

Ground Water Report

Drought Management Advisory Council

Raleigh, NC, April 10, 2014

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Ground Water Management Branch

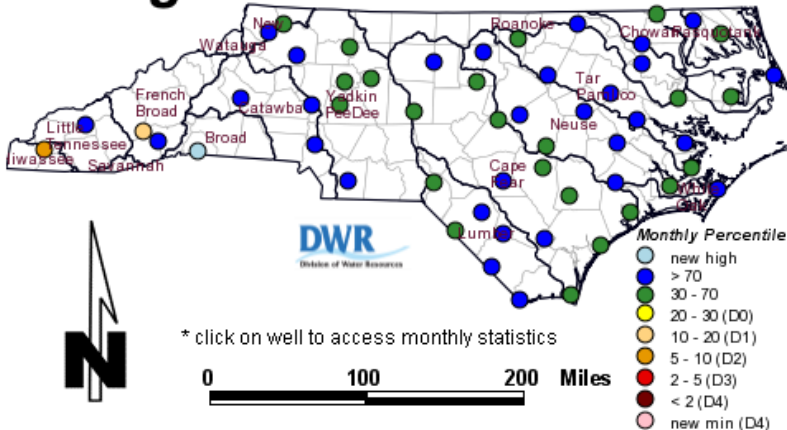
Water Planning Section



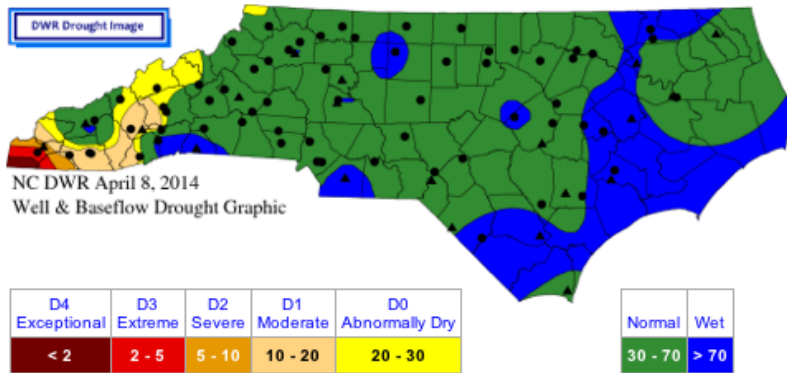
Drought Indicator Wells

- 56 wells with a 34 year average record
- 14 wells monitored by USGS
 - Automatic recorders, hourly data, satellite telemetry
- 41 wells monitored by DWR
 - Automatic recorders, hourly data, downloaded quarterly (Feb, May, Aug & Nov) & cell phone telemetry on three wells
- 1 well destroyed

Drought Indicator Wells



Water level in status table ranked against historical data for the matching month through 2013.



Contoured baseflow (circles) and well (triangles) percentile data. Current or selected month ranked against data from same month in previous years (1965 - 2013). Graphic is re-drawn each Tuesday.

The NC Division of Water Resources and the US Geological Survey monitor ground water levels in the listed wells to measure the impact of rainfall (or the lack of rainfall). These wells are chosen as **Drought Indicator Wells** because they respond to rainfall quickly and their levels are a measure of the amount of water stored in the subsurface which is available to discharge to surface water.

