

Introduction

Currently, drought impacts data are not well integrated into drought monitoring and management. The Carolinas Integrated Sciences & Assessments (CISA) research team is collaborating with the National Integrated Drought Information System (NIDIS) to advance drought preparedness and develop a Drought Early Warning System pilot program for the coastal Carolinas. In a 2012 pilot program scoping workshop, stakeholders recommended examining how tools developed by the Community Collaborative Rain, Hail and Snow (CoCoRaHS) network can be used to expand drought impact reporting and improve understanding of drought impacts in North and South Carolina. This citizen science project began in 2013, and this poster presents project findings to date.

From Drought Impacts to Condition Monitoring Reports



CoCoRaHS is a national, non-profit, community-based network of local volunteer precipitation reporters (see <http://www.cocorahs.org/>) that augments existing National Weather Service precipitation monitoring networks. CoCoRaHS observers submit daily precipitation and drought impact reports through online reporting forms. They typically submit drought impact reports only when a lack of rainfall has led to noticeable and adverse effects on plants, animals, or people. A limitation of drought impact reports arises from the short temporal resolution of impact information that does not capture drought onset, intensification, and recovery.

For this project, the CISA team worked with CoCoRaHS coordinators in North Carolina and South Carolina to encourage observers to submit weekly "condition monitoring reports" through the "drought impact report" form on the CoCoRaHS website (Figure 1). In contrast to drought impact reporting, condition monitoring involves submitting weekly or monthly reports describing normal conditions that are likely to change during periods of less or more rainfall. In doing so, observers establish a long-term baseline of information about local conditions that may increase information about drought onset, intensification, and recovery.

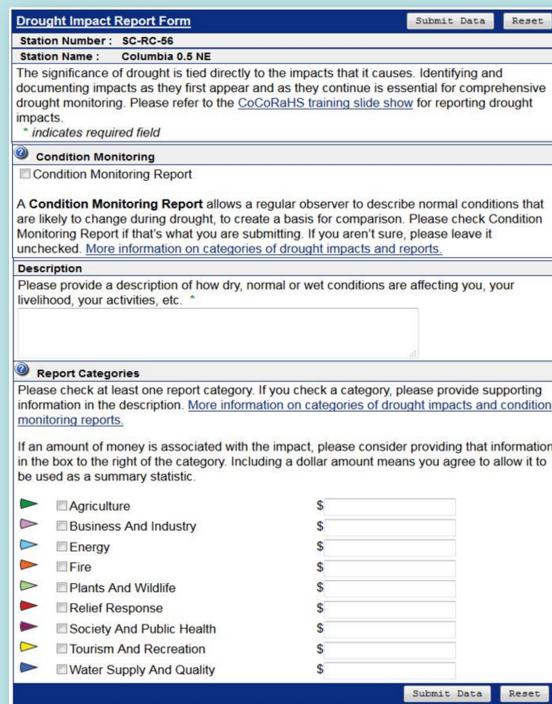



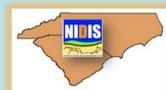
Figure 1. Portion of CoCoRaHS Drought Impact Report Form used to submit condition monitoring reports

Objectives

1. Assess the usefulness of information provided by citizen scientists in supporting drought-related decision making
2. Examine how tools developed by Community Collaborative Rain, Hail and Snow (CoCoRaHS) can be used to expand drought impact reporting

Acknowledgements

This project is supported by the National Integrated Drought Information System (NIDIS), the NOAA Climate Program Office, Regional Integrated Sciences and Assessments (RISA) Program, and CoCoRaHS.



Project Components

With the exception of participant recruitment, all components of this project are ongoing. Since September 2013, the CISA team has recruited a total of 43 volunteers who have submitted over 1,000 condition monitoring reports containing various types of information (Figure 2).

Component 1: Citizen scientist recruitment and training

- Recruited participants in North and South Carolina and coastal Georgia by identifying and contacting groups who would be interested in recording precipitation measurements and local conditions in their area, such as Master Naturalists, Master Gardeners, and current CoCoRaHS observers (Figure 3)
- Provided training on how to use rain gauges, take precipitation measurements, and record observations for condition monitoring reports
- Fostered participant support and retention by providing education and training through monthly newsletters, weekly blog posts, conference calls, webinars, and feedback surveys

