

# NORTH CAROLINA

Agricultural Water Use

2009



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## 2009 Agricultural Wateruse

The second statewide survey was conducted to document water use for the agricultural sector during 2009. As directed in legislation enacted in 2008 (SL2008-0143), the North Carolina Department of Agriculture and Consumer Services, Agricultural Statistics Division, is required to collect annual information from farmers who withdraw 10,000 gallons or more in any one day. Individual responses remain confidential and are only used in combination with other reports to produce totals.

Farmers who use over 1,000,000 gallons in any one day are required to report their water usage directly to the Department of Environment and Natural Resources (DENR). DENR's report can be found on [http://www.ncwater.org/Water\\_Withdrawals/ResultsTabJS?tab=data](http://www.ncwater.org/Water_Withdrawals/ResultsTabJS?tab=data).

When looking at agricultural water use from a total volume withdrawn perspective, table 1 on page 3 is most representative of total water use. Because farms that withdraw the largest amounts of water do not make those withdrawals every day, the average daily use across all 365 days of the year is most representative of relative volumes used. On average, farm operations that use irrigation will withdraw water about 18 days each month. Field crop operations use water even less often, primarily to supplement rainfall. Western states rely on irrigation more frequently and in larger volumes throughout the year. To help put North Carolina water use in perspective, there were about 150,000 acres of farm land irrigated in 2008, compared to nearly 9 million total acres of land in farms. While there are other agricultural users of water, including livestock and poultry producers, aquaculture farms, and others, the largest volume of water use is from irrigators. The average North Carolina farm that uses water does so infrequently and in relatively small amounts. Table 2 displays "demand" use, which is calculated by dividing the total water withdrawn for the month by the days applied.

The results of this survey reflect water withdrawals from ground and surface sources. Many comparisons across sectors will incorporate an estimate of consumptive use of withdrawals. The definition of a consumptive use varies depending on the source. Most experts in agricultural sciences consider consumptive use to be the amount of water that is either taken up by plants, or evaporated. According to an Economic Research Service (USDA) report, irrigation consumptive use on farms is about 61 percent of total withdrawals nationally. This can vary greatly between regions depending on the type of system used and efficiency of the irrigation equipment.

Of the farms surveyed in the state, 1372 withdrew over 10,000 gallons of water in any one day. The year began with western portions of the state experiencing abnormally dry to severe drought conditions that spread throughout the whole state by

the end of February. Middle portions of the state recovered to normal conditions in March & April and much of the state was normal by May. Lingering abnormally dry conditions spread from the coast westward in June and plagued the mid regions of the state through the end of October. July was the largest water use month in 2009, averaging 154.3 million gallons daily, with a maximum daily withdrawal of 383.5 million gallons. The annual average daily water use for 2009 was 74.6 million gallons. The daily withdrawal capacity for the 1372 operations totaled 1167.3 million gallons in 2009.

A questionnaire was mailed to operations which had potential for large water usage. Operations that did not respond were contacted by telephone follow-up. In addition, livestock and poultry contractors in the state were contacted by email, phone, or mail.

The total number of operations by type, the annual average daily ground and surface demand usage, as well as the capacity is published by county and by hydrologic unit codes (HUC). The type of operations will not add to the total in all counties or HUCs, because some operations had irrigated cropland and livestock water use. The capacity is the potential amount of ground and/or surface water that could be withdrawn in a 24-hour period. The published capacity represents the sum of capacities for all reporting operations in that county or HUC. In nearly all cases, this capacity was never met. Data was not disclosed if there were less than three operations in any category or if one report comprised 60 percent or more of the total.

One survey instrument was used to gather data for the whole state as well as for the Central Coastal Plain Capacity Use Area (CCPCUA). Results for the CCPCUA are summarized and published in a separate table. Caution should be used in comparing the 2009 summary with prior year summaries due to the impact of a more comprehensive source of names, primarily from the 2007 Census of Agriculture.

