

Condition Monitoring: *A New System for Drought Impacts Reporting through CoCoRaHS*

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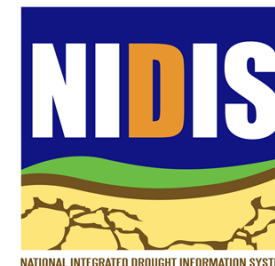
University of South Carolina

WERA 1012

Annual Conference

May 17 – 19, 2017

Estes Park, CO



Phase 1: September 2013 – December 2015

Impetus: 2012
Coastal Carolinas
DEWS Scoping
Workshop



Priority:
Drought
impacts



Recommendation: Existing tools



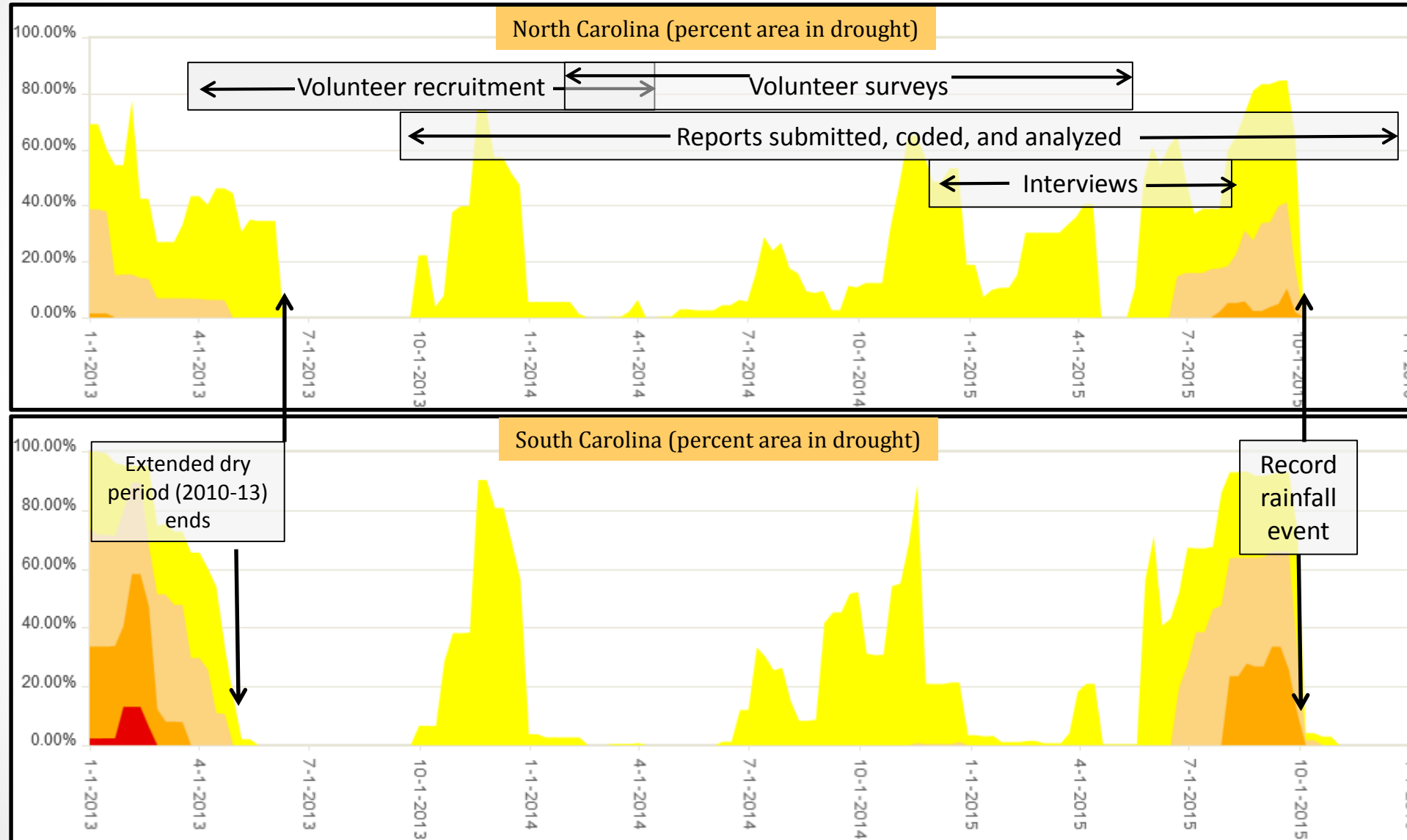
- A novel approach: “condition monitoring”



Research/project evaluation questions:

- 1) What practices and approaches are best for engaging citizen scientists around drought issues and building their capacity to participate in drought monitoring?
- 2) What types of information can volunteers provide in their “condition monitoring” reports?
- 3) How can the information add value to drought monitoring and decision making?

