2015 PROGRAM AGENDA

Sunday, May 17th
5:00-6:00PM Registration/Check-In – Main Administration Building

5:00-7:00PM Dining Hall Open for Dinner

7:00PM Evening Activity – Short Park Tour -- Meet at Main Administration Building

Monday, May 18th

7:00-9:00AM Dining Hall Open for Breakfast
8:30AM **WERA 1012 Kick-off:** Henry Reges, Laura Edwards

Welcome to 8,700 feet: Survival Guide for High Altitude, logistics for YMCA and meeting
Welcome from Chair, Laura Edwards

Icebreaker and introductions. Should have received a receipt for registration. WIFI slow this morning – as if on dial-up. They are looking into it. Park tour two vans 6 to 6:15 departure. Meet at 6pm in Ram's Horn Lobby. Calendars – please take some home with you. Snacks in the back, ships, cookies, muffins, coffee, juice, popcorn. Henry found a bedbug this morning. The Y is checking all the rooms. There are pens and notepads on the tables – help yourself.

Nancy AZ SC State Coco; Cindy OK state coordinator, Harry Hillaker IA state coordinator, Kevin Stewart – Flood Warning Coord for Denver and area. NM – Bill Sorenson, HPRCC; Ian – Ontario; Chuck Hanagan, Colorado Dept Ag; Mark Knapp, KS; Nolan - CO SC; Jim Z – NCEI Coop Mgr; Chris Daly -PRISM OSU; Henry Reges CoCo Coord; Tony Bergantino – WY SC and Coco coord; Steve Hilberg – IL Coord; Adnan ND SC and Coco Coord; Glen Conner – KY SC emeritus; Zach Schwalbe – CoCo; Tim Williams, NE.

Goals and Objectives: After this meeting Laura submits an annual report on what we did. If you have minutes or notes from past meeting, we would like to collect them as we don't really have a place to keep those or post them, but we should. This year we have three remote presenters – which is new, but necessary due to travel restrictions in a lot of agencies.

Ice Breaker – groups of 7 – story and create a thread with each person adding a story. Do as many as you can. Winner group had 12 stories related to flooding, being trapped, travel storm issues, and the like.

9:30AM **Session One:** *The State of the Union – CoCoRaHS Status Update*

Previous Year's Activities and Accomplishments – Nolan Doesken – CoCoRaHS now 17 years old. WERA is in the 8th year. Added Puerto Rico in May 2014. Canada added Alberta and BC and greatly expanded Ontario. 2015 CoCoRaHS calendar. Evaluation of CoCoRaHS by DHA (consultants) completed. No new funding in the past year. NOAA and NSF no-cost extensions. US Virgin Islands added April 2015. Added White House in April 2015. Averaged 11,000 reports per day last year. Most observers male, Caucasian, over 45; steady recruiting continues, new observers every day; continued growth in the schools/student sector; journal pubs citing or using CoCoRaHS rising fast; number of consistent reporters increasing but total number of active observers seems to be declining in some areas; fewer significant weather reports (lowest since 2011); fewer hail reports this year than in previous 7 years; fewer drought impacts reports; less responsiveness to NJD e-mail messages; higher fraction of observers using data entry apps; having to work a bit harder now to grow or to stay even.

The Pulse of the CoCoRaHS Network – Tony Bergantino – Some states doing well, some not, Growth leveled off at about Sept 2013. This March madness was down near the 2011 numbers, which was not nearly as high as 2013 and 2014. The number of observers who stop observing is increasing. So the net observers are decreasing as more stopped than started over the past 18 months. Engage your observers, send them an e-mail once a month or so. Tony has the numbers for every state. Recruitment is important, but we really need to work on retention, keeping them interested and engaged.

10:15AM Break

10:45AM **Keynote Presentation:** Perceptions of Climate Change *Glen Conner, Kentucky State Climatologist Emeritus*. Perceptions often substitute for truth when there is no truth available. Believe in free speech? Yes, of course. Good, then we would like you to come and give us one.. Biblical record of Noah's Flood – were no CoCoRaHS observers, and it was probably an outlier – a very far outlier. Chinese weather records 1685 – recorded clear and rain days. Because the tax collectors had trouble collecting taxes as the people said they didn't have good crops because there were too many rain days so they didn't have good crops. Emperor asked him to keep a record to verify it. There was no climate information when the settlers came to the new world. It was colder than they expected and Jamestown had a frigid winter in 1607-1608. They came 900 miles further south than England, but it was much colder. They thought it

