



Carolinas Integrated Sciences & Assessments
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CISA & CoCoRaHS Citizen Science Condition Monitoring Project

Evaluation Background Materials

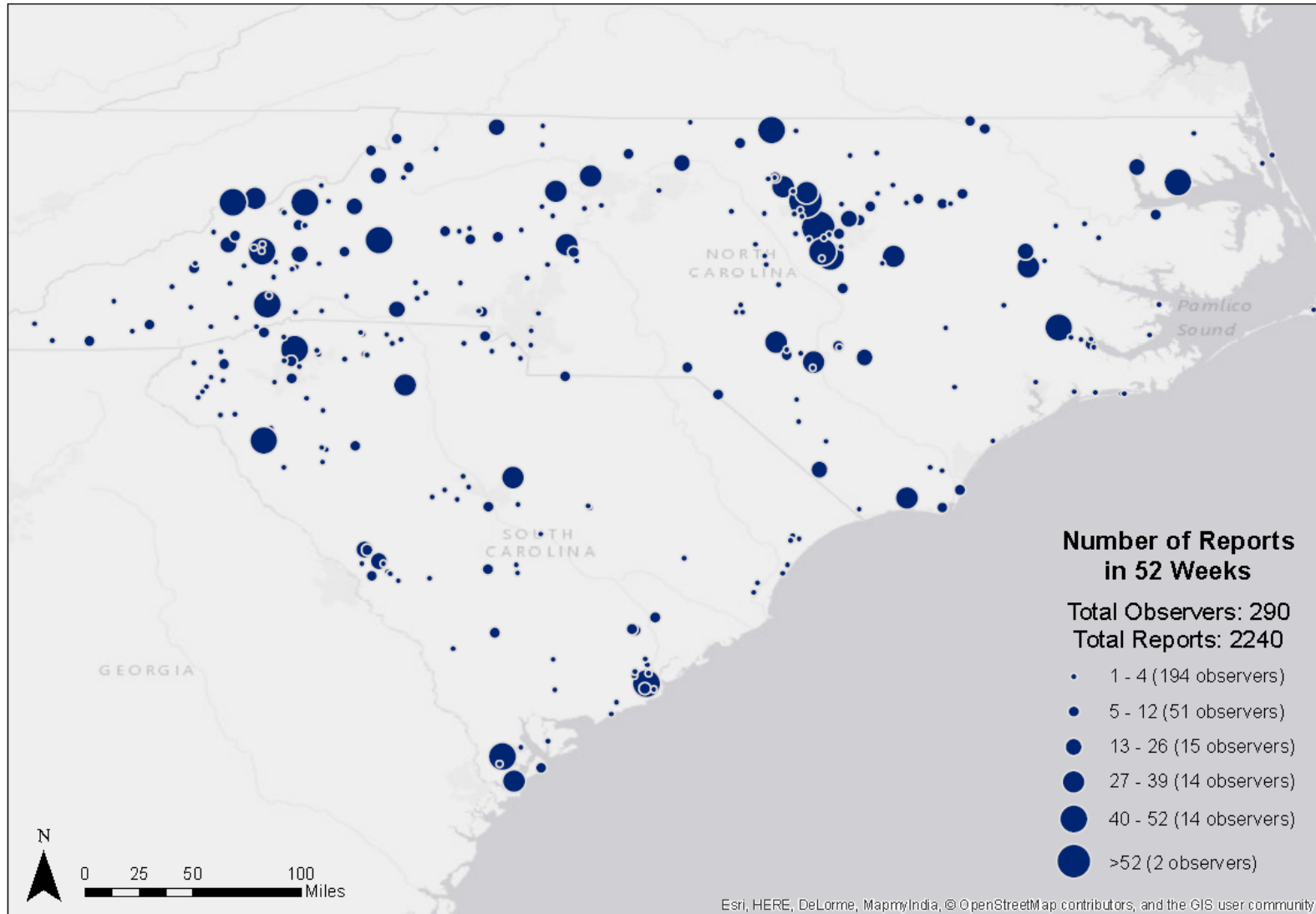
The following pages include information about CoCoRaHS observers in North and South Carolina who have submitted condition monitoring reports over the study period, October 2016 to October 2017, to include:

- A map of observer locations and number of reports submitted
- A timeline of the study period showing the number of condition monitoring reports submitted each week in conjunction with potential factors which may have influenced report submission (e.g., drought conditions, other extreme events, communications and outreach materials)
- An analysis of condition monitoring scale bar selections in comparison to other, objective drought indices
- Six individual observer case studies