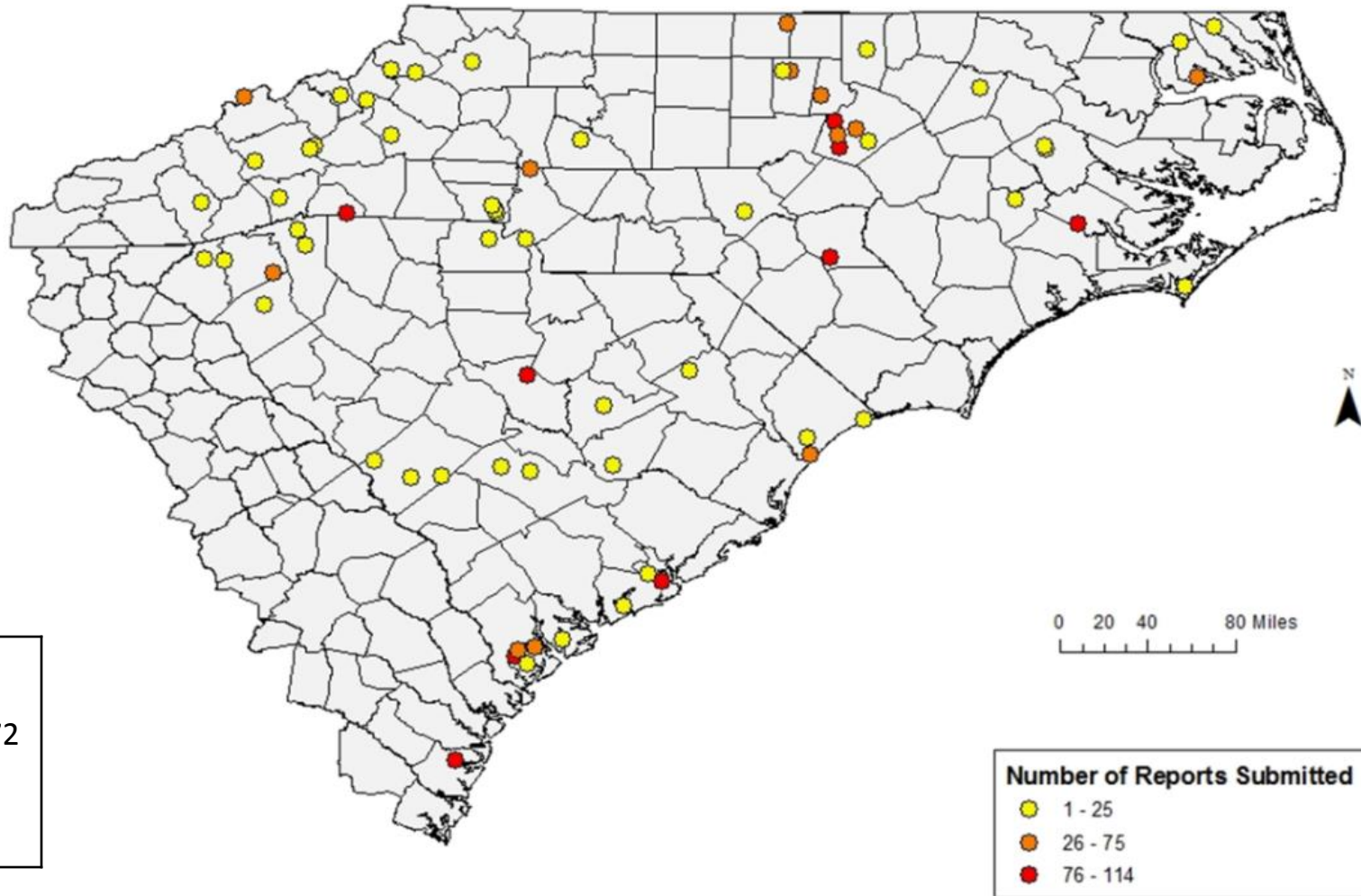
Project Components (2013-2015)



Source: US Drought Monitor, <http://droughtmonitor.unl.edu/MapsAndData/Graph.aspx>

Phase 1: Sept 2013 – Dec 2015

Condition Monitoring Reporter Locations, September 2013-December 2015



Totals

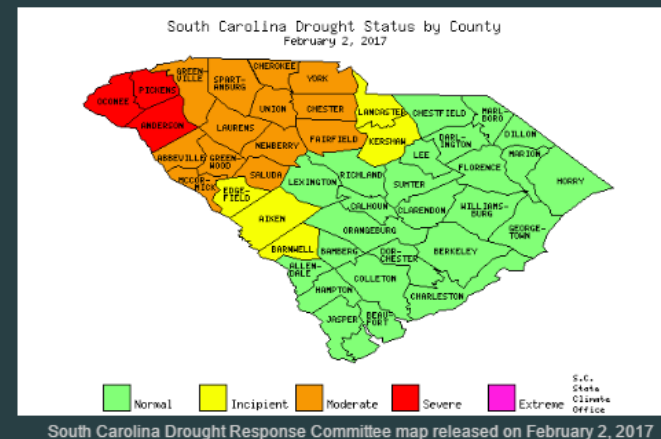
of reports submitted 1,572

of observers 68

1) What practices and approaches are best for engaging citizen scientists around drought issues and building their capacity to participate in drought monitoring?

- Training and informational materials
- Project webpage
 - www.cisa.sc.edu/CoCoRaHS.html
- Ongoing communications
 - “Cuckoo for CoCoRaHS in the Carolinas” blog
 - <https://carolinascocorahs.blogspot.com/>
 - Monthly newsletter
 - Thank You postcards
 - Observer of the month
 - Quarterly conference calls
- Surveys

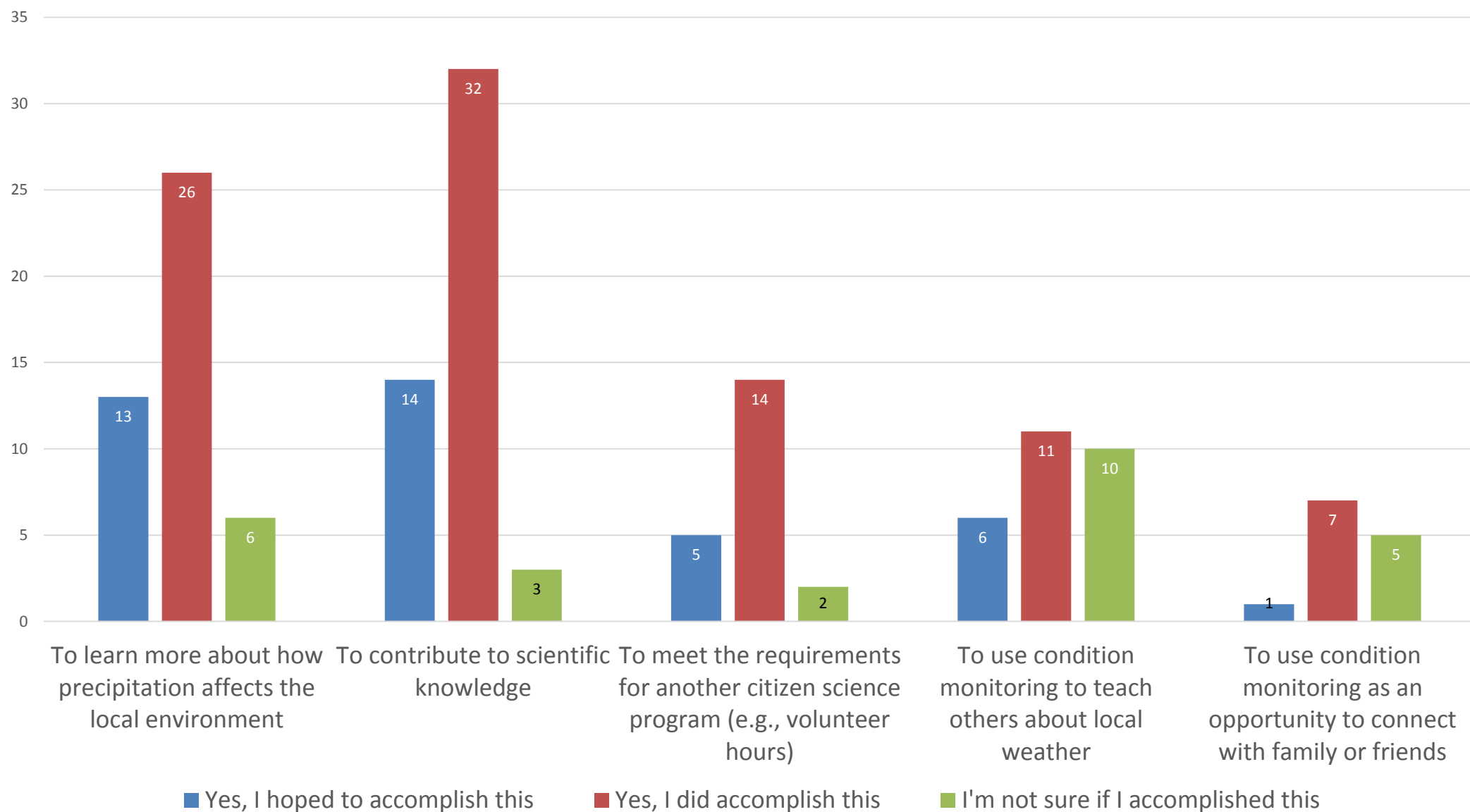
The [South Carolina Drought Response Committee](#) recently decreased the drought status for 15 counties in the central and southern regions. As of February 2nd, there were still three counties in the Northwest region of the state considered to be in severe drought, 13 counties considered to be in moderate drought and five counties with an incipient drought status.



