B. EVERETT JORDAN	CPF055C	CHATHAM	CAPE FEAR	840709				YES, BLUE-GREENS	
B. EVERETT JORDAN	CPF0884A	CHATHAM	CAPE FEAR	840709				YES, BLUE-GREENS	
B. EVERETT JORDAN	CPF055C	CHATHAM	CAPE FEAR	850613	38	8491	18080	YES, BLUE-GREENS	
B. EVERETT JORDAN	CPF055E	CHATHAM	CAPE FEAR	850613	33	1586	3648	YES, BLUE-GREENS	
B. EVERETT JORDAN	CPF055C	CHATHAM	CAPE FEAR	850621	76	6529	149066	YES, BLUE-GREENS	
B. EVERETT JORDAN	CPF055E	CHATHAM	CAPE FEAR	850621	86	1378	33889	YES, BLUE-GREENS	
NORTHEAST CAPE FEAR @ MT OLIVE	02107586	WAYNE	CAPE FEAR	850627		19482	76164	YES, CRYPTOPHYTES, DINOFLAGELLATES	
E.J. HORNE PRIVATE POND		CUMBERLAND	CAPE FEAR	850905		1091	12141	NO	
LAKE BELOW IPI		GUILFORD	CAPE FEAR	860120		7394	67167	YES, PURE CHLAMYDOMONAS-GREENS	
GREAT COHARIE CREEK		SAMPSON	CAPE FEAR	860213				NO, POLLEN ETC.	
CAPE FEAR RIVER	NR RIEGELWOOD	COLUMBUS	CAPE FEAR	860305				N/A, FILAMENTOUS MELOSIRA AND MOSTLY FUNGUS	
STOCKINGHEAD CREEK	02107985	DUPLIN	CAPE FEAR	860505				N/A, FILAMENTOUS SIPHONALES	
ROBESON CREEK	02097189	CHATHAM	CAPE FEAR	860617	80	3331	13626	YES,CRYPTOPHYTES,BLUE-GREENS	
CAPE FEAR RIVER	@ LOCK AND DAM#1	BLADEN	CAPE FEAR	860729	17	1504	2504	NO, BUT LOW D.O.	
ROSES LAKE		CUMBERLAND	CAPE FEAR	860807				NO	
ROBESON CREEK	02097189	CHATHAM	CAPE FEAR	860827	65	25538	152676	YES,CRYPTOPHYTES,BLUE-GREENS	
DOVEFIELD POND	@ OAKLEY	NEW HANOVER	CAPE FEAR	861126				NO, BACTERIA	
HODGE FARM POND	HODGE FP	RANDOLPH	CAPE FEAR	870521		1344	7468	NO, FISH KILL	
ROBESON CREEK	02097189	CHATHAM	CAPE FEAR	870603		4642	12883	YES, GREENS	
ROBESON CREEK	02097189	CHATHAM	CAPE FEAR	871015	41	5399	17003	YES	
ROSEBORO LAGOON	ROSEBORO-1	SAMPSON	CAPE FEAR	880218	NS	35103	286050	YES, GREENS	
GREENFIELD LAKE	GREENFIELD-1	NEW HANOVER	CAPE FEAR	880428	<1	157	419	NO	
GREENFIELD LAKE	GREENFIELD-2	NEW HANOVER	CAPE FEAR	880428	4	1437	1269	NO	
GREENFIELD LAKE	GREENFIELD-3	NEW HANOVER	CAPE FEAR	880428	<1	330	291	NO	
GREENFIELD LAKE	GREENFIELD	NEW HANOVER	CAPE FEAR	880501	NS			N/A FILAMENTOUS GREENS	
LAKE RIM	LAKE RIM-1	CUMBERLAND	CAPE FEAR	880525	NS	8136	16071	YES, CHRYSOCROMULINA BREV	YES
TALLY POND	TALLY-A	CUMBERLAND	CAPE FEAR	880601	6	1484	3653	NO	
TALLY POND	TALLY-B	CUMBERLAND	CAPE FEAR	880601	2	847	5808	NO	
JORDAN LAKE	CPF055C	CHATHAM	CAPE FEAR	880602	65	5357	48828	YES, BLUE-GREENS MER TEN, PHOR ANG	FEW (3)
JUMP AND RUN BRANCH	JR-1	BRUNSWICK	CAPE FEAR	880719	5	111	419	NO, FILAMENTOUS BLUE-GREENS	
STEWART POND	STEWART-1	RANDOLPH	CAPE FEAR	880913	460	145866	153724	YES, EUGLENOPHYTES,GREENS	YES
HOLT FARM POND	HFP-1	RANDOLPH	CAPE FEAR	890531	23	1090	757	NO	
LAKE LYNWOOD	LYNWOOD-1	GUILFORD	CAPE FEAR	890606	230	13501	6987	YES, CYA	
STEWART POND	STEWART-1	RANDOLPH	CAPE FEAR	900515	350	113537	73017	YES, TRAC VOL	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
HIGH POINT RESERVOIRS	CITY LAKE-1	GUILFORD	CAPE FEAR	900705		4464	17468	YES, CYA-ANABS RAC, ANAB LEV	
HIGH POINT RESERVOIRS	HIGH PT LAG-1	GUILFORD	CAPE FEAR	900705		63388	32142	YES, CHL-STAU, SCEN QUA	
HIGH POINT RESERVOIRS	OAK HOLLOW-1	GUILFORD	CAPE FEAR	900705		2518	55200	YES, CYA-ANABS RAC, ANAB LEV	
LATHAM LAKE	MBN-D2	ALAMANCE	CAPE FEAR	900710	21	1134	2811	YES, FIL ALGAL MATS	
DEEP RIVER IMPOUNDMENT	DEEP-COL	RANDOLPH	CAPE FEAR	900711	28	3503	8245	NO, BUT CHL-CARTERIA SP	
ATLANTIC OCEAN	ATLANITC OCEAN	BRUNSWCK	CAPE FEAR	900723		N/A		FIL CYA-OSCI ERYTHRAEA	
ROCKY RIVER	ROCKY-2A	WAKE	CAPE FEAR	900726	44	1889	13451	YES, CHL, CRY, BAC	
STEWART POND	STEWART-1	RANDOLPH	CAPE FEAR	900802	6400	350745	85597	YES, CYA-ANAB SPI, APHA FLO, ANAC CYA	
BACKGROUND POND	BACKGROUND-1	RANDOLPH	CAPE FEAR	900802	37	10567	25854	YES, CHL,EUG,BAC,CYA	
ROCKY RIVER	ROCKY-1	WAKE	CAPE FEAR	900803	32	1662	6594	YES, CHL, CRY, CHR	
ROCKY RIVER	ROCKY-2	WAKE	CAPE FEAR	900803	44	1250	5590	YES, CHR, CYA	
STEWART POND	STEWART-1	RANDOLPH	CAPE FEAR	900809	400	N/A		YES, CYA-ANAB SPI,CHL, EUG	
ROBESON CREEK	02097189	CHATHAM	CAPE FEAR	900813	23	3324	25854	YES, CYA, CHL, CRY, BAC	
NEW HOPE CREEK	02097314	DURHAM	CAPE FEAR	900814	8	3211	5008	NO, BUT CYA	
UT TO BIG ALAMANCE CR	F MOSER POND	ALAMANCE	CAPE FEAR	900821		N/A		YES, CYA-ANAB POR,SPI, BACTERIA	
LAKE CEDAR HOLLOW	CEDAR HOLLOW	GUILFORD	CAPE FEAR	900828				YES, CYA-ANAB SUB, OSCI SP	
JORDAN RESERVOIR	CPF081A1C	WAKE	CAPE FEAR	900913	74	102611	499604	YES, CYA ANAC CYA, OSCI GEM, CHL,EUG	
POPLIN POND	POPLIN POND	UNION	CATAWBA	850619		8231	1922	YES, EUGLENOPHYTES	
PRICE POND	PRICE POND	UNION	CATAWBA	850619		40360	12752	YES, EUGLENOPHYTES	
UNION POND	UNION POND	UNION	CATAWBA	850619		2766	945	YES, EUGLENOPHYTES	
PRIVATE POND		IREDELL	CATAWBA	850621				ID, BLUE-GREENS, DIATOMS	
FREEDOM PARK LAKE		MECKLENBURG	CATAWBA	850822		37722	1003751	YES,BLUE-GREENS	YES
LAKE NORMAN	LN1	CATAWBA	CATAWBA	851015	2400	16381	11529	YES, BLUE-GREENS	
LAKE NORMAN	LN2	CATAWBA	CATAWBA	851015	8700	59283	27950	YES, BLUE-GREENS	
LAKE NORMAN	LN3	CATAWBA	CATAWBA	851015	1300	45010	22709	YES, BLUE-GREENS	
EAST FORK		UNION	CATAWBA	860414		21495	17935	YES, ENRICHED MATS OF ULOTHRIX, SPIROGYRA	
WAVERLY LAKE	#1	MECKLENBURG	CATAWBA	860716	29	13782	21661	YES, BLUE-GREENS	
WAVERLY LAKE	#2	MECKLENBURG	CATAWBA	860716	110	100813	50485	YES, BLUE-GREENS	
CHARLES FOWLER FARM POND		UNION	CATAWBA	860808	130	7826	15198	YES,EUG, GREENS	YES
CATAWBA CREEK (WYLIE)	02145524	GASTON	CATAWBA	860924	19	4326	20438	YES, BLUE-GREENS	
UT TO WAXHAW CR.	UT TO WAXHAW CR.	UNION	CATAWBA	870407	2			NO, FUNGUS	
S. FORK CATAWBA R.(WYLIE)	02145442	GASTON	CATAWBA	870526	31	2153	5870	YES, OSCI GEM	
CATAWBA CREEK (WYLIE)	02145524	GASTON	CATAWBA	870526	50	4927	13032	YES, OSCI GEM	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
S. FORK CATAWBA R.(WYLIE)	02145442	GASTON	CATAWBA	870623	47	6791	7100	YES, MELOSIRAS	
S. FORK CATAWBA R.(WYLIE)	02145442	GASTON	CATAWBA	870723	10	2882	2463	NO	
CEDARWOOD POND	CEDARWOOD-1	MECKLENBURG	CATAWBA	870812		7663	19303	YES, GREENS, BLUE-GREENS	YES
CLEATON POND	CLEATON-1	MECKLENBURG	CATAWBA	870818		3050	11355	YES,GREENS, DIATOMS,EUGL	YES
COOK POND	COOK-1	GASTON	CATAWBA	870821	19	19089	59044	YES,CRYPTOPHYTES,GREENS	YES
HUNSUCKER FARM POND	HUNSUCKER-1	CATAWBA	CATAWBA	870918				YES	
LITHIUM EFFLUENT	LITHIUM-1	GASTON	CATAWBA	870924		5740	162808	YES, GREENS	
SUMMERLIN POND	SUMMERLIN-1	MECKLENBURG	CATAWBA	880902	160	14872	8953	YES, GREENS, CRY, BLUE-GREENS	
LAKE WYLIE	CTBCKCOVE	GASTON	CATAWBA	890706	27	6683	24573	YES	
IRWIN CREEK	02146300	MECKLENBURG	CATAWBA	890802	10	3000	4629	NO, BUT PERIPHYTON	
CRICKET LAKE	CRICKET-1	MECKLENBURG	CATAWBA	890823	54	333762	54502	YES, CHL	
FLAT BRANCH	BRAGG POND	MECKLENBURG	CATAWBA	900614	10			YES, CHL-CLOSTERIOPSIS	YES
GRANTS POND	GRANTS-1	GASTON	CATAWBA	900621	14	5037	4658	YES, EUG,CHL,CRY	
WILSONS LAKE	WILSONS LAKE	MCDOWELL	CATAWBA	900730	10	813	6201	NO	YES
STEELE CREEK	STEELE CREK	MECKLENBURG	CATAWBA	900801	5	3712	1572	NO, BUT CYA	
SOUTH FORK POND	CRAMMERTON-1	GASTON	CATAWBA	900820	1900	194118	1388760	YES, CHL-CHLOROGONIUM EUCHLORUM	YES
CROWDERS CREEK	CROWD-15A	YORK, SC	CATAWBA	900905	35	12551	56948	YES, EUG, CYA-MER TEN	
LAKE NORMAN	LAKE NORMAN-2	CATAWBA	CATAWBA	901003				YES, CYA-ANAC CYA	
LAKE NORMAN	DAVIDSON-1	IREDELL	CATAWBA	901016	6	695	3668	NO	
COMMSCOPE LAKE	COMMSCOPE-1	CATAWBA	CATAWBA	901114	3500	1051475	38829	YES, CYA-COELOSPHAERIUM NAEGELIANUM	
BLACKWATER RIVER	0205007750	GATES	CHOWAN	850318	2	192	367	NO	
CHOWAN RIVER	02047370	GATES	CHOWAN	860827	1	75	221	NO	
CHOWAN RIVER	02050079	CHOWAN	CHOWAN	860827	2	37	285	NO	
CHOWAN RIVER	0205363575	CHOWAN	CHOWAN	860827	29	2083	6347	NO	
CHOWAN RIVER	0205363575	CHOWAN	CHOWAN	861003				ID, BLUE-GREENS	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	861027				ID, BLUEGREENS-ANABAENA	
CATHERINE CR.	CATHERINE-1	BERTIE	CHOWAN	870613		3123	18167	YES, ANABAENA	
CATHERINE CR.	CATHERINE-1	BERTIE	CHOWAN	870707		4835	5765	ID, CRY, DIN, ANAB	
CHOWAN R. BELOW HOLIDAY I.	0205360615	BERTIE	CHOWAN	870707	82	28059	17702	YES,ANABAENA PORTORICENSIS	
ARROWHEAD BEACH	ARROWHEAD	CHOWAN	CHOWAN	870708		19291	3960	YES,ANABAENA PORTORICENSIS	
CHOWAN RIVER	DYE PLANT	CHOWAN	CHOWAN	870805		43060304	5415292	YES,ANABAENA PORTORICENSIS	
CHOWAN RIVER	MARKER 5	BERTIE	CHOWAN	870805		283196	30133	YES,ANABAENA PORTORICENSIS	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	870805	36	23352	4920	YES,ANABAENA PORTORICENSIS	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
CHOWAN RIVER	02053652	BERTIE	CHOWAN	870805	9	4909	1287	NO, SOME ANAB PORT	
ARROWHEAD BEACH	ARROWHEAD-1	CHOWAN	CHOWAN	870810	170	21808	11840	YES,ANABAENA PORTORICENSIS	
CHOWAN RIVER	02053244	HERTFORD	CHOWAN	870810	18	2292	3319	NO, SOME ANAB PORT	
CHOWAN RIVER	0205325510	BERTIE	CHOWAN	870810	19	5548	3938	YES,ANABAENA PORTORICENSIS	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	870810	42	15643	5629	YES,ANABAENA PORTORICENSIS	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	871019	2	246	1089	NO	
CHOWAN RIVER	0205360615	BERTIE	CHOWAN	880602	8	684	1671	NO	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	880602	17	1325	2986	NO	
CHOWAN RIVER	02053632005	BERTIE	CHOWAN	880602	9	2239	3710	NO	
CHOWAN RIVER	02053632095	BERTIE	CHOWAN	880602	14	915	2981	NO	
CHOWAN RIVER	02053652	BERTIE	CHOWAN	880602	13	620	3265	NO	
CHOWAN RIVER	02053652005	BERTIE	CHOWAN	880602	23	6931	7022	YES, PREVIOUSLY?	
CHOWAN RIVER	02053652095	BERTIE	CHOWAN	880602	6	6038	16421	YES, PREVIOUSLY?	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	890522	25	4507	8851	NO, DIN,CRY,CHR	
CHOWAN RIVER	CANAL-ARROW	CHOWAN	CHOWAN	890716	170	493	786	YES, CYA CELLS DEGRADED-ANAB SUB	
CHOWAN RIVER	CHOWAN-3M	CHOWAN	CHOWAN	890716	8	892	1071	NO	
CHOWAN RIVER	CHOWAN-1	BERTIE	CHOWAN	890718	170	5506	8909	YES, CYA - ANAB SUB	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	890718	1	1745	2232	NO, BUT CYA-ANAB SUB	
CHOWAN RIVER	02053652	CHOWAN	CHOWAN	890718	2	478	565	NO, BUT CYA-ANAB SUB	
CHOWAN RIVER	CHOWAN-COL	BERTIE	CHOWAN	890801	NS	151798	270765	YES, CYA - ANAB SUB, ANAB POR	
CHOWAN RIVER	CATHERINE-1	CHOWAN	CHOWAN	890808	54	30583	10970	YES, CYA- ANAB POR, ANAB SUB	
CHOWAN RIVER	INDIAN-2	BERTIE	CHOWAN	890808	35	15056	9084	YES, CYA - ANAB POR	
CHOWAN RIVER	INDIAN-3	BERTIE	CHOWAN	890808	360	26978	13975	YES, CYA - ANAB POR	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	890808	3	1197	827	NO, BUT CYA-ANAB SUB	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	890816	10	1850	4051	NO, BUT CYA-ANAB SUB	
CHOWAN RIVER	02053652	CHOWAN	CHOWAN	890816	26	2763	2763	NO, CYA-ANAB POR	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	891010	4	358	571	NO, CYA, DIN, EUG	
CHOWAN RIVER	02053652	CHOWAN	CHOWAN	891010	400	23595	3756	YES, CYA	
CHOWAN RIVER	02053652	CHOWAN	CHOWAN	891127	1	1222	274	NO	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	900612	2	279	681	NO	
CHOWAN RIVER	02053652	BERTIE	CHOWAN	900612	3	666	1380	NO	
CHOWAN RIVER	CHOWAN-9	BERTIE	CHOWAN	900612	4	305	1002	NO	
CHOWAN RIVER	ARROWHEAD-1	BERTIE	CHOWAN	900619	15	11656	13695	YES CYA, CHL, CRY, BAC	
CHOWAN RIVER	CATHERINE-1	BERTIE	CHOWAN	900619	24	5330	5066	YES, CYA	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
CHOWAN RIVER	CHOWAN-14	BERTIE	CHOWAN	900619	12	3034	5401	NO	
CHOWAN RIVER	INDIAN-2	BERTIE	CHOWAN	900619	11	3390	5590	NO	
CHOWAN RIVER	ROCKYHOCK-1	BERTIE	CHOWAN	900619	12	6857	10307	YES, CYA	
CHOWAN RIVER	0205360615	BERTIE	CHOWAN	900619	9	1684	2533	NO	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	900619	10	3475	4076	NO	
CHOWAN RIVER	0205363575	BERTIE	CHOWAN	900619	6	14765	12438	YES, CYA	
CHOWAN RIVER	02053652	BERTIE	CHOWAN	900619	6	11552	8860	YES, CHLMD, CRY	
CHOWAN RIVER	02053652005	BERTIE	CHOWAN	900711		13095	3419	YES, CYA-ANAB POR, CRY	
CHOWAN RIVER	CATHERINE-7	BERTIE	CHOWAN	900712	350	32805	8122	YES, CYA -ANAB POR	
CHOWAN RIVER	CHOWAN-5	BERTIE	CHOWAN	900712	250	69869	15897	YES, CYA -ANAB POR	
CHOWAN RIVER	INDIAN-8	BERTIE	CHOWAN	900712	200	23698	6551	YES, CYA -ANAB POR	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	900712	120	31330	8036	YES, CYA -ANAB POR	
CHOWAN RIVER	02053652	BERTIE	CHOWAN	900712	17	3335	1910	NO	
CHOWAN RIVER	BENNETTS	BERTIE	CHOWAN	900712	270	22603	6521	YES, CYA -ANAB POR	
CHOWAN RIVER	INDIAN-8	BERTIE	CHOWAN	900726	35	7142	3474	YES, CYA -ANAB POR, CRY	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	900802	14	5179	2180	YES, CYA -ANAB POR, CRY	
CHOWAN RIVER	02053652	BERTIE	CHOWAN	900802	16	6245	2725	YES, CYA -ANAB POR, CRY	
CHOWAN RIVER	CHOWAN-ROCK	BERTIE	CHOWAN	900802	100	10923	2306	YES, CYA -ANAB POR, ANAC CYA	
CHOWAN RIVER	CHOWAN-3	BERTIE	CHOWAN	900912	370	N/A		YES, CYA -ANAC CYA	
CHOWAN RIVER	02053632	BERTIE	CHOWAN	901016	6	3652	1077	YES, CHLMD, CYA	
CHOWAN RIVER	0205360615	BERTIE	CHOWAN	901016	4	1388	256	NO	
CHOWAN RIVER	02053574	BERTIE	CHOWAN	901016	6	5109	699	NO	
UT TO NORTH TOE		MITCHELL	FRENCH BR	850320				ID, ENRICHMENT	
CANE RIVER @ SIOUX	03464000	MITCHELL	FRENCH BR	850329		1243	3616	NO, HIGH pH	
SANTEELAH LAKE	SANTEELAH2	GRAHAM	LITTLE TENNESSEE	891101	81	N/A		YES, CYA-ANACYSTIS	
SANTEETLAH LAKE	SANTEETLAH-1	GRAHAM	LITTLE TENNESSEE	900620	27	10780	2492	YES, CYA-ANAB POR, ANAC CYA	
INTRACOASTAL WATERWAY	@ SHALOTTE	BRUNSWICK	LUMBER	861110		267	1071	NO	
DUNNS POND	DUNN-1	ROBESON	LUMBER	870624		45661	41404	YES, OSCI MES, SCENEDESMUSES	
HOLDEN BEACH	HOLDEN-1	BRUNSWICK	LUMBER	870924				ID, DINOFLAGELLATES	
DUNNS POND	DUNN-1	ROBESON	LUMBER	880408	220	20397	117040	YES, BLUE-GR - ANACYSTIS	
BRUCE POND	BRUCE-1	ROBESON	LUMBER	880531	NS	1451	833	NO, EUG-TRACHELOMONAS VOLVOCINA	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
ECHO LAKE	ECHO LAKE-1	MOORE	LUMBER	900227	.1	70	934	NO	
LAKE PINEHURST	LP-1	MOORE	LUMBER	900718	3	710	833	NO	
SWIFT CREEK	02092084	CRAVEN	NEUSE	840808	110			YES, GREENS, CRYPTOPHYTES	
SLOCUM CREEK	MARKER 8	CRAVEN	NEUSE	840816	38	50000	46379	YES, DINOFLAGELLATES	
BROAD CREEK	@ MOUTH MARKER#4	CARTERET	NEUSE	840816	460	160933	8386	YES, DINOFLAGELLATES	
HOOD SWAMP DRAINAGE POND		WAYNE	NEUSE	841022	960	177696	208314	YES, EUGLENOPHYTES	
GOODWIN CREEK		CRAVEN	NEUSE	850108	62	71056	29837	YES, DINOFLAGELLATES-PROROCENTRUM	
SANDY RUN		CRAVEN	NEUSE	850108	45	82282	36125	YES, DINOFLAGELLATES-PROROCENTRUM	
TUCKER CREEK		CRAVEN	NEUSE	850108	91	67095	28893	YES, DINOFLAGELLATES-PROROCENTRUM	
CRABTREE CREEK	@ HWY 54	WAKE	NEUSE	850522		26070	7803	YES, BLUE-GREENS	
WALNUT CREEK		WAYNE	NEUSE	850816	4	1112	9034	NO	
NEUSE RIVER	MOUTH OF TRENT	CRAVEN	NEUSE	850829	40	3538	2066	YES, DINOFLAGELLATES, DIATOMS	
NEUSE RIVER	02092162	CRAVEN	NEUSE	850918	46	2815	33802	YES, CRYPTOPHYTES, DIATOMS	
TRENT RIVER	@ BUSINESS 70 BRIDGE	CRAVEN	NEUSE	850918		18577	72670	YES,CRYP,DIATOMS	YES
NEUSE RIVER	@ WILDLIFE RAMP ABOVE RR	CRAVEN	NEUSE	850918		7772	49960	YES, DIATOMS, CRYPTOPHYTES, DINOFLAGELLATES	
CONTENTNEA CREEK		WILSON	NEUSE	850920				NO	
WENDELL LAKE		JOHNSTON	NEUSE	851108				ID, DIATOMS, BLUE-GREENS	
NEUSE RIVER @ ORIENTAL	02092674	PAMLICO	NEUSE	860401	16	5346	28416	YES, CYCLOTELLA	
LITTLE LICK CREEK	0208700780	DURHAM	NEUSE	860513	400	21847	39916	YES, GREENS	
LITTLE LICK CREEK	0208700780	DURHAM	NEUSE	860616	68	450	728	ID, HIGH CHLA SOME EUGLENOPHYTES	
PIGEONHOUSE CREEK	0208732544	WAKE	NEUSE	860620	22	3628	6987	NO, ENRICHED THOUGH	
FALLS OF THE NEUSE RESERVOIR	FALLS @ I85	DURHAM	NEUSE	860716	280	17692	11966	YES, GREENS, EUGLENOPHYTES	
FALLS OF THE NEUSE RESERVOIR	NEU010	DURHAM	NEUSE	860721	19	13742	41808	YES,GREENS,CRYPTOPHYTES	YES
MIDDLE CREEK	02088000	JOHNSTON	NEUSE	860721	8	641	7220	NO	YES
FAIRGROUNDS POND		WAKE	NEUSE	860729		1768	4280	ID, BLUEGREENS	
TRENT RIVER	0209256050	CRAVEN	NEUSE	860923	66	2863	183072	YES, OLISTHODISCUS	
NEUSE RIVER	02092586	CRAVEN	NEUSE	860923	26	7730	36859	YES, DINOFLAGELLATES-PROROCENTRUM	
UT TO NORTHWEST CREEK	FAIRFIELD HAR	CRAVEN	NEUSE	861010	31	110694	83850	YES,DIATOMS	YES
SLOCUM CREEK		CRAVEN	NEUSE	861013	49	3065	10631	YES	
CONTENTNEA METRO SEWAGE		PITT	NEUSE	861013				N/A, FILAMENTOUS GREENS, ULOTHRIX	
NEUSE RIVER	02092092	CRAVEN	NEUSE	861028				ID,ANAC CYA, SALT WEDGE	
TRENT RIVER	0209256050	CRAVEN	NEUSE	861028	150	2863	183072	YES, OLISTHODISCUS	
PAULA HARRIS POND	PAULA HARRIS POND	WAKE	NEUSE	870409	3			N/A, FILAMENTOUS	