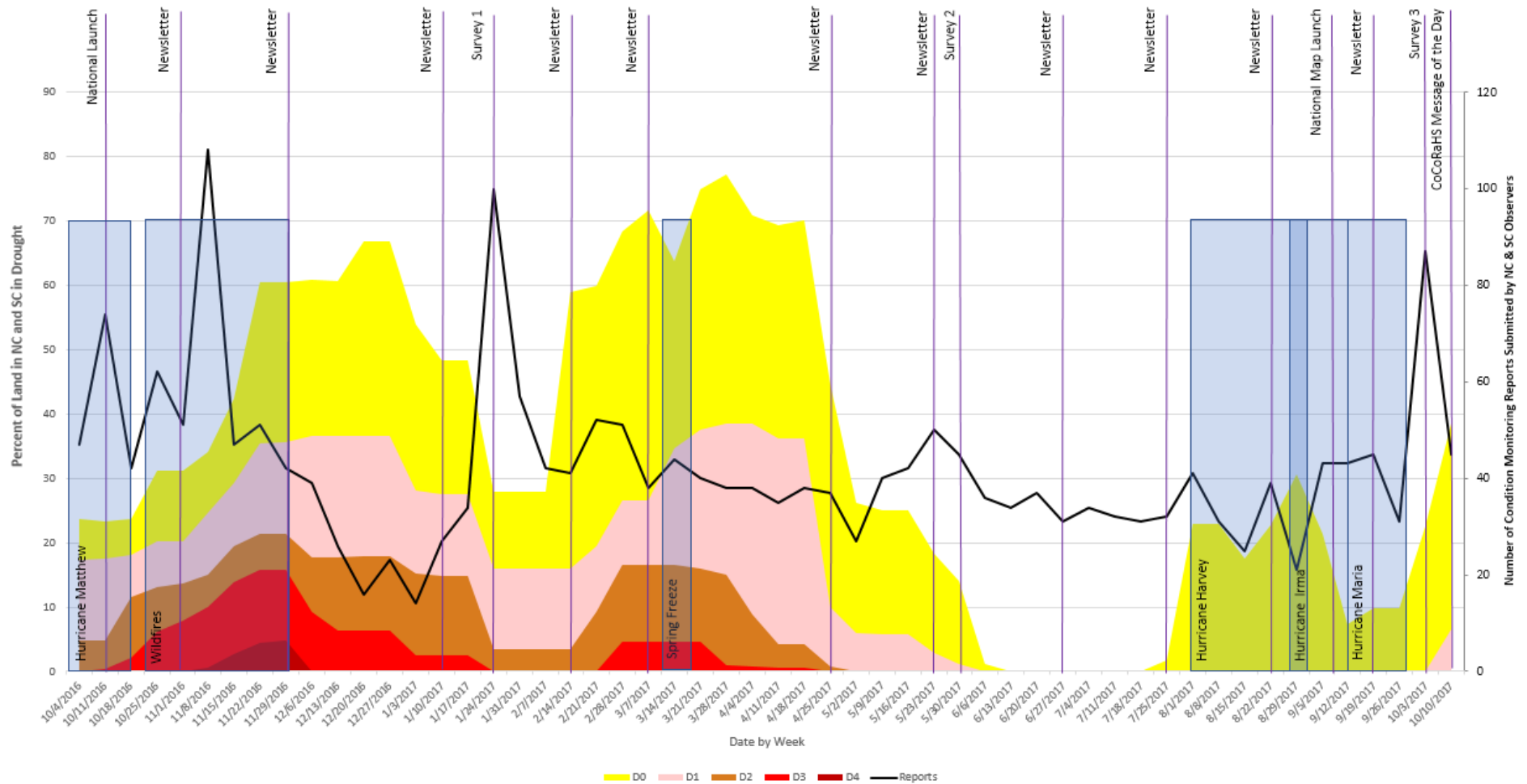
We will use these materials during the feedback discussion as we talk through different elements of the pilot program. If you are completing the online survey on your own, links are provided within the survey to various parts of this document for you to reference while taking the survey.

Total Reports Submitted by Each Observer

October 10, 2016 - October 10, 2017



Potential Factors Influencing Carolinas Condition Monitoring Report Submission



Drought categories represents drought conditions throughout both North and South Carolina during the study period, October 2016 – October 2017

CoCoRaHS Condition Monitoring Scale Bar Analysis

Condition Scale Bar More information on the scale bar Clear Scale Bar						
Severely Dry	Moderately Dry	Mildly Dry	Near Normal	Mildly Wet	Moderately Wet	Severely Wet
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

One question potential users of condition monitoring reports often ask is how well observations match with objective drought indices. To help answer this question, Rebecca Ward, Extension Climatologist with the State Climate Office of North Carolina, completed an assessment to compare CoCoRaHS observer's scale bar selections with two objective drought indices, the Standardized Precipitation Index (SPI) and the Standardized Precipitation-Evapotranspiration Index (SPEI).