Condition Monitoring Reports Document Drought Recovery

Condition monitoring reports help document how recent rainfall has helped to improve drought conditions and lead to drought recovery. If you are in an area that has not had sufficient rainfall in the last few months, but you are starting to measure rainfall again, please be sure to submit your condition monitoring reports to let us know how the rainfall is contributing to the health of plants, animals, and people in your area.

Please tell us what you hoped to accomplish by participating in the [project] AND whether or not you feel you have achieved your goals. (n=43)

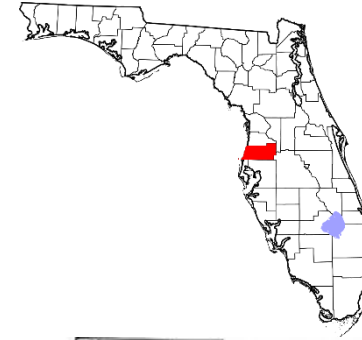


2) What types of information can observers include in their reports?

Pasco County, FL – May 15, 2017

Severely Dry

Good rain yesterday has **ground** still moist this morning! **Air quality** is better from reduced **wildfires** statewide. **Plants** are turning dark green and grass is jumping. Everything is waiting on late spring showers.



San Diego County, CA – May 16, 2017

Near Normal

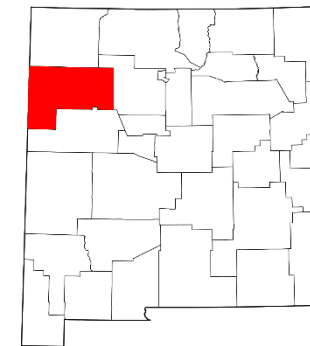
During a hike on 4/16/17 to the top of a mountain in my area a fine opportunity was provided to assess the local conditions after our **excellent rains this winter**. Overall, the impression of **appropriate seasonal lushness** is everywhere. Lake Hodges is full and extends east of the interstate that crosses it; **this eastern extension of the lake has not been possible for many years**. The lake is filled from natural runoff so is a good measure of rainfall abundance. Two turtles swimming were a delight to see. Here is a partial list of the blooming.....Invasive mustard was in abundance. **Although we have not had rain in several weeks, this is normal and the native plants are doing exactly what they should be doing** which is having a blooming spring, setting their seeds, and getting ready for the next long, dry spell.