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STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
HAYWARD CR	HAYWARD-2	CRAVEN	NEUSE	870609	50	4517	46991	YES, CYCL SP	
CRYSTAL LAKE	CRYSTAL-1	CRAVEN	NEUSE	870710		10435	113197	YES, OSCI GEM	
WENDELL LAKE	WENDELL-1	JOHNSTON	NEUSE	870814	230	54681	838497	YES, ANACYSTIS CYANEA	
ENO RIVER	ENO-EFLAND	ORANGE	NEUSE	870818		8957	31444	YES, GREENS	
UT TO NORTHWEST CREEK	FAIRFIELD HAR	CRAVEN	NEUSE	870923	18	4950	96427	YES,OSCI GEM,CYCL	YES
DATA GENERAL POND	DGP	JOHNSTON	NEUSE	871008		11678	16945	YES, EUGLENOPHYTES	YES
NEUSE RIVER	NEUSE-OYC	CRAVEN	NEUSE	880122	17	4962	7424	NO, CYCLOTELLA, PRO MIN	
SMITH CREEK	SMITH-GE2,GE3	CRAVEN	NEUSE	880122	23			N/A FIL-MELOSIRA MONOLIFORMIS	
LOWER BROAD CREEK	BROAD 3A, 3B	PAMLICO	NEUSE	880202	NS			N/A FIL GREENS-CLADOPHORA	
WHITAKER CREEK	WHITAKER-1	PAMLICO	NEUSE	880202	NS			N/A MELOSIRA MONOLIFORMIS	
UPPER BROAD CREEK	BROAD-1	CRAVEN	NEUSE	880210	33	21154	52057	YES, CYCLOTELLA SPECIES 3	
UPPER BROAD CREEK	BROAD-1	CRAVEN	NEUSE	880215	44	6996	36510	YES, CYCLOTELLA SPECIES 3	
NEUSE RIVER	PITCH	CRAVEN	NEUSE	880415	<1	140	210	NO	
FALLS OF THE NEUSE RESERVOIR	NEU013	GRANVILLE	NEUSE	880601	210	29487	44254	YES, CRYPTOPHYTES	
RIVER BEND CANALS	RIVER-BEND	CRAVEN	NEUSE	880614	510	108802	90837	YES, GREENS-CARTERIA	
LITTLE RIVER	0208524169	DURHAM	NEUSE	880614	6			N/A FILAMENTOUS GREENS	
BELL FAMILY POND	BELL POND	WAKE	NEUSE	880706	80			N/A FILAMENTOUS GREENS-OEDOGONIUM	
NEUSE RIVER	RIVERDALE	CRAVEN	NEUSE	880801	26	4934	8734	NO, EUG, CRY, BL-GREENS	
LAKE ORANGE	NEU00B	ORANGE	NEUSE	880810	13	1744	3337	NO	
LAKE ORANGE	NEU00B2	ORANGE	NEUSE	880810	9	2076	2638	NO	
LAKE ORANGE	NEU00B4	ORANGE	NEUSE	880810	9	2432	3476	NO	
CORPORATION LAKE	NEU00C1	ORANGE	NEUSE	880810	15	601	1368	NO, BUT OSCI MATS PRESENT	
RALEIGH GOLF COURSE POND	GOLF-BL	WAKE	NEUSE	880823	570	36280	55179	YES, EUGLENOPHYTES	YES
LAKE WHEELER	LW-1 25%	WAKE	NEUSE	881027	<1	834	1089	NO, FIL BL-GR	
TRENT RIVER	0209256050	CRAVEN	NEUSE	881116	3	9780	8152	YES, CRYPTOPHYTES	
MACGREGOR GOLF COURSE P.	MACGREGOR POND	WAKE	NEUSE	881208	NS			YES, BLUE-GREEN	
LAKE WHEELER	LW-DOCK	WAKE	NEUSE	881220	160	19592	12112	YES, FIL BL-GR - ANABAENA	
MACGREGOR GOLF COURSE P.	MACGREGOR POND	WAKE	NEUSE	890427	<1			N/A FIL CHO - OEDOGONIUM	
NEUSE RIVER	02092682	PAMLICO	NEUSE	890525	29	2845	18080	YES, BAC	
BEARD CREEK	BEARD-A	PAMLICO	NEUSE	890601	NS	8193	26552	YES, BAC, DIN	
BEARD CREEK	BEARD-B	PAMLICO	NEUSE	890601	38	13050	23408	YES, BAC, DIN	
BEARD CREEK	BEARD-C	PAMLICO	NEUSE	890601	NS	10699	10044	YES, BAC, DIN	
HANCOCK CREEK	HANCOCK-E	CRAVEN	NEUSE	890601	20	17769	33540	YES, BAC, DIN	
NEUSE RIVER	NEUSE-D	CRAVEN	NEUSE	890601	69	42649	12461	YES, BAC, DIN	

