Climate Monitoring, Climate Research, and Climate Services for Colorado

Russ Schumacher, Becky Bolinger, Noah Newman, Zach Schwalbe, Julian Turner, Peter Goble, Henry Reges, and Nolan Doesken

Colorado Climate Center
Department of Atmospheric Science, Colorado State University

ATMOSPHERIC SCIENCE
COLORADO STATE UNIVERSITY

COLORADO CLIMATE CENTER
Providing information and expertise on Colorado's complex climate

CSU-ATS Colloquium
28 September 2018

Colorado State University

Brief history of the CCC

- Until 1973, the federal government operated a “state climatologist” program – but in in 1973 this was abolished
- Later that same year, Colorado established the Colorado Climate Center at CSU with support through the Colorado Agricultural Experiment Station

Previous state climatologists

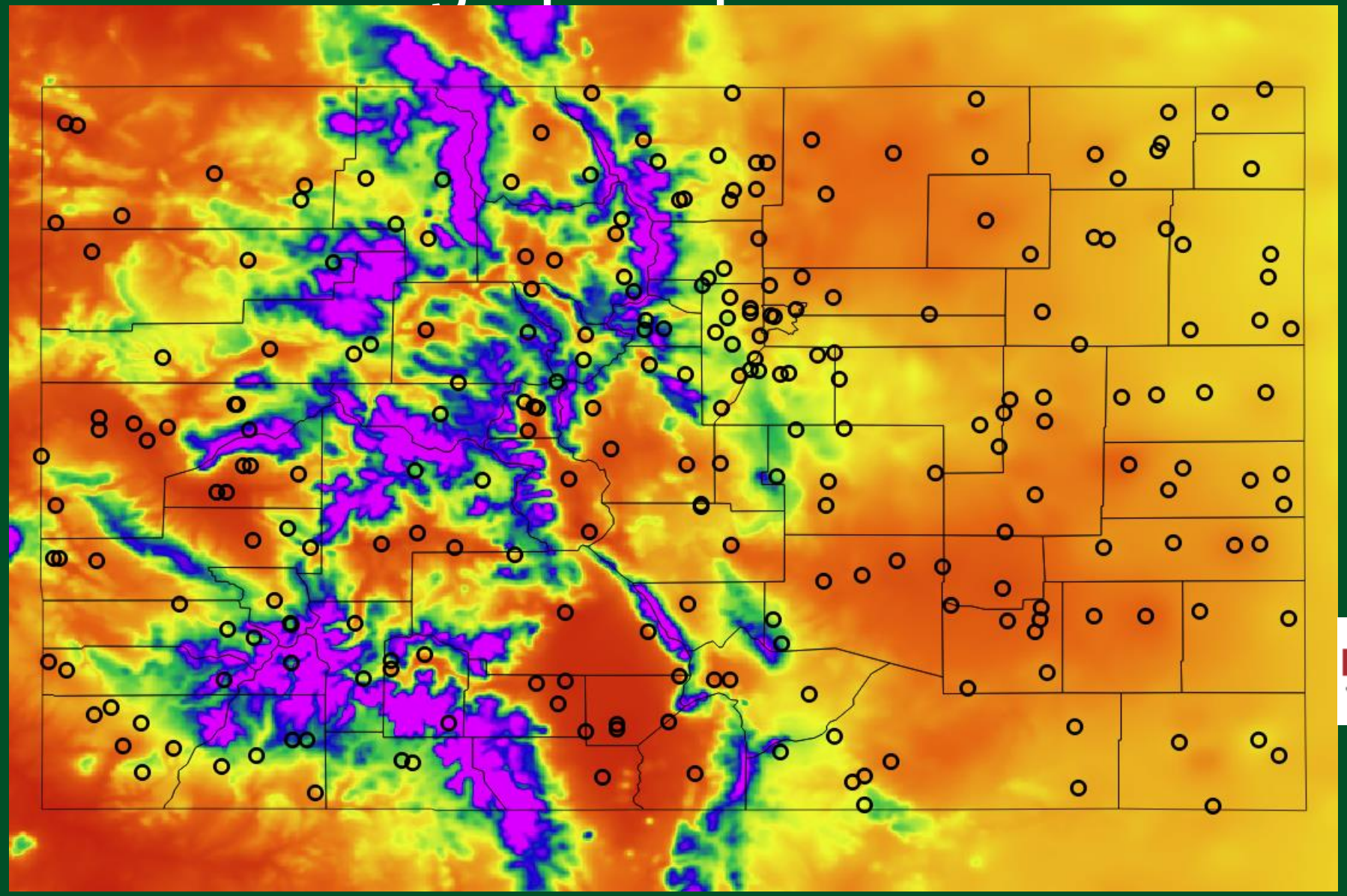
Tom McKee, 1974-2000

Nolan Doesken, 2006-2017
(Assistant State Climatologist, 1977-2006)

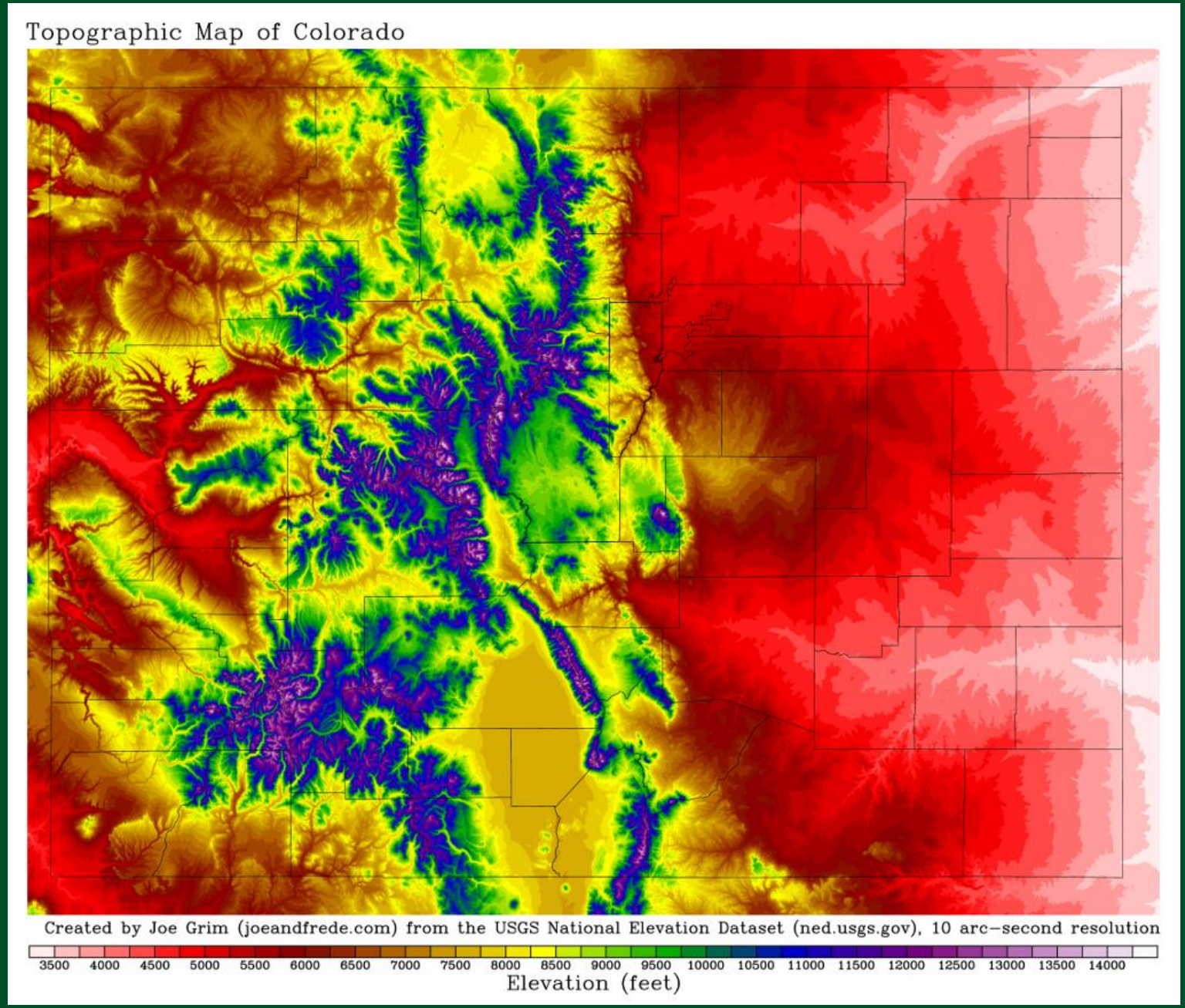
https://www.atmos.colostate.edu/wp-content/uploads/2017/08/8.9.17_Nolan_retirement.jpg

Roger Pielke, Sr, 2000-2006

Annual average precipitation



Data: PRISM climate group
prism.oregonstate.edu



http://www.joeandfrede.com/colorado/misc_trip_reports/colorado_topo_med_res.png

Colorado's weather and climate extremes

High Park Fire, June 2012 (from the dept)

https://twitter.com/ViaeroWXCams/status/1009168644415328258

"Great Colorado Flood of September 2013"

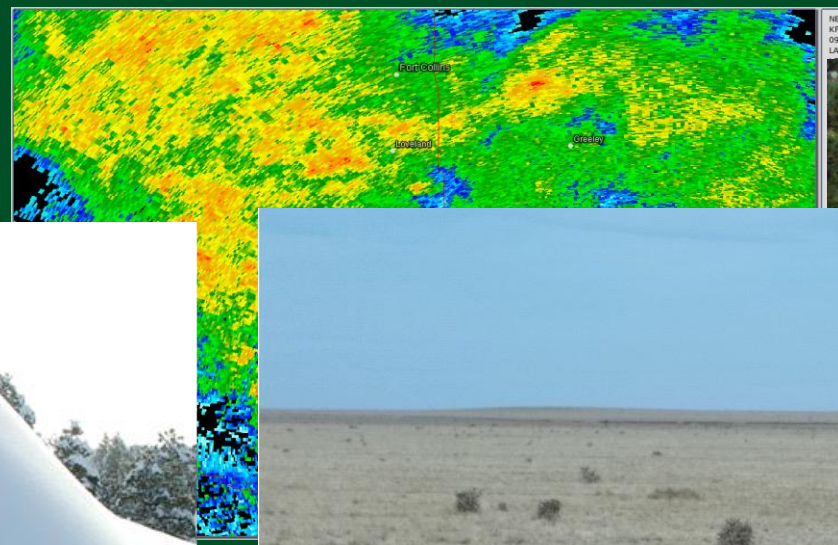


Photo courtesy of Noel Bryan

Nederland, March 2003
From Wesley et al. (2013)

Otero County, May 2018

Fountain, August 2018
Photo from Jennifer Stark, NWS Pueblo

COLORADO CLIMATE CENTER

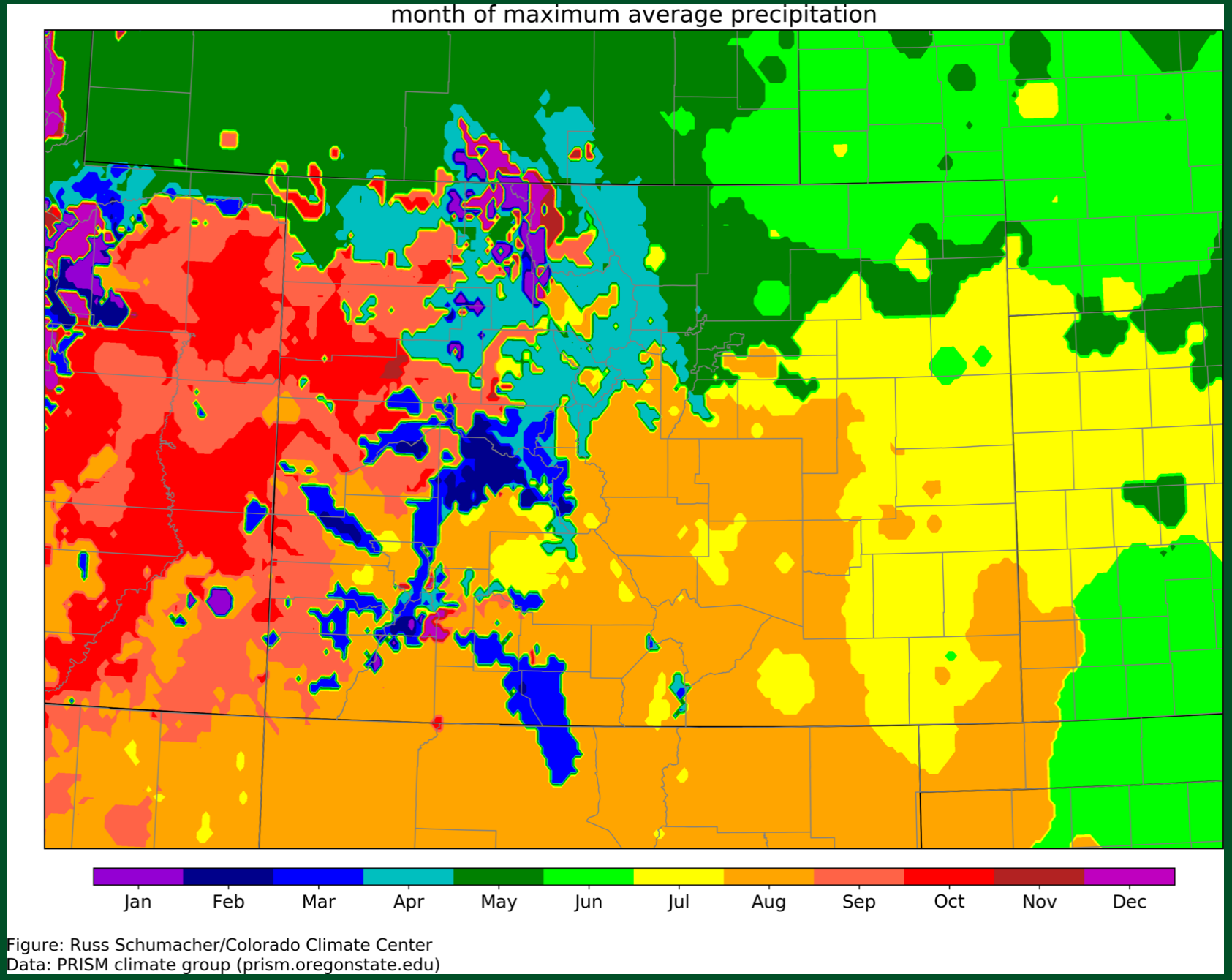


Figure: Russ Schumacher/Colorado Climate Center
Data: PRISM climate group (prism.oregonstate.edu)

Analyzing climate data: both useful and fun!

Month of maximum average precip
Data: PRISM Climate Group, prism.oregonstate.edu

COLORADO STATE UNIVERSITY | COLORADO CLIMATE CENTER

Providing information and expertise on Colorado's complex climate

http://climate.colostate.edu/

General Info | Colorado's Climate | Data Access | Climate Maps | Normals and Extremes | Drought | Tools

Previous | Next

Current Conditions

Fort Collins, CO

68.5°F

Last Updated on September 26, 5:43 PM MDT

Wind: Calm

Dewpoint: 33°F

Humidity: 27%

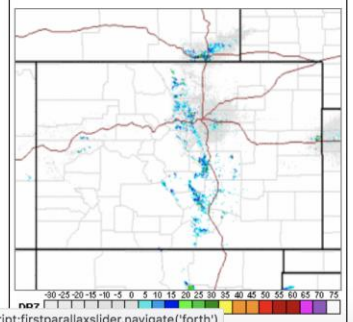
WEATHER UNDERGROUND

Zip Code | Local Conditions

Fort Collins Weather Station

Current conditions

Colorado Radar



CCC News Feed

As fall is nigh, drought persists

September 21, 2018

The Grand Junction Daily Sentinel talked with Becky Bolinger about recent drought expansion in western CO and the "wait and see" mode for what the next snow season will bring.

Record-breaking heat, dry weather increase fire danger, worsen drought conditions across Colorado

September 17, 2018

Colorado Springs Gazette interviewed Russ Schumacher to learn more about the recent hot weather and how it's contributing to drought conditions.

Most weather signs are pointing to an El Niño weather pattern this fall and winter

August 31, 2018

Becky Bolinger shares with The Fence Post what an El Niño winter could mean for Colorado.

Social Media

Colorado Climate Ce…

Liked 963 likes

Colorado Climate Center

on Monday

"Here in Colorado, over 20 percent of severe hail reports through the beginning of September have been at least 2 inches. Three percent have been at least 3 inches – bigger than a standard 2.75-inch baseball. These are the highest such percentages in state history. Moreover, Colorado saw a new record, with hail greater than 3 inches in diameter reported 10 times, over seven different days."

Tweets by @ColoradoClimate

ColoClimateCenter Retweeted

NWS Pueblo @NWSPueblo

The high temperature through 300 PM today in Colorado Springs has been 87 degrees, This breaks the previous record high for today of 86 degrees, which was set in 2003 and 1924. #cowx

Quick Links

CoAgMET

The Colorado Agricultural Meteorological nETwork provides live-updated meteorological conditions at agriculture sites across Colorado.

CoCoRaHS

The Community Collaborative Rain Hail and Snow network provides daily precipitation data from around the country, recorded by citizens.

NIDIS

Drought

View our weekly updated drought summary for the NIDIS Intermountain West Region's Drought Early Warning System.

Our mission

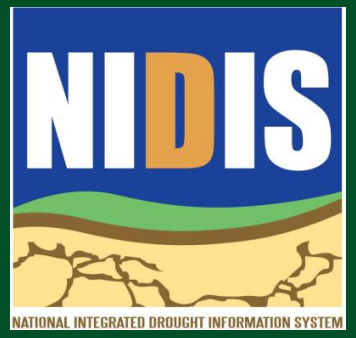
The Colorado Climate Center at CSU provides valuable climate expertise to the residents of the state through its threefold program of:

1) ***Climate Monitoring*** (data acquisition, analysis, and archiving)

2) ***Climate Research***

3) ***Climate Services*** (providing data, analysis, climate expertise, education and outreach)

A small selection of our partners and stakeholders



Today's outline

- Drought monitoring and early warning
  - Becky Bolinger, Assistant State Climatologist
- Community Collaborative Rain, Hail, and Snow network (CoCoRaHS)
  - Noah Newman, Julian Turner, and Henry Reges (currently in Geneva at a WMO meeting)
- The Colorado Agricultural Meteorological Network (CoAgMET, "Colorado's Mesonet"
  - Zach Schwalbe
- Other CCC projects and activities
  - Peter Goble (currently on his honeymoon!)

National Integrated Drought Information System

Intermountain West Drought Early Warning System

Becky Bolinger

@ClimateBecky

Colorado State University

some history...

National Integrated Drought Information System - NIDIS

A Pathway for National Resilience

Fall 2009 — Volume 1 Issue 1

Upper Colorado River Basin Pilot

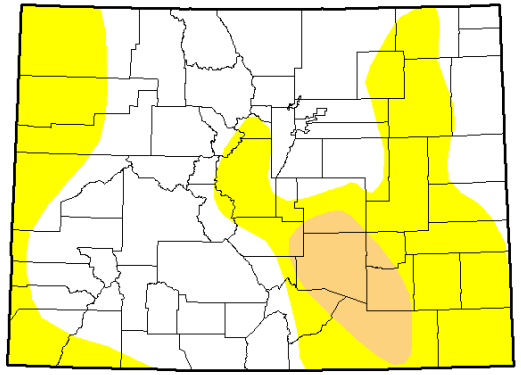
The first NIDIS drought early warning and information system pilot was successfully launched during October 2008 with a meeting of stakeholders in Boulder, CO. In this newsletter, find these related articles...


Landsat image of Lake Mead 2003

Welcome!

Welcome to the first edition of the NIDIS
ter. A lot has happened in the past year,
want to update the drought risk manager
water resources communities on NIDIS
In our newsletter you will find informat

U.S. Drought Monitor
Colorado



May 5, 2009
(Released Thursday, May. 7, 2009)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	55.82	44.18	6.47	0.00	0.00	0.00
Last Week 4/28/2009	55.81	44.19	6.47	0.00	0.00	0.00
3 Months Ago 2/3/2009	34.69	65.31	6.15	0.00	0.00	0.00
Start of Calendar Year 12/30/2008	23.00	77.00	5.91	0.00	0.00	0.00
Start of Water Year 9/30/2008	43.04	56.96	12.69	3.36	0.00	0.00
One Year Ago 5/6/2008	63.58	36.42	16.54	0.00	0.00	0.00

Intensity:

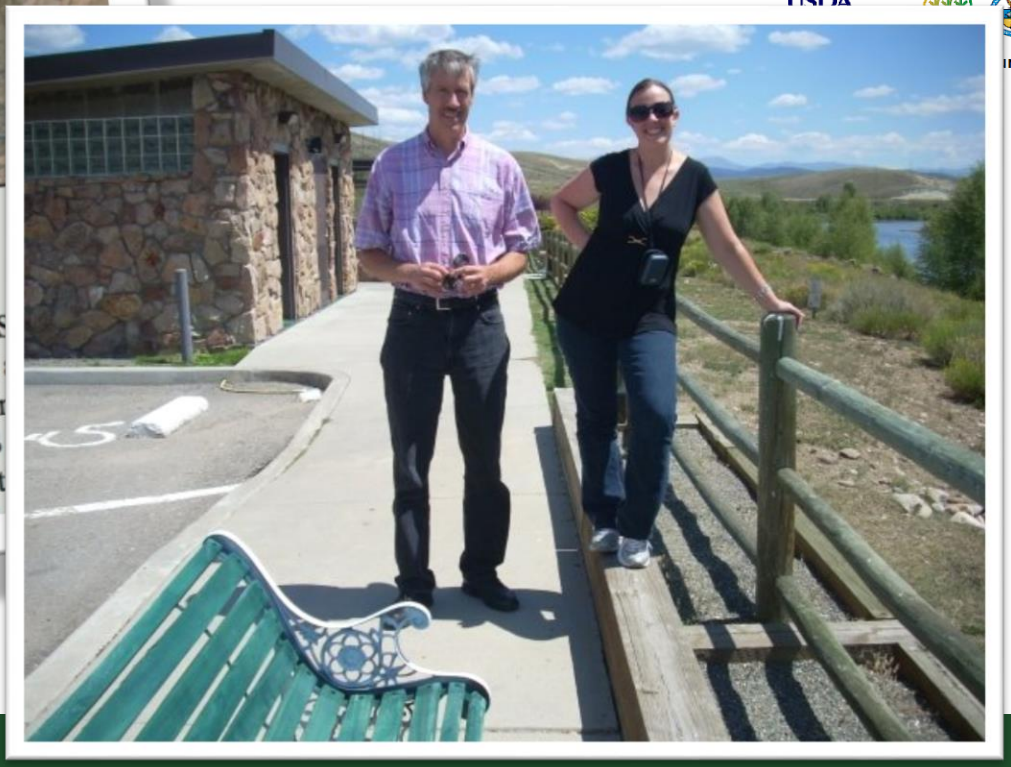
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

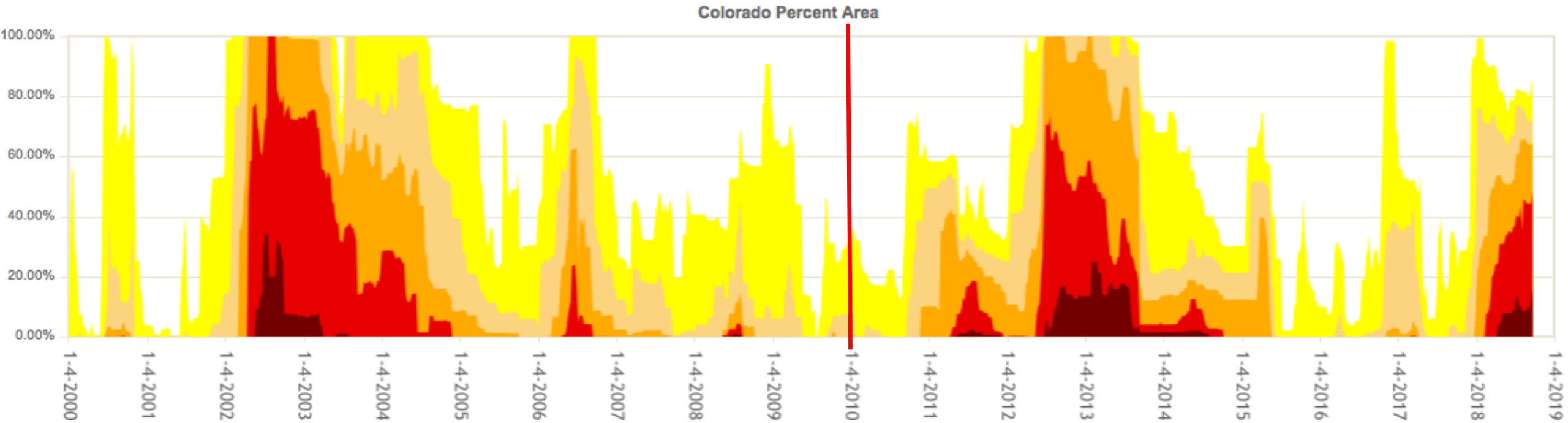
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Laura Edwards
Western Regional Climate Center

USDA

...unl.edu/

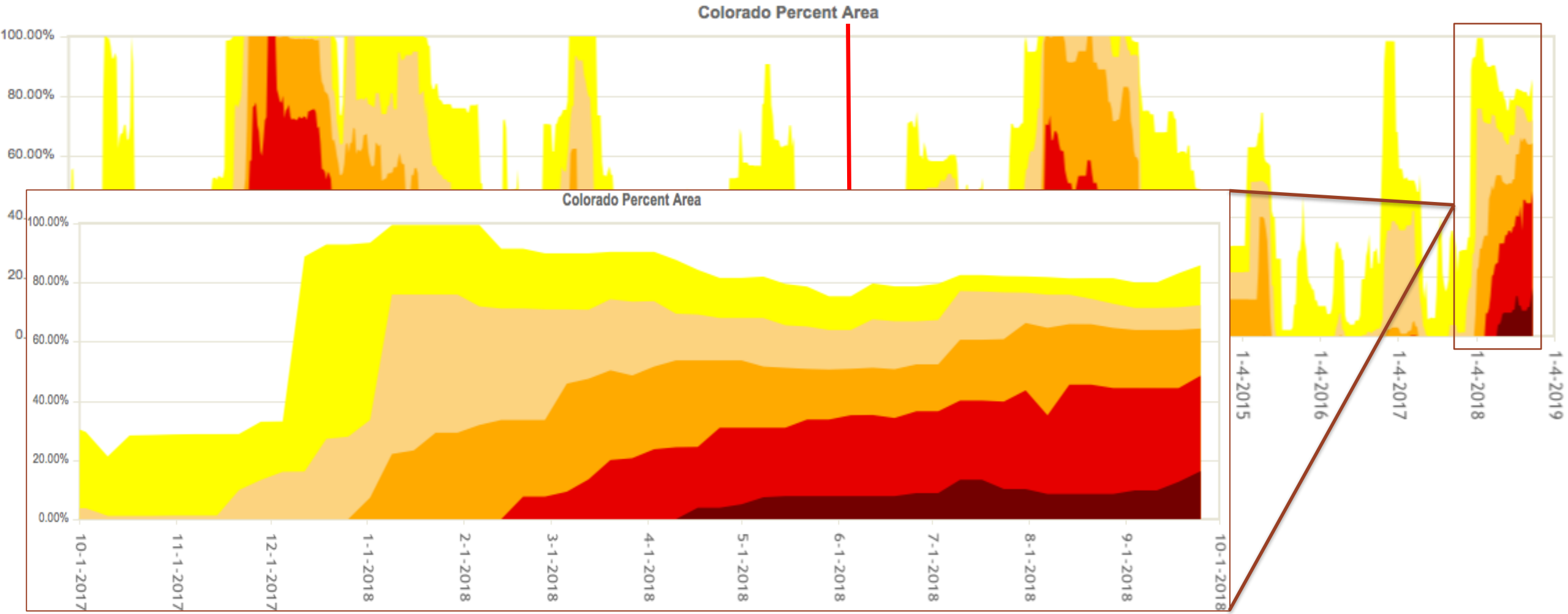




Implementation of weekly monitoring operations in 2010 led to more timely detection of the 2012 drought.

Yes! Drought can happen in the winter!!

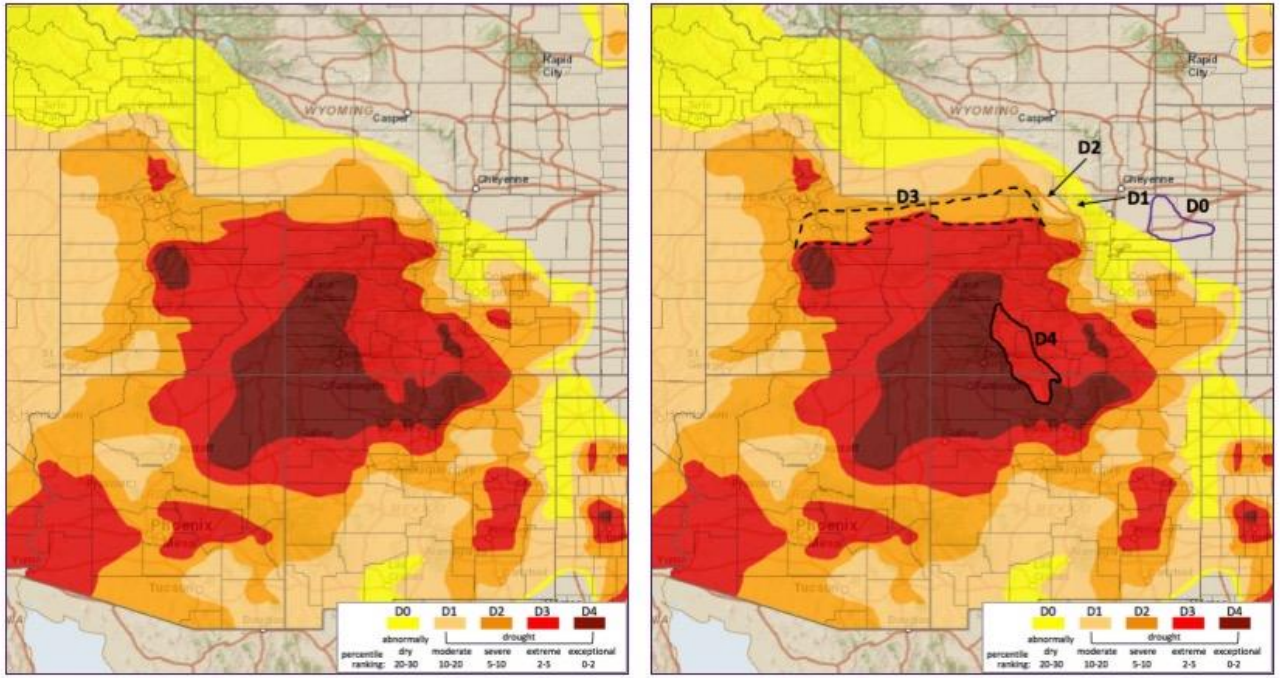
improved monitoring = improved drought depiction



improved monitoring = improved drought depiction

COLORADO CLIMATE CENTER

NIDIS Intermountain West Drought Early Warning System
September 25, 2018



Current U.S. Drought Monitor Depiction ⓘ Recommended Changes ⓘ

Summary: September 25, 2018

On the tail of a very hot and dry first half of September, a plume of tropical moisture surged across the southern portion of the Intermountain West region last week. This moisture brought precipitation accumulations of around half an inch to an inch to widespread parts of Arizona and New Mexico. Some isolated locations in eastern Colorado and eastern Wyoming received spotty precipitation, but much of Utah and the majority of the Upper Colorado River Basin missed out. And despite the precipitation, and a brief cool-down, temperatures for the week remained well above average for this time of year.

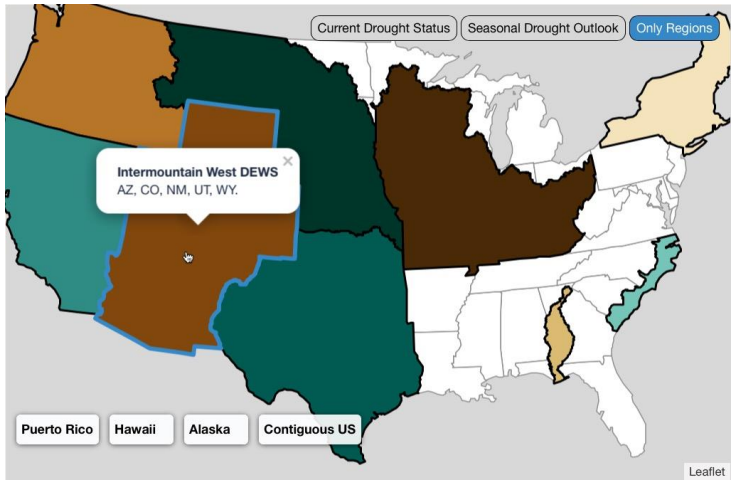
An alarming 30% of USGS stream gauges are reporting record low 7-day averaged streamflows this week (also observed last week). With only one week left in the water year, the gauge on the San Juan River near Bluff, UT is on course for breaking the record for lowest accumulated discharge. The current record low is 2002, with a period of record of 92 years.