The analysis was completed for the study period, October 1, 2016 to October 10, 2017 (data through 9am EDT on the ending date). SPI and SPEI were obtained for the grid points closest to each station for timescales of 1, 2, 3, 6, 9, and 12 months.

- All instances where a reporter did not select a scale bar value were removed (31 reports).
- In total, there are 2,231 reports from 288 observers.
- Of these observers,
 - 106 submitted one report only
 - 46 submitted only two reports
 - 23 submitted only 3 reports
 - 82 observers submitted 6 or more reports

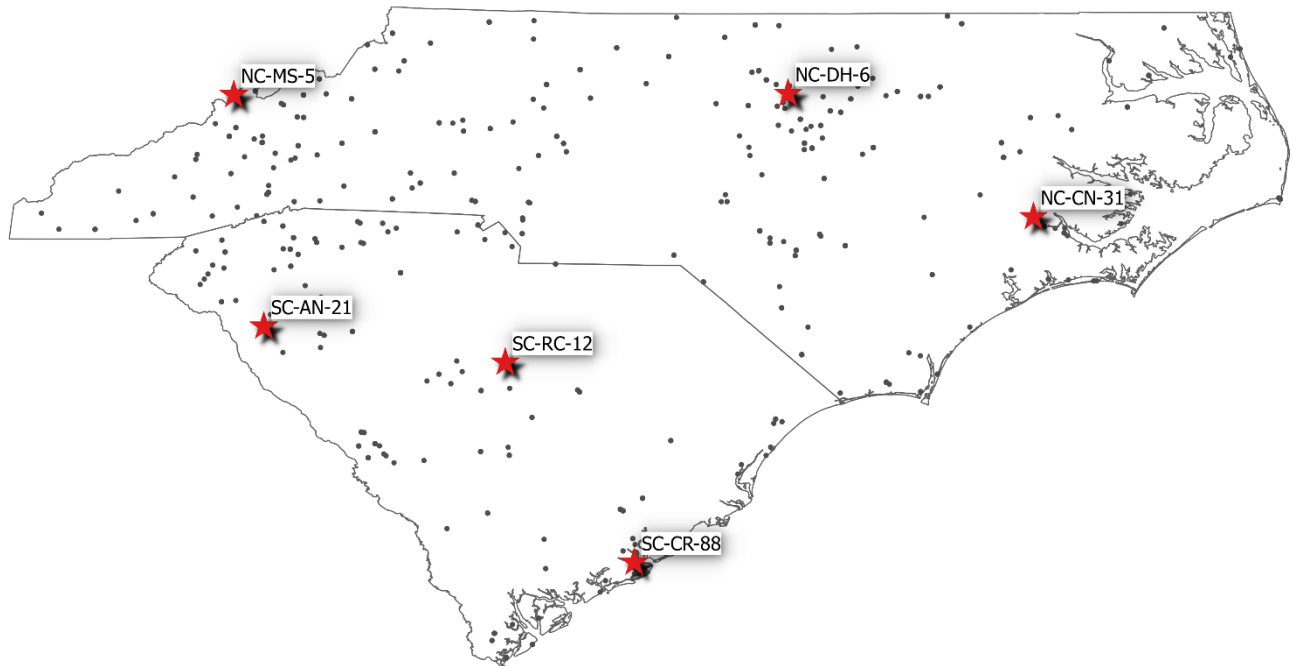
Guidance for observers instructs them to submit weekly. The remaining 82 observers were subset to those who had submitted at least 27 reports (or for approximately half of the weeks within the study period) *and* who had an average reporting interval between 5 and 9 days (7 days \pm 2). This resulted in a list of 17 observers, (5 in SC and 12 in NC). Combined, these 17 observers account for 36% of all submitted reports for the study period.

Condition Monitoring Scale Bar Correlations with the Standardized Precipitation Index & Standardized Precipitation-Evapotranspiration Index								
	All 288 Observers				Subset of 17 "Consistent" Observers			
	SPI-CM		SPEI-CM		SPI-CM		SPEI-CM	
Duration	Pearson	Spearman	Pearson	Spearman	Pearson	Spearman	Pearson	Spearman
1	0.52	0.53	0.56	0.55	0.44	0.47	0.48	0.48
2	0.44	0.44	0.46	0.45	0.39	0.38	0.40	0.39
3	0.38	0.38	0.39	0.37	0.37	0.35	0.37	0.35
6	0.33	0.31	0.33	0.32	0.28	0.25	0.28	0.25
9	0.39	0.37	0.39	0.37	0.34	0.30	0.34	0.31
12	0.29	0.29	0.29	0.29	0.30	0.28	0.30	0.29

For the whole set of observers, correlations are slightly higher than those for the smaller set of "consistent" observers. Overall, observer scale bar selections correlate more strongly with shorter-term drought index durations, though there are cases for individual observers where this is not the case (see case study observer pages below). Additionally, while SPI and SPEI are similarly correlated with condition monitoring scale bar selections, SPEI has a slightly higher correlation, which may indicate the role of temperature in observers' reporting.

