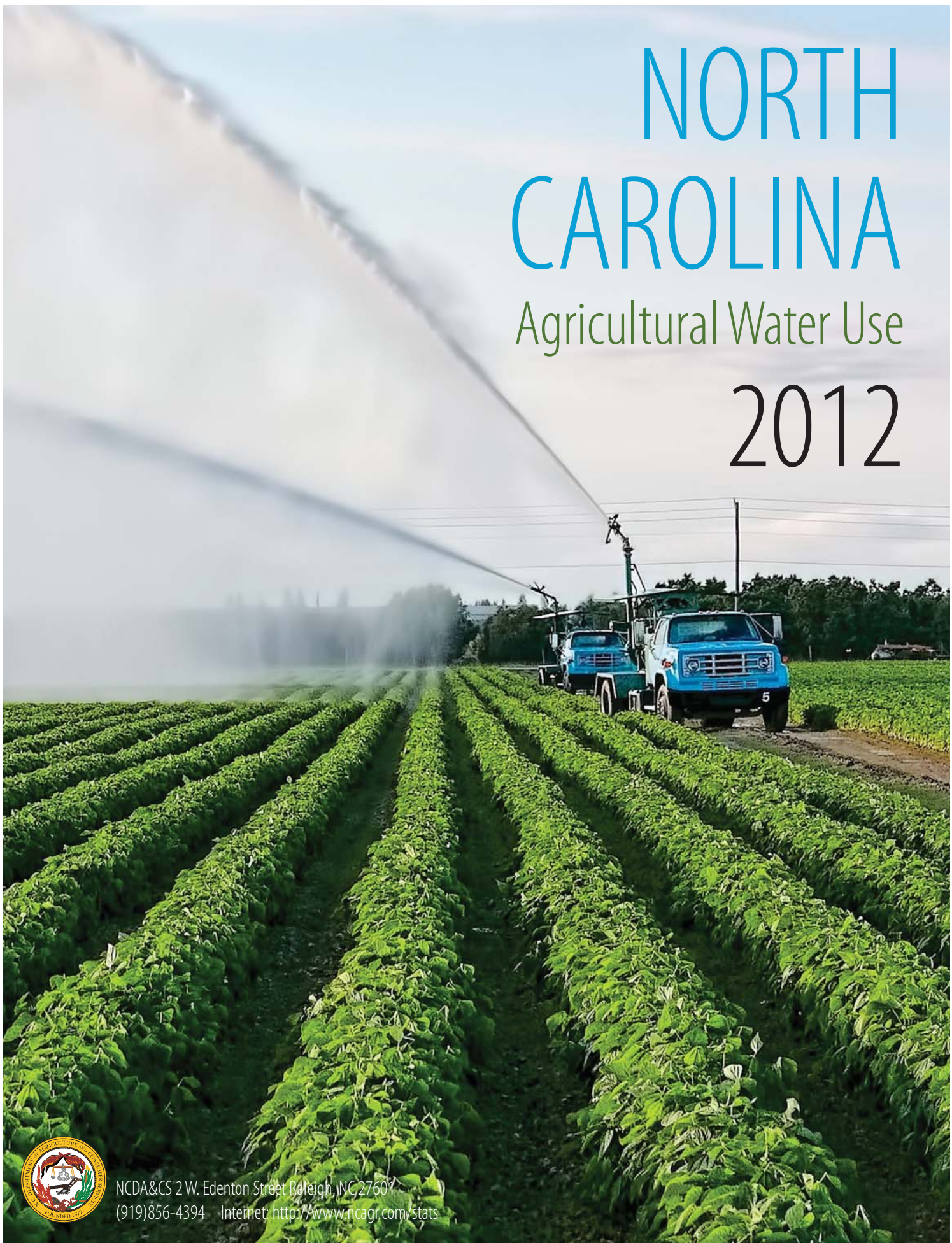


# NORTH CAROLINA

Agricultural Water Use

# 2012



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# NORTH CAROLINA

## 2012 Agricultural Water Use Survey

The fifth statewide survey was conducted to document water use for the agricultural sector during 2012. 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/Permits and Registration/Water Withdrawal and Transfer Registration/report](http://www.ncwater.org/Permits_and_Registration/Water-Withdrawal_and_Transfer_Registration/report).