Weather and climate outlooks don't provide a lot of good news. The 7-day precip forecast does show more promising accumulations for AZ and NM, with some accumulation expected in the parched areas of UT. 7-day accumulations expected across the UCRB would still be below average for this time of year though. The two week outlook shows that above average

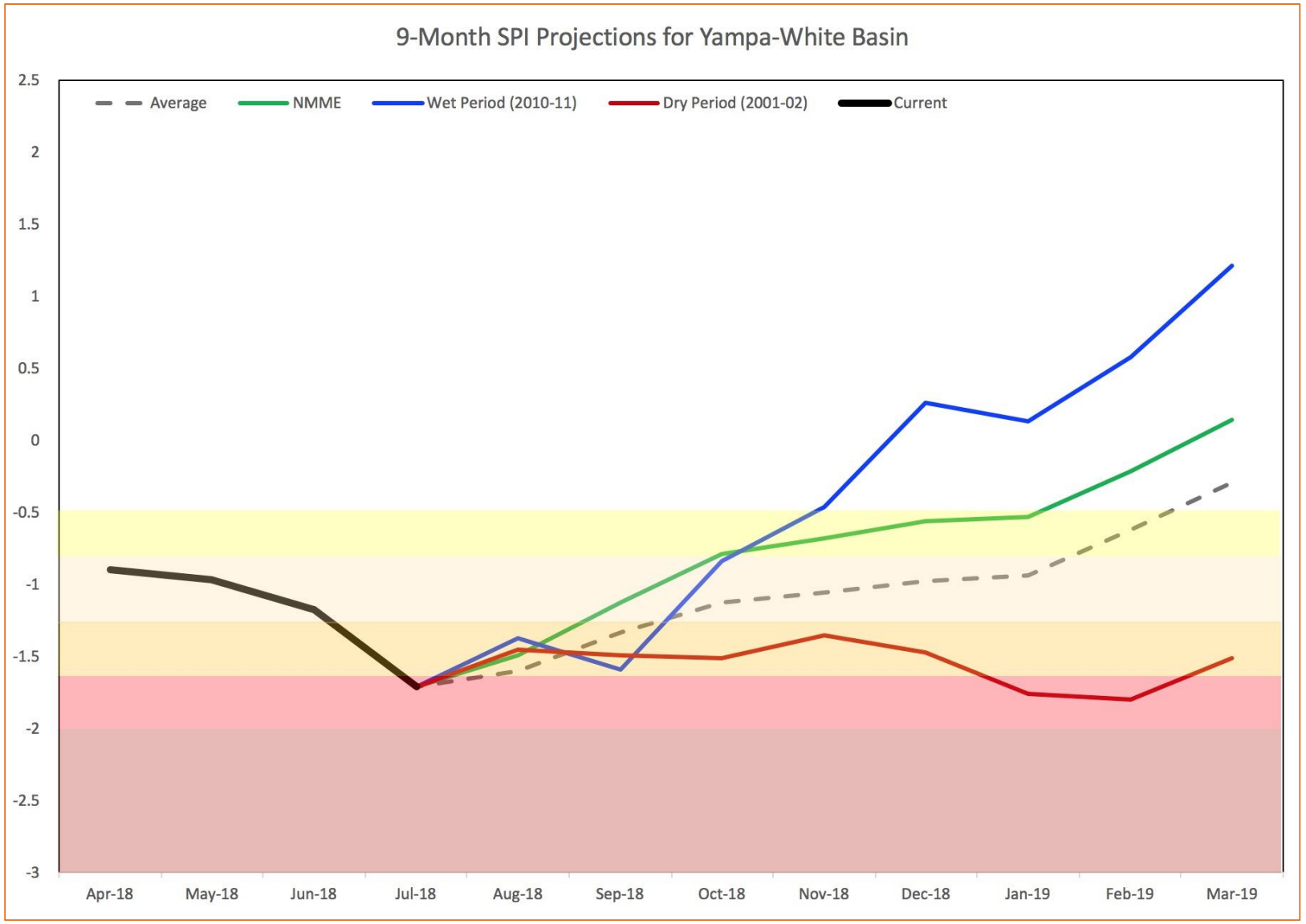
Weekly Drought Monitoring
climate.colostate.edu/~drought

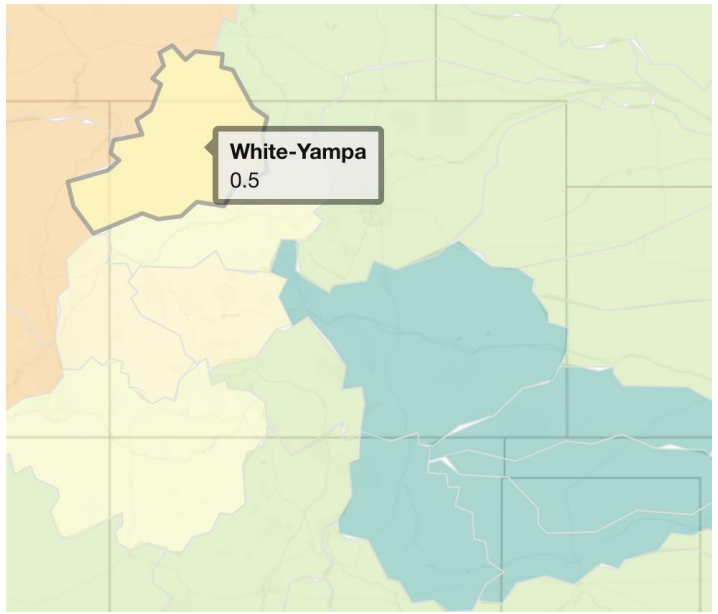
- ❑ **Conditions**
  - ❑ **Precipitation, snow**
  - ❑ **Evaporative Demand**
  - ❑ **Streams, soils, vegetation**
- ❑ **Impacts Reports**
- ❑ **Outlooks**
- ❑ **Recommendation to USDM**

Our Current NIDIS Team



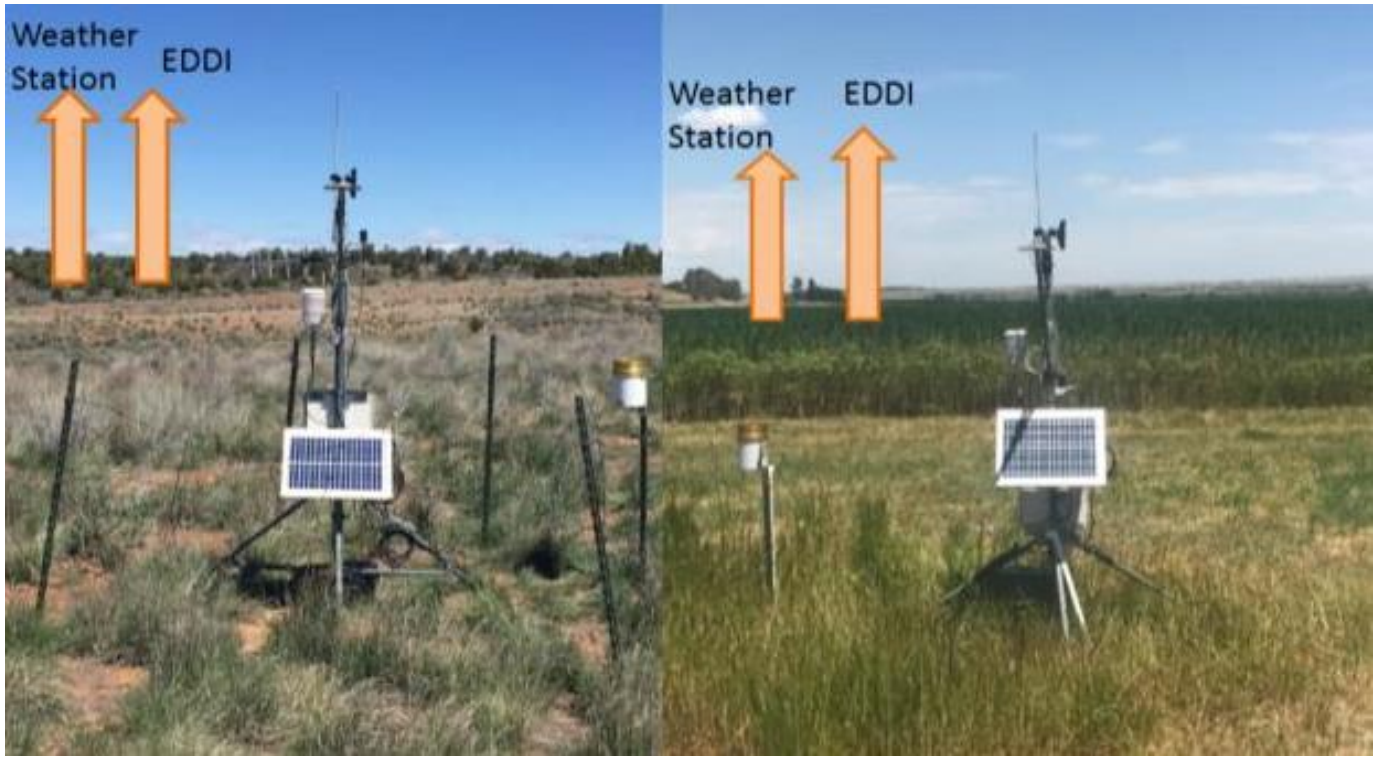
- Me! (about 50% of my time)
- Peter (about 50% of his time)
- Zach (weekly summary, some mapping products)
- Noah (condition monitoring efforts, communication)
- Henry (in-person engagement with NWS and climate offices)
- Julian (support for CoCoRaHS efforts)

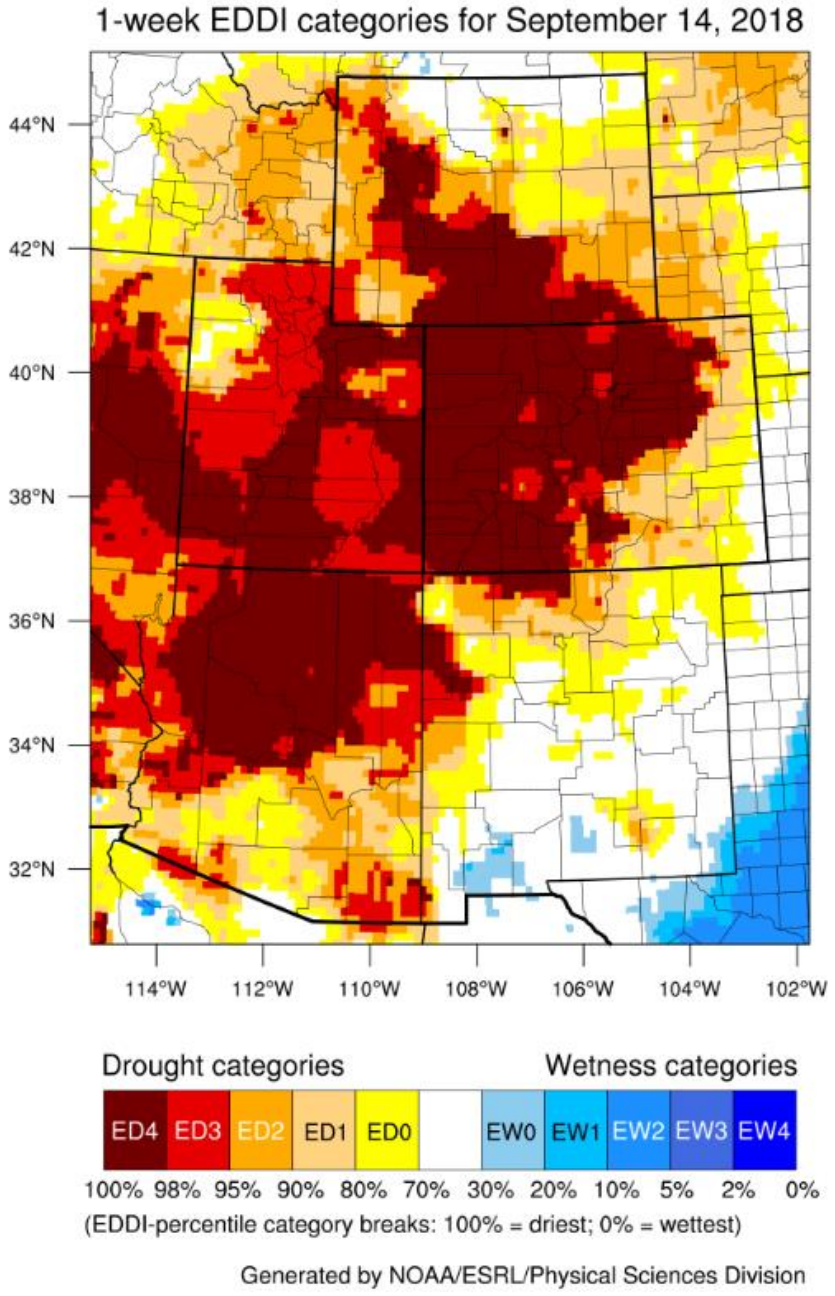




Seasonal prediction of drought-specific metrics, like the Standardized Precipitation Index

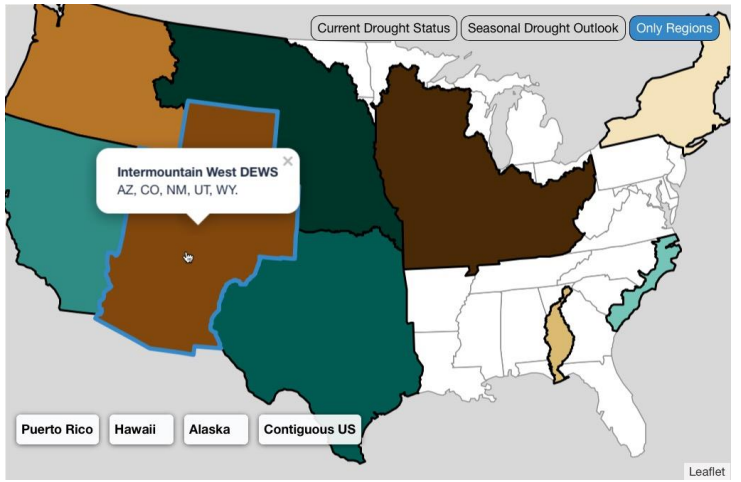
Ground validation of the Evaporative Demand Drought Index (EDDI) product using CoAgMET data.





NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

Our Current NIDIS Objectives



- ✓ enhancing engagement and interaction
- ✓ communication and dissemination
- ✓ value added information and products

enhancing engagement and interaction

works for Durango-Silverton Railroad
(suspected cause of the 416 Fire)

Soliciting Condition Monitoring reports from CoCoRaHS observers in D2 counties

Rizza,John
To: Bolinger,Becky
Re: Conditions in west and southwest CO

February 20, 2018 at 4:48 PM

I think this is a good approach, plan for the worst and hope for the best rather than be behind the eight ball.

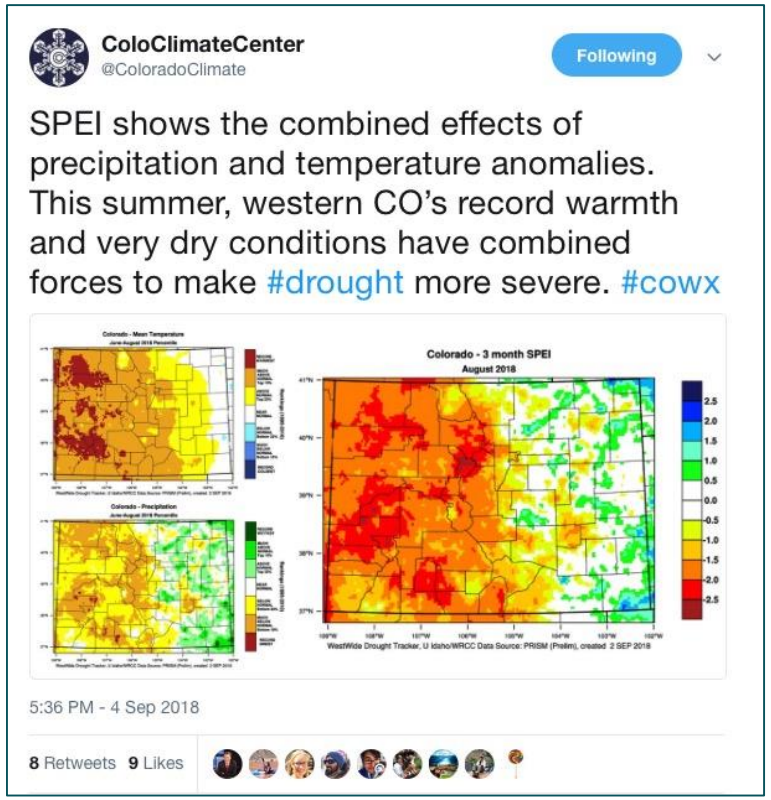
Thank you for your efforts. Maybe this is a good time to revisit the conversation about the short webinars directed towards producers? I can follow up on that email from the other week and Maybe we can set something up for a week or two away?

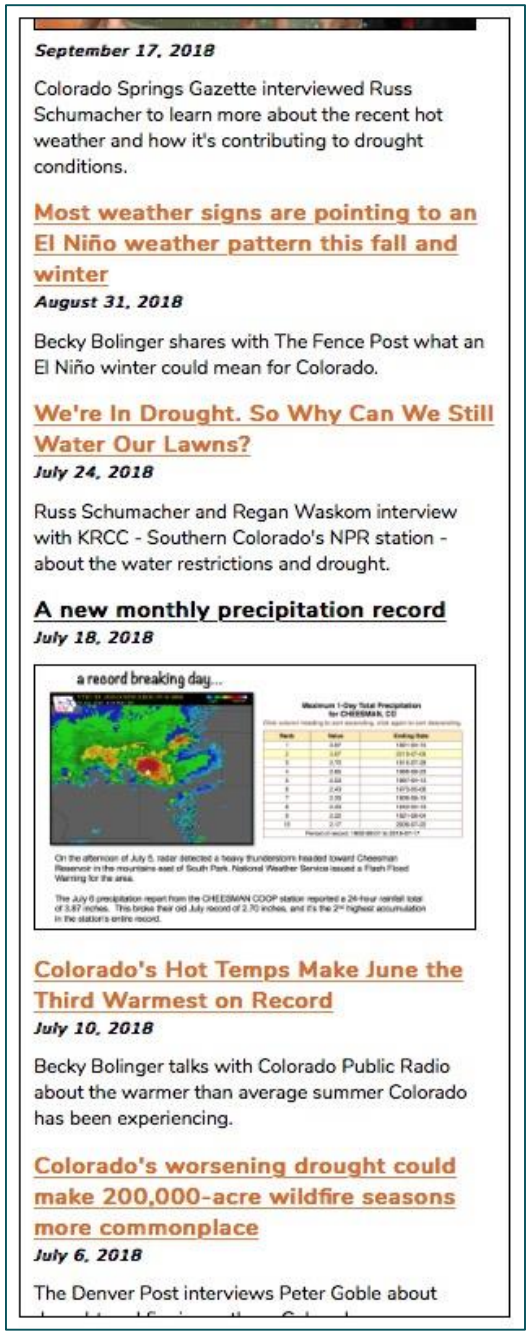
working with CSU Extension to keep engaged with the ag community

communication and dissemination

webinars and videos

presentations





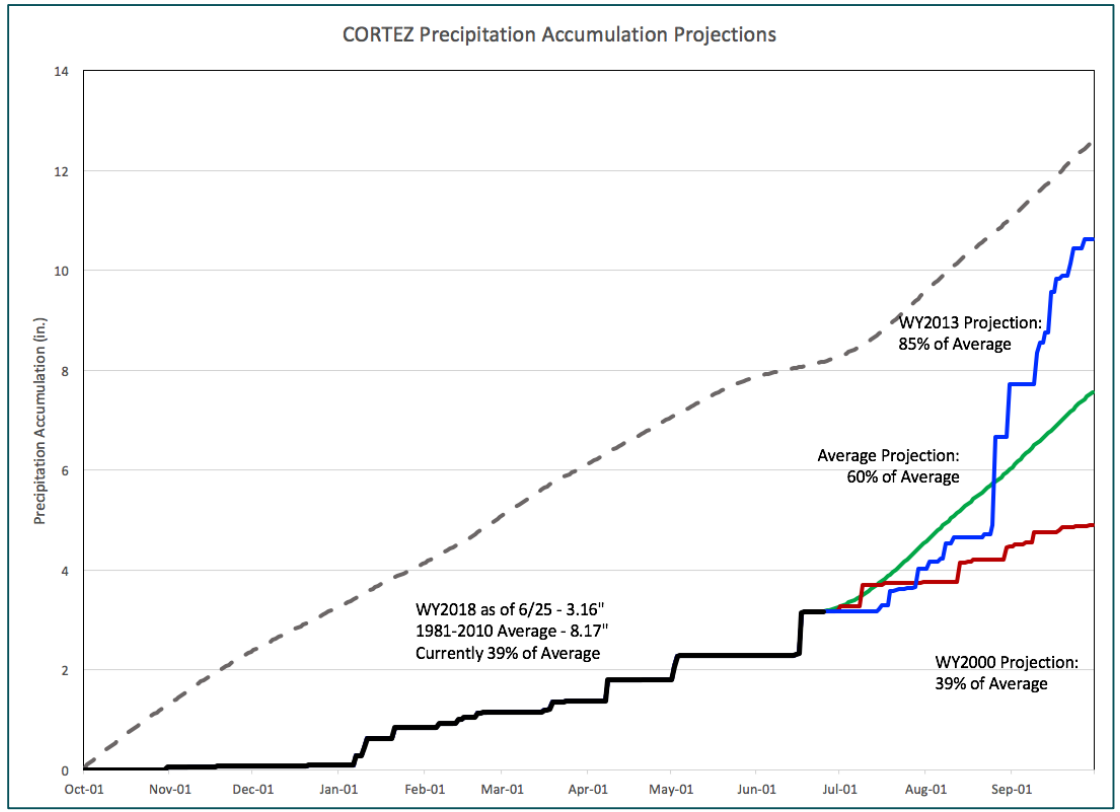
social media

promotional materials

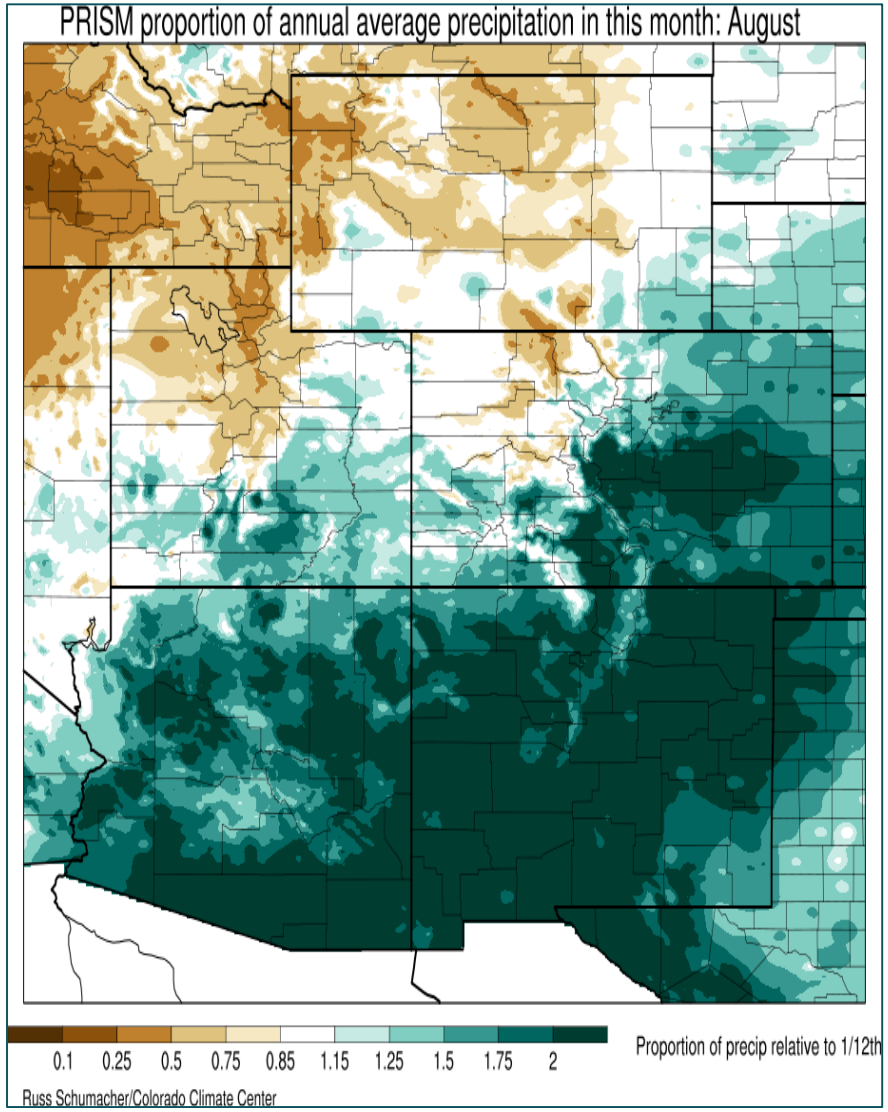
website updates

media interviews

value added information and products



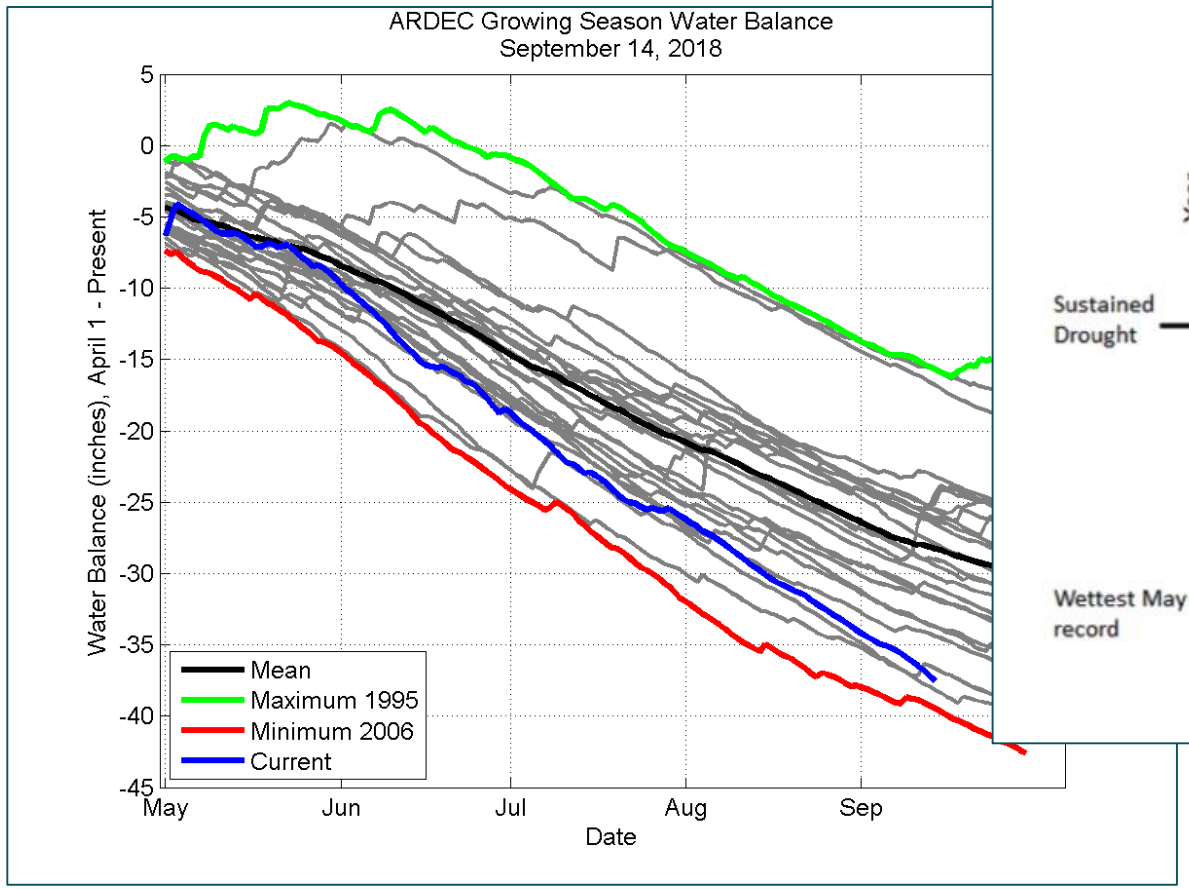
how hard would it be to get back to normal?

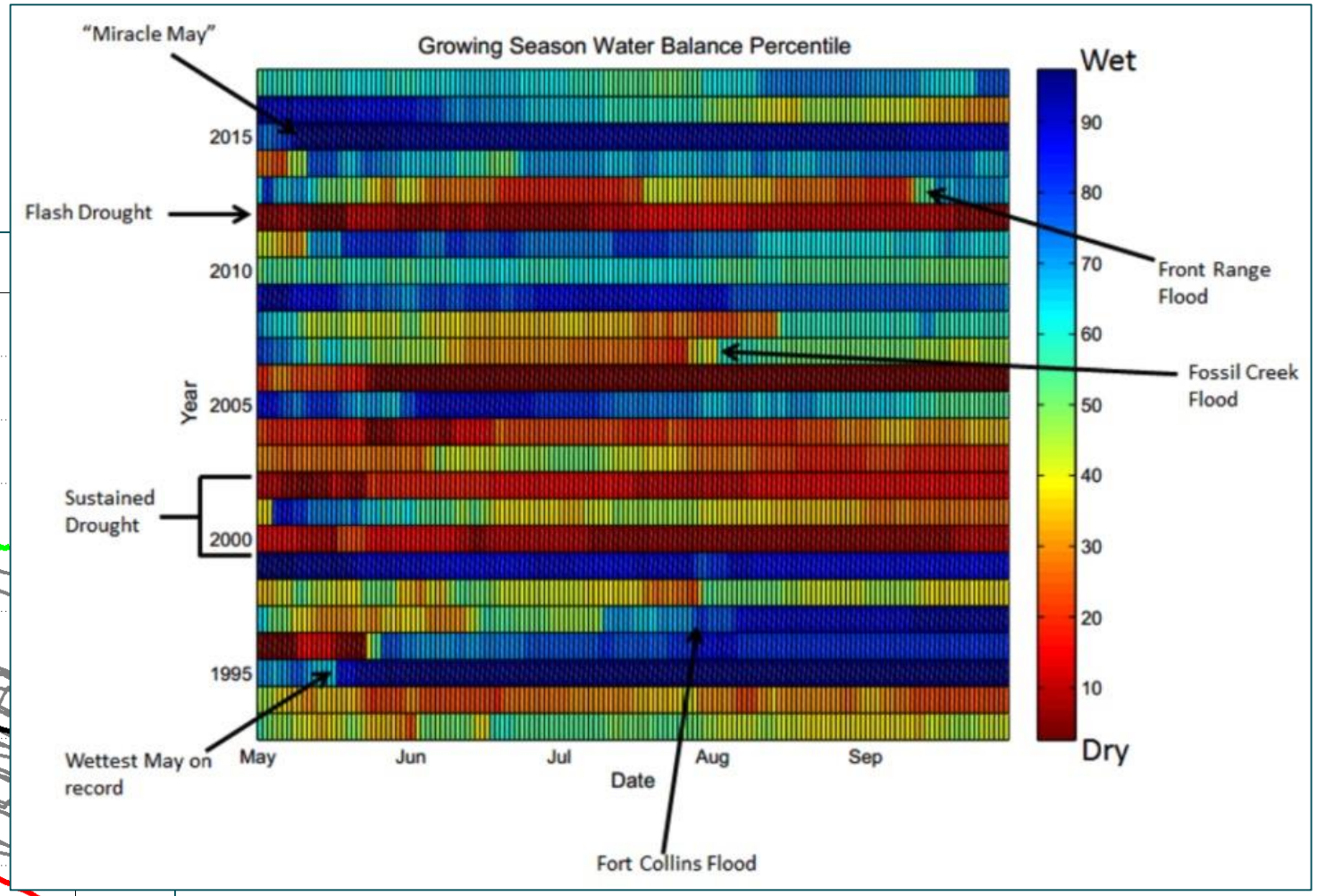


how "important" is each month to the annual contribution of precipitation?

value added information and products

understanding the relationship between precipitation and evaporation and how the drought responds to water balance





The Community Collaborative Rain, Hail and Snow Network

https://www.cocorahs.org

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

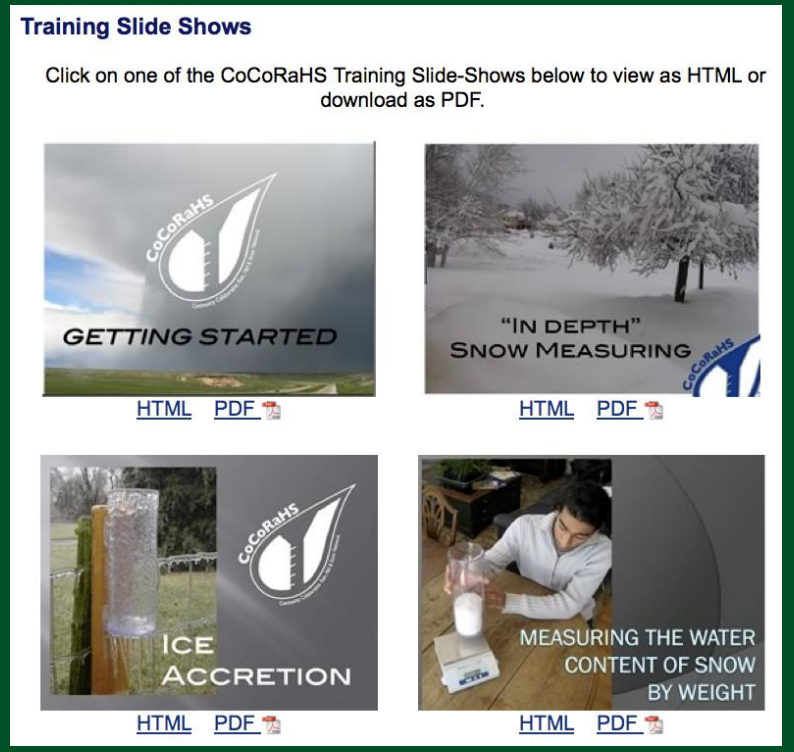
Simple low-cost measurement tools

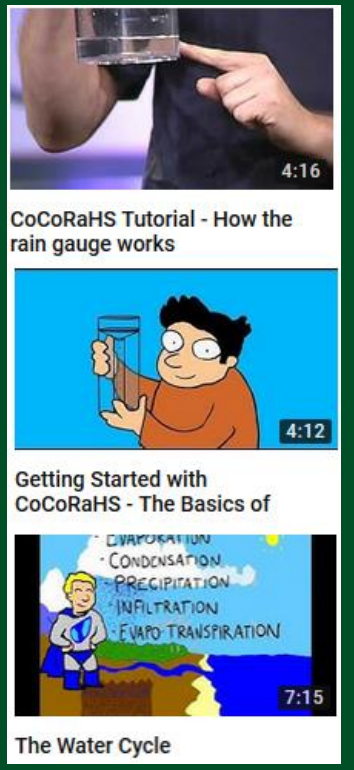
4-inch diameter
High capacity rain gauges

