

Ground Water Report

Drought Management Advisory Council

Raleigh, NC, April 30, 2015

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Ground Water Management Branch

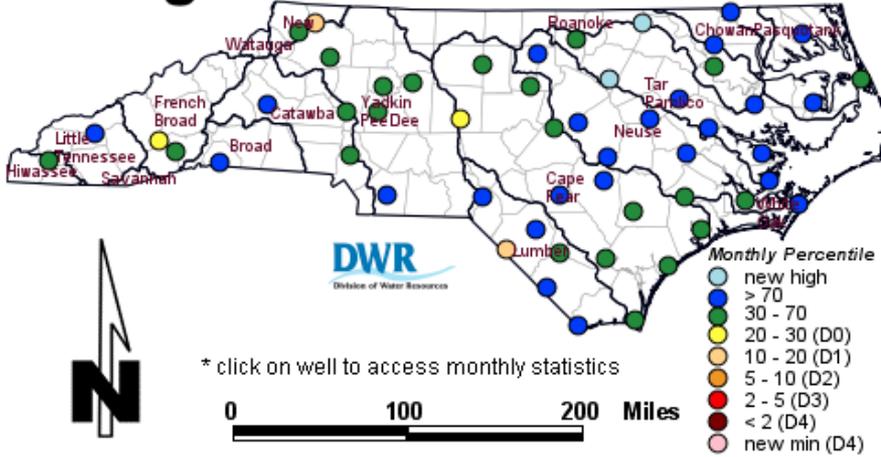
Water Planning Section



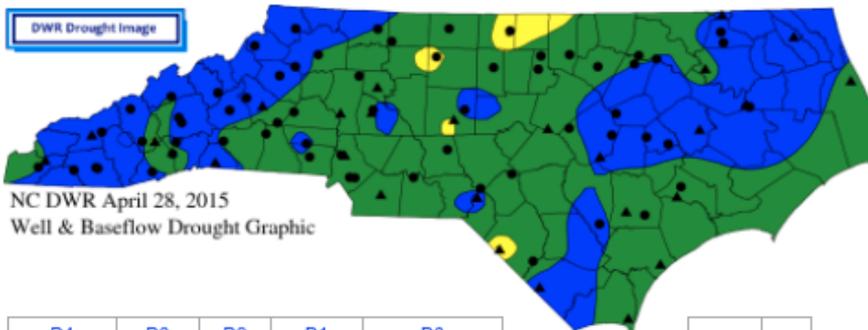
Drought Indicator Wells

- 54 wells with a 35 year average record
- 14 wells monitored by USGS
 - Automatic recorders, hourly data, satellite telemetry
- 40 wells monitored by DWR
 - Automatic recorders, hourly data, downloaded quarterly (Feb, May, Aug & Nov) & cell phone telemetry on twelve wells
 - A couple of wells are in flux due to land owner or well construction issues

Drought Indicator Wells



Water level in status table ranked against historical data for the matching month through 2014.



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 - 2014). 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