When looking at agricultural water use from a total volume withdrawn perspective, table 1 on page 3 is most representative of total water use.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 days of the year is most representative of relative volumes used. On average, farm operations that use irrigation will withdraw water about 19 days each month. Field crop operations use water even less often, primarily to supplement rainfall. 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 Table 2 on page 6 displays "demand" use, which is calculated by dividing the total water withdrawn for the month by the days applied.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, 1,346 withdrew over 10,000 gallons of water in any one day. The year began with much of the state experiencing abnormally dry to severe drought conditions. Dry conditions grew worse and spread to include all but 10 of the western most counties. Moisture levels gradually improved in April and May until most of the state experienced normal soil

moisture levels during the critical summer months. Abnormally dry conditions began returning in November and deteriorated to moderate drought in most of the state in December. July was the largest water use month in 2012, averaging 172.2 million gallons daily, with a maximum daily withdrawal of 375.9 million gallons. The annual average daily water use for 2012 was 66.4 million gallons. The daily withdrawal capacity for the 1,346 operations totaled 1,381.6 million gallons in 2012.

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 unique number of operations, the annual average daily ground and surface usage, as well as the capacity is published by county and by hydrologic unit codes (HUC). 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.

**Table 1: Total & Average Daily Water Withdrawn <sup>1</sup>  
2012 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	827	470,341,217	195,749,537	15,172,297	6,314,501
February	844	412,313,104	197,386,597	14,217,693	6,806,434
March	911	727,436,592	337,640,079	23,465,697	10,891,615
April	994	896,637,154	721,524,645	29,887,905	24,050,821
May	1045	1,473,548,933	1,054,732,714	47,533,837	34,023,636
June	1194	2,062,021,269	2,305,179,278	68,734,042	76,839,309
July	1227	2,294,495,092	3,045,039,735	74,015,971	98,227,088
August	1096	1,765,405,197	2,281,555,315	56,948,555	73,598,559
September	963	843,495,438	867,020,361	28,116,515	28,900,679
October	909	530,740,414	513,496,030	17,120,659	16,564,388
November	853	447,038,490	261,222,279	14,901,283	8,707,409
December	836	455,978,219	207,156,381	14,708,975	6,682,464
<b>Annual Average</b>				<b>33,735,286</b>	<b>32,633,909</b>

