Assessing the Usefulness of Citizen Science Information in Drought-Related Decision Making

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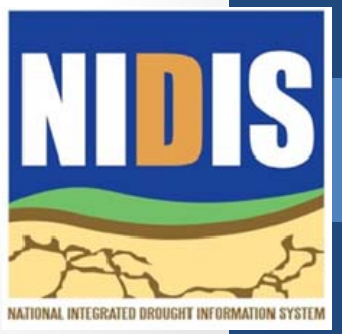
96th American Meteorological Society Annual Meeting
January 13, 2016

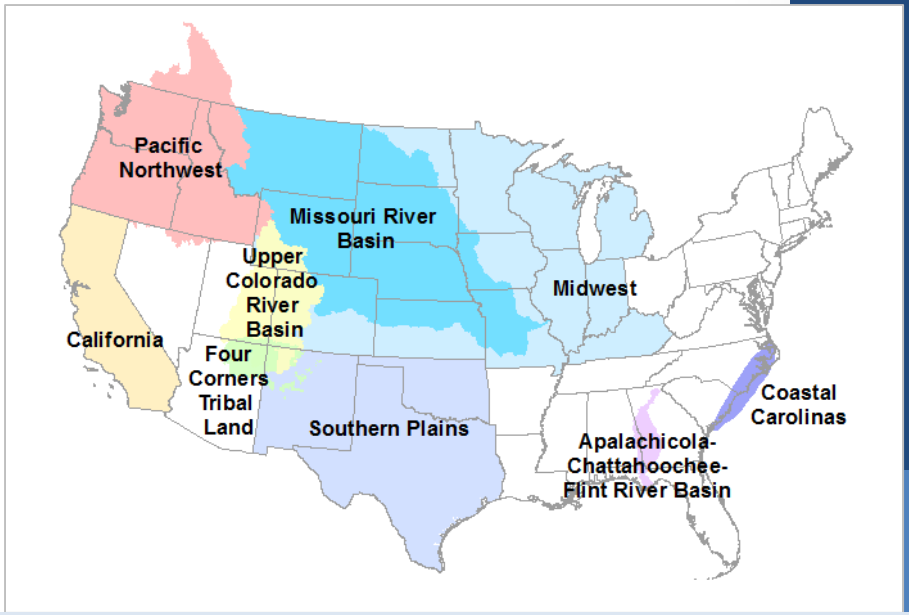


NIDIS Carolinas DEWS

2012 Scoping Workshop

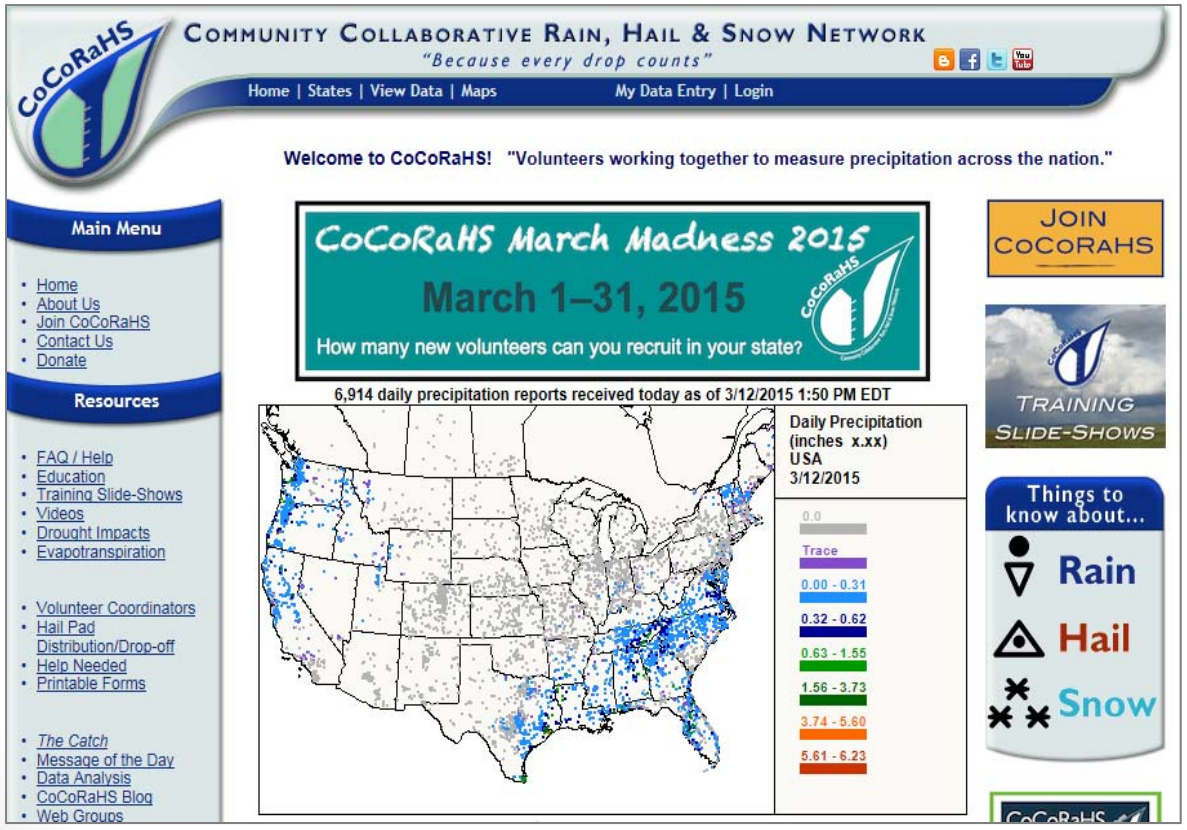
Key needs identified:

- Improve on-the-ground drought impacts monitoring and reporting
- Understand impacts not captured by traditional drought indices (e.g., agriculture, water supply, fire)
- Capture more information about drought onset , intensification, and recovery



NIDIS Regional Drought Early Warning System Programs

Community Collaborative Rain, Hail & Snow Network



- Daily precipitation measurements
- Severe weather reports
- Drought impact reports
  - Incorporated into the National Drought Impacts Reporter

Research questions

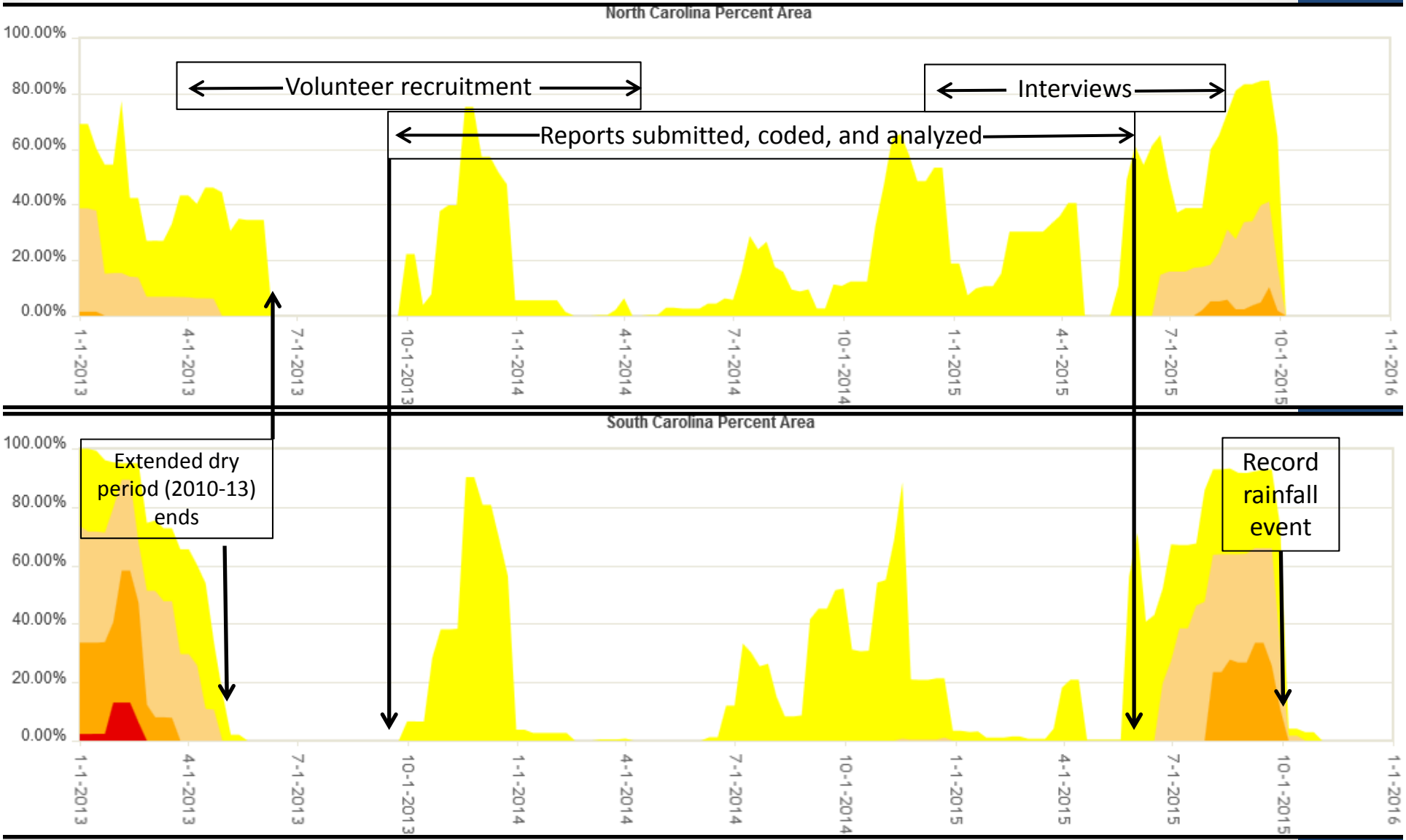
- How effective is citizen science, using the CoCoRaHS network, as a tool to improve understanding of drought impacts?

- Is information collected by CoCoRaHS observers considered credible and reliable information by drought decision makers and resource managers?