was colder because forests had not been cut down. In Europe forests had been cut down, so when they cut down the forests they expected it to be warmer. William Penn suggested for every 5 acres of tree cutting they leave one acre with trees. Illinois demarcation line of forest vs tall grass prairie. Assumed the soil must be poor and not enough rain to grow forests. James MacSparran – 1753 – said "In general the air is more clear and serene than in England and Ireland." In New England the transitions from Heat to Cold are short and sudden - "We are sometimes frying and at other times freezing." Thomas Jefferson though climate records would be useful. He believed temperatures were warming, but no data to support that. 1804 C. F. Volney wrote "View of Soils and Climate in US". Spring early, summer hot, At Hudson's Bay the ground in open places thaws to the depth of four feet, and in the woods only to the depth of two. Dr. Rush – PA spring much colder, autumns more temperature, rivers freeze later. Ascribed it to the clearing of land of trees. In KY, they thought longer summers, shorter winters, rapid rise in temperature was proportional to deforestation. Cotton Mather – "cold is much moderated since the opening and clearing of the woods. Winds do not blow as roughly as in the days of our fathers". Dr. Daniel Drake 1815. Observed weather daily 1789 through 1813 in area of Cincinnati. Said we don't have enough records or data to conclude we are having warming. Joseph Lovell, Surgeon General of Army – directed every army surgeon to observe temperature and precipitation 3 times a day. He wanted it to be done out at the frontier so they could learn about the climate before the area was settled and changed the climate. KY 1825 first records. Late 1840 Smithsonian – established a network – Dr. Samuel Martin was an observer, had temperature, precipitation, wind, and as many comments as they could write down. "The 17 year locust made their appearance but they were not so numerous as in 1804, 1821, 1838 and 1855, because the forests were no longer there. Smithsonian wanted standardized precipitation with an Ombrometer (rain gage) 1856. Buried in the ground, and only the funnel extended slightly above the ground. Elias Loomis 1868 – early meteorology textbook. Funnel taller and more above ground (2" diameter). Charles Boerner's gage 1883 – (He was a jeweler). Mounted above ground, but same shape as previous. Weather Bureau had most of their stations in Cities. Observation station typically on the tallest building in the City – 84 feet agl in Salt Lake City. Because they had forecast flags on the top of the building. J. Murray Mitchell - NOAA Research scientist 1874 Climograph showed warming to 1950 then cooling into the 1970s. Disaster climate change – cooling. Mitchell called together 24 of the most famous climatologists together and they had 5 scenarios large global cooling, small global cooling, no change, small global warming, large global warming, and they were to talk about each and what the consequences might be. They said they had no way to predict the future, but would offer their perceptions. The concluded that to the year 2000, catastrophic change was unlikely, slight global warming less than 0.5^{o}C, amplified toward the poles. High plains 20-22 year drought cycle to continue. Uncertain about changes in precipitation variability. They published the Crop Yields and Climate to the Year 2000 (DoA). Then without any action on the humans part (1980), the temperature rose dramatically, and global warming became the watchword. Govt sponsored workshops (teach-ins) taught the perception of global warming. Global Warming is a mass movement, and it has to have a good name. GW not a good name because it was not occurring everywhere on the globe. Required the catastrophe to be global, and that it be warming. Also has to have a name that has no opposite so it can't be challenged. So they came up with Climate Change. Has no opposite, and neither "climate" nor "change" has a hard, one directional definition. This was first used in 1978. It's also politically correct to use that term. But it's still perceived by the public to mean "global warming". We'll probably run out of water before it gets too hot.

11:45 PM Game Break

12:00PM Lunch (Dining Hall open for Lunch 11:30AM-1:30PM)

1:30PM **Session Two:** *Drought Monitoring*
Drought Impact Reporting, *Kelly Smith, National Drought Mitigation Center, University of Nebraska-Lincoln (remote connection)* Track drought impacts for planning and mitigation and recovery since

impacts point to vulnerability. From How to Reduce Drought Risk on NIIS website. Also research is done to improve understanding of the relationship between drought and certain impacts in various places across the US. Also used to help with response and recovery – where to direct relief and what sort of relief is required. So Drought Impact Reporter launched in 2005 with reports coming from media, users, volunteer observers, and other agencies (USFS, BLM, USDA, NRCS, USGS, Fish and Game, LCCs, etc.) Impact is an observable loss or change that occurred at a specific place and time because of drought. Because river is low, fish died, for example. 2/3 of the reports since 2005 are from media reports, then CoCoRaHS is the next biggest source of reports. Dilemma and challenges – no methodology for valuing or quantifying drought impacts; even in agriculture; easier to list than to summarize impacts; no units; angst index. In drought as in rainbows, each person has their own drought – since there are no common references. Impacts observing effort needs to be embedded in a larger system. Planners may lack awareness of drought impacts, may not know how to use impacts, may not be collected or aggregated at the correct scale; and impact information may not be what they need. Planners and policymakers annual or seasonal aggregations preferably with $ amounts, want continuous data not one-off impacts, and US drought monitor authors, near real-time, but with a 30 year track record. Purpose of impact reporting needs to be clearly articulated; even well-intentioned volunteers get maxed out; and agency personnel may need to play key roles. Identifying a drought impact is harder than describing what you are seeing. Attribution is a separate question. Citizen observers can provide a lot more geographically dispersed data; provide relatively standardized continuous data; help define what is meaningful; develop data useful for local decision-making; respond to prompts re: insects, weeds, etc. Condition Monitoring Reports – continuous data, not event based, just tell us what you see, don't worry about whether is because of drought or not. List of ideas for what to monitor: height or density of vegetation, number of birds or species, number of people boating, canoeing, swimming, fishing, etc. CISA has guidelines for CoCoRaHS Observers to report.

Chuck Hanagan, USDA Farm Service Agency Otero/Crowley county Executive Director
Discussion

2:45PM Committee Reports (10 minutes each)
CoCoRaHS/COOP Collaboration – Mary Knapp

March Madness Recruitment – Henry Reges

Sustainability/Funding – Henry Reges

3:15PM Break

3:30PM **Session Three:** *Institutional and Partner Reports*
NWS COOP program, *Jim Zdrojewski, NOAA/NWS Headquarters, Silver Spring, MD*
Plans – station information system – now operational with improvements coming. More detailed metadata. Can track the equipment that is out there so they can keep supplies stocked. Mapping capabilities (for WFOs to recruit in targeted areas), subscription service for metadata users. Updated equipment – contract being created for wireless temperatures system. Based off Nimbus developed by the National Reconditioning Center – Outdoor unit – wireless with long range 1000 feet or more, and re-designed display based on Nimbus. Will also be able to use it to tie into other gages in the future. Will first go to places where the wire is a problem. 900 MHz directional antenna. All the parts are currently in their system. Being tested now. Updated equipment – soil temperature on back burner as the wireless temp is front burner. Single stalk sensors at 4", 8". 12", 20", 40" depths. NWS reorganization. Office of Planning and Programming for Service Delivery. Chief Operating Officer. Office of Observations – Surface and Upper Air Division, ….. Office of Observations is a new office – so they are trying to education all the new bosses on the COOP system. There were a bunch of COOP Non-believers – too

antiquated, like the new shiny stuff, don't understand it is the most cost effective system, etc. They are starting to believe. Support is coming down from the top. Louis Uccellini happy COOP is on the upswing. There is an individual COOP observer 85 years individual service on observations.