**Operations:**

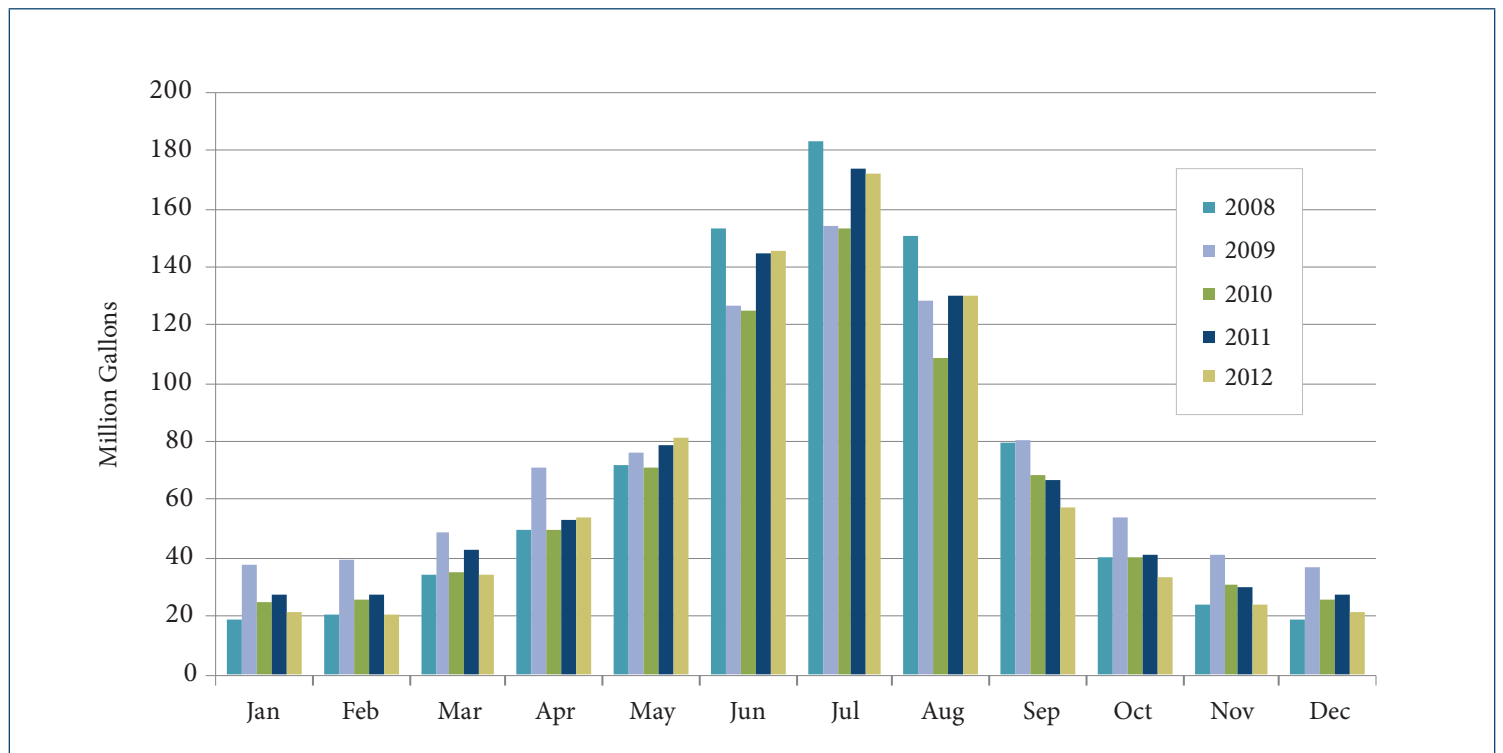
**1346 Total Operations**

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

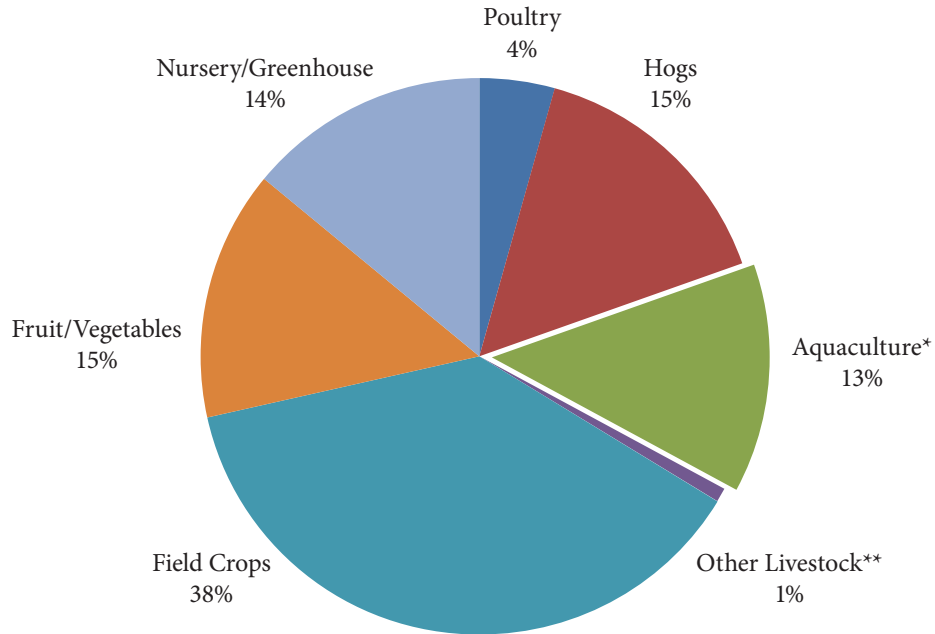
**1,381,560,821 Gallons**

<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. Farms that reported their withdrawals directly to DENR by May 21, 2013 have been excluded. The monthly number of operations will not add to the total. Some operations reported both surface and ground water withdrawals, which are counted twice in the monthly number of