Case Study Observers

Six observers were selected as case studies due to demonstrated consistency in submitting condition monitoring reports (number and frequency) and inclusion of a variety of information in their reports.



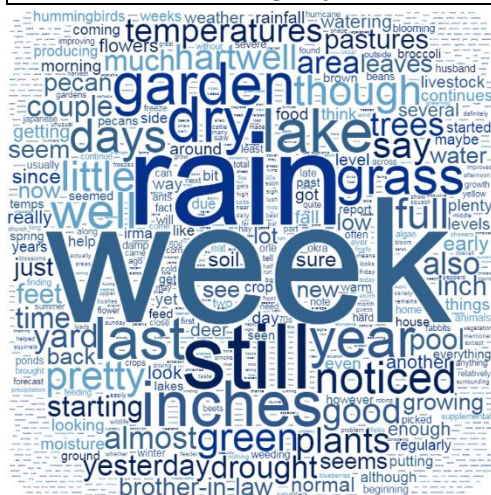
Observers selected for case study are marked with red stars on map above.

Each Observer page includes the following information:

- CoCoRaHS Station Name and Number
- Table of observer characteristics
- Word Cloud created using the observer's condition monitoring reports
- Results table from Condition Monitoring Scale Bar Analysis
 - The highest correlations between an observer's scale bar selections and the drought indices (SPI & SPEI) are highlighted. Time scales for the closest correlations vary by observer.
- Pie chart of condition monitoring report content with respect to the 10 impact reporting categories available to select on the CoCoRaHS Condition Monitoring report form and the National Drought Impact Reporter.
 - The number of category references refers to self-selected report categories in the observer's reports submitted between October 1, 2016 and October 10, 2017.
- Examples of the observers' condition monitoring reports

SC-AN-21 (Anderson 10.5 SE)

County	Anderson
Watershed (HUC8)	Upper Savannah River
CoCoRaHS Observer Since	July 19, 2009
2016-2017 Water Year Days Reported	354
Condition Monitoring Reporter Since	October 23, 2016
Condition Monitoring Reports Submitted thru October 10, 2017	49

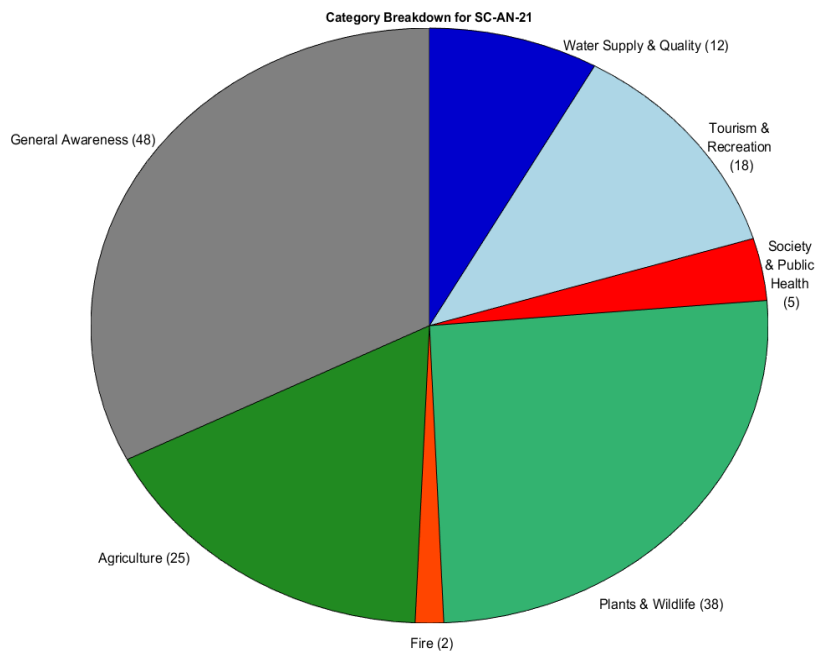


October 23, 2016: We have had only 0.08 inches of rainfall in October so far and only about 2 inches since the beginning of September. Between lack of rain and high temperatures (we hit 90 a couple days this week) grass in the yard is brown and I'm regularly watering young plants in the yard. My brother-in-law is also concerned about feeding his cattle and sheep. The garden is finished producing but the ground is too hard and dry to weed. Our pecans have started to fall, especially with the strong winds we've experienced as this most recent cold front came through.