Chris Daly, PRISM Group, Oregon State University Main source of data for the Crop Insurance Adjustors. Don't yet deal with hail, winds, flooding and that sort of stuff. They are working to open a severe weather portal. Insurance adjustors are looking for information for crop losses and other losses. Hail is under-reported as someone has to be there. Want NOAA NSSL Radar MESH product – gridded, then adding the local storm reports through LDM, and the CoCoRaHS reports. Julian provided info on CoCoRaHS reports, 9600 hail reports – but there were 47,000 mentions of hail in the comments, so they are mining the hail info from the comments reports. 8500 of them include the words "hail" and "size", but still looking. METAR comments about hail, and severe weather warning boxes for hail. Can also check the storm verification data that NWS uses to determine if a storm actually hit within the warning polygon. They are also having the students mine the twitter feeds and pictures, but lacking location feeds. M-ping is also a potential source. Do you also care about depth of hail, duration, wind speed? Small hail with high winds knock down crops. The larger stones don't hurt the crops as much. Precipitation report could ask – Did you have Hail? If you answer yes, then a message – please submit a hail report. Minnesota mesonet data are coming in 120 days after the fact. They are mostly a paper network. It's very slow to get digitized. Would like to see those observers get their data into CoCoRaHS so the data get into the Crop Insurance Reports. New Assistant State Climatologist is supposed to work on the automated network. ND State Water Commission network has 700-800 stations, for over 30 years. Rural recruitment – handing out a 1 pager in rural areas, mostly insurance adjustors to get them to observe.

Harry Hillaker, Iowa Fischer-Porter gages hourly precipitation data (FPR data) using it to QC manual COOP data (150 sites) and 60 FPR sites, but mostly no overlap spatially. Punch paper tape data have a lot of missing data due to mechanical problems. Now with digital output rather than punch cards, they are great. FP is a positive, very reliable weighing mechanism. Very reliable clock. Easy to use digital record. Can measure precipitation year round, unlike tipping buckets, though occasionally under-report slightly. Negative – can have significant evaporation losses if not kept with oil at the top. Antifreeze prevents freezing. Readings can fluctuate a lot after you empty and recharge the gage for an hour or two. In a few gages can have some radio interference (electrical interference) to data logger.

4:45PM Adjourn for the day

5:00-7:00PM Dining Hall Open for Dinner

6:30-8PM Area tour?? Meet at Rams Horn lobby at 6:30 pm

Tuesday, May 19th
7:00-9:00AM Dining Hall Open for Breakfast

8:30AM **Session Four:** *Snow Water Equivalent Measurement*

CoCoRaHS Canada Snow Weighing Pilot Program, *Rick Fleetwood, CoCoRaHS Canada (remote connection)* Environment Canada. CoCoRaHS, MN, SK, ON so far. Partners Agri-Foods Canada and agriculture. Are trying to expand the network to all provinces. CoCoRaHS is a key component of their monitoring strategic plan. No targeted recruiting yet in BC, Alberta and some eastern provinces. New Brunswick has quite a few observers. Trend of reports per day is increasing. Registration is way ahead of reporting – 35-40% participation of registered observers. Determining SWE is a challenging part of the process, as well as taking snow core measurements when the snow got deep and there were ice layers

as well. Tried to come up with easier methods to do this in hopes of getting more reports. Easier to do SWE by weighing using low cost nutrition scale. Weigh it in the gage, and subtract the gage weight. Or for snow depth coring and SWE, use a 2" diameter PVC pipe. Cut triangular shaped teeth in one end, and make sure pipe is long enough to handle your deepest snow. The instructions to make the core sampler are posted on the CoCoRaHS Canada webpage and instructions to use it. They tested the CoCoRaHS snow measurements with the Snow survey data form the snow survey network in NB. Some areas to the NE as well correlated, and others in the NW are too high or low. Data being used in storm summary reports to the public and media to report on storm impacts. Snow clearing operations uses the data, help verify the EC network data, and as supplementary for media interviews on storms.; helping forecast offices to verify their forecast warnings. Helps forecasters understand local effects; and as supplemental source for storm reports. Agri companies are using the CoCoRaHS data to QC other networks. NOHR is using it for hydrologic forecasting. The data are generally considered to be of good quality, and reliable. And they can use it in the drought monitor products. Most errors are decimal points and other typos, entering as English rather than metric, enter zero rather than missing. In the Maritimes, December was dry, but January and February had a few blizzards with very heavy snow and strong winds, drifting the snow to rooftops. Watched video on snow measurement and snow coring. Keeping the cap on the end of the coring pipe caused air pressure to prevent the core tool from going all the way to the surface. How are the teeth holding up to the ice layers? Pretty well. When they get dull, it's easy to take the file to them to sharpen them up. Just insert slowly and rotate as you push down. Is it easy enough to recommend occasionally doing 3 cores and averaging rather than taking just one? Yes, but not sure how receptive the volunteers would be. Key is picking a representative location. Do you mark the core locations so on the next snowfall you know where not to core again? Keeps shovel in the location of the last core so he knows where it was.