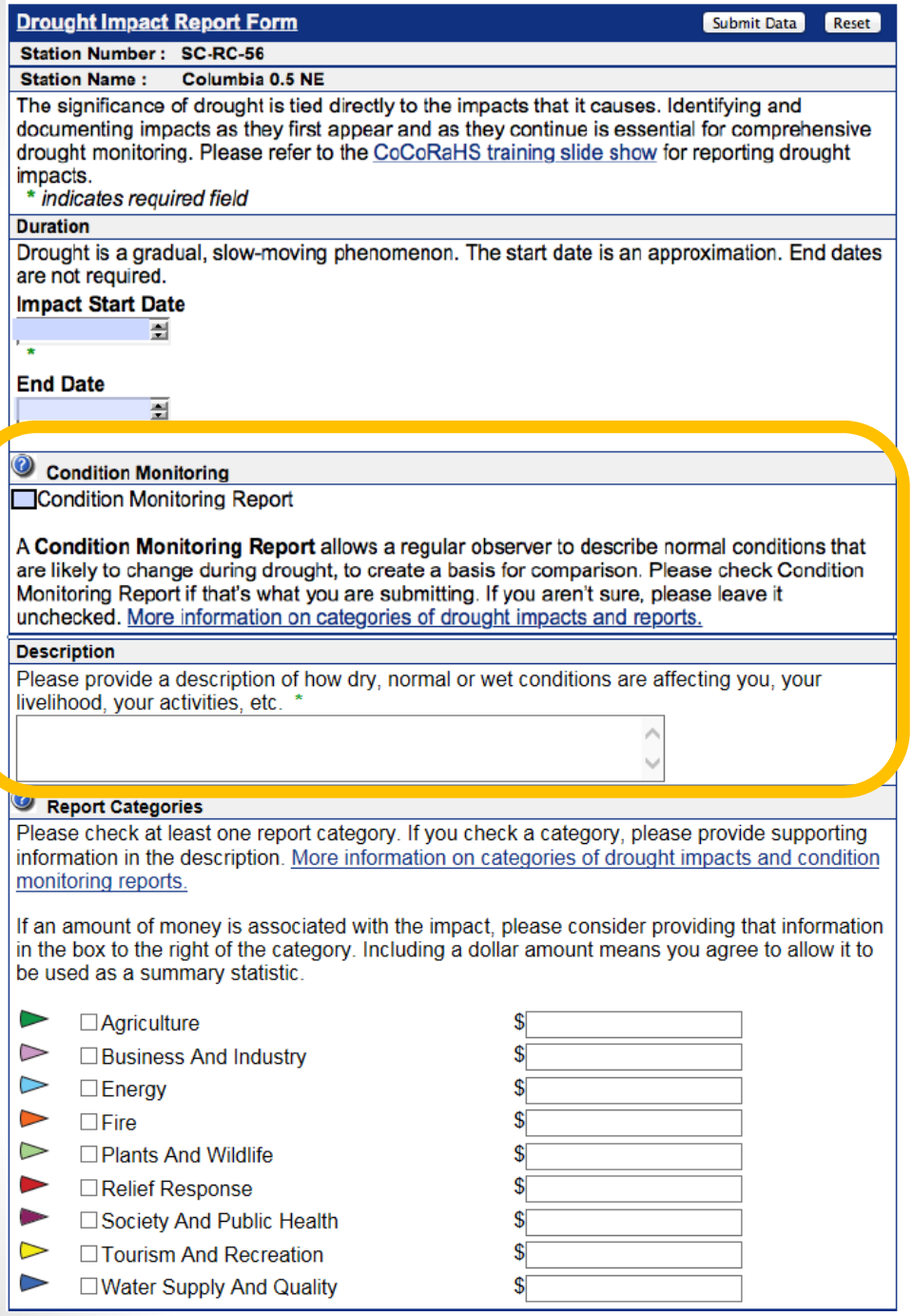
- How can the information provided through the CoCoRaHS-citizen science network be used to support drought monitoring, planning, and preparedness activities?

Findings are informing “Phase 2”

Project Components (2013-2015)



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



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 CoCoRaHS 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.

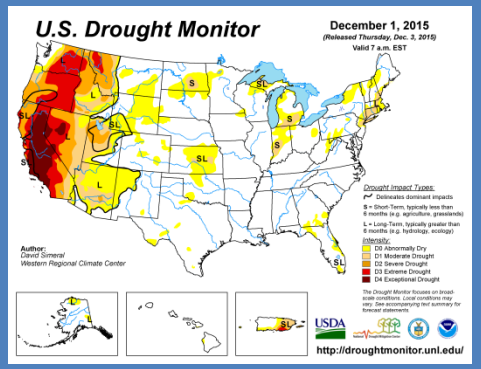
☐ Agriculture	$
☐ Business And Industry	$
☐ Energy	$
☐ Fire	$
☐ Plants And Wildlife	$
☐ Relief Response	$
☐ Society And Public Health	$
☐ Tourism And Recreation	$
☐ Water Supply And Quality	$

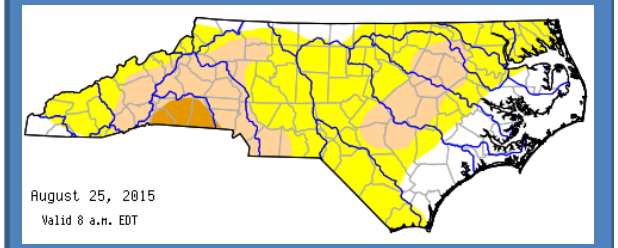
Condition Monitoring Report Information	
# of reports submitted, Sept 1, 2013 – June 30, 2015	1,154
# of observers who submitted reports	66
# of coded references to all coding categories	13,512
# of references to drought impact categories	6,538

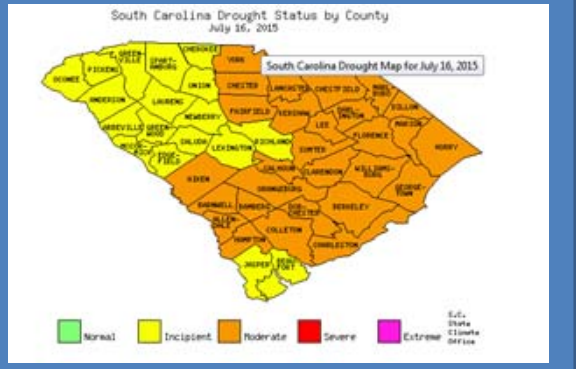
Coding Categories
Drought impacts
Weather observations
Drought onset and recovery
Spatial scale
Temporal scale