November 6, 2016: Another week with no rain. My brother-in-law is selling a few calves to help with the food situation. Temperatures are a little more moderate than they have been, at least yesterday was in the upper 60s to low 70s. Drought maps from the weather channel show our area in severe drought but other areas are much worse.

January 1, 2017: Happy New Year! This week as I was working in the garden I noticed that, even though we haven't had a ton of rain, the soil is still relatively damp. I guess the cooler temps have allowed the rain that we've had to stay in the soil longer. The pecan crop is harvested weighing in at about 230 pounds of cracked pecans! Obviously a dry October and November didn't affect it.

Month	SPI to Scale Bar		SPEI to Scale Bar	
Duration	Pearson	Spearman	Pearson	Spearman
1	0.58	0.61	0.67	0.66
2	0.75	0.81	0.82	0.83
3	0.86	0.90	0.89	0.89
6	0.84	0.82	0.81	0.74
9	0.79	0.78	0.76	0.75
12	0.34	0.39	0.39	0.42

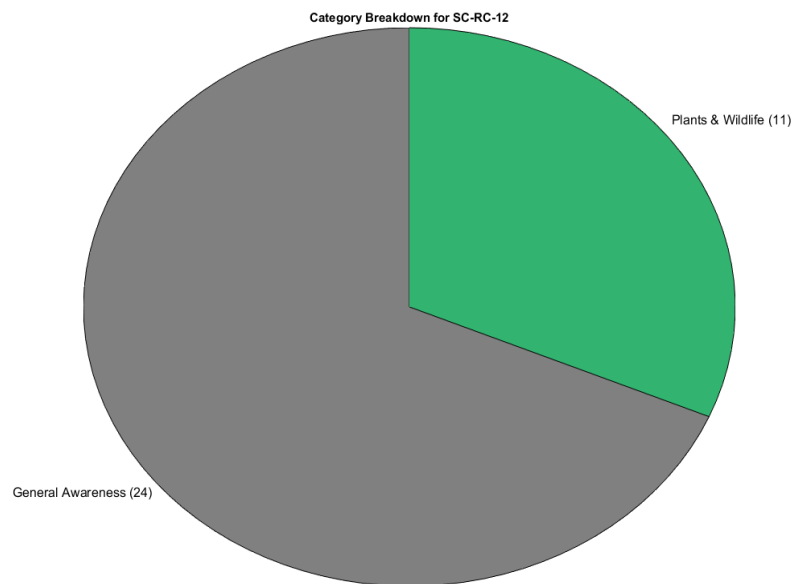


SC-RC-12 (Columbia 6.7N)

County	Richland
Watershed (HUC8)	Lower Broad River
CoCoRaHS Observer Since	March 23, 2008
2016-2017 Water Year Days Reported	339
Condition Monitoring Reporter Since	November 10, 2013
Condition Monitoring Reports Submitted through October 10, 2017	37



Month	SPI to Scale Bar		SPEI to Scale Bar	
Duration	Pearson	Spearman	Pearson	Spearman
1	0.57	0.59	0.59	0.62
2	0.52	0.58	0.47	0.56
3	0.39	0.44	0.35	0.35
6	0.58	0.62	0.46	0.48
9	0.58	0.52	0.47	0.41
12	0.13	0.12	0.06	0.05



October 15, 2016: For the first half of October, all of our precipitation (5.25") came from Hurricane Matthew. We see no evidence of water stress in any of our plant life. Even the plants in pots have required relatively little care. Growth has slowed, but we attribute that to significantly lower temperatures, especially at night.

December 3, 2016: After 15 straight zeros, we recorded 1.23" on November 30 and December 1. Again, because everything is going dormant, we don't see stress in plants. It was a good soaker, so it helped the soil, which was quite dusty.

April 8, 2017: We just completed the first week in April and already have close to 3". The lion's share of it fell in two intense and relatively quick-hitting thunderstorm events and, since so much water ran off, things don't seem exceptionally moist. No problems here with hail or twisters, but we've heard that folks west of here got one or both.

October 7, 2017: Reported our first rain this morning after 15 zeros. We've had 0.07" since Sep 14. The lawn looks stressed in most places; it probably would look worse, but milder temperatures at the end of the growing season have helped mitigate evaporation.