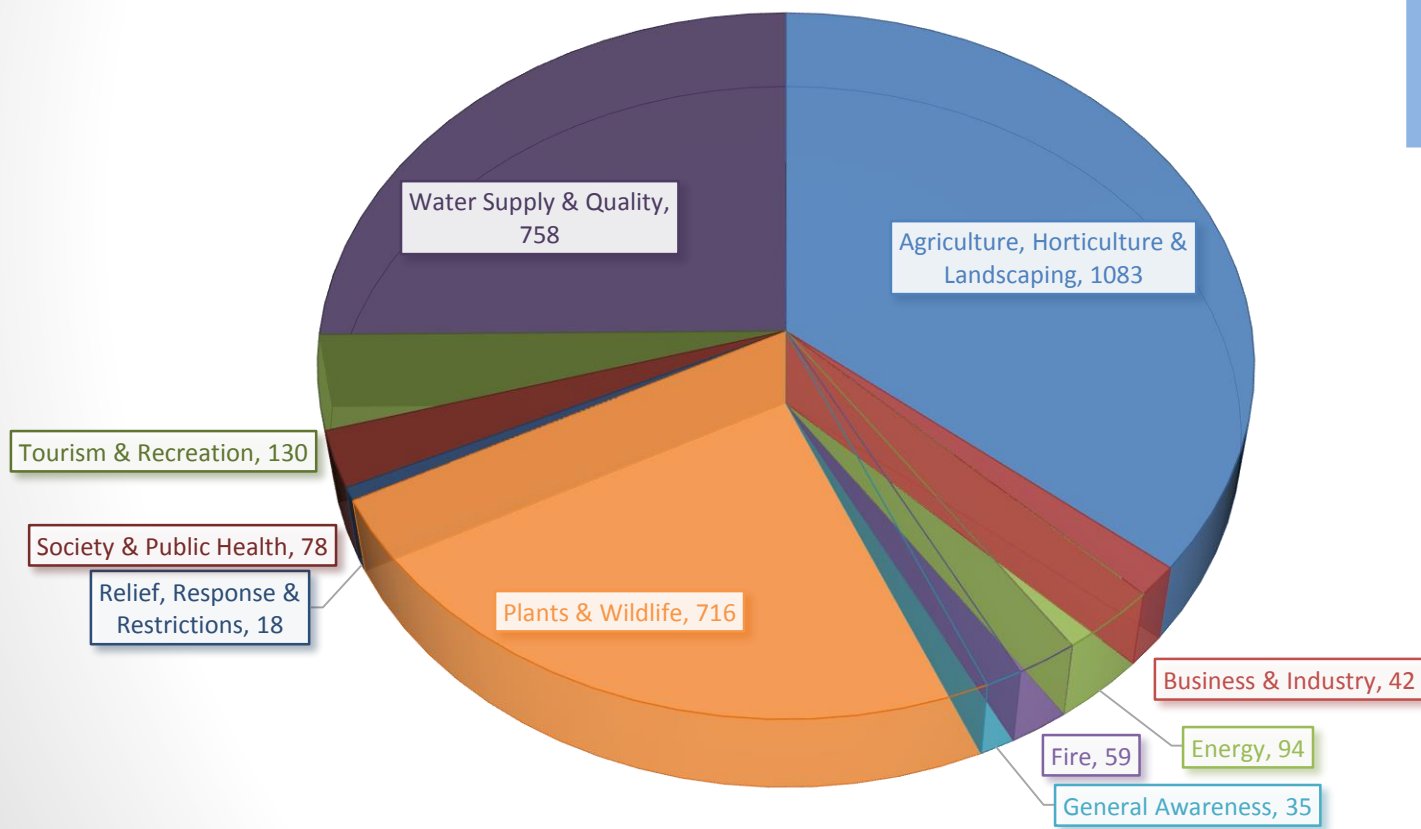
McKinley County, NM – May 15, 2017

Moderately Wet

This week saw more than 1.5" of mixed precipitation, including rain, hail, sleet, and snow, the **most precipitation in a week at my location in two years**. The ground is still mildly damp, the grass was difficult to mow in some places. Flowering plants continue to bloom. There is still standing water in some areas.



2) What types of information can volunteers provide in their condition monitoring reports?

