“Ciencia ciudadana en su propio patio trasero”

CoCoRaHS

CoCoRaHS
Community Collaborative Rain, Hail & Snow Network

An international volunteer citizen science precipitation network complementing national and sub-national observational capacities. Daily and real time observations available to support preparedness and response relating to extreme events.

Use of Volunteer Networks to Address Information Gaps
Mexico City, Mexico
25 September 2019

Henry Reges, Matt Spies, Steve Hilberg

The Bahamas Meteorology Department
Environment and Climate Change Canada | Environnement et Changement climatique Canada
NOAA
Colorado State University

PART ONE

An overview of our network

CoCoRaHS was born in response to the 1997 Fort Collins, Colorado Flood

The flood pointed out:

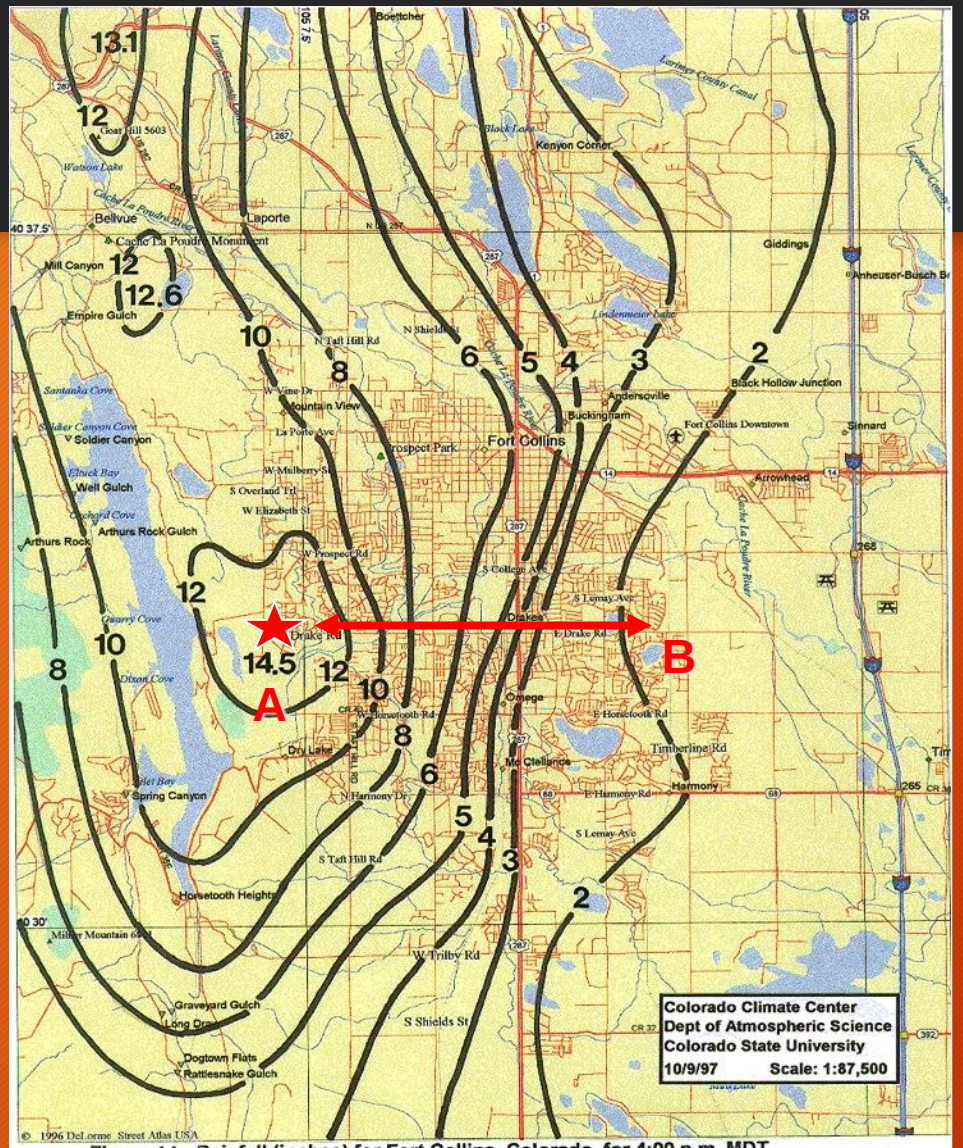


Figure 14. Rainfall (inches) for Fort Collins, Colorado, for 4:00 p.m. MDT July 27, 1997 through 11:00 p.m. MDT for July 28, 1997

1. The extreme local variations in rainfall possible from convective storms.

2. The important role individuals can play in measuring, mapping and reporting precipitation.

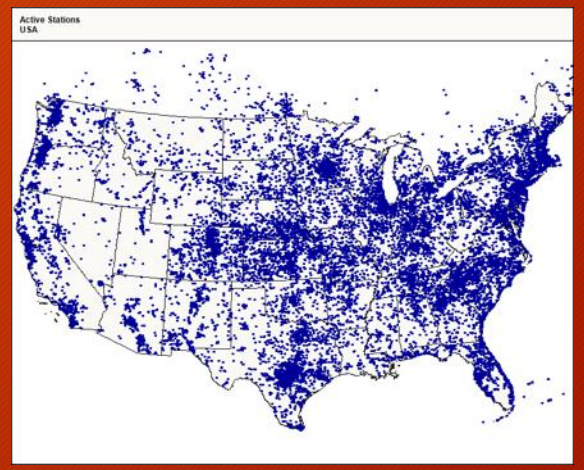
Distance between A and B = 5 miles (8 km)

A = 14.5 inches (368 mm)
B = 2.0 inches (50.8 mm)

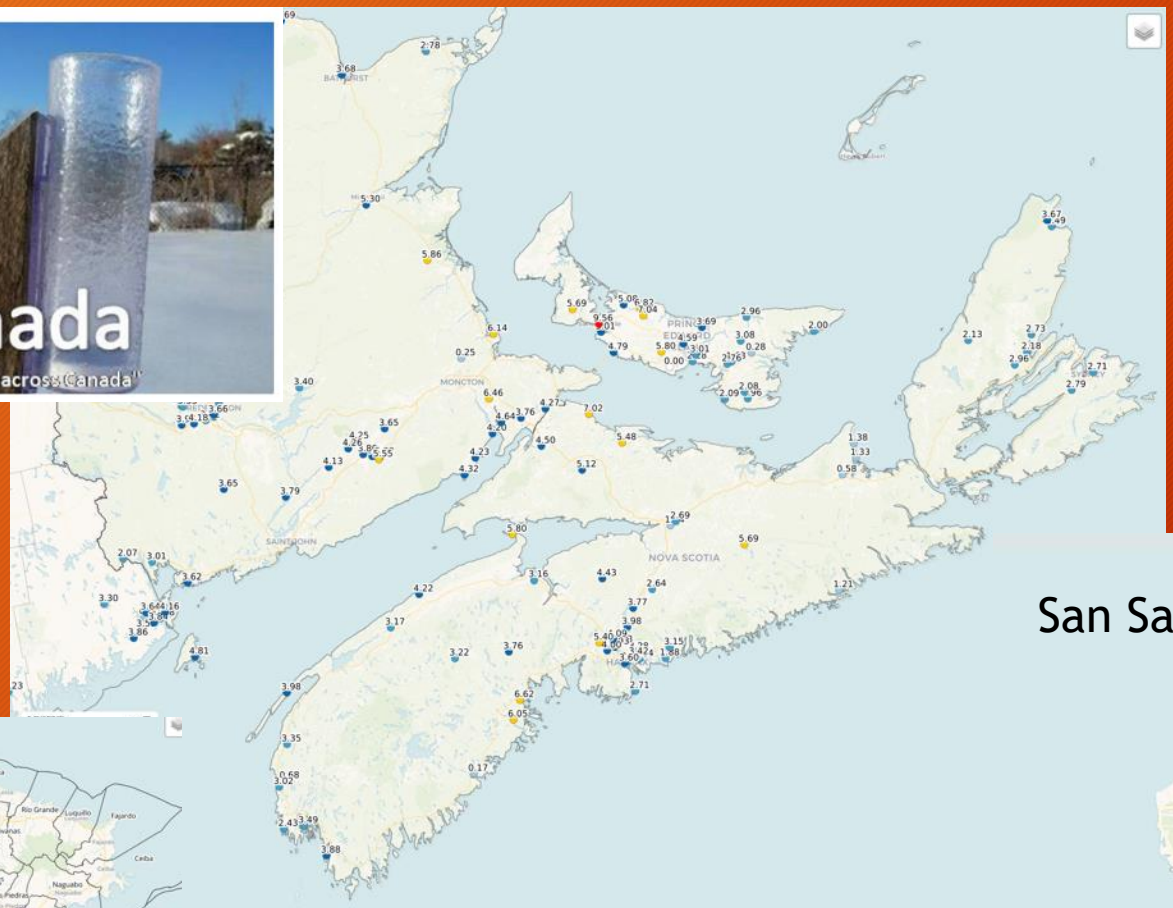
1998

Today

A few dozen volunteers
in Northern Colorado



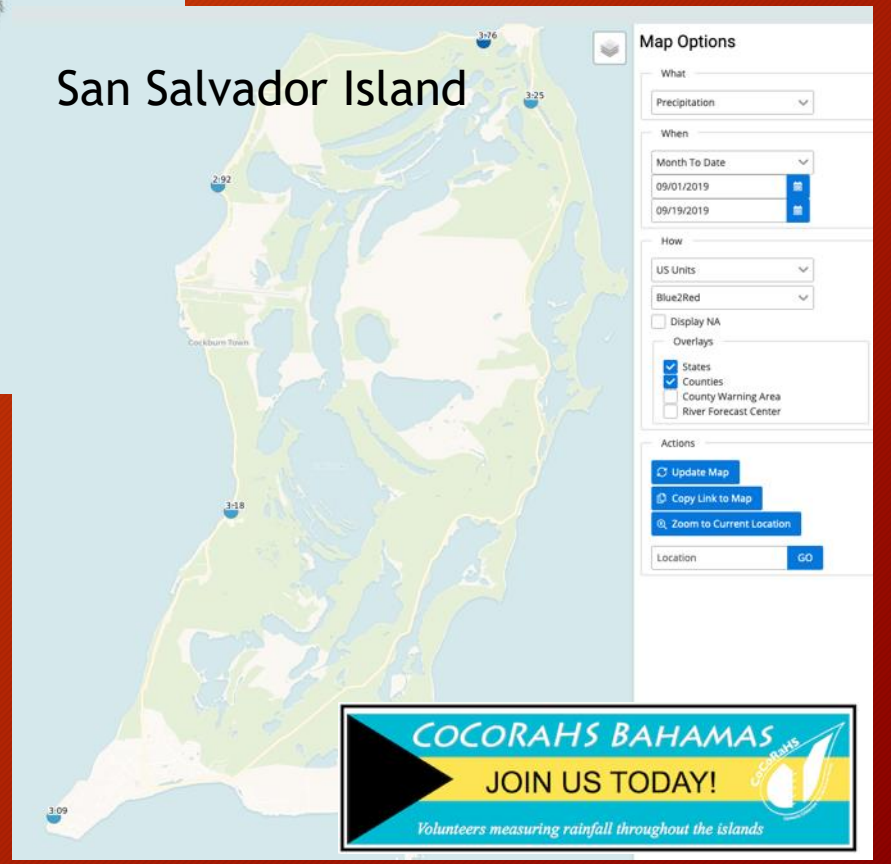
21,000+ volunteers in all
50 states, Canada, Puerto Rico,
the U.S. Virgin Islands and the Bahamas

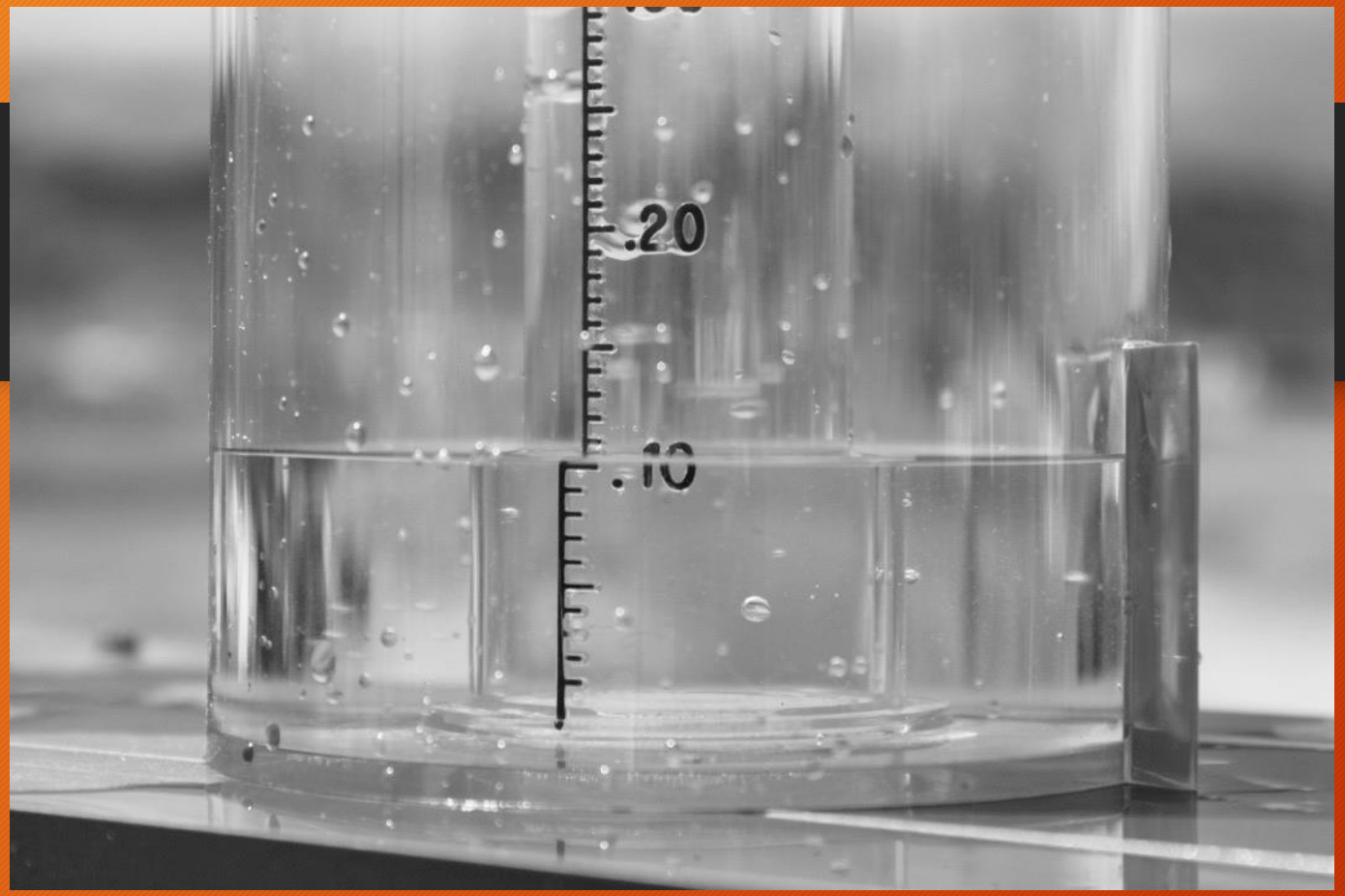


¡Bienvenidos a CoCoRaHS Puerto Rico!

La ***"Isla Del Encanto"*** se complace en participar en la creciente red de CoCoRaHS. Los observadores de CoCoRaHS PR proveen información importante acerca de la lluvia, que es utilizada por meteorólogos, hidrólogos, agricultores, los administradores de los recursos de agua, al igual que por tus amigos y vecinos. Este esfuerzo es de gran importancia dada la gran variabilidad en las acumulaciones de lluvia local, fluctuando entre 175 pulgadas en la Sierra de Luquillo y en El Yunque hasta solo unas 25 pulgadas de lluvia en las áreas más áridas del sur de Puerto Rico. ¡Este programa eventualmente se expandirá a las Islas Vírgenes Americanas (USVI, por sus siglas en inglés)! Para información adicional acerca del capítulo de CoCoRaHS PR o USVI, favor de contactar a cualquiera de los coordinadores locales.