Aluminum foil-wrapped
Styrofoam hail pads

Snow rulers marked
in tenths of an inch

Easy Training



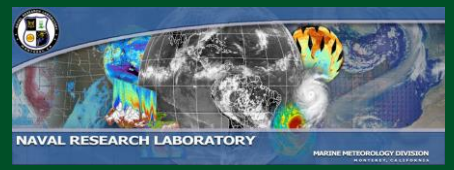


Written Instructions

Slide Shows

Videos and Animations

Data used by national entities

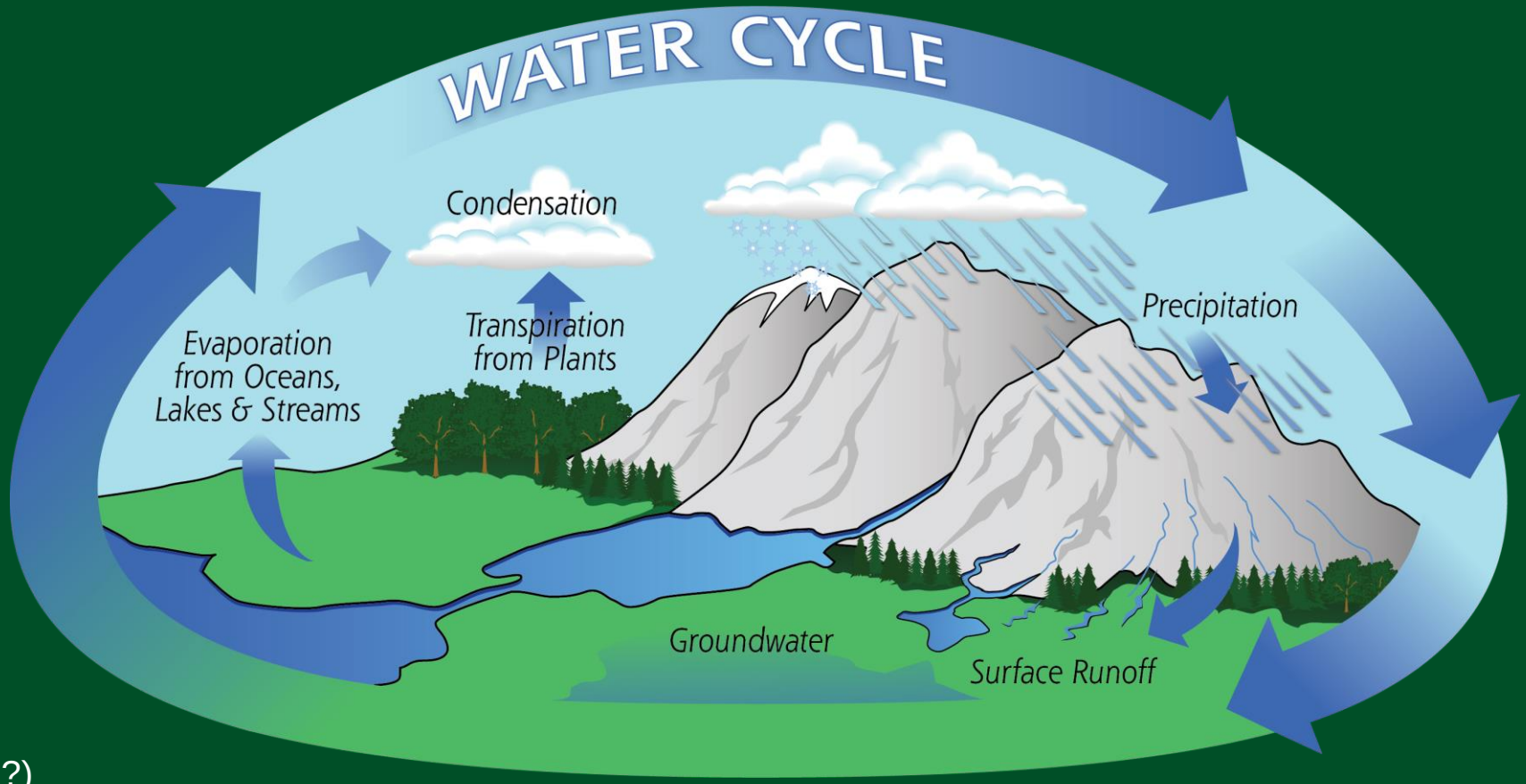


CoCoRaHS For Schools

- All 50 states
  - Colorado, Florida, Maine Coastal Islands, Hawaii school network, and more
- Connections with Scientists
  - UNC Chapel Hill and schools in Washington isotope analysis
- “Rain Gauge Week” bi-annual campaign

CoCoRaHS Observation Protocols

- Daily Precipitation
- Multi-day Precipitation
- Hail
- Significant Weather
- Condition Monitoring
- Soil Moisture
- Evapotranspiration
- Frost
- Optics
- Snowflake
- Thunder
- Ice Accretion (Coming 2019?)



https://pmm.nasa.gov/education/sites/default/files/article_images/Water-Cycle-Art2A.png

Precipitation Reports Make Up the Bulk of the Observations

COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK
"Because every drop counts"

Select Language

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

Enter My New Reports

- Daily Precipitation
- Multi-Day Accumulation
- Hail
- Significant Weather
- Monthly Zeros
- Condition Monitoring Report
- Soil Moisture
- Evapotranspiration

FROST Reports
- Frost
- Optics
- Snowflake
- Thunder

List/Edit My Reports

- Daily Precipitation
- Multi-Day Accumulation
- Hail
- Significant Weather
- Condition Monitoring Report
- Soil Moisture
- Evapotranspiration

FROST Reports
- Optics
- Frost
- Snowflake
- Thunder

My Data Entry : Daily Precipitation Report Form

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

Precipitation Report Form Submit Reset

Station Number : CO-LR-607
Station Name : Fort Collins 3.8 SSW

* Denotes Required Field

9/26/2018 *Observation Date

7:00 AM *Observation Time

0.00 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)

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

Duration Information

If a time is unknown or the storm has not ended leave it blank.

Precipitation Began AM PM
Precipitation Ended AM PM
Heaviest Precipitation Began AM PM
Heaviest Precipitation Lasted minutes
These times are: Select Time Accuracy

Additional Information

Any Flooding? Select a Flooding Value

Yes / No Did you record hourly precipitation (or other detailed time increments) for this storm?
If yes, CoCoRaHS personnel may request a copy of this data later, so please save it.

Submit Data Reset

My Data Entry : Multi-Day Precipitation Report Form

Multiple Day Accumulation Form Submit Data Reset

Station Number : CO-LR-607
Station Name : Fort Collins 3.8 SSW

9/25/2018 First day of accumulation period. This day should be one day after your last daily report or one day after the End Date of the last multi-day report.

9/26/2018 Date the rain gauge was emptied.

7:00 AM Time the rain gauge was emptied.

Yes / No Report was taken at registered location?

in. Multi-Day Precipitation (rain and melted snow, to the nearest hundredth of an inch), or T for trace, or NA for unknown. Information about snowfall should be included in the comments.

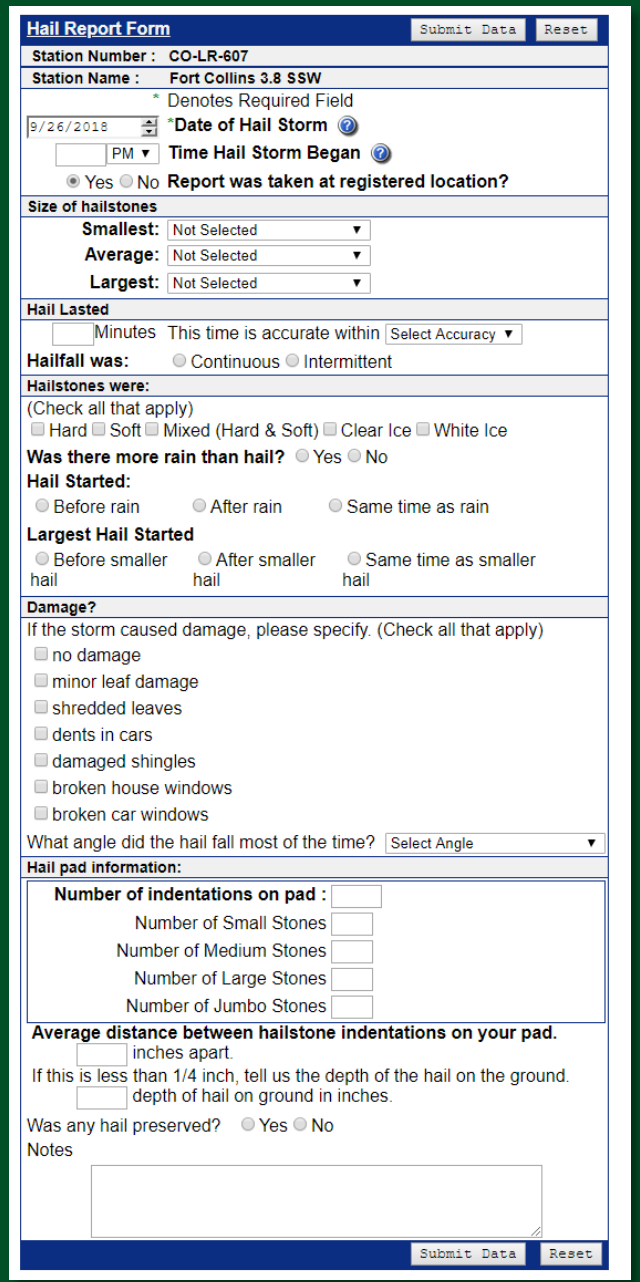
in. Total Depth of Snow on Ground (to the nearest tenth of an inch)

in. Water content of core sample (The amount of water present in a core sample of the total depth of snow on the ground, to the nearest hundredth of an inch)

Notes

Submit Data Reset

Significant Weather and Hail Reports are sent to the NWS in Real-time



Hail Report Form Submit Data Reset

Station Number : CO-LR-607

Station Name : Fort Collins 3.8 SSW

* Denotes Required Field

9/26/2018 *Date of Hail Storm

PM Time Hail Storm Began

Yes No Report was taken at registered location?

Size of hailstones

Smallest: Not Selected

Average: Not Selected

Largest: Not Selected

Hail Lasted

Minutes This time is accurate within Select Accuracy

Hailfall was: Continuous Intermittent

Hailstones were:

(Check all that apply)

Hard Soft Mixed (Hard & Soft) Clear Ice White Ice

Was there more rain than hail? Yes No

Hail Started:

Before rain After rain Same time as rain

Largest Hail Started

Before smaller hail After smaller hail Same time as smaller hail

Damage?

If the storm caused damage, please specify. (Check all that apply)

no damage
minor leaf damage
shredded leaves
dents in cars
damaged shingles
broken house windows
broken car windows

What angle did the hail fall most of the time? Select Angle

Hail pad information:

Number of indentations on pad :
Number of Small Stones
Number of Medium Stones
Number of Large Stones
Number of Jumbo Stones

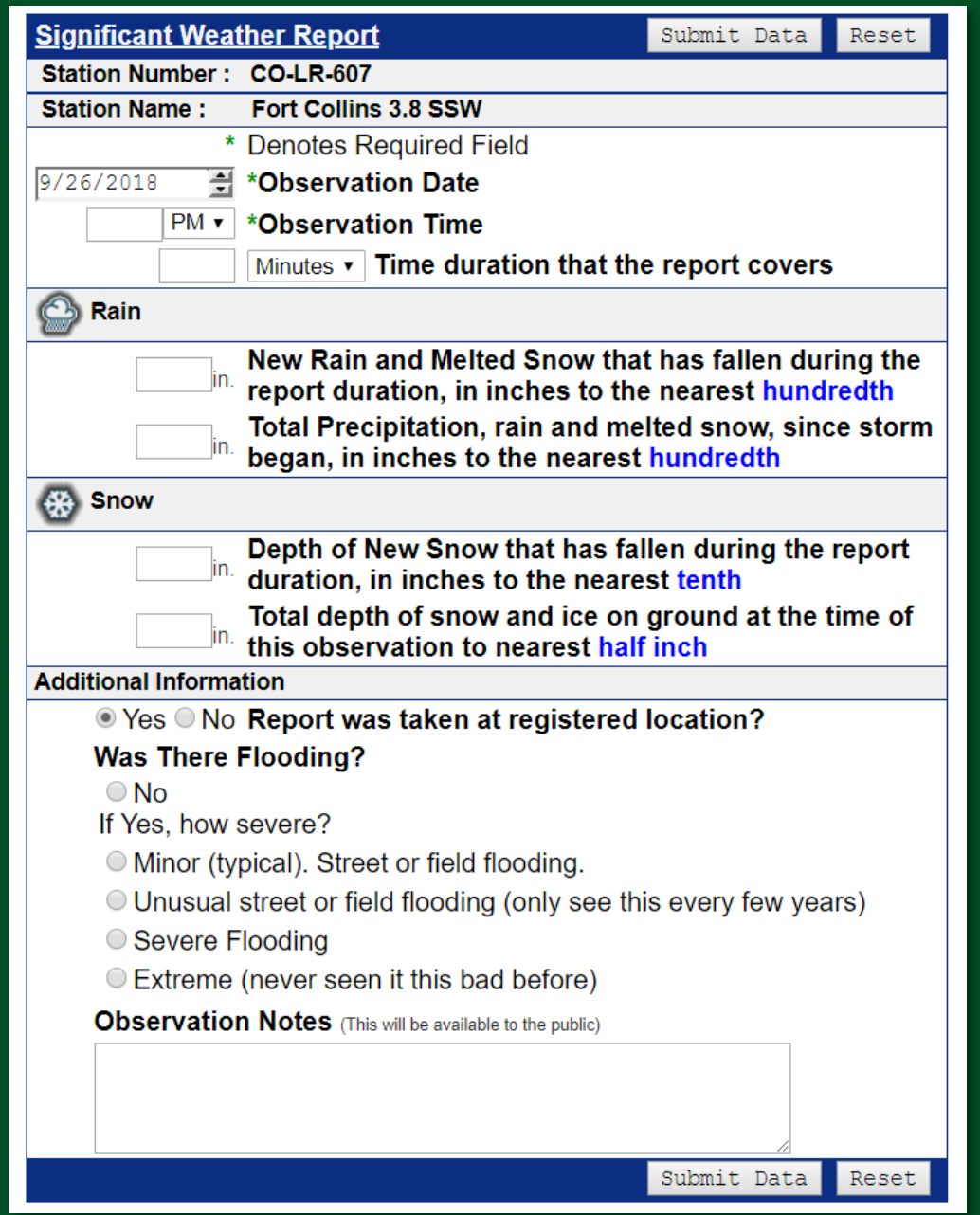
Average distance between hailstone indentations on your pad.
inches apart.

If this is less than 1/4 inch, tell us the depth of the hail on the ground.
depth of hail on ground in inches.

Was any hail preserved? Yes No

Notes

Submit Data Reset



Significant Weather Report Submit Data Reset

Station Number : CO-LR-607

Station Name : Fort Collins 3.8 SSW

* Denotes Required Field

9/26/2018 *Observation Date

PM *Observation Time

Minutes Time duration that the report covers

Rain

in. New Rain and Melted Snow that has fallen during the report duration, in inches to the nearest hundredth

in. Total Precipitation, rain and melted snow, since storm began, in inches to the nearest hundredth

Snow

in. Depth of New Snow that has fallen during the report duration, in inches to the nearest tenth

in. Total depth of snow and ice on ground at the time of this observation to nearest half inch

Additional Information

Yes No Report was taken at registered location?

Was There Flooding?

No

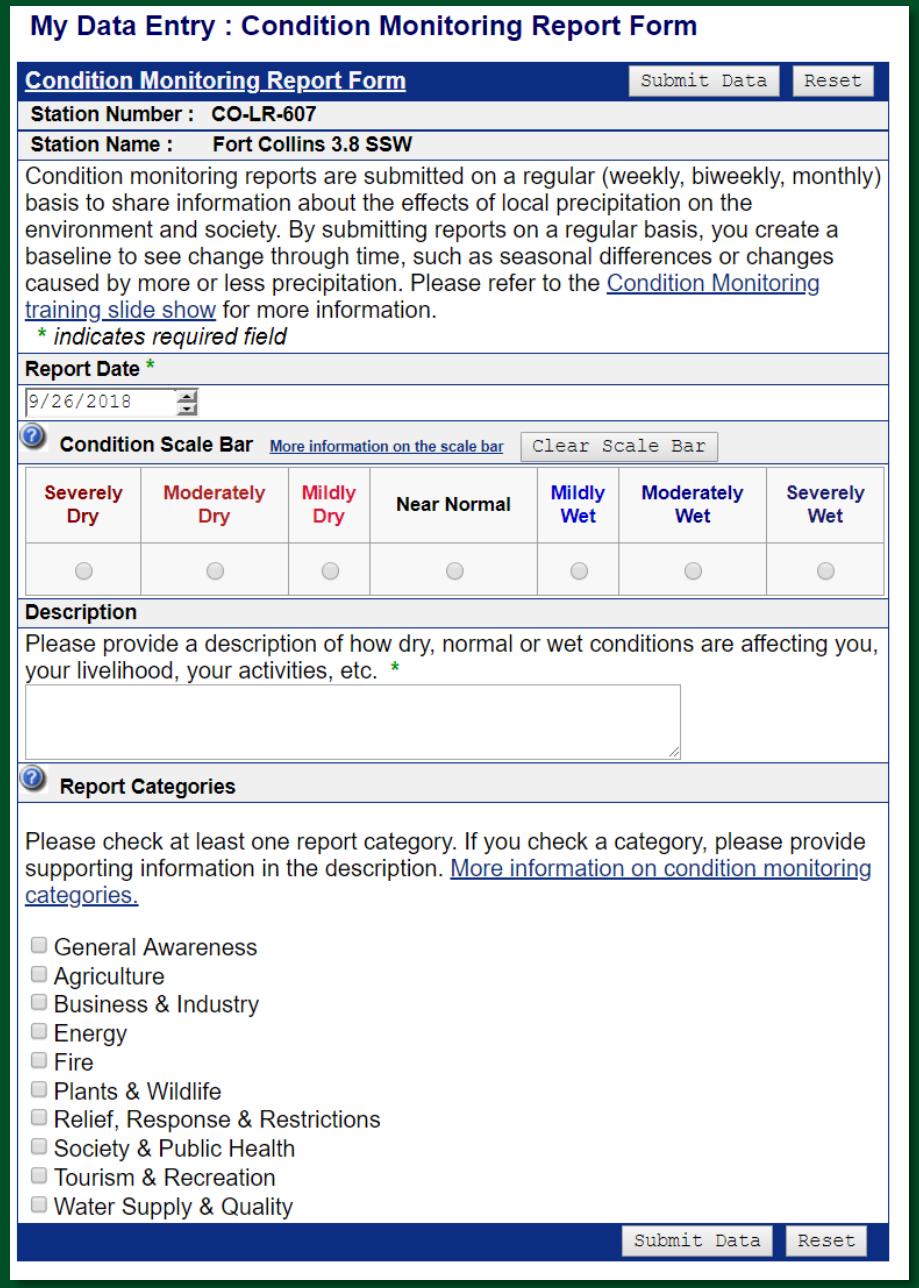
If Yes, how severe?

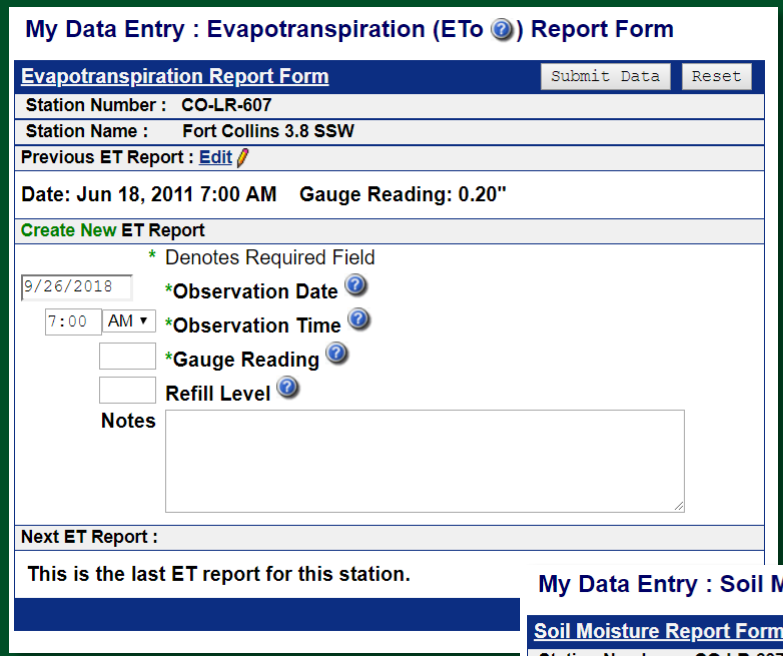
Minor (typical). Street or field flooding.
Unusual street or field flooding (only see this every few years)
Severe Flooding
Extreme (never seen it this bad before)

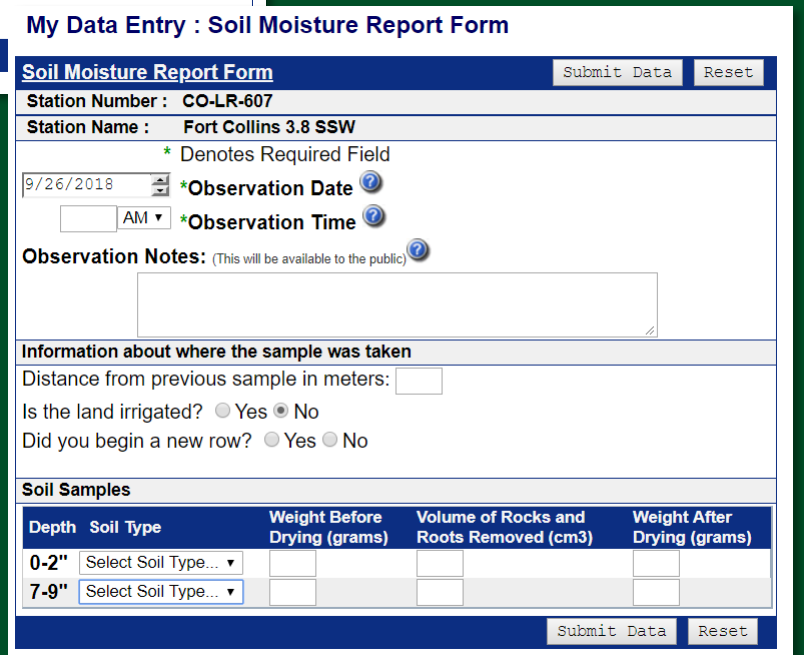
Observation Notes (This will be available to the public)

Submit Data Reset

Observation Protocols Used in Drought Monitoring







Observation Protocols from PA FROST Project

My Data Entry : Snowflake Report Form

Snowflake Report Form Submit Data Reset

Station Number : CO-LR-607

Station Name : Fort Collins 3.8 SSW

* Denotes Required Field

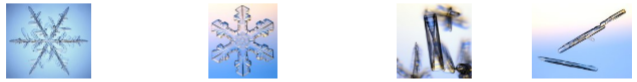
9/26/2018 *Observation Date

7:00 AM *Observation Time

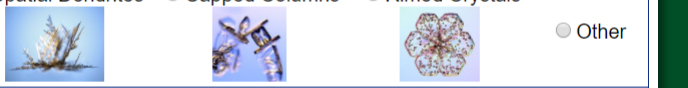
Yes No Report was taken at registered location?

Snowflake shapes were predominantly:

Stellar Dendrites | Sectored Plates | Hollow Columns | Needles



Spatial Dendrites | Capped Columns | Rimed Crystals | Other



If present, select up to two (2) other snowflake shapes:

Stellar Dendrites | Sectored Plates | Hollow Columns | Needles

Spatial Dendrites | Capped Columns | Rimed Crystals | Other

Click here see snowflake types

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

Submit Data Reset

My Data Entry : Frost Report Form

Frost Report Form Submit Data Reset

Station Number : CO-LR-607

Station Name : Fort Collins 3.8 SSW

* Denotes Required Field

9/26/2018 *Observation Date

7:00 AM *Observation Time

Yes No Report was taken at registered location?

Percent coverage of frost on surface:

Less than 25%

25%-50%

50%-75%

Greater than 75%

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

Submit Data Reset

My Data Entry : Thunder Report Form

Thunder Report Form Submit Data Reset

Station Number : CO-LR-607

Station Name : Fort Collins 3.8 SSW

* Denotes Required Field

9/26/2018 *Observation Date

Yes No Report was taken at registered location?

Number of Thunder Claps

For information about counting thunderclaps, click here.

0 Morning (12AM-12PM)

0 Afternoon (12PM-5PM)

0 Evening (5PM-9PM)

0 Night (9PM-12AM)

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

Submit Data Reset

My Data Entry : Optics Report Form

Optics Report Form Submit Data Reset

Station Number : CO-LR-607

Station Name : Fort Collins 3.8 SSW

* Denotes Required Field

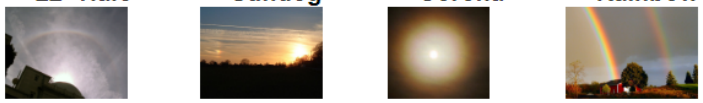
9/26/2018 *Observation Date

Not Selected *Observation Time of Day

Yes No Report was taken at registered location?

What did you see?

22° Halo | Sundog | Corona | Rainbow



Did you see a double rainbow? Yes No

Click here to see optical effects.

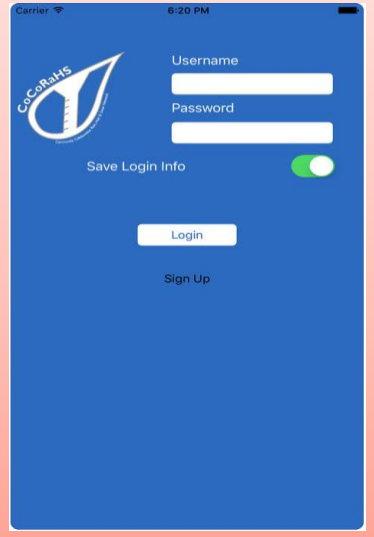
Observation Notes: (This will be available to the public)

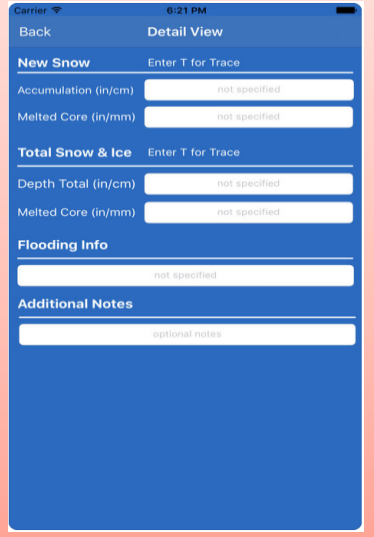
Submit Data Reset

Mobile Apps

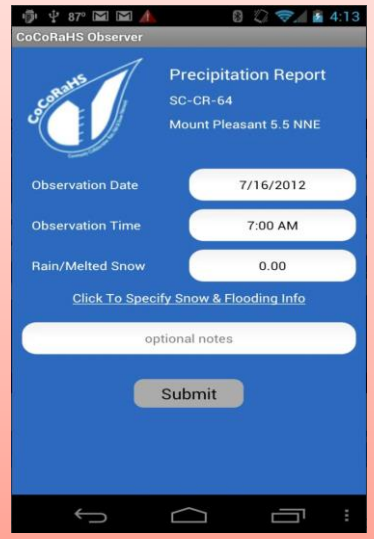
Android and iOS apps currently support entry and editing of daily and multi-day precipitation observations with more observation types and features to come

iOS



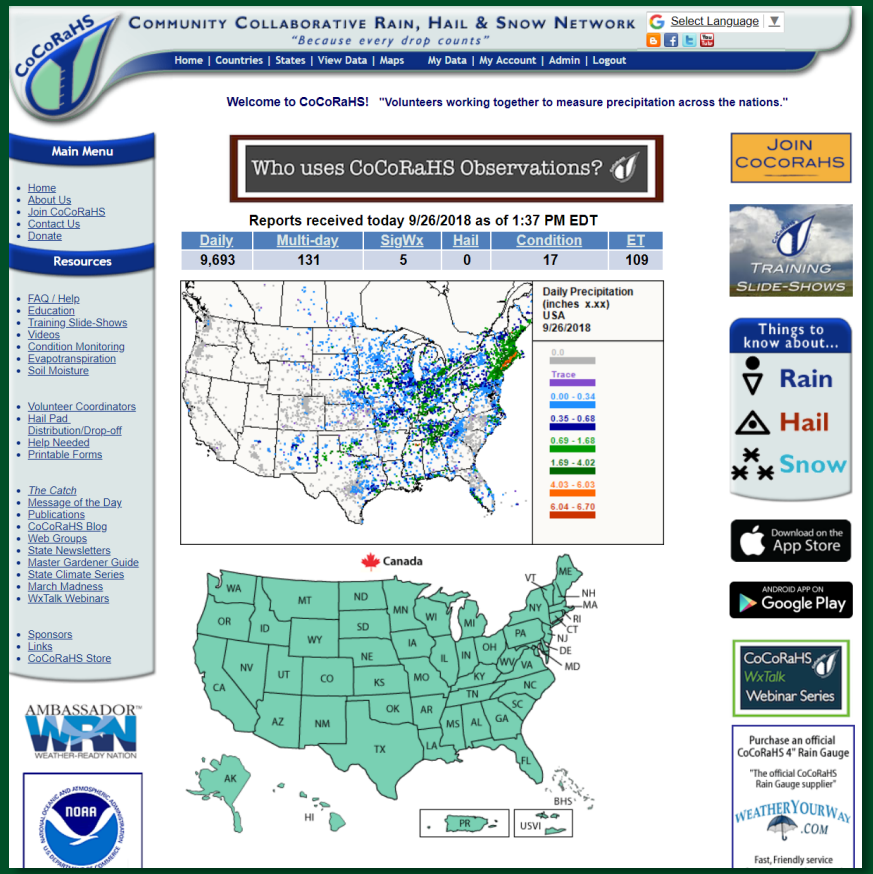


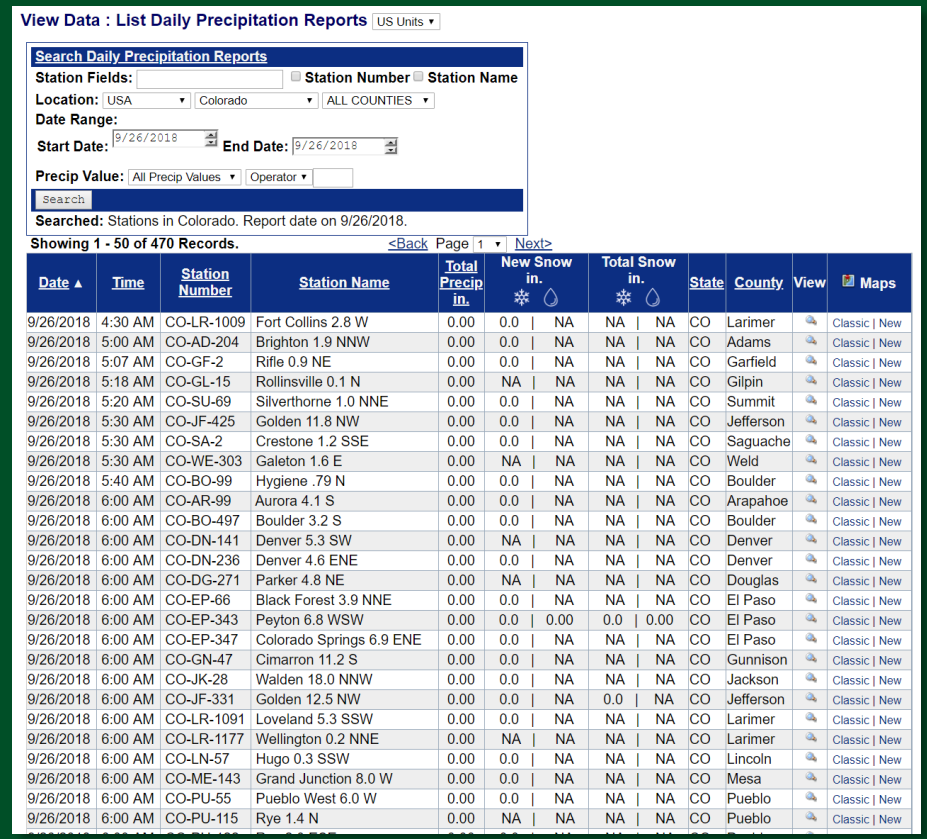
Android



Viewing the Data

www.cocorahs.org => View Data





View Data : List Daily Precipitation Reports US Units

Search Daily Precipitation Reports

Station Fields: Station Number Station Name

Location: USA Colorado ALL COUNTIES

Date Range:

Start Date: 9/26/2018 End Date: 9/26/2018

Precip Value: All Precip Values Operator

Search

Searched: Stations in Colorado. Report date on 9/26/2018.