Decision Maker Interviews

- December 2014-September 2015
- 17 interviewees
  - USDM, Drought Impact Reporter, SCOs, CoCoRaHS, NWS Forecast Offices, Soil & Water Conservation District
- Questions about the usefulness and usability of information
  - Report content
  - Reliability and credibility
  - Visualization and communication







Elements of usable climate science

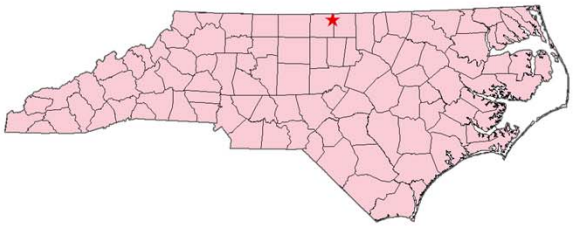
(Dilling and Lemos 2011)

Contextual factors (users)	Intrinsic factors (producers)
Institutional setting • Formal rules, established practices	Sensitivity to the decision context
"Fit" w/decisions, goals	"Fit" w/spatial, temporal scales of decisions
Organizational context • Reward structures, capacity to innovate	Level of skill
Cultural context of information • uncertainty	Trust, legitimacy
Capacity to implement	Accessibility, availability of information

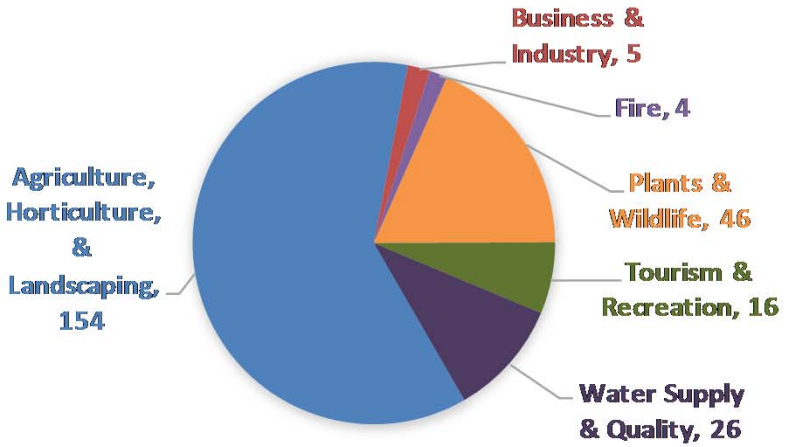
Drought decision makers/information providers = users
Citizen scientists/volunteers = providers

"Observer Case Studies"

NC-CS-1 (Milton 5.7 SSE)



Report Content
(251 coded references in 30 reports)



County	Caswell
Watershed	**HUC8:** Lower Dan, **HUC6:** Roanoke
NC Planning Basin	Roanoke
CoCoRaHS Observer Since	November 1, 2007
2013-2014 Water Year Days Reported	365
Condition Monitoring Reporter Since	February 2014
Condition Monitoring Reports Submitted (11/14)	31
Chosen as case study observer because	Consistent reporter, variety of information in reports, in an area designated as abnormally dry by the US Drought Monitor

Oct 2013-Sept 2014	Water Year Total	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
CoCoRaHS Observer NC-CS-1	42.06"	1.52"	2.16"	4.81"	3.49"	2.05"	1.55"	4.60"	5.14"	2.43"	4.22"	3.29"	4.53"
Nearest Co-op Station (7.7 miles)	48.9"	0.87"	2.75"	5.73"	4.61"	2.59"	5.66"	5.63"	6.3"	2.05"	3.35"	3.77"	5.59"

Report Content

- Any drought impact information is valuable
  - However, the extent to which it is used and how depends on organizational context, capacity, and drought role

"We've been watching conditions quickly deteriorate in the western half of NC over the last few weeks and these have been **invaluable sources of on-the-ground information**.

"This is a time of year where there still aren't many impacts to be felt in more "typical" sectors such as agriculture. **The wealth and detail of information in these reports is amazing** -- from talking about stagnant creeks that were flowing only a few weeks ago, to squishy yards, to the species of plants that are emerging.

"Connecting the information in these reports with objective indicators such as streamflow levels or SPI really gives us a fuller picture of what's happening in parts of the state." *-State Climate Office of NC, April 2015*

Report Content

- Seasonal conditions
  - spring planting, spring floods
- Onset and intensification