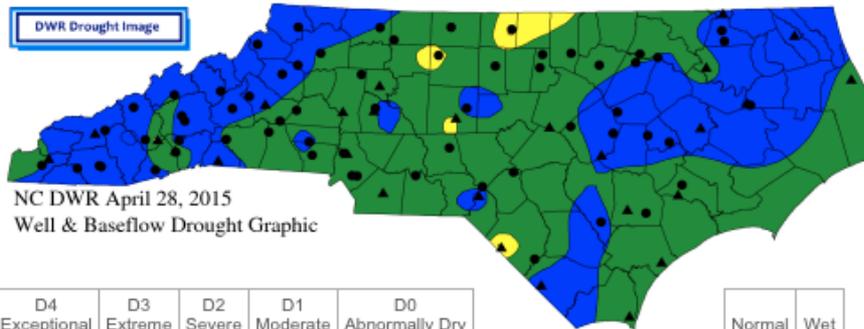
Today: April 28, 2015

#	WELL NAME	STATUS	COUNTY	RIVER BASIN	YEARS	%-DAILY
1	Columbus	Apr 28, 2015	Polk	Broad	40	33
2	Kelly	Feb 5, 2015	Bladen	Cape Fear	34	27
3	Southport (BR-083)	Apr 25, 2015	Brunswick	Cape Fear	45	40
4	Seabrook School	Jan 27, 2015	Cumberland	Cape Fear	33	29
5	Rose Hill (NC-222R)	Apr 25, 2015	Duplin	Cape Fear	33	43
6	Gibsonville	Jan 26, 2015	Guilford	Cape Fear	47	30
7	Camp Lejeune	Feb 3, 2015	Onslow	Cape Fear	28	88
8	UNC Campus	Jan 26, 2015	Orange	Cape Fear	65	25
9	Topsail Beach	Apr 28, 2015	Pender	Cape Fear	31	34
10	NC Zoo	Apr 28, 2015	Randolph	Cape Fear	45	29
11	Halls	Jan 29, 2015	Sampson	Cape Fear	34	28
12	Fuquay Varina	Apr 8, 2015	Wake	Cape Fear	33	34
13	Glen Alpine (BK-126)	Apr 25, 2015	Burke	Catawba	45	33
14	Troutman	Apr 28, 2015	Iredell	Catawba	46	49
15	Hornets Nest Park	Apr 28, 2015	Mecklenburg	Catawba	25	100
16	Roxobel	Jan 21, 2015	Bertie	Chowan	16	100
17	Sunbury **	May 21, 2014	Gates	Chowan	47	18
18	Como	Apr 28, 2015	Hertford	Chowan	34	33
19	Champion (HW-047)	Apr 25, 2015	Haywood	French Broad	59	96
20	Blantyre (NC-144)	Apr 25, 2015	Transylvania	French Broad	34	99
21	American Thread (NC-192)	Apr 25, 2015	Cherokee	Hiwassee	26	99
22	Bryson City	Apr 28, 2015	Swain	Little Tennessee	50	34
23	Bladenboro	Feb 3, 2015	Bladen	Lumber	39	28
24	Calabash (BR-123) **	Feb 9, 2015	Brunswick	Lumber	42	30
25	Clarendon	Apr 28, 2015	Columbus	Lumber	39	15
26	Rowland	Apr 28, 2015	Robeson	Lumber	44	7
27	Magnolia School	Jan 29, 2015	Robeson	Lumber	37	27
28	Jordan Creek (NC-194)	Apr 25, 2015	Scotland	Lumber	21	84
29	Cherry Point	Jan 22, 2015	Craven	Neuse	25	40
30	Cleveland	Feb 12, 2015	Johnston	Neuse	10	91
31	Comfort (NC-173)	Apr 25, 2015	Jones	Neuse	29	62
32	Graingers	Feb 6, 2015	Lenoir	Neuse	24	59
33	Caldwell	Jan 26, 2015	Orange	Neuse	46	18
34	Whortonsville	Jan 26, 2015	Pamlico	Neuse	37	17
35	Grantham (NC-148)	Apr 25, 2015	Wayne	Neuse	35	50
36	Stantonsburg	Jan 26, 2015	Wilson	Neuse	13	80
37	Laurel Springs	Feb 3, 2015	Alleghany	New	44	33
38	Beaver Creek	Feb 3, 2015	Ashe	New	45	46
39	Manteo Airport	Apr 28, 2015	Dare	Pasquotank	31	39
40	Elizabeth City (NC-195)	Apr 25, 2015	Pasquotank	Pasquotank	24	87
41	Gum Neck	Feb 11, 2015	Tyrrell	Pasquotank	38	30
42	Lewiston	Apr 28, 2015	Bertie	Roanoke	32	38
43	Van Swamp (NC-158)	Apr 25, 2015	Washington	Roanoke	21	85
44	Godley	Jan 26, 2015	Beaufort	Tar-Pamlico	34	32
45	Old Sparta	Jan 26, 2015	Edgecombe	Tar-Pamlico	15	73
46	Bunn	Jan 26, 2015	Franklin	Tar-Pamlico	9	86
47	Oxford	Jan 27, 2015	Granville	Tar-Pamlico	47	25
48	Littleton	Jan 27, 2015	Halifax	Tar-Pamlico	47	23
49