Showing 1 - 50 of 470 Records. <Back Page 1 Next>

Date ▲	Time	Station Number	Station Name	Total Precip in.	New Snow in.		Total Snow in.		State	County	View	Maps
9/26/2018	4:30 AM	CO-LR-1009	Fort Collins 2.8 W	0.00	0.0	NA	NA	NA	CO	Larimer		Classic | New
9/26/2018	5:00 AM	CO-AD-204	Brighton 1.9 NNW	0.00	0.0	NA	NA	NA	CO	Adams		Classic | New
9/26/2018	5:07 AM	CO-GF-2	Rifle 0.9 NE	0.00	0.0	NA	NA	NA	CO	Garfield		Classic | New
9/26/2018	5:18 AM	CO-GL-15	Rollinsville 0.1 N	0.00	NA	NA	NA	NA	CO	Gilpin		Classic | New
9/26/2018	5:20 AM	CO-SU-69	Silverthorne 1.0 NNE	0.00	0.0	NA	NA	NA	CO	Summit		Classic | New
9/26/2018	5:30 AM	CO-JF-425	Golden 11.8 NW	0.00	0.0	NA	NA	NA	CO	Jefferson		Classic | New
9/26/2018	5:30 AM	CO-SA-2	Crestone 1.2 SSE	0.00	0.0	NA	NA	NA	CO	Saguache		Classic | New
9/26/2018	5:30 AM	CO-WE-303	Galeton 1.6 E	0.00	NA	NA	NA	NA	CO	Weld		Classic | New
9/26/2018	5:40 AM	CO-BO-99	Hygiene .79 N	0.00	0.0	NA	NA	NA	CO	Boulder		Classic | New
9/26/2018	6:00 AM	CO-AR-99	Aurora 4.1 S	0.00	0.0	NA	NA	NA	CO	Arapahoe		Classic | New
9/26/2018	6:00 AM	CO-BO-497	Boulder 3.2 S	0.00	0.0	NA	NA	NA	CO	Boulder		Classic | New
9/26/2018	6:00 AM	CO-DN-141	Denver 5.3 SW	0.00	NA	NA	NA	NA	CO	Denver		Classic | New
9/26/2018	6:00 AM	CO-DN-236	Denver 4.6 ENE	0.00	0.0	NA	NA	NA	CO	Denver		Classic | New
9/26/2018	6:00 AM	CO-DG-271	Parker 4.8 NE	0.00	NA	NA	NA	NA	CO	Douglas		Classic | New
9/26/2018	6:00 AM	CO-EP-66	Black Forest 3.9 NNE	0.00	0.0	NA	NA	NA	CO	El Paso		Classic | New
9/26/2018	6:00 AM	CO-EP-343	Peyton 6.8 WSW	0.00	0.0	0.00	0.0	0.00	CO	El Paso		Classic | New
9/26/2018	6:00 AM	CO-EP-347	Colorado Springs 6.9 ENE	0.00	0.0	NA	NA	NA	CO	El Paso		Classic | New
9/26/2018	6:00 AM	CO-GN-47	Cimarron 11.2 S	0.00	0.0	NA	NA	NA	CO	Gunnison		Classic | New
9/26/2018	6:00 AM	CO-JK-28	Walden 18.0 NNW	0.00	0.0	NA	NA	NA	CO	Jackson		Classic | New
9/26/2018	6:00 AM	CO-JF-331	Golden 12.5 NW	0.00	0.0	NA	0.0	NA	CO	Jefferson		Classic | New
9/26/2018	6:00 AM	CO-LR-1091	Loveland 5.3 SSW	0.00	0.0	NA	NA	NA	CO	Larimer		Classic | New
9/26/2018	6:00 AM	CO-LR-1177	Wellington 0.2 NNE	0.00	NA	NA	NA	NA	CO	Larimer		Classic | New
9/26/2018	6:00 AM	CO-LN-57	Hugo 0.3 SSW	0.00	0.0	NA	NA	NA	CO	Lincoln		Classic | New
9/26/2018	6:00 AM	CO-ME-143	Grand Junction 8.0 W	0.00	0.0	NA	NA	NA	CO	Mesa		Classic | New
9/26/2018	6:00 AM	CO-PU-55	Pueblo West 6.0 W	0.00	0.0	NA	NA	NA	CO	Pueblo		Classic | New
9/26/2018	6:00 AM	CO-PU-115	Rye 1.4 N	0.00	NA	NA	NA	NA	CO	Pueblo		Classic | New

View Data : View Hail Report

Hail Report

Hail Report Information

Station Number:	CO-LR-885
Station Name:	Fort Collins 3.7 S
Date:	5/22/2018 5:56 PM
Submitted	8/09/2018 3:17 PM
Taken at registered location:	True
Notes:	Hail started about 3-4 minutes after initial rainfall. First hailstones about 3/4" in diamter. Received .35" of precipitation during total thundserstorm event (approx 12 minutes) {Observer indicated in the report that the largest hail size was 0.75", largest measured on the hail pad was 0.50" CoCoSTAFF DNT}

Click to enlarge image.
Upload Image

Hailstone Information

Largest Size:	1/2" Grape
Average Size:	3/8"
Smallest Size:	1/4" Pea Size
Stone Consistency:	Mixed, White Ice

Hail Storm Information

Duration Minutes:	6
Duration Accuracy:	1min
Timing:	
More Rain than Hail:	True
Hail Started:	After rain
Largest Hail Started:	Before smaller hail
Damage:	shredded leaves

Hail pad information

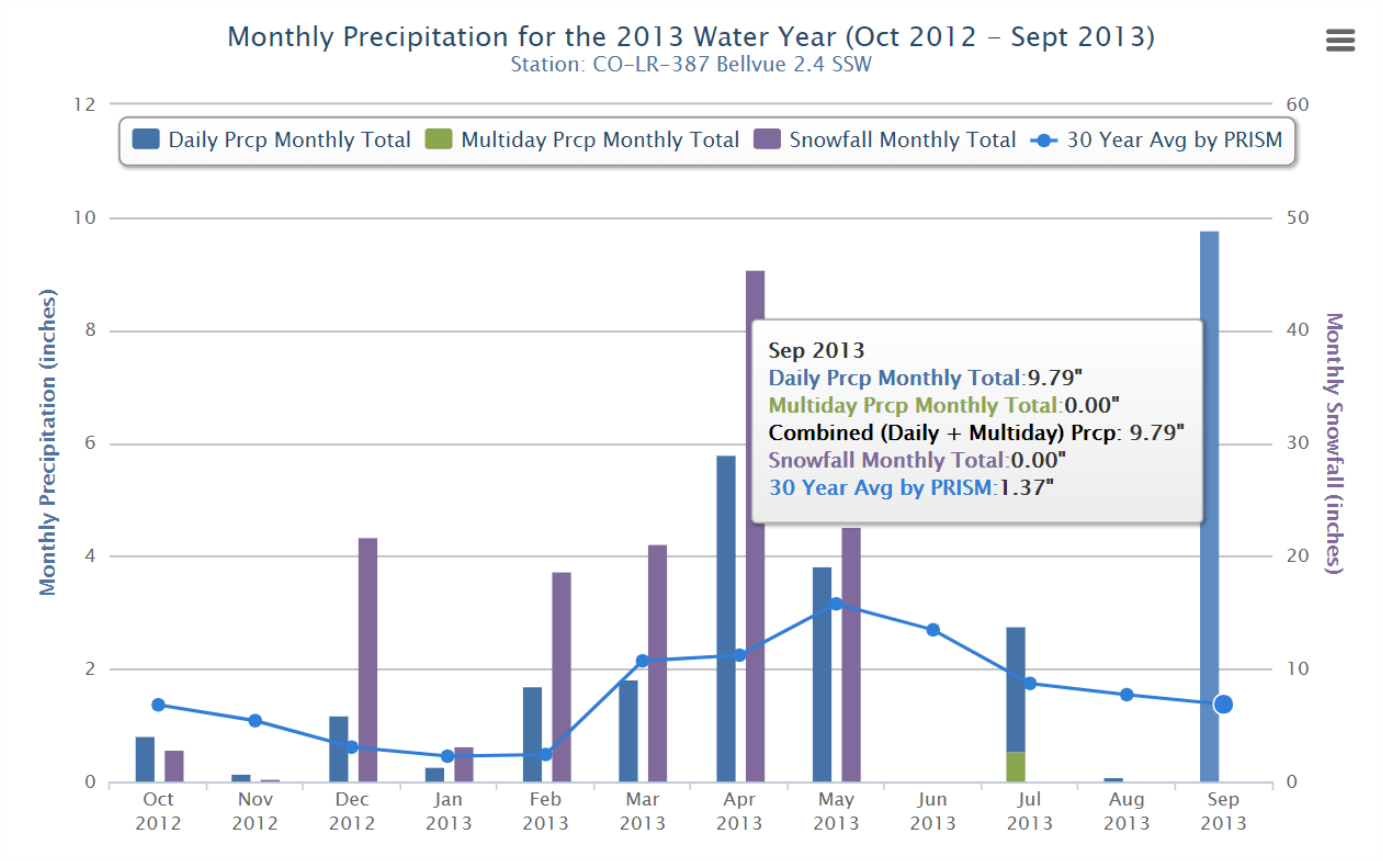
Angle of Impact:	10-20
Number of Stones On Pad:	212
Distance Between Stones On Pad:	.5
Depth Of Stones on Ground:	
Has Samples:	False

Water Year Summary Reports

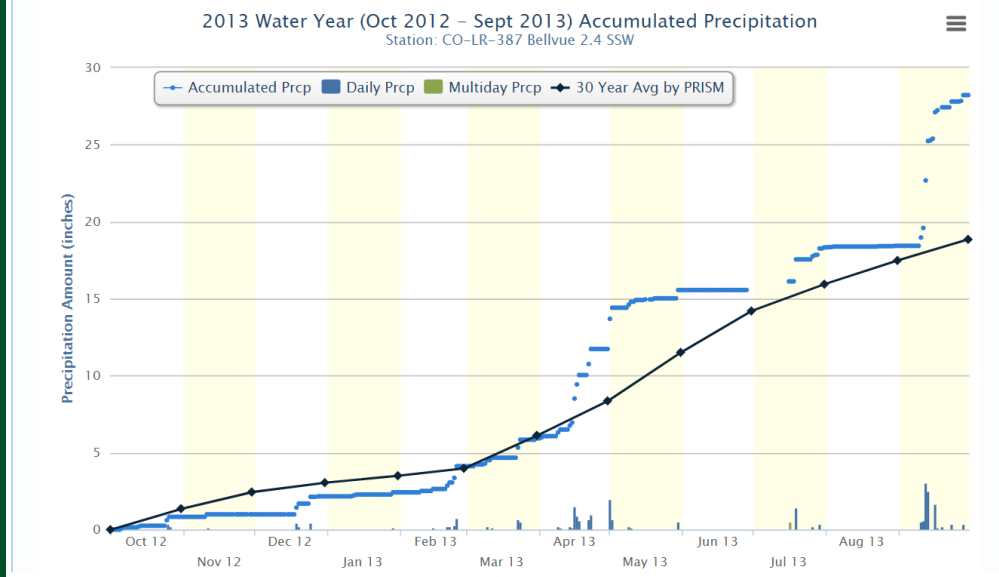
2013 CoCoRaHS Water Year Summary for Station CO-LR-387

Station Number	CO-LR-387	Latitude	40.5984
Station Name	Bellvue 2.4 SSW	Longitude	-105.189
County	Larimer	Elevation	5554 feet

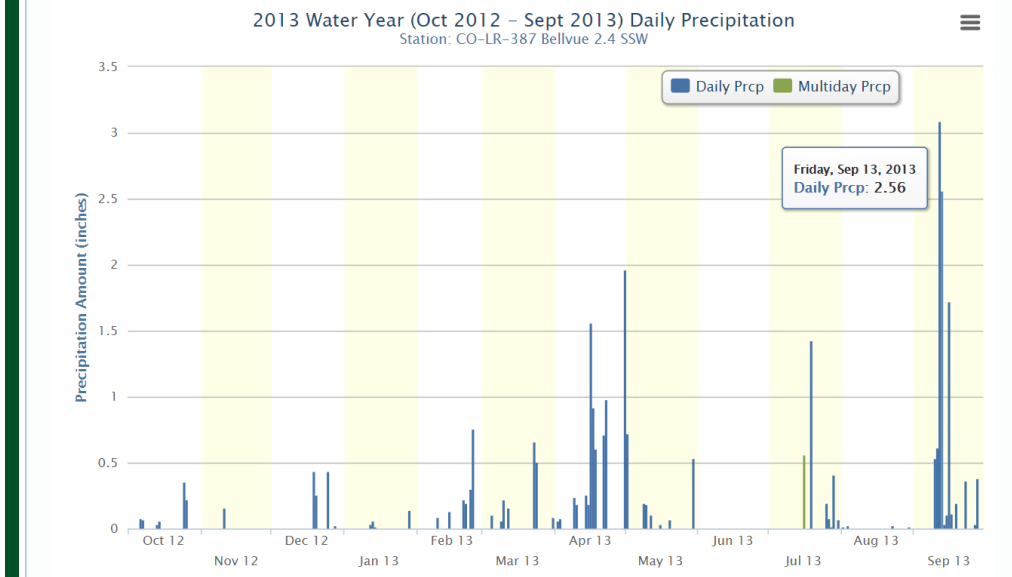
Monthly Prcp Totals Chart | Accumulated Prcp Chart | Daily Prcp Chart



Monthly Prcp Totals Chart | Accumulated Prcp Chart | Daily Prcp Chart

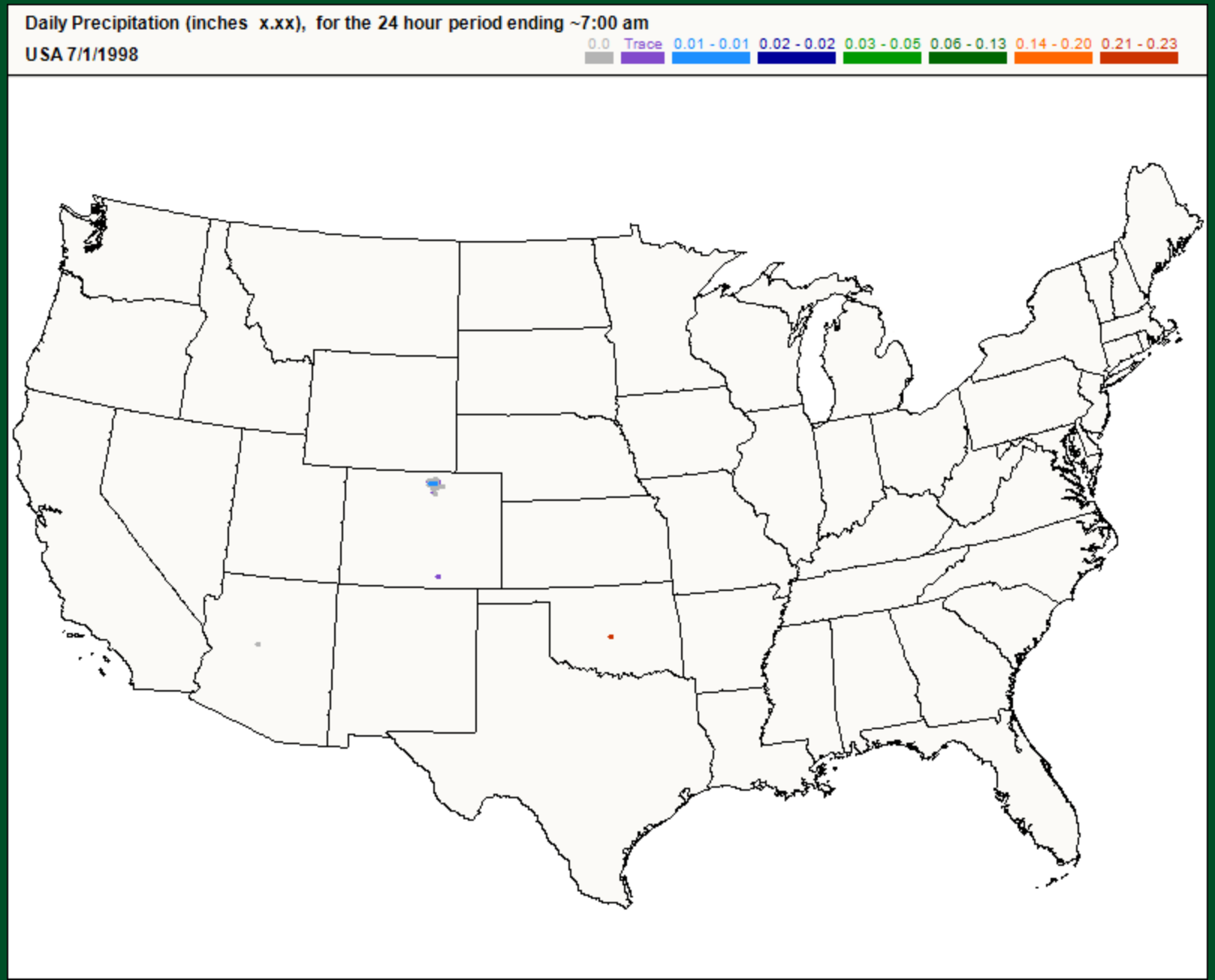


Monthly Prcp Totals Chart | Accumulated Prcp Chart | Daily Prcp Chart

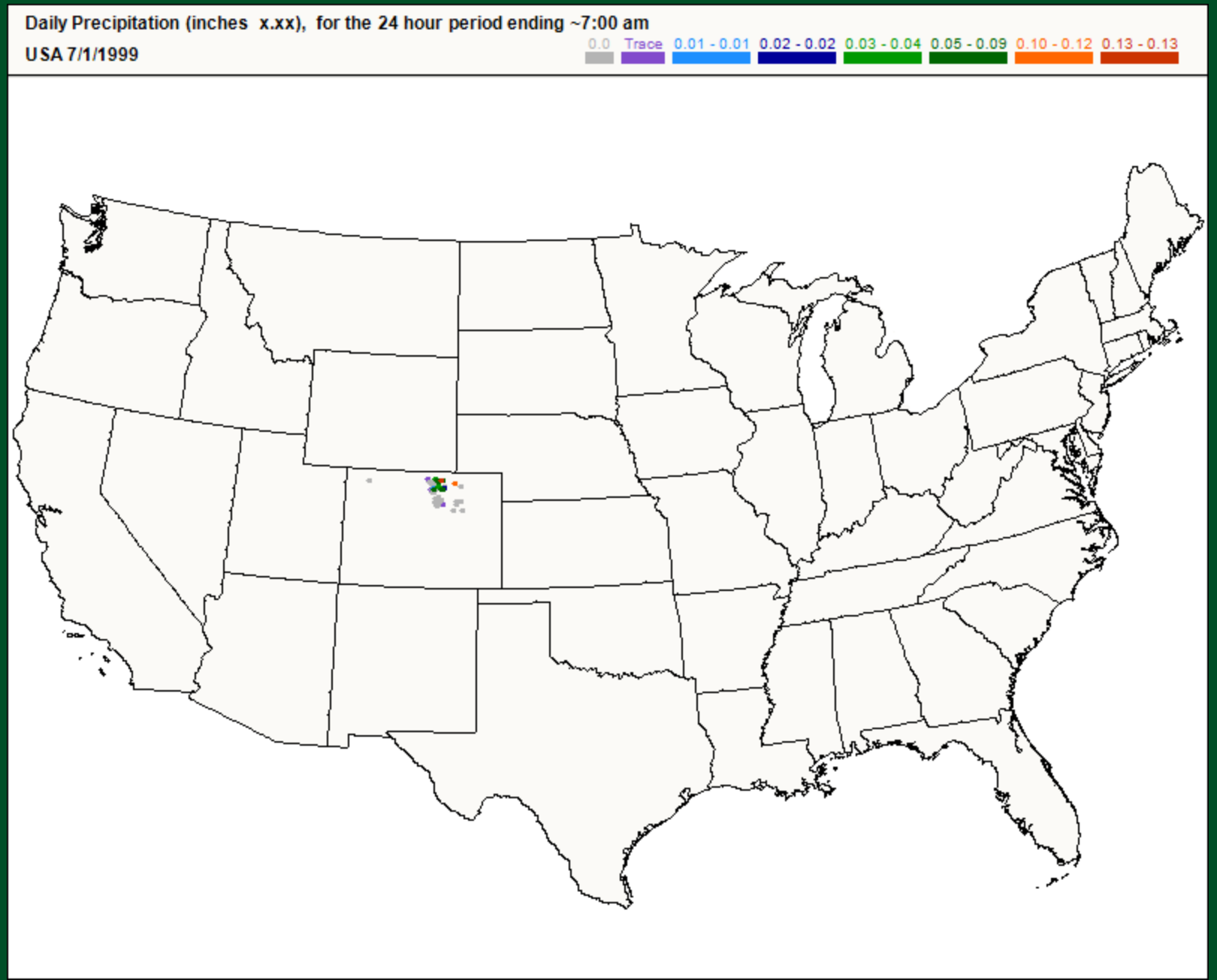


Growth in the Network

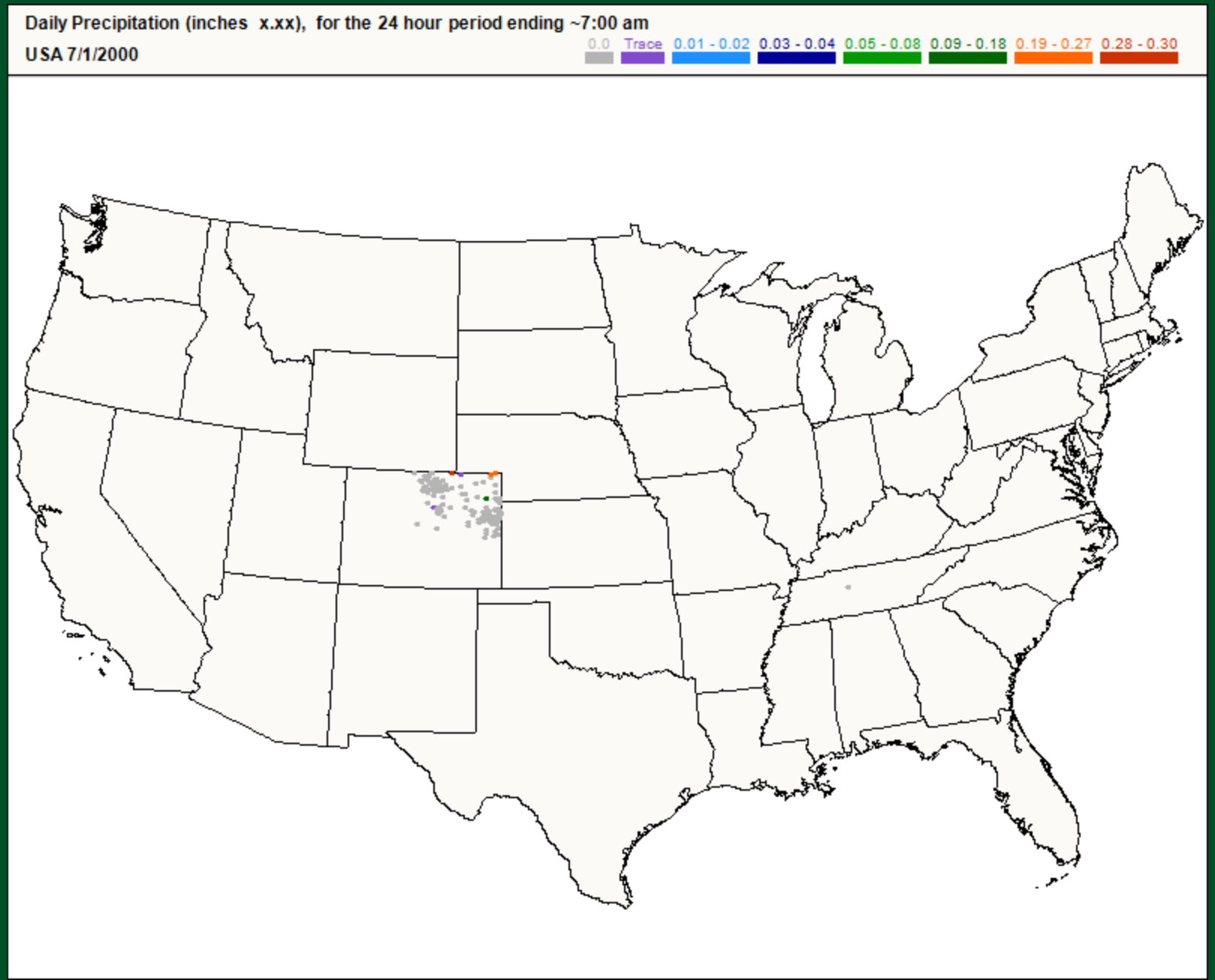
Daily Precipitation Observations for July 1st 1998



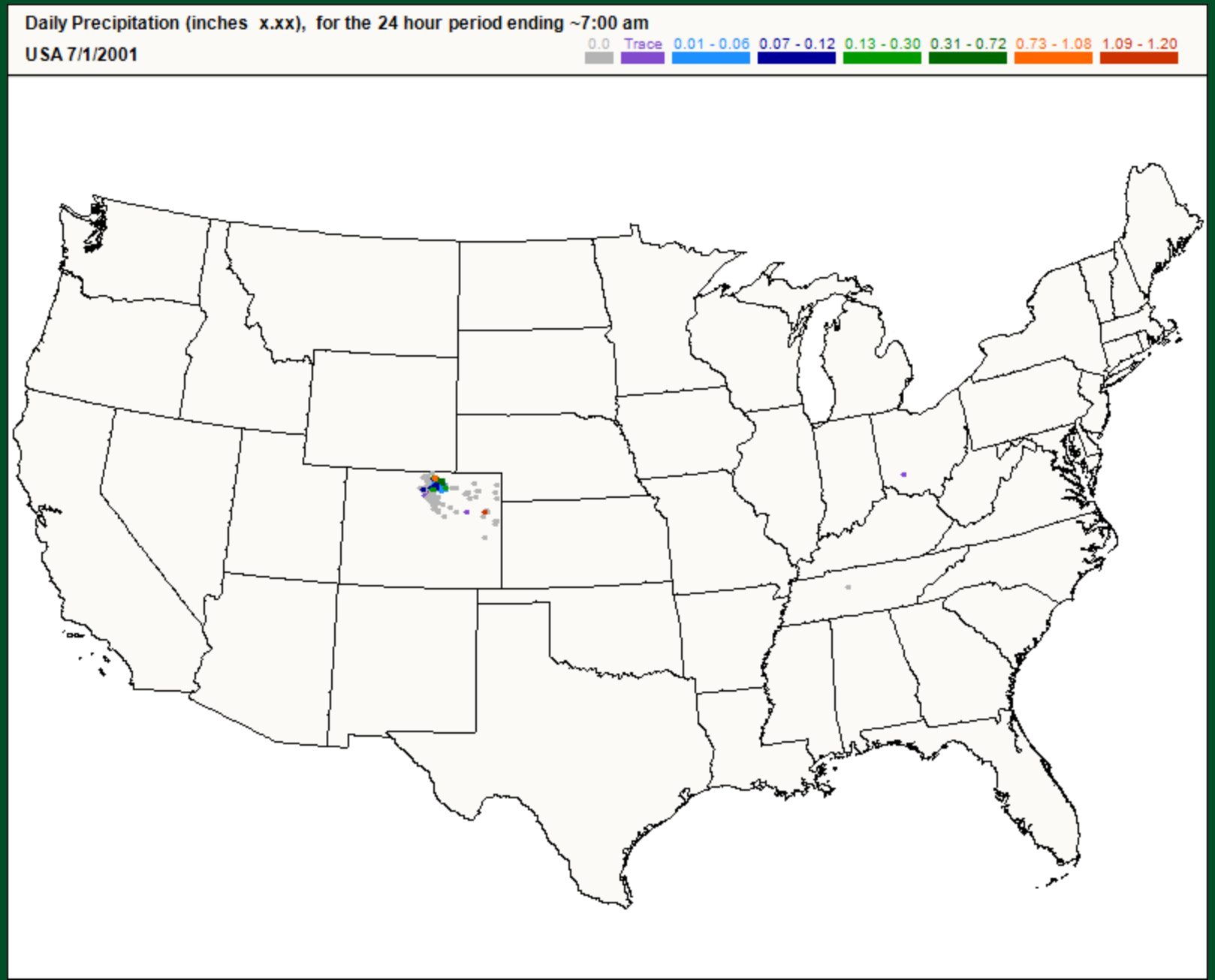
Daily Precipitation Observations for July 1st 1999



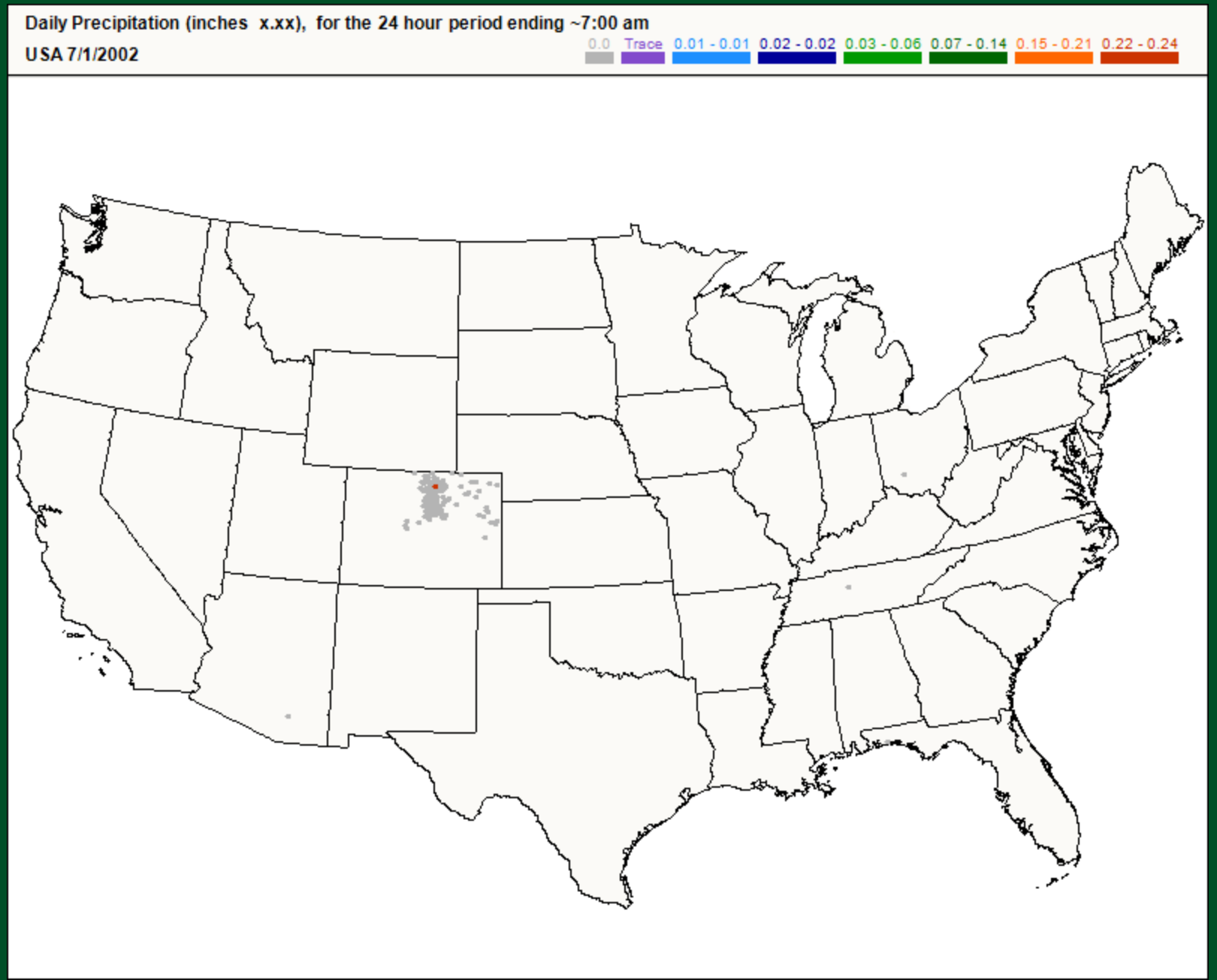
Daily Precipitation Observations for July 1st 2000



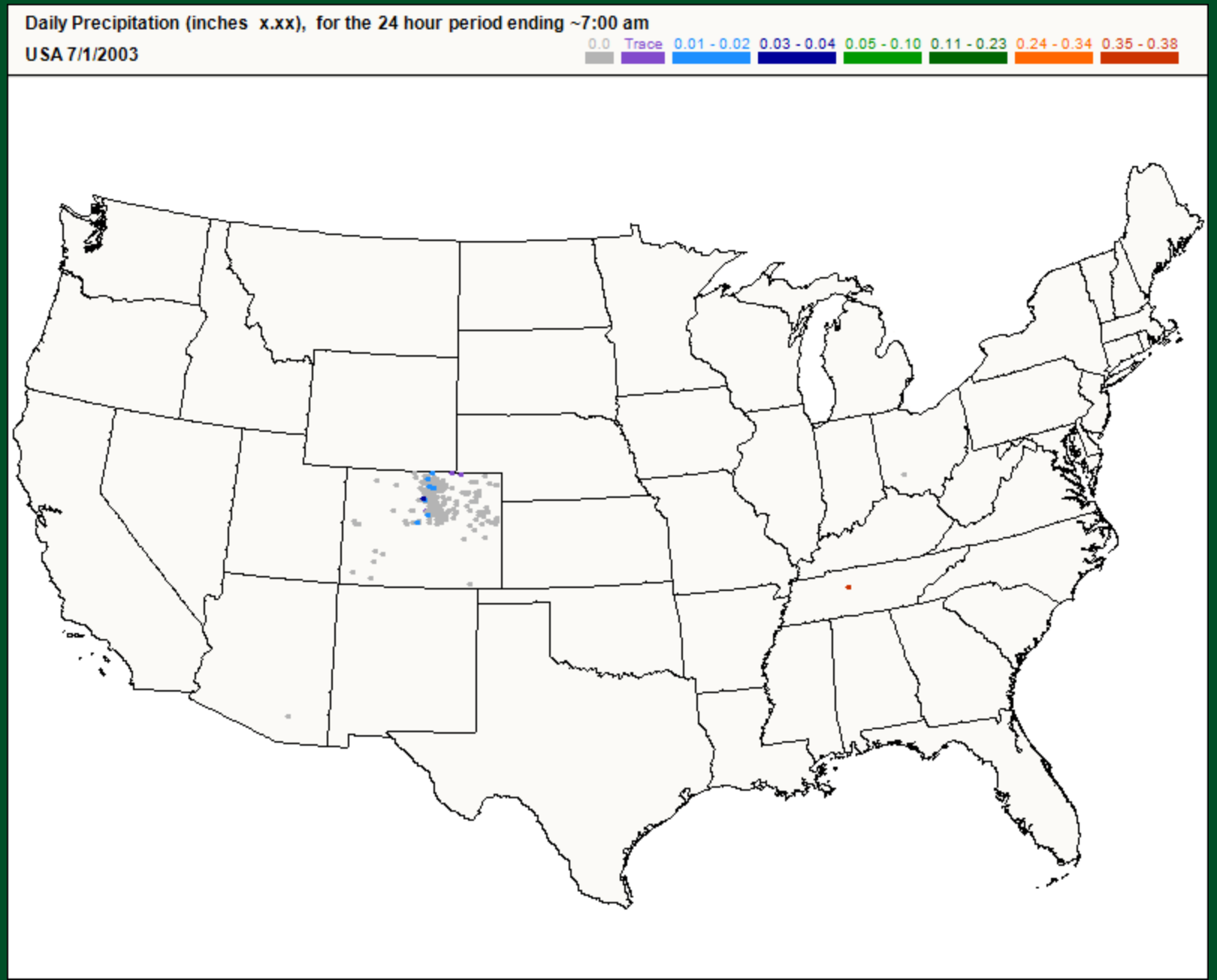
Daily Precipitation Observations for July 1st 2001