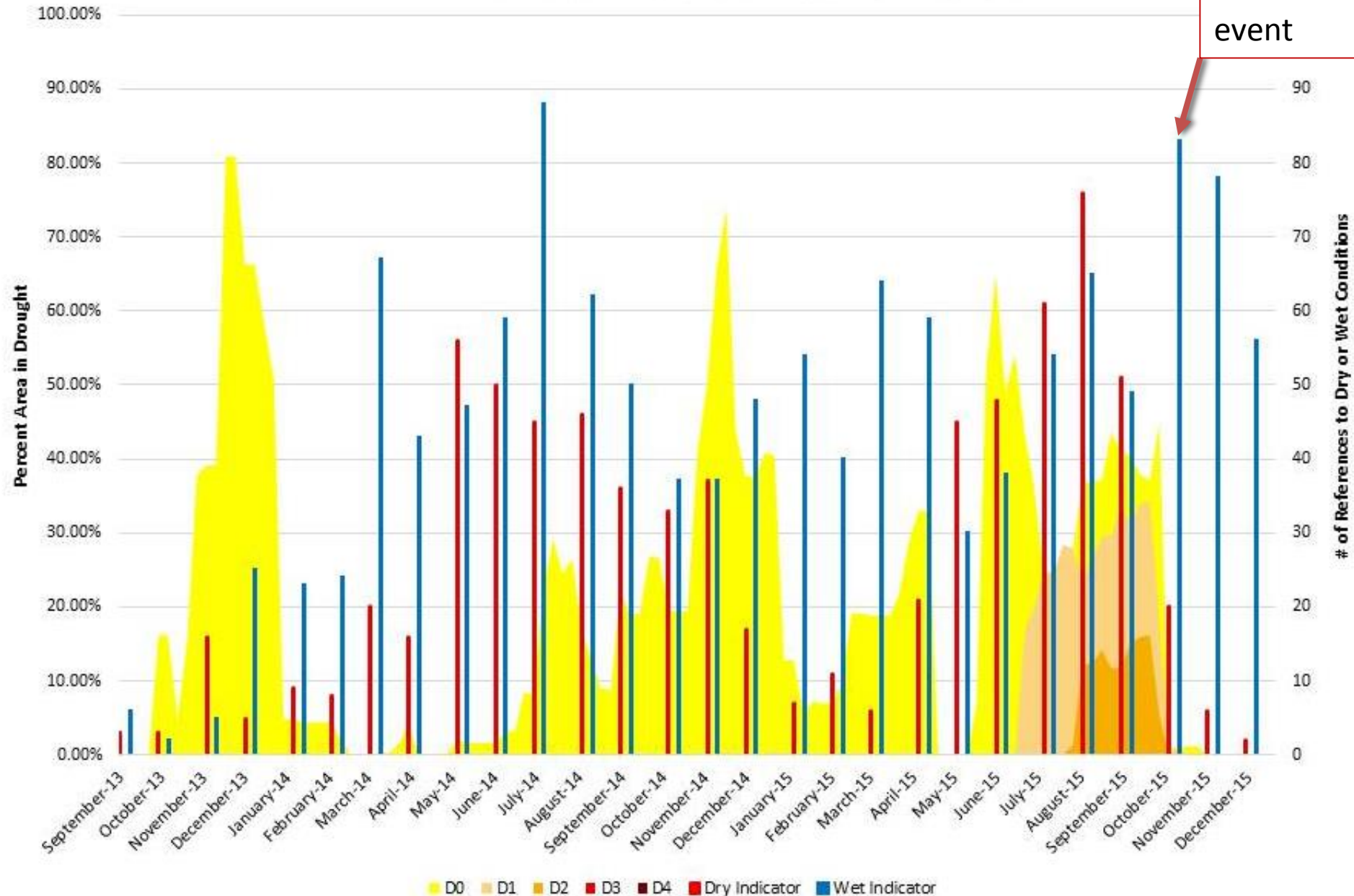


# of reports submitted, Sept 1, 2013 – Dec 31, 2015	1,572
# of coded references to all coding categories	21,216

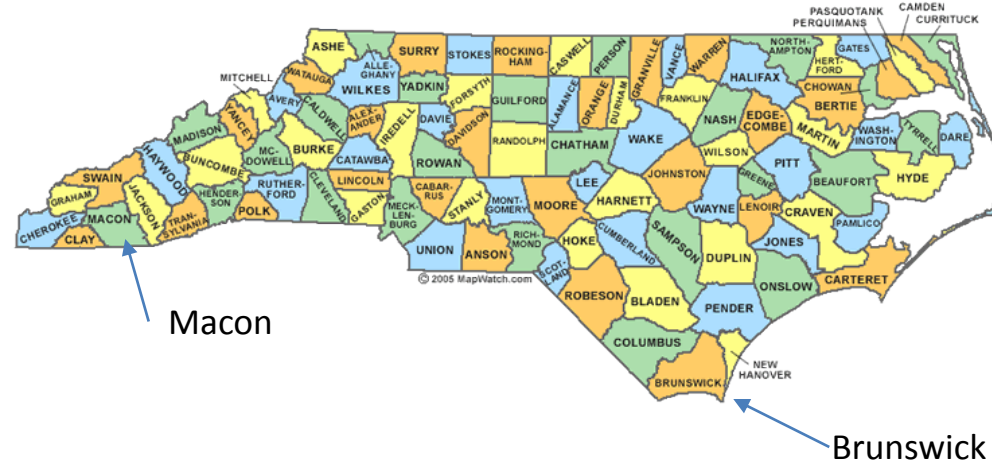
Coding Categories
Drought impacts
Weather observations
Drought onset and recovery
Spatial scale
Temporal scale

References to Dry and Wet Conditions,
With % Area in Drought (North Carolina and South Carolina)

October 2015 heavy
rainfall and flood
event



Documenting the Impacts of Extremes



Brunswick County, NC – October 15, 2016

Severely Wet

No direct impact on me, but **numerous people** in the southeast portion of the state are **severely impacted** by the aftermath of **Hurricane Matthew**. Roads are blocked, farmers' fields are inundated, homes are under water, beaches are eroded. Has the water supply been impacted by agricultural runoff? Testing stations are inaccessible due to flooding.

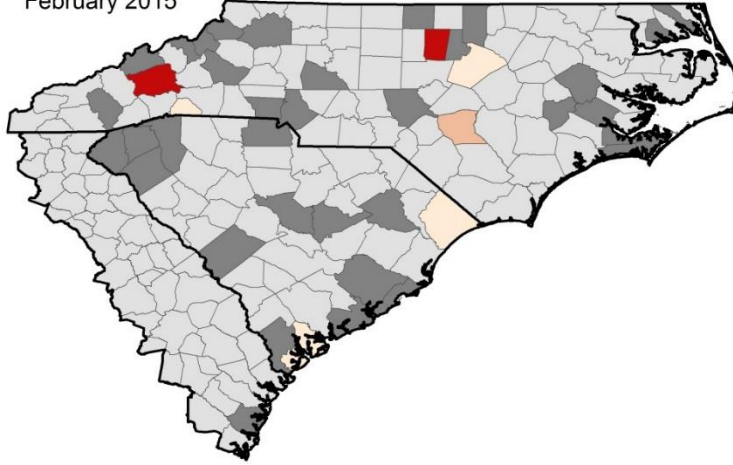
Macon County, NC – October 30, 2016

Severely Dry

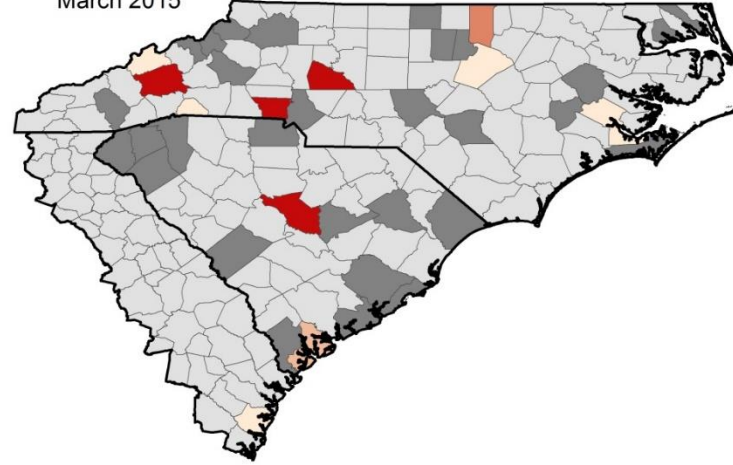
0.16 inches of rainfall this month. Extreme drought conditions in Macon, Clay, and Cherokee counties, with major crop and pasture loss. **Worst drought conditions since 2011**. Streams and rivers remain low, and many springs are completely dry. Our fall wildfire season typically runs from mid-October to mid-December. Extreme caution with fires is needed. Two wildfires burning in Macon County today. Black Hawk helicopters from Franklin have been in use.

Relative Dry Conditions by County

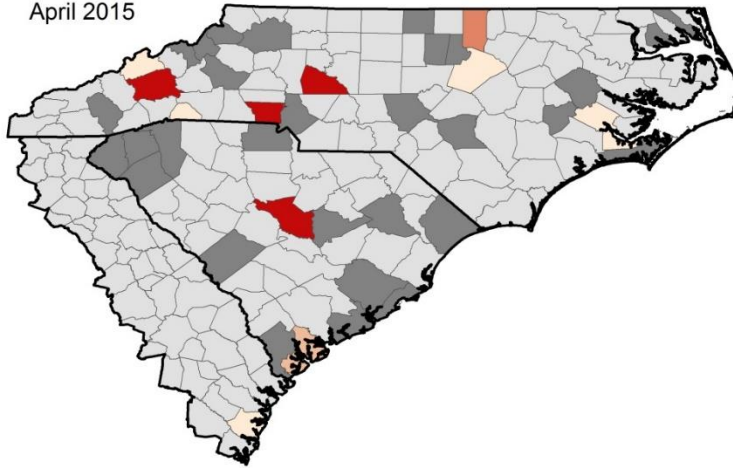
February 2015



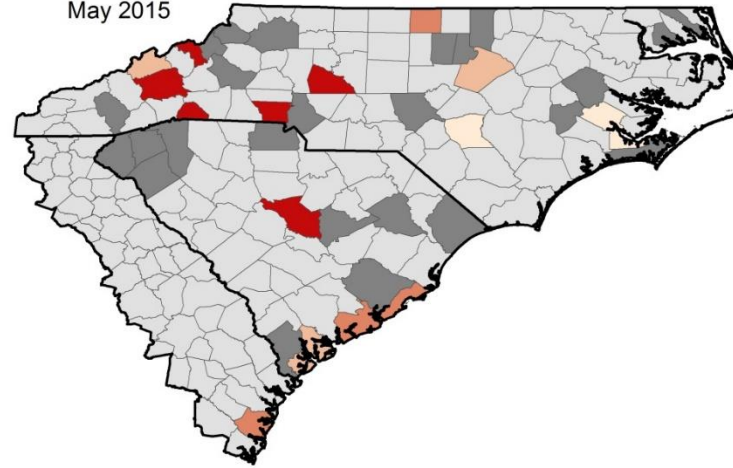
March 2015



April 2015



May 2015



These maps display the proportion of dry indicator references to the general condition references for corresponding indicator categories made by observers each month. The proportions are aggregated to the county level.