Missouri Basin SWE network, *Kevin Stamm, US Army Corps of Engineers (remote connection)* 2011 Started a volunteer snow observer network to augment their snow surveys. 72.4 Maf storage in all the reservoirs on the Missouri. Can hold 3 times the amount of water that would be expected to flow into the basin in one year. Flood control water supply, recreation, hydro power, environment and ecosystems, etc. 25% of the run-off is from plains snowpack and rainfall March and April. Mountain snowpack and rainfall is 50% of the run-off in May, June and July, and the last 25% of run-off is summer March through October in both plains and mountains. Average annual run-off 23.5 Maf. Cooperative Plains Snow Survey did periodic plains snow surveys, depth, SWE, 2 week frequency, standardized method and reporting. Volunteer, agency, and employee surveys, Northern Plains in Missouri Basin – stationary sites where surveyors are available. Supports run-off/water supply forecasts, reservoir release forecasts, and flood preparedness. Used a 40-inch snow tube, spring or digital scale, ample bucket, shovel, pick ax for ice. 5 measurements, 50 feet between measurements, frost depth and estimated soil moisture, ground ice thickness. Reported back to MRBWM via e-mail fax; data posted to MRBWM website; disseminated via e-mail or website; shared with cooperators, states, Corps of Engineers, NWS NOHRSC, MBRFC, and WFOs. http://www.nwdmr.usace.army.mil/rcc/snowsurvey/snowsurvey.html Had about 38 or 34 regular measurements in the upper basin. Have gotten ND and SD operators to take measurements, county emergency managers, NWS, USACE, USGS, and private citizens. Used data for modeling, for water resources, flooding, etc. Challenges are operating with a limited budget. Using low cost equipment that works in most situations; site selection is an issue with forested places, ground cover; data reporting; and finding and maintaining volunteer observers. 2011 Plains Snowpack had very heavy SWE on February 28, so when it melted out there was significant flooding as they had to release water. The Missouri River Flood of 2011 could not have been avoided based on the snow season. They can only improve the data collection and develop an improved historical record of snow fall. A monitoring proposal has been developed including automated monitoring, aerial snow surveys, and manual snow sampling. Automated measurements – NRCS SCAN and SNOTEL network, AWDN, SD and Nebraska network, CRN stations, and there are some gaps that could be sites for additional monitoring in WY and MT and SD. Aerial snow surveys and manual sampling would include the effort described in this report. Budget for this is

$6.245 M in capital improvements (additions and upgrades of automated stations), and $1.456 M annual operation and maintenance; and enhance aerial gamma measurements and adding manual snow samplers. The long-term investment would provide a better understanding of the basin – during flood, normal and drought conditions. Consistency throughout the basin with instruments, standards, and QA/QC, and data collected real-time, QCed archived and available to everyone. In need of volunteers and welcome suggestions as they are not a data collection agency. How do you motivate the volunteers and keep them coming back? They provide them all the information and forecasts they issue based on the data collected. Reminds all the volunteers of what the current conditions are. Having snow keeps them interested. In dry years they lose observers. What's the make-up of the volunteers? Is it a diverse group? There are EM employees, some professions like meteorologists and reservoir engineers or managers. Will the CoCoRaHS snow measurement be useful at all to you? Would Rick's method be more useful to you than the current US CoCoRaHS snow protocols? Yes, that would be better.

Ian Nichols, CoCoRaHS Canada –Weather Innovations Consulting LP (WIN) Has a number of funding supporters. Goal is to have a volunteer observer in every province and territory in Canada. Just got a BC coordinator who moved from Manitoba. It would be useful to show the Canadian government how CoCoRaHS has evolved across the US and Canada. Have a board of directors, and everyone who gave funding has a seat on the board. Has an administrator in the middle (non-profit program manager) – Farm and Food Care Foundation. The Non-profit is required so the government can contribute to the non-profit organization. National Program Coordinator runs the program and makes it work. Will have a Provincial Coordinator for every province and territory. They are also chasing end users organizations to have them provide some funding and some volunteers. Convince these groups to augment their automated agricultural weather network with CoCoRaHS observers. Farm and Food Care Foundations is the Financial Program Administrator. They are a National Charitable organization – established in 2011. Develops and supports programs to communicate with Canadians helping to build confidence and trust in Canadian food and agriculture. Online store has a website to purchase the gages and other equipment. 853 volunteers and 567 reporting. The ministry is planning to select volunteers to get a uniform distribution of volunteers. They need some sort of campaign for the great white north – March Madness won't work as they aren't basketball fans. Official prime minister's residence – might be a good place for one. Got 361 new volunteers last year. Many locations are more interested in the summer precipitation. Average participation rate is 66%. Conservation Authorities in Ontario – there are 36 – so they are working with them. Have a CoCoRaHS rain game (squirt gun one) they take to fairs and other activities to attract kids and adults.

10:00AM Break Everyone made a snowball, we arranged in size order and selected the median to be melted. Everyone guessed the SWE in the median snowball, and the time it would melt out.

10:30AM **Session Five:** *Committee Reports (10 minutes each)*
Precipitation Measurements – Tony Bergantino In house publications have been compiled. Out of house publications are extensive – scholarly search yields > 100K citations. Many applicable but many not. Where do we start and stop? Resetting to earlier tack? Restrict to measurement methods found in CoCoRaHS? Evaporation from weighing gage impacts on automated measurements and quality assurance methods. Where does this information reside? Thought the purpose was to compare gages and methods and last year it was to find all the pubs that did comparisons or discussed measurement methods to evaluate under and over catch from various gages.

Quality Assurance/Quality Control – Steve Hilberg - . Members: Tony Bergantino, Mat Gerbush, Tim Kearns, Bryant Korzeniewski, Zach Schwalbe, current QC person at HQ (Michael). The subcommittee was on standby this year for a number of reasons. We had two conference calls. At the most recent conference call we agree to resume posting a "QC Tip of the Week" to the CoCoRaHS Coordinator Google group. We also carried over last year's goals to this year which was to educate observers on the

importance of data quality. Specifically, the plan is to look into developing CoCoRaHS animations that cover the topics of how to avoid errors, keeping local records, the importance of QC, and how to respond if you are asked about an observation. The committee has been very active in its first five years of operation.