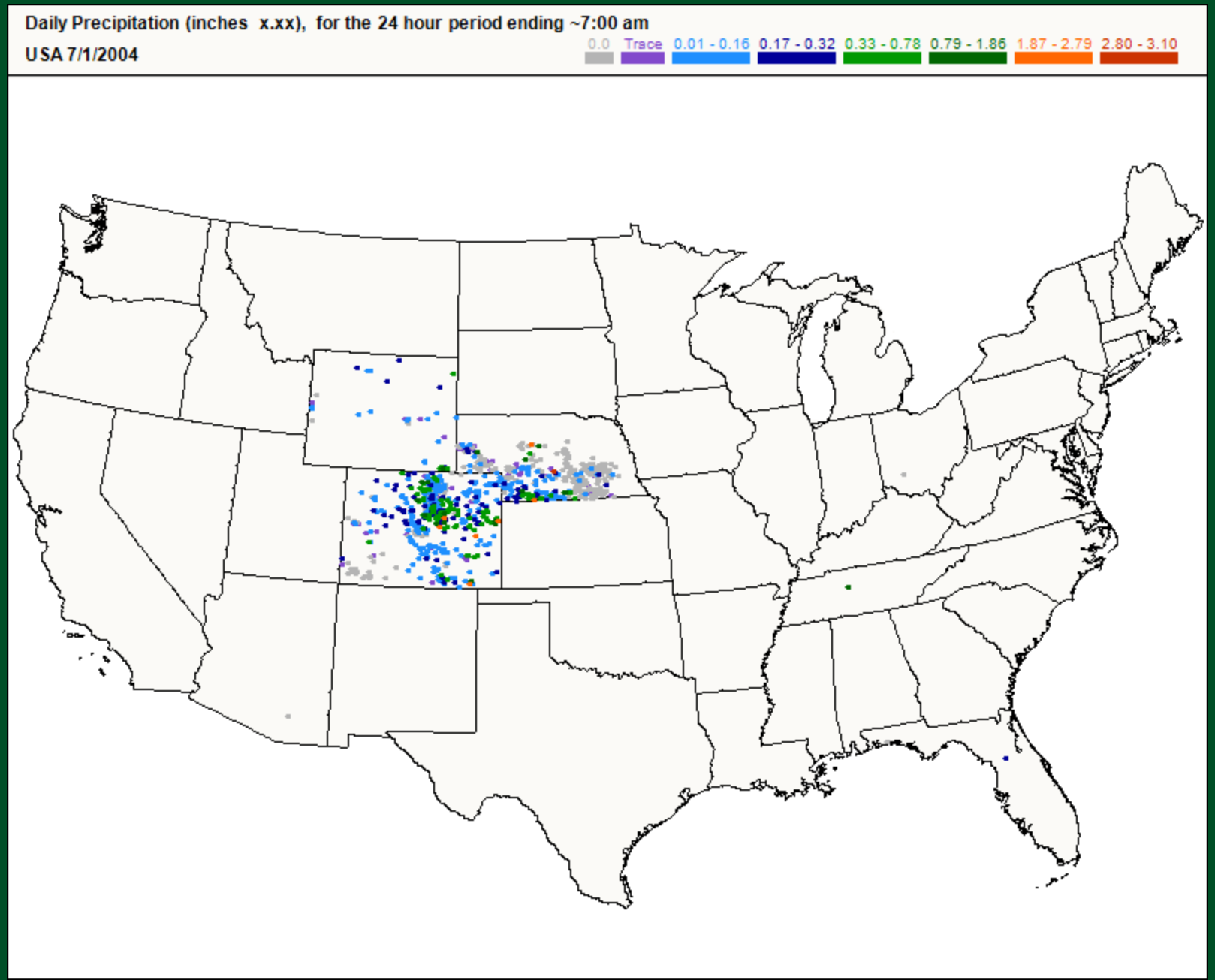
Daily Precipitation Observations for July 1st 2002



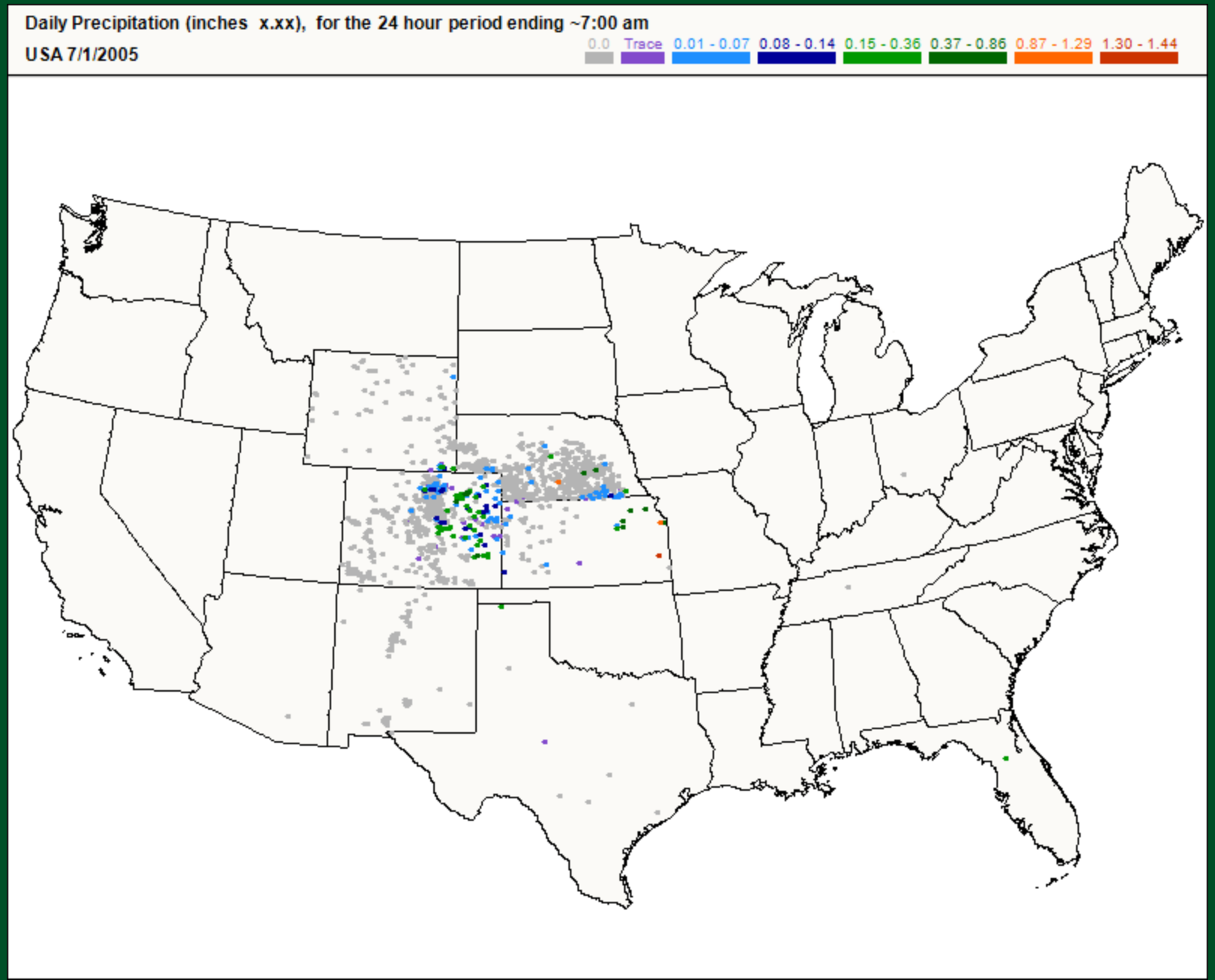
Daily Precipitation Observations for July 1st 2003



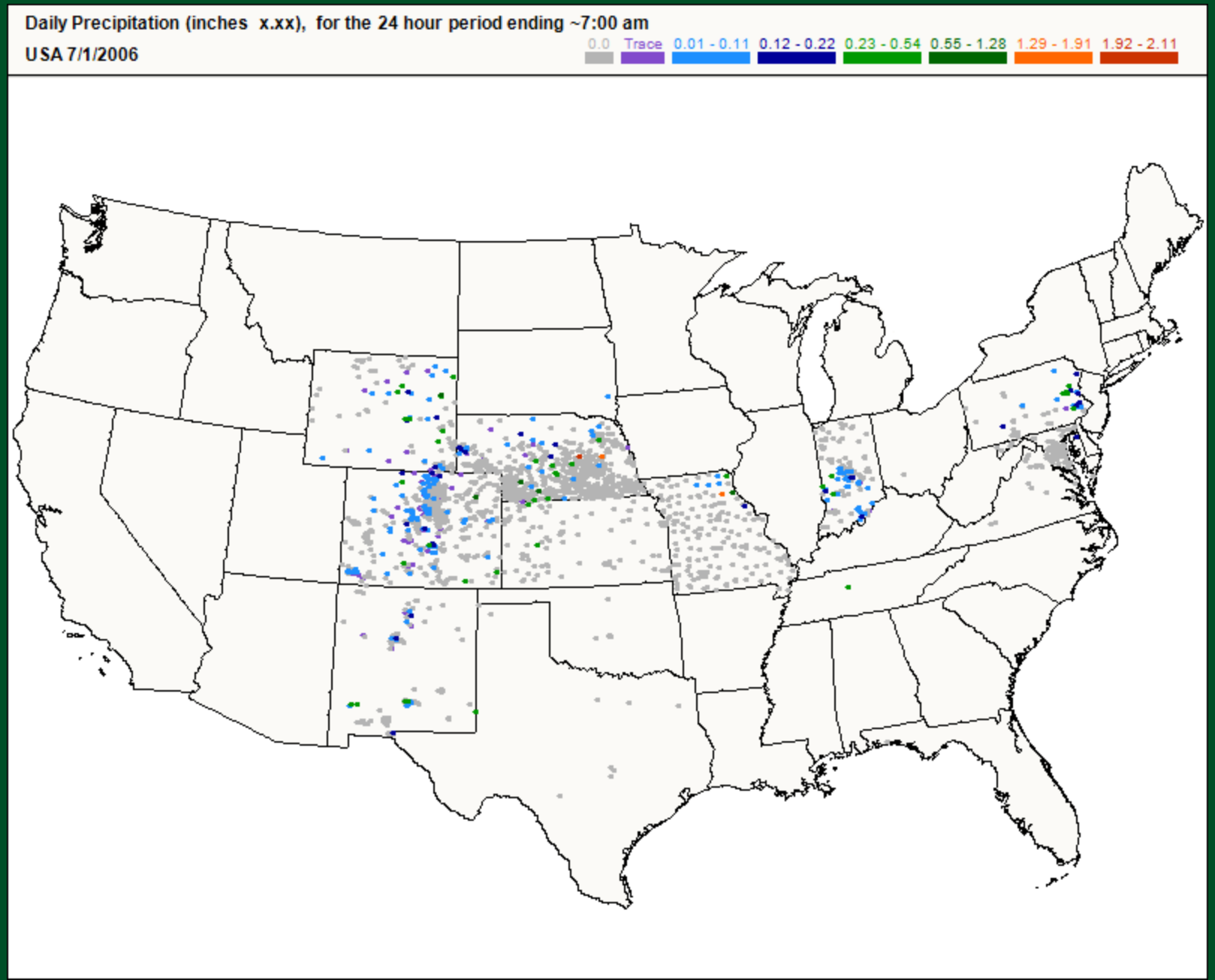
Daily Precipitation Observations for July 1st 2004



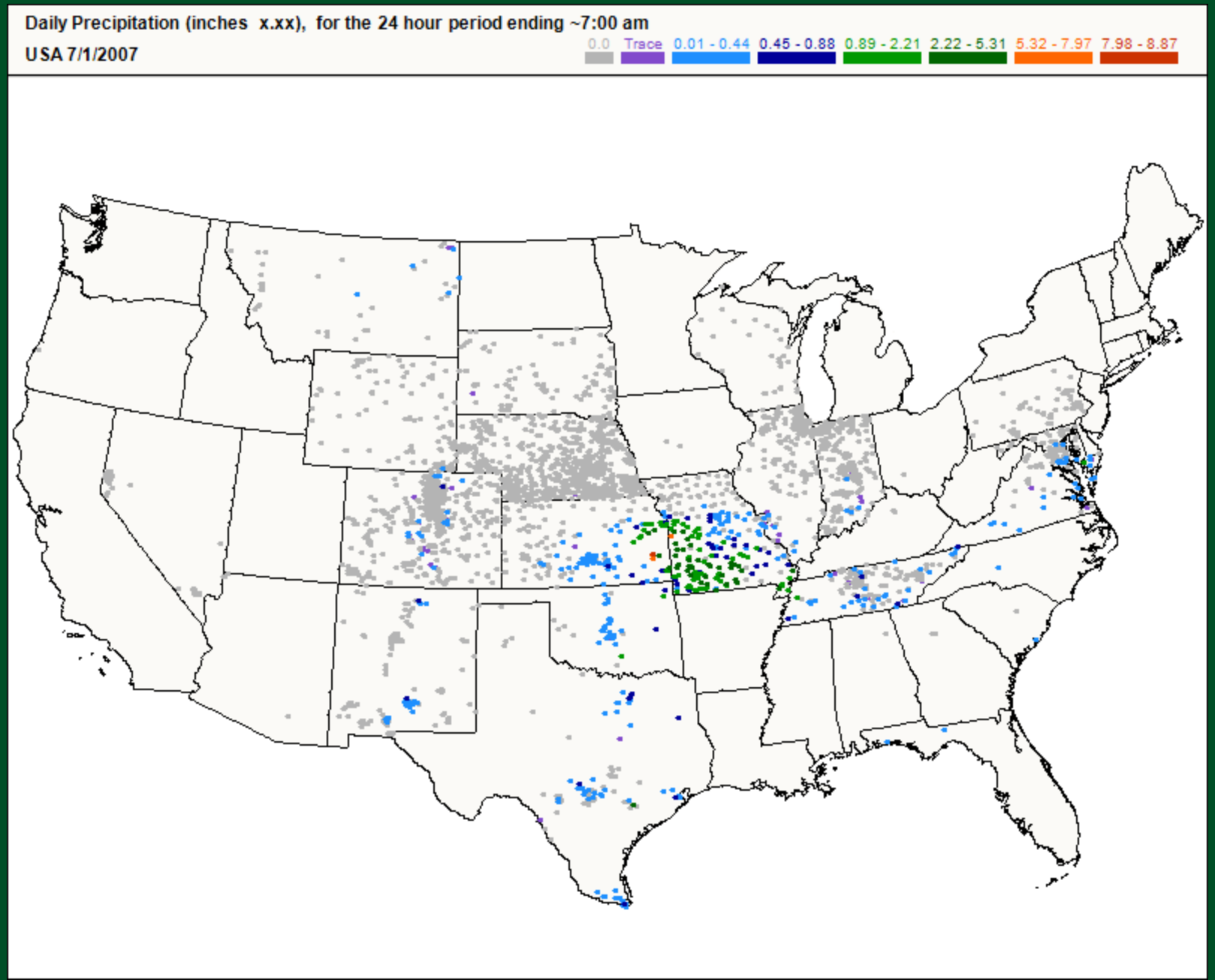
Daily Precipitation Observations for July 1st 2005



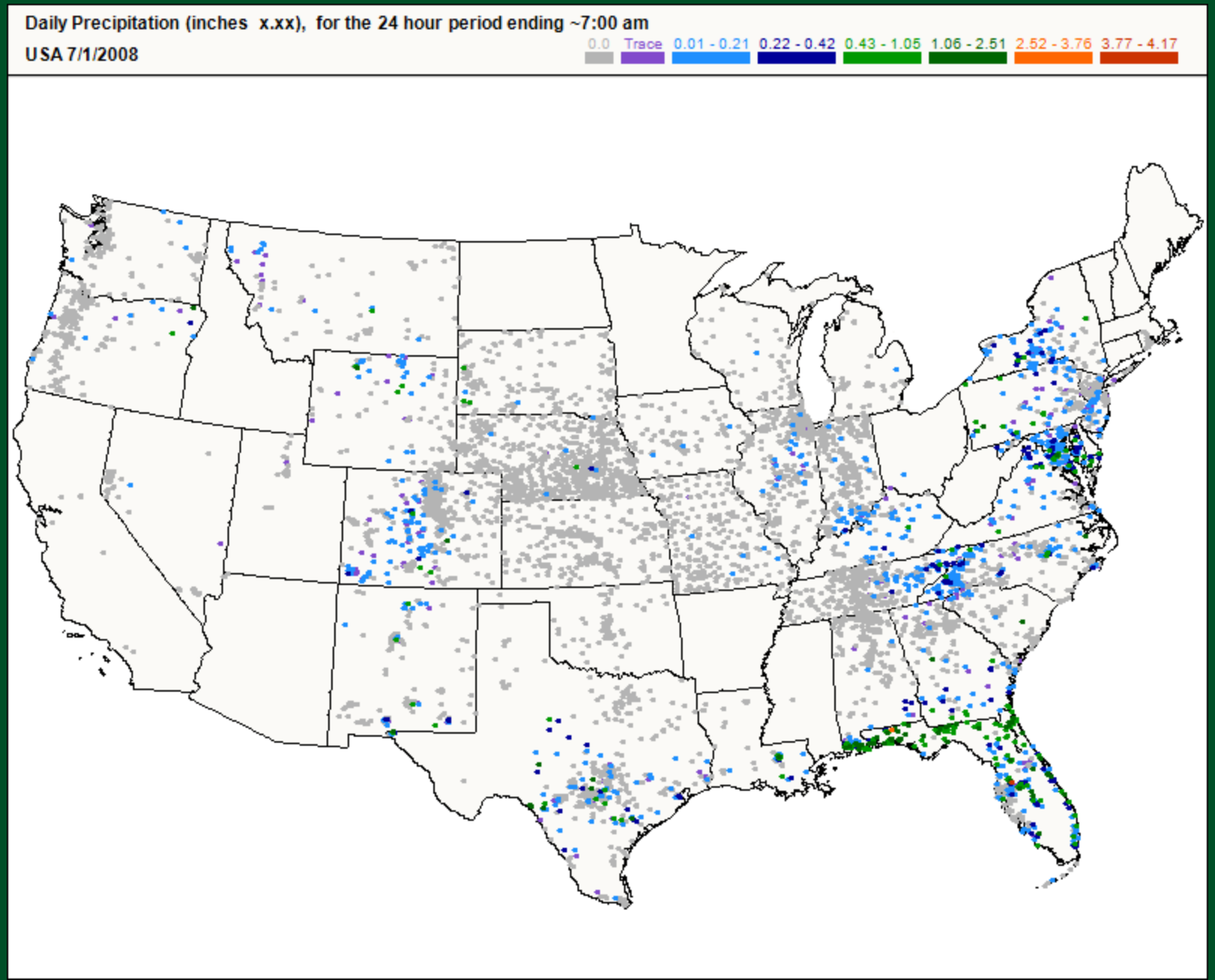
Daily Precipitation Observations for July 1st 2006



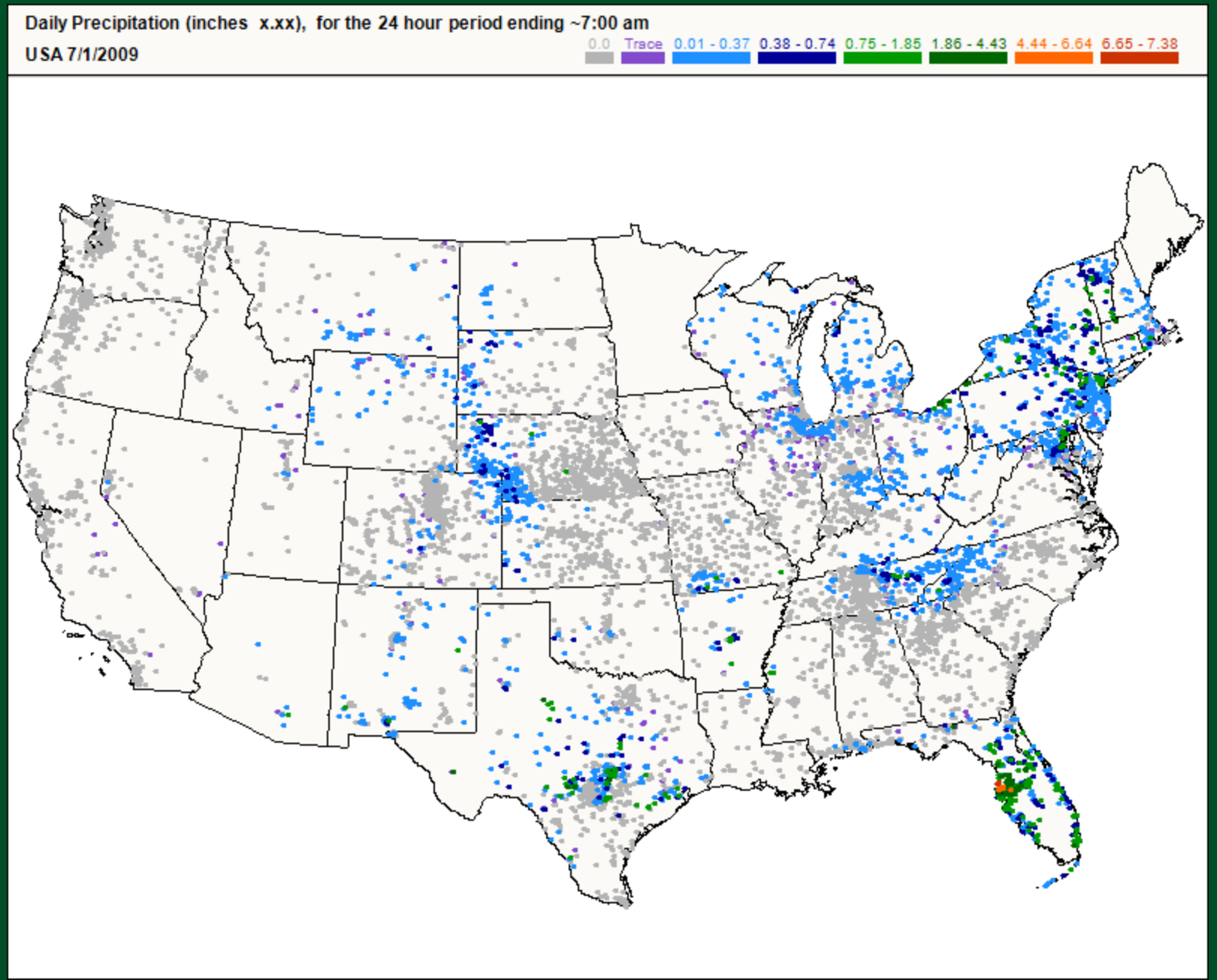
Daily Precipitation Observations for July 1st 2007



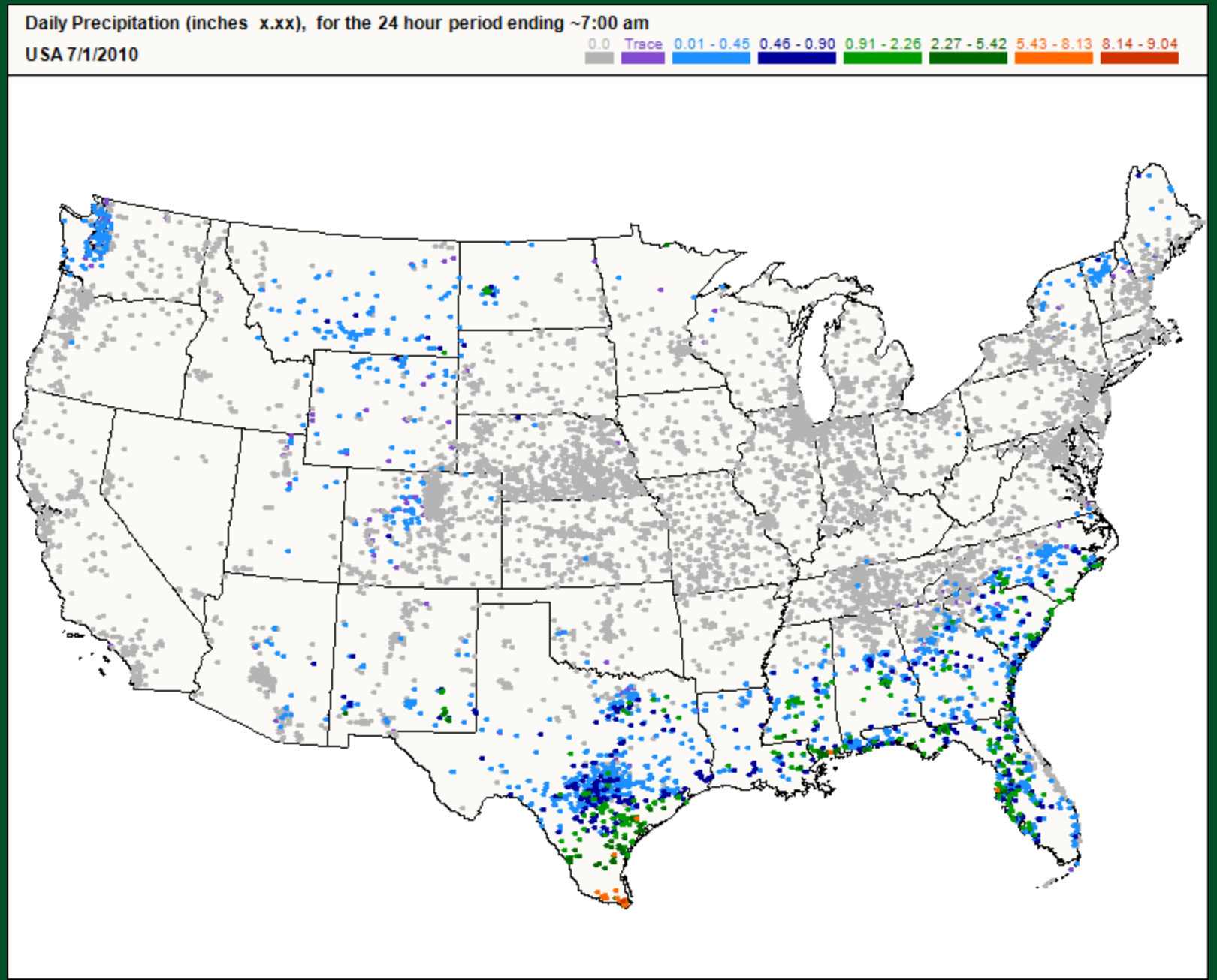
Daily Precipitation Observations for July 1st 2008



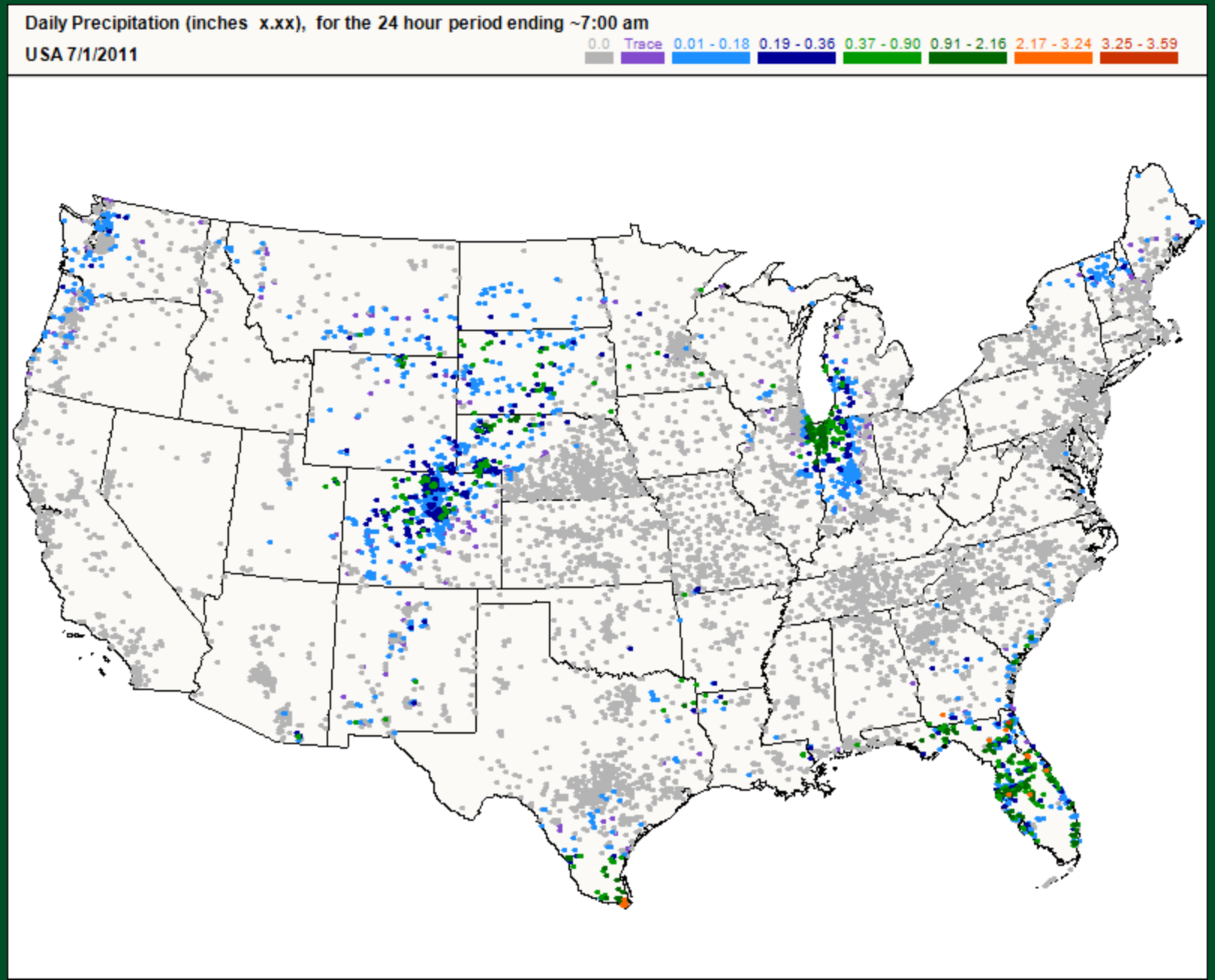
Daily Precipitation Observations for July 1st 2009



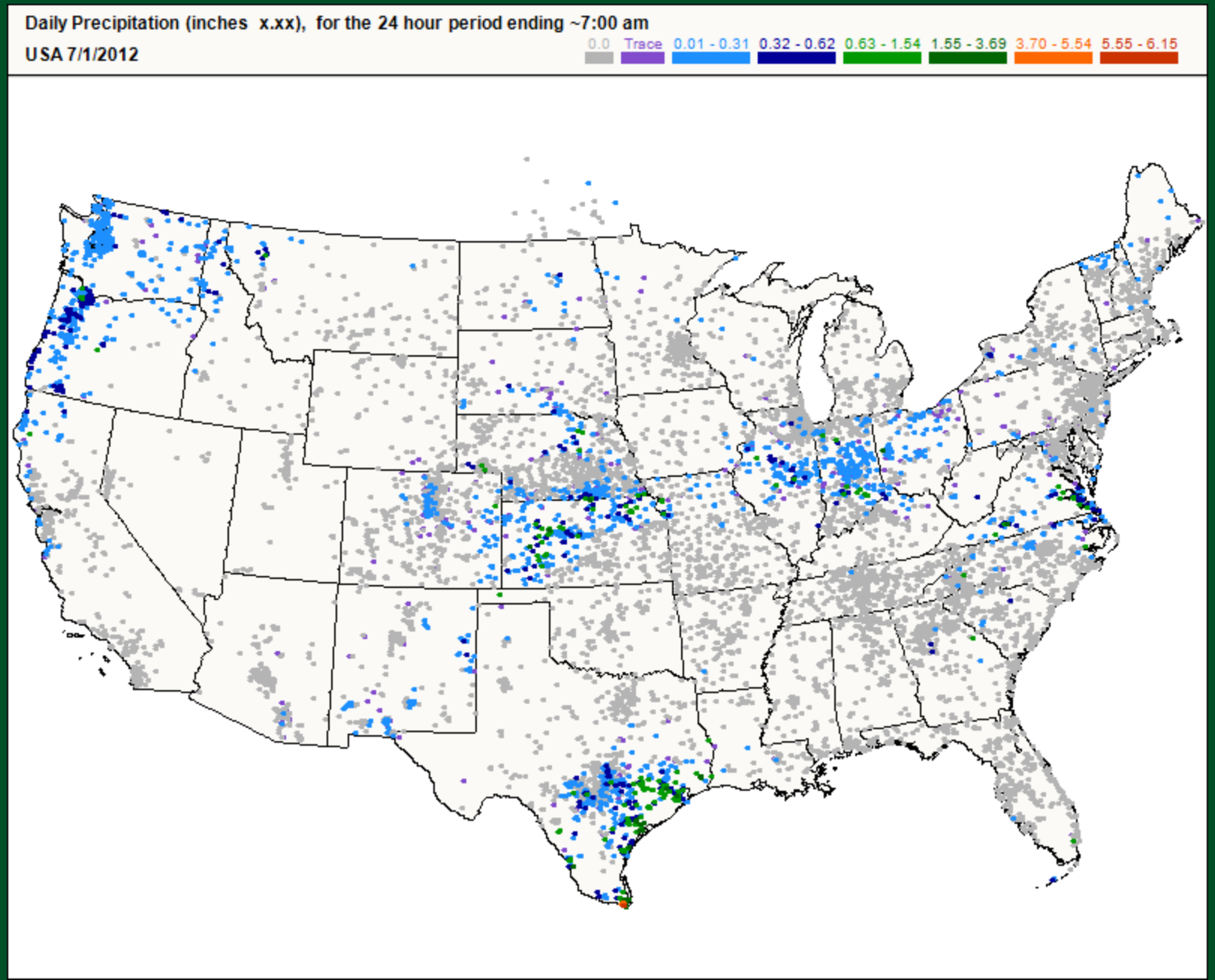
Daily Precipitation Observations for July 1st 2010