Proportion of dry condition references

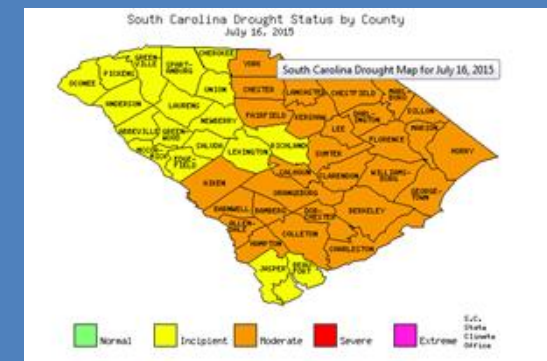
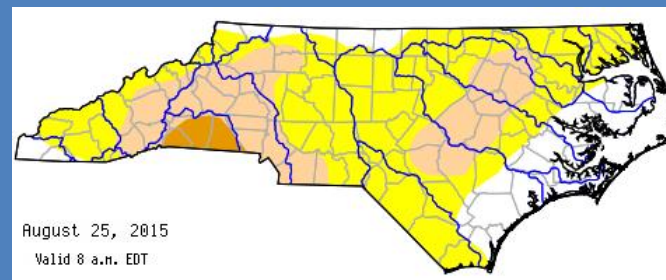
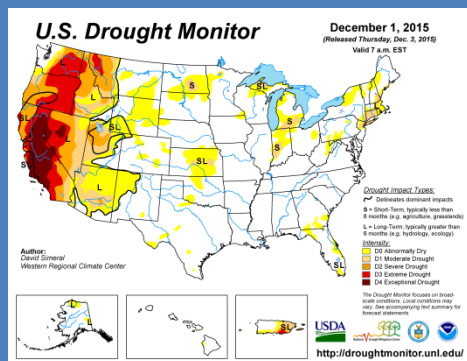


0 50 100 200 Miles

Map created by Sumi, July 2015 - data obtained from CISA and CoCoRaHS

3) How can the information add value to drought monitoring and decision making?

- Decision Maker Interviews: December 2014-September 2015
- 11 interviews, 17 interviewees
 - NDMC – USDM authors (2), Drought Impact Reporter (1)
 - CoCoRaHS (2)
 - State Climate Offices – NC (2), SC (1)
 - NWS Forecast Offices (8)
 - York County Soil & Water Conservation District (1)





Visualization and Communications Feedback

- Charts, graphs and maps:
 - Provide a useful summary of the data
 - Could be used to help identify trends
 - Onset, recovery, transitions from one level to another
- Spatial scale and aggregation of information
 - County, hydrologic (HUC) boundaries are most useful
 - However, most observations report on backyard-household scale



Phase 2: September 2015 – 2018

- Develop new tools based on Phase 1 feedback
 - Condition Monitoring Scale Bar
 - Condition Monitoring Web Map
- Expand to a national effort
 - Collaboration with CoCoRaHS
- Continue volunteer engagement
 - Recruit new participants
 - Update training materials
 - Communications and outreach
 - Surveys
- Analyze condition monitoring reports
 - Compare citizen scientists' scale bar selections with objective drought indicators
- Engage current and potential users

Drought Impact Report Form Submit Data Reset

Station Number : SC-RC-56
Station Name : Columbia 0.5 NE

The significance of drought is tied directly to the impacts that it causes. Identifying and documenting impacts as they first appear and as they continue is essential for comprehensive drought monitoring. Please refer to the [CoCoReHS training slide show](#) for reporting drought impacts.
* indicates required field

Duration
Drought is a gradual, slow-moving phenomenon. The start date is an approximation. End dates are not required.

Impact Start Date
*

End Date

Condition Monitoring
☐ Condition Monitoring Report

A **Condition Monitoring Report** allows a regular observer to describe normal conditions that are likely to change during drought, to create a basis for comparison. Please check Condition Monitoring Report if that's what you are submitting. If you aren't sure, please leave it unchecked. [More information on categories of drought impacts and reports.](#)

Description
Please provide a description of how dry, normal or wet conditions are affecting you, your livelihood, your activities, etc. *

Report Categories
Please check at least one report category. If you check a category, please provide supporting information in the description. [More information on categories of drought impacts and condition monitoring reports.](#)

If an amount of money is associated with the impact, please consider providing that information in the box to the right of the category. Including a dollar amount means you agree to allow it to be used as a summary statistic.

☐ Agriculture	\$	
☐ Business And Industry	\$	
☐ Energy	\$	
☐ Fire	\$	
☐ Plants And Wildlife	\$	
☐ Relief Response	\$	
☐ Society And Public Health	\$	
☐ Tourism And Recreation	\$	
☐ Water Supply And Quality	\$	

My Data Entry : Condition Monitoring Report Form

Condition Monitoring Report Form Submit Data Reset

Station : CO-LR-607 : Fort Collins 3.8 SSW

Condition monitoring reports are submitted on a regular (weekly, biweekly, monthly) basis to share information about the effects of local precipitation on the environment and society. By submitting reports on a regular basis, you create a baseline to see change through time, such as seasonal differences or changes caused by more or less precipitation. Please refer to the Condition Monitoring training slide show for more information.
* indicates required field

Observation Date *
4/13/2016

Condition Scale Bar [More information on the scale bar](#)

Severely Dry	Moderately Dry	Mildly Dry	Near Normal	Mildly Wet	Moderately Wet	Severely Wet
☐	☐	☐	☐	☐	☐	☐

Description
Please provide a description of how dry, normal or wet conditions are affecting you, your livelihood, your activities, etc. *

Report Categories
Please check at least one report category. If you check a category, please provide supporting information in the description. [More information on condition monitoring categories.](#)

- ☐ General Awareness
- ☐ Agriculture
- ☐ Business And Industry
- ☐ Energy
- ☐ Fire
- ☐ Plants And Wildlife
- ☐ Relief Response
- ☐ Society And Public Health
- ☐ Tourism And Recreation
- ☐ Water Supply And Quality

Submit Data Reset

Old Form/Phase 1

New Form/Phase 2

Launched on October 10, 2016!