Accomplishments 2010-2015

- Regular committee conference calls
- Development of "QC Tips of the Week" for distribution to State and Regional Coordinators
- Design and implementation of CoCoRaHS Data QC ticketing system to five pilot states
- Extension of CoCoRaHS Data QC ticketing system to three additional states
- Extension of CoCoRaHS Data QC ticketing system to all participating Canadian provinces
- Added all states (even those not in pilot) to ticketing system
- Survey of QC Ticketing system users
- Webinar conducted about the ticketing system for new participants
- Second webinar was held in December 2011 for coordinators in the new participating states and Manitoba to familiarize them with the system.
- Draft of white paper overview of QA/QC processes being used for CoCoRaHS
- Survey of CoCoRaHS coordinators on QC practices. Information was used to categorize and prioritize recommended QC checks both at the data entry point (Daily Report form) and manually.
- Development and addition of error categories to ticketing system
- Monthly QC open ticket reminders to participating states
- Coordinator webinar on QC in May 2013
- Development of the CoCoRaHS Error Checking Assistant (CECA) (Tony Bergantino)

Beta of CECA2 in development

Future plans – the animations are really popular. How to avoid errors and importance of QC. Want to do more analysis of data and integrate the QC ticketing system with the CoCoRaHS database. Get ready access to data and observer contact info (for QC coordinators); continued development of CECA and other QC tools, and passing of QC flags to GHCN so they don't overwrite valid data.

11:00AM **Keynote Presentation**: 125th Anniversary of National Weather Service Cooperative Observer Program *Jim Zdrojewski, NOAA/NWS Headquarters, Silver Spring, MD and Nolan Doesken, Colorado State Climatologist & CoCoRaHS* We are at the beginning of the 125th anniversary of the beginning of the network. When US Weather Bureau was formed, they were resistant to taking over and there was a bunch of casting aspersions on the Signal Corps to justify taking over the system. Thomas Jefferson was one of the first to recognize the importance of measuring and monitoring. He was consistent in locations and reporting times and that methodology. In the west we had very few stations when the Smithsonian started their network 1949 with over 600 stations. Army Medical with post surgeons 1800-1870 (3 obs per day 7 am, 2 pm, and 9pm Calculated 7am + 2pm + 3*9pm divided by 5 was mean. Not all places did it the same; Smithsonian 1847-1874; US War Dept Signal Service 1870-1890; Colorado Met Assn 1886-1891 – states and Signal Service worked together, and in some cases did not work well together; USDA US Weather Bureau replaced War Dept in 1890 when COOP started. Organic Act started this. The USWB proponents were trying to cast aspersions on the Signal Service to justify taking the observations away from them; US Weather Bureau transferred to Dept of Commerce (1940-1970), Weather Bureau renamed to NWS 1970-present. Signal Corps put stations on Mountain tops as well as tops of buildings where the flag forecast system was. Pikes Peak in CO, and Mt. Washington in NH, and numerous others. Now about 8700 COOP stations, peaked around 1948-1951 near 11,000. Does not include HPD stations. Most recently many gages that had COOP IDS but were not COOP stations have been re-assigned to the network they belong in, so they are no longer listed as COOP stations, though they did not disappear, just got put back in their proper network. First Fort Collins observer was Smithsonian station guy from Kentucky 1871. .

11:30AM Game Break

12:00PM Lunch (Dining Hall open for Lunch 11:30AM-1:30PM)

1:30PM Election of Officers (2016 term). For 2016 Steve Hilberg will be the Chairperson. Nancy Selover was nominated for the 2017 Chairperson. Seconded. Voted unanimously approved.

1:45PM **Session Six:** *CoCoRaHS Headquarters Updates*
Discussion with Julian Turner (database and web development), Zach Schwalbe (new observers and changes-helpdesk), Nolan Doesken (State Climatologist and Director of CoCoRaHS), Henry Reges (National program coordinator),Noah Newman (ED & Outreach); Michael Willette (QC) from U. Northern Colorado-Geology. Are bringing on outside help to answer some of the more mundane questions (average 25 questions a day sometimes a lot more). Zach is moving up in Colorado Climate Center as Wendy left for the private sector. Carol will be the new person. Also have several comment readers (including Jim Jones), who put important comments into a spreadsheet, like where they mention hail or that it's a multiday report. Linda Erickson is in charge of the new observers. Do not keep track of the questions they get or where they come from (state), but that might be useful information for training. Coordinator bios on state welcome webpages. Helps to connect to the observers when they see what activities they are interested in. Going to re-visit the CoCoRaHS webinars – starting up in September. Nolan – history of observing networks, then Chris Castro will talk about the SW monsoon., and looking for more speakers and topics. If you have burning ideas for the message of the day – particularly short discussion topics - please send them in. Working on the next fundraiser. Want to do a new shirt. Has done, rain, hail, snow, thunderstorm, and dust storm. Maybe blizzard – what is the symbol? Is none – but heavy blowing snow would be one. Or maybe Shower, Drizzle, or Hail Yes and Hail No shirt. Get a picture of everyone with their gage, and CoCoRaHS can cycle through them, if they sign a waiver on their homepage, as the "face of CoCoRaHS". We can do a lot with the water balance data and charts for stations with the ET gages. Jim Z went to buy 500 ET gages (atmometers) for the COOP stations, but they wanted over $500 each for them. CoCoRaHS pays $200 for them, and Jim had contacted the same vendor. Julian wants to show what has been accomplished and what we still want to accomplish. First is always deliverables for the grants. Prototype of mapping system (total rain for a date) with numbers at a zoom in level and color dots zoomed out further. Keep consistent colors with a max regardless of the highest any given day. Can now map accumulated data, and the mapping is much faster than it used to be. This is on a separate PostGres database, so it has taken a load off the CoCoRaHS database. Can export maps and be able to get 300 dpi by setting the size and the resolution. Station History reported now on a daily basis – under admin somewhere. Discussion of hail report changes – including damage, or none. Currently the hail storm duration is a tough part to fill out.