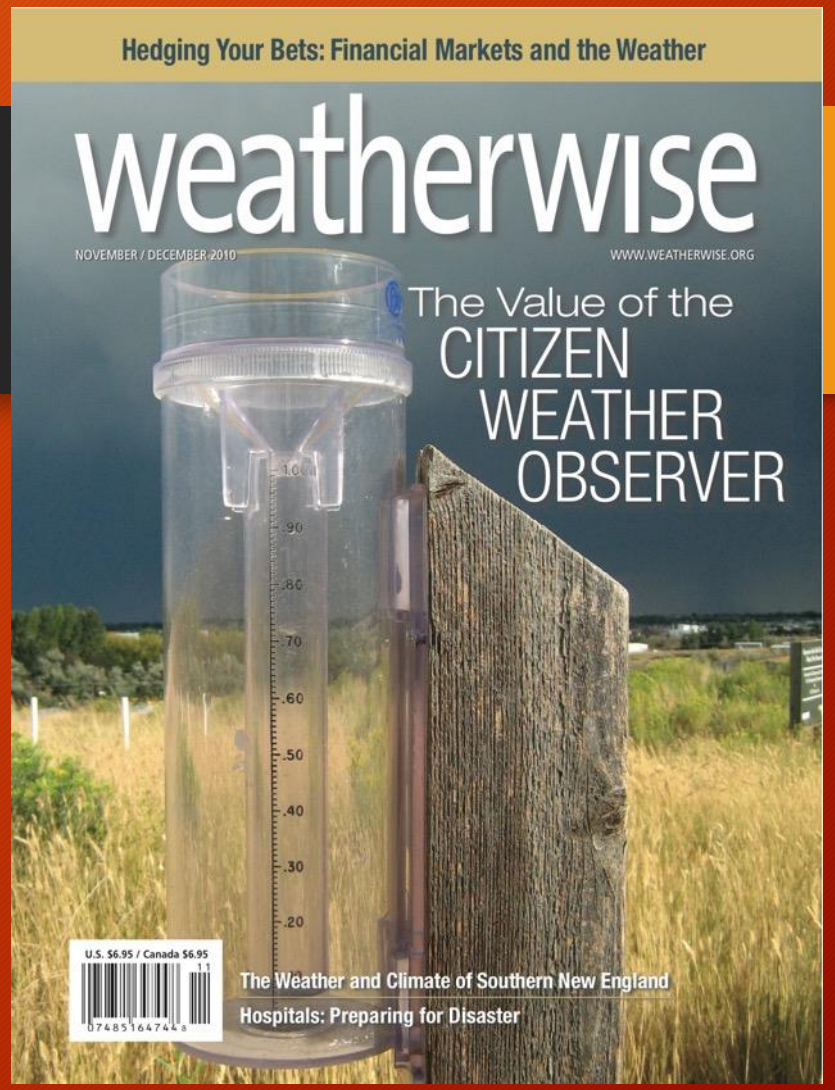
San Salvador Island



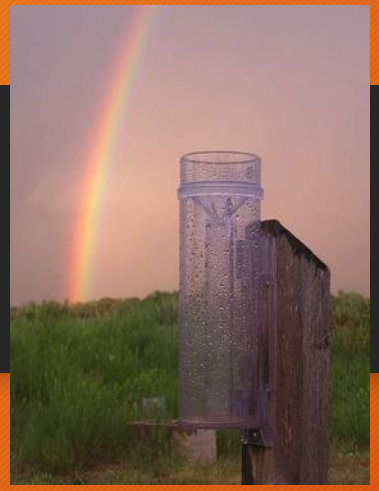


CoCoRaHS's goal is to provide:

High Quality Precipitation Data
and
Educational Resources and Outreach



Today's citizen weather observer can play a valuable role with supplemental observations



Rainfall data

CoCoRaHS provides daily precipitation measurements and real-time observations when conditions warrant

Snowfall data

CoCoRaHS Volunteers measure both snowfall depth (new and accumulated) as well as the water content of the snow (SWE)

Hail data

CoCoRaHS observers report hail and reports are available daily and in real time to the public.

The CoCoRaHS Website

www.cocorahs.org

COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK

"Because every drop counts"

Select Language

Home | Countries | States | View Data | Maps | My Data | My Account | Admin | Logout

Welcome to CoCoRaHS! "Volunteers working together to measure precipitation across the nations."

Main Menu

- Home
- About Us
- Join CoCoRaHS
- Contact Us
- Donate

Resources

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- Soil Moisture

- Volunteer Coordinators
- Hail Pad Distribution/Drop-off
- Help Needed
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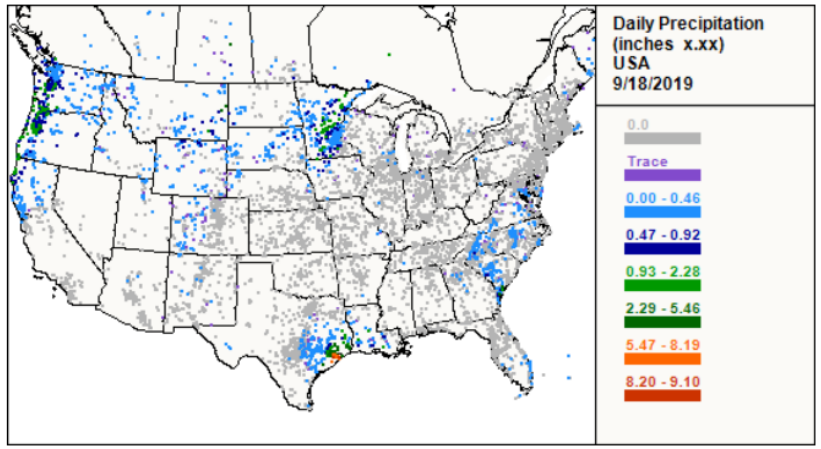
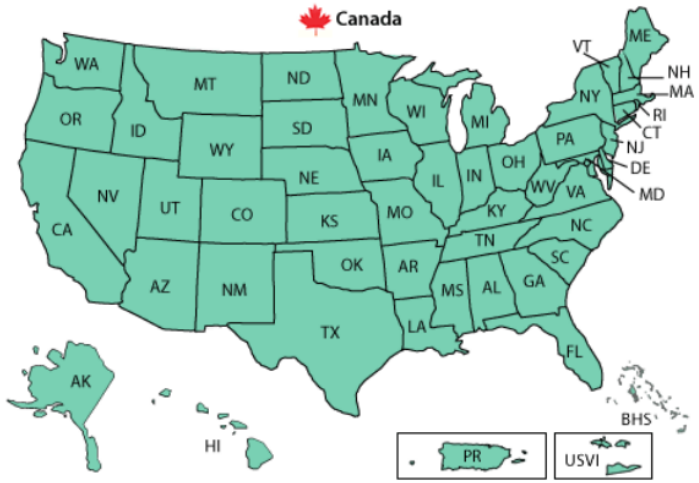
AMBASSADOR WRN WEATHER-READY NATION

Who uses CoCoRaHS Observations?

Reports received today 9/18/2019 as of 4:08 PM EDT

Daily	Multi-day	SigWx	Hail	Condition	ET
9,220	115	0	0	23	118





JOIN CoCoRaHS

Download on the App Store

ANDROID APP ON Google Play

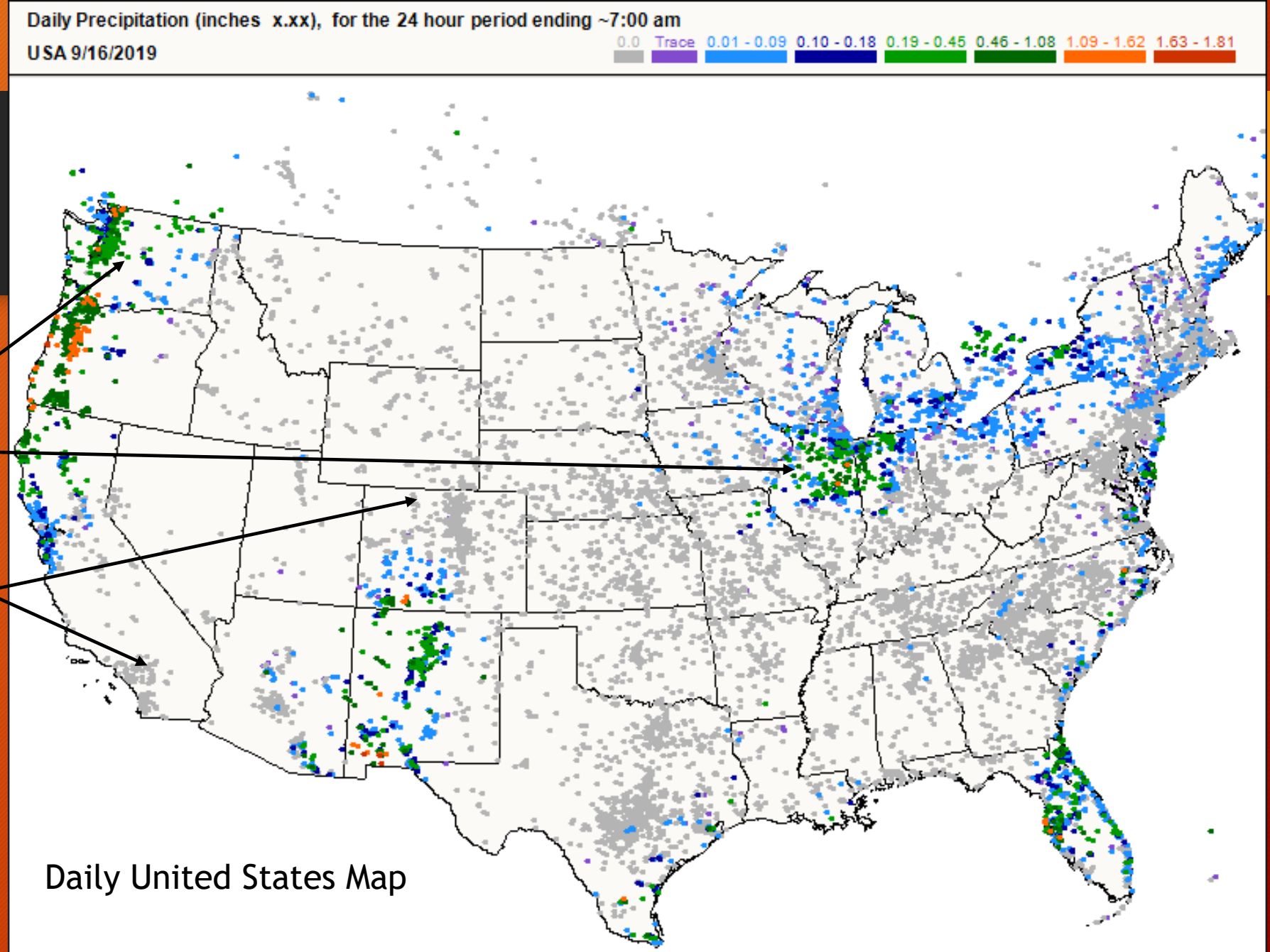
CoCoRaHS WxTalk Webinar Series

Purchase an official CoCoRaHS 4" Rain Gauge

"The official CoCoRaHS Rain Gauge supplier"

Observers reporting where precipitation fell

. . . and where it did not

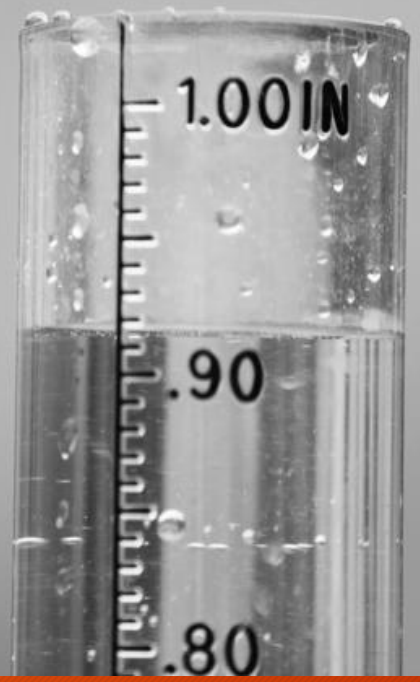


Daily United States Map

A dense network of observers across the country

Simple, easy-to-handle low cost equipment

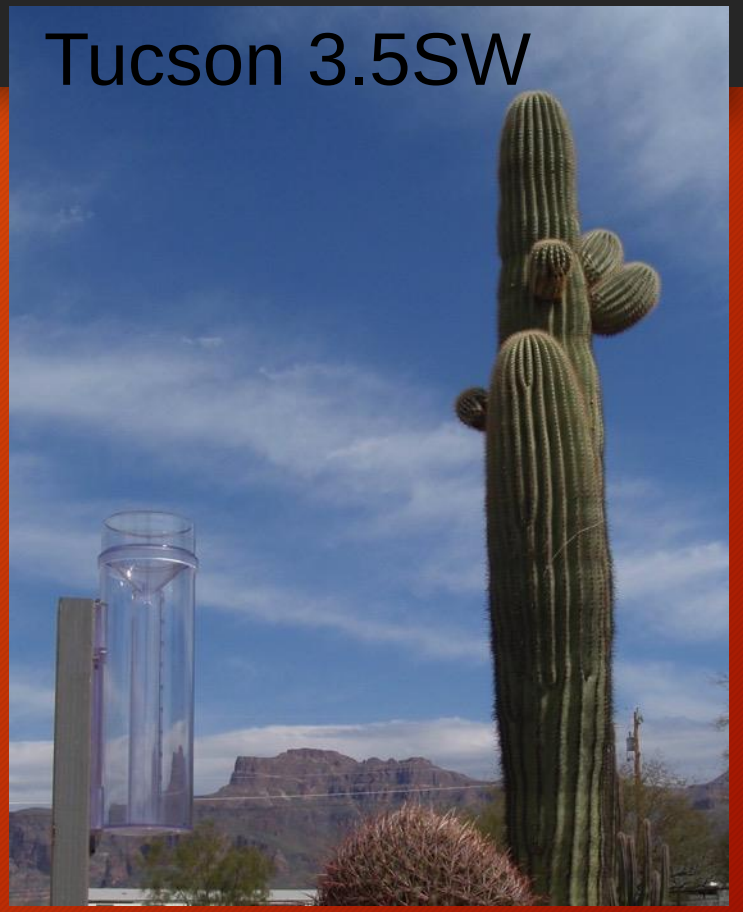
Cost approximately
$33.00 (U.S.)



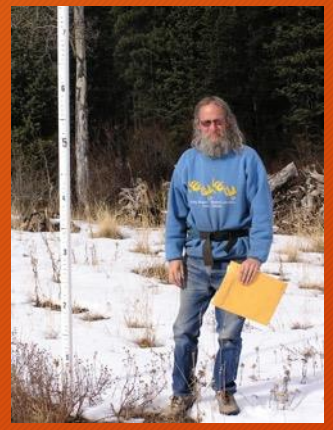
Gauge measures to 0.01” (0.2mm),
holds 11.30” (260 mm) of precipitation.

Everyone uses the same rain gauge for consistency of observations.

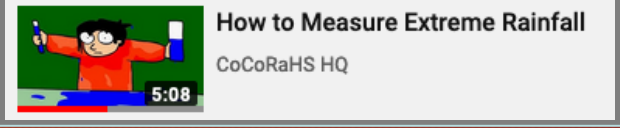
Each station is given a name name and location



Volunteer observers of all ages take a simple daily measurement at their location.



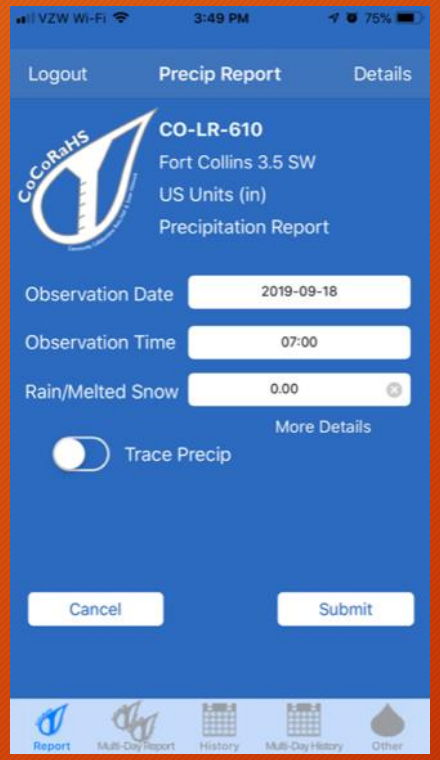
On-line training is provided



Volunteers observe daily at ~7:00 AM local time for uniformity

Observations can be recorded in millimeters or inches

We provide easy to use entry forms for reporting daily observations



The CoCoRaHS App

My Data Entry : Daily Precipitation Report Form

For observations spanning more than 24 hours, please use the multiple day accumulation report.