operations. However, the total number of operations represents operations that withdrew water at any time during the year, regardless if withdrawn from multiple sources.

**Average Across All Days  
Ground & Surface Water Withdrawals  
2008–2012**



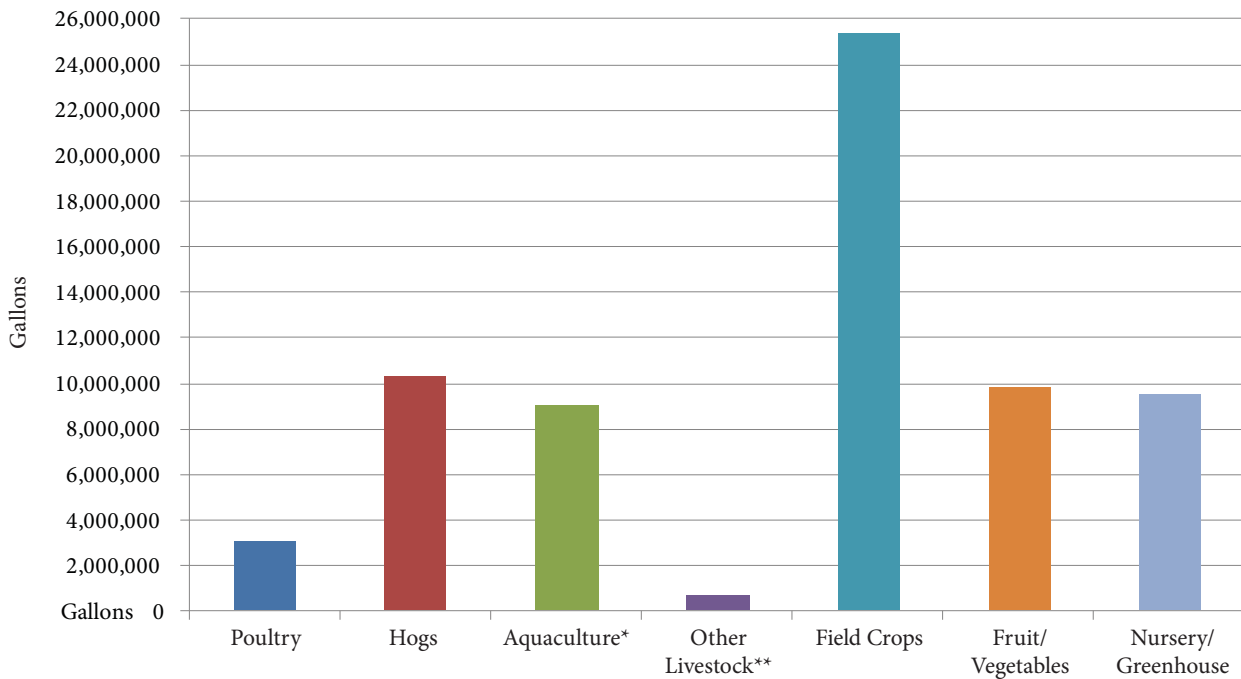
## 2012 Annual Water Withdrawals by Percent



\* 44% of aquaculture water withdrawals occur in western counties from rivers and streams and are typically flow through/non-consumptive.

\*\* Other Livestock includes cattle, horses, goats, sheep, etc.