3:00PM Break

3:30PM **Session Seven:** *Recruiting in Rural Areas: Successes, Opportunities and Challenges*
Panel Discussion: *(moderated by Laura Edwards)*

Jim Williams, NE-Rain Have a separate network of sites. Lots of counties allocate groundwater pumping. NRDs (Natural Resource Divisions?) are associated with it and has written grants for this, and originally gave away free gages to both rural and urban locations. Some of the recruitment was quite aggressive. Farmers all collect data and keep good records. The challenge is getting the farmers to share their data. Are re-writing their website with better graphing and mapping. Will be splitting the gages from the observers so observers can cover each other's gages when necessary. Have about 800 active observers in summer, and smaller numbers report zeros and report snow. If you had one in each section, like planned, how many would that be? Maybe a couple thousand. NRDs were motivated by

groundwater, and they have devoted staff time and money to this effort. They include the rain gages in "educational" funding, so they try to give away gages. Have there been any issues with their network and CoCoRaHS being in parallel. No, just some confusion. Their network data go to CoCoRaHS regardless. Can't report to both networks as they already send their data to CoCoRaHS. One question was the real-time issue of severe weather events that will go directly to NWS. No – they already have severe weather reports, but they don't go to NWS in real-time. Will be trying an in-house messaging service asking observers to report their SWE after weekend snow event.

Mary Knapp, Kansas CoCoRaHS – When they joined there were already a few stations in some cities. Have had good coordination with all but the Topeka NWS office. Spotter training includes CoCoRaHS brochures. Water quality group is very involved in dong observations as well as their water quality observations. Recruiting younger age groups. People think of the rural areas as being the western half of the state, but the eastern side has lots of rural areas. In a couple of counties everyone bought their own gages. Last year they did OK in March madness. Had a lot of people sign up in June 2014 and 85% did their first observation right away. No special recruiting was done, don't know why they all signed up. Engaged with the tribal groups, Potowatomee. Things tend to go slowly with the tribal groups, but they got the school kids engaged. Storm spotter network uses the same gages. Extension provides about 1/3 of the gages and 2/3 of the gages are provided by NWS or observers purchase their own. Reporting response is the same regardless of who bought the gage.

Nolan Doesken, Colorado CoCoRaHS. First outside recruitment was in about 2000 in Kansas. In CO they had a hard ask for observers in conjunction with a research project in the rural areas. Set up local phone lines so observers could make a local call, and hired high school students to recruit, train, and take phone calls and enter the data in the computer. Had 50-100 observers per county. As soon as there was an article in the paper that the project was over, everyone quit. It all lasted 2 months. After watching Nebraska do their rural recruiting, they made it look easy. It was not easy, and it has been a struggle in rural areas. Wyoming success was due to some Farm Service Agency interest. It started out very well, but then sort of fell apart in 2008 as the FSA head left office and was replaced by someone who was not interested. More and more observers are using the apps on their phones since Internet is not always available, but cell phone coverage is much broader. Many rural farmers are getting rainfall estimates from Climate.com and think they don't need a gage, because that website has the information. But they don't have field data and they are overselling the PRISM product. They can be off by 0.10" or more, but people think that's pretty close, but it's not. If a crop consultant says that's close enough, they think they don't need to bother measuring themselves. What about recruiting through the libraries – where rural areas have Internet access at the library? Probably not so good. Not worked in SD or KS. Jim Z has used City Hall in very small towns as the City clerk knows everyone, and may even know who's interested in weather. Most popular restaurant in town? SD pushes CoCoRaHS at all the agricultural extension events and meetings. They do not mention giving out gages. Sometimes raffle them off. Henry keeps track of the recruiting source, and it continues to be NWS offices. In Colorado about 10% of the COOP network came from the CoCoRaHS network.

4:30PM Committee workgroup break-out session

Current committees:

Collaborative committee – CoCoRaHS and COOP – Mary Knapp, Jim Z, Tim Kearns and Harry Hillaker. Could also include other networks.

Sustainability Committee – Funding mostly – Henry Reges, Nolan Doesken

Training and Education – Noah Newman, Melissa Griffin, Mary Knapp, Dave Robinson, Lesley-Ann. Has been pretty inactive the past few years.

Data QA/QC – Steve Hilberg, Tim Kearns, Tony, Zach

Web Interface – Rob Davies, Adnan, - not really a committee, Julian will send out stuff for us all to look at and comment.

Precipitation Measurements – Tony

March Madness

New –Recruitment-Retention Committee replacing March Madness. Henry Reges, Tony B on that committee (statistics)
Coordinator Support Committee. Henry already does this, but could use help and ideas for tools and maybe help attracting coordinators, training, resources.
Precipitation Protocols – Tony Bergantino, Nolan, Matt Kelsch (UCAR) (new name for Precip Measurement)
Innovation and Development (creation of value added products) - Adnan

Wednesday topics – document archiving; standing committees and membership; spatial importance factor; observer retention and network sustaining; station metadata collection app; prioritize new mobile app features; presentation of WERA webpage. internationalization (use CoCoRaHS as automated stations are never maintained so human simple obs are probably a better choice) but will internationalization help CoCoRaHS. Maybe we can best help them by providing them with our structure and protocols and let them copy us, not get involved in adding them to our network.