<http://www.cocorahs.org/Content.aspx?page=cm-scalebar>

Scale bar guidance

When writing reports you can use the report categories as a guide:

Were there **Agricultural** impacts this week?

Was **Business And Industry** affected?

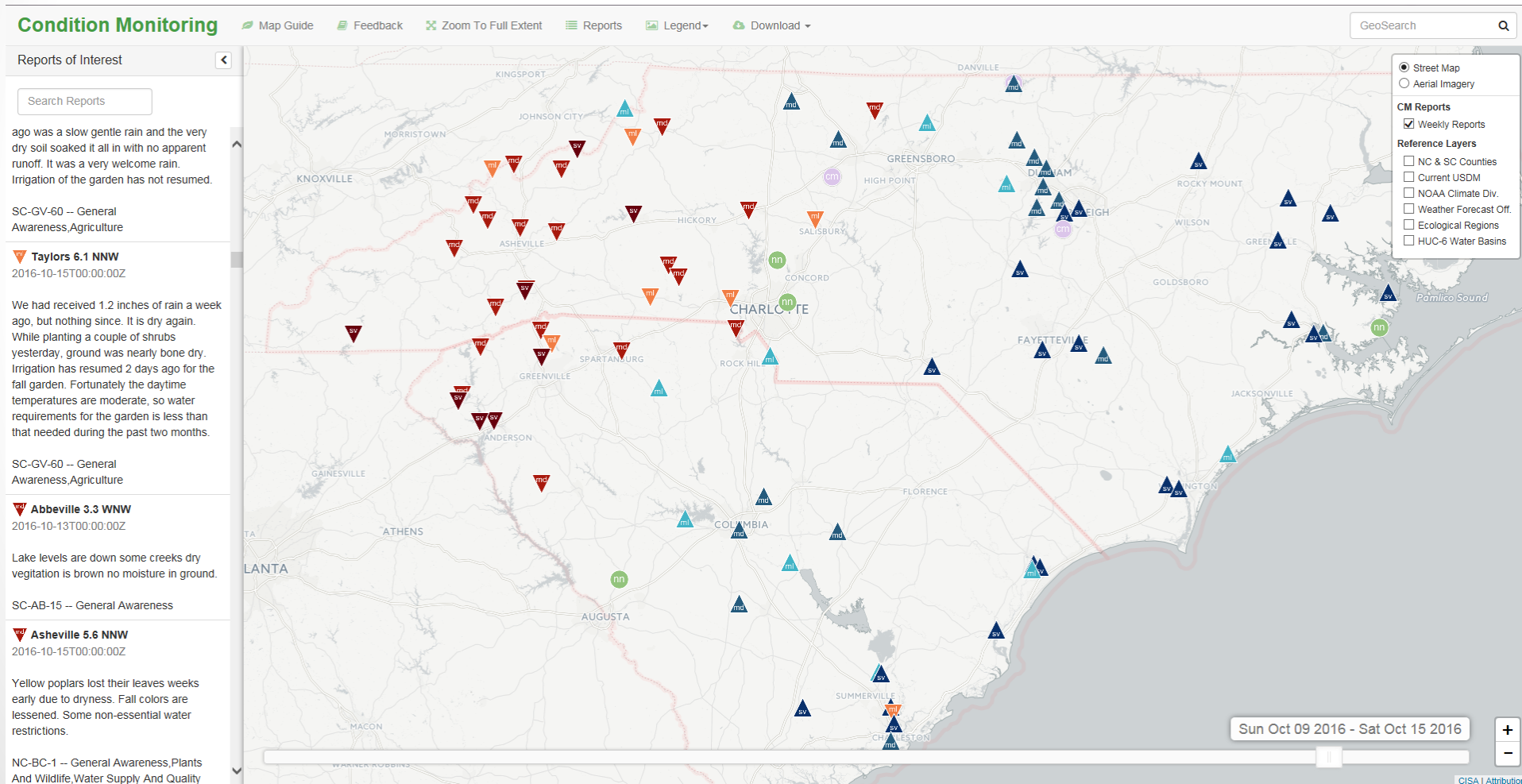
Did you notice any **Public Health** impacts?

Was there **Fire**?

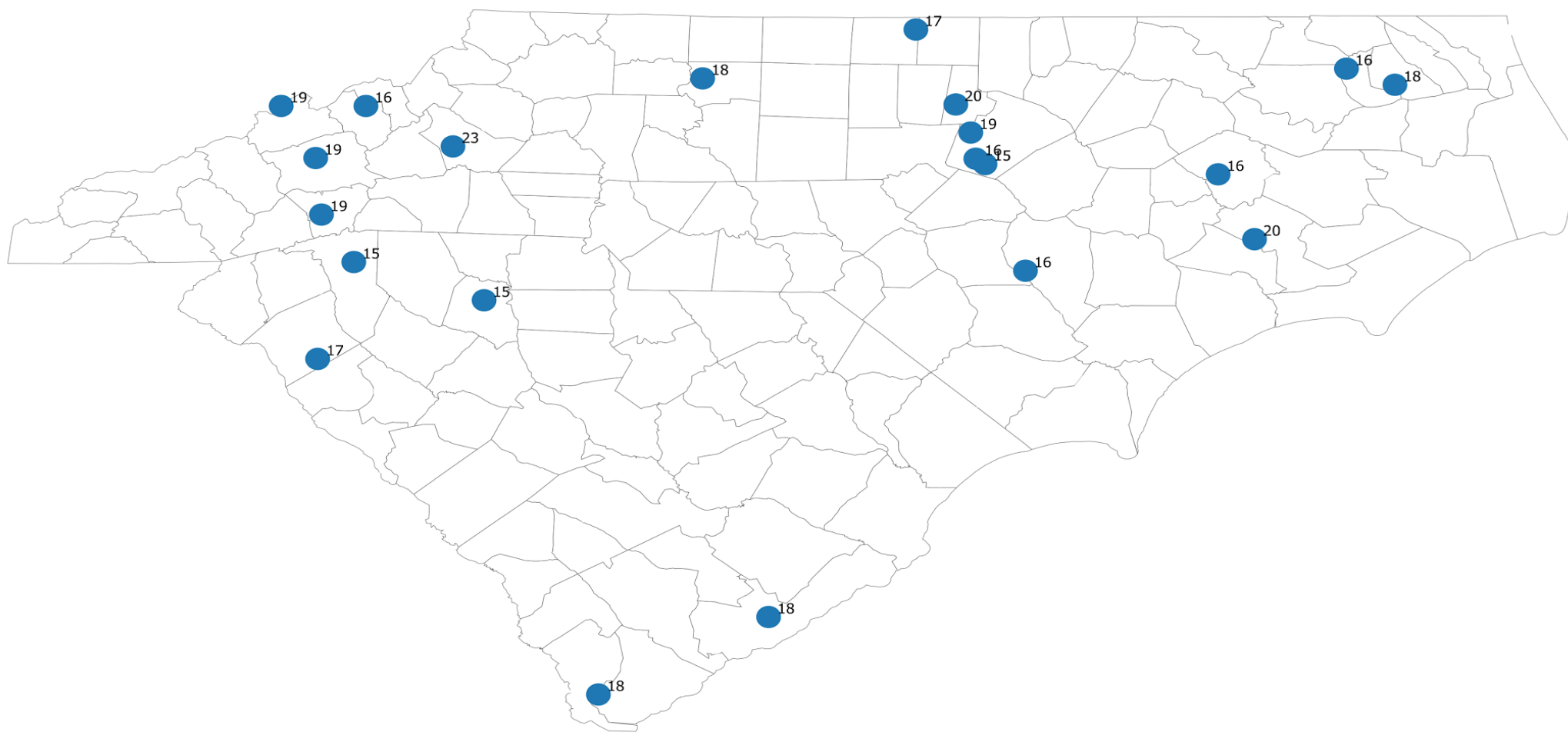
See reporting guide at <http://cocorahs.org/Content.aspx?page=condition> for more ideas on what to report.