Today: April 8, 2014

#	WELL NAME	STATUS	COUNTY	RIVER BASIN	YEARS	%-DAILY
1	Columbus	Apr 8, 2014	Polk	Broad	39	32
2	Kelly	Mar 26, 2014	Bladen	Cape Fear	33	25
3	Southport (BR-083)	Apr 6, 2014	Brunswick	Cape Fear	44	39
4	Seabrook School	Feb 18, 2014	Cumberland	Cape Fear	32	27
5	Rose Hill (NC-222R)	Apr 6, 2014	Duplin	Cape Fear	32	41
6	Gibsonville	Feb 20, 2014	Guilford	Cape Fear	46	29
7	Camp Lejeune	Feb 3, 2014	Onslow	Cape Fear	27	88
8	UNC Campus	Feb 27, 2014	Orange	Cape Fear	65	25
9	Topsail Beach	Feb 20, 2014	Pender	Cape Fear	30	32
10	NC Zoo	Feb 17, 2014	Randolph	Cape Fear	42	29
11	Halls	Feb 4, 2014	Sampson	Cape Fear	33	26
12	Fuquay Varina	Feb 3, 2014	Wake	Cape Fear	32	32
13	Glen Alpine (BK-126)	Apr 6, 2014	Burke	Catawba	44	31
14	Troutman	Feb 17, 2014	Iredell	Catawba	45	48
15	Hornets Nest Park	Feb 17, 2014	Mecklenburg	Catawba	25	100
16	Roxobel	Feb 20, 2014	Bertie	Chowan	15	100
17	Sunbury	Feb 25, 2014	Gates	Chowan	47	17
18	Como	Feb 20, 2014	Hertford	Chowan	33	31
19	Champion (HW-047)	Apr 6, 2014	Haywood	French Broad	58	96
20	Blantyre (NC-144)	Apr 6, 2014	Transylvania	French Broad	33	99
21	American Thread (NC-192)	Apr 6, 2014	Cherokee	Hiwassee	25	99
22	Bryson City	Apr 8, 2014	Swain	Little Tennessee	49	33
23	Bladenboro	Feb 18, 2014	Bladen	Lumber	39	27
24	Calabash (BR-123)	Feb 18, 2014	Brunswick	Lumber	41	30
25	Clarendon	Feb 18, 2014	Columbus	Lumber	38	13
26	Magnolia School	Feb 26, 2014	Robeson	Lumber	36	25
27	Rowland	Mar 27, 2014	Robeson	Lumber	43	5
28	Jordan Creek (NC-194)	Apr 6, 2014	Scotland	Lumber	20	84
29	Cherry Point	Feb 4, 2014	Craven	Neuse	24	38
30	Cleveland	Feb 3, 2014	Johnston	Neuse	9	90
31	Comfort (NC-173)	Apr 6, 2014	Jones	Neuse	28	61
32	Graingers	Feb 19, 2014	Lenoir	Neuse	24	55
33	Caldwell	Feb 24, 2014	Orange	Neuse	45	16
34	Whortonsville	Feb 6, 2014	Pamlico	Neuse	36	15
35	Grantham (NC-148)	Apr 6, 2014	Wayne	Neuse	34	48
36	Stantonsburg	Feb 18, 2014	Wilson	Neuse	12	84
37	Laurel Springs	Feb 19, 2014	Alleghany	New	43	32
38	Beaver Creek	Feb 20, 2014	Ashe	New	44	45
39	Manteo Airport	Feb 24, 2014	Dare	Pasquotank	30	37
40	Elizabeth City (NC-195)	Apr 6, 2014	Pasquotank	Pasquotank	23	87
41	Gum Neck	Feb 24, 2014	Tyrrell	Pasquotank	37	29
42	Lewiston	Apr 8, 2014	Bertie	Roanoke	31	36
43	Van Swamp (NC-158)	Apr 6, 2014	Washington	Roanoke	19	84
44	Godley	Feb 6, 2014	Beaufort	Tar-Pamlico	33	30
45	Old Sparta	Feb 18, 2014	Edgecombe	Tar-Pamlico	14	71
46	Bunn	Feb 3, 2014	Franklin	Tar-Pamlico	8	85
47	Oxford	Feb 24, 2014	Granville	Tar-Pamlico	46	23
48	Littleton	Feb 10, 2014	Halifax	Tar-Pamlico	46	21
49	Simpson (NC-160)	Apr 6, 2014	Pitt	Tar-Pamlico	20	84
50	Atlantic	Feb 17, 2014	Carteret	White Oak	33	7