Drought Indicator Wells
Current conditions tab on www.ncdrought.org

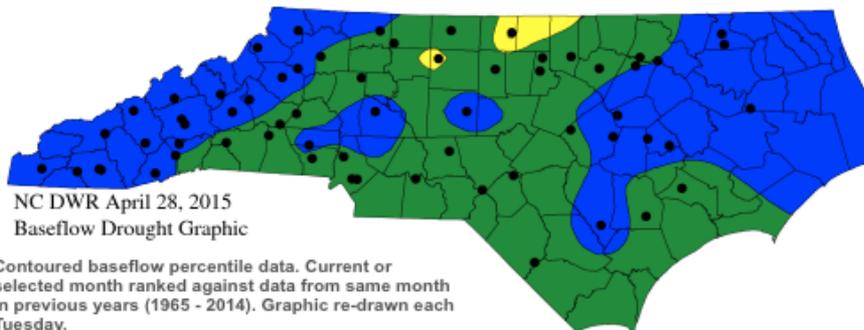
DWR Drought Image

April 28, 2015



NC DWR April 28, 2015
Well & Baseflow Drought Graphic

Contoured baseflow (circles) and well (triangles) percentile data. Current or selected month ranked against data from same month in previous years (1965 - 2014). Graphic re-drawn each Tuesday.



NC DWR April 28, 2015
Baseflow Drought Graphic

Contoured baseflow percentile data. Current or selected month ranked against data from same month in previous years (1965 - 2014). Graphic re-drawn each Tuesday.



NC DWR April 28, 2015
Well Drought Graphic

Contoured well percentile data. Current or selected month ranked against data from same month in previous years (1965 - 2014). 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.

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

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 12 wells and is planning on adding telemetry to the remainder of the drought indicator 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.

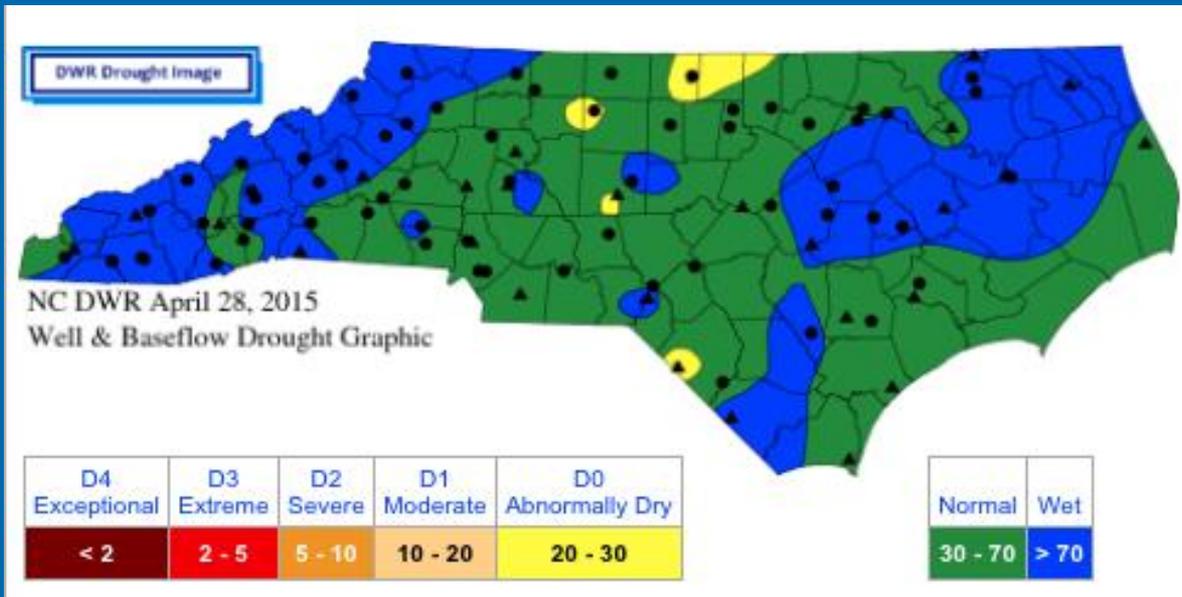
DWR hopes that DMAC members will use these graphics to help form their recommendations to the US Drought Monitor.