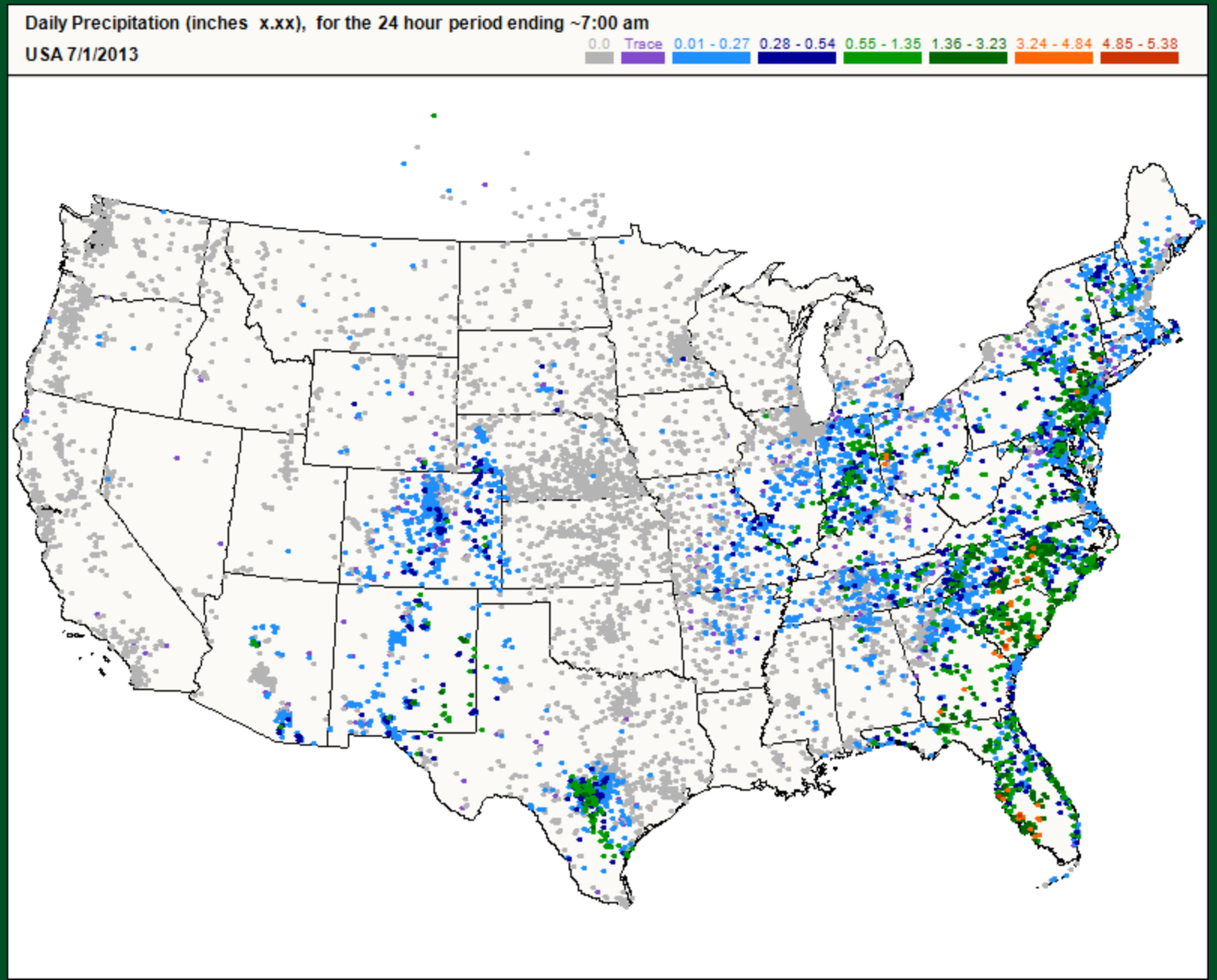
Daily Precipitation Observations for July 1st 2011



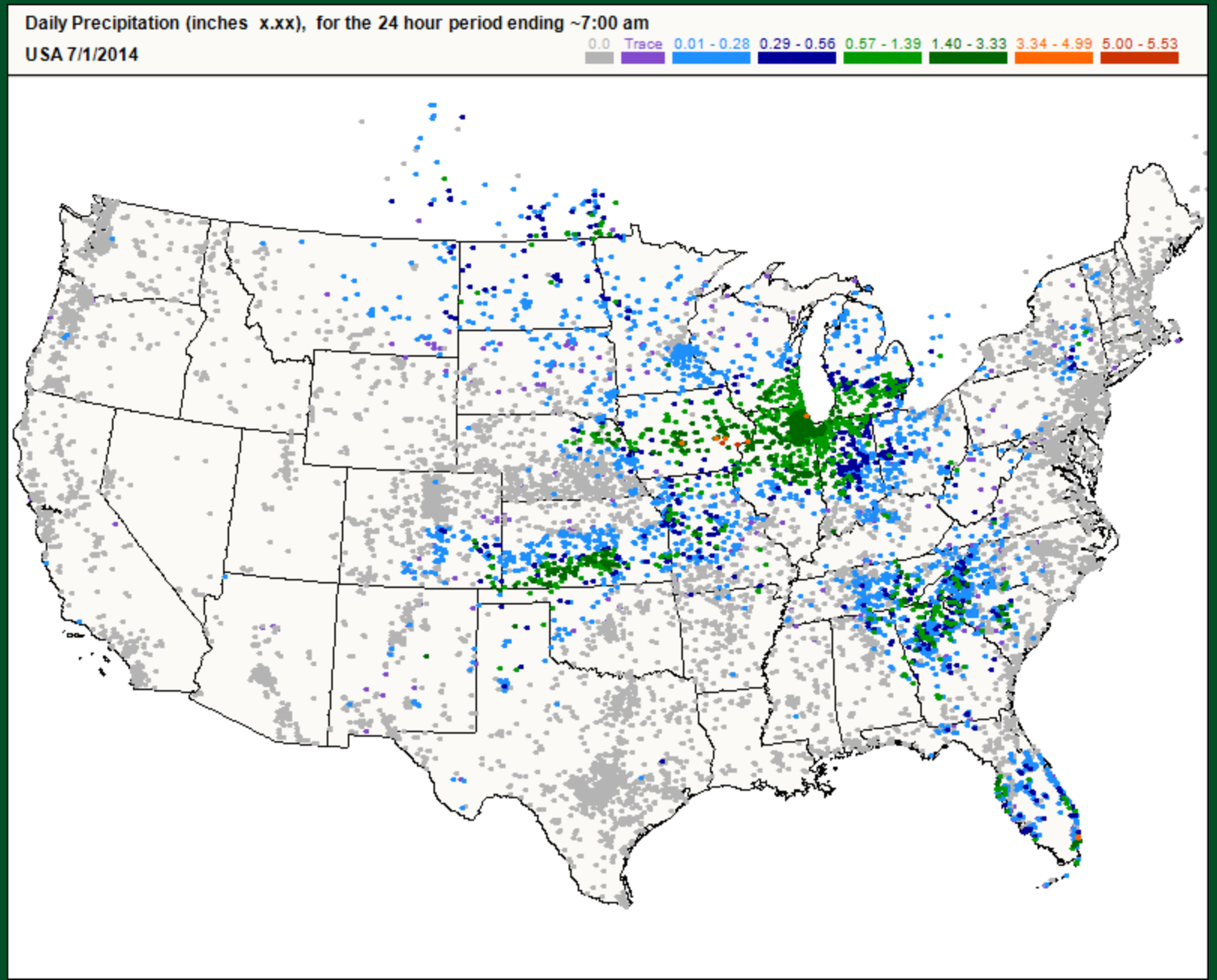
Daily Precipitation Observations for July 1st 2012



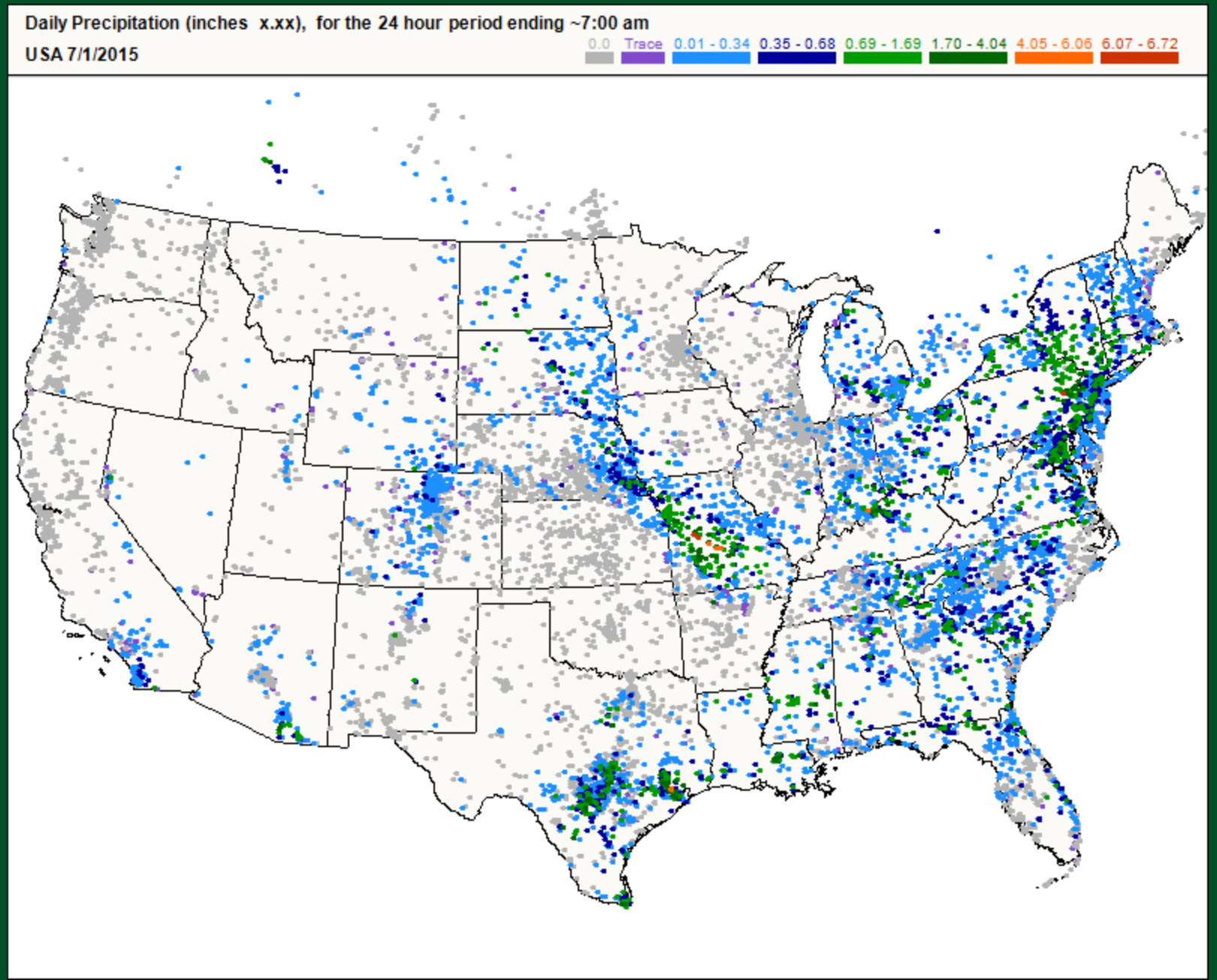
Daily Precipitation Observations for July 1st 2013



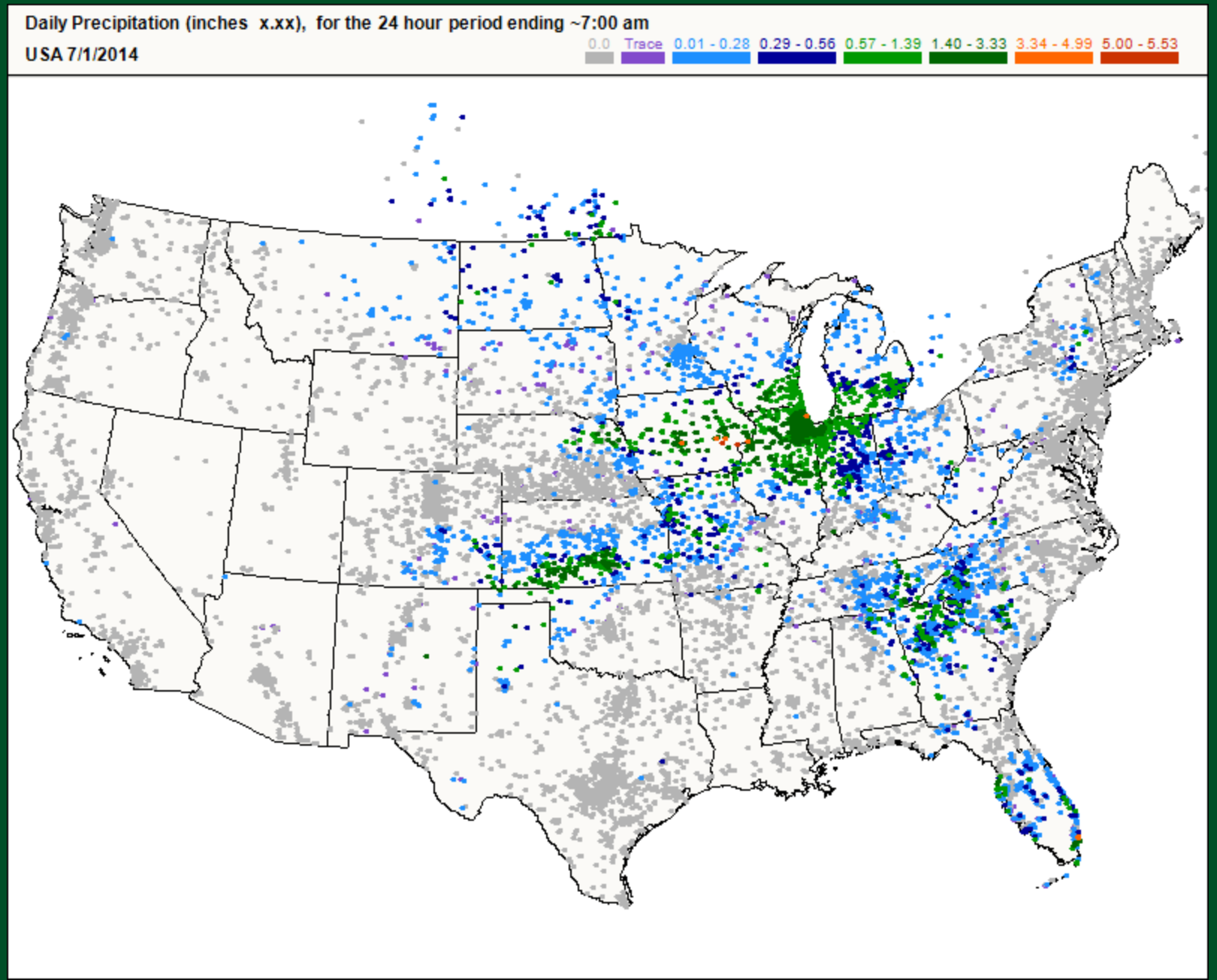
Daily Precipitation Observations for July 1st 2014



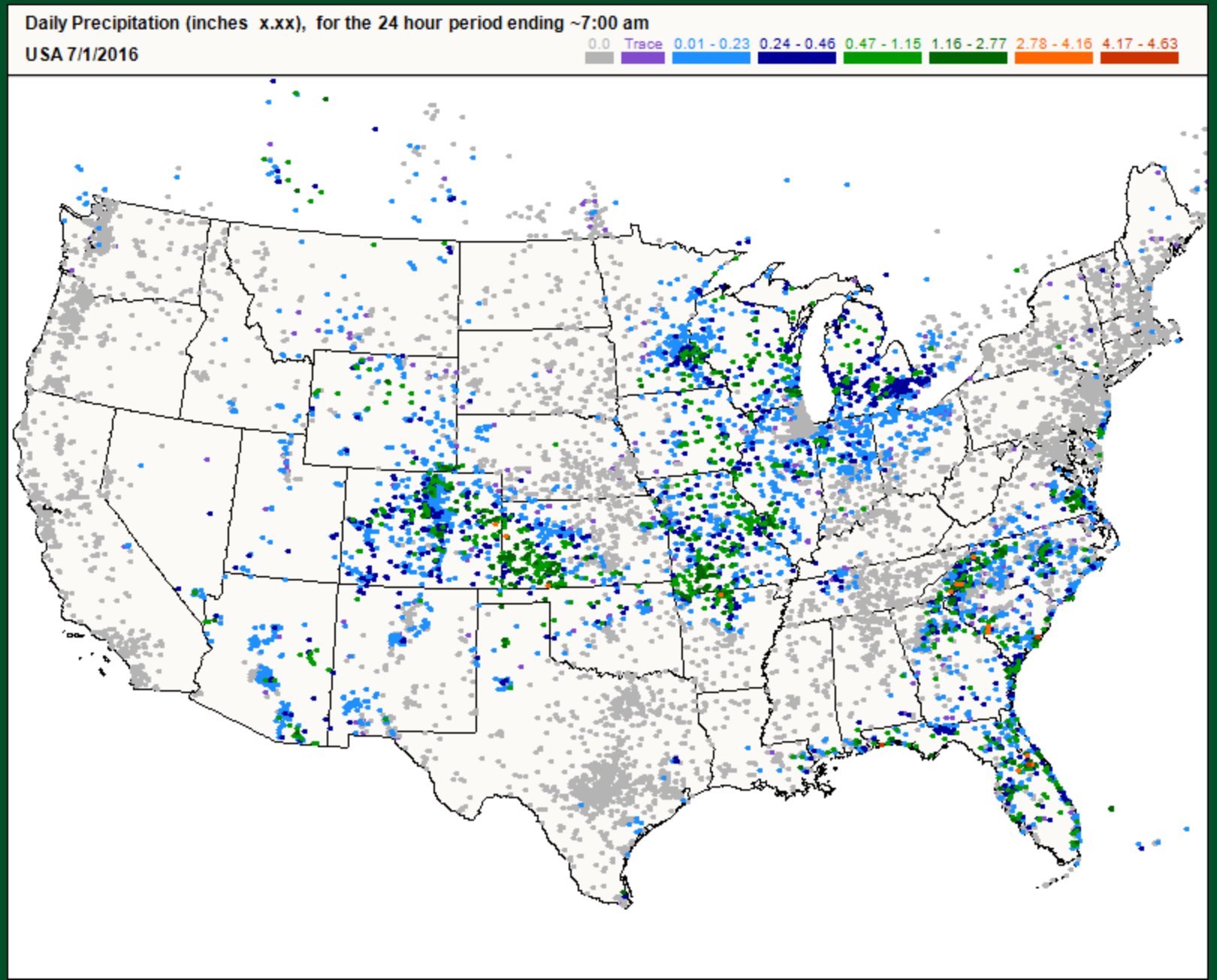
Daily Precipitation Observations for July 1st 2015



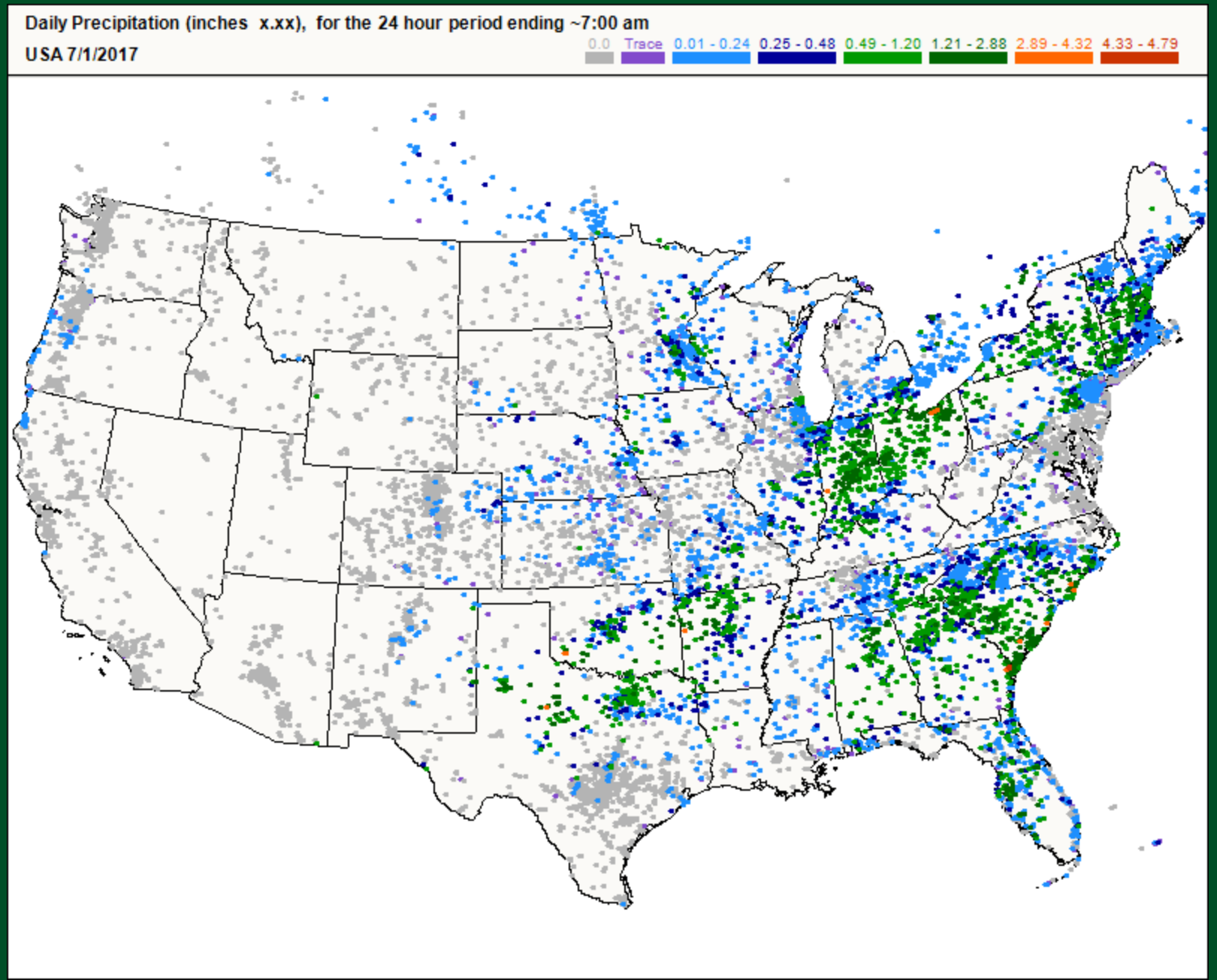
Daily Precipitation Observations for July 1st 2014



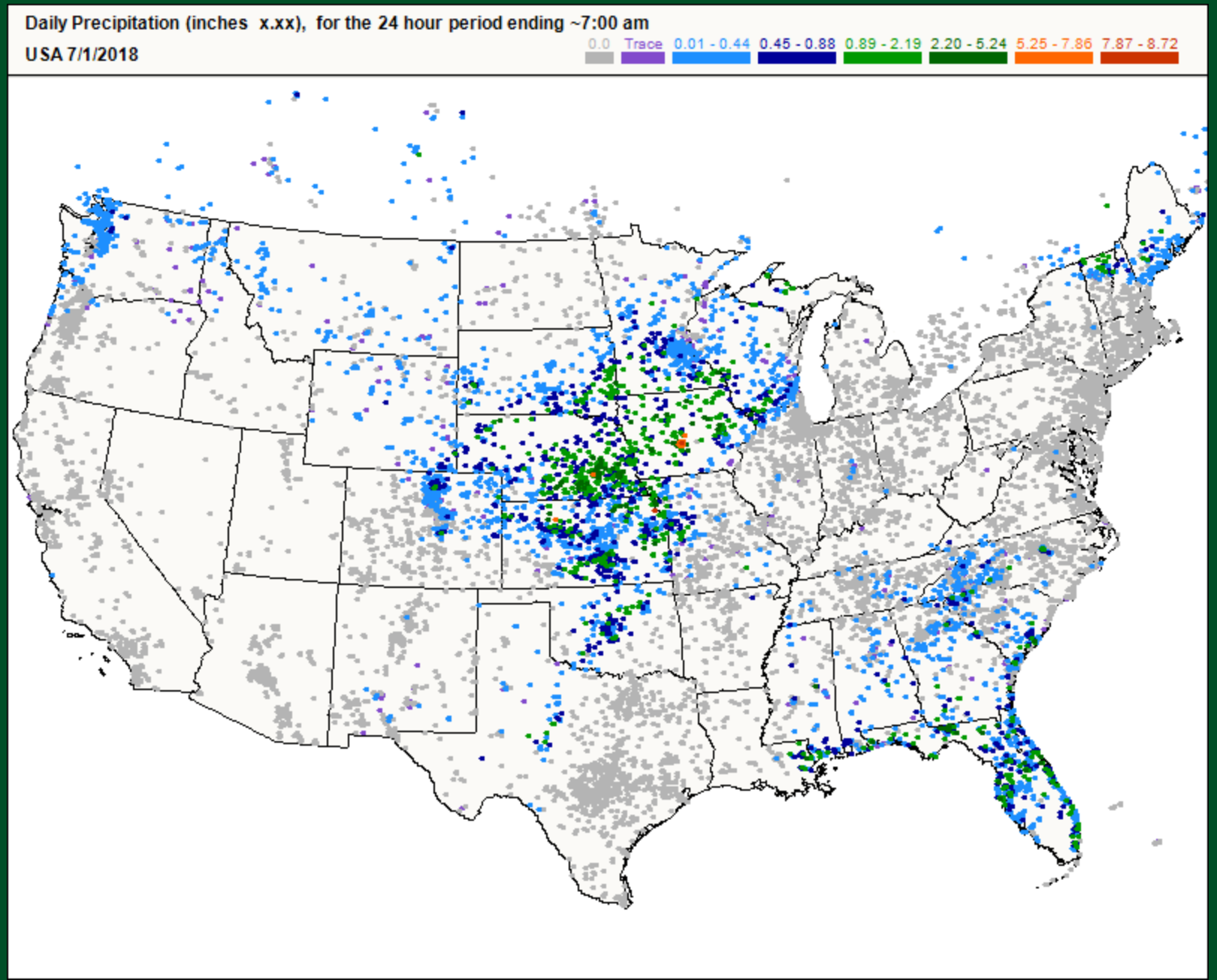
Daily Precipitation Observations for July 1st 2016

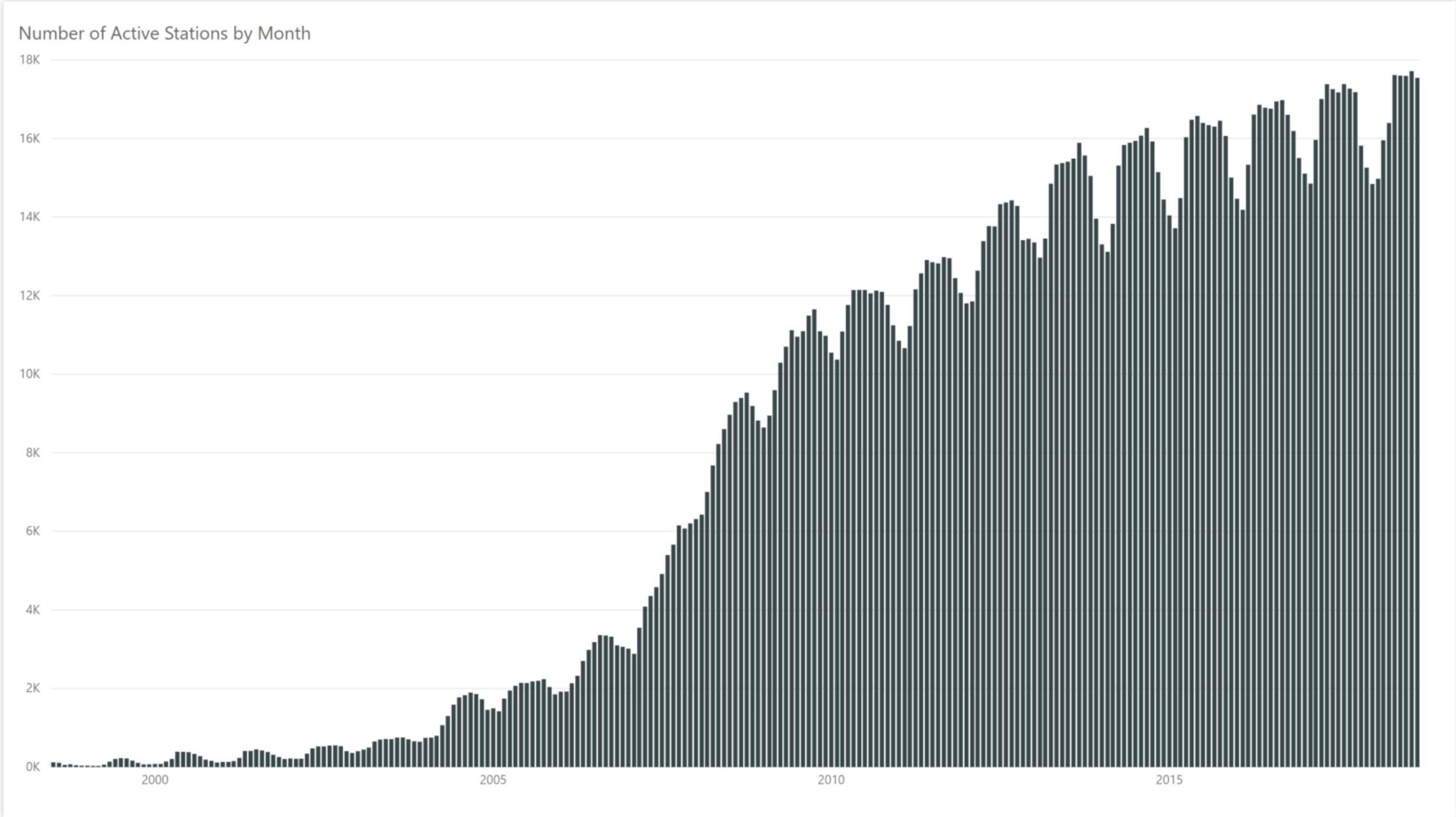


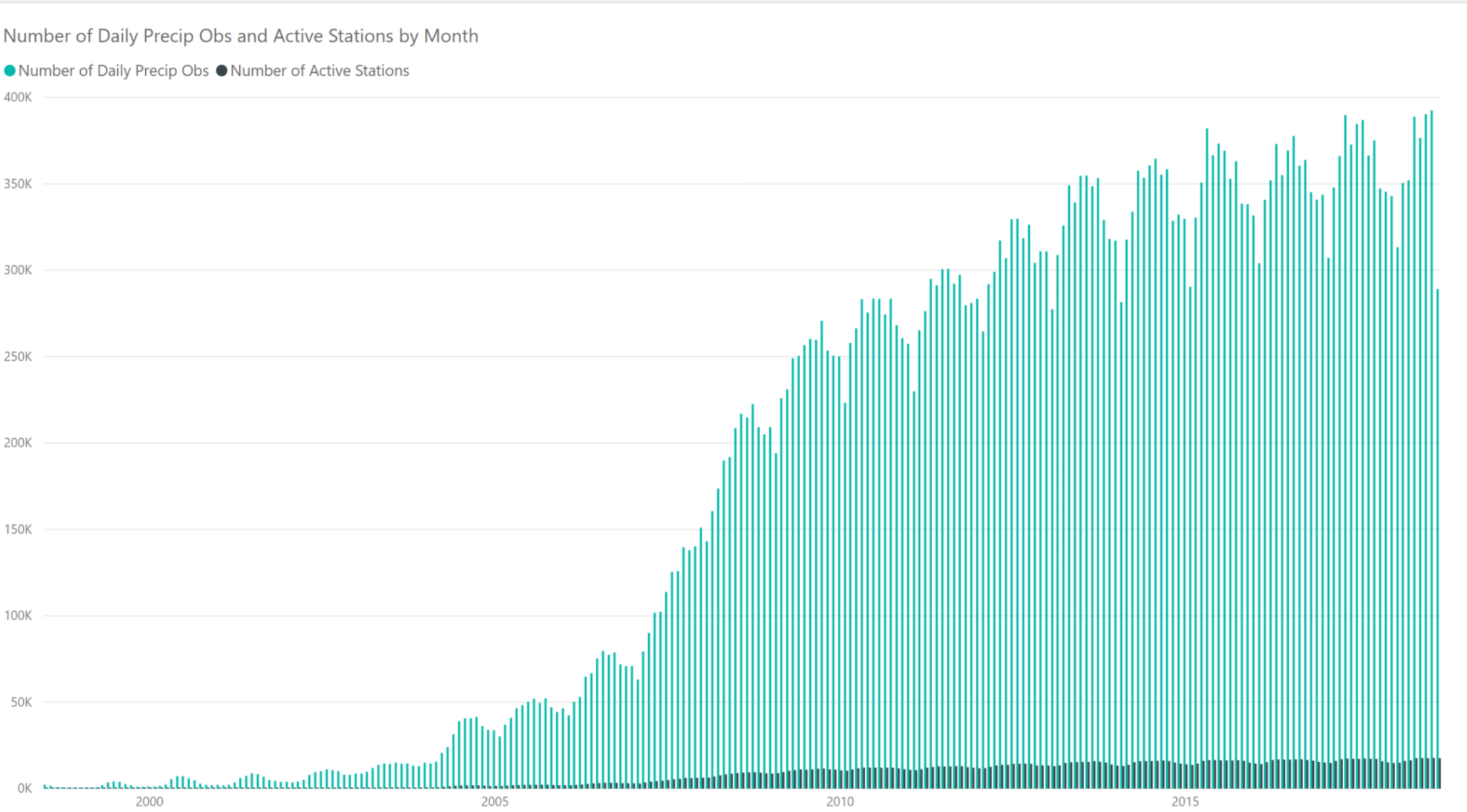
Daily Precipitation Observations for July 1st 2017

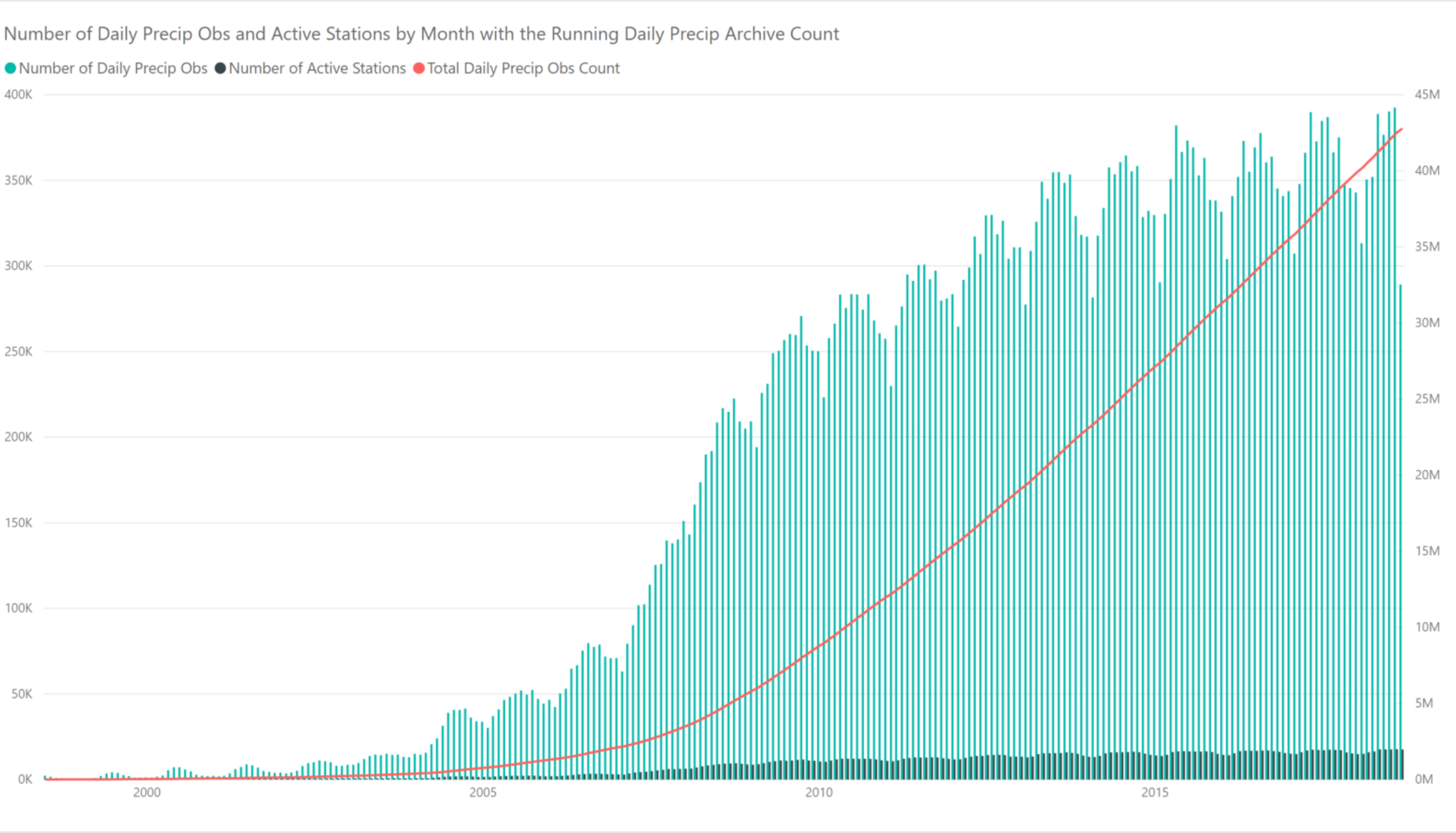


Daily Precipitation Observations for July 1st 2018




Number of Active Stations by Month
18K
16K
14K
12K
10K
8K
6K
4K
2K
0K
2000
2005
2010
2015


Number of Daily Precip Obs and Active Stations by Month
Number of Daily Precip Obs
Number of Active Stations
400K
350K
300K
250K
200K
150K
100K
50K
0K
2000
2005
2010
2015


Number of Daily Precip Obs and Active Stations by Month with the Running Daily Precip Archive Count
Number of Daily Precip Obs
Number of Active Stations
Total Daily Precip Obs Count
400K
350K
300K
250K
200K
150K
100K
50K
0K
45M
40M
35M
30M
25M
20M
15M
10M
5M
0M
2000
2005
2010
2015

Condition Monitoring

My Data Entry : Condition Monitoring Report Form

Condition Monitoring Report Form Submit Data Reset

Station Number : CO-LR-607

Station Name : Fort Collins 3.8 SSW

Condition monitoring reports are submitted on a regular (weekly, biweekly, monthly) basis to share information about the effects of local precipitation on the environment and society. By submitting reports on a regular basis, you create a baseline to see change through time, such as seasonal differences or changes caused by more or less precipitation. Please refer to the Condition Monitoring training slide show for more information.