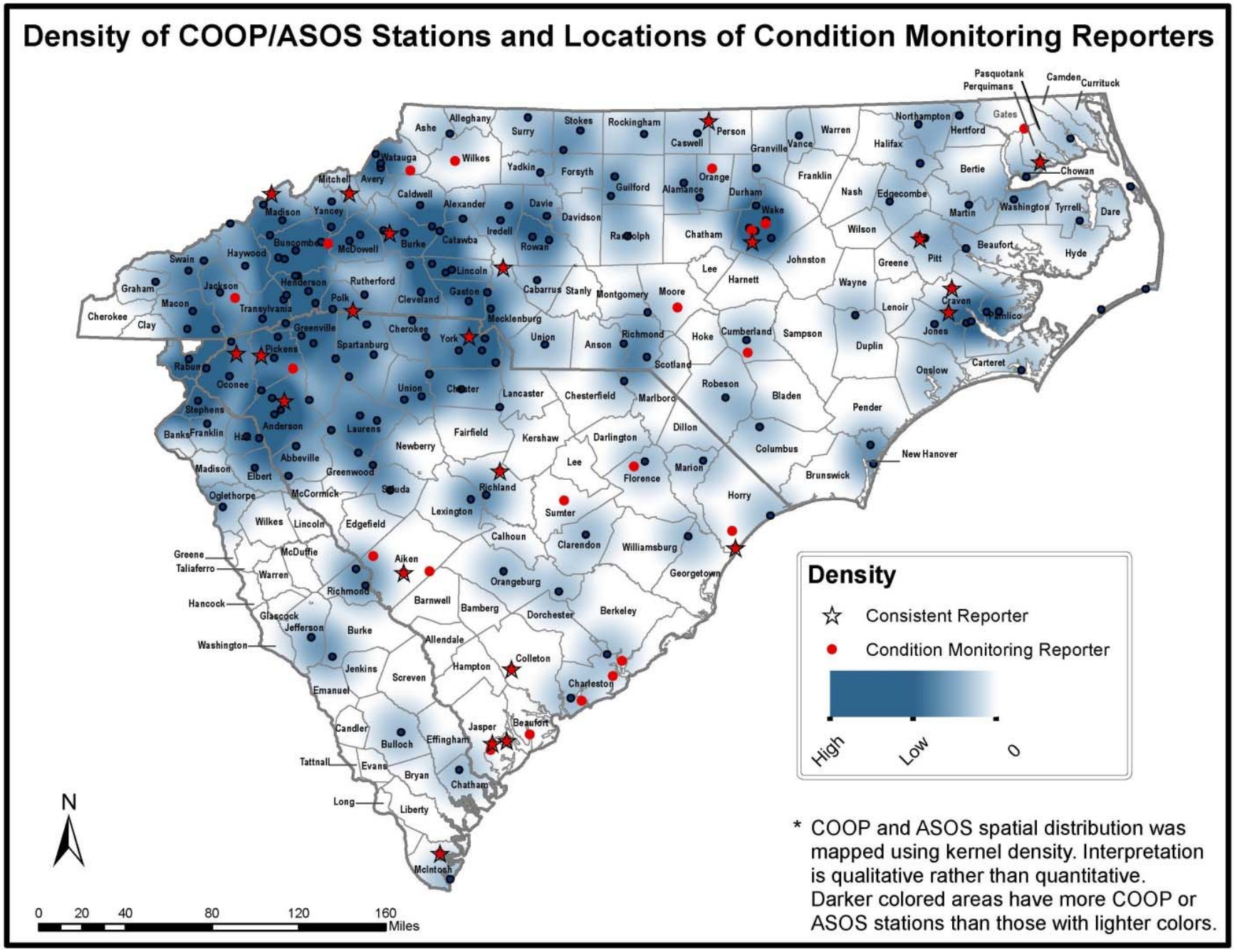
Pickens County, SC, April 20-June 10, 2014 - Incipient drought is now occurring in western Pickens County, SC. Except for a 3.14" single day rainfall on May 15, only 2.12" of rain has fallen during a 51 day span from April 20 to June 10. Irrigation has become an increasingly normal activity for both agriculture and (in my case) horticulture. Year to date rainfall at SC-PC-1 is only 20.71" or about 7 inches below normal.

Gaston County, NC, May 1, 2015 – 47 days from impact start date with 1.13 inches of precipitation at station NC-GS-28. Paired with record breaking heat, fescue lawns suffering significantly. Non-irrigated lawns have long since entered complete dormancy and/or death. Irrigated lawns also showing significant stress.

Rowan County, NC, May 27, 2015 – We have had only 0.37" of rain since 4/27. During this 31 day period we have had less than 10% of our normal rainfall. Strawberry farms are watering their fields daily. … Fields and yards that are not watered have been turning brown and/or yellow. Burning permits are not being issued without severe restrictions.

Polk County, NC, June 21, 2015 – The topsoil across the property is mostly dry. We needed to irrigate our orchard twice this past week and water plants in the garden. The heat (daily highs in the 90s) has probably been an additional stress on plants.