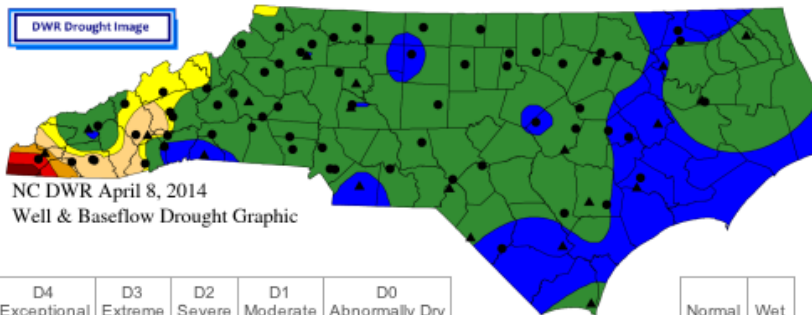
Drought Indicator Wells

Current conditions tab on www.ncdrought.org

DWR Drought Image

April 8, 2014

DWR Drought Image

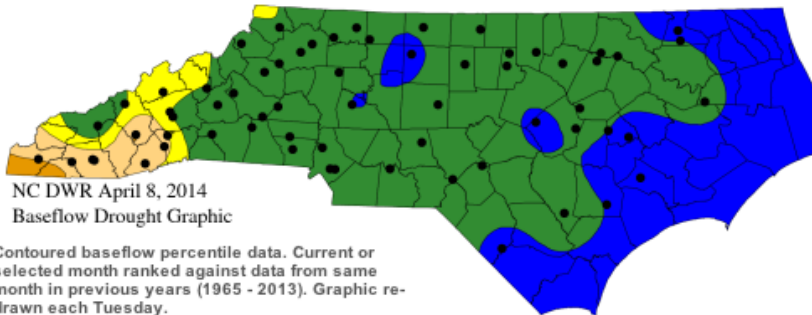


NC DWR April 8, 2014
Well & Baseflow Drought Graphic

D4	D3	D2	D1	D0
Exceptional	Extreme	Severe	Moderate	Abnormally Dry
< 2	2 - 5	5 - 10	10 - 20	20 - 30

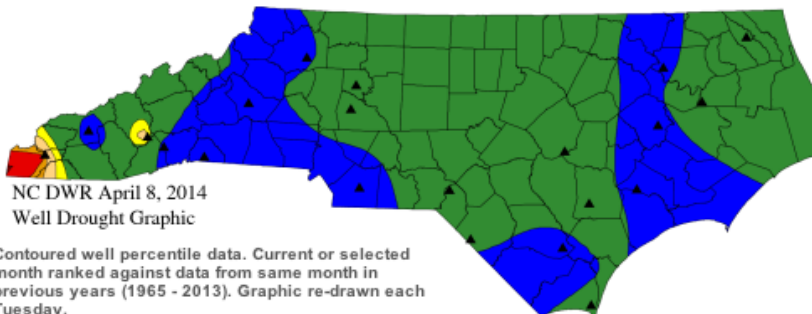
Normal	Wet
30 - 70	> 70

Contoured baseflow (circles) and well (triangles) percentile data. Current or selected month ranked against data from same month in previous years (1965 - 2013). Graphic re-drawn each Tuesday.



NC DWR April 8, 2014
Baseflow Drought Graphic

Contoured baseflow percentile data. Current or selected month ranked against data from same month in previous years (1965 - 2013). Graphic re-drawn each Tuesday.



NC DWR April 8, 2014
Well Drought Graphic

Contoured well percentile data. Current or selected month ranked against data from same month in previous years (1965 - 2013). Graphic re-drawn each Tuesday.

The **DWR Drought Image** brings together two data sources: ground water levels from the **Drought Indicator Well** network and surface water gage data. The daily surface water gage data is filtered to create a daily baseflow data set. Date of interest values are ranked against the historical baseflow data and the resulting percentiles are contoured. Similarly, ground water levels from the date of interest are ranked against the historical ground water level data and those percentiles are contoured. These graphics are shown in the middle and bottom maps, respectively. Percentile rankings from both data sets are combined and contoured in the top map.