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

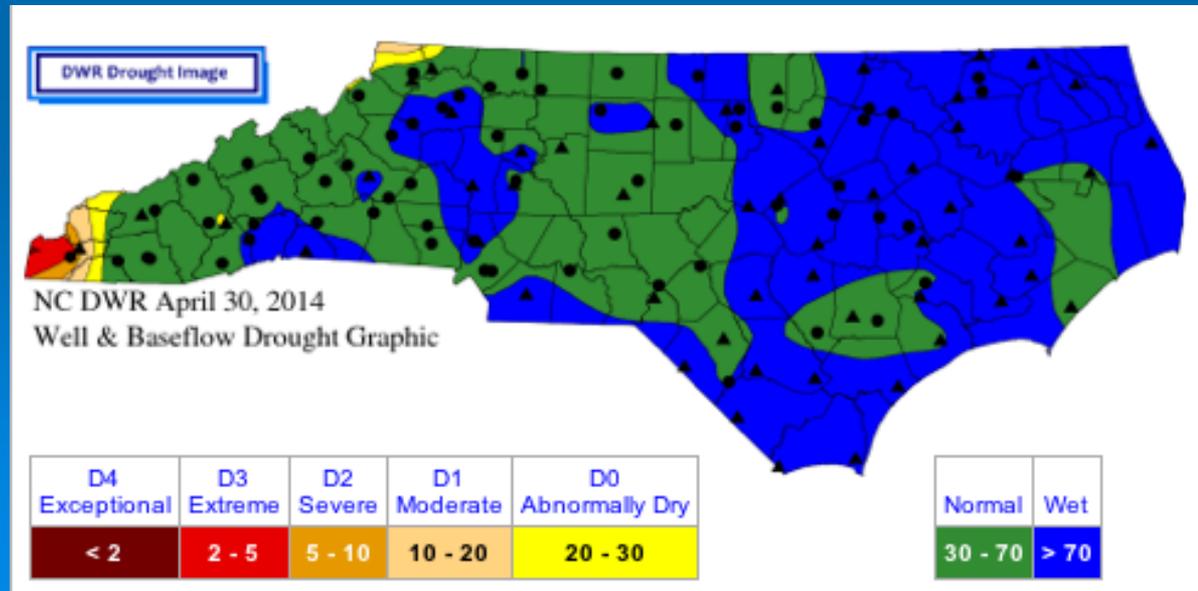
DWR Drought Image



April
2015



April
2014



Network News & Guidance

DWR has installed cell phone telemetry on twelve wells. All are working steadily now, but there have been a few hiccups with data plans and batteries...

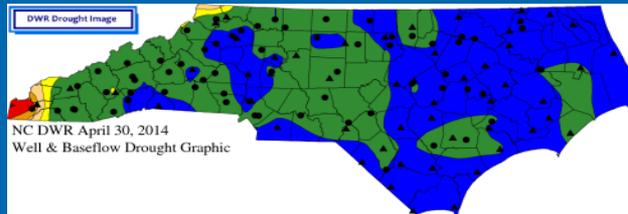
Full ground water storage translates to fewer drought related water supply impacts later this year.