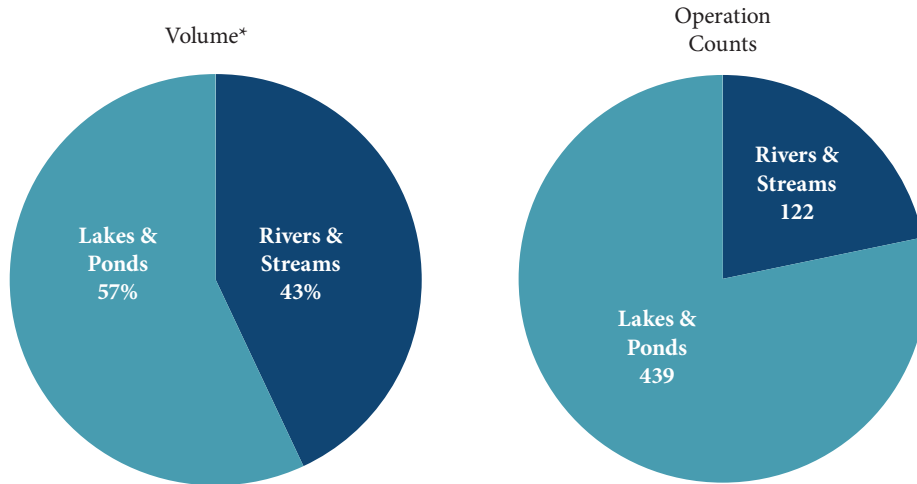
## 2012 Average Daily Water Withdrawals



\* 44% of aquaculture water withdrawals occur in western counties from rivers and streams and are typically flow through/non-consumptive.

\*\* Other Livestock includes cattle, horses, goats, sheep, etc.

## 2012 Annual Surface Water Withdrawals



*\* 37% of River & Stream Withdrawals are made by aquaculture operations from the western portion of the state and are typically flow through/ non-consumptive.*



**Table 2: Demand Use for Days Applied <sup>1</sup>  
2012 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	16,817,735	8,448,261	18,356,245	15,045,001
February	26	15	16,571,872	9,761,321	18,126,526	16,803,324
March	28	14	31,433,341	43,529,056	33,428,566	49,250,368
April	27	15	42,833,887	74,187,194	46,497,797	85,296,027
May	27	16	84,628,510	78,020,819	99,483,343	89,229,394
June	26	15	121,959,874	178,882,277	141,361,452	201,668,747
July	28	15	137,820,562	193,540,507	156,914,761	218,964,567
August	28	16	109,562,000	142,609,908	125,272,992	161,320,374
September	27	17	45,738,288	50,538,979	51,030,173	63,794,673
October	29	18	22,326,034	30,064,143	24,679,179	37,585,667
November	27	19	20,215,434	13,063,765	21,907,872	19,908,778
December	28	17	19,334,106	10,371,918	21,642,467	17,181,198
<b>Annual Average</b>			<b>55,770,137</b>	<b>69,418,179</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. Farms that reported their withdrawals directly to DENR by May 21, 2013 have been excluded.



## 2012 North Carolina Water Use County Summary

County	Unique Operations <sup>1</sup>	Annual Average Daily <sup>2</sup> Ground	Annual Average Daily <sup>2</sup> Surface	Daily Withdrawal Capacity <sup>3</sup>
	Count	Gallons	Gallons	Gallons
Alexander	4	19,190	*	*
Anson	14	149,661	*	1,323,111
Bertie	16	298,013	1,634,455	34,390,000
Bladen	81	1,629,889	641,694	222,444,448
Buncombe	8	*	389,856	10,268,480
Cabarrus	8	58,752	*	2,346,840
Carteret	4	46,086	*	*
Caswell	21	*	409,632	15,896,200
Catawba	10	*	1,497,683	12,476,800
Chatham	11	51,706	13,497	*
Cleveland	6	69,476	*	1,666,200
Duplin	147	2,657,356	*	55,106,168
Edgecombe	13	93,540	*	*
Franklin	18	*	541,304	18,685,200
Granville	18	5,186	766,844	35,403,080
Greene	28	413,465	*	*
Halifax	11	246,607	627,742	9,590,156
Harnett	23	125,977	203,041	7,191,053
Henderson	9	246,800	*	6,985,600
Iredell	7	157,687	*	4,273,800
Johnston	37	520,225	952,869	26,392,320
Lee	11	24,603	*	10,181,736
Lenoir	18	183,323	*	6,237,120
Lincoln	10	96,743	635,778	6,334,720
Montgomery	10	48,279	11,987	2,503,840
Moore	23	51,772	308,945	15,444,320
Nash	24	109,838	757,529	32,998,200
Northampton	12	112,216	*	8,178,310
Onslow	15	158,122	*	2,932,040
Orange	7	*	44,419	2,893,480
Pender	35	639,175	*	54,690,140