**Table 1: Total & Average Daily Water Withdrawn<sup>1</sup>  
2009 North Carolina Water Use by Month**

Month	# Operations	Monthly Total-Ground	Monthly Total-Surface	Average Across All Days-Ground	Average Across All Days-Surface
	<i>(count)</i>	<i>(gallons)</i>	<i>(gallons)</i>	<i>(gallons)</i>	<i>(gallons)</i>
January	854	407,658,130	750,274,551	13,150,262	24,202,405
February	893	394,091,417	706,536,058	14,074,693	25,233,431
March	952	517,040,772	1,008,519,420	16,678,735	32,532,885
April	1071	725,459,625	1,399,772,987	24,181,988	46,659,100
May	1120	880,869,578	1,495,624,063	28,415,148	48,245,938
June	1267	1,090,349,535	2,713,292,569	36,344,985	90,443,086
July	1384	1,303,118,815	3,480,200,110	42,036,091	112,264,520
August	1262	1,124,879,898	2,855,124,581	36,286,448	92,100,793
September	1048	788,680,951	1,632,821,336	26,289,365	54,427,378
October	974	635,720,469	1,034,949,280	20,507,112	33,385,461
November	894	447,239,659	795,825,923	14,907,989	26,527,531
December	839	386,833,953	753,238,571	12,478,515	24,298,018
<b>Annual Average</b>				<b>23,779,277</b>	<b>50,860,045</b>

Operations<sup>2</sup>:

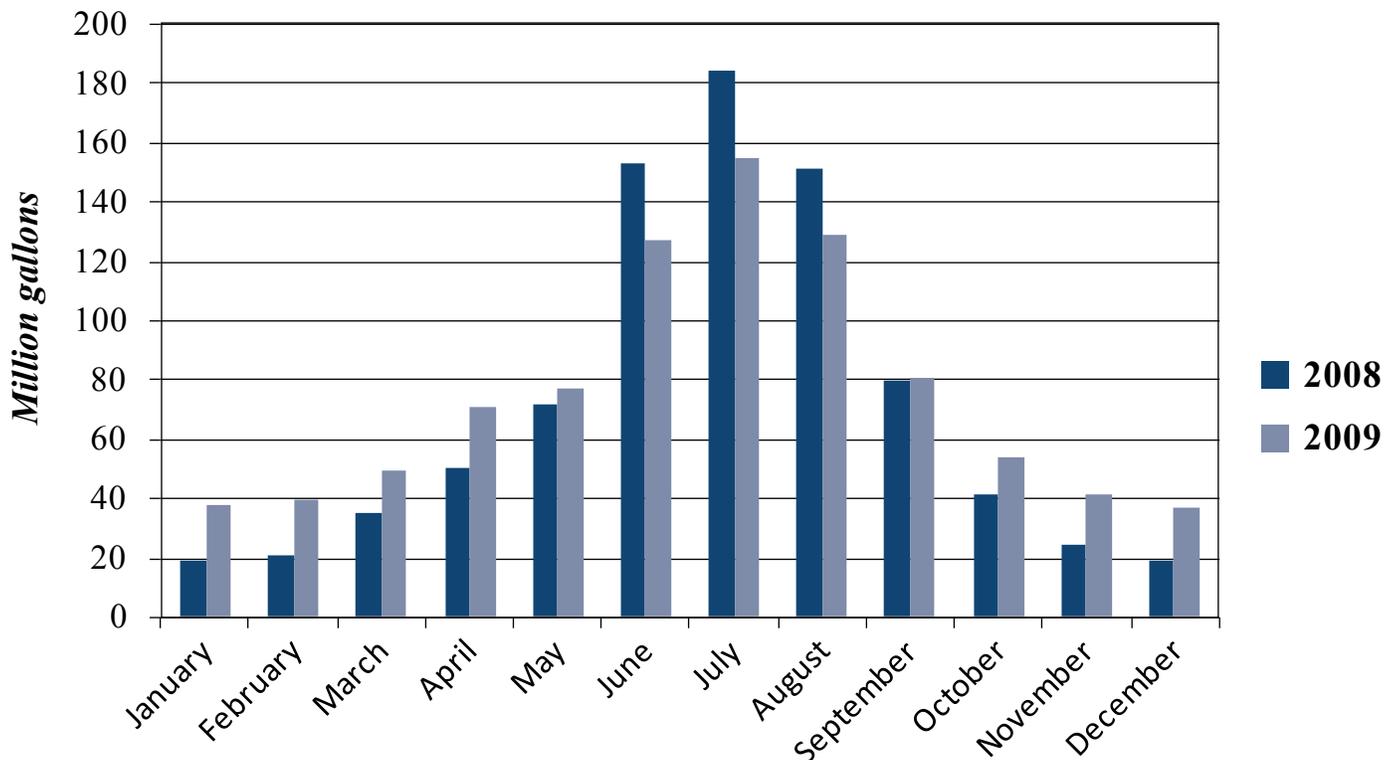
- 1372 Total Operations
- 787 Livestock
- 645 Irrigation
- 43 Aquaculture