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STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
LAKE JOHNSON	JOHNSON-1	WAKE	NEUSE	890605	91	25410	24844	YES, CYA	
YATES POND	YATES-1	WAKE	NEUSE	890615	3	1136	3824	NO, CHL	
NEUSE RIVER	NEU131X	CRAVEN	NEUSE	890619	250	35829	109354	YES, BAC - CYCLOTELLA	
NEUSE RIVER	02092586	CRAVEN	NEUSE	890619	100	11367	247357	YES, BAC - CYCLOTELLA	
FYKEWOOD POND	FYKEWOOD-1	WILSON	NEUSE	890623	19	7382	22290	YES, CHL	
DAWSON CREEK	DAWSON-X	CRAVEN	NEUSE	890714	NS	19958	49,087	YES, CHR, BAC, DIN	
DAWSON CREEK	DAWSON-Y	CRAVEN	NEUSE	890714	NS	8313	51,533	YES, CHR, BAC, DIN	
FAIRGROUNDS POND	FAIRGROUNDS POND	WAKE	NEUSE	890721	6	25179	204383	YES, CYA	
NEUSE RIVER	NEUSE-1	PAMLICO	NEUSE	890804	300	25298	33715	YES, DIN, BAC, CYA	
NEUSE RIVER	NEUSE-2	PAMLICO	NEUSE	890804	33	2582	48039	YES, DIN, BAC, CYA	
NEUSE RIVER	NEUSE-3	CRAVEN	NEUSE	890804	73	5369	52406	YES, DIN, BAC, CYA	
NEUSE RIVER	NEUSE-4	PAMLICO	NEUSE	890804	38	3318	10097	YES, DIN, BAC, CYA	
NEUSE RIVER	NEUSE-1A	PAMLICO	NEUSE	890807	38	8181	14907	YES, DIN, BAC, CYA	
NEUSE RIVER	NEUSE-2B	PAMLICO	NEUSE	890807	38	4603	15023	YES, DIN, BAC, CYA	
NEUSE RIVER	NEUSE-3C	PAMLICO	NEUSE	890807	46	4359	20322	YES, DIN, BAC, CYA	
NEUSE RIVER	BEARD (NEUSE-E)	CRAVEN	NEUSE	890809	77	14303	46816	YES, DIN, CYA	
NEUSE RIVER	GOOSE (NEUSE-B)	PAMLICO	NEUSE	890809	35	5036	8734	YES, DIN, CYA	
NEUSE RIVER	KENNEL (NEUSE-F)	PAMLICO	NEUSE	890809	130	23043	29347	YES, DIN, CYA	
NEUSE RIVER	02092162 (NEUSE-A)	CRAVEN	NEUSE	890809	1	320	943	NO	
NEUSE RIVER	NEU139	PAMLICO	NEUSE	890814	14	38460	34239	YES, DIN, CYCL, CYA	
NEUSE RIVER	02092586	PAMLICO	NEUSE	890821	94	7469	56424	YES, BAC, CYA, DIN	
NEUSE RIVER	NEUSE-MINN	PAMLICO	NEUSE	890918	NS	35531	35054	YES, DIN-PERI TRO, CYA, CHL	
WENDELL LAKE	WENDELL-1	JOHNSTON	NEUSE	890919	130	14676	4949	YES, CYA-ANABAENA	
WENDELL LAKE	WENDELL-2	JOHNSTON	NEUSE	890921	200	29219	13043	YES,CYA-ANABAENA SPP, ANACYSTIS	
NEUSE RIVER	NEU139	CRAVEN	NEUSE	891017	31	6855	96777	YES, BAC, CYA, DIN	
LAKE WHEELER DOCK	WHEELER DOCK	WAKE	NEUSE	891031	54	1394	1409	YES,CYA, BUT PATCHY	
NEUSE RIVER	NEU131X	CRAVEN	NEUSE	891114	100	25442	30046	YES, BAC	
GARNER POND	GARNER POND	WAKE	NEUSE	900228	130	8306	4944	YES, EUG	
GOBBLE POND	GOBBLE POND	WAKE	NEUSE	900315	17	N/A		FIL GREENS	
BAY RIVER	ALLIGATOR-5	PAMLICO	NEUSE	900315	140	35788	33191	YES DIN PRO MIN	
BAY RIVER	CHAPPEL-7	PAMLICO	NEUSE	900315	71	12178	13364	YES DIN PRO MIN, CRY	
BAY RIVER	RACOON-2	PAMLICO	NEUSE	900315	56	7414	11005	YES DIN PRO MIN, BAC	
BAY RIVER	TRENT-1	PAMLICO	NEUSE	900315	110	25910	24980	YES DIN PRO MIN	
BAY RIVER	VANDEMERE-8	PAMLICO	NEUSE	900315	7	1414	1834	NO	