County	Unique Operations <sup>1</sup>	Annual Average Daily <sup>2</sup> Ground	Annual Average Daily <sup>2</sup> Surface	Daily Withdrawal Capacity <sup>3</sup>
	Count	Gallons	Gallons	Gallons
Person	12	*	555,769	16,545,390
Pitt	18	372,085	*	13,462,016
Randolph	22	133,066	381,522	10,116,200
Richmond	21	241,886	*	9,296,517
Robeson	45	2,574,726	*	39,510,982
Rockingham	32	22,628	645,728	42,372,112
Rowan	10	105,023	869,465	15,054,800
Sampson	128	*	806,719	105,185,059
Stanly	4	25,162	*	*
Stokes	9	*	66,372	6,778,880
Surry	15	96,951	*	8,207,580
Union	34	492,832	*	16,899,040
Wake	35	206,475	916,220	28,920,716
Warren	10	137,606	*	5,559,923
Washington	9	140,743	*	701,098
Wayne	40	637,411	*	11,389,093
Wilkes	13	108,376	*	3,251,980
Yadkin	6	60,688	*	3,786,400
Other Counties*	224	20,165,942	18,954,838	437,689,674
<b>State</b>	<b>1346</b>	<b>33,735,286</b>	<b>32,633,909</b>	<b>1,381,560,821</b>

\*Disclosure - Data is not published for some counties to avoid disclosure of individual farming operations.

<sup>1</sup> represents the unique # of operations which withdrew surface and or ground water <sup>2</sup> represents the average across all days of the year <sup>3</sup> includes ground and surface <sup>4</sup> includes nondisclosed data from the table above and all data for Alamance, Alleghany, Ashe, Avery, Beaufort, Brunswick, Burke, Caldwell, Camden, Cherokee, Chowan, Clay, Columbus, Craven, Cumberland, Currituck, Dare, Davidson, Davie, Durham, Forsyth, Gaston, Gates, Graham, Guilford, Haywood, Hertford, Hoke, Hyde, Jackson, Jones, McDowell, Macon, Madison, Martin, Mecklenburg, Mitchell, New Hanover, Pamlico, Pasquotank, Perquimans, Polk, Rutherford, Scotland, Swain, Transylvania, Tyrrell, Vance, Watauga, Wilson, Yancey, as well as non-disclosed data from the published counties.

