What Can Citizen Scientists Tell Us about Drought?

Using CoCoRaHS to Improve the Monitoring and Reporting of Drought Impacts

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University of South Carolina

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October 12-13, 2016
Key information needs identified by workshop participants:

- Improved on-the-ground drought impacts monitoring and reporting

- Understanding impacts not captured by traditional drought indices (e.g., agriculture, water supply, fire)

- Capturing more information about drought onset, intensification, and recovery
Community Collaborative Rain, Hail & Snow Network

- Daily precipitation measurements using the “official” 4” CoCoRaHS rain gauge
- Severe weather reports
- Drought impacts reports
  - Incorporated into the National Drought Impacts Reporter
- Online data entry (mobile apps also available)
Project Components

Volunteer recruitment
Reports submitted, coded, and analyzed
Interviews

Extended dry period (2010-13) ends
Record rainfall event

Source: US Drought Monitor, http://droughtmonitor.unl.edu/MapsAndData/Graph.aspx
Weekly Condition Monitoring
Connecting weather and climate to the environment

CISA recruited volunteers to submit weekly condition monitoring reports in addition to their daily precipitation measurements.

Regular observations help to identify:
• The early signs of drought
• When conditions begin to improve
• Any lingering impacts
Volunteer Training & Engagement

- In-person trainings
- Webinars
- Training and informational materials
- Project webpage
  - [www.cisa.sc.edu/CoCoRaHS.html](http://www.cisa.sc.edu/CoCoRaHS.html)
- Ongoing communications with participants
  - “Cuckoo for CoCoRaHS in the Carolinas” blog
    - [https://carolinascocorahs.blogspot.com/](https://carolinascocorahs.blogspot.com/)
- Monthly newsletter
- Thank You postcards
- Quarterly conference calls
Sample Reports

Pickens County, SC, September 18, 2015
Dry conditions persist in the Easley area. Local streams are well below average. Ground is hard and difficult to dig. Some leaves are beginning to fall on top of the already dry grass.

Richland County, SC, October 18, 2015
From Sep 22 to Oct 12 we've had 25.44 inches. The springs in our neighborhood have been "bleeding" since the heavy rain during the first weekend in October. This has slowed during the last few days.
## Report Analysis

**Condition Monitoring Report Information**

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
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<tbody>
<tr>
<td># of reports submitted, Sept 1, 2013 – December 31, 2015</td>
<td>1,572</td>
</tr>
<tr>
<td># of observers who submitted reports</td>
<td>68</td>
</tr>
<tr>
<td># of coded references to all coding categories</td>
<td>21,216</td>
</tr>
<tr>
<td># of references to drought impact categories (e.g., agriculture, water quality and supply, recreation and tourism, etc.)</td>
<td>8,221</td>
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</table>

The pie chart illustrates the distribution of reported impacts across various categories:

- **Agriculture, Horticulture & Landscaping**: 1,083
- **Water Supply & Quality**: 765
- **Plants & Wildlife**: 716
- **Relief, Response & Restrictions**: 18
- **Business & Industry**: 42
- **Energy**: 94
- **Fire**: 59
- **General Awareness**: 35
- **Society & Public Health**: 78
- **Tourism & Recreation**: 130
Other weather observations include: cloudiness, dew, fair weather, fog, frost, humidity, sunny, and wind.
References to wet and dry conditions

[Bar chart showing the number of references to wet and dry conditions over time, with separate bars for 'All dry indicators' and 'All wet indicators'.]
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)
Summary of Findings

• 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
Summary of Findings: 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
My Data Entry: Condition Monitoring Report Form

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

<table>
<thead>
<tr>
<th>Severe Dry</th>
<th>Moderately Dry</th>
<th>Mildly Dry</th>
<th>Near Normal</th>
<th>Mildly Wet</th>
<th>Moderately Wet</th>
<th>Severely Wet</th>
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Description

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

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<thead>
<tr>
<th>Report Categories</th>
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<tbody>
<tr>
<td>General Awareness</td>
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<td>Agriculture</td>
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<td>Business And Industry</td>
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<tr>
<td>Energy</td>
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<td>Fire</td>
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<tr>
<td>Plants And Wildlife</td>
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<td>Relief Response</td>
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<td>Society And Public Health</td>
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<td>Tourism And Recreation</td>
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<td>Water Supply And Quality</td>
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Greenville County, SC – Monday, October 10, 2016

We were "Severely Dry" before the 1.2 inches of gentle rain we received on Oct. 7. No rain since, so soil does have moisture from that rain. Bare packed garden soil is still moist on top at mid-day. Recovery of centipede grass in lawn seems to begin to show signs of recovery. The 1.2 inches of rain we had a few days ago was a slow gentle rain and the very dry soil soaked it all in with no apparent runoff. It was a very welcome rain. Irrigation of the garden has not resumed.

*Scale Bar Level – Mildly Dry*

Beaufort County, SC – Tuesday, October 11, 2016

It has been mildly dry this month, until last Friday when Hurricane Matthew hit. Recorded 10.63" of rain total. Mandatory evacuation. Returned last evening. Water everywhere, but then, it IS the Lowcountry! We lost a full sized Japanese loquat tree, but other than that, very lucky. Our power was out only a short while unlike much of the rest of the area. Hilton Head Island is still evacuated. Next report in 2 weeks.

*Scale Bar Level – Severly Wet*
Condition Monitoring Web Map

www.cisa.sc.edu/map
Interested in Participating?

• Visit [www.cisa.sc.edu/cocorahs.html](http://www.cisa.sc.edu/cocorahs.html)
• Training and educational materials
• Volunteer information form
  • Return to [afarris@sc.edu](mailto:afarris@sc.edu)

• We will host a webinar training for new project volunteers on **Monday, October 17**
  • Contact Amanda Farris at [afarris@sc.edu](mailto:afarris@sc.edu) if you would like information to join the call.

• Please also let us know if you are interested in testing the web map and providing feedback about the project.
Thank You!

Questions or Comments?