Density of COOP/ASOS Stations and Locations of Condition Monitoring Reporters

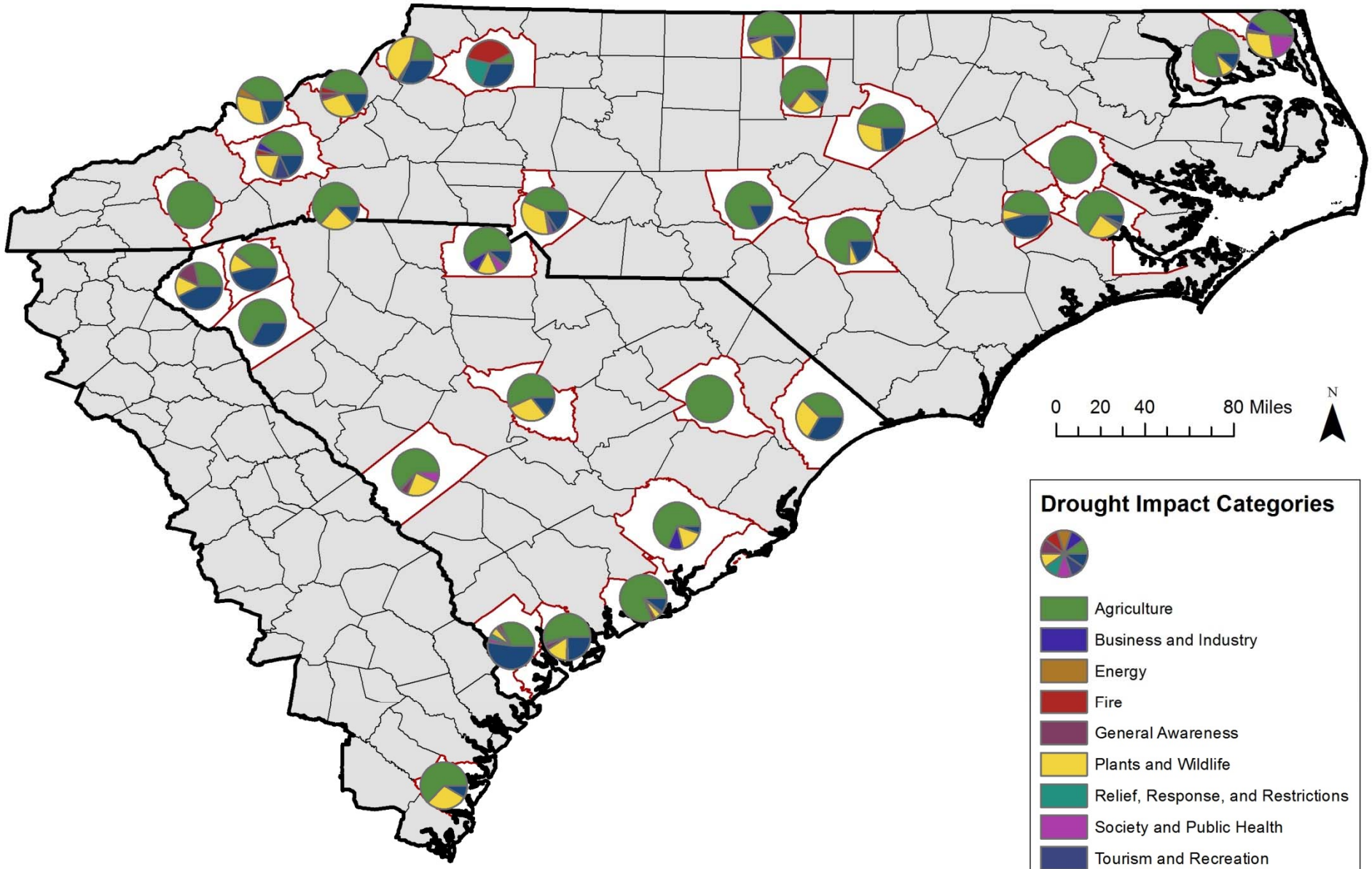


* COOP and ASOS spatial distribution was mapped using kernel density. Interpretation is qualitative rather than quantitative. Darker colored areas have more COOP or ASOS stations than those with lighter colors.

Reliability and credibility

- Local variability expected
- Consistency in reporting precipitation measurements adds value to condition monitoring observations
  - Reporting “zero” (0.00”)
- Used in conjunction with other data and information
- Additional, “baseline” information about the observer context and expertise could be helpful

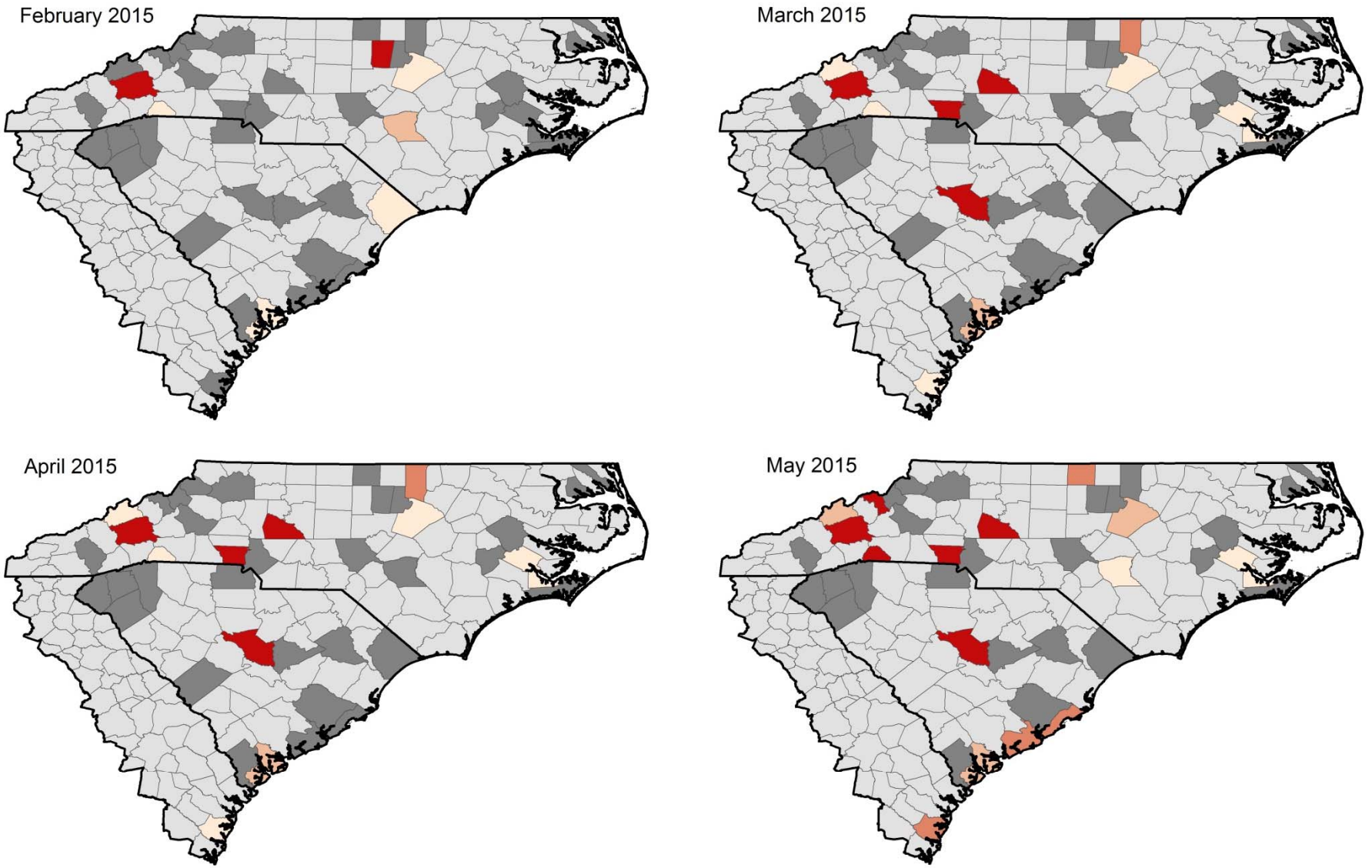
Report Content, Coded by Drought Impact Categories