Precipitation Report Form Submit Reset

Station Number : CO-LR-610

Station Name : Fort Collins 3.5 SW

* Denotes Required Field

9/18/2019 *Observation Date

7:00 AM *Observation Time

0.89 in. *Rain and Melted Snow to the nearest hundredth inch that has fallen in the gauge during the past 24 hours, or T for trace, or NA for unknown.

Observation Notes: (This will be available to the public)

Heavy rainfall from 6-9PM. Tree limbs down. Minor street flooding.

New Snowfall

NA in. Accumulation of new snow in inches to the nearest tenth

NA in. Melted value from core to the nearest hundredth

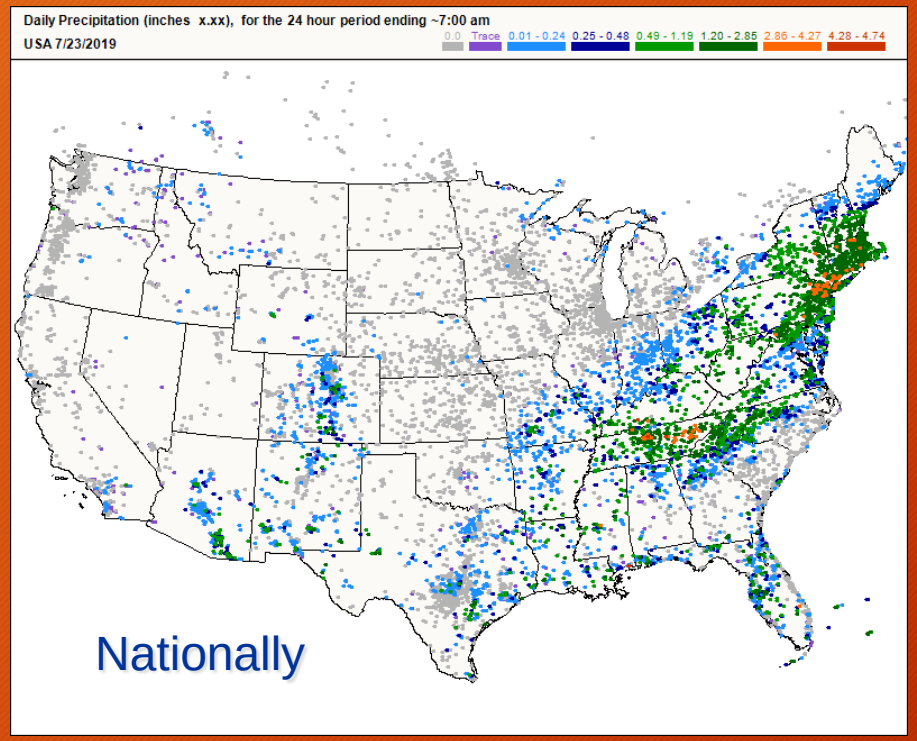
Total Snow and Ice on Ground at Observation Time

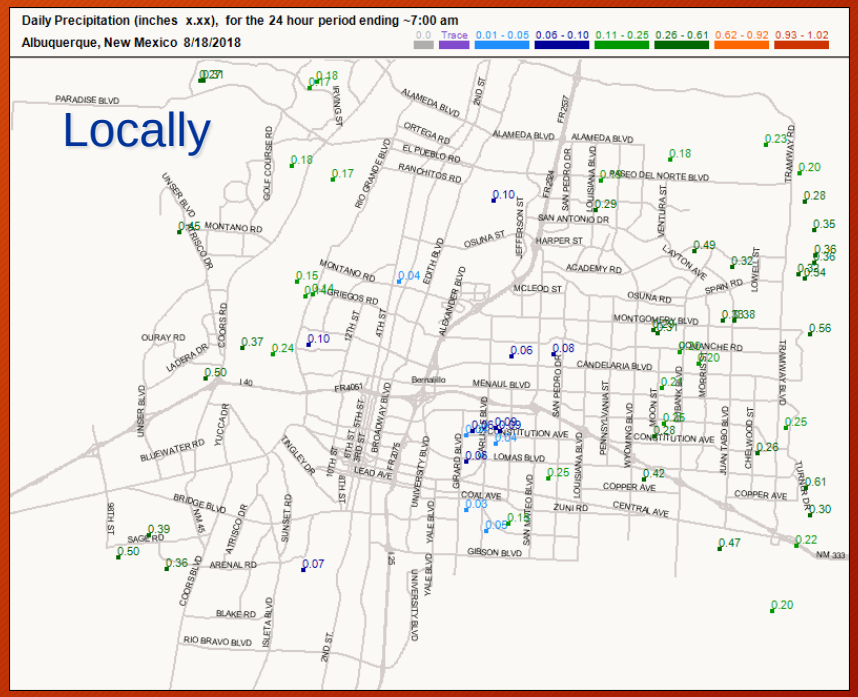
NA in. Depth of total snow and ice (new and old) in inches to the nearest half inch

NA in. Melted value from core to the nearest hundredth

On-line form

Date	Time	Station Number	Station Name	Total Precip in. ▲	New Snow in. ❄ 💧	Total Snow in. ❄ 💧	State	County	View	Maps
7/23/2019	12:45 PM	ME-HN-26	Brooklin 2.8 SE	0.28	NA | NA	NA | NA	ME	Hancock		Classic | New
7/23/2019	7:30 AM	ME-HN-3	Southwest Harbor 2.6 SE	0.21	NA | NA	NA | NA	ME	Hancock		Classic | New
7/23/2019	5:30 AM	ME-HN-58	Sullivan 2.4 SSE	0.14	NA | NA	NA | NA	ME	Hancock		Classic | New
7/23/2019	8:15 AM	ME-HN-56	Surry 2.5 SSE	0.13	NA | NA	NA | NA	ME	Hancock		Classic | New
7/23/2019	9:17 AM	ME-HN-12	Blue Hill 0.1 WSW	0.13	NA | NA	NA | NA	ME	Hancock		Classic | New
7/23/2019	9:00 AM	ME-HN-2	East Surry	0.12	0.0 | NA	0.0 | NA	ME	Hancock		Classic | New
7/23/2019	1:00 PM	ME-HN-21	Ellsworth 4.6 NNE	0.11	NA | NA	NA | NA	ME	Hancock		Classic | New
7/23/2019	8:00 AM	ME-HN-7	Ellsworth 7.4 NW	0.09	NA | NA	NA | NA	ME	Hancock		Classic | New



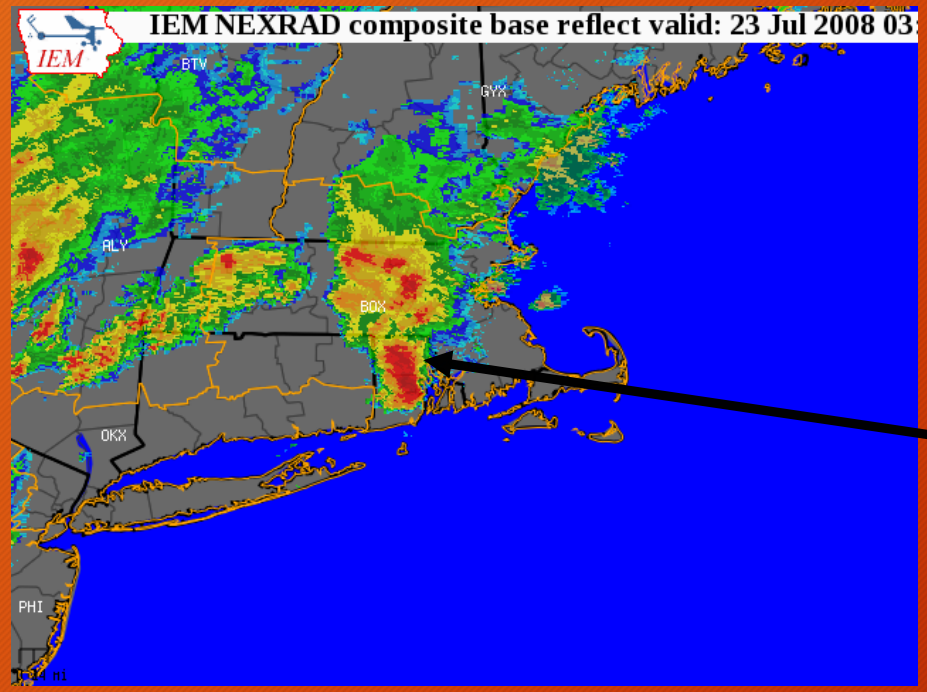


Volunteer's observations are immediately available in map and table form for the public to view.

“REAL TIME” CoCoRaHS Significant Weather Reports

Advanced warning to the National Weather Service regarding potential flash flooding

Sends an alarm to NWS AWIPS workstation

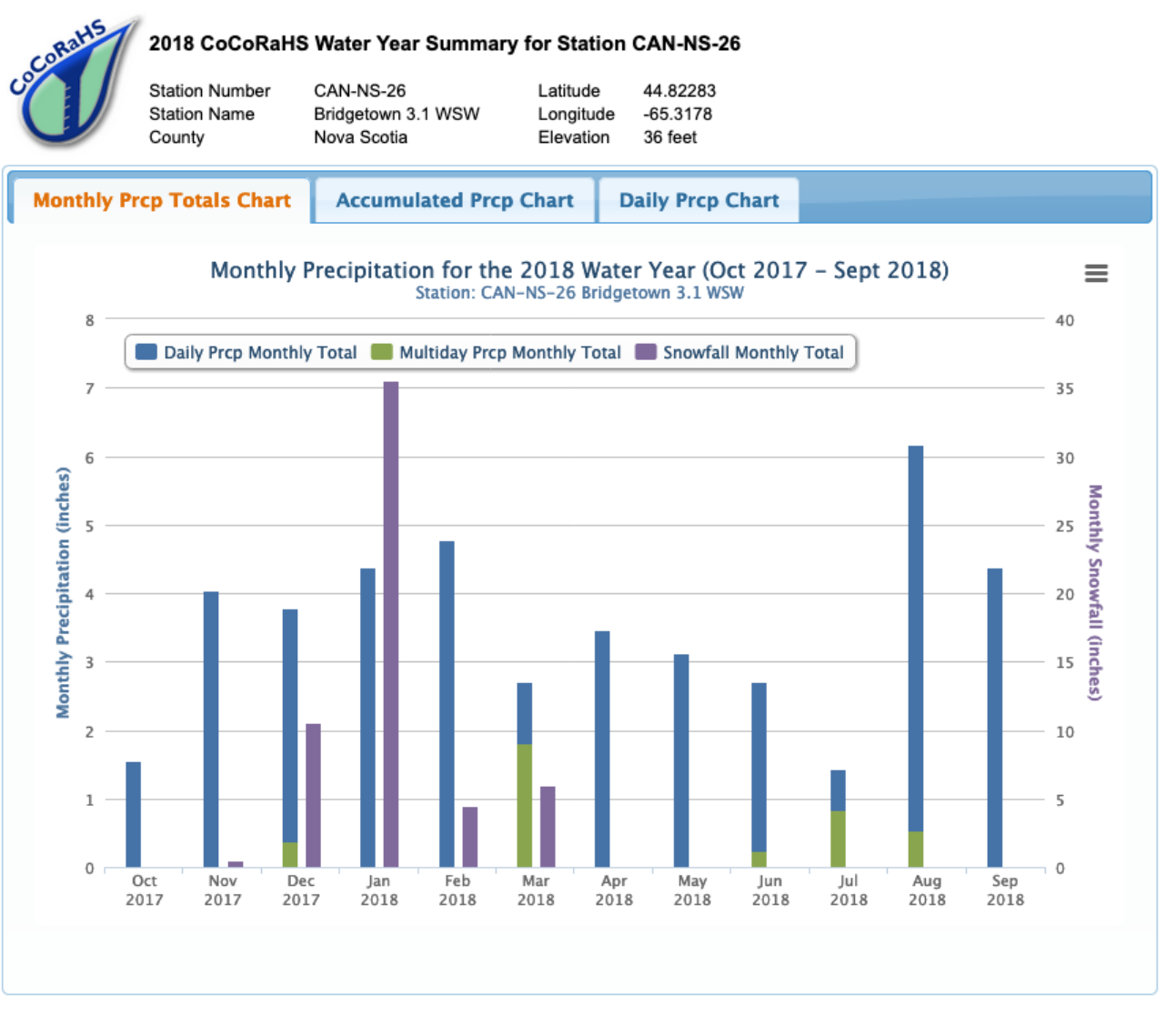


View Data : View Significant Weather Report

Significant Weather Report	
Station Number:	RI-WS-1
Station Name:	Hope Valley 3.7 S
Date:	7/23/2008 3:15 PM
Submitted	7/23/2008 3:23 PM
Notes:	
Taken at Registered Location:	True
Precip Duration Minutes:	15
New Precip Amount:	1.00
Total Precip Amount:	NA
New Snow Depth:	NA
Total Snow Depth:	NA
Flooding:	No

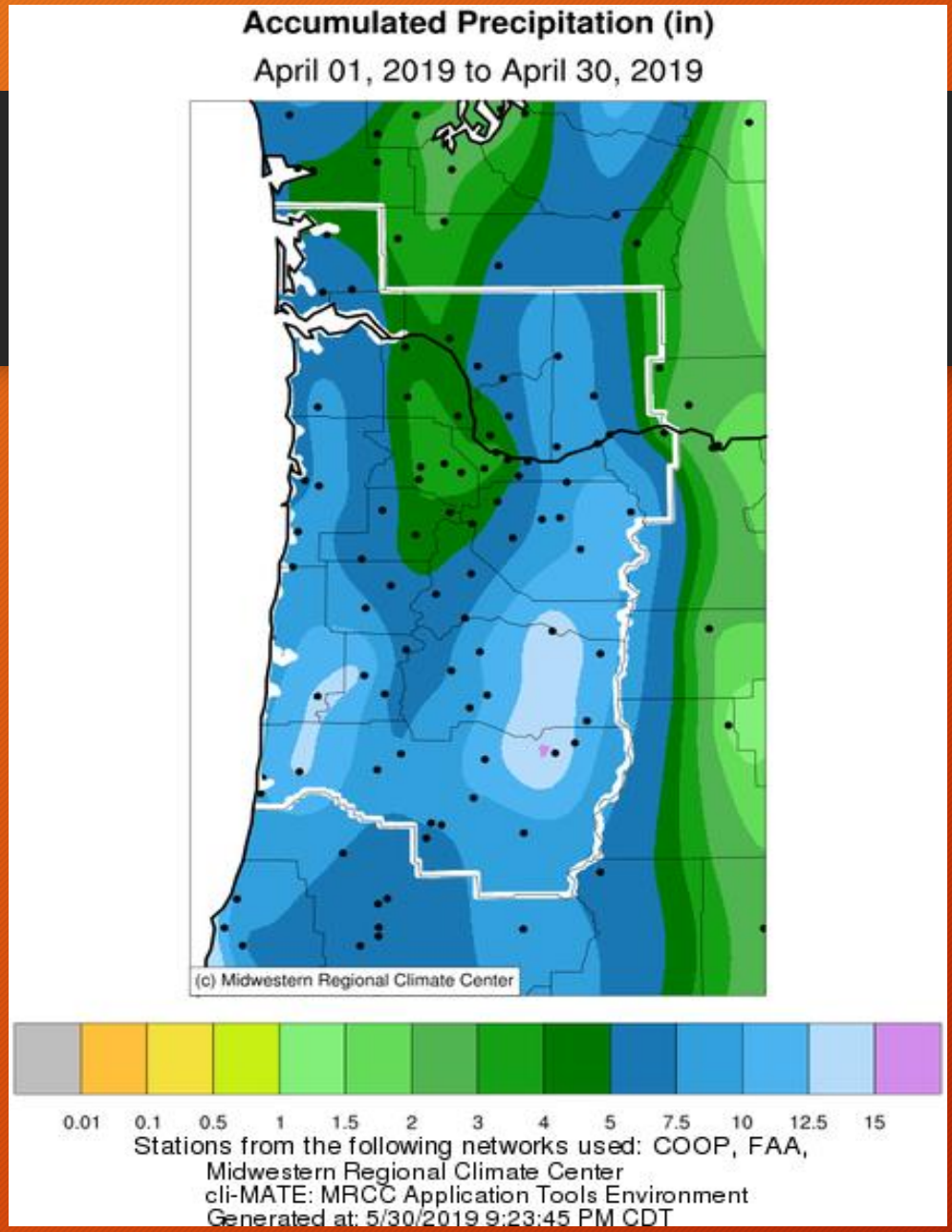
July 23, 2008 – A CoCoRaHS observer in Hope Valley, RI provided an intense rainfall report which led to the issuance of a timely Flash Flood Warning. Life threatening urban flooding was reported in Warwick and Providence at the start of the evening rush hour, where several cars were stranded in more than 2 feet of water, requiring people to be rescued. Lead time would have been much less without the CoCoRaHS report. - Joe Dellicarpini, NWS Taunton, MA