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STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
NEUSE RIVER	NEU139	PAMLICO	NEUSE	900319	140	4954	19128	YES, PRO MIN, HET TRI, BAC-SKEL POT	
NEUSE RIVER	NEU139	PAMLICO	NEUSE	900524	25	1044	11398	YES, BAC-CYCL SP3, DIN PERI TRO	
NEUSE RIVER	NEU131X	PAMLICO	NEUSE	900524	120	4710	11049	YES, DIN-GYM NEL,GYR AUR,CRY	
NEUSE RIVER	NEU131F	CRAVEN	NEUSE	900627	16	1066	10365	YES, BAC-CYCL SP3, CRY,CHR	
NEUSE RIVER	02092586	CRAVEN	NEUSE	900627	27	13190	27077	YES, XAN-OLIS CAR,CRY,CHR	
LAKE WENDELL	WNDL-D2	JOHNSTON	NEUSE	900705	270	58404	13014	YES, CYA - ANAB, APHA FLO, ANAC CYA	
ORIENTAL WWTP LAGOON	ORIENTAL-LAG	PAMLICO	NEUSE	900718	90	13,773	19041	YES, CHL-CHLLA, CYA ANABS RAC	
NEUSE RIVER	NEU139	PAMLICO	NEUSE	900724	21	8868	12578	YES, DIN , CRY, CYA-PHOR ANG	
NEUSE RIVER	NEU131X	PAMLICO	NEUSE	900724	23	2957	18779	YES, DIN , CRY	
NEUSE RIVER	NEU131F	CRAVEN	NEUSE	900725	34	2438	3756	YES, DIN-GYR AUR,BAC,CRY	
VET SCHOOL	VET S-1	WAKE	NEUSE	900812	4600	96001	61722	YES CYA - ANAC CYA	YES
VET SCHOOL	VET S-2	WAKE	NEUSE	900812	140	38055	24339	YES EUG, CYA	YES
VET SCHOOL	VET S-3	WAKE	NEUSE	900812	88	15001	18459	YES EUG, CYA	YES
NEUSE RIVER	NEUSE-12	CRAVEN	NEUSE	900817	13	1046	3052	NO	YES
ENO RIVER	ENO-1	DURHAM	NEUSE	900821	250	30120	6580	YES, EUG	
ENO RIVER	ENO-2	DURHAM	NEUSE	900821	83	30325	6359	YES, EUG	
NEUSE RIVER	GREEN SPRINGS A	CRAVEN	NEUSE	900827	29	2223	13975	YES, XAN-OLIS CAR, CRY	
NEUSE RIVER	GREEN SPRINGS B	CRAVEN	NEUSE	900827	26	11278	36102	YES, XAN-OLIS CAR, CRY	
NEUSE RIVER	GREEN SPRINGS C	CRAVEN	NEUSE	900827	51	11984	35170	YES, XAN-OLIS CAR, CRY	
FALLS RESERVOIR	NEU010	GRANVILLE	NEUSE	900912	33	5271	12578	YES, EUG, CYA	
NEUSE RIVER	NEUSE-2	CRAVEN	NEUSE	900916	25	5409	66381	YES, BAC-CYCL SP3, CYA	YES
NEUSE RIVER	NEUSE-4	CRAVEN	NEUSE	900916	25	4960	90488	YES, BAC-CYCL SP2, CYA	YES
NEUSE RIVER	NEUSE-7	CRAVEN	NEUSE	900916	22	10416	84898	YES, BAC-CYCL SP3,CRY	YES
NEUSE RIVER	NEU131X	CRAVEN	NEUSE	900925	16	5474	172591	YES, BAC-CYCL SP2	YES
HART POND	HART POND	GRANVILLE	NEUSE	900926		N/A		YES, CYA - ANAB PORT	YES
NEUSE RIVER	02092162	CRAVEN	NEUSE	900926	39	2485	45419	YES, DIN, BAC-CYCL SP2&3	YES
NEUSE RIVER	NEU131F	CRAVEN	NEUSE	900926	53	19670	129967	YES, BAC-CYCL SP2	YES
MILL CREEK	MILL CR-B	PAMLICO	NEUSE	901204	17	7776	9549	YES, DIN-PRO MIN	
MILL CREEK	MILL CRMAR	PAMLICO	NEUSE	901204	140	88369	79133	YES, DIN-PRO MIN	
PHELPS LAKE	NR BOAT RAMP	WASHINGTON	PASQUOTANK	840416	170	23923	1901	YES, GREENS-MOUGEOTIA	
ALBEMARLE SOUND	02081145	CHOWAN	PASQUOTANK	840524	2	822	1310	NO	
ALBEMARLE SOUND	02081172 N. SHORE	PERQUIMANS	PASQUOTANK	840723	11	394	1398	NO	
ATLANTIC OCEAN	NR COROLLA	CURRITUCK	PASQUOTANK	840809				YES, DINOFLAGELLATES-PROROCENTRUM	