This map displays impacts reported in each county from September 2013 to June 2015 coded according to the drought impact categories used by the National Drought Impacts Reporter.

Created by Sumi Selvaraj, December 2015
Data Obtained from CISA and CoCoRaHS, 2014-2015

Relative Dry Conditions by County



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

- No dry conditions reported
- 0.01 - 0.25
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00

N

0 50 100 200 Miles

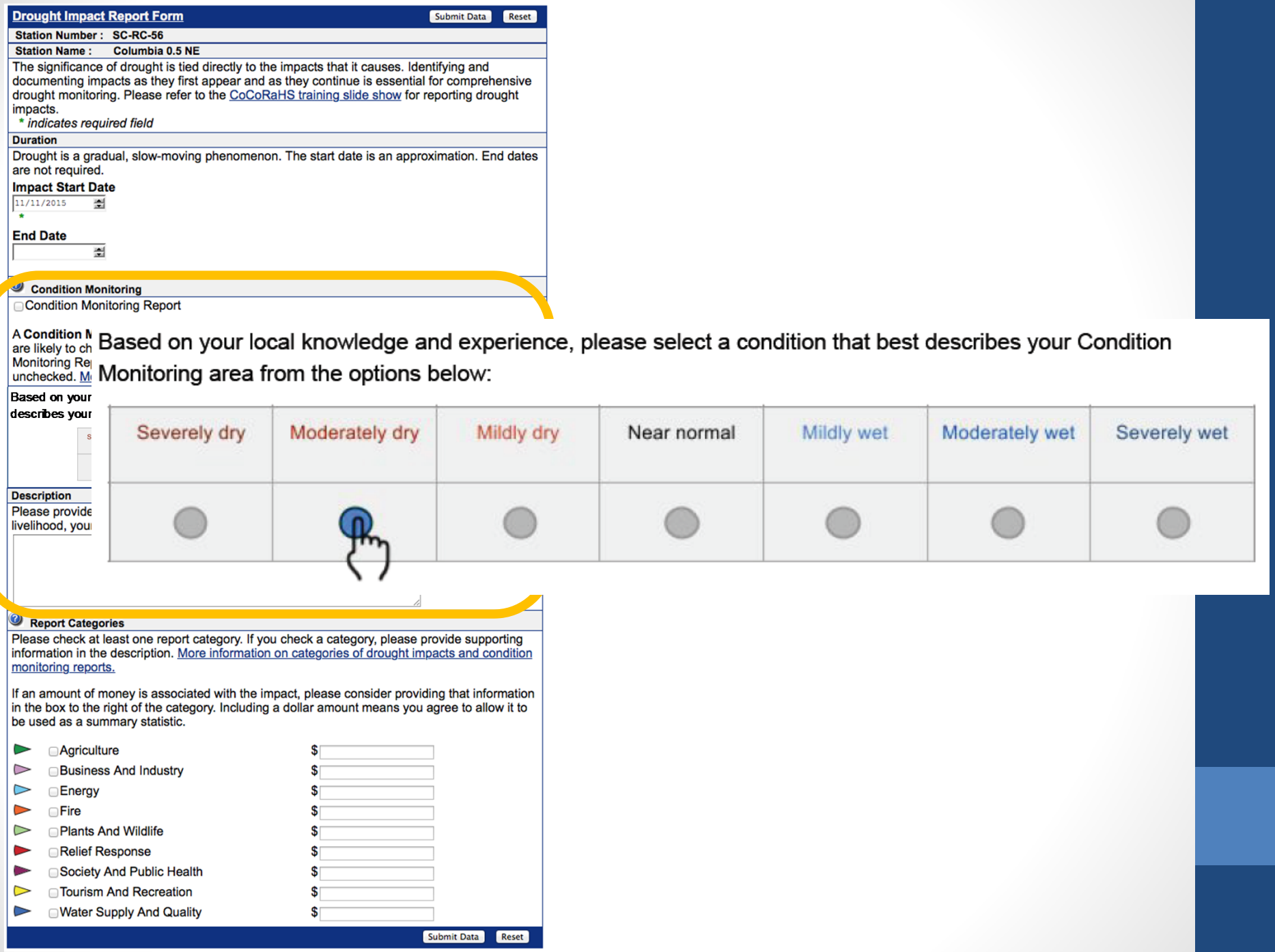
Map created by Sumi, July 2015 - data obtained from CISA and CoCoRaHS