Volunteers data are permanently archived and available in a variety of summary reports

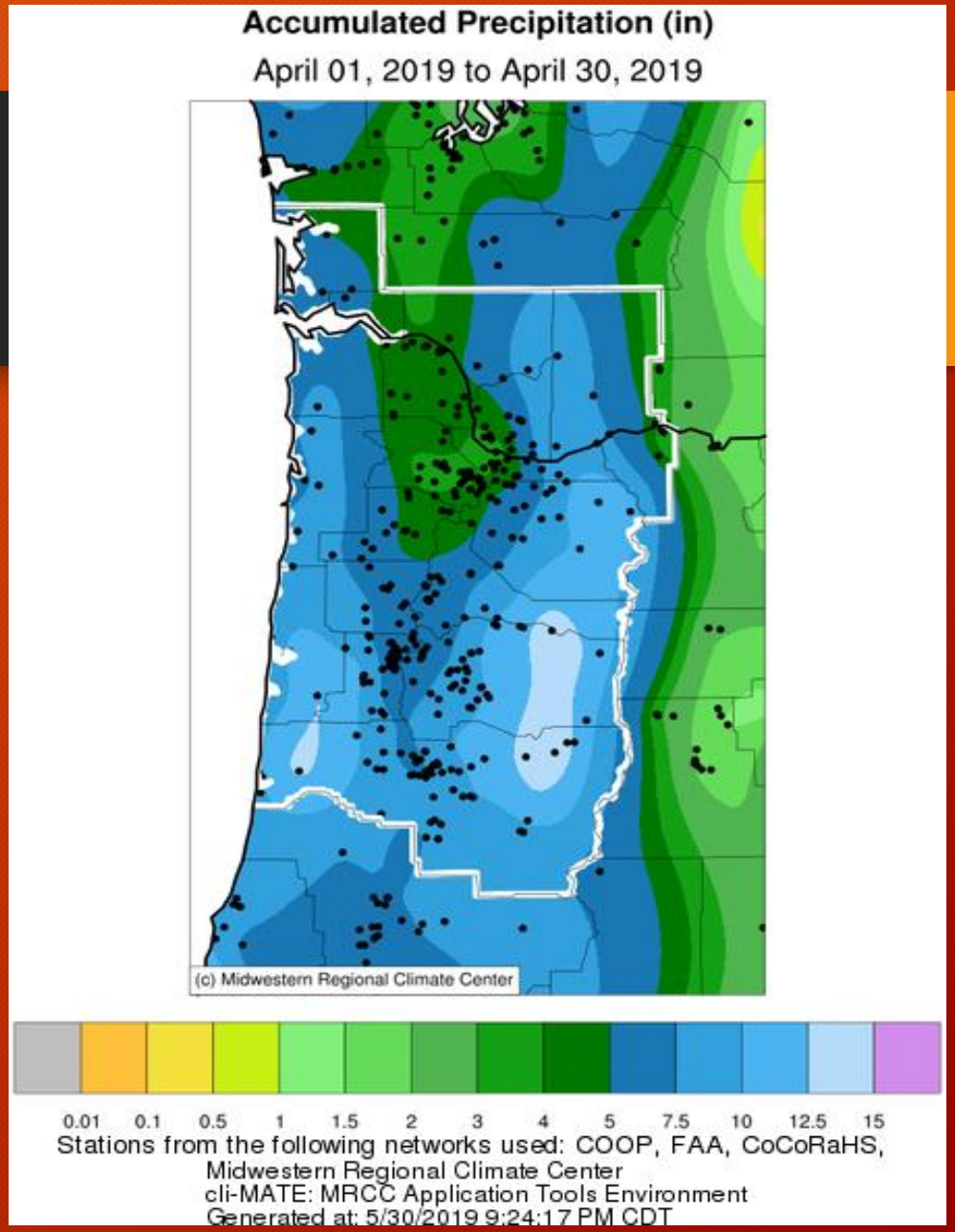


In the U.S. CoCoRaHS data is archived daily in NOAA/NCEI's GHCN-D (Global Historical Climate Network)

CoCoRaHS helps provide a finer mesh of data by supplementing other precipitation networks



Without CoCoRaHS data



With CoCoRaHS data

PART TWO

Volunteer Engagement

Recruiting

It is important to recruit new volunteers as the months and years move along. There are most certainly data gaps on all of our maps that we would love to have precipitation observations from.

nhpr
NEW HAMPSHIRE PUBLIC RADIO

Retaining observers

The longer observers participate, the more value of their data to the long term climate record for their location.

<u>Ideas to help retain observers for the long run:</u>

Observer recognition - certificates
Headquarters support
Local emails – letting them know they matter
Letting observers know there data is used


Community Collaborative Rain, Hail & Snow Network

Southern New England

September 2017

The moon eclipsed the sun on a sunny afternoon this month of August. For most of the month, the sun shined brightly and we reported a record exceeding 5000 Daily Reports of zero, however, some of you did find the variability of precipitation that the summertime downpours can bring.

August was also a month for getting away and getting together. A time to get away from our daily lives. A time to get together with those we know that live away from us.

As this Water Year comes to a close, we are pleased to see so many of you are reporting more than 80% of the days. After this Water Year closes at the end of September and the new one begins, we will be issuing Certificates for those that reported more than 80% of the days, 290 days, and that number may be close to 200 observers. Well done by many of you.

In this edition, we recognize those that have submitted 1000 Daily Reports recently, more about Comments with the rain in eastern Cape Cod that even caught Nolan's eye, it's not too early to talk about Snow reporting, Map of the Month is Norfolk County MA, and before a new map of reports comes out soon, another mention about Condition Monitoring Reports.

Let us read on

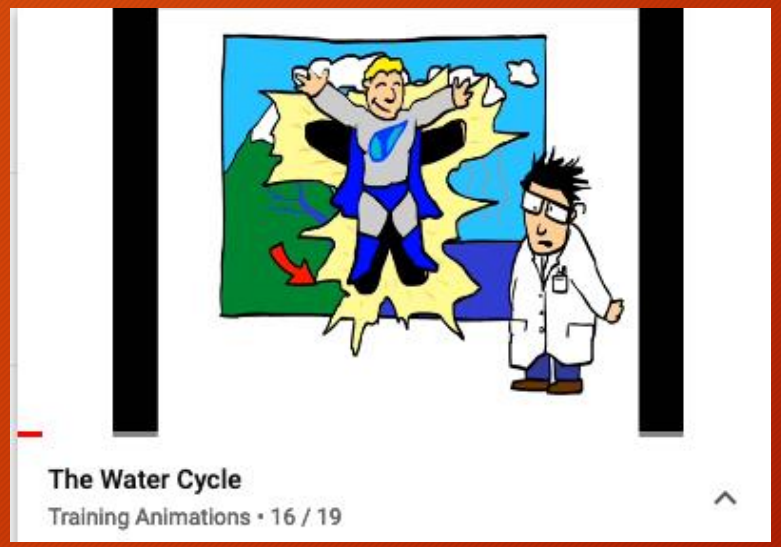
<u>Observers may leave due to:</u>

Illness
Relocation
Loss of interest
Broken equipment
Lack of support (in some cases)

CoCoRaHS believes that volunteerism is a two way street . . .

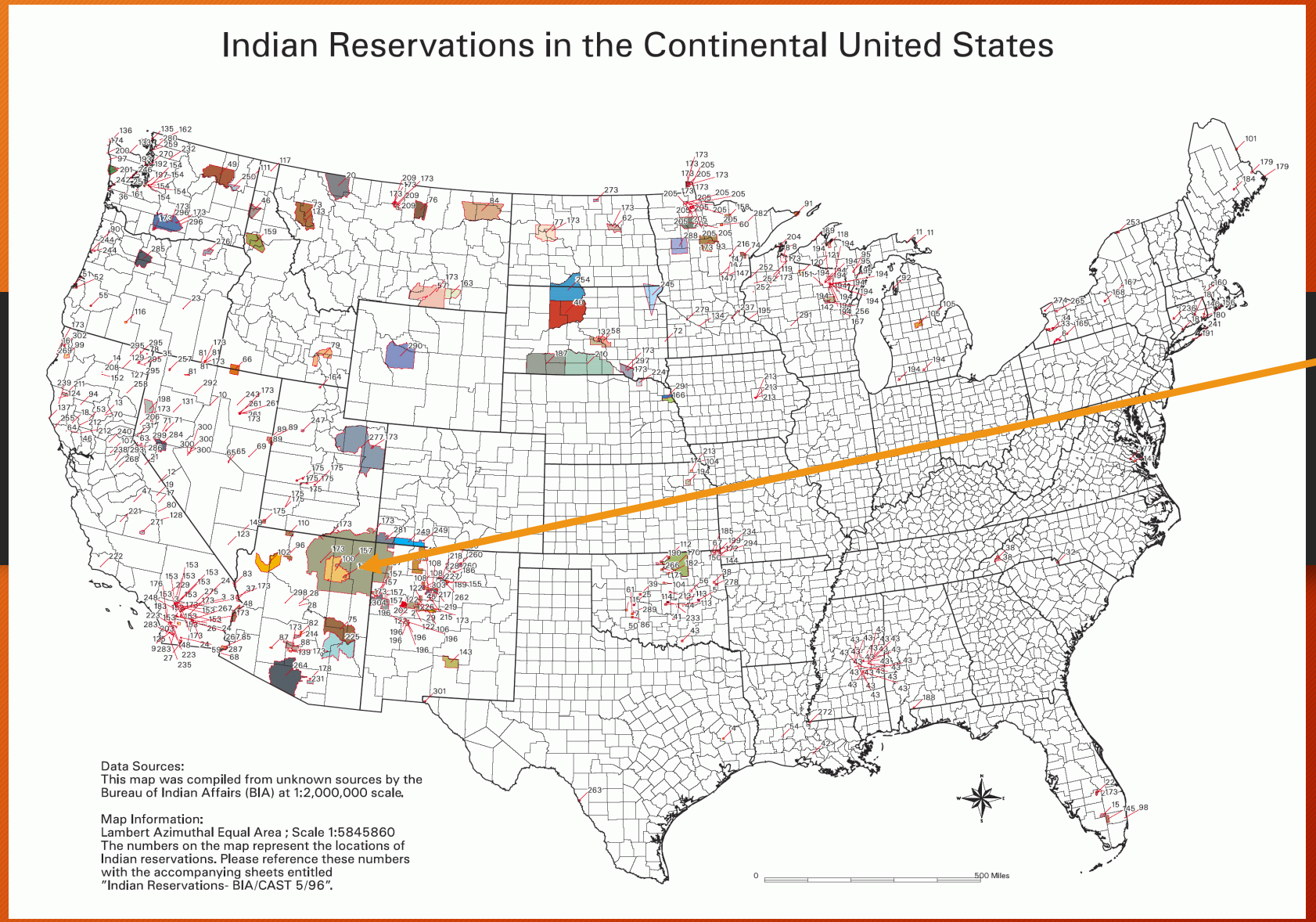
We feel that it is really important to engage with our volunteers and give something back in return for their observations.

There are many opportunities for an observer to become more involved than just taking measurements. By doing so they learn more about their climate and weather in general.



Outreach to under-represented groups

CoCoRaHS & Tribal Engagement



CoCoRaHS
Community Collaborative Rain, Hail & Snow Network

CoCoRaHS continues to engage Tribal Nations in the U.S. and First Nations in Canada

PART THREE

Coordination/Educational Outreach

Coordination

CoCoRaHS has over 250 State and Regional Volunteer Coordinators to oversee the network in their area. Each coordinator is responsible for recruiting and retaining observers in their area, as well as other duties. We even have coordinators on the county level in some states.





Many coordinators come from the fields of meteorology, hydrology, academia, etc. But others are just interested citizens who have come to embrace the network and want to take a role in overseeing their area.

Matt Spies, Connecticut State Coordinator

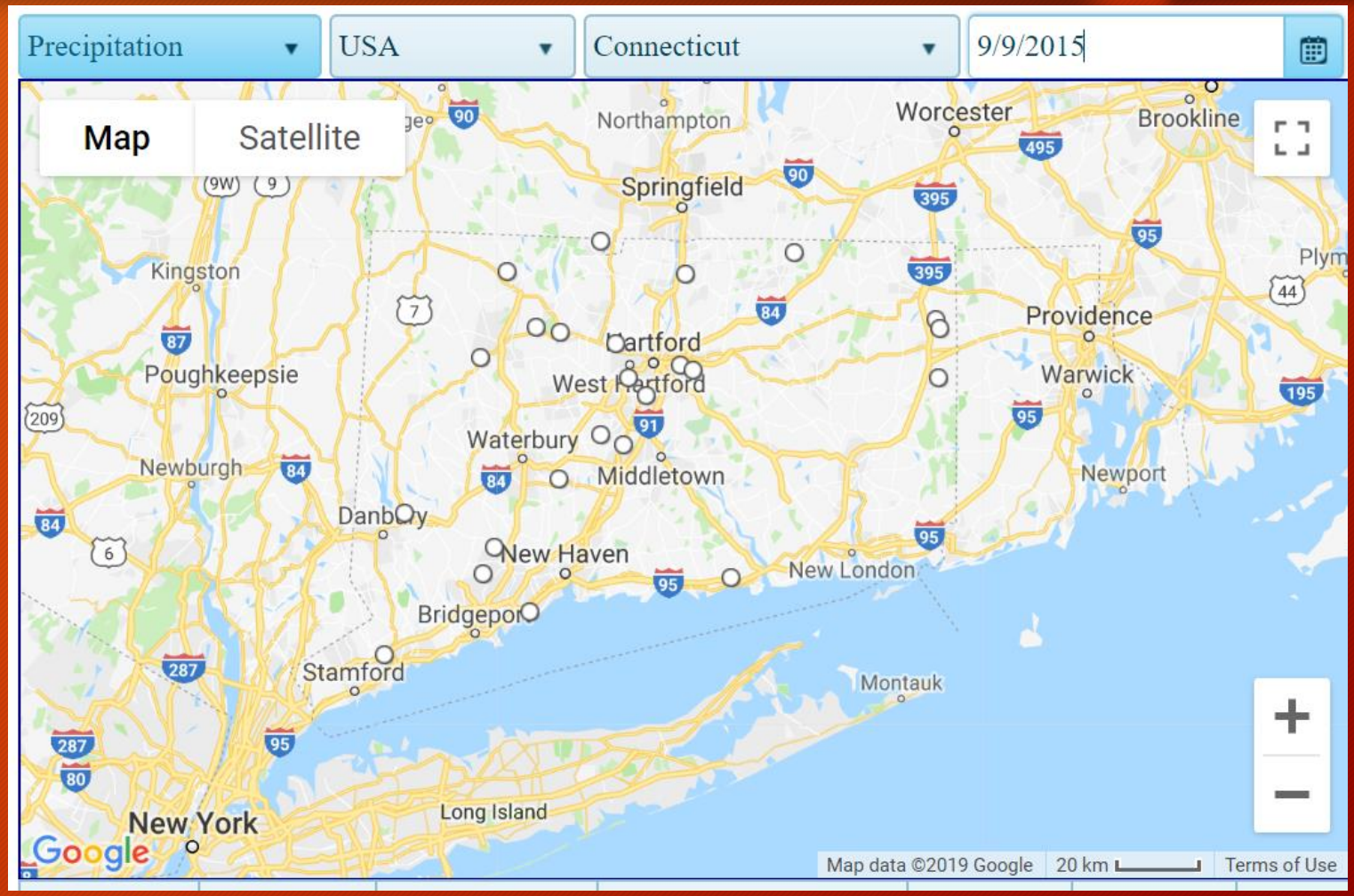
- Matt will share with us what it's like being a non-meteorological volunteer being responsible to coordinate CoCoRaHS in his state.

- Matt also gives of his time to help educate young people about precipitation and will show you an example from Nantucket.

Started in Year 2009 as an observer CT-FR-9

Time to make a change

- September 9, 2015
- 24 reports of 0 (zero)



We are going to do better

Community Collaborative Rain, Hail & Snow Network

Southern New England

September 2019

We begin National Rain Gauge Week. It is our network's time to shine, and to shine with reports of precipitation and zeros alike. Our quest is to submit 15,000 Daily Reports in a day, and to do that, we need everyone to report.