Daily Withdrawal Capacity (incl. ground & surface):

1,167,338,667 (gallons)

<sup>1</sup> Users of 10,000 gallons or more per day. Averages reported in this table reflect the average water withdrawn across all days of the month. Does not include farms that have reported their withdrawals directly to DENR by July 1, 2010. <sup>2</sup> The type and monthly number of operations will not add to the total. Some operations reported multiple types and others reported both surface and ground water.

**Average Across All Days  
Ground & Surface Water**



**Table 2: Demand Use for Days Applied <sup>1</sup>**  
**2009 North Carolina Water Use by Month**

Month	Average Days Applied Ground	Average Days Applied Surface	Total Avg. Daily-Ground	Total Avg. Daily-Surface	Total Max Daily-Ground	Total Max Daily-Surface
	<i>(days)</i>	<i>(days)</i>	<i>(gallons)</i>	<i>(gallons)</i>	<i>(gallons)</i>	<i>(gallons)</i>
January	29	17	18,309,640	28,099,949	22,100,516	29,143,477
February	25	16	19,469,452	33,656,680	22,510,906	34,861,543
March	27	15	39,336,420	84,689,949	43,254,726	101,477,179
April	27	16	54,359,955	145,476,810	60,858,407	173,565,574
May	27	16	56,712,772	123,327,626	68,476,923	149,194,035
June	26	15	69,938,051	193,888,506	83,357,480	227,804,669
July	27	16	78,687,387	240,180,809	107,488,154	276,002,857
August	27	16	65,519,951	204,402,368	82,067,156	225,406,234
September	27	18	42,127,765	117,950,055	51,082,756	136,626,684
October	28	19	34,370,793	64,393,091	40,529,311	73,773,465
November	27	16	21,161,364	36,337,859	24,442,902	37,279,197
December	28	17	16,583,974	29,108,800	20,083,270	29,642,237
<b>Annual Average</b>			<b>43,048,127</b>	<b>108,459,375</b>		

<sup>1</sup> Users of 10,000 gallons or more per day. Averages reported in this table reflect the average water withdrawn during the days of application. Does not include farms that have reported their withdrawals directly to DENR by July 1, 2010.

**Total & Average Daily Water Withdrawn <sup>1</sup>**  
**2009 Irrigation Operations Water Use by Month**

Month	# Operations	Monthly Total-Ground	Monthly Total-Surface	Average Across All Days-Ground	Average Across All Days-Surface
	<i>(count)</i>	<i>(gallons)</i>	<i>(gallons)</i>	<i>(gallons)</i>	<i>(gallons)</i>
January	165	64,649,914	73,410,270	2,085,481	2,368,073
February	195	73,499,657	97,281,115	2,624,988	3,474,326
March	265	183,369,104	335,756,699	5,915,132	10,830,861
April	362	318,107,669	746,197,099	10,603,589	24,873,237
May	417	387,268,084	864,808,414	12,492,519	27,897,046
June	570	603,320,778	2,097,506,494	20,110,693	69,916,883
July	667	739,884,180	2,898,268,858	23,867,232	93,492,544
August	548	643,028,487	2,320,212,384	20,742,854	74,845,561
September	355	375,397,456	1,052,403,546	12,513,249	35,080,118
October	271	231,271,172	372,990,692	7,460,360	12,031,958
November	199	111,796,133	142,265,459	3,726,538	4,742,182
December	167	55,713,298	80,670,007	1,797,203	2,602,258
<b>Annual Average</b>				<b>10,328,320</b>	<b>30,179,587</b>