SC-CR-88 (Charleston 2.0 S)

County	Charleston
Watershed (HUC8)	Stono River
CoCoRaHS Observer Since	November 21.2013
2016-017 Water Year Days Reported	365
Condition Monitoring Reporter Since	December 1, 2013
Condition Monitoring Reports Submitted through October 10, 2017	52



Month	SPI to Scale Bar		SPEI to Scale Bar	
Duration	Pearson	Spearman	Pearson	Spearman
1	0.34	0.31	0.37	0.32
2	0.30	0.31	0.29	0.30
3	0.44	0.48	0.39	0.49
6	0.56	0.51	0.53	0.49
9	0.59	0.59	0.56	0.57
12	0.62	0.59	0.63	0.59

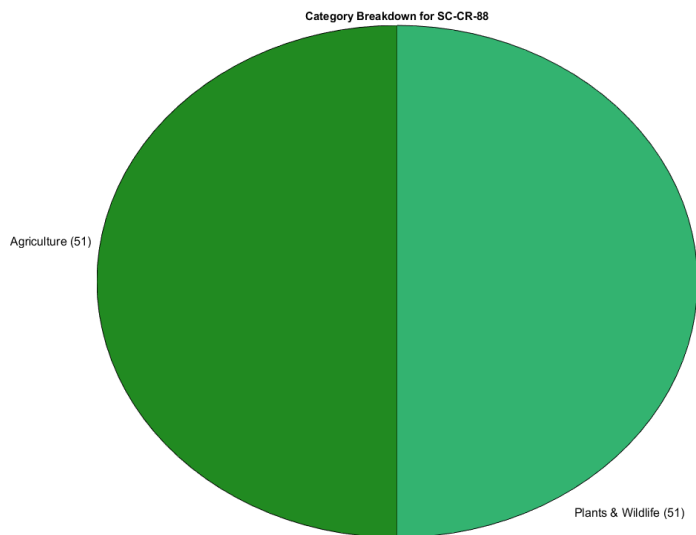
October 23, 2016: With no rain at all for two weeks since being soaked by Hurricane Matthew, the soil in the raised bed vegetable garden is dry enough to require supplemental watering.

December 11, 2016: With more than 2 inches of rain mid-week, water stood in low places like storm ditches for a day or so but soaked in well after that. Plants in the vegetable garden are doing well.

March 19, 2017: Continuing weeks with very limited rainfall leaves soil quite dry. Supplemental watering in the vegetable garden is required both for new transplants and for newly planted seed beds.

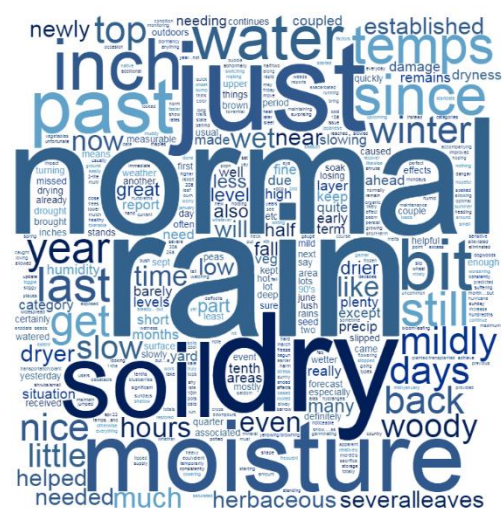
July 20, 2017: With several weeks of multi-inch rain, the ground is now saturated, with water standing in low places like storm water ditches.

September 3, 2017: Standing water again. Plants in the vegetable garden continue to do well except that frequent rain all Summer has meant more damage from mildew diseases that thrive in wet conditions.

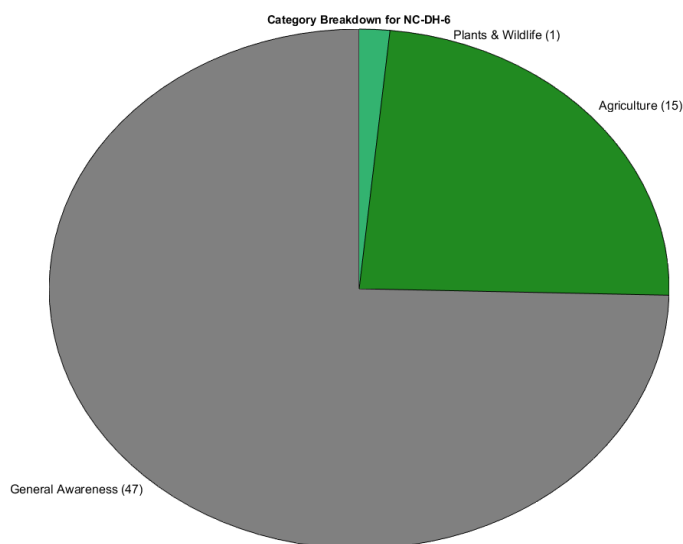


NC-DH-6 (Durham 1.2 NW)

County	Durham
Watershed (HUC8)	Haw River
CoCoRaHS Observer Since	September 5, 2007
2016-2017 Water Year Days Reported	364
Condition Monitoring Reporter Since	June 1, 2015
Condition Monitoring Reports Submitted through October 10, 2017	53



Month	SPI to Scale Bar		SPEI to Scale Bar	
Duration	Pearson	Spearman	Pearson	Spearman
1	0.61	0.59	0.56	0.56
2	0.37	0.33	0.32	0.27
3	0.26	0.24	0.22	0.24
6	0.07	-0.03	0.04	-0.04
9	0.42	0.40	0.40	0.39
12	0.54	0.49	0.55	0.49



October 17, 2016: Although no rain the past week the lots of soil moisture remains from the more than 5 1/2" or slow rain (Mostly Matthew), the week before.