With this National Rain Gauge Week, it would be quite the accomplishment to break 10,000 Daily Reports in a 30-day month of September. Another record to break is our single day total of 366 Daily Reports.

Rhode Island broke its single month reporting record, and they led our growth to another month over 10,000 Daily Reports for the month. Rhode Island reported a staggering, a very high, 27.2 Daily Reports per Reporting Observer, putting their reporting effort higher than Delaware.

Our last set of Water Balance Charts are included. We thank our ET observers for the great work they have done this growing season.

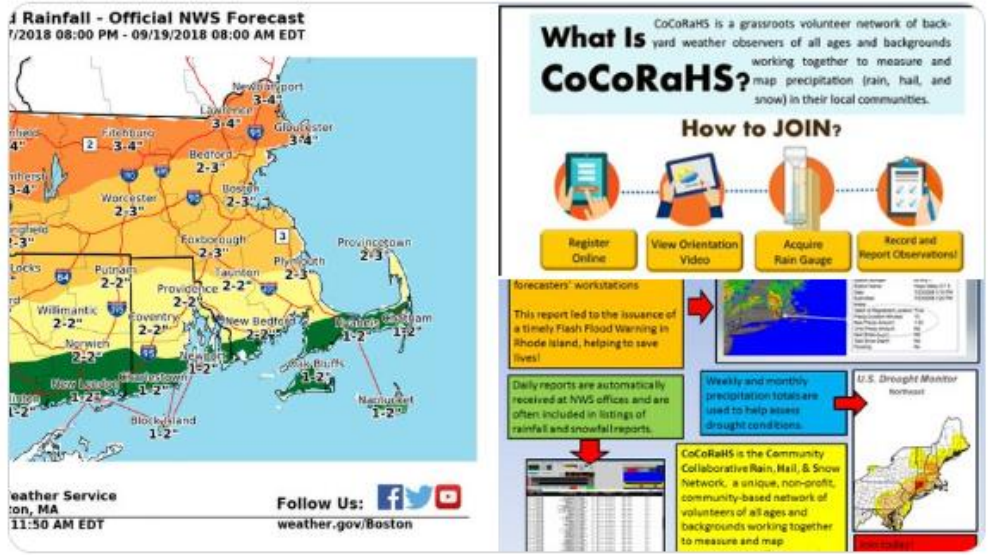
Grand List, Observer Tips, Condition Monitoring Reports, and more.

The longest list of over 263 stations awaits. Congratulations to all, including our newest observers that made the list for the first time.

We have more than 400 Reporting Observers now! Let's get into it.

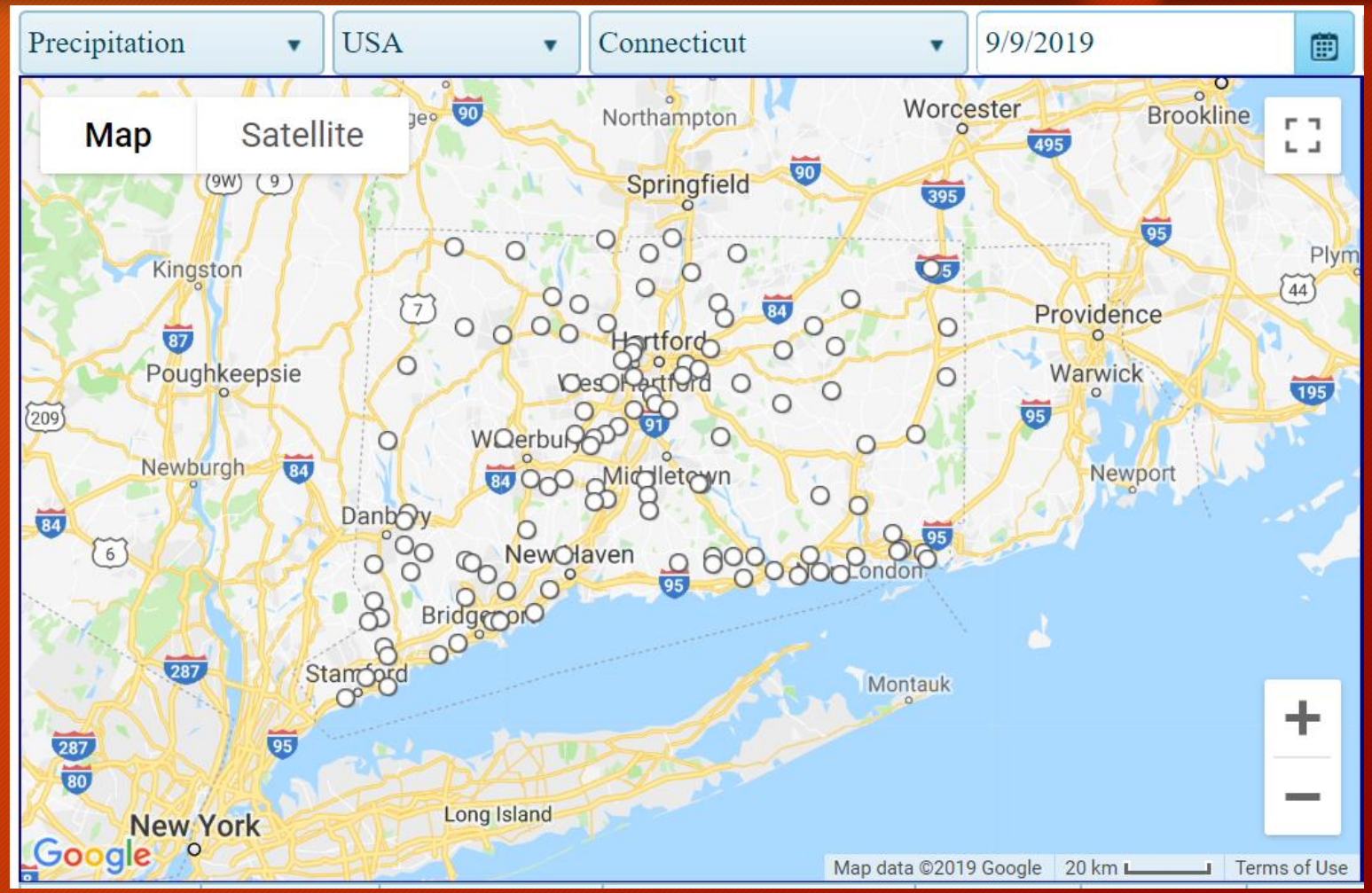
NWS Boston ✓
@NWSBoston

With rain and possible flooding on the way, we rely on @CoCoRaHS to help fill in the gaps with rainfall reports. Want to help? Sign up today, get a rain gauge, & start reporting! The more reports we have, the better the picture of how much rain fell in SNE!



Coordinators create change

- September 9, 2019
- 111 reports of 0 (zero)
- Zeros are obtained by saying “Be a hero. Report your zeros.” repeatedly.



Where do the reports go? Where does the data end up?

- Volunteer observers want to know where and how their efforts are used.

CONNECTICUT

...HARTFORD COUNTY...

1 NNE	WEST HARTFORD	3.72	700 AM	8/08	COCORAHS
2 NNE	WEST HARTFORD	3.67	700 AM	8/08	COCORAHS
1 W	WEST HARTFORD	3.22	700 AM	8/08	COCORAHS
2 SSE	EAST HARTFORD	2.90	514 AM	8/08	COCORAHS
1 WSW	KENSINGTON	2.62	834 AM	8/08	COCORAHS
2 SSW	NEWINGTON	2.59	700 AM	8/08	COCORAHS
5 WSW	FARMINGTON	2.32	900 AM	8/08	COCORAHS
3 NNE	BRISTOL	2.17	713 AM	8/08	COCORAHS
3 WNW	BRISTOL	2.10	700 AM	8/08	COCORAHS
1 ENE	NEWINGTON	2.10	700 AM	8/08	COCORAHS
1 E	WEATOGUE	1.99	700 AM	8/08	COCORAHS
1 WSW	WETHERSFIELD	1.91	900 AM	8/08	COCORAHS
1 E	EAST HARTFORD	1.85	630 AM	8/08	COCORAHS
2 SSW	WETHERSFIELD	1.81	637 AM	8/08	COCORAHS
3 E	SOUTHINGTON	1.72	700 AM	8/08	COCORAHS
3 SW	CENTRAL MANCHES	1.64	700 AM	8/08	COCORAHS
HARTFORD-BRAINARD AP		1.63	753 AM	8/08	ASOS
3 W	WINDSOR LOCKS	1.63	700 AM	8/08	COCORAHS
3 NNE	SUFFIELD DEPOT	1.60	600 AM	8/08	COCORAHS
BRADLEY AP		1.51	757 AM	8/08	ASOS
1 ENE	SOUTHINGTON	1.48	700 AM	8/08	COCORAHS
2 SW	PLAINVILLE	1.42	600 AM	8/08	COCORAHS
1 N	CENTRAL MANCHEST	1.40	630 AM	8/08	COCORAHS
1 SSE	SOUTHINGTON	1.35	700 AM	8/08	COCORAHS
1 E	ROCKY HILL	1.23	730 AM	8/08	COCORAHS
1 N	NORTH GRANBY	1.00	818 AM	8/08	COCORAHS
4 ENE	GLASTONBURY CE	0.98	700 AM	8/08	COCORAHS
2 W	CANTON	0.94	900 AM	8/08	COCORAHS
1 NW	COLLINSVILLE	0.94	700 AM	8/08	COCORAHS
1 ENE	NORTH GRANBY	0.88	600 AM	8/08	COCORAHS
1 NNE	SUFFIELD	0.81	700 AM	8/08	COCORAHS
1 SSW	NORTH CANTON	0.75	700 AM	8/08	COCORAHS

Top 3 Highest 2018 Precipitation Totals By State
Eastern US – As of December 19th

Connecticut		Massachusetts		Pennsylvania	
Moosup CT	72.95"	Kingston MA	72.81"	Hidden Valley PA	85.56"
Madison Center CT	71.40"	Taunton MA	71.10"	Fairfield PA	81.35"
Hampton CT	67.66"	Norton	70.36"	Tamaqua PA	81.10"
Delaware		**New Hampshire**		**Rhode Island**	
Smyrna DE	66.09"	Mount Washington NH	88.75"	Cranston RI	68.84"
Laurel DE	63.80"	Pinkham Notch NH	68.51"	Woonsocket RI	65.95"
Dover DE	63.66"	Greenville NH	65.57"	North Foster RI	65.64"
Florida		**New Jersey**		**South Carolina**	
Alford FL	100.21"	Mine Hill Township NJ	76.31"	Caesars Head SC	106.27"
De Funiak Springs FL	93.62"	Rockaway NJ	75.35"	Jocassee SC	104.14"
Vernon FL	91.62"	Hardyston Township NJ	74.83"	Table Rock SC	92.76"
Georgia		**New York**		**Vermont**	
Germany Valley GA	107.50"	Phonecia NY	70.76"	Peru VT	62.04"
Helen GA	98.56"	Wurtsboro NY	70.20"	Wilmington VT	57.92"
Sautee GA	96.12"	East Jewett NY	67.92"	Jeffersonville VT	51.56"
Maine		**North Carolina**		**Virginia**	
West Rockport ME	59.34"	Mount Mitchell NC	131.08"	Montebello VA	93.56"
Eastport ME	58.93"	Jonas Ridge NC	129.18"	Roanoke VA (5.8 mi SW)	83.36"
Kennebunkport ME	57.39"	Lake Toxaway NC	114.12"	Sperryville VA	83.02"
Maryland		**Ohio**		**West Virginia**	
Cantonsville MD	81.89"	Hannibal OH	68.41"	Parsons WV	94.40"
Thurmont MD	81.15"	Steubenville OH	67.42"	Snowshoe WV	82.61"
Mechanicsville MD	78.60"	Newport OH	64.15"	Savis WV	77.77"

Recognize volunteer efforts

The "Grand" List

Congratulations to all of these observers from our three states who have recently passed a milestone of 1000 Daily Reports.

3000 Daily Reports

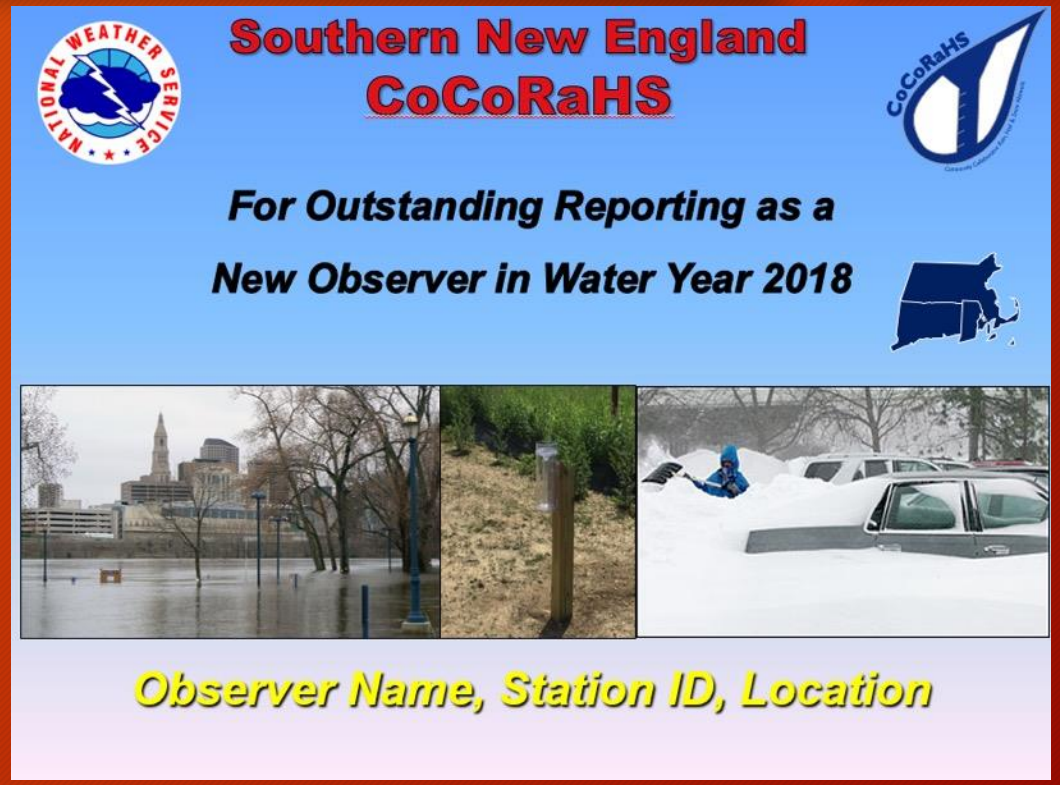
MA-BE-3	Stockbridge .2 NNE

2000 Daily Reports

CT-FR-23	Shelton 1.3 W
MA-BA-36	Harwich 2.6 ENE
MA-NF-11	Millis 2.0 SW

1000 Daily Reports

MA-MD-55	Holliston 0.7 W
MA-NF-19	Foxborough 1.8 SSW
MA-NF-26	Bellingham 2.4 S
MA-HD-20	Wilbraham 3.7 SSW
RI-PR-50	Harrisville 1.2 SSE



Accuracy matters. Completeness matters.