**Operations<sup>2</sup>:**

- 645 Total Operations
- 90 Livestock
- 645 Irrigation
- 8 Aquaculture

**Daily Withdrawal Capacity (incl. ground & surface):**

1,036,233,117 (gallons)

<sup>1</sup> Users of 10,000 gallons or more per day. Averages reported in this table reflect the average water withdrawn across all days of the month. Does not include farms that have reported their withdrawals directly to DENR by July 1, 2010. <sup>2</sup> The type and monthly number of operations will not add to the total. Some operations reported multiple types and others reported both surface and ground water.

## Total & Average Daily Water Withdrawn <sup>1</sup> 2009 Livestock Operations Water Use by Month

Month	# Operations	Monthly Total-Ground	Monthly Total-Surface	Average Across All Days-Ground	Average Across All Days-Surface
	(count)	(gallons)	(gallons)	(gallons)	(gallons)
January	728	338,313,109	1,836,820	10,913,326	59,252
February	738	315,088,520	2,268,232	11,253,161	81,008
March	736	313,720,632	5,841,080	10,120,020	188,422
April	763	343,019,302	44,555,015	11,433,977	1,485,167
May	764	398,647,840	126,101,372	12,859,608	4,067,786
June	777	427,505,749	325,573,713	14,250,192	10,852,457
July	810	512,797,349	513,892,497	16,541,850	16,577,177
August	788	438,833,077	368,592,005	14,155,906	11,890,065
September	751	362,090,527	102,647,787	12,069,684	3,421,593
October	749	376,076,367	14,562,882	12,131,496	469,770
November	734	327,499,695	3,860,798	10,916,657	128,693
December	711	322,970,020	1,800,304	10,418,388	58,074
<b>Annual Average</b>				<b>12,255,355</b>	<b>4,106,622</b>

**Operations<sup>2</sup>:**

- 787 Total Operations
- 787 Livestock
- 90 Irrigation
- 10 Aquaculture

**Daily Withdrawal Capacity (incl. ground & surface):**

193,522,007 (gallons)

<sup>1</sup> Users of 10,000 gallons or more per day. Averages reported in this table reflect the average water withdrawn across all days of the month. Does not include farms that have reported their withdrawals directly to DENR by July 1, 2010. <sup>2</sup> The type and monthly number of operations will not add to the total. Some operations reported multiple types and others reported both surface and ground water.

## Total & Average Daily Water Withdrawn <sup>1</sup> 2009 Aquaculture Operations Water Use by Month

Month	# Operations	Monthly Total-Ground	Monthly Total-Surface	Average Across All Days-Ground	Average Across All Days-Surface
	(count)	(gallons)	(gallons)	(gallons)	(gallons)
January	26	23,327,135	681,069,109	752,488	21,969,971
February	28	23,246,358	609,545,014	830,227	21,769,465
March	30	46,021,333	671,823,189	1,484,559	21,671,716
April	39	92,228,727	651,565,754	3,074,291	21,718,858
May	38	144,626,077	628,779,749	4,665,357	20,283,218
June	44	136,921,757	711,478,897	4,564,059	23,715,963
July	42	135,745,513	670,203,290	4,378,888	21,619,461
August	44	108,763,453	599,315,382	3,508,498	19,332,754
September	36	81,584,944	611,252,968	2,719,498	20,375,099
October	29	50,684,456	660,687,349	1,634,982	21,312,495
November	26	26,843,038	652,884,464	894,768	21,762,815
December	25	26,259,799	676,240,709	847,090	21,814,216
<b>Annual Average</b>				<b>2,446,226</b>	<b>21,445,503</b>