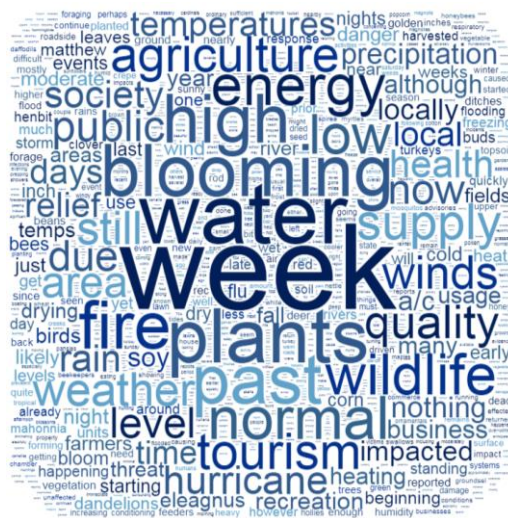
December 4, 2016: With just .15" this week, and only .87" since Matthew (since 10/10, about 8 weeks) conditions remain dry. However, since most plant growth has slowed or stopped, very little effect. Even winter annuals seem to be looking healthy except in v. dry, sunny exposed areas.

February 26, 2017: With no rain this week and only .97" for the month we have definitely reached the drier than normal category. This has been exacerbated by the much higher than normal temps, often 20° above normal. Am having to water newly planted garner seed (peas), and many of the newly planted/transplanted perennials (mostly woody), that we have put in this winter.

May 28, 2017: With 2.80" this week (and 6.58" for the month to date), we have slipped back into the mildly wet. Places where water stands are wet and even this all the rains have been nice and slow, there has been some run off due to the on occasion saturated top soil. Plant growth is lush!

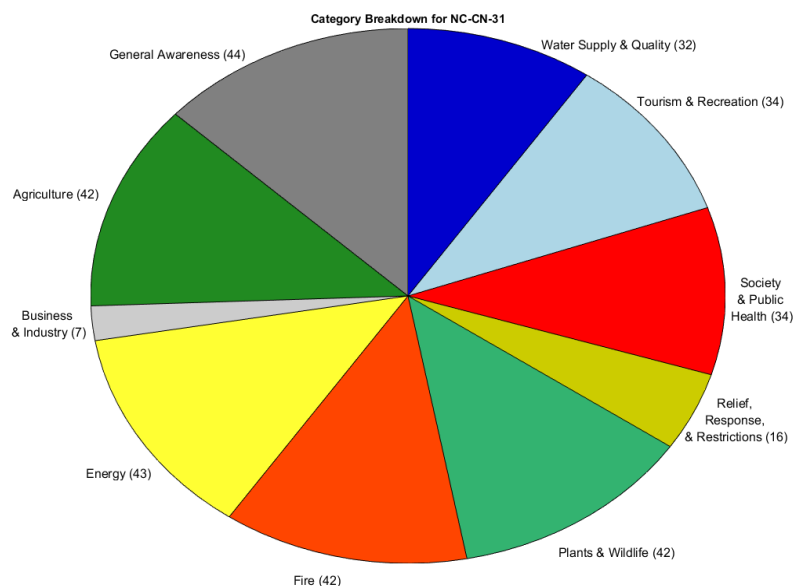
NC-CN-31 (New Bern 8.8 W)

County	Craven
Watershed (HUC8)	Middle Neuse River
CoCoRaHS Observer Since	March 10, 2013
2016-2017 Water Year Days Reported	325
Condition Monitoring Reporter Since	May 17, 2013
Condition Monitoring Reports Submitted through October 10, 2017	50



Month	SPI to Scale Bar		SPEI to Scale Bar	
Duration	Pearson	Spearman	Pearson	Spearman
1	0.39	0.42	0.45	0.42
2	0.12	0.07	0.13	0.10
3	0.15	0.12	0.13	0.13
6	-0.03	-0.02	0.00	-0.02
9	-0.07	-0.13	-0.06	-0.13
12	-0.07	-0.11	-0.07	-0.08

October 2, 2016: abnormally wet: corn that wasn't harvested last week - is now standing in the fields which are wet; lower temps at night - but still hot and humid during the daytimes so Air Conditioners running; fire threat level must be low - everything is wet, and the fall dry leaves haven't really started yet; Blooming - morning glories / magnolias / golden rod / some eleagnus / wild aster / some groundsel; Does have abandoned their now 7 month or so old offspring / Squirrels are burrowing their finds into the ground; MOSQUITOS are AWFUL this year; leaves continue to change color and are beginning to fall - especially oak Tourism: mostly not impacted, although some events were held this week because previous weekend was impacted (mostly high school football games); Normal rivers are higher than normal.