## 2012 North Carolina Water Use - Hydrologic Unit Code Summary

Hydrologic Unit Code	Unique Operations <sup>1</sup>	Annual Average Daily <sup>2</sup> Ground	Annual Average Daily <sup>2</sup> Surface	Daily Withdrawal Capacity <sup>3</sup>
	<i>Count</i>	<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>
03010103	23	*	258,402	19,499,632
03010104	25	*	698,692	25,286,590
03010107	24	478,163	1,778,008	39,306,613
03010203	20	1,103,024	*	63,637,551
03010204	5	28,134	*	3,112,000
03010205	17	172,563	*	8,623,898
03020101	55	*	2,116,345	87,511,080
03020102	13	168,824	867,757	9,960,484
03020103	24	422,886	*	*
03020201	88	552,331	1,791,518	78,896,053
03020202	40	859,636	82,639	19,759,898
03020203	52	583,033	683,659	68,456,851
03020204	16	*	11,286	3,656,964
03020301	6	58,706	*	*
03020302	13	158,633	*	2,160,400
03030002	55	103,222	1,237,307	55,941,136
03030003	42	168,852	580,910	25,385,396
03030004	44	*	1,263,956	*
03030006	174	*	1,459,019	305,724,580
03030007	194	4,039,095	1,617,611	87,412,427
03040101	43	251,613	*	23,425,880
03040102	13	200,123	76,456	8,510,600
03040103	22	250,823	1,178,422	20,034,920
03040104	16	126,716	22,334	2,219,511
03040105	46	601,523	*	19,662,040
03040201	4	32,097	*	438,197
03040203	68	1,951,373	202,914	38,190,505
03040204	40	2,107,788	*	40,416,615
03040208	5	57,358	*	1,368,000
03050102	16	134,999	2,006,805	14,426,720
03050105	11	92,174	40,572	4,311,000
06010105	20	292,449	593,059	25,110,880
06010106	8	*	67,876	8,806,000
<b>Other HUC <sup>4</sup></b>	<b>104</b>	<b>18,739,148</b>	<b>13,998,358</b>	<b>270,308,402</b>
<b>STATE</b>	<b>1346</b>	<b>33,735,286</b>	<b>32,633,909</b>	<b>1,381,560,821</b>

\*Disclosure - Data is not published for some HUCs to avoid disclosure of individual farming operations.

<sup>1</sup> represents the unique # of operations which withdrew surface and or ground water <sup>2</sup> represents the average across all days of the year <sup>3</sup> includes ground and surface <sup>4</sup> includes nondisclosed data from the table above and all data for 3010102, 03010106, 03020104, 03020105, 03030005, 03040206, 03050101, 03050103, 05050001, 06010103, 06010108, 06010202, 06010203, 06020002



## 2012 Central Coastal Plain Total Water Use by Month <sup>1</sup>

Month	# Operations	Average Across All Days-Ground	Average Across All Days-Surface	Total Max Daily-Ground	Total Max Daily-Surface
	<i>Count</i>	<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>
January	264	4,652,561	442,514	5,047,304	495,143
February	273	4,494,885	407,669	5,202,064	512,350
March	284	4,916,886	1,296,923	7,632,507	8,279,325
April	292	5,810,420	3,218,326	9,871,935	10,915,805
May	293	6,558,837	3,421,884	10,716,130	9,528,277
June	313	8,133,048	5,186,135	15,829,737	16,807,109
July	304	9,022,581	4,661,472	16,300,009	12,978,241
August	289	6,441,073	2,682,576	10,738,747	6,225,280
September	281	5,959,791	2,186,637	8,167,606	2,989,835
October	280	5,453,983	1,670,979	8,199,706	1,931,668
November	273	4,474,754	1,213,952	6,593,118	1,310,421
December	271	5,055,108	760,783	7,015,813	1,114,562
Annual Average		5,914,494	2,262,488		