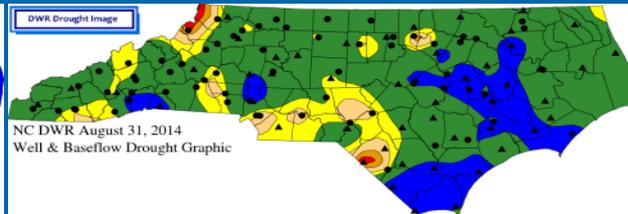
Manteo Airport
Station, Dare
County

Year in Review

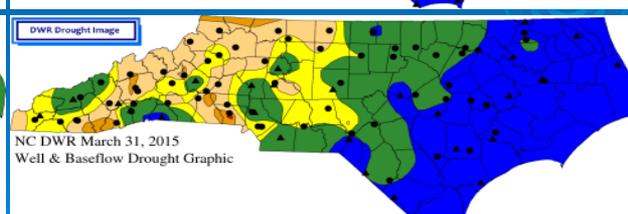
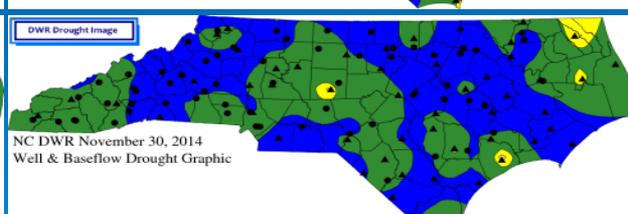
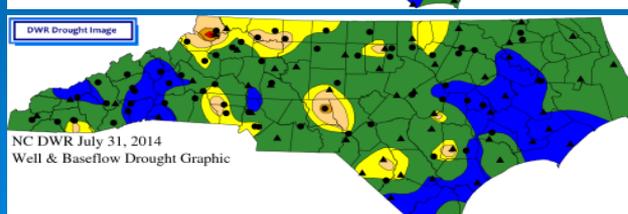
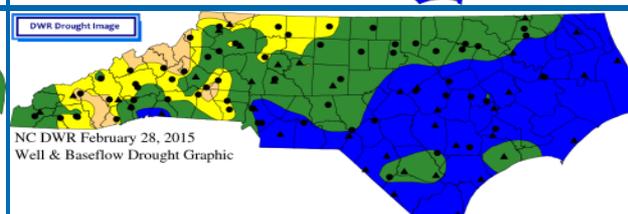
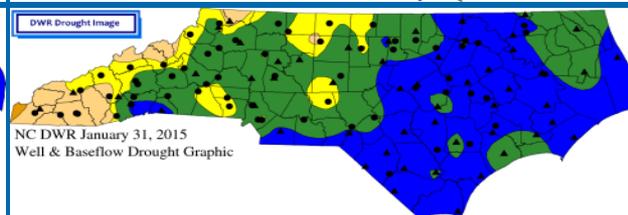
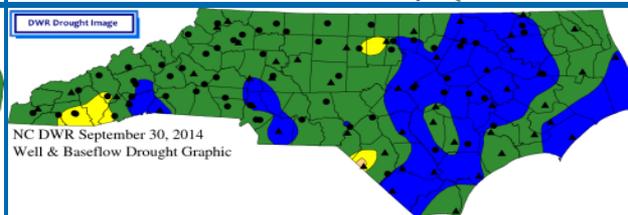
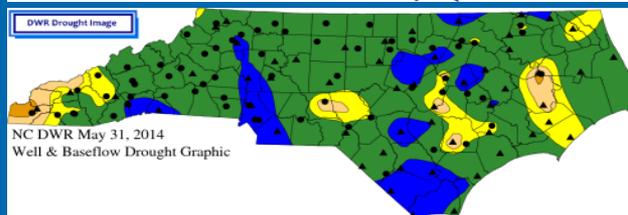
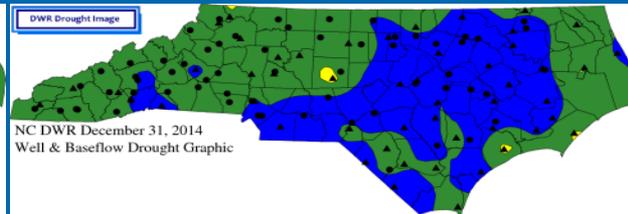
April 2014