Because ground water level data begins in 1965, USGS gage data from 1965 or later for a selection of North Carolina gages are filtered using a technique known as the **Lyne and Hollick algorithm**. The resulting **baseflow** values are stored and used to compare to current values. Each baseflow value approximates the daily amount of discharge occurring into a gaged stream from the subsurface.

$$q_f(i) = \alpha q_f(i-1) + (q(i) - q(i-1)) \frac{1 + \alpha}{2}$$

where $\alpha = 0.925$

Baseflow is $q_b = q - q_f$

The USGS gage data and a portion of the well data are collected using satellite telemetry, so daily values are available each day. DWR has added cell phone telemetry to three wells and is planning on adding telemetry to the remainder of the wells they monitor as time and funds allow to improve the resolution of this picture of the **natural subsurface storage conditions**. If the latest ground water level data point ages beyond 30 days old, it is dropped from the data set that is contoured. So, adding more telemetry sites will improve the drought depiction. Drought Management Advisory Council contour intervals and colored fills are used to help the end user compare this image to the national drought illustration.

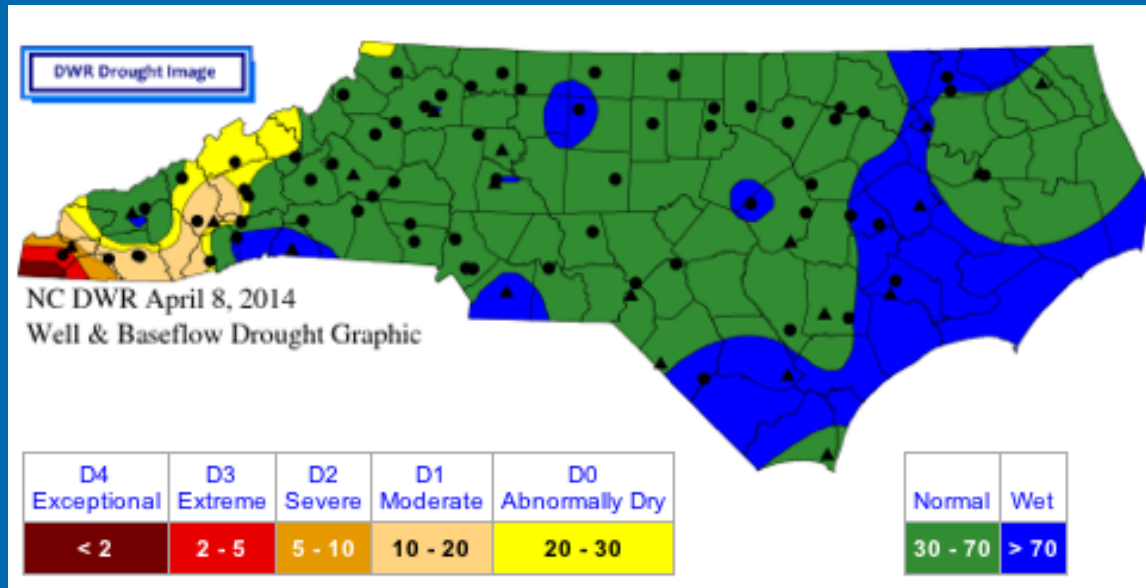
DWR hopes that DMAC members will use these graphics to help form their recommendations to the US Drought Monitor.

Arnold, J.G., P.M. Allen, R. Muttiah, and G. Bernhardt. 1995. Automated baseflow separation and recession analysis techniques. *Ground Water* 33(6): 1010-1018.

Arnold, J.G. and P.M. Allen. 1999. Automated methods for estimating baseflow and ground water recharge from streamflow records. *Journal of the American Water Resources Association* 35(2): 411-424.