Condition Monitoring Web Map

www.cisa.sc.edu/map



Scale Bar Analysis ~ Early Results

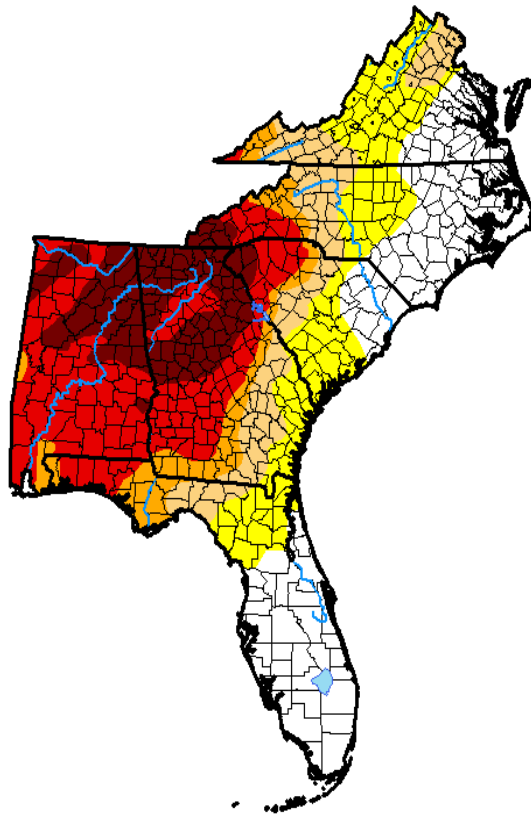


Pearson (linear) Correlation For All Reports					
Between SPEI/SPI and Scale Bar Values					
	1 month	2 month	3 month	6 month	12 month
SPEI	0.6047	0.4650	0.3722	0.4596	0.3620
SPI	0.5366	0.4115	0.3588	0.4595	0.3629
Between precipitation total from daily CoCoRaHS precipitation and Scale Bar Values					
	7 day precipitation total	Precipitation between reports			
Only 100% of obs	0.5296	0.1466			
Missing precip set to zero	0.5049	0.0227			

Pearson (linear) Correlation For Observers with 15+ Reports					
Between SPEI/SPI and Scale Bar Values					
	1 month	2 month	3 month	6 month	12 month
SPEI	0.4069	0.2863	0.2681	0.3626	0.3134
SPI	0.3428	0.2543	0.2739	0.3683	0.3133
Between precipitation total from daily CoCoRaHS precipitation and Scale Bar Values					
	7 day precipitation total	Precipitation between reports			
Only 100% of obs	0.5132	0.2326			
Missing precip set to zero	0.4015	0.2328			

Does level of dryness or wetness affect correlation?

U.S. Drought Monitor Southeast



November 29, 2016

(Released Thursday, Dec. 1, 2016)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	26.89	73.11	54.89	43.33	36.15	14.06
Last Week 11-22-2016	26.89	73.11	52.33	41.31	31.51	14.53
3 Months Ago 08-30-2016	60.51	39.49	17.61	7.85	1.41	0.00
Start of Calendar Year 12-29-2015	95.00	5.00	0.00	0.00	0.00	0.00
Start of Water Year 09-27-2016	50.04	49.96	22.51	10.61	4.15	0.32
One Year Ago 12-01-2015	94.12	5.88	0.06	0.00	0.00	0.00

Intensity

D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought
D2 Severe Drought	

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Richard Heim
NCEI/NOAA



<http://droughtmonitor.unl.edu/>

East vs. West Pearson Correlation Analysis

	"West"	"East"
All Observers	0.65 (121 observers, 480 reports)	0.48 (110 observers, 447 reports)
Observers with 15+ reports	0.46 (9 observers, 161 reports)	0.32 (12 observers, 209 reports)

Next Steps

- Volunteer recruitment and engagement
 - Communications
 - Online feedback surveys
- Continue Report analysis
 - Additional analysis to assess correlations between the scale bar and other objective drought indices
- Decision maker feedback
 - Utilize the Carolinas web map through the spring and summer
 - Share feedback about how the information may have been useful
- Going national
 - National web map to be developed
 - Regional scale bar guidance

Interested in Contributing or Providing Feedback?

- Web Map Evaluation
 - Access the web map and view condition monitoring reports
 - Participate in a follow-up conversation to let us know how you used the report information
- Regional scale bar guidance
 - Key partners to help develop guidance suitable for different regions

Thank You!

Questions or Comments?

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RISA
Regional Integrated Sciences
and Assessments