September 10, 2017: This past week has seen a continuation of a couple nice days, followed by a day or so of rain. The rain accumulations have been enough to make it difficult to mow - standing water areas in some places. THIS was especially concerning as the original predicted forecast for Hurricane Irma's track was directly at our area. It is now MUCH REMOVED from our concerns. Pending the anticipated arrival of Hurricane Irma, the corn farmers were scrambling, on very wet ground, to harvest their crops prior to the anticipated storm;

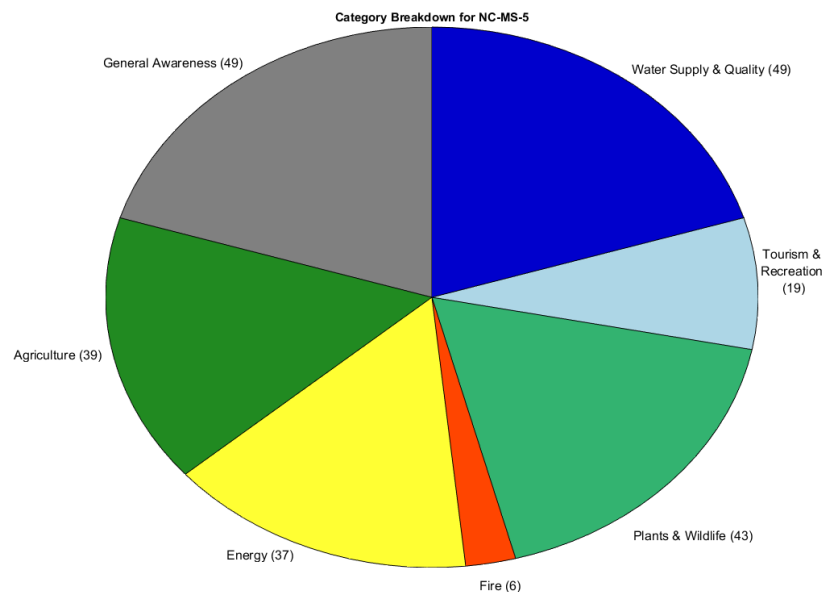
NC-MS-5 (Marshall 13.6 NNW)

County	Madison
Watershed (HUC8)	French Broad River
CoCoRaHS Observer Since	November 21, 2008
2013-2014 Water Year Days Reported	351
Condition Monitoring Reporter Since	June 26, 2014
Condition Monitoring Reports Submitted through October 10, 2017	49



Month	SPI to Scale Bar		SPEI to Scale Bar	
Duration	Pearson	Spearman	Pearson	Spearman
1	0.66	0.60	0.65	0.60
2	0.75	0.71	0.73	0.69
3	0.64	0.61	0.65	0.59
6	0.62	0.59	0.56	0.56
9	0.43	0.43	0.39	0.40
12	0.29	0.32	0.23	0.27

November 12, 2016: Despite the prolonged lack of rain--only .05" in the last week, only .22" for this month--we still have growing grass! Our spring & creek continue to run. However, a state of emergency and a total fire ban have been issued for the 25 western counties of NC. Over 20 forest are burning causing evacuations, excessive smoke, and closures of roads, trails, and state parks. The air quality is considered unhealthy for sensitive people. Last week the winds brought some of that smoke thickly across our county. Fall color is essentially over. Our forest trees are mostly bare, with just a few oaks and beeches hanging on to their leaves as is typical. The woods are quiet --only a few crickets and bird chirps. We continue to have heavy dew in the morning which was heavy frost the last two days. Our garden plants are growing without additional water. We expect a hard freeze tonight.



January 22, 2017: The week some rain has fallen every other day for a total of .65". Warm weather (50s & 60s) with rain brought the wood frogs to our pond to mate on January 20. In the 13 years that I've been keeping records at this pond, only one year was earlier (Jan. 17, 2013). The average date for the wood frogs return is Feb. 18. Today the frogs are still singing and one large mass of eggs had been laid. Some birds are starting to sing their spring songs. Greens in the garden are actually growing.