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STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
ALBEMARLE SOUND	MARKER 3	TYRELL	PASQUOTANK	840822			1747	NO	
ALBEMARLE SOUND	02081172	PERQUIMANS	PASQUOTANK	840822	10		4193	NO	
PASQUOTANK RIVER	02043862	PASQUOTANK	PASQUOTANK	840925		7122	725	YES, BLUE-GREEN	
PERQUIMANS RIVER	NR WHITE HAT LANDING	PERQUIMANS	PASQUOTANK	841005		6935	1042	YES, BLUE-GREEN	
PASQUOTANK RIVER	HWY 158	PASQUOTANK	PASQUOTANK	841009		5433	3494	YES	
ALBEMARLE SOUND	02081172 85%	TYRELL	PASQUOTANK	850524	2	1522	4498	NO	
SCUPPERNONG	@ MOUTH MARKER #3	TYRELL	PASQUOTANK	850822				ID	
ALBEMARLE SOUND	02081145 50%	CHOWAN	PASQUOTANK	851019				ID, BLUE-GREEN	
PASQUOTANK RIVER	02043862	PASQUOTANK	PASQUOTANK	860730	41	24845	28648	YES, BLUE-GREENS, GREENS	
LITTLE RIVER NEAR WEEKSVILLE	02043884	PASQUOTANK	PASQUOTANK	860730		3059	32055	YES, GREENS, BLUE-GREENS	
ALBEMARLE SOUND	@ BLUFFS	CHOWAN	PASQUOTANK	870707				ID, ANACYSTIS CYANEA	
YEOPIM RIVER	YEOPIM	PERQUIMANS	PASQUOTANK	870709		82692	114595	YES, ANABAENA PORTORICENSIS	
ALBEMARLE SOUND	02081172	CHOWAN	PASQUOTANK	870709	6	947	4367	NO	
ALBEMARLE SOUND	02081172085	CHOWAN	PASQUOTANK	870709	9	725	3394	NO	
ALBEMARLE SOUND	02081145	CHOWAN	PASQUOTANK	870710	10	933	4309	NO	
ALBEMARLE SOUND	02081145005	CHOWAN	PASQUOTANK	870710	3	864	2492	NO	
LITTLE RIVER	02043884	PERQUIMANS	PASQUOTANK	880718	51	11528	115992	YES, BLUE-GREENS	
ALLIGATOR	ALLIGATOR CREEK	TYRELL	PASQUOTANK	890118	NS	N/A		N/A, FILAMENTOUS CHL	
ALBEMARLE SOUND	ALBEMARLE-A	WASHINGTON	PASQUOTANK	900417		N/A		FIL CHL-CLADOPHORA SP	
ALBEMARLE SOUND	ROANOKE-B	WASHINGTON	PASQUOTANK	900417		N/A		FIL BAC-MELOSIRA VAR, CHL SPIROGYRA, ULOTHRIX	
ALBEMARLE SOUND	ALB BEACH	WASHINGTON	PASQUOTANK	900706		N/A		FIL CYA-TOLYPOTHRIX SP	
KENDRICKS CREEK	02081185	WASHINGTON	PASQUOTANK	900712		30400	2030	YES, CHLMD, CRY	
ALLIGATOR RIVER	0208117810	TYRELL	PASQUOTANK	900820	14	4456	14761	YES, XAN-OLIS CAR,CRY,CYA	
ROANOKE RIVER @ SAN SOUCI	02081141	BERTIE	ROANOKE	850320		4622	2708	NO	
CASHIE RIVER @ SAN SOUCI	02081134	BERTIE	ROANOKE	850710		2141	7803	NO	
NUTBUSH CREEK	ROA037A	VANCE	ROANOKE	860722	65	11136	102716	YES, BLUE-GREENS	
FLAT CREEK	@ HWY 39	VANCE	ROANOKE	860722	16	9620	92584	YES, BLUE-GREENS	
BELEWS CREEK	BELEWS CR L	FORSYTH	ROANOKE	890515	3	2055	804	NO	
LIT BRUSHY FORK CREEK	HOLT FERG-1	STOKES	ROANOKE	890622	44	24387	19215	YES, EUG, CRY	
ROANOKE RIVER	ROANOKE NETS	WASHINGTON	ROANOKE	900314		N/A		FIL BAC - MELOSIRA ITA TE	
OTIS CRISP SAND PIT		BEAUFORT	TAR-PAMLICO	850315		6320	466	NO	YES
PAMLICO RIVER	@ RR TRESSLE, WASHINGTON	BEAUFORT	TAR-PAMLICO	850402				N/A, MELOSIRA, SYNEDRA ON NETS	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
DURHAM CREEK	WEST TRANSECT	BEAUFORT	TAR-PAMLICO	850404	12	3827	1922	NO	
PAMLICO RIVER	@ MOUTH OF BATH CREEK	BEAUFORT	TAR-PAMLICO	850404	9	2561	1415	NO	
RIVER PARK POND		PITT	TAR-PAMLICO	851023	6	1834	2341	NO, BUT EUGLENOPHYTES-COLORED WATER	
PAM-PUNGO	JACKS CREEK	BEAUFORT	TAR-PAMLICO	860224		26201	24456	YES, DINOFLAGELLATES- COLORED WATER	
PUNGO RIVER	DOWN FROM JORDAN CR.	BEAUFORT	TAR-PAMLICO	860226	12	4042	4629	YES, DINOFLAGELLATES- COLORED WATER	
PUNGO CREEK	NR PARKERS MOTEL	BEAUFORT	TAR-PAMLICO	860226	170	52770	40760	YES, DINOFLAGELLATES- COLORED WATER	
PAM-PUNGO	ROADSIDE DITCH	BEAUFORT	TAR-PAMLICO	860226		71212	52872	YES, DINOFLAGELLATES- COLORED WATER	
BATH CREEK	STATION #1	BEAUFORT	TAR-PAMLICO	860226	53	11977	14883	YES, DINOFLAGELLATES- COLORED WATER	
PAMLICO RIVER	@ N SHORE FERRY	BEAUFORT	TAR-PAMLICO	860226	11	6193	5503	YES, DINOFLAGELLATES- COLORED WATER	
PAMLICO-PUNGO	NR PARKERS MOTEL	BEAUFORT	TAR-PAMLICO	860325	53	6818	160188	YES	
BATH CREEK	STATION #1	BEAUFORT	TAR-PAMLICO	860325	28	6132	128570	YES	
PAMLICO RIVER	@ N SHORE FERRY	BEAUFORT	TAR-PAMLICO	860325	9	5893	13160	NO, FOLLOWUP	
BATH CREEK	@ POINT	BEAUFORT	TAR-PAMLICO	860414				N/A, FILAMENTOUS RED-BOSTRICHIA, GREEN ENTEROMORPHA	
PUNGO CREEK	LOWER SITE	BEAUFORT	TAR-PAMLICO	860424	28	4289	52755	YES, CYCLOTELLA	YES
PUNGO CREEK	SAMPLE #3	BEAUFORT	TAR-PAMLICO	860424	48	6587	54852	YES, CYCLOTELLA	YES
PUNGO CREEK	SAMPLE #4	BEAUFORT	TAR-PAMLICO	860424	160	14589	99222	YES, CYCLOTELLA	YES
PUNGO CREEK	UPPER SITE	BEAUFORT	TAR-PAMLICO	860424	7	1654	6009	NO	YES
PUNGO CREEK	@ US 264 BRIDGE	BEAUFORT	TAR-PAMLICO	860424	22	2896	10,481	YES, CYCLOTELLA	YES
PAMLICO RIVER	@ BAYVIEW	BEAUFORT	TAR-PAMLICO	860507				N/A, FILAMENTOUS-CLADOPHORA	
PAMLICO RIVER	1 MI ABOVE WHICHARDS BEACH	BEAUFORT	TAR-PAMLICO	860527	120	17944	121233	YES, CYCLOTELLA	YES
BROAD CREEK		BEAUFORT	TAR-PAMLICO	860716	61	5449	43235	YES, CYCLOTELLA	
BATH CREEK	DOWN FROM CRADLE GUT	BEAUFORT	TAR-PAMLICO	860815	23	2953	31007	YES, CHRYSOPHYTES-OLISTHODISCUS	
CRADLE GUT	LOWER SITE	BEAUFORT	TAR-PAMLICO	860815	150	18027	53804	YES, CHRYSOPHYTES-OLISTHODISCUS	
CRADLE GUT	UPPER SITE	BEAUFORT	TAR-PAMLICO	860815	680	72362	219057	YES, CHRYSOPHYTES-OLISTHODISCUS	
PAMLICO RIVER	@ TEXAS GULF	BEAUFORT	TAR-PAMLICO	860815		2315	17032	ID, BUT CRAB KILL	YES
BATH CREEK	02084534, UPSTREAM	BEAUFORT	TAR-PAMLICO	860817		2418	33365	ID	
PAMLICO RIVER	02084472	BEAUFORT	TAR-PAMLICO	860925	97	5626	22290	YES, CHRYSOPHYTES-OLISTHODISCUS	
TRANTERS CREEK	02084392	PITT	TAR-PAMLICO	860930	730	43119	122281	YES, CHRYSOPHYTES-OLISTHODISCUS	
PAMLICO RIVER	02084472	BEAUFORT	TAR-PAMLICO	861008	94	9833	40877	YES, CYCLOTELLA	YES
PAMLICO RIVER	WHICHARDS BEACH	BEAUFORT	TAR-PAMLICO	861215	930	172841	137304	YES, PROROCENTRUM, HETEROCAPSA	
PAMLICO MARKER 16	PAM-16	BEAUFORT	TAR-PAMLICO	870527		15210	199842	YES, CYCL SP2	
PUNGO CR	0208457020	BEAUFORT	TAR-PAMLICO	870706	100	101048	113197	YES, PERITROC	
MOUTH OF BROAD CR.	0208451950	BEAUFORT	TAR-PAMLICO	870708	30	6084	52755	YES, OSCI GEM, ANABS CIR	
PAMLICO RIVER @ HICKORY PT.	0208454450	BEAUFORT	TAR-PAMLICO	870708	27	20205	11389	YES, PERITROC	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
HAWKINS BEACH	HAWKINS-1	BEAUFORT	TAR-PAMLICO	870713		4728	10307	YES,ANABS CIR, OSCI GEM, PERI TRO	YES
BAYVIEW	BAYVIEW-1	BEAUFORT	TAR-PAMLICO	870715	19	8241	16333	YES,DINOFLAGELLATES,OSCI GEM	YES
BAYVIEW	BAYVIEW-2	BEAUFORT	TAR-PAMLICO	870715	20	3218	28474	YES,DINOFLAGELLATES,OSCI GEM	YES
BAYVIEW	BAYVIEW-3	BEAUFORT	TAR-PAMLICO	870715	14	5030	53105	YES,DINOFLAGELLATES,OSCI GEM	YES
PUNGO CR	PUNGO-1	BEAUFORT	TAR-PAMLICO	870720	11	3556	7453	ND	
PUNGO CR	PUNGO-4	BEAUFORT	TAR-PAMLICO	870720	19	1792	9154	ND	
PUNGO CR	PUNGO-6	BEAUFORT	TAR-PAMLICO	870720	56	22391	15722	YES, DINOFLAGELLATES,OSCI GEM	
OLD FORT	OLD FORT	BEAUFORT	TAR-PAMLICO	870723		6478	40527	YES, DINOFLAGELLATES,OSCI GEM	
KENNEDY CREEK	KC-1	BEAUFORT	TAR-PAMLICO	870730	200	19548	289980	YES, GREENS	
PAMLICO R.	GPSL	BEAUFORT	TAR-PAMLICO	870731	22	4181	12752	YES, DINOFLAGELLATES	YES
PAMLICO R.	POUND	BEAUFORT	TAR-PAMLICO	870731	30	9303	15430	YES, DINOFLAGELLATES	YES
PAMLICO R.	1C	BEAUFORT	TAR-PAMLICO	870731	23	14701	21137	YES, DINOFLAGELLATES	YES
PAMLICO R.	CONTROL-B	BEAUFORT	TAR-PAMLICO	870804	60	11123	20700	YES, CRAB KILL, LYNGBYA	CRAB KILL
PAMLICO R.	9	BEAUFORT	TAR-PAMLICO	870804	22	8953	50485	YES	
TAR RIVER	02084171	PITT	TAR-PAMLICO	870825	15	5968	12193	ID, TRACHELOMONAS	
BLOUNTS CREEK	BLOUNT-1	BEAUFORT	TAR-PAMLICO	870831	88	34065	50135	YES,DINOFLAG,CYCL, OSCI GEM	YES
COTTON PATCH CANAL	CPC	BEAUFORT	TAR-PAMLICO	870831	44	12059	26767	YES,CRYPTOPHYTES,DINOFLAG,CYCL,	YES
PAMLICO RIVER	SWAN PT.	BEAUFORT	TAR-PAMLICO	870922				NO, FUNGUS	
BROAD CREEK	02084151950	BEAUFORT	TAR-PAMLICO	871005	28	3404	38781	YES,GREENS,CHRYSOPHYTES	
WASTE LAGOON	WSL	GRANVILLE	TAR-PAMLICO	871006				YES, EUGLENOPHYTES	
WHEELER POND	WHEELER-P	FRANKLIN	TAR-PAMLICO	880125	10	1467	6143	NO, MALLOMONAS	
BATH CREEK	BATH-EAST	BEAUFORT	TAR-PAMLICO	880126	41	32604	13917	YES DIN - PRO MIN	
BATH CREEK	BATH-WEST	BEAUFORT	TAR-PAMLICO	880126	44	34409	9389	YES DIN - PRO MIN	
HAWKINS BEACH	HAWKINS-1	BEAUFORT	TAR-PAMLICO	880131	NS	560964	93632	YES DIN - PRO MIN	
BATH CREEK	BATH-1	BEAUFORT	TAR-PAMLICO	880209	40	37027	11573	YES,HETEROCAPSA,PROROCENTRUM	
PAMLICO RIVER	DURHAM CR-NET	BEAUFORT	TAR-PAMLICO	880209	NS			N/A FIL GREEN-CLADOPHORA	
DURHAM CREEK	DURHAM-1	BEAUFORT	TAR-PAMLICO	880209	33	34387	14220	YES,HETEROCAPSA,PROROCENTRUM	
DURHAM CREEK	DURHAM-2	BEAUFORT	TAR-PAMLICO	880209	15	22807	7337	YES,HETEROCAPSA,PROROCENTRUM	
PAMLICO RIVER	PR-1 (BROAD MO)	BEAUFORT	TAR-PAMLICO	880209	34	32358	8996	YES,HETEROCAPSA,PROROCENTRUM	
PAMLICO RIVER	PR-2 (BTWN BROAD & BLOUNTS)	BEAUFORT	TAR-PAMLICO	880209	43	35116	8135	YES,HETEROCAPSA,PROROCENTRUM	
PAMLICO RIVER	PR-3 (NR UPPER GOOSE CR)	BEAUFORT	TAR-PAMLICO	880209	150	158273	35461	YES,HETEROCAPSA,PROROCENTRUM	
PAMLICO RIVER	PR-5 (NR BATH MOUTH)	BEAUFORT	TAR-PAMLICO	880209	39	48498	21312	YES,HETEROCAPSA,PROROCENTRUM	
PAMLICO RIVER	PR-50 (BTWN BATH & DURHAM)	BEAUFORT	TAR-PAMLICO	880209	940	316037	60441	YES,HETEROCAPSA,PROROCENTRUM	
PAMLICO RIVER	PR-95 (NR DURHAM CR)	BEAUFORT	TAR-PAMLICO	880209	140	56996	14604	YES,HETEROCAPSA,PROROCENTRUM	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
PAMLICO RIVER	02084534	BEAUFORT	TAR-PAMLICO	880209	130	95580	23175	YES,HETEROCAPSA,PROROCENTRUM	
PUNGO CREEK	PUNGO CR-1	BEAUFORT	TAR-PAMLICO	880303	34	64334	65682	YES,PROROCENTRUM MINIMUM	
DUCK CREEK	DUCK-3	BEAUFORT	TAR-PAMLICO	880325	42	27931	19914	YES,PROROCENTRUM MINIMUM	
HAWKINS BEACH	HAWKINS-1	BEAUFORT	TAR-PAMLICO	880325	34	35261	34588	YES,PROROCENTRUM MINIMUM	
PUNGO CREEK	PUNGO CR-1	BEAUFORT	TAR-PAMLICO	880524	110	37310	5781	YES,DINOFLAGELLATES	
PUNGO CREEK	PUNGO CR-2	BEAUFORT	TAR-PAMLICO	880524	46	13256	5348	YES,DINOFLAGELLATES	
PUNGO CREEK	PUNGO CR-3	BEAUFORT	TAR-PAMLICO	880524	34	2958	4979	YES,DINOFLAGELLATES	
PAMLICO RIVER	SWAN-5	BEAUFORT	TAR-PAMLICO	880524	100	19661	143593	YES,SKELETONEMA COSTATUM	
PAMLICO RIVER	BATH-MO	BEAUFORT	TAR-PAMLICO	880527	20	5035	3581	YES,DINOFLAGELLATES	
PAMLICO RIVER	CONTROL-B	BEAUFORT	TAR-PAMLICO	880527	18	9302	6944	YES,DINOFLAGELLATES	
PAMLICO RIVER	PAM-MID	BEAUFORT	TAR-PAMLICO	880527	19	6871	3808	YES,DINOFLAGELLATES	
PAMLICO RIVER	PAM-3B	BEAUFORT	TAR-PAMLICO	880527	15	2669	2484	YES,DINOFLAGELLATES	
PAMLICO RIVER	PAM-9	BEAUFORT	TAR-PAMLICO	880527	20	13551	7022	YES,DINOFLAGELLATES	
DURHAM CREEK	UP DURHAM	BEAUFORT	TAR-PAMLICO	880527	4	7764	3050	YES,DINOFLAGELLATES	
PAMLICO RIVER	PAM-A (BATH MO)	BEAUFORT	TAR-PAMLICO	880603	NS	2567	1723	ND	
PAMLICO RIVER	PAM-H (TG)	BEAUFORT	TAR-PAMLICO	880603	NS	1481	4425	ND	
PUNGO CREEK	PUNGO-264	BEAUFORT	TAR-PAMLICO	880606	4	364	547	ND	
PUNGO RIVER	SCRANTON-1	BEAUFORT	TAR-PAMLICO	880715	38	20251	7293	YES, DINOFLAGELLATES	
PAMLICO RIVER	MARKER # 17	BEAUFORT	TAR-PAMLICO	880811	NS	1967	68827	YES, CYCL SP2	
KENNEDY CREEK	KC-1	BEAUFORT	TAR-PAMLICO	880907	91	3868	12097	YES,OLISTHODISCUS, CRYPTOPHYTES	
KENNEDY CREEK	KC-2	BEAUFORT	TAR-PAMLICO	880907	120	7377	23233	YES,OLISTHODISCUS, CRYPTOPHYTES	
KENNEDY CREEK	KC-1	BEAUFORT	TAR-PAMLICO	880923	64	2529	22797	YES,CYCLOTELLA SP3, CRYPTOPHYTES	
KENNEDY CREEK	KC-2	BEAUFORT	TAR-PAMLICO	880923	64	7203	37034	YES,CYCLOTELLA SP3, CRYPTOPHYTES	
PAMLICO RIVER	PAM-1 (TG)	BEAUFORT	TAR-PAMLICO	881017	NS	1967	68827	YES,CYCLOTELLA SP2, CRYPTOPHYTES	
PAMLICO RIVER	PAM-2 (WHICHARDS)	BEAUFORT	TAR-PAMLICO	881017	NS	4876	9922	NO, CRYPTOPHYTES, DINOFLAGELLATES	
BATH CREEK	BATH CR @ 264	BEAUFORT	TAR-PAMLICO	890106	42	N/A		N/A, FILAMENTOUS CHL	
WASTE LAGOON	WSL	GRANVILLE	TAR-PAMLICO	890124	NS	N/A		YES, EUG-EUGLENA CAUDATA	
PANTEGO CREEK	PANTEGO-1	BEAUFORT	TAR-PAMLICO	890130	8	782922	12315	YES, DIN-POLYKRIKOS	
CHOCOWINITY BAY	CHOC BAY-1	BEAUFORT	TAR-PAMLICO	890131	35	49231	31706	YES, BAC, DIN	
CHOCOWINITY BAY	CHOC BAY-3	BEAUFORT	TAR-PAMLICO	890131	20	16244	15140	YES, BAC, DIN	
SIDNEY CREEK	SIDNEY-2	BEAUFORT	TAR-PAMLICO	890131	12	27924	44021	YES, BAC, DIN	
PAMLICO RIVER	PAM UP BR	BEAUFORT	TAR-PAMLICO	890202	6	11823	11413	YES, DIN, BAC, CRY	
PAMLICO RIVER	OLD FORT-1	BEAUFORT	TAR-PAMLICO	890203	2700	271697	23932	YES, DIN, EUG	
PAMLICO RIVER	OLD FORT-2	BEAUFORT	TAR-PAMLICO	890203	580	83393	22709	YES, DIN, EUG	