**Operations:**

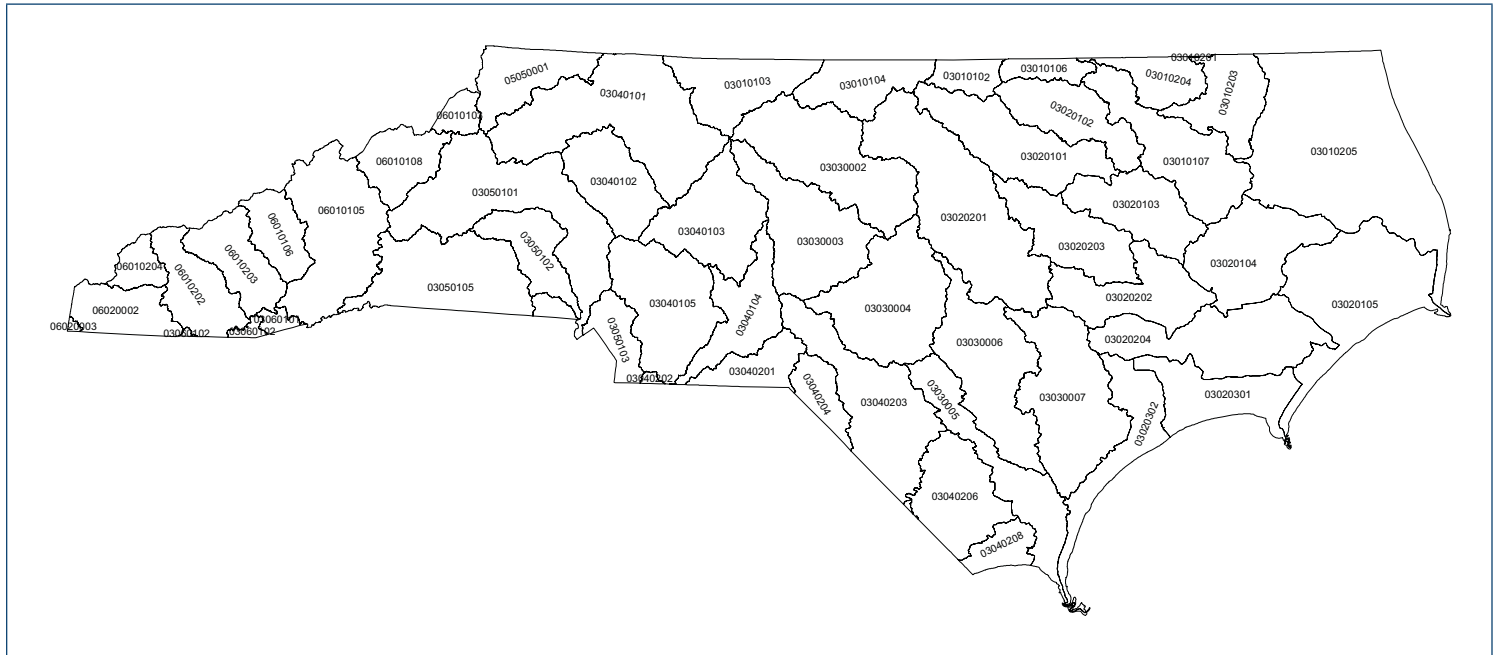
330 Total Operations

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

224,629,469 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 May 21, 2013. The number of operations represents operations that withdrew water at any time during the year. Central Coastal Plain Counties include Beaufort, Carteret, Craven, Duplin, Edgecombe, Greene, Jones, Lenoir, Martin, Onslow, Pamlico, Pitt, Washington, Wayne, and Wilson.

### Hydrologic Unit Codes (HUC)



## Statistical Defensibility

The North Carolina Department of Agriculture and Consumer Services' Agricultural Statistics Division conducted a census of all known farm operations in North Carolina which had farming types that could potentially use more than 10,000 gallons of water in one day. More than 3,400 such operations were contacted and included farms with a history of withdrawing more than 10,000 gallons on any one day. Also included were operations with large numbers of poultry, hogs, cattle, aquaculture, fruits, vegetables, nursery/ greenhouse crops, tobacco, or other field crops which are often irrigated. A 91% response rate was attained via mail, phone, or electronically via the web or email. Historical data for all respondents was reviewed to insure comparability with previous surveys. Operations were offered work sheets which assisted them, if necessary, in reporting their withdrawals.

The Census of Agriculture List, the most comprehensive source of farms, was used as the basis for this survey. Although no under-coverage estimator has been applied, the list of NC farmers is expanded on a daily basis as new operations are discovered through routine list building activities. Since agricultural operations that withdraw at least 10,000 gallons of water per day tend to be larger, more intensive farms, under-coverage for this survey is minimal based on historic surveys with similar operations.

Taking the above steps, including conducting a census of all known farm operations that use 10,000 gallons of water on any one day, results in zero sampling error around the estimates and minimal non-sampling and coverage error. Prior to the 2008 NC Agricultural Water Use Survey, there was no official statistically defensible data set to represent agricultural water use in North Carolina.