August 2014



December 2014

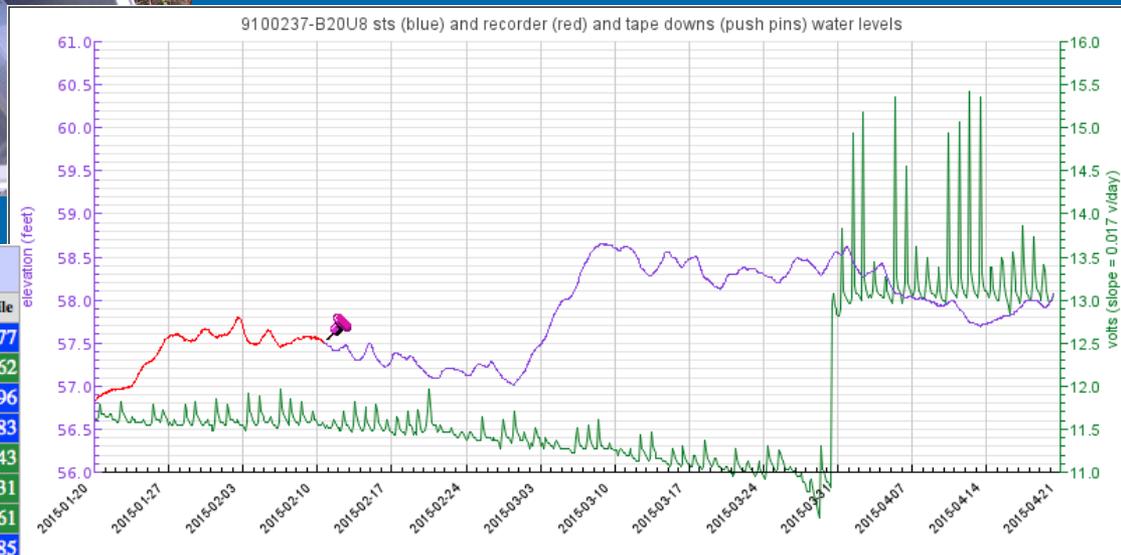
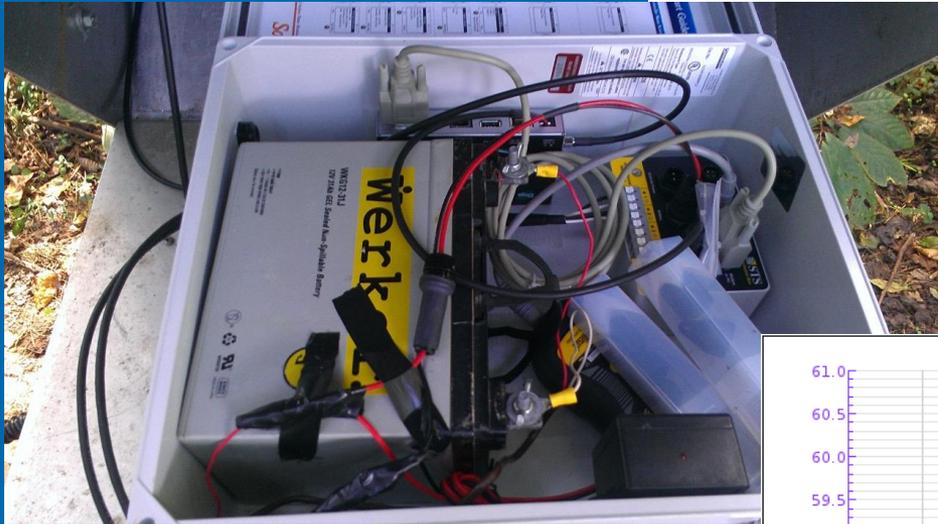
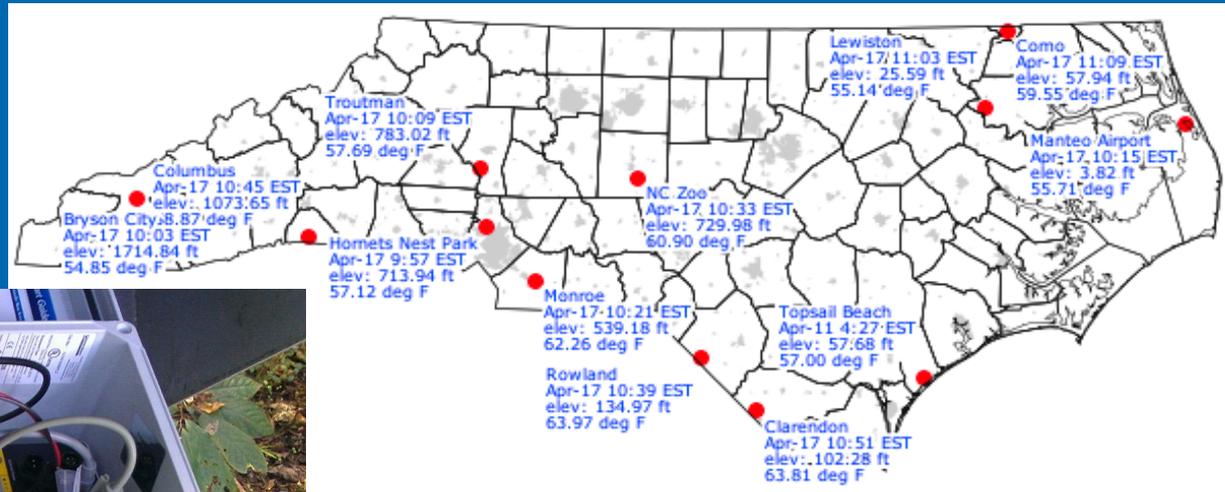