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STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
FARM POND	FARM POND	FRANKLIN	TAR-PAMLICO	890208	NS	N/A		N/A FIL CHL-SPIROGYRA, ZYGNEMA	
PAMLICO RIVER	PAMLICO-3A	BEAUFORT	TAR-PAMLICO	890214	170	29038	12534	YES, DIN	
PAMLICO RIVER	TEXAS GULF	BEAUFORT	TAR-PAMLICO	890302	NS			YES, DIN-POLYKRIKOS	
PAMLICO RIVER	BLOUNTS-14	BEAUFORT	TAR-PAMLICO	890530	72	9937	368590	YES, BAC	
PAMLICO RIVER	NORTH-8	BEAUFORT	TAR-PAMLICO	890530	16	2415	18779	YES, BAC	
PAMLICO RIVER	PAM-15	BEAUFORT	TAR-PAMLICO	890530	78	5039	13190	YES, BAC	
PAMLICO RIVER	PAMLICO-1	BEAUFORT	TAR-PAMLICO	890602	130	5147	176259	YES,BAC-CYCL SP 2 & 3	
PAMLICO RIVER	0208451950	BEAUFORT	TAR-PAMLICO	890614	21	18475	447548	YES, BAC, CRY	
BATH CREEK	02084534	BEAUFORT	TAR-PAMLICO	890614	26	17104	19355	YES, DIN, CRY, CHR	
BOND CREEK	BOND-1	BEAUFORT	TAR-PAMLICO	890625	11	1311	10612	NO	
CAMPBELL CREEK	CAMPBELL-1	BEAUFORT	TAR-PAMLICO	890626	16	2746	15023	YES, BAC, DIN, CHR	
CAMPBELL CREEK	CAMPBELL-2	BEAUFORT	TAR-PAMLICO	890626	15	6436	37558	YES, BAC, DIN, CHR	
BOND CREEK	BOND-2	BEAUFORT	TAR-PAMLICO	890628	100	N/A	10612	YES, DIN, BAC-NITZ ACI	
PAMLICO RIVER	BAYVIEW	BEAUFORT	TAR-PAMLICO	890629	29	3491	42449	YES, BAC-CYCL SP2	
PAMLICO RIVER	JAMACIA-1	BEAUFORT	TAR-PAMLICO	890713	58	2345	35287	YES, BAC-CYCL SP2,CRY,EUG	
LAKE ROYALE	LAKE ROYALE-2	GRANVILLE	TAR-PAMLICO	890714	NS			YES, CYA	
PAMLICO RIVER	PAM-1	BEAUFORT	TAR-PAMLICO	890714	NS	1716	10796	NO, DIN,BAC	
SOUTH CREEK	SOUTH-2	BEAUFORT	TAR-PAMLICO	890714	NS	42504	107607	YES, DIN, BAC	
PUNGO CREEK	PUNGO-A	BEAUFORT	TAR-PAMLICO	890718	31	8620	1316	YES, DIN, EUG	
BLOUNTS BAY	BLOUNTS-1	BEAUFORT	TAR-PAMLICO	890726	25	1986	59918	YES, BAC-CYCL SP2, CYA-PHOR ANG	
BLOUNTS CREEK	BLOUNTS-2	BEAUFORT	TAR-PAMLICO	890726	31	3561	56076	YES,BAC-CYCL SP2, CYA-PHOR ANG	
PAMLICO RIVER	PAM-A	BEAUFORT	TAR-PAMLICO	890727	81	7280	164904	YES, BAC, DIN, EUG	
SOUTH CREEK	SOUTH CR-1	BEAUFORT	TAR-PAMLICO	890728	210	100646	45419	YES, DIN, BAC, CYA	
SOUTH CREEK	SOUTH CR-2	BEAUFORT	TAR-PAMLICO	890728	94	5099	35811	YES, DIN, BAC, CYA	
LAKE ROYALE	LAKE ROYALE-2	GRANVILLE	TAR-PAMLICO	890807	50	4296	2795	YES, CYA, CHL	
PAMLICO RIVER	STERLING	BEAUFORT	TAR-PAMLICO	890808	16	3401	13800	YES, DIN,BAC,CHL,CRY	
PUNGO CREEK	CEE BEE MAR	BEAUFORT	TAR-PAMLICO	890822	160	71212	14208	YES, DIN, BAC-CYCL SP2	
PUNGO CREEK	PUNGO CR-1	BEAUFORT	TAR-PAMLICO	891016	140	23714	67779	YES, PRY	
PUNGO CREEK	PUNGO CR-5	BEAUFORT	TAR-PAMLICO	891016	63	17080	22273	YES, BAC, PRY, DIN	
PUNGO CREEK	PUNGO CR-7	BEAUFORT	TAR-PAMLICO	891016	110	8435	12286	YES, CRY, BAC	
PANTEGO CREEK	0208455850	BEAUFORT	TAR-PAMLICO	891017	150	15382	19652	YES, CRY	
PAMLICO RIVER	BATH-MO	BEAUFORT	TAR-PAMLICO	891019	19	2297	16421	YES, BAC, DIN	
PAMLICO RIVER	MIXON-MO	BEAUFORT	TAR-PAMLICO	891019	67	2965	3948	YES, DIN, BAC	
PANTEGO CREEK	0208455850 (PANTEGO CR)	BEAUFORT	TAR-PAMLICO	891113	14	2430	3494	NO, EUG, DIN, CHR	