5:00PM Adjourn for the day

5:00-7:00PM Dining Hall Open for Dinner

6:30PM Evening Activity –Bowling - Meet at Ram's Horn

Wednesday, May 20th
7:00-9:00AM Dining Hall Open for Breakfast

8:30AM **Session Eight:** *Committee Reports, Institutional and Partner Reports*
Outreach/Education Committee -- Noah Newman Water Festivals – 5th graders form all the area schools with 20 minute sessions, and a booth and 5 or 6 sessions to give an overview of weather, climate, water cycle, reading rain gages, squirt guns into rain gages. Fractions, decimals, scientific instruments, etc. Hand out brochures. Also have to let them know about multi-day Mondays for teachers. In North Carolina – they sent out a letter to every school principal for March Madness, to encourage sign-ups. They do it because the principal told them to do it, not because they are excited about it, but it works and they have continued to report. Teachers will be the ones doing the measurements or teacher assigns kids each day to do the observations, and their submit it individually or as a class. The schools have more decimal and other common errors, because they have different students each day doing the reporting. Evaluations of CoCoRaHS. For the education – positive finding is that the teachers felt their students improved their science process skills and they believe this program helps their students in ability and confidence in reading the rain gage. Age range is in 3rd to 6th grade – where this meets their standard as they have a weather component. Can sign up just for a month or whatever, but usually the kids want them to continue. Hail video animation. They come up with a script for the animator and he generates a story board and rough up. $1000/minute of finished animation, but he usually gives CoCoRaHS a discount. Usually the script goes to a bunch of people to review and edit before it goes to the animator. In two different counties, every 5th grader in the county got a gage and encouraged to register with their family., Prizes for most consistent data, gift certificates – grand prize was iPad mini. Sponsors to purchase the gages and prizes. "Measuring Hail". Will need the evaluators to try and determine how helpful the animations are in education.

Nancy Selover, Arizona – Monsoon 2015 was very active in Arizona. Record rainfall in Phoenix, including 3 events that were between 850 and 10o00 year ARI. Significant flooding and loss of one life

in Phoenix. Set new 1 day and 24 hour rainfall record at Sky Harbor airport of 3.30". Most of the flooding and heavy rain were attributable to the active eastern pacific hurricane season.

Bill Sorensen, University of Nebraska-Lincoln, High Plains Regional Climate Center: Does a lot of data ingest, QC and CoCoRaHS data come into ACIS from CoCoRaHS go to NCEI, then into ACIS RCCs. After the data are ingested several times in the morning by CoCoRaHS, then once in the afternoon, and again the next day, so some data are entered late and don't get to ACIS for a few days. The data are most valuable if they get in within 24 hours. ACIS Maps for precipitation include CoCoRaHS data. 3 days of missing data allowed per station for gridded data. They can't use CoCoRaHS data for the gridded maps as they are only using morning observations, and NCEI does not include the TOB of their data, so they can't be included. GHCN daily is Matt Menne – who answers to Jay Lawrimore. GRADs interpolation is not so useful. RCCs may need to pull the data directly from CoCoRaHS rather than getting it from NCEI, as they can get the metadata with the data. Would help ACIS if all CoCoRaHS observers enter the zeros, and have minimal lag in data by prompt reporting, prompt inclusion of corrections and edits, synchronized data sources, and time of observations metadata. – grab directly from CoCoRaHS as frequently as they want. NCEI do not provide multi-day data back to RCCs and ACIS. But if they pull it directly they can get it. Would help CoCoRaHS if the RCCs pulled the data directly from CoCoRaHS as it would make the CoCoRaHS data more valuable to their users.

Adnan Akyuz, North Dakota Avalanche from the top of the car. Made a snow core sampler from PVC so he wouldn't have to use the gauge. 2" PVC scrap. Then weigh it and do the calculation for SWE. Takes only 2 minutes to do it completely. Has three sizes one foot, 2 foot and 3 foot. Depth(in)=mass(gm)/2.54pir^2(cm) for PVC radius in cm; depth (in) = mass(gm)/2.54^{3}pir^2(in) for PVC radius in inches. Depth(mm) = 10*mass(gm)/pir^2(mm) for radius and depth in mm. Must cover the gage with plastic for melting so sublimation does not occur. Scales $30 to nearest gm. USACE uses fishing scale, but not very accurate.

10:00AM Break for check-out

10:15AM **Session Nine:** *Open Discussion/MeetingSummary/Wrap-Up Laura Edwards & Steve Hilberg (2016 Chairperson)*

WERA 1012 Website – is where we file our reports, and our participants are listed. Waaesd webpage. CoCoRaHS has a WERA-1012 webpage that we can put whatever we want on it. Will include agenda and minutes and if you have a presentation a link to it, and the group pictures will be up on it.

Next Year's Meeting: Can do Sun-Wed or Tues-Fri. Do we have a preference? Usually the week before Memorial Day Weekend: Will aim for Wed 18th-Fri 20th arriving Tuesday the 17th. Or Mon 23rd thru Wed 25th arriving Sun 22nd.

Committees - Membership

Collaboration – Mary Knapp, Jim Z, Harry Hillaker, Tim Kearns, Jim Williams, Ian Nichols or Angie (Canada)
Sustainability – Nolan Doesken, Henry Reges, Chris Daly, Mary Knapp
Recruitment – Retention – Henry Reges, Tony Bergantino, Dave Robinson, Laura Edwards, Noah Newman, Stan Engle
Coordinator Support – Henry Reges, Steve Hilberg, Jim Z, Tony Bergantino, David Glenn, Dave Robinson
QualityAssurance/QC – Steve Hilberg, Tony Bergantino, Zach Schwalbe, Bill Sorenson, Tim Kearns, Matt Gerbush, Julian Turner, Michael Willette, Bryant Kor.
Education & Training – Mary Knapp, Melissa Griffin, Adnan Akyuz, Noah Newman, Zach Schwalbe

Precipitation Protocols – Tony Bergantino, Adnan Akyuz, Nolan Doesken, Zach Schwalbe
Innovation & Development – Adnan Akyuz, Chris Daly, Ian Nichols, Bill Sorenson, Julian Turner, Nancy Selover, Cindy Lutrell, Tony Bergantino

Spatial Importance Factor – when we get new observer, we care where it is, small number means adding to rural area or county. Spatial importance factor (SIF) is average distance from the closest five stations. Relative SIF = SIF/SIF State So a new station with a large SIF is a good thing. Incorporate in the new server data. That info comes out to the coordinators when Linda send the new observer e-mail. Innovation & Development will look into this.