Connecticut Precipitation
National Weather Service Offices
Boston/Norton MA, Albany NY, Upton NY
Preliminary Precipitation Data (inches) by County
Precipitation Data Through August 2019
Includes CoCoRaHS data

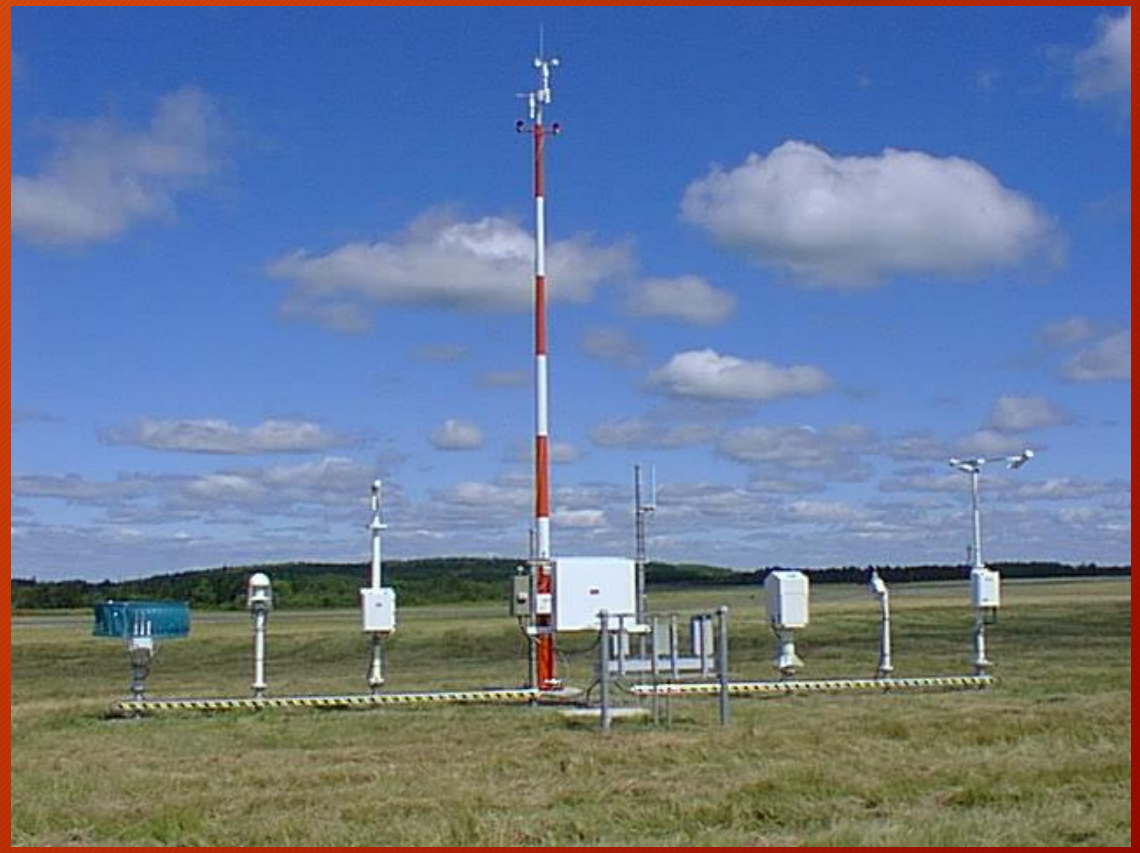
CT 1 Month August 2019	Rainfall	Departure	Percent	Nor
Litchfield	3.70	-0.69	84	4.39
Hartford	4.49	0.15	103	4.34
Tolland	6.07	2.10	153	3.97
Windham	6.13	1.97	147	4.17
Fairfield	3.62	-0.82	82	4.45
New Haven	3.45	-0.51	87	3.95
Middlesex	3.03	-0.99	75	4.02
New London	5.33	0.86	119	4.47

Rhode Island Precipitation
National Weather Service Boston/Norton, MA
Preliminary Precipitation Data (inches) by Drought Region
Past 12 to 36 months ending August 2019
Includes CoCoRaHS Data

RI 1 month August 2019	Rainfall	Departure	Percent	Normal
Northwest	8.07	3.74	186	4.33
Northeast	4.85	0.72	118	4.13
Central West	3.48	-0.55	86	4.02
Central East	2.82	-0.78	78	3.60
Eastern	2.64	-1.16	69	3.80
Southern	3.75	-0.61	86	4.36
New Shoreham	2.35	-2.01	54	4.36

No one lives at the airport

- We compare our totals with those from automated gauges and typically find 10% undercatch from automated gauges.
- Our network does not use automated gauges, and we do not live at the airport!

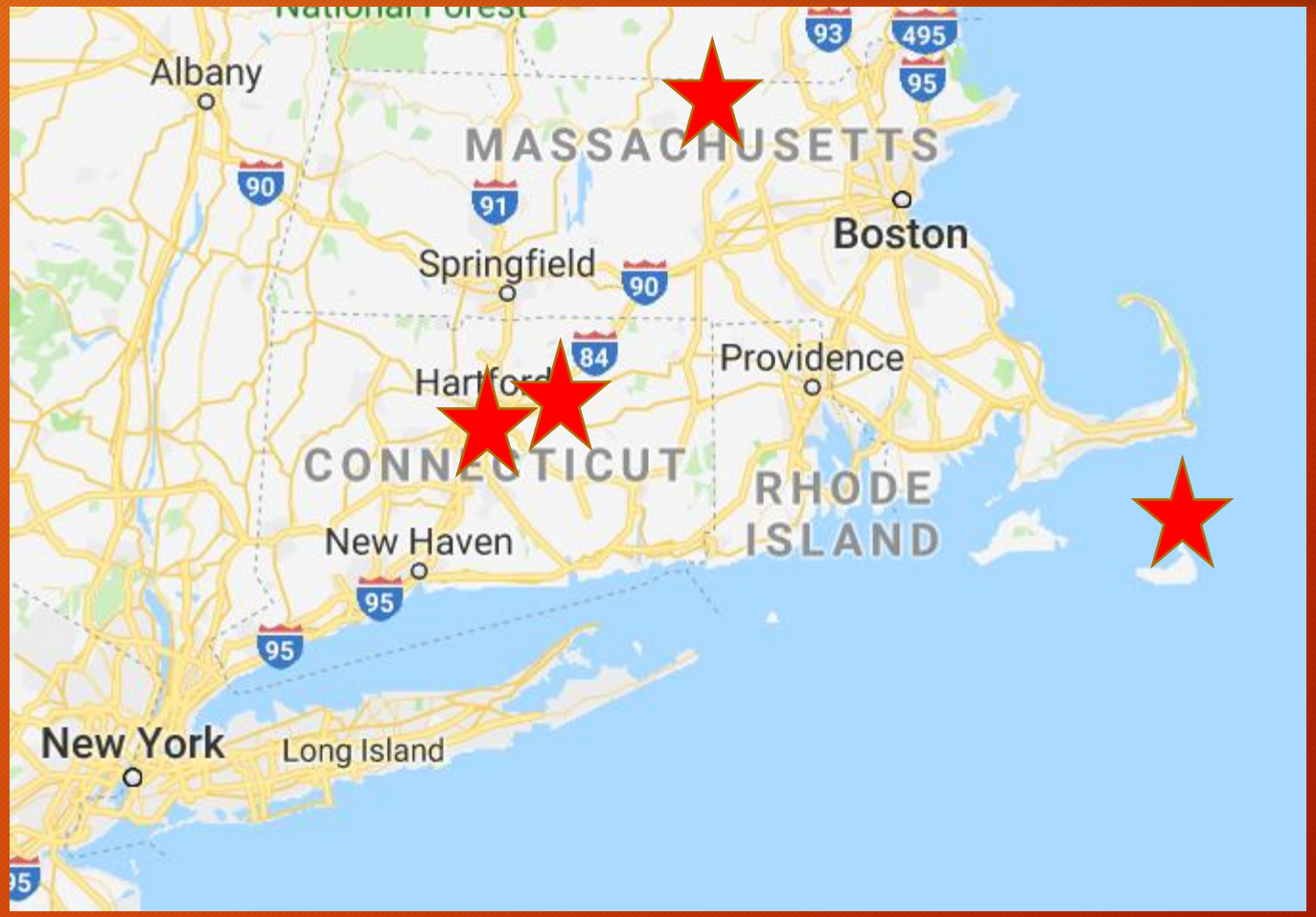


ASOS – Automated Surface Observation System

We believe

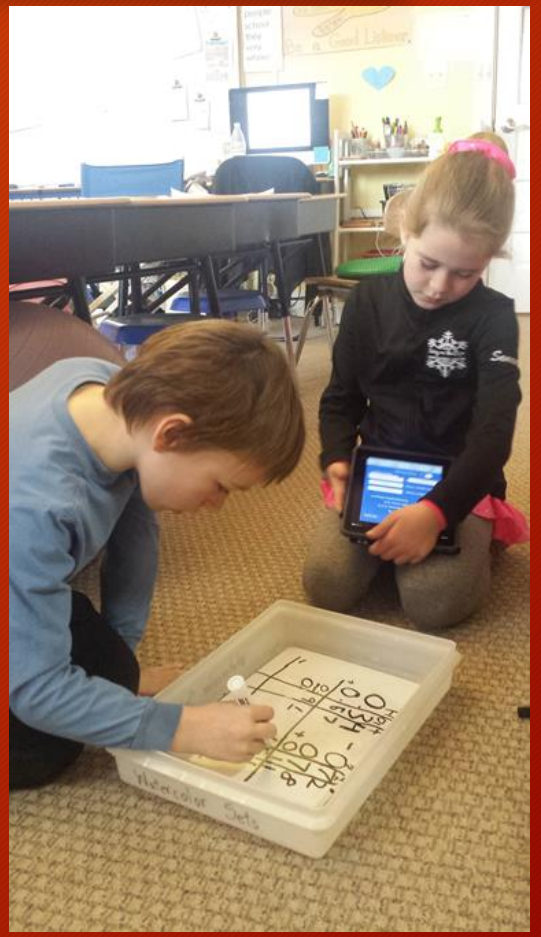
- One small measurement to make.
- One giant impact that measurement makes upon the millions the depend upon water.

Schools participating in CoCoRaHS in our area



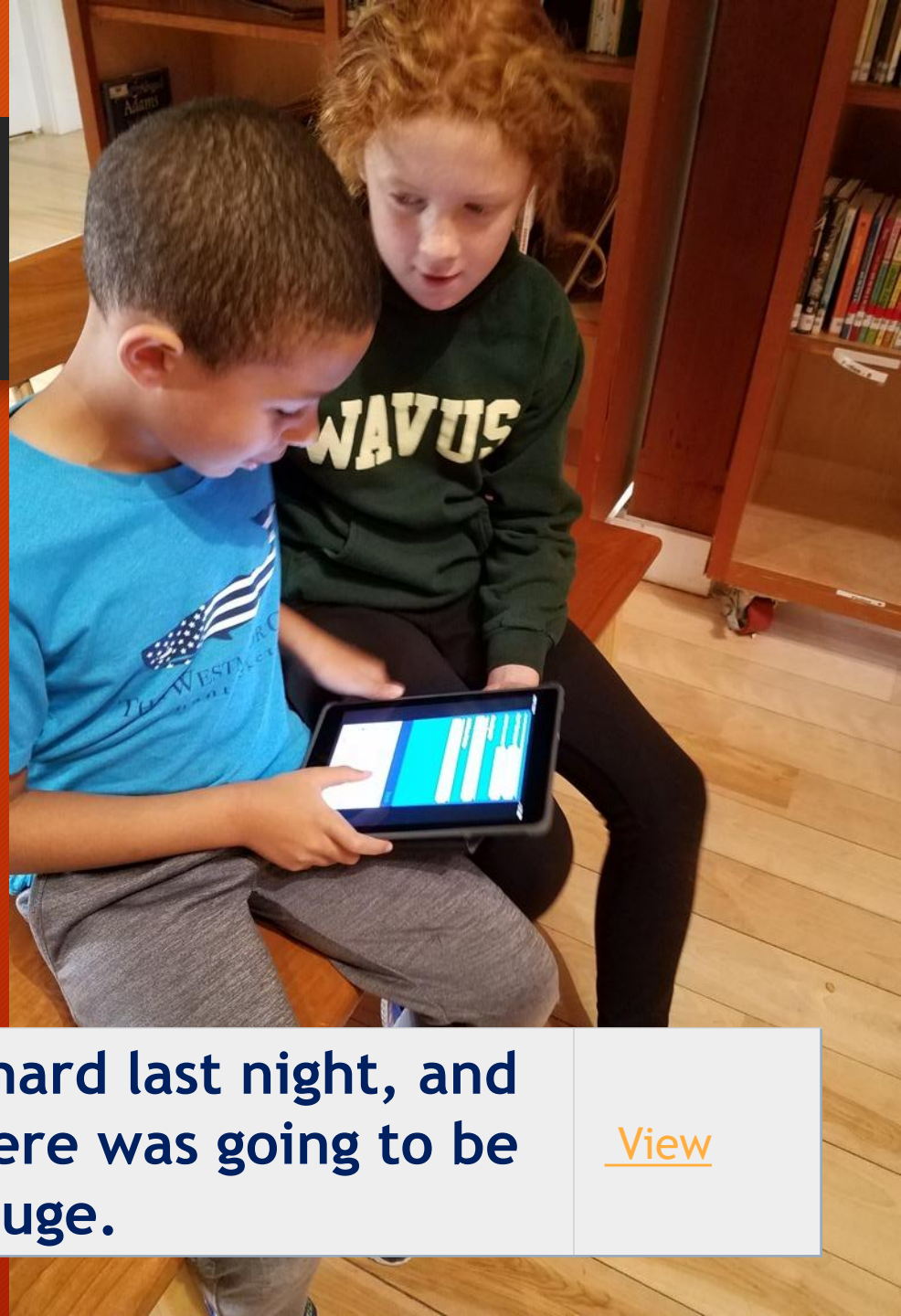
Meet the 7 and 9 year old students from Nantucket Island, Massachusetts, USA

Rain, snow, read a scale, and add decimals



With every report, they write a well written comment

More than the science and the numbers, they learn to construct and type a complete sentence.



4/23/2019	MA-NT-2	Nantucket 2.2 E	0.23	**It was raining hard last night, and we thought there was going to be more in the gauge.**	View

The students have many questions

Learning about the three states of matter:

Solid

Liquid

Gas

PART FOUR

Quality Control-data/technical aspects – Steve Hilberg

CoCoRaHS QA/QC

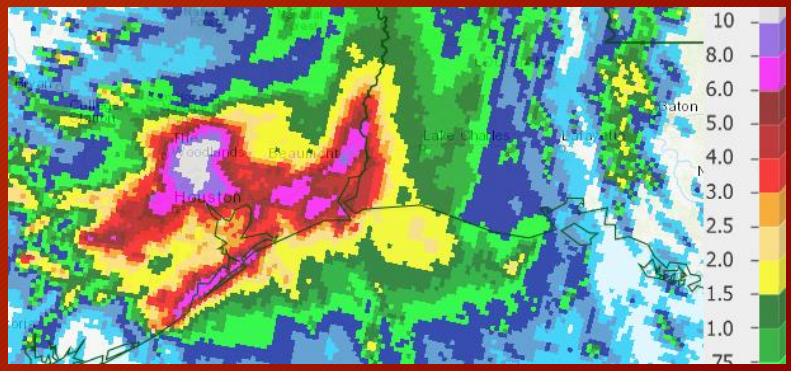
- Part of the CoCoRaHS mission
  - *"to provide the highest quality data for natural resource, education and research applications."*
- The value in CoCoRaHS data is not just quantity (more observations) but quality.
- Errors happen! A QC process is needed to assure data quality is maintained.

CoCoRaHS QA/QC

- Training and education are a large component of Quality Assurance. Training is a continuous process.
  - Well-trained observers are less prone to errors
- Most errors are reporting errors, not measurement errors!

CoCoRaHS QA/QC

- QC is a mix of automated and manual processes.
  - Error checks are built into the fields on the data input forms
  - We use a web-based tool to help identify potential errors, but this requires manual follow up
  - Also use radar and NOAA multi-sensor precipitation product
  - Volunteer “comment checkers” help identify potential errors



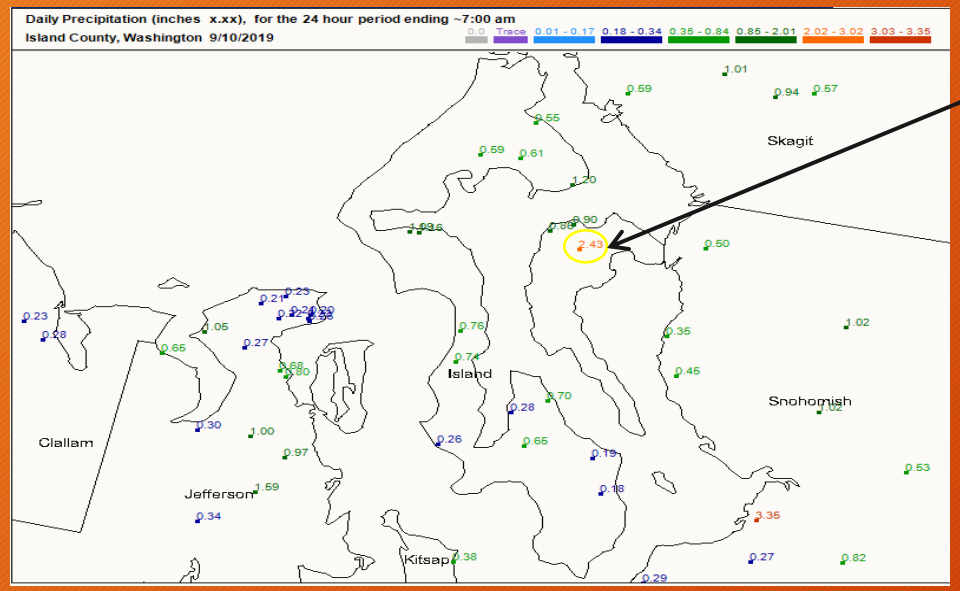
CoCoRaHS QA/QC

- QC tasks are distributed through the CoCoRaHS hierarchy (HQ, state coordinators, regional coordinators, local coordinators)
- Potential errors are logged into a QC ticketing system
- Coordinators are asked to follow up with observations that are flagged.