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STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
SOUTH CREEK	SOUTH CREEK	BEAUFORT	TAR-PAMLICO	891220	3	844	937	ND	
CHOCOWINITY BAY	CHOCO-1	BEAUFORT	TAR-PAMLICO	900305	52	17393	26028	YES, BAC-SKEL COS	
PAMLICO RIVER	BACK CR-92	BEAUFORT	TAR-PAMLICO	900525		6085	30046	YES, DIN	
PAMLICO RIVER	MBC	BEAUFORT	TAR-PAMLICO	900525		2000	33190	YES, XAN,BAC,CRY	
PAMLICO RIVER	MBB	BEAUFORT	TAR-PAMLICO	900525		641	10132	YES, XAN,BAC,CHL	
PAMLICO RIVER	PAM-BATH CR	BEAUFORT	TAR-PAMLICO	900525		1897	28474	YES, BAC,CRY	
PAMLICO RIVER	TAR057G	BEAUFORT	TAR-PAMLICO	900604	23	9955	46641	YES, DIN, BAC,CRY	
PAMLICO RIVER	TAR057G085	BEAUFORT	TAR-PAMLICO	900604	15	713	26727	YES, BAC-CYCL SP2	
PAMLICO RIVER	02084534	BEAUFORT	TAR-PAMLICO	900604	34	13577	88217	YES, XAN-OLIS CAR,BAC-CYCL SP2	
PAMLICO RIVER	CHOCO-1	BEAUFORT	TAR-PAMLICO	900604	31	2996	70224	YES, BAC-CYCL SP3, CRY	
CANAL-FAR CREEK	ENGLEHARD	HYDE	TAR-PAMLICO	900612	25	5780	97126	YES, BAC - CYCLOTELLA SP 2 & 3	
PAMLICO RIVER	TAR057G	BEAUFORT	TAR-PAMLICO	900718	62	6602	7017	YES, DIN,CYA,CRY	
PAMLICO RIVER	PAM-WASH	BEAUFORT	TAR-PAMLICO	900718	50	N/A		YES, CYA-MER TEN BREAKING UP	
GREENVILLE UTILITIES POND	GREENVILLE UT	PITT	TAR-PAMLICO	900719		N/A		FIL CYA-LYNG NANA, OSCI CHL,OSCI GEM	
PAMLICO RIVER	PAM-2A	BEAUFORT	TAR-PAMLICO	900724	20	21354	29347	YES, DIN,CYA	YES
PAMLICO RIVER	PAM-4B	BEAUFORT	TAR-PAMLICO	900724	27	3739	11412	YES, DIN,CYA	YES
PAMLICO RIVER	PAM-5C	BEAUFORT	TAR-PAMLICO	900724	36	13414	21225	YES, DIN,CYA	YES
PAMLICO RIVER	PAM-7D	BEAUFORT	TAR-PAMLICO	900724	23	3414	24980	YES, DIN,CYA	YES
PAMLICO RIVER	PAM-10E	BEAUFORT	TAR-PAMLICO	900724	85	36260	25675	YES, DIN,CYA	YES
PAMLICO RIVER	PAMLICO-R ACRES	BEAUFORT	TAR-PAMLICO	900726		N/A		FIL RHOD-COMPSOPOGON COERULEUS	CRAB KILL
PUNGO CREEK	PUNGO CR-2	BEAUFORT	TAR-PAMLICO	900801	62	11405	14616	YES, DIN,CRY,CYA	CRAB KILL
PUNGO CREEK	PUNGO CR-5	BEAUFORT	TAR-PAMLICO	900801	28	2559	12985	YES, DIN,CRY,CYA	CRAB KILL
PUNGO CREEK	PUNGO CR-8	BEAUFORT	TAR-PAMLICO	900801	27	2634	10248	YES, DIN,CRY,CYA	CRAB KILL
PUNGO CREEK	PUNGO CR-9	BEAUFORT	TAR-PAMLICO	900801	51	14505	12461	YES, DIN,CRY,CYA	CRAB KILL
PAMLICO RIVER	02084519505	BEAUFORT	TAR-PAMLICO	900802	8	1394	13844	YES,XAN,CYA,DIN,CHR,BAC	
BROAD CREEK	BROAD CREEK	BEAUFORT	TAR-PAMLICO	900815		N/A		MACRO ALGAE-NITELLA SP.	
PAMLICO RIVER	PAMLICO-5	BEAUFORT	TAR-PAMLICO	900827	60	15517	47515	YES,DIN,CYA,BAC	CRAB KILL
PAMLICO RIVER	PAMLICO-6	BEAUFORT	TAR-PAMLICO	900827	32	4393	33278	YES,DIN,CYA,CRY	CRAB KILL
PAMLICO RIVER	SUMMER-A1	BEAUFORT	TAR-PAMLICO	900827		4766	30134	YES,DIN,CRY,BAC,CYA	CRAB KILL
PUNGO CREEK	PUNGO-1	BEAUFORT	TAR-PAMLICO	900829	31	2375	38780	YES,DIN,CYA,BAC	YES
GREENVILLE UTILITIES POND	GREENVILLE UT	PITT	TAR-PAMLICO	901008		N/A		FIL CYA-LYNG NANA, OSCI SP, CHL-CHLA SP	
PAMLICO RIVER	HERRING-A	BEAUFORT	TAR-PAMLICO	901219	21	6057	2853	YES, DIN-OXY MAR	
NORTHEST CREEK	@ JACKSONVILLE	ONSLOW	WHITE OAK	841105				ID, DINOFLAGELLATES	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
NEW RIVER	WILSON BAY @ TAR LANDING	ONSLOW	WHITE OAK	85/8-10				YES,CYCLOTELLA,CRYPTOPHYTES	YES
MOTT CREEK		ONSLOW	WHITE OAK	860731		11810	43322	YES, OLISTHODISCUS	
PINE KNOLL SH. CANALS	PINE KNOLL-1	CARTERET	WHITE OAK	880331	1500	4875	12857	YES,DIATOMS-NAV, MELO MON	
PINE KNOLL SH. CANALS	PINE KNOLL-1	CARTERET	WHITE OAK	880401	4	590	2679	NO, DIATOMS, CRY, DINOFLAGELLATES	
PINE KNOLL SH. CANALS	PINE KNOLL-11	CARTERET	WHITE OAK	880401	NS	356	1584	NO	
PINE KNOLL SH. CANALS	PINE KNOLL-2	CARTERET	WHITE OAK	880401	3	367	1933	NO	
PINE KNOLL SH. CANALS	PINE KNOLL-5	CARTERET	WHITE OAK	880401	1	240	792	NO	
PINE KNOLL SH. CANALS	PINE KNOLL-9	CARTERET	WHITE OAK	880401	1	200	745	NO	
HENDERSON POND	HEND-1	ONSLOW	WHITE OAK	880428	1	148	885	NO	
HENDERSON POND	HEND-2	ONSLOW	WHITE OAK	880428	11	101	841	NO	
BOGUE SOUND	BOGUE-1	CARTERET	WHITE OAK	880609	820	41427	147610	YES, BL-GR - GOMP APO	
LITTLE NORTHEAST CREEK	0209317585	ONSLOW	WHITE OAK	880621	1	302	978	NO, SOME CHRYSOPHYTES	
LITTLE NE CREEK	0209317585	ONSLOW	WHITE OAK	901002	44	1461	7570	YES, CHR-OCHR SP, BAC-MELOSIRA VAR	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	840816	69	15901	80007	YES, BLUE-GREENS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	840926		2579	16595	YES, BLUE-GREENS	
TWIN OAKS FARM POND		CABARRUS	YADKIN-PEE DEE	850102		5224	4651	YES,FISH KILL,BLUE-GREENS	YES
MOUNTAIN CREEK		STANLEY	YADKIN-PEE DEE	850610				ID, HYDRODICTYON MATS	
UT. TO WALNUT BRANCH		ROWAN	YADKIN-PEE DEE	850626				ID,BLUE-GREENS, GREENS, EUGLENOPHYTES	YES
UT TO WATSON CREEK		UNION	YADKIN-PEE DEE	850828		11125	5887	YES,GREENS,BLUE-GREENS	YES
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	850919	22	22663	164206	YES, BLUE-GREENS	
LASATER MILL POND	LOWER END	FORSYTH	YADKIN-PEE DEE	851003	14	908	1497	NO	
LASATER MILL POND	UPPER END	FORSYTH	YADKIN-PEE DEE	851003	45	5456	5415	YES,ENRICHMENT	
SWEARING CREEK		DAVIDSON	YADKIN-PEE DEE	851010	1	182	8944	NO	
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	851010	48	10792	44603	YES, BLUE-GREENS	
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	851015	100	11544	86121	YES,GREENS, DIATOMS	
UT. TO RICHARDSON CREEK		UNION	YADKIN-PEE DEE	851022	400	24717	140332	YES,BLUE-GREENS	YES
LACEY BRANCH		UNION	YADKIN-PEE DEE	860414		15633	41226	YES, ENRICHMENT, CHRYSOPHYTES, CRYPTOPHYTES	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	860528	23	1965	12849	YES, BLUE-GREENS	
EVERETTS MILL POND		RICHMOND	YADKIN-PEE DEE	860616		14927	5825	YES, BLUE GREENS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	860619	31	5413	17673	YES, BLUE GREENS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	860724	100	12509	90138	YES, BLUE GREENS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	860818	160	19652	163507	YES, BLUE GREENS	
SAM BENNET POND		MECKLENBURG	YADKIN-PEE DEE	860827	300	2896	11704	YES, HYDRODICTYON MATS, CYCLOTELLA	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
GRANTS CREEK	NR HIGH ROCK LAKE	DAVIDSON	YADKIN-PEE DEE	860827	1	169	1223	NO	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	860904	88	21085	110402	YES, BLUE GREENS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	861002	68	13074	106559	YES, BLUE GREENS	
STRINGER POND		FORSYTH	YADKIN-PEE DEE	861015		936	3952	NO, EUGL,LYNG	YES
TOWN CREEK	0212140080	ROWAN	YADKIN-PEE DEE	861106	210	30611	190059	YES, DIATOMS	
UT TO BEAVER CR.	UT TO BEAVER CR.	IREDELL	YADKIN-PEE DEE	870422				NO, FUNGUS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	870422	3	265	606	NO	YES
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	870526	33	4827	22069	YES, OSCI GEM	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	870624	29	5859	38955	YES, OSCI GEM,ANABS RAC	
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	870720	66	14322	188312	YES, OSCI GEM ANABS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	870720	29	8161	89440	YES, OSCI GEM ANABS	
HIGH ROCK LAKE	NR. 0212140080	ROWAN	YADKIN-PEE DEE	870805	88	13074	31444	YES, FISH KILL CRYPTOPHYTES, EUGLENOPHYTES	YES
TOWN CREEK	0212140080	ROWAN	YADKIN-PEE DEE	870820	47	15256	92235	YES, OSCI GEMS, GREENS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	870825	57	12601	91536	YES, OSCI GEM,ANABS	
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	870914	12	4073	15722	YES,OSCI GEM,ETC	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	870914	36	13776	158965	YES, OSCI GEM, ANABS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	871015	17	4733	43089	YES, OSCI GEM, ANABS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	871109	70	987	12170	YES,ANKI FAL SP, ETC	
TOWN CREEK	0212140080	ROWAN	YADKIN-PEE DEE	871118	180	45519	204733	YES, DIATOMS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	871201	15	784	6376	NO	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	880105	4	434	1234	NO	
UT TO JACOBS CR.	JACOB-1	STANLEY	YADKIN-PEE DEE	880125	NS			NO FUNGUS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	880202	7	375	1351	NO	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	880308	10	772	4049	NO	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	880406	19	3664	17818	YES,DIATOMS, CHRYSOPHYTES, GREENS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	880518	51	1533	29522	YES,BL-GR - OSCI GEM, CRY	
ABBOTTS CREEK @ POUNDERS FORK	HIGH ROCK-8	DAVIDSON	YADKIN-PEE DEE	880621	76	12736	17338	YES, CRY, EUG, GREENS, DIATOMS	
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	880621	120	25431	37907	YES,CRYPTOPHYTES	
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	880621	250	31584	43089	YES,CRY, EUG, GREENS, DIATOMS	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	880621	38	2537	30046	YES,BL-GR ANABS, ANAB, OSCI GEM LYNG	
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	880714	3	876	3552	NO	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	880714	91	13115	15719	YES,BL-GR OSCI GEM,ANABS RAC	
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	880811	9	368	2795	NO	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	880811	89	2977	69525	YES,BL-GR OSCI GEM,ANABS RAC	