Retention – Certificates: when an observer reaches 100 data points – reports they get a certificate. The state coordinators would present them, but the HQ will develop the certificate. Mary – some state coordinators do monthly recognition when observers have complete monthly reports. There is a CoCoRaHS webpage that shows the publications that use CoCoRaHS data so the observers know their data are being used. Maybe the Recruitment and Retention Committee could come up with a list of rewards or ideas to recognize observers. Also identify barriers to retention. Coordinators are important as some have great ideas and others need ideas to be more effective, so these two committees might work together.

Internationalization – Some interest in WMO to help CoCoRaHS – but the chief of instrumentation wants to know about the accuracy of the gage. Is this gage manufactured to US Wx Bureau standards? We don't know whether this is a good idea. Unless something international comes with a very large amount of money, this is something we don't currently have time or personnel to do. The model of CoCoRaHS is what should go to the rest of the world, not becoming part of CoCoRaHS as we have it here. Their reporting structures will be different as internet service is not global. Could talk to them and show them what we're doing and how it can be done, but not necessarily take it on, perhaps advise with WMO to provide all the funds or find the funds. Advise consult assist, but not re-create our system. Each country's Weather Service would be where the planning, training, and ingestion, etc. would have to occur. Have to have costs calculated for every level of effort, travel, database, ingest, web development, gages, education, etc. Can't walk into this sort of project saying, "sure, we'll help or advise you." Without providing the costs, as they have provided no funding source. Definitely go and hear what they are thinking, but be careful when considering commitments. Only CoCoRaHS HQ knows what you can and cannot handle.

Station Metadata Collection App and Prioritize new mobile app features: Julian has worked with some computer students in mobile app development. They came up with Station Metadata app to collect coordinates, pictures, and upload those data to a database. Lets them know ahead of time that the station is well or poorly sited, so the stations can be re-sited before a major event. This is for coordinators, not sure there is much use for this. Many observers would not want someone coming to their house to take pictures of the gage and all that. Maybe have the new observers do this. May be a one-time use app. Maybe have the observer submit a picture when they submit a severe weather report or a really extreme value. Maybe Instagram. What's the priority for building out the mobile aps? Language translations, add multi-day, severe, hail report. If the hail report could use the phone's GPS function, that would be cool, but every observer has a GPS location, so handling the new geotag on the hail report is something Julian does not currently know how to handle. Priorities are 1) Multi-day, 2) Hail, 3) Significant Weather, 4) Edit Daily Report, 5) ET Multi-Day – should also find your last report so you know when it should start.. Priority voting: 1 = Multi-Day, 2 = Edit Daily Report, 3= Hail, 4=Significant Wx, 5=ET.

Evaluation – NOAA Education and NSF education – informal science learning, so they have evaluations into how well the informal science learning is working. Very hard to determine how effective this is. Even logging in is a barrier to participation. The survey is painful to take, and the minorities are the

smallest demographic. We can't get to underserved populations. Unless you direct your project to underserved populations, you will be white male middle aged demographic. People who answered the survey tend not to be the minorities, also tended not to be the most active observers. Is there a pdf copy of the evaluation that we can look at and send in comment or suggestions? Yes and a 2 page executive summary. The school connections are paying off as people who first heard about this as 5th graders are now participating later in life.

Steve Hilberg incoming president. Hopefully the rejuvenated committees will move forward. We might spend some longer sessions on specific topics. Maybe some after dinner informal discussion or activities that are related to this project. They do provide sack lunches we could grab and go. But many people are catching up on e-mail and work during the lunch breaks. There were a lot of action items that came out of last year's meeting, so we want to try and keep on top of the committee tasks. Maybe send out some reminders of committee work. If you have format suggestions or ideas, let Steve know.

12:00PM Conference Ends Adjourned at 12:10 pm MDT
Lunch and Meeting Adjourn (Dining Hall open for Lunch 11:30AM-1:30PM)

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What does WERA stand for?
III. WESTERN MULTISTATE PROJECTS

A. Research Projects (W)
Multistate Research Projects involve cooperative, jointly planned research employing multidisciplinary approaches in which SAESs, working with the ARS, or other college or university, cooperate to solve problems that concern more than one state and, usually, more than one region. Cooperative Extension and academic faculty are encouraged to participate if and where appropriate to meeting joint objectives.

B. Coordinating Committees (WCC)
Coordinating Committees provide a mechanism a for addressing critical regional issues where multistate coordination or information exchange is appropriate within a function (i.e. research, education or extension); have expected outcomes; convey knowledge; and are peer reviewed. The work of Western Coordinating Committees can be classified into the following categories:
• Multistate research, education or extension programs with clearly established, outcome oriented, goals where research results are already available. Knowledge is conveyed utilizing methodology which results in increased understanding and effective resolution of identified needs.
• Multistate research, education or extension coordination resulting in increased communication between faculty, avoidance of unnecessary duplication and gained efficiencies in the use of resources and shared ideas.

C. ***Education/Extension and Research Activity (WERA)***
These activities serve to integrate two or more functions (i.e., education, extension and research) on a particular topic where multistate coordination or information exchange is appropriate; have expected outcomes; convey knowledge; and are peer reviewed. The work of Western Education/Extension and Research Activity Committees can be described as follows:
• Fully integrated research, education and extension program coordination with clearly defined, impact oriented
objectives, where results are effectively embodied in educational efforts to assist those in need.

WERA 1012 Attendees 2015

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