* *indicates required field*

Report Date *

9/25/2018

Condition Scale Bar More information on the scale bar Clear Scale Bar

Severely Dry	Moderately Dry	Mildly Dry	Near Normal	Mildly Wet	Moderately Wet	Severely Wet
○	○	○	○	○	○	○

Description

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

Report Categories

Please check at least one report category. If you check a category, please provide supporting information in the description. More information on condition monitoring categories.

- ☐ General Awareness
- ☐ Agriculture
- ☐ Business & Industry
- ☐ Energy
- ☐ Fire
- ☐ Plants & Wildlife
- ☐ Relief, Response & Restrictions
- ☐ Society & Public Health
- ☐ Tourism & Recreation
- ☐ Water Supply & Quality

Submit Data Reset

Condition Monitoring Summary Report

Home CM Maps CM Reports

Filter Condition Monitoring Data

By Location:

United States | North Carolina | Entire State

By Station Field:

Station Number or Name ◉ Station Number ○ Station Name

About the summary

The summary charts display information provided in condition monitoring reports to document changing on-the-ground conditions that are affected by precipitation, or a lack thereof. The data in the charts represent observers' scale bar and condition monitoring category selections.

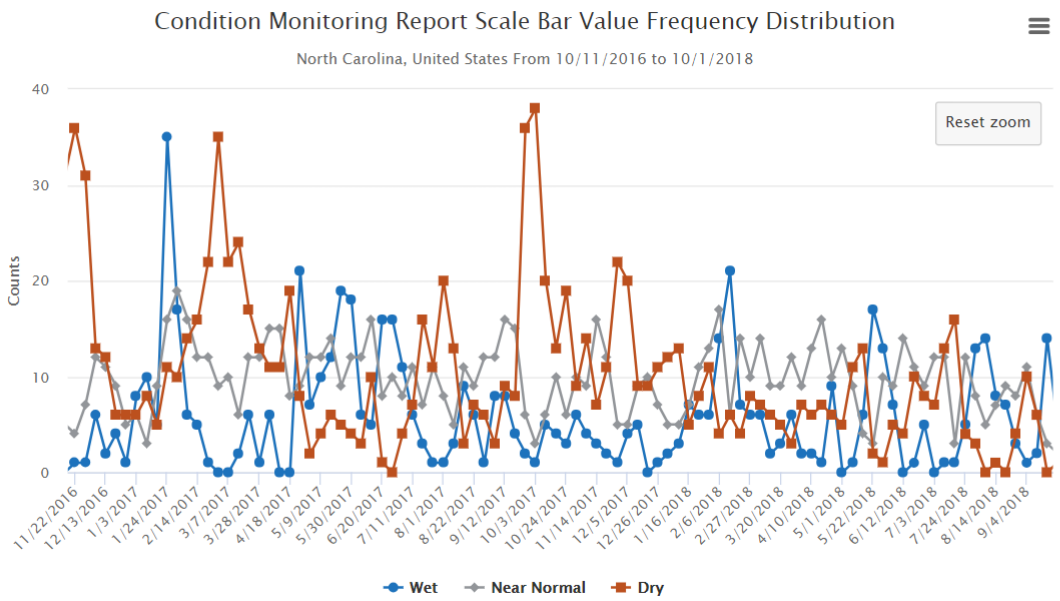
Reset Filter Generate Report

Current Summary Report Settings

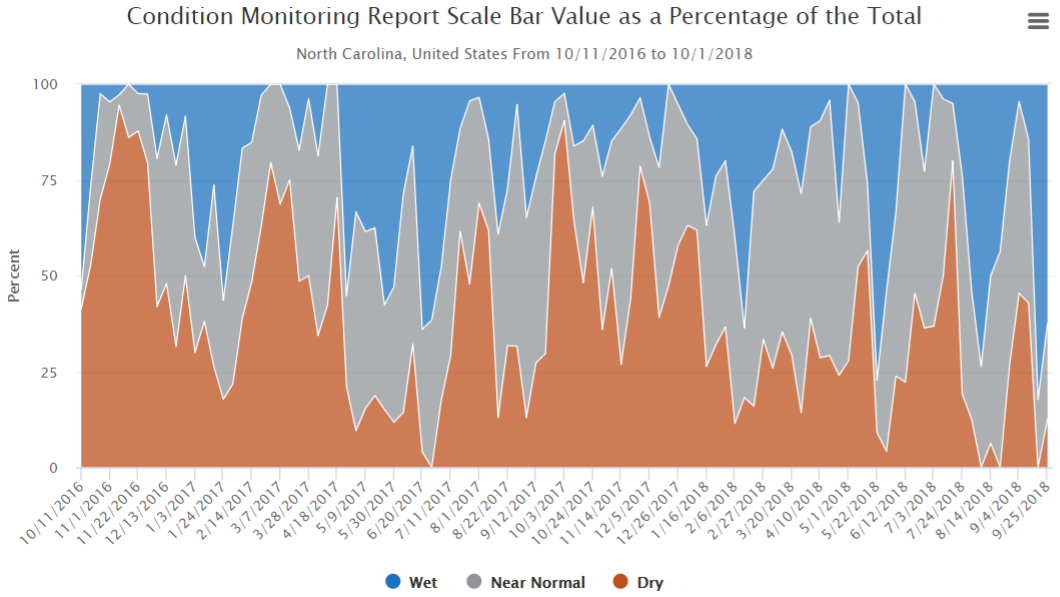
Location: North Carolina, United States

Station: Any Station

Period of Record: From the week starting on Oct 11, 2016 through the week ending on Oct 01, 2018



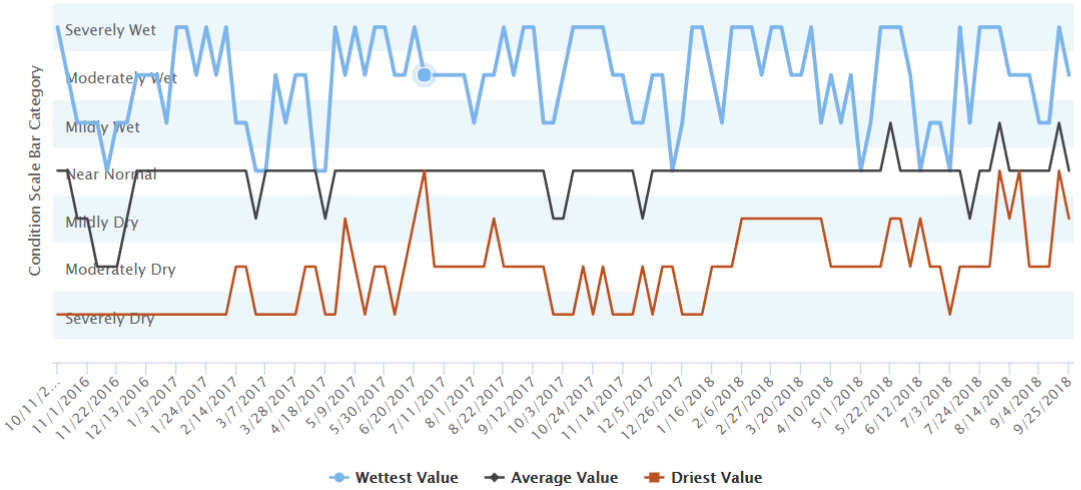
This chart displays observers' scale bar selections for each week. The chart can give the viewer an idea of how conditions might have changed from dry to wet, or wet to dry, for the selected geographic scale (i.e., nation, state, county, or individual station). The wet and dry values from the condition monitoring scale bar have been grouped in this chart. That is to say, all reports with scale bar selections of either mildly dry, moderately dry, or severely dry are represented by the "dry" category in this chart.



This chart displays observers' scale bar selections as a percentage of the total number of reports submitted for that week. For instance, if there were 10 reports submitted for a single state in a given week with 5 reports indicating dry conditions, 2 reports indicating wet conditions, and 3 reports indicating near normal conditions, the chart would display 50% dry, 20% wet, and 30% near normal values for that week. This chart can give the user a sense of change in conditions over time as observer selections change from wet to dry or dry to wet.

Weekly Condition Monitoring Scale Bar Values

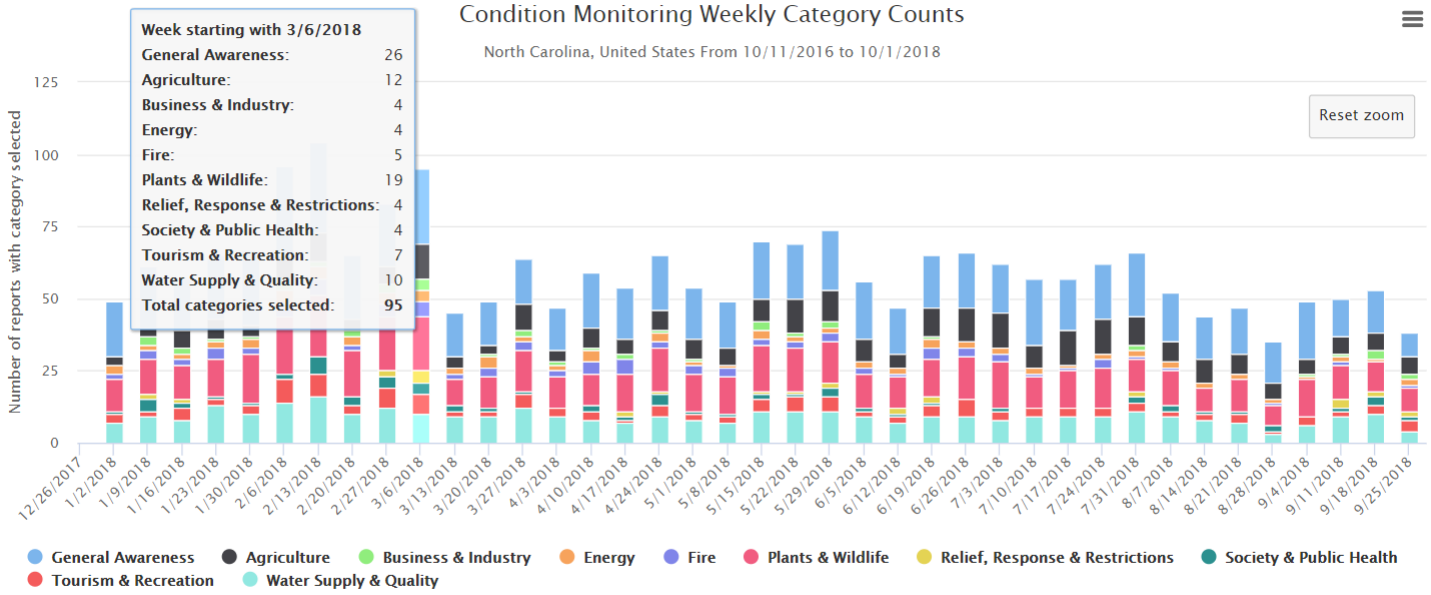
North Carolina, United States From 10/11/2016 to 10/1/2018



This chart shows the wettest and driest weekly scale bar selections for the chosen geographic scale (i.e., nation, state, county, or individual station). The Average Value graphed line helps visualize when scale bar selections are predominantly wet or predominantly dry.

Condition Monitoring Weekly Category Counts

North Carolina, United States From 10/11/2016 to 10/1/2018

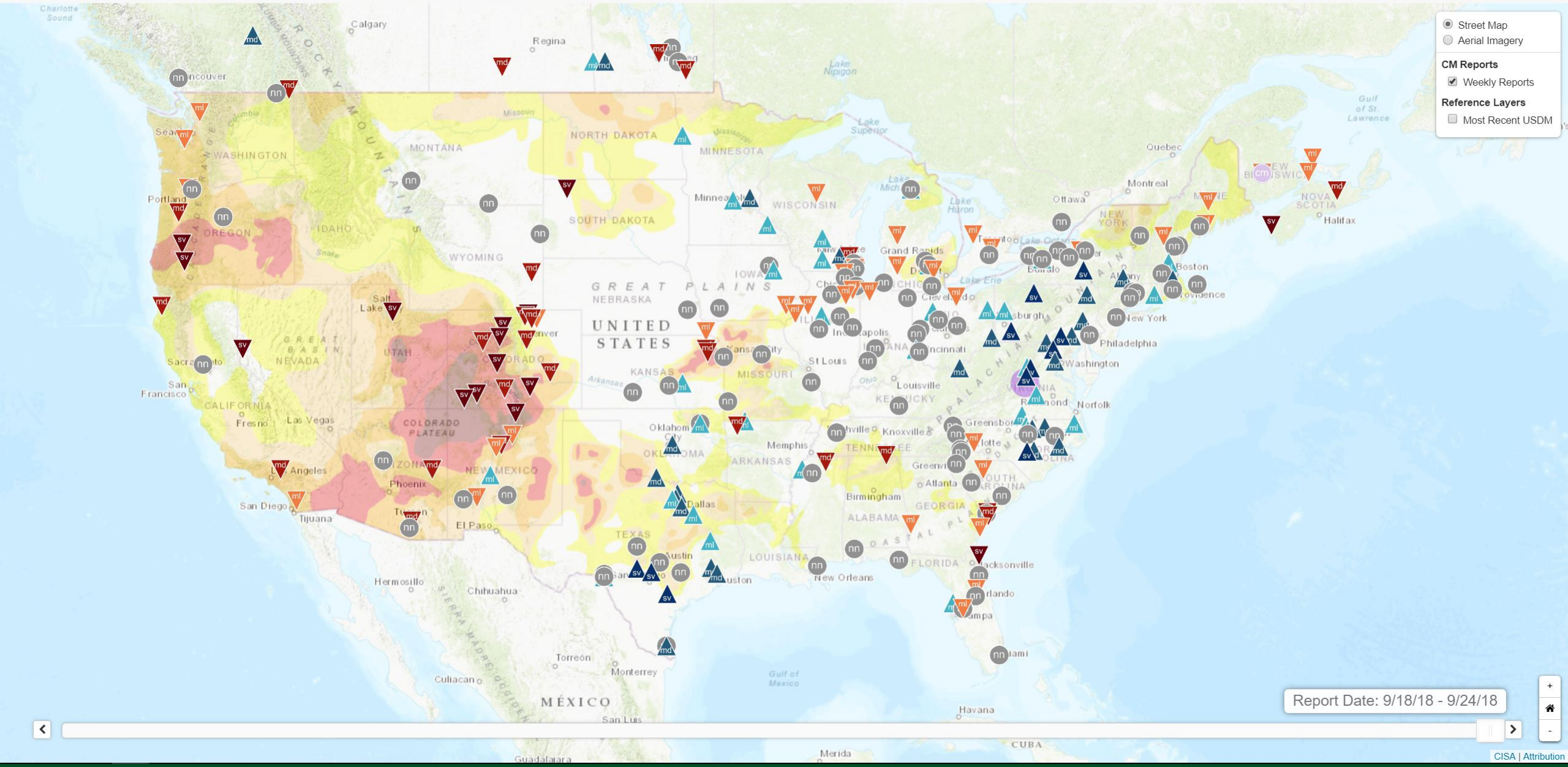


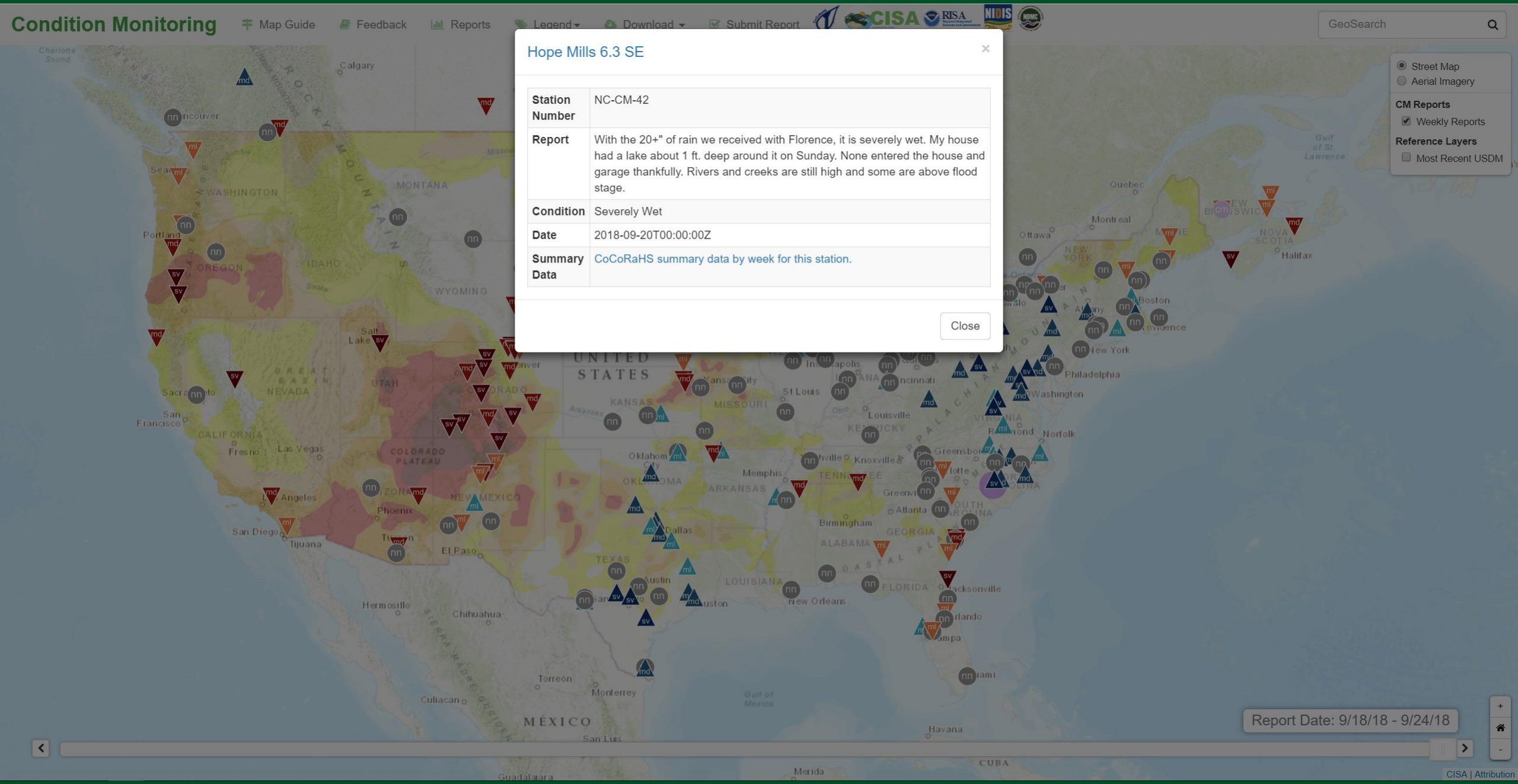
This chart displays which of the ten report categories observers selected to indicate the type of information included in their condition monitoring report.

Condition Monitoring

Map Guide | Feedback | Reports | Legend | Download | Submit Report

GeoSearch

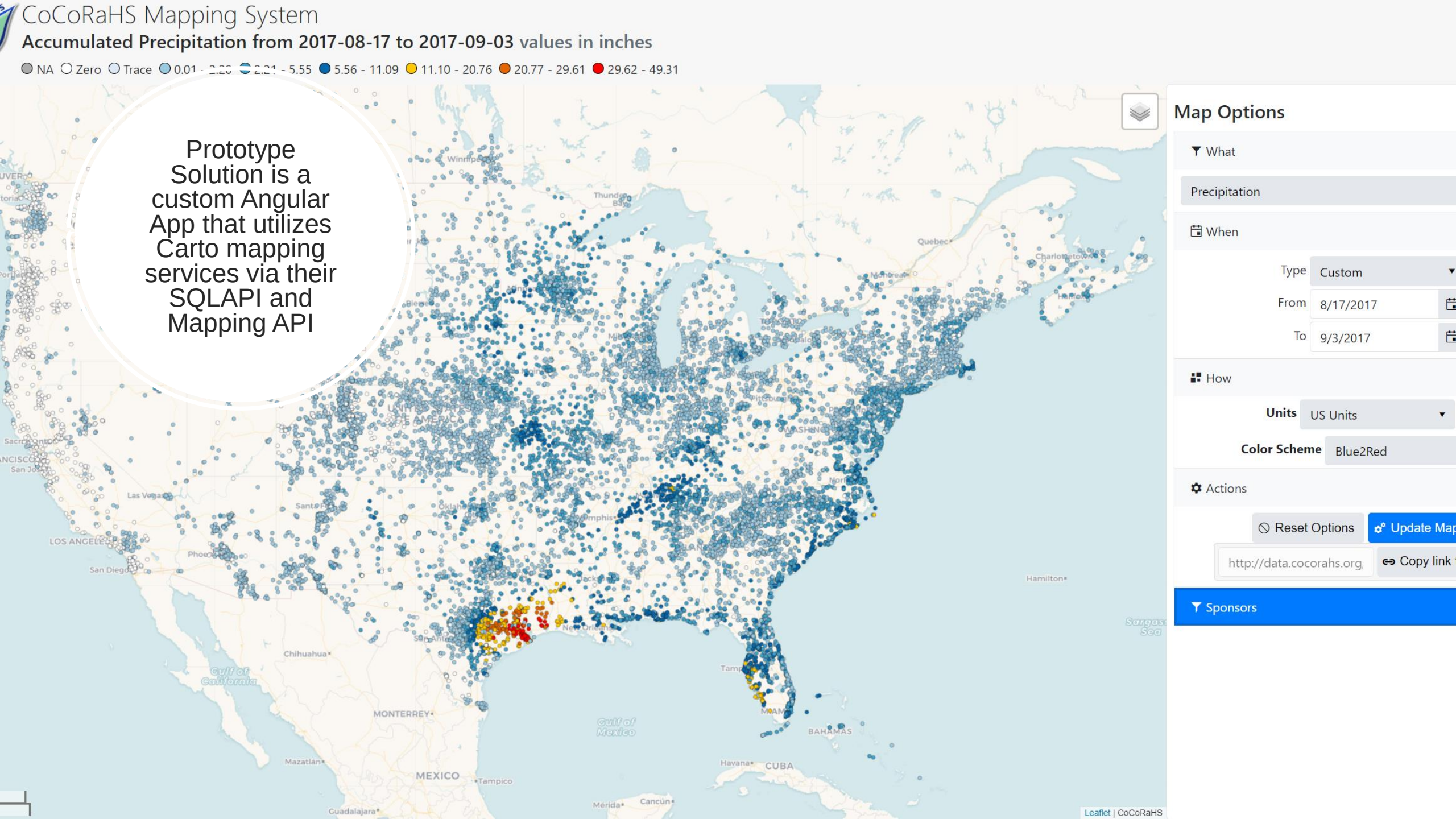



Condition Monitoring
Map Guide
Feedback
Reports
Legend
Download
Submit Report
GeoSearch
Hope Mills 6.3 SE
Station Number
NC-CM-42
Report
With the 20+" of rain we received with Florence, it is severely wet. My house had a lake about 1 ft. deep around it on Sunday. None entered the house and garage thankfully. Rivers and creeks are still high and some are above flood stage.
Condition
Severely Wet
Date
2018-09-20T00:00:00Z
Summary Data
CoCoRaHS summary data by week for this station.
Close
Street Map
Aerial Imagery
CM Reports
Weekly Reports
Reference Layers
Most Recent USDM
Report Date: 9/18/18 - 9/24/18
CISA | Attribution

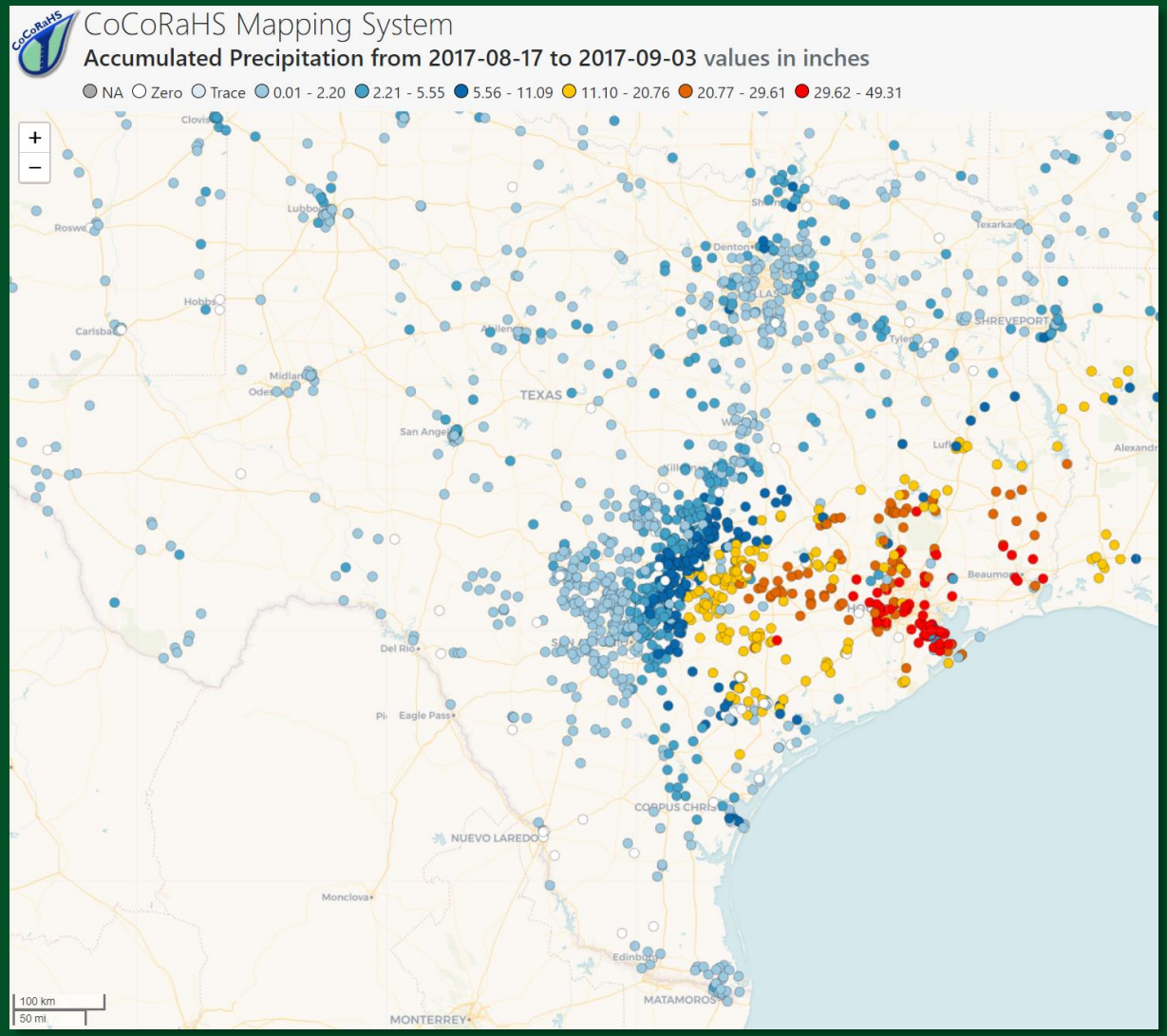
CoCoRaHS Mapping vNext

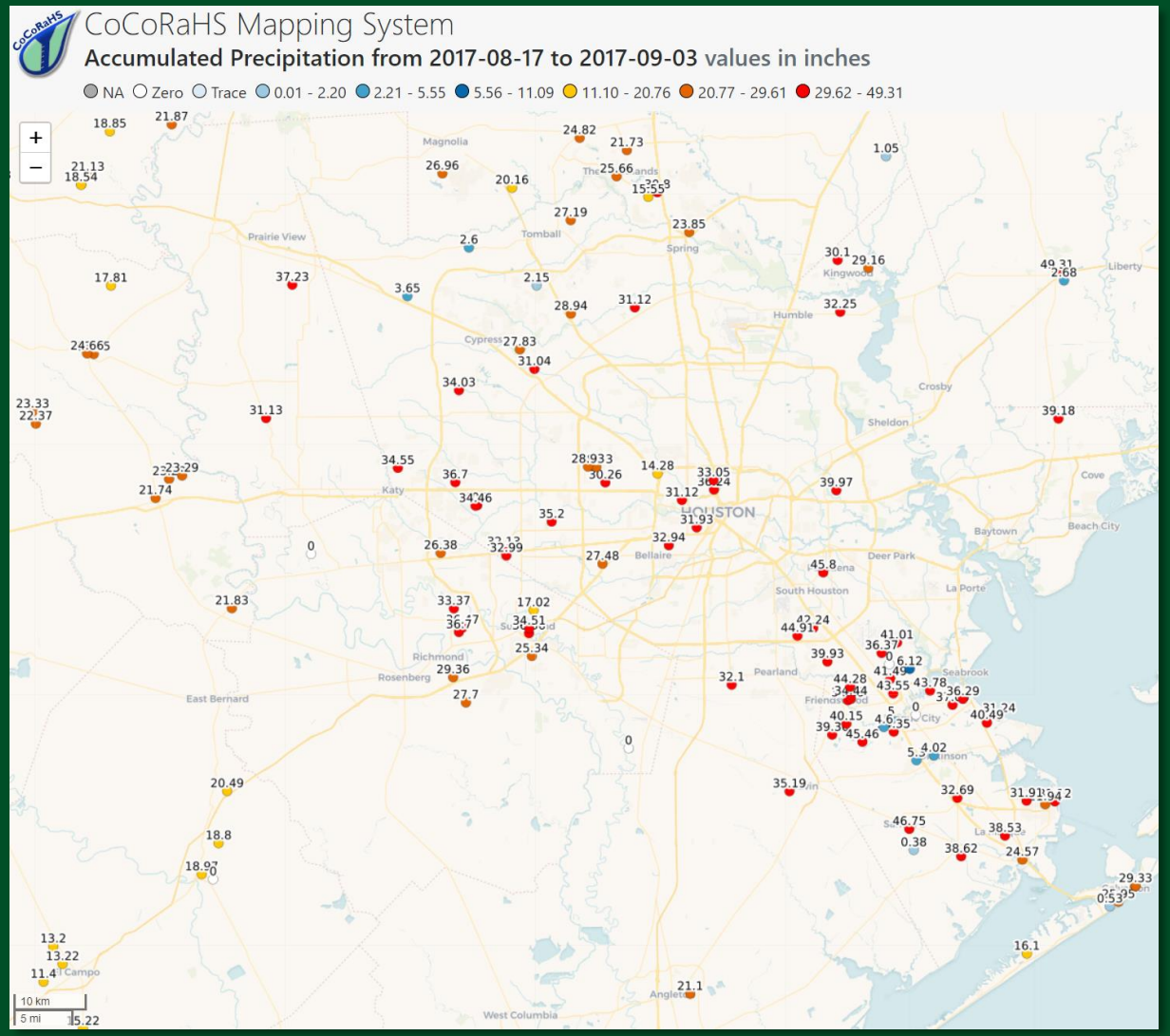
Overview of CoCoRaHS Mapping Requirements

- Ability to map tens of thousands of data points without crashing the browser
- Make every data point interactive
- Ability to provide maps for the entire CoCoRaHS archive of over 40 million daily precip observations
- Provide accumulation maps over entire archive of daily and multi-day observations for dynamic (user-defined) date ranges
- Ability to map the observer contributed data in near real-time
- Support for a multitude of stakeholder filtering and visualization requirements