**Operations<sup>2</sup>:**

- 44 Total Operations
- 10 Livestock
- 8 Irrigation
- 44 Aquaculture

**Daily Withdrawal Capacity (incl. ground & surface):**

58,125,800 (gallons)

<sup>1</sup> Users of 10,000 gallons or more per day. Averages reported in this table reflect the average water withdrawn across all days of the month. Does not include farms that have reported their withdrawals directly to DENR by July 1, 2010. <sup>2</sup> The type and monthly number of operations will not add to the total. Some operations reported multiple types and others reported both surface and ground water.

## 2009 North Carolina Water Use - County Summary

County	Unique Operations <sup>1</sup>	Livestock Operations	Irrigation Operations	Aquaculture Operations	Annual Average Daily Ground	Annual Average Daily Surface	Capacity
	<i>(count)</i>	<i>(count)</i>	<i>(count)</i>	<i>(count)</i>	<i>(gallons)</i>	<i>(gallons)</i>	<i>(gallons)</i>
Alamance	13	3	12	*	88,816	368,214	13,439,800
Alexander	9	8	*	*	79,804	*	559,200
Anson	8	7	*	*	45,672	*	1,506,840
Beaufort	10	3	3	5	3,275,533	*	9,578,680
Bertie	17	10	7	*	75,088	3,116,260	17,353,000
Bladen	81	61	21	*	341,416	6,090,880	217,046,408
Brunswick	7	*	5	*	240,599	*	1,729,400
Buncombe	6	*	5	*	*	244,283	3,844,000
Burke	7	*	7	*	*	397,147	14,534,400
Cabarrus	5	*	3	*	38,951	7,405	45,204,759
Caswell	17	*	17	*	*	419,841	8,058,200
Catawba	8	3	6	*	76,731	*	5,255,680
Chatham	14	11	4	*	37,773	*	1,522,780
Cleveland	8	4	4	*	55,750	36,779	2,413,000
Cumberland	9	3	6	*	29,553	*	6,149,300
Duplin	121	111	11	*	2,204,856	888,929	36,488,957
Edgecombe	12	6	7	*	104,660	1,424,674	18,565,140
Franklin	21	4	*	*	1,633	1,540,254	26,079,780
Granville	21	*	21	*	*	775,231	22,926,599
Greene	25	20	5	*	155,475	*	35,129,024
Guilford	15	*	15	*	103,454	586,454	5,658,160
Harnett	26	12	14	*	213,012	529,674	10,816,594
Haywood	7	*	7	*	*	264,157	3,207,500
Hertford	9	5	5	*	10,099	896,789	22,924,124
Hoke	8	7	*	*	102,180	*	1,343,352
Iredell	8	5	5	*	28,257	48,024	5,067,475
Johnston	41	12	33	*	356,652	2,455,044	18,940,012
Jones	10	9	*	*	81,998	*	2,313,984
Lee	15	7	12	*	10,270	101,829	17,275,225
Lenoir	22	14	8	*	987,913	*	20,257,237
Lincoln	8	5	*	*	129,165	142,711	2,235,120
Moore	27	14	15	*	75,284	1,144,178	18,347,760
Nash	22	7	19	*	86,279	971,464	28,775,840
Northampton	10	6	4	*	77,623	*	4,744,600
Onslow	11	9	4	*	231,556	*	1,429,900
Orange	8	*	7	*	30,773	23,314	2,380,870