Nathan, R. J. and T. A. McMahon. 1990. Evaluation of automated

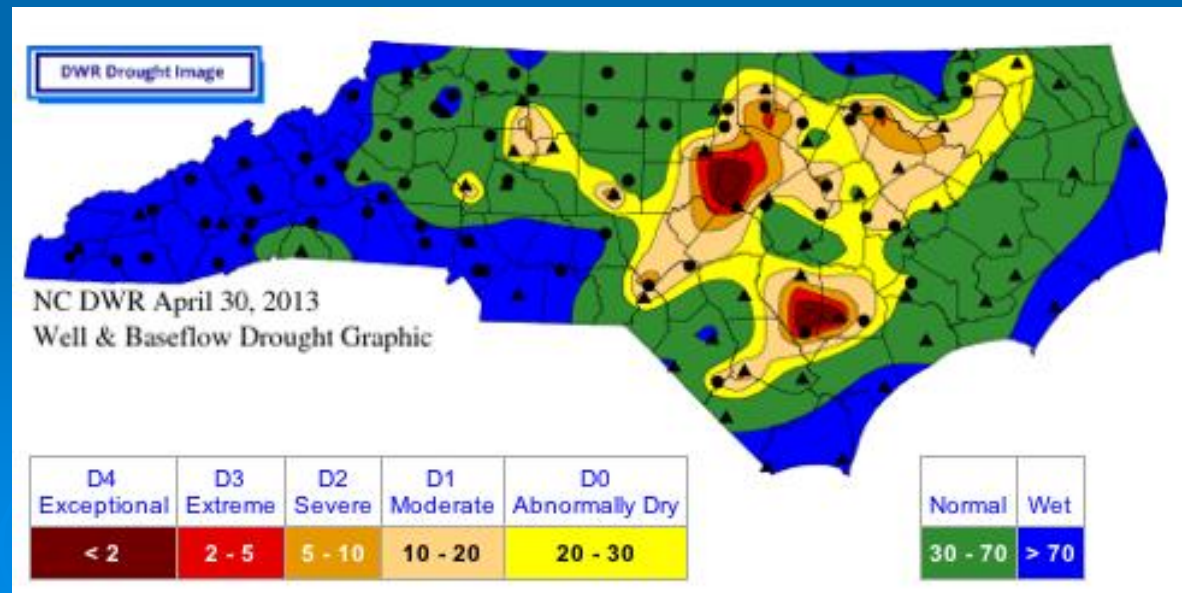
DWR Drought Image



April
2014

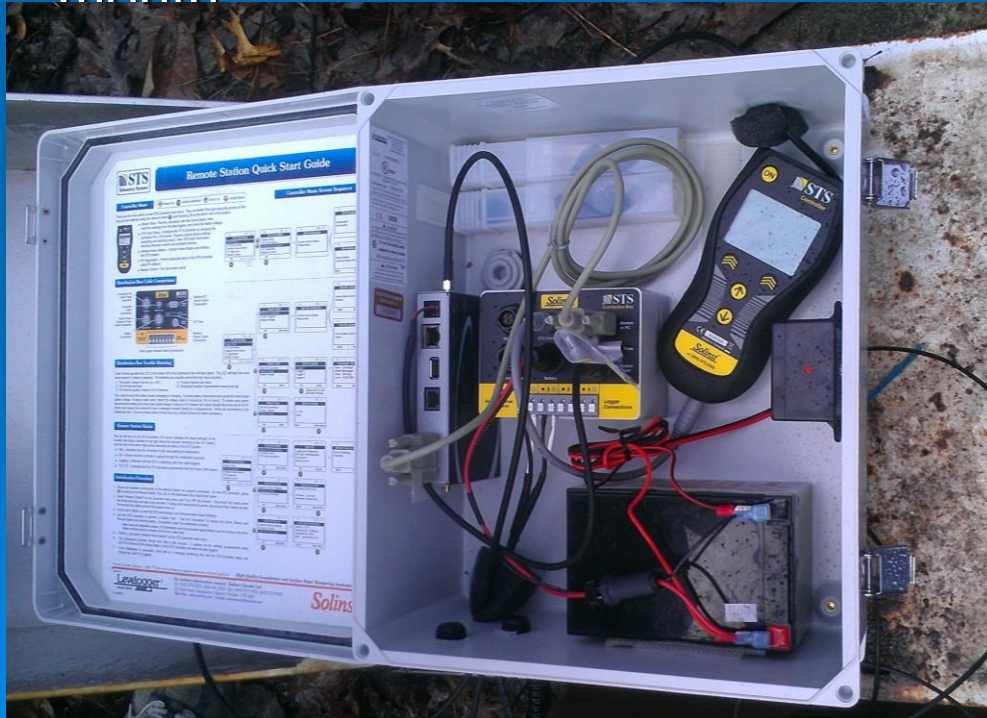


April
2013



Network News

DWR has installed cell phone telemetry on three wells and plans to add nine more sites this year. Cost of each site is initially about \$4,200 plus \$4.13 per month.



Columbus Station,
Polk County