Visualization and communication

- 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

Summary

- Project confirmed the value of CoCoRaHS as a tool for condition monitoring
  - NC SCO currently uses reports for weekly drought monitoring
- Limitations and suggestions
  - Real-time “translation” of information and ongoing engagement with volunteers are resource-intensive
  - Limited drought conditions during study period
  - Difficult for many users to access information
    - Streamlined process to view and access reports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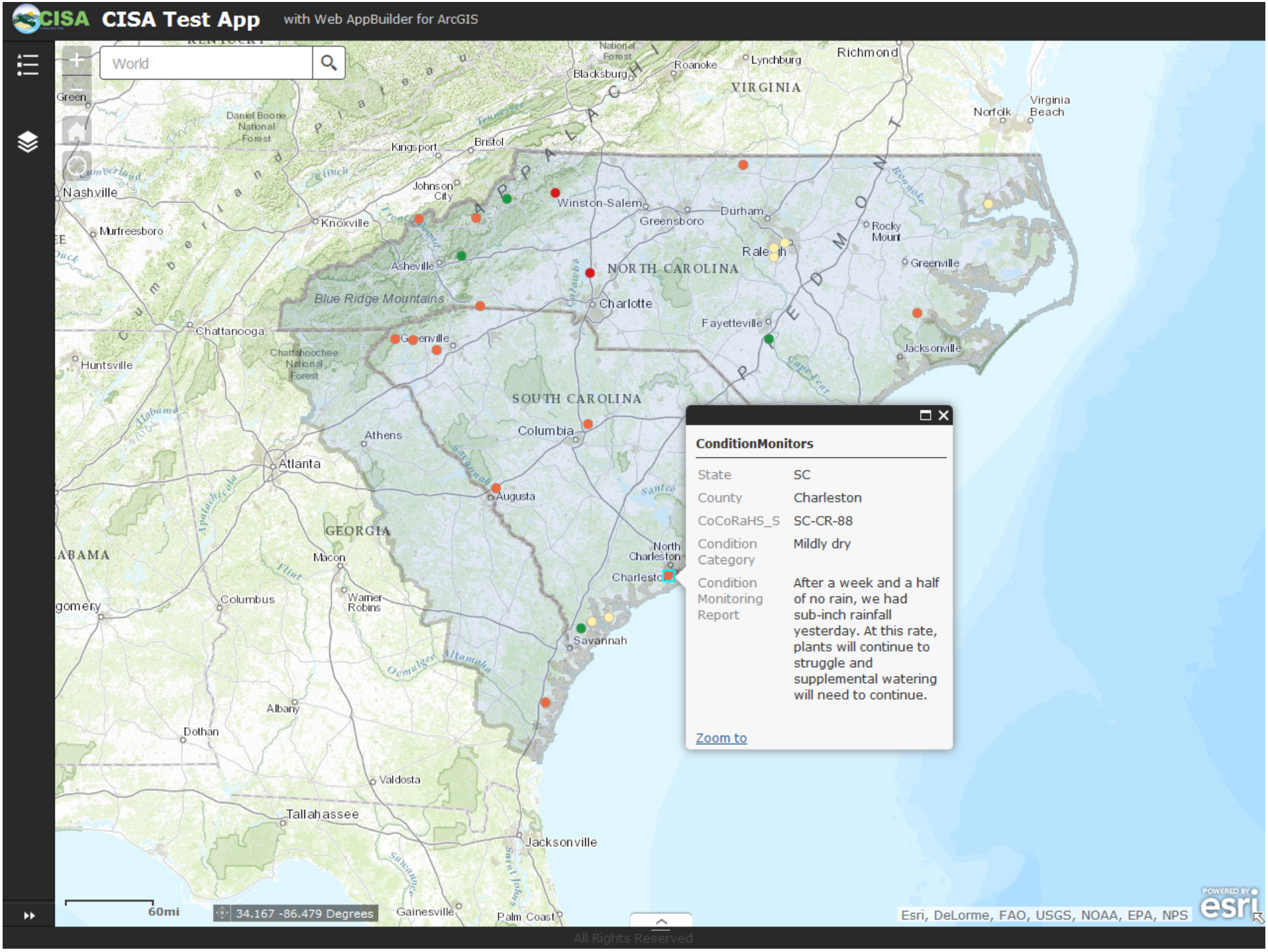
* indicates required field
Duration
Drought is a gradual, slow-moving phenomenon. The start date is an approximation. End dates are not required.
Impact Start Date
11/11/2015
End Date
Condition Monitoring
Condition Monitoring Report
Based on your local knowledge and experience, please select a condition that best describes your Condition Monitoring area from the options below:
Severely dry
Moderately dry
Mildly dry
Near normal
Mildly wet
Moderately wet
Severely wet
Description
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
Submit Data
Reset


CISA Test App
with Web AppBuilder for ArcGIS
World
ConditionMonitors
State SC
County Charleston
CoCoRaHS_S SC-CR-88
Condition Category Mildly dry
Condition Monitoring Report After a week and a half of no rain, we had sub-inch rainfall yesterday. At this rate, plants will continue to struggle and supplemental watering will need to continue.
Zoom to
60mi
34.167 -86.479 Degrees
Esri, DeLorme, FAO, USGS, NOAA, EPA, NPS
All Rights Reserved

Thank You!

Questions or Comments?

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http://www.cisa.sc.edu/cocorahs.html