**Project No. and Title:** WERA 1012: Managing and Utilizing Precipitation Observations from

Volunteer Networks

**Period Covered:** May 2016‐April 2017

**Date of Report:** 9/20/2017

**Annual Meeting Dates:** May 17‐19, 2017

Highlights from the 10th WERA 1012 Committee Meeting May 17-19, 2017.

Michael Harrington of Colorado State University, our WERA 1012 advisor, informed the committee that there is a search for a new Director for Research Education and Economics at USDA, and that there is uncertainty about the budget, which has been flat-lined with a continuing resolution.

Nolan Doesken reported on the CoCoRaHS network – we have expanded into the Bahamas and schools are a growing component of our observers, which is encouraging as we are increasing our contribution to education. We are still struggling with making our demographics more diverse, trying to engage the millennials and the minority and low income communities. Overall observer numbers are growing though active observers are declining. We’re trying to maintain at least a balance of observers dropping out and new active observers signing up. The mobile app makes it easier to participate and it can now accept multi-day observations, but much of our content is unavailable to the mobile app at this time. We have added condition monitoring for drought and soil moisture to the observations. Condition monitoring will be scaled up the US so the mapping and context makes sense for all climate regions. We’re hopeful that the condition monitoring will be easy to do and have consistent results. The soil moisture measurement is a bit cumbersome, so it will likely have a much smaller number of participants, but is a very useful indicator. A 100+ observation certificate has been created to help recognize observers. State and local coordinators should create their own certificates as well, to recognize consistent reporting. There is a need for improved documentation of the database, the procedures for running the system, procedures for pulling data, the web API and the cyber infrastructure. Consider crowd-sourcing some of the documentation and explanations. We also need to improve the educational component by providing explanations of what the graphs and maps are showing. Coming soon, the cartoDB map will replace all the existing maps.

Efforts to educate our observers and grow the network through education are ongoing and so far over 1000 schools are in the network and over 700 have reported in the last 2 years. This is a very important component of the network as most of the funding for CoCoRaHS has been focused on the education aspect of the program. It has been useful in both STEM education and environmental awareness. Various states are using the data to teach water balance, climate of their state, and environmental awareness, as well as math and statistics, during school and 4H field trips and in their newsletters.

There is interest in adding ice accretion to the precipitation reports, but the protocol needs more development. It is of particular interest to power companies, the insurance sector and transportation engineers as ice accumulating on power lines, towers, and tree branches is both dangerous and costly. The measurement is the radial thickness of the ice, and the typical values vary across the country. The Precipitation Protocols Committee will work on this. The engineers at MetStat, Inc. are working on an automated CoCoRaHS gauge which essentially weighs our gauge using two load cells and can transmit or archive the data. Data can be recorded every 5 minutes and there are no moving parts, antifreeze or oil requirements like the Geonor gauges. For testing purposes they should be co-located with CoCoRaHS observers. They are looking for a $50 cost, and are working on the software and web interface.

There is concern about the hail pad program as the material and shipping costs have become prohibitive. The materials have increased the pad price from $0.80 to $5.00, plus assembly is required. The Chill Radar group wants the pads, but doesn’t have funding to pay for them. It’s too expensive for the HQ to handle, but if observers want to do it and make their own pads, we could train the observers to take photos of their pads and send the photos in, instead of the pads, to save money, and still have hail information.

Coordinator and observer support is critical to maintaining and growing the network. We work closely with NWS personnel in many states, and they are often coordinators in addition to handling the COOP program. The two programs enhance each other as the CoCoRaHS observers can provide severe weather reports effectively expanding the storm spotter network and the reports come into the NWS offices during events and the additional network density can help verify the radar estimates. CoCoRaHS observers also often take over when COOP stations need to be closed and the nearby or co-located CoCoRaHS and COOP data can be used for QC-ing each network. Multi-day reports are still a problem when observers report multi-day as a single day. The maps, website information and data are useful feedback mechanisms for observers to see how their data are used. Certificates of appreciation and recognition of continuous reporting reward the observers for their efforts. Newsletters are very helpful in retaining volunteers as they are a type of personal engagement that really keeps the observers connected. The newsletters can also be used for training and recognition.

How our work makes a difference in people’s lives:

The additional information provided by the CoCoRaHS reports improves the depiction of drought by the Drought Monitor enabling thousands of affected farmers and ranchers to get drought relief. It also increases the information available to the fire community so they can be better prepared for wildfires and improve their fire danger notification. The World Meteorological Organization is interested in our work with high quality, low cost precipitation monitoring for application in developing countries where rainfall is not monitored, yet agriculture is the dominant activity and drought can be catastrophic.

Benefits of this WERA Committee:

CoCoRaHS has increased the spatial density of precipitation data and the QA/QC procedures this committee has developed allows this network to enhance the quality control of COOP data as well as for verification of radar estimates and crop insurance verification. Addition of Condition Monitoring and Soil Moisture reports aid the National Drought Mitigation Center Drought Monitor authors in their weekly depiction of drought status nationwide. As CoCoRaHS expands to the U.S. Virgin Islands, Bahamas, the rest of the Caribbean and the Pacific islands, the Drought Monitor will be able to provide drought status maps in those regions as well. The significant weather reports aid the National Weather Service in issuing severe storm and flood warnings. The additional warning information prevents injury and death from flash flooding. Some NWS offices use CoCoRaHS data to add to their hydrometeorological forecasts. Our Education and Retention and Recruitment Committees have expanded the use of CoCoRaHS data for STEM education by increasing the number of schools participating in the network and developing online educational resources. This includes the activities of coordinators generating newsletters and blogs to their observers, as well as the continued expansion of the animation video library by the CoCoRaHS National Office. The current development of the automated CoCoRaHS gauges will allow many stations to become more real-time in reporting so the NWS will have more data available for warnings, as they will not have to depend on observers being home to file significant weather reports. CoCoRaHS data are now included in 1-, 2-, and 3-day snowfall totals reported to FEMA so there is a better depiction of impacts from snow storms for response and recovery.

Challenges we need to work on:

* Convincing observers to report their zeros.
* Handling multi-day reports.
* Improving our demographics to reach the minority and low-income populations – this is important as we are a STEM activity and need to improve STEM education in those underserved communities. This may be a generational challenge and we may need to start in the schools rather than as an informal education strategy.
* Engaging the Native American Tribes – this requires more personal engagement and relationship development for trust to be established. In some areas Internet or cell phone service is an issue, but where Internet is available, we need to spend more time to cultivate observers in the Indian communities. Many are very large areas that have very little information, but a vulnerable population.
* Improving our observer retention numbers
* Finding sustainable funding to pay for operations, not just to develop new things. – Come up with some numbers on how much the data are worth to various sectors – similar to what we need to do with COOP data.

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