APPENDIX 2. ALGAL BLOOMS 1984-1990

STUDY	STATION	COUNTY	RIVER BASIN	DATE	CHL-a	BIOVOLUME	DENSITY	BLOOM	FISH KILL?
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	880915	24	3456	9782	NO	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	880915	64	6374	71272	YES,BL-GR OSCI GEM,ANAB SPI	
ABBOTTS CR. @ COTTON GROVE	02121602	DAVIDSON	YADKIN-PEE DEE	881010	3	884	2702	NO	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	881010	34	5961	62887	YES,BL-GR OSCI GEM,MELO GRA	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	881108	32	250	3843	YES,ANKI CON, CHLLA VUL	
ABBOTTS CR. @ SOUTHMONT	0212160350	DAVIDSON	YADKIN-PEE DEE	881205	4	390	3098	NO	
ABBOTTS CREEK	0212160350	DAVIDSON	YADKIN-PEE DEE	890504	19	999	10446	YES, BAC, CRY	
TOWN CREEK	0212140080	ROWAN	YADKIN-PEE DEE	890522	21	7606	25621	YES, CRY, BAC, CHL	
ABBOTTS CREEK	02121602	DAVIDSON	YADKIN-PEE DEE	890607	75	4017	16595	YES, CRY, CHL	
ABBOTTS CREEK	0212160350	DAVIDSON	YADKIN-PEE DEE	890607	33	6972	16013	YES, CYA, CHR	
RICHARDSON CREEK	RICHARDSON	UNION	YADKIN-PEE DEE	890612	13	N/A		N/A FIL CHL-ULOTHRIX	
ABBOTTS CREEK	02121602	DAVIDSON	YADKIN-PEE DEE	890706	21	6743	60761	YES, CYA, CRY	
ABBOTTS CREEK	0212160350	DAVIDSON	YADKIN-PEE DEE	890713	18	3652	38955	YES, CYA-OSCI GEM, ANABS RAC, BAC	
MEYERS GOLF COURSE	MEYERS GOLF-1	MECKLENBURG	YADKIN-PEE DEE	890718	7	395	2253	N/A FILAMENTOUS CHL	
UT HAUSER CREEK	*SHIELDS-1*	*DAVIE*	*YADKIN-PEE DEE*	*890719*	*35*	*11955*	*44021*	*YES, CYA*	
WILIFORD POND	WILIFORD-1	ROWAN	YADKIN-PEE DEE	890726	56	9918	7395	YES, EUG	
ASHLEY POND	ASHLEY-1	YADKIN	YADKIN-PEE DEE	890731	NS	11772	19303	YES, EUG, CHL	
ABBOTTS CREEK	0212160350	DAVIDSON	YADKIN-PEE DEE	890803	40	3939	30483	YES, CYA-OSCI GEM, ANABS RAC	
LAKE TOM-A-LEX	YAD160B	DAVIDSON	YADKIN-PEE DEE	890816	44	5062	16351	YES, CYA,CRY,EUG,CHR, CHL	
LAKE TOM-A-LEX	YAD1611-A	DAVIDSON	YADKIN-PEE DEE	890816	20	13051	38897	YES, CYA,CRY,EUG,CHR, CHL	
ABBOTTS CREEK	02121602	DAVIDSON	YADKIN-PEE DEE	890913	25	9703	62535	YES, CHR, CYA, CHL	
ABBOTTS CREEK	0212160350	DAVIDSON	YADKIN-PEE DEE	890913	52	9526	104113	YES, CYA-OSCI GEM, ANABS RAC, BAC, CHL	
DUTCHMAN POND	DUTCHMAN-1	DAVIE	YADKIN-PEE DEE	900201	16	82	442	NO	
HANES PONDS	HANES-1	DAVIE	YADKIN-PEE DEE	900725	90	3265	20962	YES, CHL-ANKI FAL MI	
HANES PONDS	HANES-2	DAVIE	YADKIN-PEE DEE	900725	18	2684	1922	NO, BUT ENRICHED	

APPENDIX 3.

DESCRIPTION OF SEVERAL ALGAL CLASSES

Cyanophyceae - CYA - (blue-greens or cyanophytes) This most primative class of algae can be found anywhere other algae exists. They have evolved features that allow them to occupy more diverse habitats than any other group of plants. Some species are capable of forming surface blooms. The presence of phycobilin pigments phycocyanin (blue) and phycoerythrin (red) in varying amounts, chlorophyll-a, and carotene give the plants colors varying from green to blue-green, purple, red, yellow or brown.

Chlorophyceae - CHL - (greens or chlorophytes) A large class of algae containing unicellular, colonial, and filamentous species. Pigmentation in most species is similar to that in higher plants. Starch contained within the cells turn dark blue-purple when stained with iodine.

Cryptophyceae - CRY - (cryptophytes or cryptomonads) Most species unicellular and motile. Pigmentation is similar to that in the Dinophyceae. Occur commonly and may be abundant in the phytoplankton, especially during the cooler seasons.

Xanthophyceae - XAN- (yellow-greens or xanthophytes) May have structures similar to those in the Chlorophyceae, but an absence of starch and the presence of leucosin help distinguish them. Motile cells have unequal flagella. Widespread but rarely abundant in N. C.

Euglenophyceae - EUG - (euglenoids or euglenophytes) Most are motile and may produce powdery surface blooms especially in the presence of high concentrations of organic nutrients.

Chrysophyceae - CHR - (golden, golden-browns or chrysophytes) Silica scales and spines are characteristic of some species. Many species grow well in cold water.

Bacillariophyceae - BAC - (diatoms or bacillariophytes) Inhabit a wider variety of habitats than any group other than the Cyanophyceae. Most abundant in cool seasons but are present year-round in rivers, streams, and lakes.

Dinophyceae - DIN - (dinoflagellates) Motile cells partly or completely encircled by transverse or spiral groove. Two flagella with one in groove and one behind the cell, give a rotating forward motion. Yellowish-green to brown pigments in chloroplasts. Group responsible for toxic "Red Tides".

Prymesiophyceae - PRY - (golden flagellates or prymesiophytes) Some members of this class have structure unique to group (haptonema) which has been described as as attached organelle. Some are capable of heterotrophic growth by saprophytic or phagotrophic means.

Chloromonadophyceae - CHM - (chloromonadophyte) A distinctive biflagellate with a swimming flagellum positioned forward and a trailing flagellum close to the cell. These cells contain a distinctive green color with a reservoir located at the anterior end of the cell. This algal class has been described by Smith (1950) as "an isolated group whose systematic position is uncertain".

Rhodophyceae - RHO - (red algae) This class encompasses fresh water and marine species. In color they range from grey, green, red and purple. Most genera reported from N.C. are macroscopic.

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