The CoCoRaHS QC Ticketing System

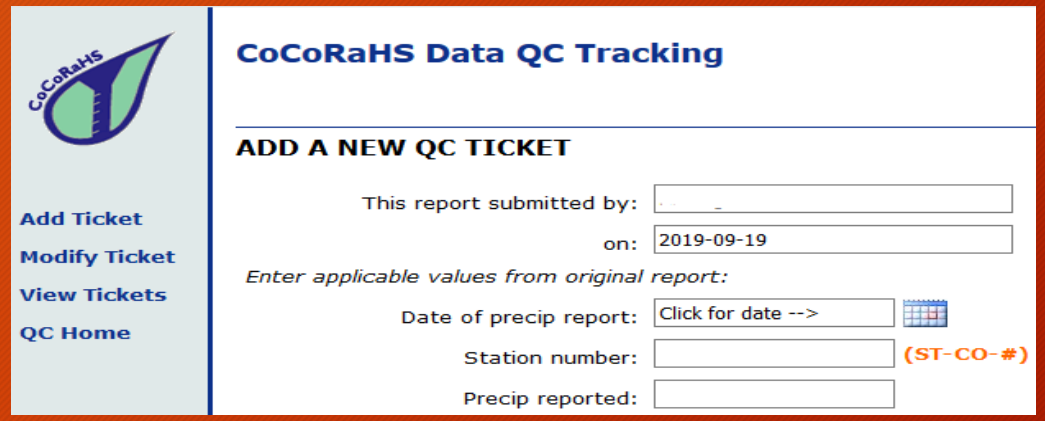
- System has been very useful in identifying
  - Types of errors
  - Frequency and pattern of errors
  - “Problem” observers – consistently making same error
- Caveat
  - Errors are more likely to be discovered where station density is greatest

QC Ticketing Process



Suspect value identified by QC staff or coordinator

QC ticket submitted



Email is automatically sent to regional and state coordinator for that station

From qc@cocorahs.org
Subject CoCoRaHS QC Ticket Notification - WA
Reply to Me <hberg@cocorahs.org>
To
Cc QC@cocorahs.org, QC@cocorahs.org

A CoCoRaHS QC ticket has been submitted for Station number WA-GH-47 / Grays Harbor County for observation date of 2019-09-15. The appropriate coordinator should contact the observer to correct/verify the observation.

Station: WA-GH-47
ObsDate: 2019-09-15
Precip Reported: 2.50
New Snow Reported: NA
New Snow Water Eq: NA
Total Snow on Ground: NA
Total Snow Water Eq: NA

Description of possible error and URL: Possible typo based on surrounding observations. Precip set to NA pending followup with observer.
https://cocorahs.org/Admin/DataEntry/ViewDailyPrecipReport.aspx?DailyPrecipReportID=0bc8a2ec-79b4-42d7-822e-1520e6fcd015

Common Errors

- False Zeroes
- Typographical/Decimal Errors
- Multi-Day Accumulations Recorded as Daily Reports
- Day Shifts/Incorrect Date
- The probability of an error goes up with the lateness of the report
  - Obs that are entered two or more days after the fact, some as much as a month
  - Requires us to redo QC a week or more prior to present to catch these (and we are still likely missing some)
  - Usually date/day shifting errors

Data Flow and Cyber Infrastructure

CoCoRaHS Data and Data Flow

CoCoRaHS has the challenges represented by “big data”; volume, velocity, variety and veracity, but not at the scale that would justify the complication and expense of big data solutions.

Volume

- 10s of gigabytes of data, not terabytes
- 10s of millions of records, not billions of records

Velocity

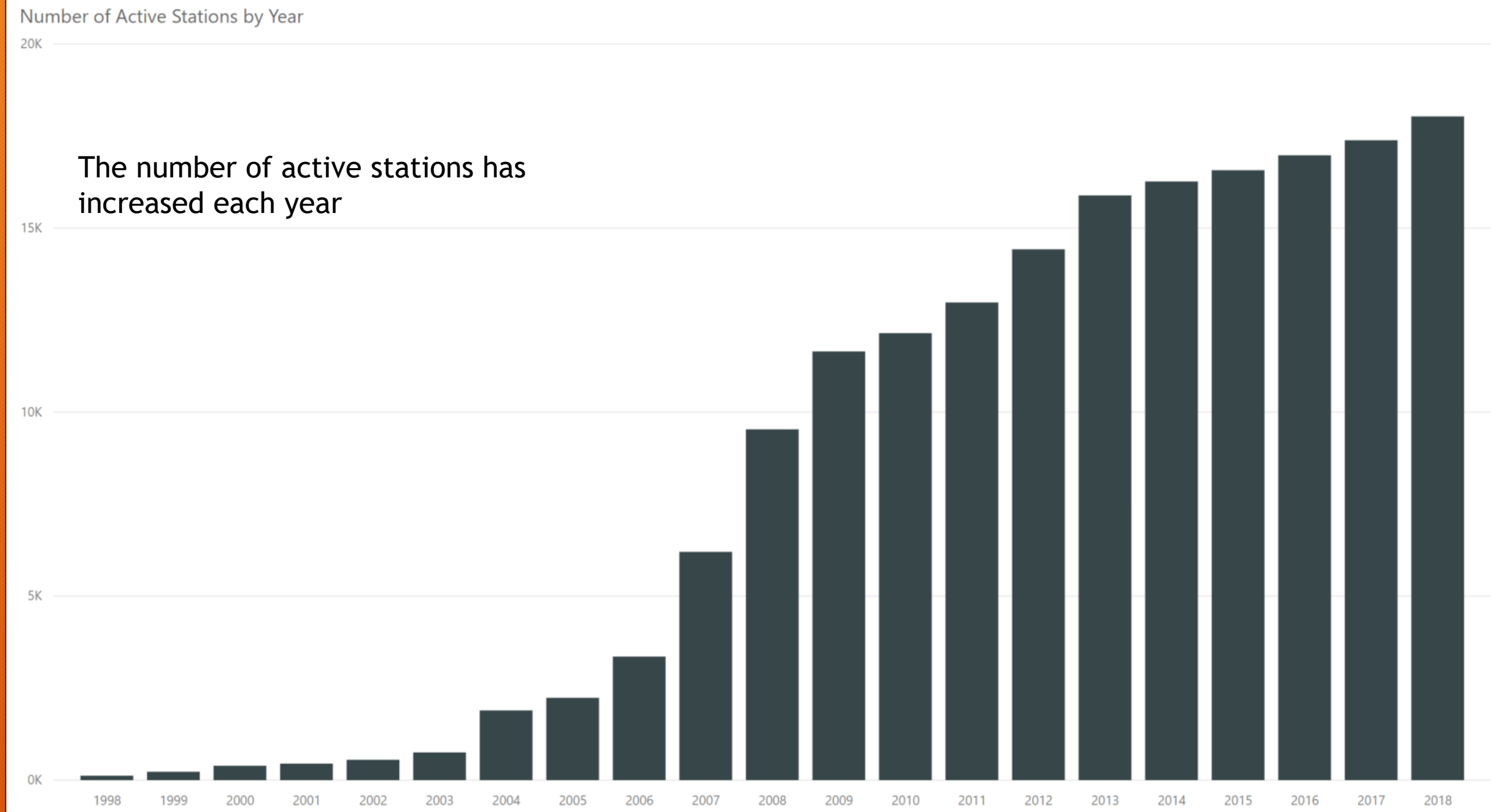
- Over 12 thousand observations submitted every day
- Around 25 observations submitted a second during our daily peak times.The concurrent demands on the system present challenges

Variety

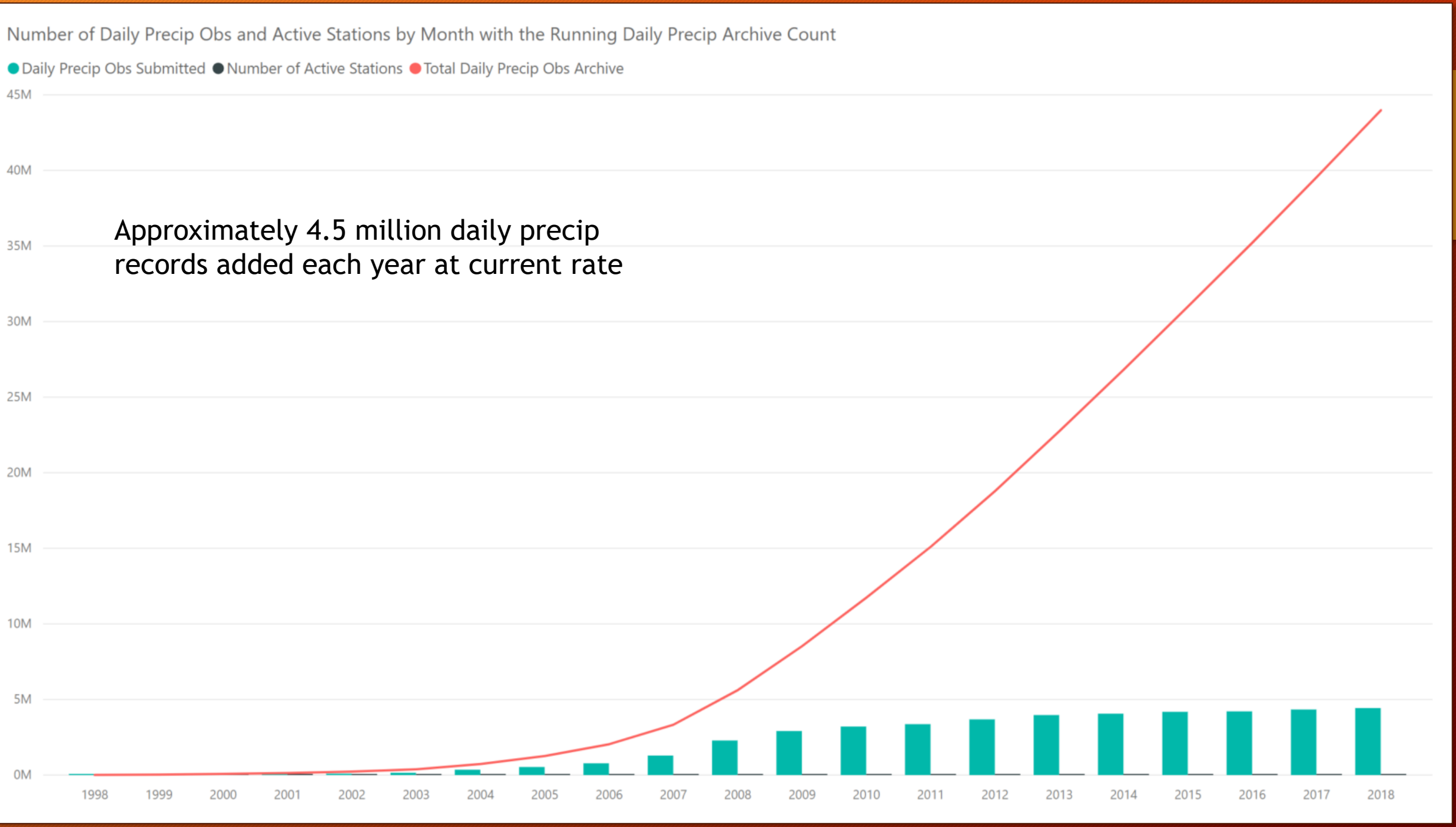
- 10 different observation protocols to manage, but it is structured data
- Would like to add photo and video upload to relevant observations
- Support for English and French, as well as Imperial and Metric units

Veracity

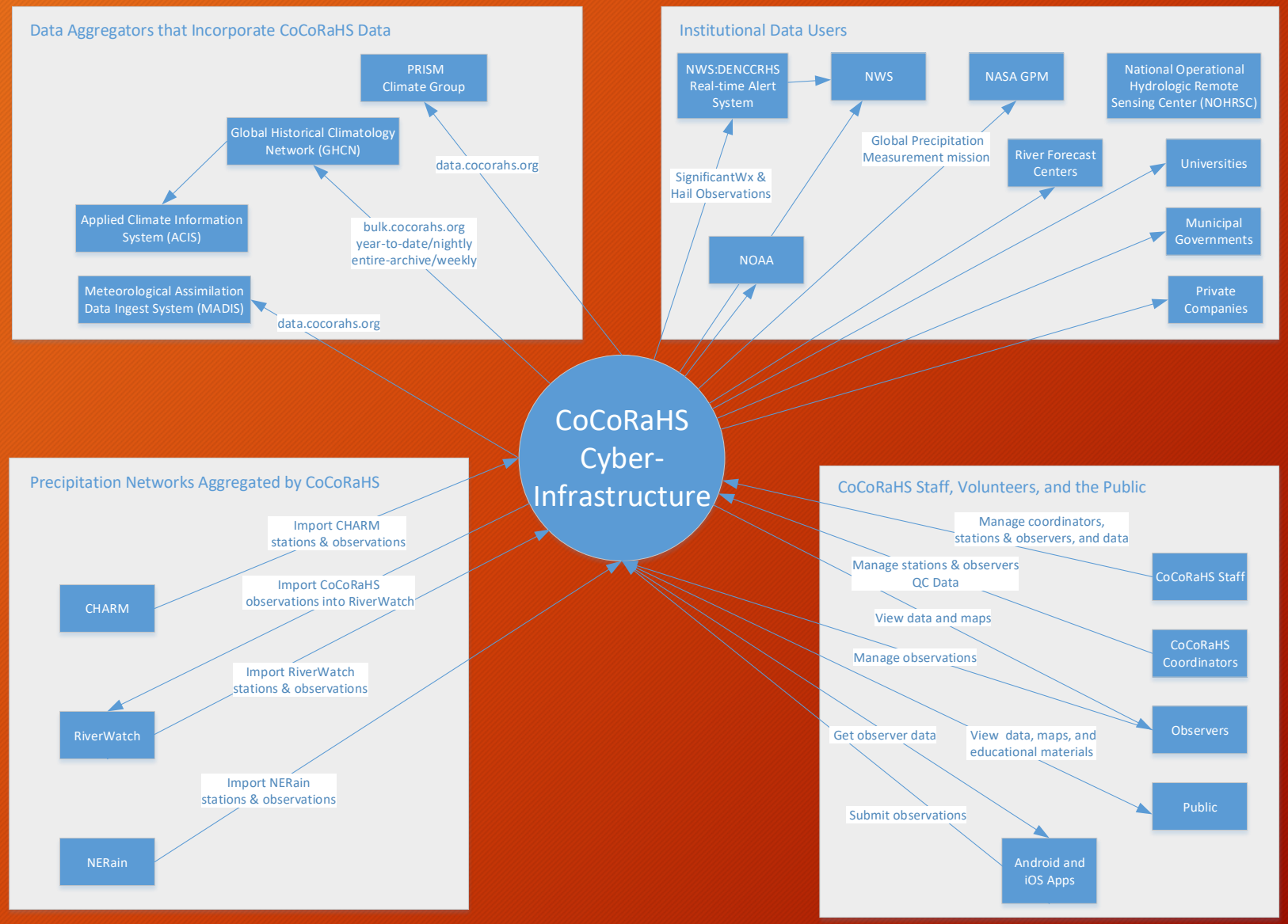
- QC Processes
- Observer Training
- Standardized processes



The number of active stations has increased each year


Number of Daily Precip Obs and Active Stations by Month with the Running Daily Precip Archive Count
Daily Precip Obs Submitted
Number of Active Stations
Total Daily Precip Obs Archive
45M
40M
35M
30M
25M
20M
15M
10M
5M
0M
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Approximately 4.5 million daily precip records added each year at current rate