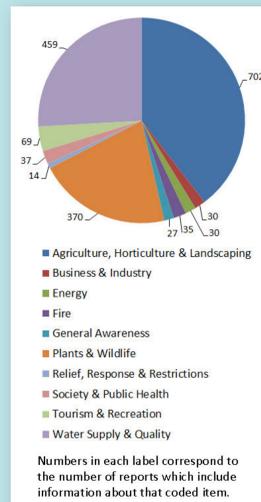


Figure 2. Report content by drought impact categories

Component 2: Condition monitoring report coding and analysis

- Downloaded condition monitoring reports from the CoCoRaHS website
- Coded using QSR NVivo 10, a qualitative analysis software, and a coding scheme derived from the US Drought Monitor drought impact categories, types of weather information, and degrees of dryness
- Analyzed coded information to identify types and patterns of information submitted through condition monitoring reporting that might inform drought decision making

Component 3: Decision maker interviews

- Identified decision makers involved in drought monitoring and assessment at state and national scales who would represent a cross-section of the diversity of interests and approaches to drought management
- Provided interviewees with information packets prior to interviews
- Packets included selected condition monitoring reports, maps of aggregated data from condition monitoring reports and precipitation measurements, and types of condition monitoring information received from participants.
- Asked interviewees about his/her organization's role in and approach to drought management and feedback about materials provided in the information packet
- As of June 2015, semi-structured interviews have been conducted with 11 decision makers from South and North Carolina drought management committees, U.S. Drought Monitor authors, National Drought Mitigation Center (NDMC), and CoCoRaHS.

Emerging Findings from Decision Maker Interviews

Utility of citizen science information

All interviewees found condition monitoring reports useful. Most used them to verify information provided by quantitative indicators such as precipitation, agricultural conditions, stream flow, and fire risks.

"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. . . . 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."
- NC Drought Management Advisory Council (NCDMAC) Representative

However, interviewees described utilizing the information from CoCoRaHS observers in different ways. They indicated that the utility of citizen science information for drought decision making varies depending on decision makers' current use of citizen science information, perceptions of reliability, and their organizational context.

What determines whether, when, how, and which reports are used?

- Reliability
 - Related to quality of reporting including correct decimal placement of precipitation measurements, reporting zeros on days with no precipitation, and consistently submitting daily precipitation and weekly condition monitoring reports
- Drought management organizational context
 - Drought committee meeting frequency
 - The NC drought committee meets weekly to determine drought status for the state while the SC drought committee meets only when conditions become dry.
- Available resources dedicated to reading and analyzing reports
- Information preferences
 - Precipitation vs. condition monitoring reports
 - Longer vs. shorter reports

What is needed to increase the usefulness of condition monitoring reports?

- Aggregation of data into maps, graphs and charts are needed to quickly assess general conditions and understand where to focus attention (Figure 4).
- Observers primarily report impacts observed in their yards. Reports describing conditions at neighborhood, community, town and county scales are also needed.
- Saliency of information provided in reports increases as dry conditions intensify.

Considerations in expanding this approach

Issues in scaling up project model

- Because observers tend to discuss a wide variety of impacts and conditions, coding structure is extensive and the coding process is time intensive.

Timely publishing to the Drought Impact Reporter

- U.S. Drought Monitor authors at the NDMC and the NCDMAC representative utilize the Drought Impact Reporter (DIR) to access condition monitoring reports for determining weekly drought status. However, it takes several days for reports submitted to the CoCoRaHS database to be published on the DIR indicating that decision makers may not receiving the most up-to-date information.

Web tools for downloading data from the CoCoRaHS website

- Currently, data on the CoCoRaHS website must be obtained through manual operations. Data can be made more accessible through tools for downloading files.

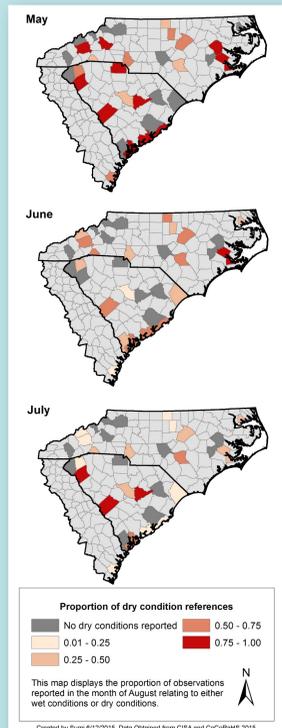


Figure 4. Dry condition references for May-July 2014

Next Steps

- Continue coding and analysis of condition monitoring reports and interviews with decision makers
- Increase efficiency of coding and analysis by working with CoCoRaHS staff to develop a reporting form that will allow observers to indicate relative wetness and dryness using a Likert scale. These ratings would be translated in to quantitative values enabling decision makers to graph, map or chart data for quick assessment.