July 2014

November 2014

March 2015

Telemetry Sites



Latest STS update: 2015-04-24 12:14:22 EDT						DIW
Well	ACCESS	MySQL	V & 24hrΔ	24hrWLA	%ile	
B20U8 (Como)	2015-04-24 12:14:22 EDT	current	15.42 ↑	-0.08 ↓	77	
H22I3 (Lewiston)	2015-04-24 12:08:20 EDT	current	14.34 ↑	-0.17 ↓	62	
DD42N1 (Clarendon)	2015-04-24 11:56:21 EDT	current	15.03 ↑	-0.02 ↓	96	
R82I1 (Columbus)	2015-04-24 11:50:22 EDT	current	12.45 ↓	-0.01 ↓	83	
Z47R5 (Rowland)	2015-04-24 11:44:22 EDT	current	12.90 =	-0.17 ↓	43	
M53L1 (NC Zoo)	2015-04-24 11:38:21 EDT	current	13.08 ↑	-0.07 ↓	31	
BB28J5 (Topsail Beach)	2015-04-24 11:32:21 EDT	current	12.81 ↓	-0.10 ↓	61	
U62A1 (Monroe)	2015-04-24 11:26:21 EDT	current	14.34 =	-0.35 ↓	85	
I4W5 (Manteo Airport)	2015-04-24 11:20:22 EDT	current	13.59 ↓	-0.02 ↓	68	
L67U2 (Troutman)	2015-04-24 11:14:21 EDT	current	12.72 ↓	0.01 ↑	29	
O97W2 (Bryson City)	2015-04-24 11:08:21 EDT	current	12.90 =	-0.06 ↓	98	
Q66C1 (Hornets Nest P)	2015-04-24 11:02:20 EDT	current	12.63 ↓	-0.13 ↓	89	