## 2009 North Carolina Water Use - County Summary

County	Unique Operations <sup>1</sup>	Livestock Operations	Irrigation Operations	Aquaculture Operations	Annual Average Daily Ground	Annual Average Daily Surface	Capacity
	(count)	(count)	(count)	(count)	(gallons)	(gallons)	(gallons)
Pender	27	20	7	*	578,417	255,855	64,623,277
Person	13	3	12	*	1,176	875,264	14,253,600
Pitt	26	10	14	3	237,403	1,711,697	26,803,406
Randolph	31	22	12	*	205,944	458,260	8,218,160
Richmond	21	19	7	*	165,742	6,560	9,196,837
Robeson	42	37	6	*	899,472	*	4,323,816
Rockingham	29	5	28	*	30,567	1,198,671	26,475,551
Rowan	10	3	10	*	12,560	815,477	7,713,200
Sampson	137	121	24	*	4,234,814	*	60,484,485
Scotland	16	16	*	*	182,328	*	1,342,819
Surry	24	12	14	*	165,117	699,499	15,045,600
Union	25	21	5	*	359,013	60,775	10,799,450
Vance	9	*	9	*	*	461,421	13,625,000
Wake	32	5	30	*	325,051	1,802,024	18,948,556
Warren	11	4	10	*	*	236,242	5,896,840
Washington	12	8	4	*	276,130	*	8,647,138
Wayne	42	33	14	*	833,843	560,790	14,126,733
Wilkes	18	15	4	*	163,792	26,589	4,435,722
Yadkin	12	4	9	*	46,110	118,207	3,985,000
Other <sup>2</sup>	169	53	109	16	24,953,828	76,698,511	195,290,778
<b>State</b>	<b>1372</b>	<b>787</b>	<b>645</b>	<b>43</b>	<b>43,048,127</b>	<b>108,459,375</b>	<b>1,167,338,667</b>

\* disclosure - one operation is greater than 60% of total or less than 3 operations. <sup>1</sup> The type of operations will not add to the unique operations in all counties since some operations used water for multiple purposes. <sup>2</sup> Other counties include all data for Alleghany, Ashe, Avery, Caldwell, Camden, Carteret, Cherokee, Chowan, Clay, Columbus, Craven, Currituck, Dare, Davidson, Davie, Durham, Forsyth, Gaston, Gates, Graham, Halifax, Henderson, Hyde, Jackson, McDowell, Macon, Madison, Martin, Mecklenburg, Mitchell, Montgomery, New Hanover, Pamlico, Pasquotank, Perquimans, Polk, Rutherford, Stanley, Stokes, Swain, Transylvania, Tyrrell, Watauga, Wilson, Yancey, as well as non-disclosed data from the published counties.

## 2009 North Carolina Water Use - Hydrologic Unit Code Summary (HUC)

Hydrologic Unit Code	Unique Operations <sup>1</sup>	Livestock Operations	Irrigation Operations	Aquaculture Operations	Annual Average Daily Ground	Annual Average Daily Surface	Capacity
	(count)	(count)	(count)	(count)	(gallons)	(gallons)	(gallons)
3010103	26	3	25	*	*	829,659	17,466,951
3010107	22	14	8	*	214,123	3,081,439	19,497,800
3010203	21	9	14	*	34,468	4,997,354	41,470,760
3010204	8	5	3	*	23,733	*	3,476,000
3010205	23	9	13	*	848,869	*	12,206,658
3020101	51	12	45	*	21,552	2,368,824	66,119,620
3020102	15	6	13	*	36,248	1,409,869	17,106,740
3020103	29	11	18	*	269,852	3,592,920	45,832,616
3020104	11	5	4	4	2,155,426	*	12,295,964
3020201	98	32	75	*	1,339,037	4,985,303	51,431,017
3020202	43	21	16	7	2,968,449	*	33,445,972
3020203	60	30	36	3	846,665	*	124,093,562
3020204	17	9	6	*	177,487	*	3,969,468
3020301	3	*	*	*	18,307	*	642,800
3020302	9	7	4	*	191,858	*	1,132,500
3030002	57	8	55	*	358,856	1,405,760	35,230,356
3030003	50	36	18	*	455,675	1,385,189	16,871,945
3030004	54	27	32	*	594,425	1,567,597	35,558,723
3030005	24	17	8	*	126,709	258,761	83,823,156
3030006	181	144	44	3	4,617,700	16,467,868	212,926,481
3030007	169	147	25	*	5,038,334	1,854,235	86,071,914
3040101	55	30	30	*	524,091	1,378,335	25,651,122
3040102	13	9	9	*	73,654	487,154	7,932,800
3040103	20	9	12	*	147,049	743,617	10,465,119
3040104	22	16	6	*	107,915	*	14,322,060
3040105	32	24	9	*	427,494	185,877	56,949,850
3040201	6	6	*	*	67,040	*	394,197
3040203	62	50	18	*	3,358,364	633,096	21,879,682
3040204	35	34	*	*	478,412	*	3,171,696
3040206	26	22	5	*	533,779	391,477	9,229,843
3050101	25	11	17	*	*	1,546,955	24,508,875
3050102	13	7	5	*	230,974	*	4,050,000
3050105	14	5	9	*	68,003	342,733	3,897,600
6010105	19	*	14	4	10,946	2,043,016	14,017,880
6010106	7	*	7	*	*	264,157	3,207,500
6010108	4	*	3	*	*	51,710	2,922,000
Other <sup>2</sup>	48	9	36	7	16,682,636	56,186,470	44,067,440
<b>State</b>	<b>1372</b>	<b>787</b>	<b>645</b>	<b>43</b>	<b>43,048,127</b>	<b>108,459,375</b>	<b>1,167,338,667</b>