CoCoRaHS Cyber-infrastructure Data Flow Context



CoCoRaHS Network and External Service Overview

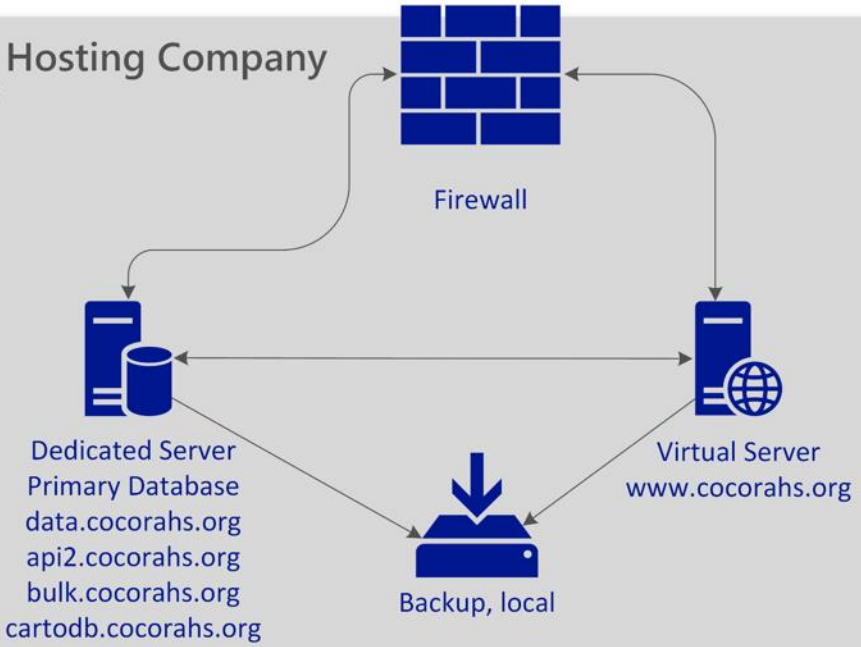
Microsoft Azure

- Storage (Azure): Hourly Database Backups
- Virtual machine: legacy.cocorahs.org
- Azure SQL Database: Dev Copy of Primary DB
- Azure Function App: SciStarter.com Integration

Office 365 Cloud

Outlook, Word, Excel, PowerPoint, OneNote, Access, Publisher, Skype, Exchange, OneDrive, Microsoft Teams, Power BI

Hosting Company



Social Media Services

- Blogspot: CoCoRaHS Blog
- YouTube: CoCoRaHS Channel
- CoCoRaHS HQ Page
  CoCoRaHS Group
  Local Groups and Pages
- Twitter

3rd Party Services

- DNS Service
- MailChimp — Bulk Email & Newsletter
- GoToMeeting by CITRIX — WxTalk Webinar Series
- CARTO — Mapping Services

PART FIVE

Collaborations with other networks/organizations

Lowest Common Denominator

Surprisingly, CoCoRaHS and a simple rain gauge can become a “lowest common denominator” opening all kinds of doors for partnerships and collaborations with many organizations. We strive to supplement and enhance their missions.

NDMC NATIONAL DROUGHT MITIGATION CENTER AT THE UNIVERSITY OF NEBRASKA-LINCOLN

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

National Weather Service Cooperative Weather Observer

News Channel in your corner.

North American Drought Monitor

NOHRSC

National Operational Hydrologic Remote Sensing Center

NIDIS NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

USDA

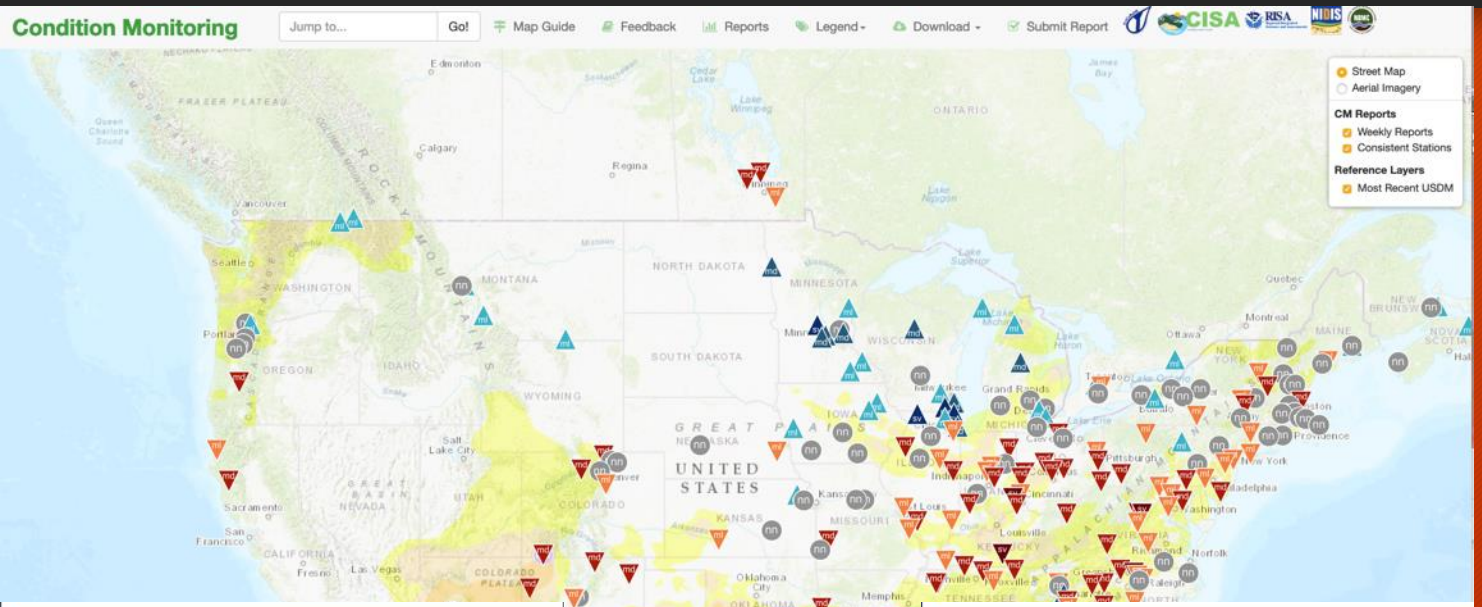
PRISM CLIMATE GROUP

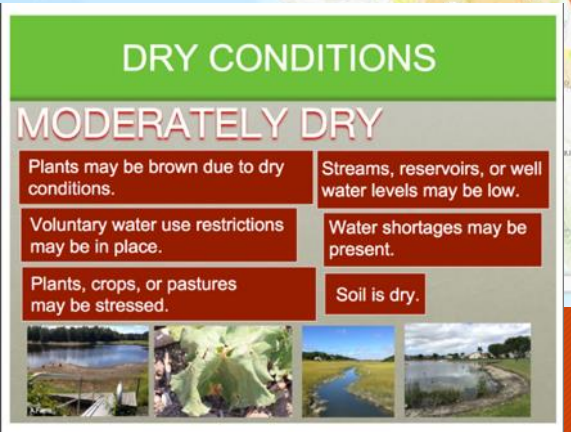
Northwest Alliance for Computational Science and Engineering

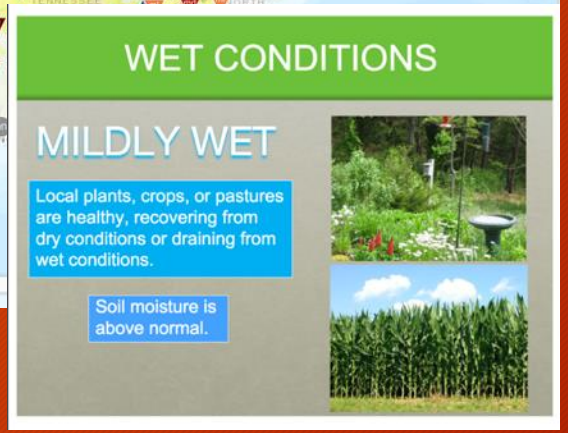
Our goal is to help others succeed by providing quality data that they can use in a variety of ways

Examples

Condition Reports provide valuable data for drought decision makers



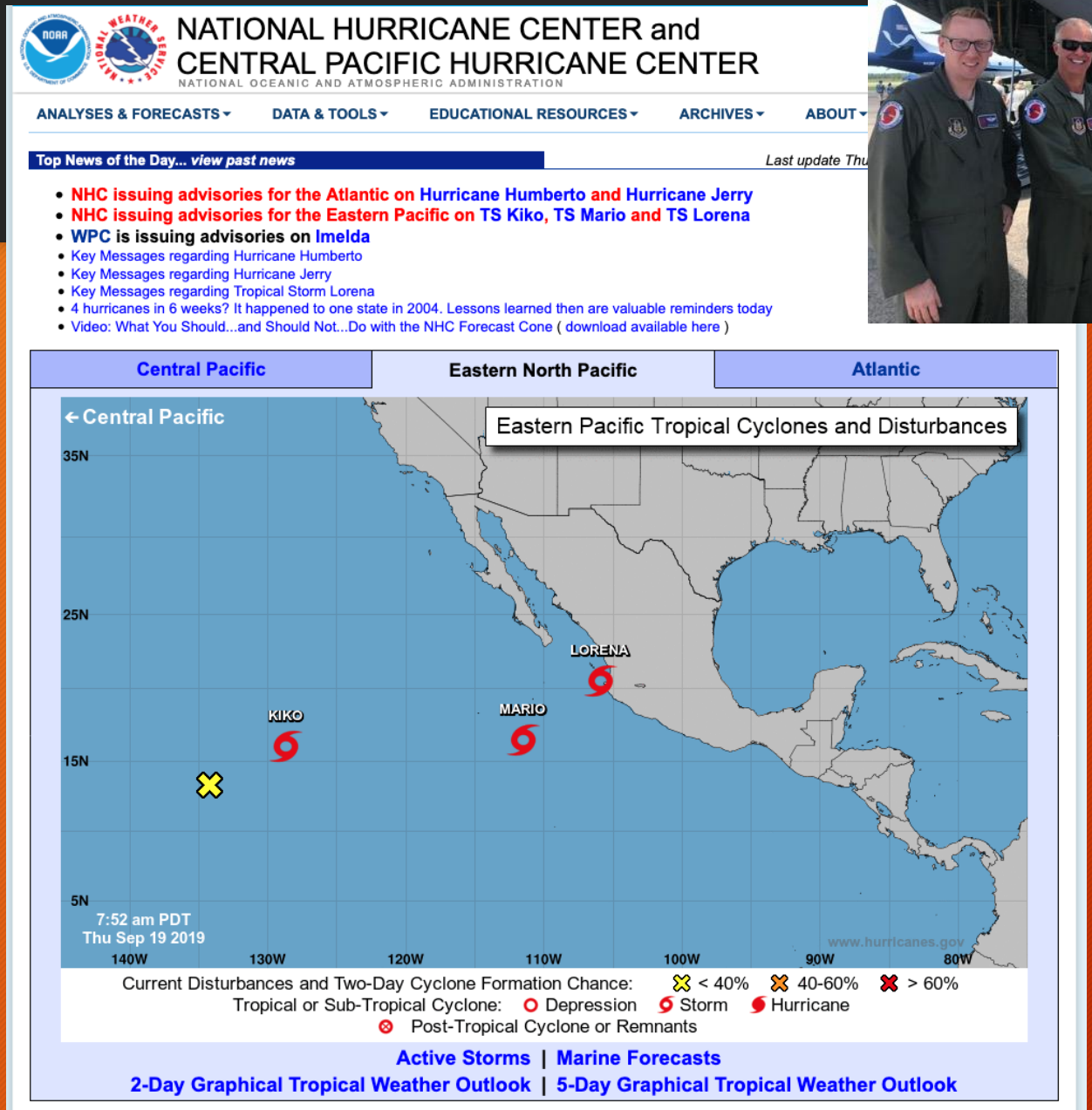




Carencro 3.9 ENE

Station Number	LA-LY-7
Report	Ground is cracking; daily watering required for all pot plants and many shrubs, flowers, etc. Grass is beginning to turn brown in spots.
Condition	Moderately Dry
Date	Sat Sep 14 2019
Summary Data	CoCoRaHS summary data by week for this station.

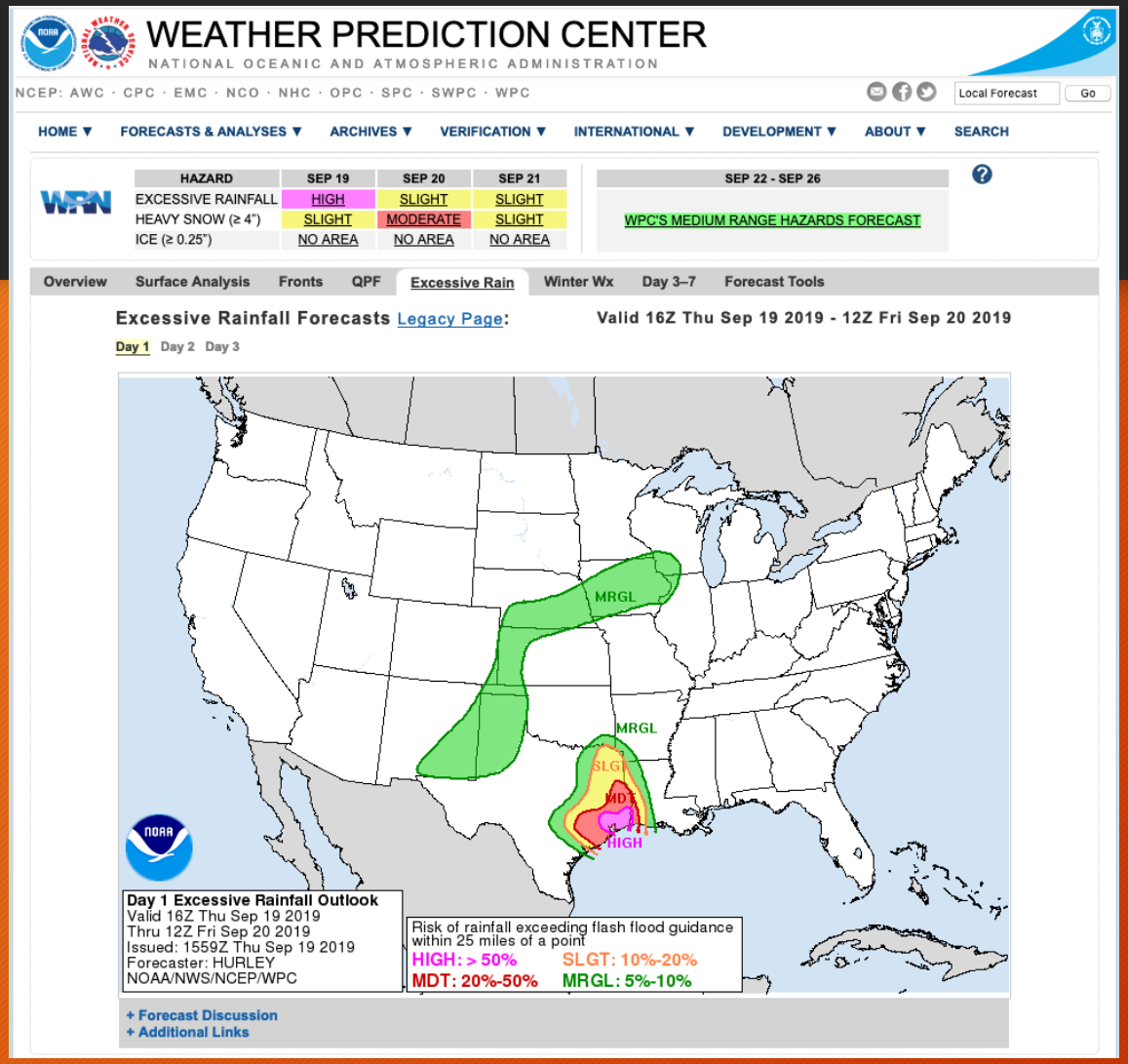
Examples



"CoCoRaHS observations play a vital role in the National Hurricane Center's efforts to document tropical cyclone rainfall and impacts in the United States. In at least one case, these observations have led to a new state tropical cyclone rainfall record."

Daniel Brown
Senior Hurricane Specialist/Warning Coordination Meteorologist
NOAA/NWS/National Hurricane Center

Examples



"CoCoRaHS data is invaluable to the forecast process. For example, forecasters at the WPC use CoCoRaHS data to understand what happened between the standard observation sites, which is critical for verify daily forecasts. Further the data are used to identify local extremes in major events, such as hurricanes and blizzards. Notable extremes are reported to key partners, the media, and the public. We are grateful for the community effort to measure precipitation."

David Novak
Director
NOAA/NWS/ Weather Prediction Center

PART SIX

Is yet to come as you hear from our friends across North America now and after lunch.

Thank you for letting us share a small snapshot of our network with you!

For more information visit: www.cocorahs.org

or contact: hreges@atmos.colostate.edu