\* disclosure - one operation is greater than 60% of total or less than 3 operations. <sup>1</sup> The type of operations will not add to the unique operations in all counties since some operations used water for multiple purposes. <sup>2</sup> Other hydrologic unit codes include all data for 03010102, 03010104, 03010106, 03020105, 03040208, 03050103, 05050001, 06010108, 06010202, 06010203, 06020002, as well as non-disclosed data from the published hucs.

## 2009 Central Coastal Plain <sup>3</sup> Total Water Use by Month<sup>1</sup>

Month	# Operations <sup>2</sup>	Total Avg. Daily-Ground	Total Avg. Daily-Surface	Total Max Daily-Ground	Total Max Daily-Surface
	(count)	(gallons)	(gallons)	(gallons)	(gallons)
January	232	4,807,321	944,837	5,082,689	945,380
February	244	5,168,972	945,483	5,578,426	947,104
March	253	8,265,653	9,017,263	9,385,932	9,059,186
April	273	16,236,663	23,388,411	18,081,967	27,471,197
May	280	21,158,051	21,706,250	23,543,271	31,837,533
June	320	25,729,416	42,339,730	29,764,288	52,240,010
July	310	22,425,738	44,564,802	43,388,830	53,309,189
August	289	19,680,388	32,368,494	31,203,261	36,966,759
September	264	14,120,911	16,643,993	16,661,637	21,004,483
October	255	11,244,429	3,063,188	12,602,541	3,167,848
November	236	6,159,675	2,225,120	6,792,483	2,225,663
December	232	4,720,998	1,955,380	5,182,054	1,955,380
<b>Annual Average</b>		<b>13,309,851</b>	<b>16,596,913</b>		

**Operations <sup>2</sup>:**

- 321 Total Unique Operations
- 228 Livestock
- 91 Irrigation
- 19 Aquaculture

**Daily Withdrawal Capacity (incl. ground & surface):**

257,267,508 (gallons)

<sup>1</sup> Users of 10,000 gallons or more per day. Does not include farms that have reported their withdrawals directly to DENR by July 1, 2009. <sup>2</sup> The type and monthly number of operations will not add to the total. Some operations reported multiple types and others reported both surface and ground water. <sup>3</sup> Central Coastal Plain Capacity Use Area Counties include Beaufort, Carteret, Craven, Duplin, Edgecombe, Greene, Jones, Lenoir, Martin, Onslow, Pamlico, Pitt, Washington, Wayne, and Wilson.

### Hydrologic Unit Codes (HUC)