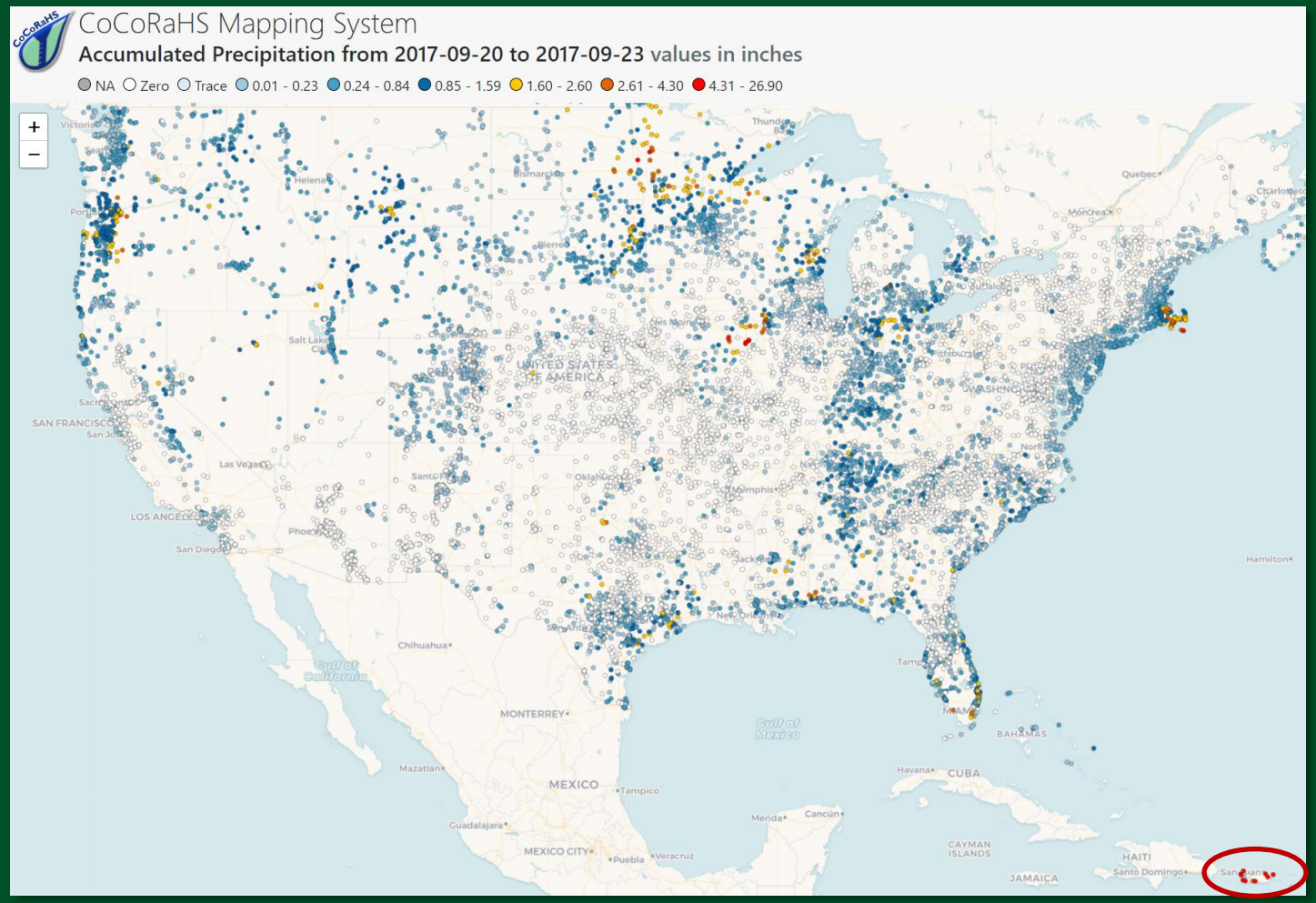

CoCoRaHS Mapping System
Accumulated Precipitation from 2017-08-17 to 2017-09-03 values in inches
NA
Zero
Trace
0.01 - 2.20
2.21 - 5.55
5.56 - 11.09
11.10 - 20.76
20.77 - 29.61
29.62 - 49.31
Prototype Solution is a custom Angular App that utilizes Carto mapping services via their SQLAPI and Mapping API
Map Options
What
Precipitation
When
Type
Custom
From
8/17/2017
To
9/3/2017
How
Units
US Units
Color Scheme
Blue2Red
Actions
Reset Options
Update Map
http://data.cocorahs.org
Copy link
Sponsors
Leaflet | CoCoRaHS

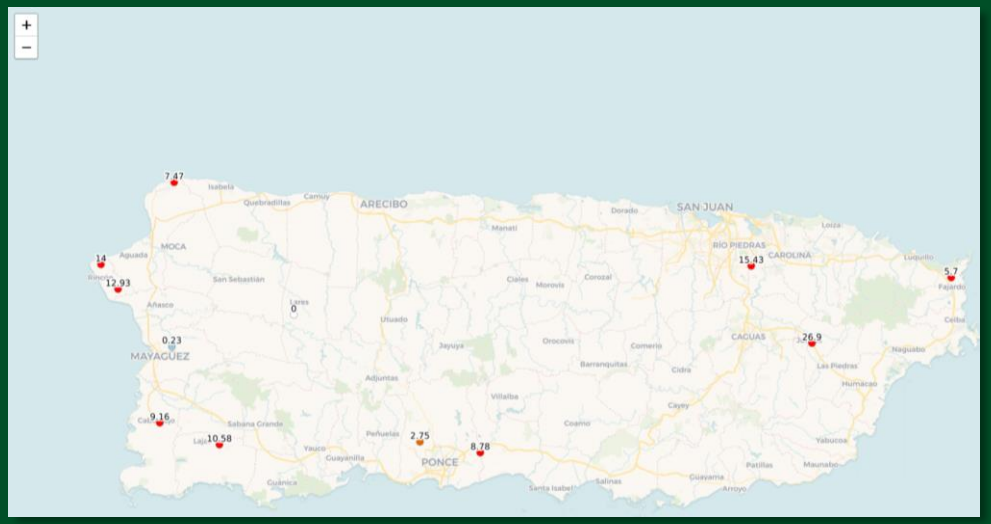
CoCoRaHS Observations of Hurricane Harvey

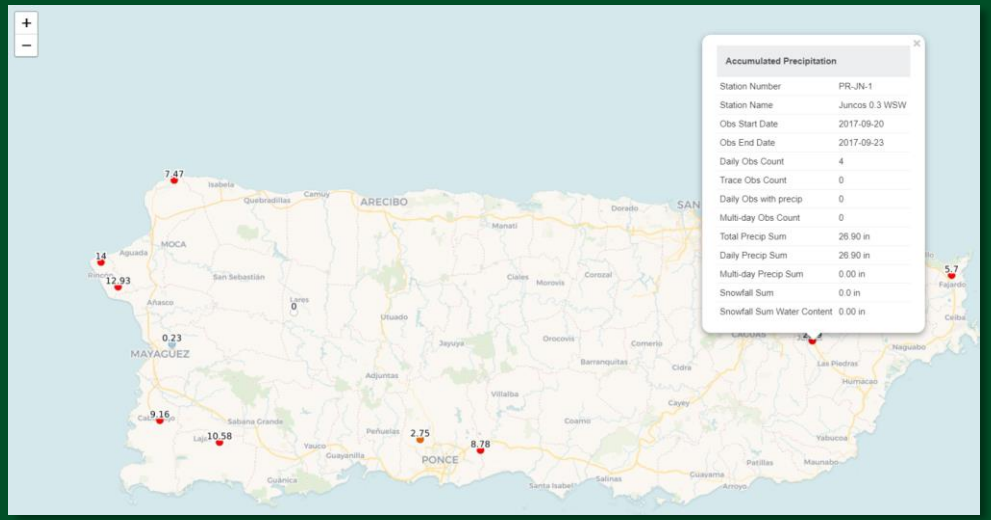




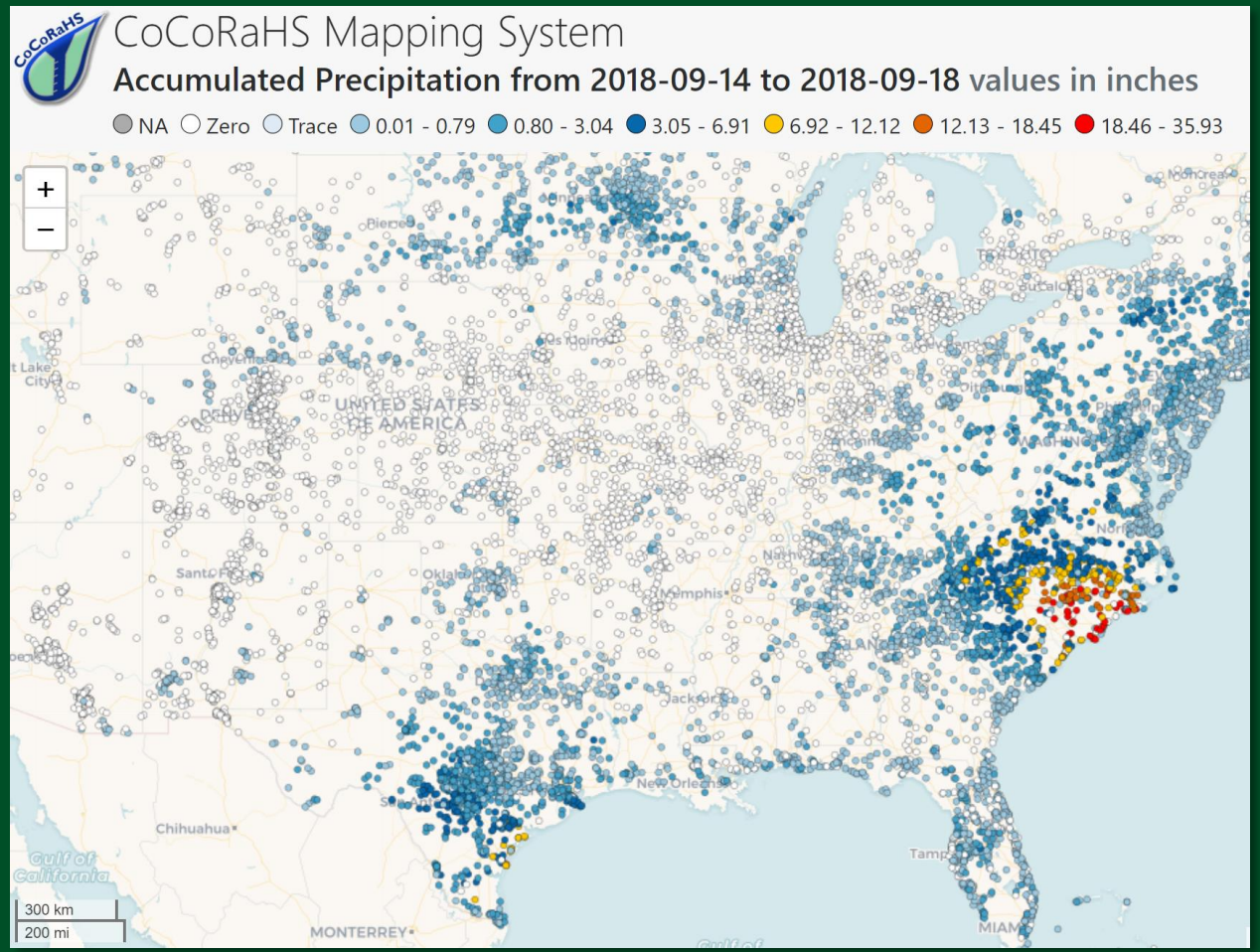
CoCoRaHS Observations of Hurricane Maria

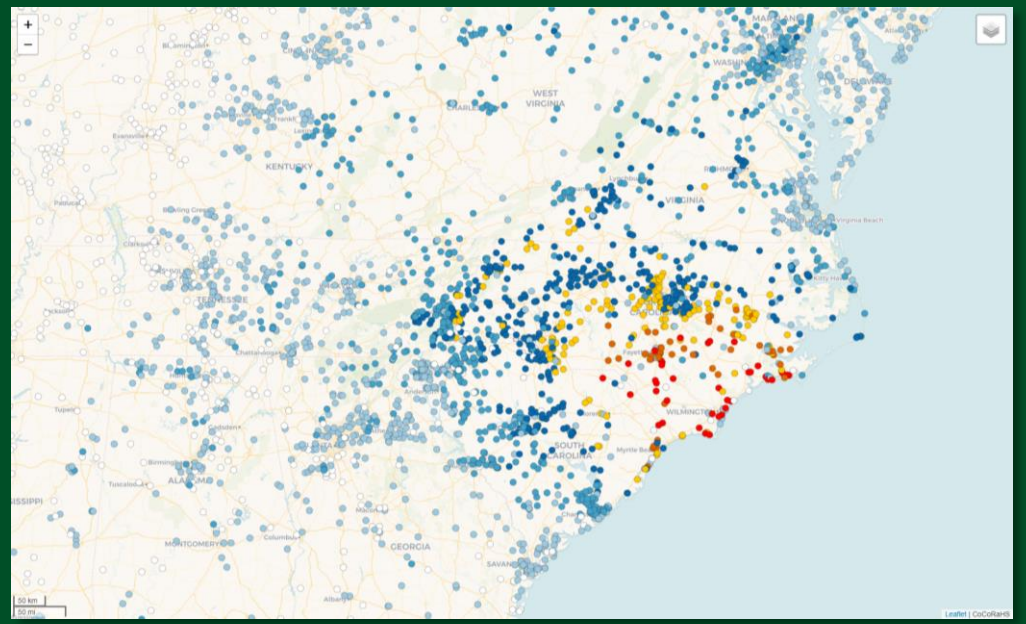


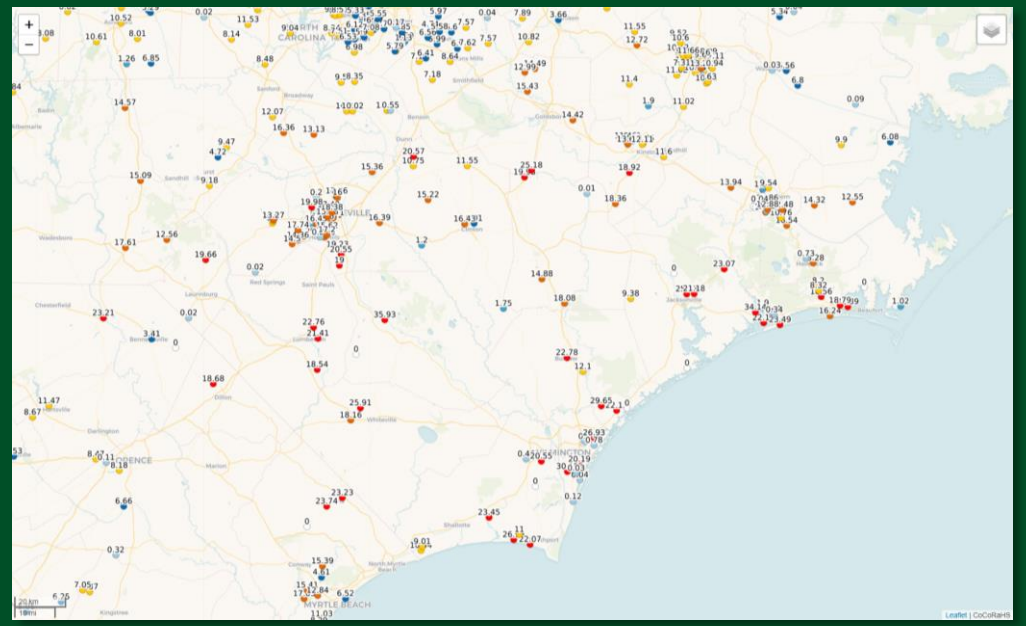




CoCoRaHS Observations of Hurricane Florence

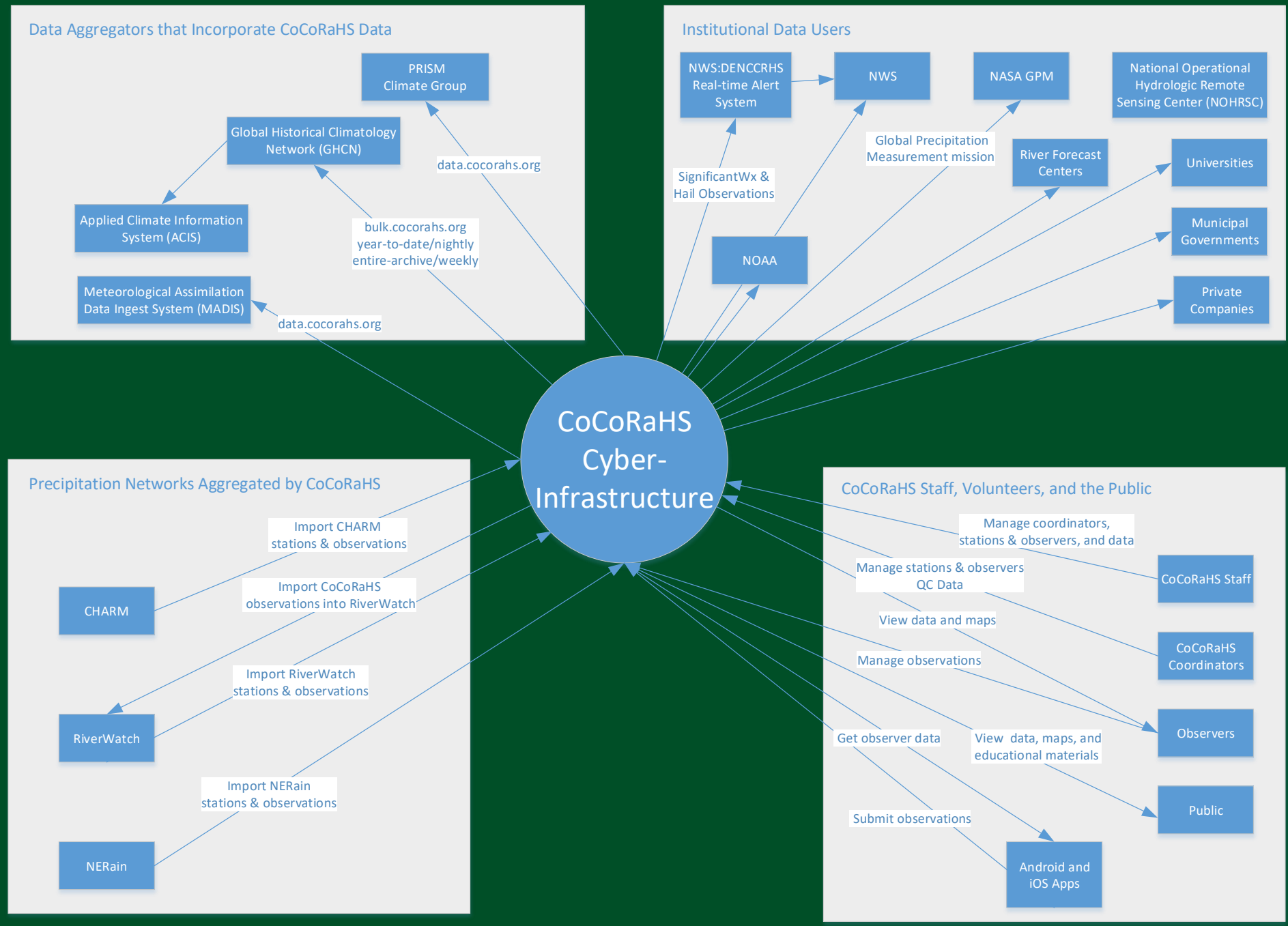




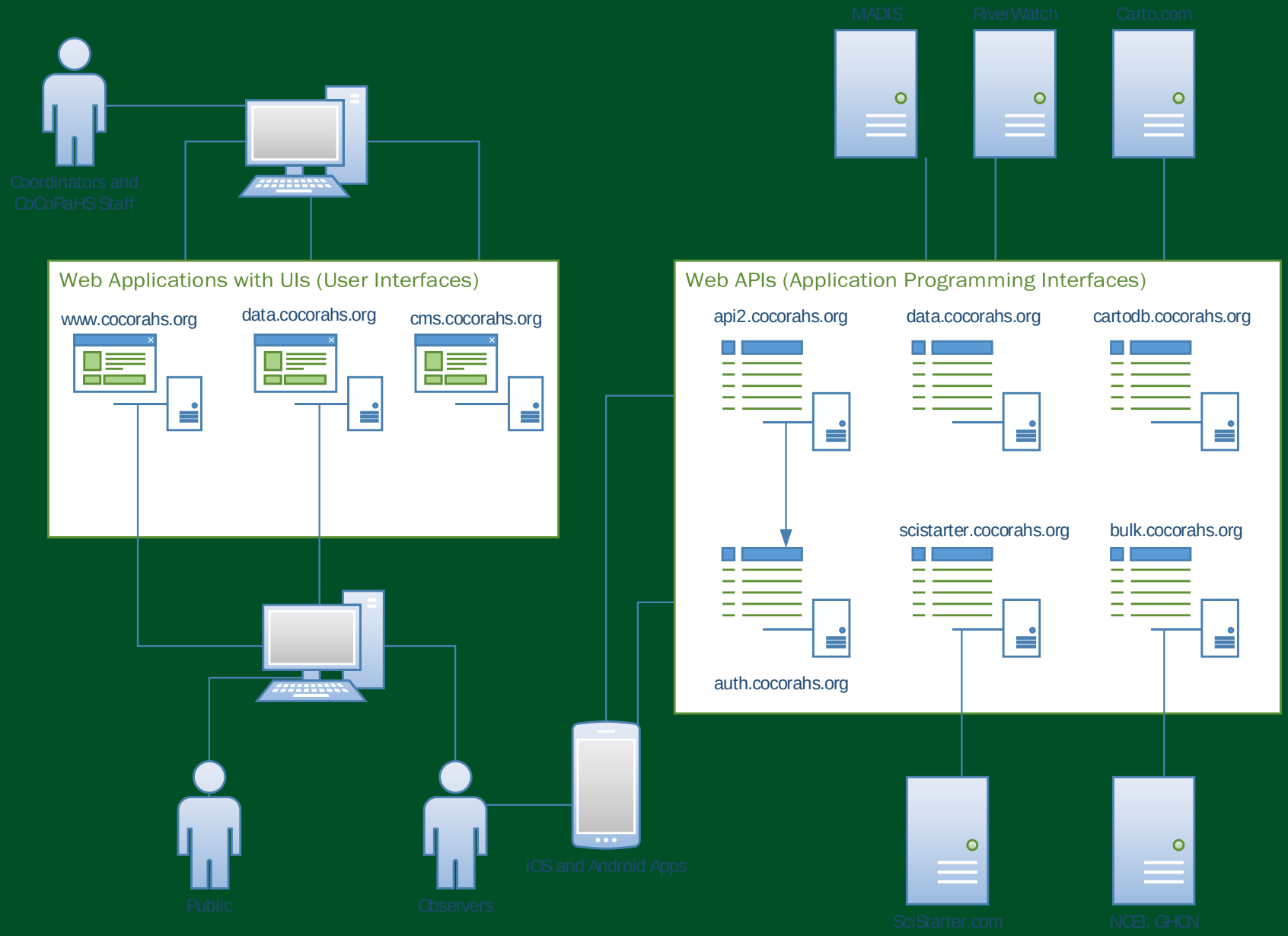


What you don’t see

CoCoRaHS Cyber-Infrastructure Data Flow Context



CoCoRaHS Web App and Web API Overview



CoCoRaHS Network and External Service Overview

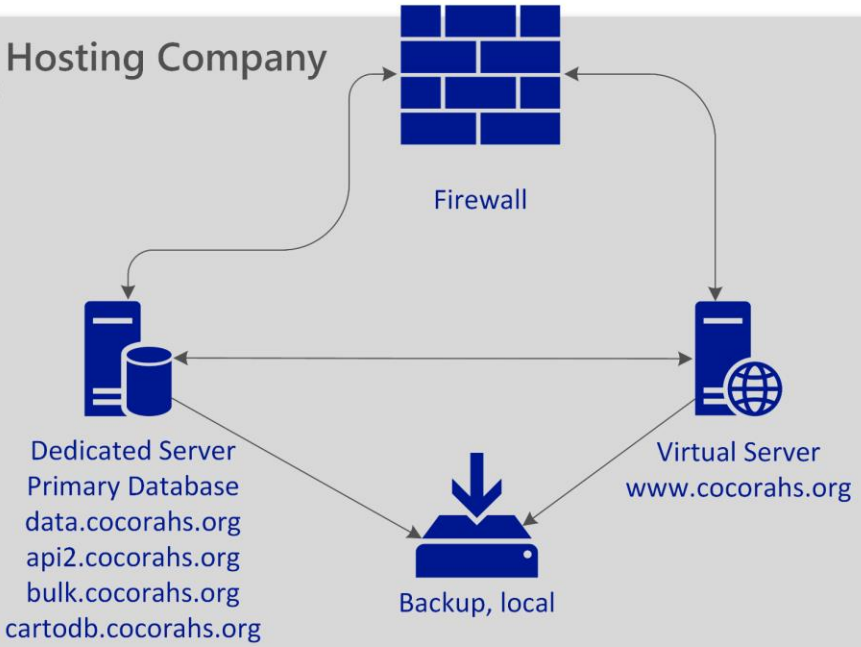
Microsoft Azure

- 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

Why use the data

Canadian Regional Deterministic Precipitation Analysis System (CaP A-RDPA RDPA)

- Product of Environment and Climate Change Canada
- Is a regional deterministic precipitation analysis system that provides objective estimates of precipitation amounts for a specific domain by combining readings from precipitation gauges, radar and a trial field generated from RDPS -V6
- As of September 18, 2018 is incorporating CoCoRaHS data into the analysis after testing its impact on the data product
- “The addition of the CoCoRaHS network combined with the change in trial field brings value to the 24-hour analysis in summer across the entire CaPA domain. It is clearly seen by the gain in skill.”

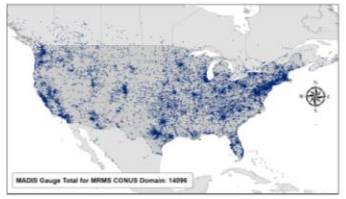
From CAPA-RDPA_4_5_0_Tech_note_e.pdf

Inter-comparison of gauge data quality

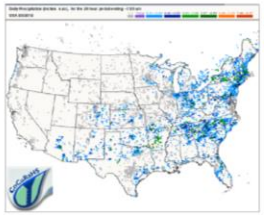
National Severe Storms Laboratory - Jian Zhang, Steve Martinaitis, Micheal Simpson

Gauge data in MRMS

- MADIS
  - Hourly
  - Contains many networks including ASOS, Mesowest, DOT, etc.
  - ~15,000 each hour at the top of the hour (+/- 4min)
    - ~11,000 after QC
  - Used in MRMS local gauge corrected QPE and Mountain Mapper



- CoCoRaHS
  - Daily
  - ~13,000 at the top of the hour (+/-15min)
    - 450 (10Z) +2800 (11Z) + 3700 (12Z) +2500 (13Z)+2000 (14Z) + 1000 (15Z) +350 (16Z) + 60 (17Z)
  - Not used in any MRMS products
  - For evaluations only

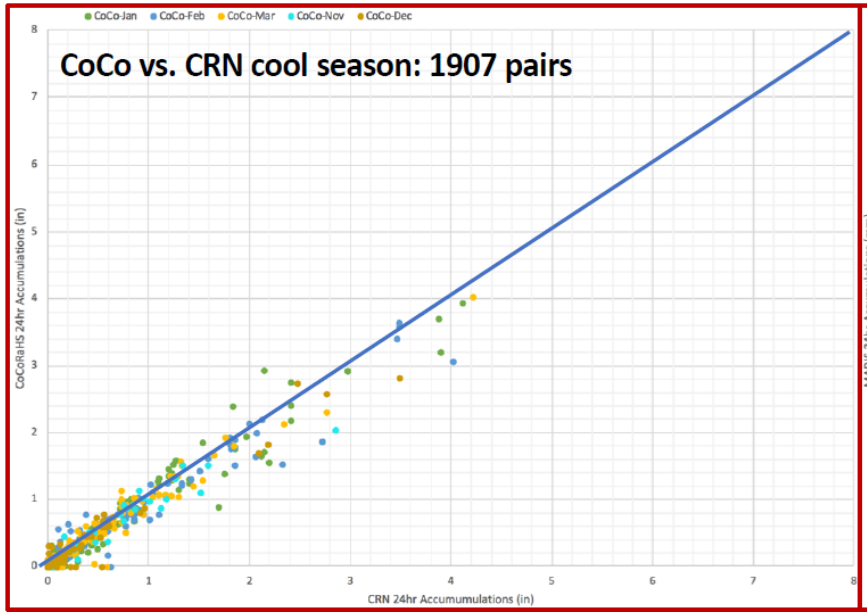


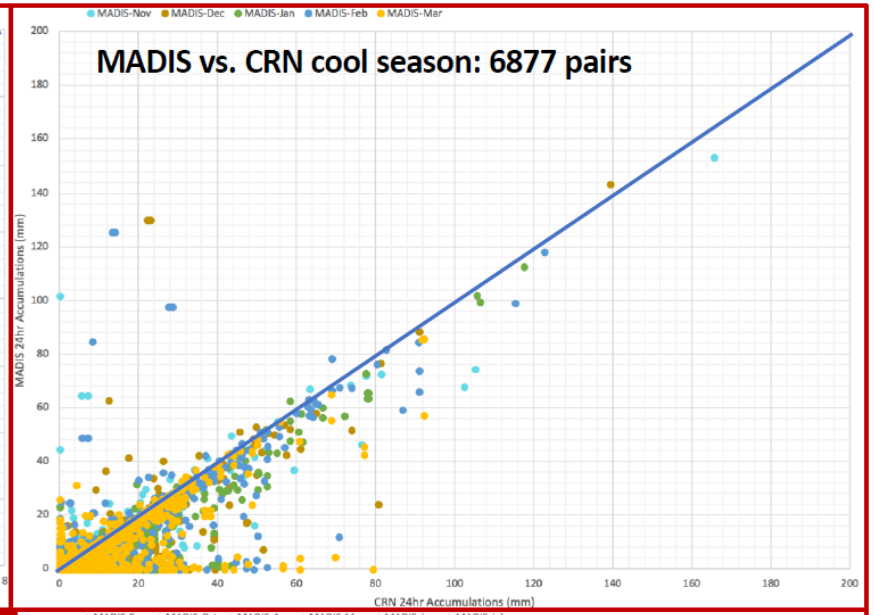
- CRN
  - Hourly
  - ~150
  - Considered the most reliable rain gauges
  - Included in MADIS (different ID, slightly different lat/lon and amounts due to truncation errors?)

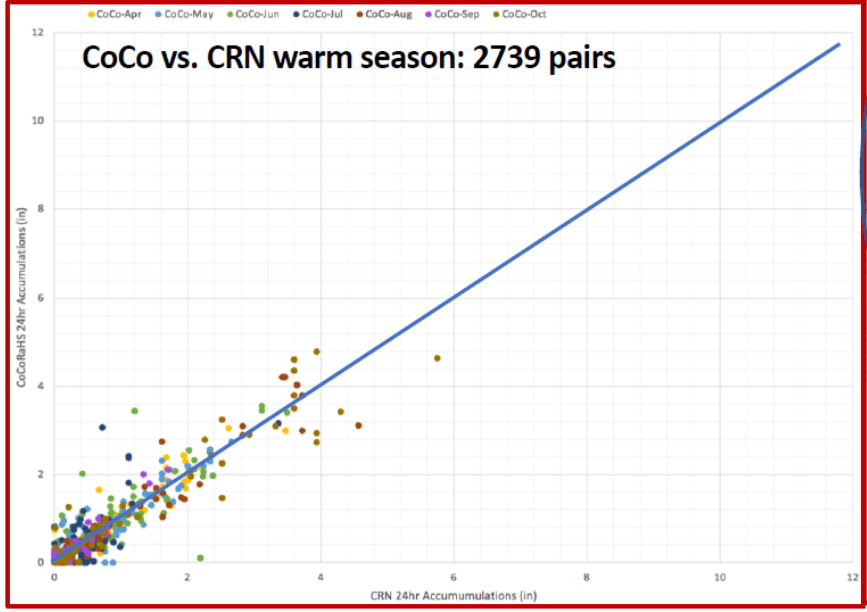
Intercomparison of gauge data

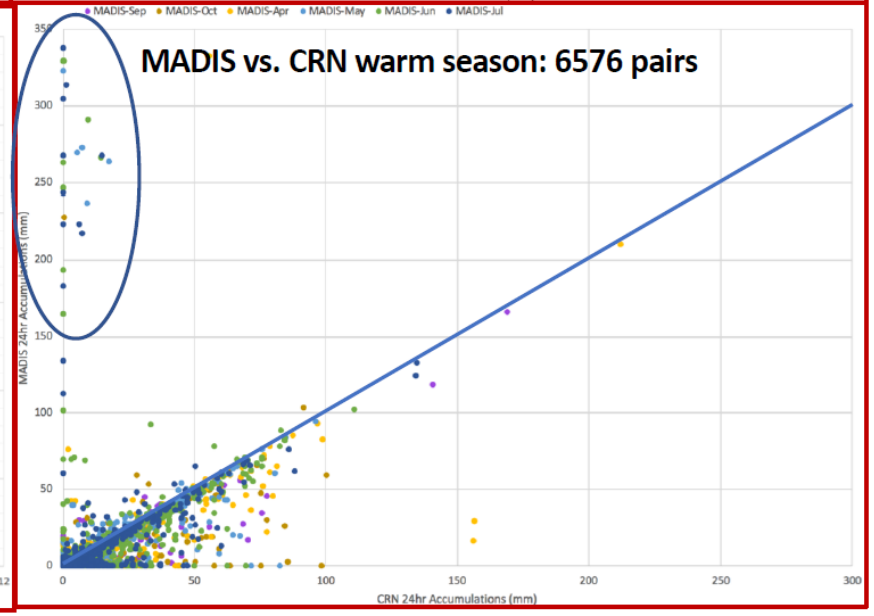
- Using CRN as reference to assess the quality of MADIS and CoCoRaHS data
- Criteria for “co-located” CRN-CoCo (MADIS) gauges: 3km radius
- CRN vs. CoCoRaHS: Jan 2017 – Jul 2018
  - Cool season: Jan – Mar 2017 and 2018, Nov – Dec 2017
  - Warm season: Apr – Oct 2017, Apr-Jul 2018
- CRN vs. MADIS: Sep 2017 – Jul 2018
  - Cool season: Nov – Dec 2017, Jan – Mar 2018,
  - Warm season: Sep – Oct 2017, Apr-Jul 2018

CRN vs. CoCoRaHS and MADIS gauges



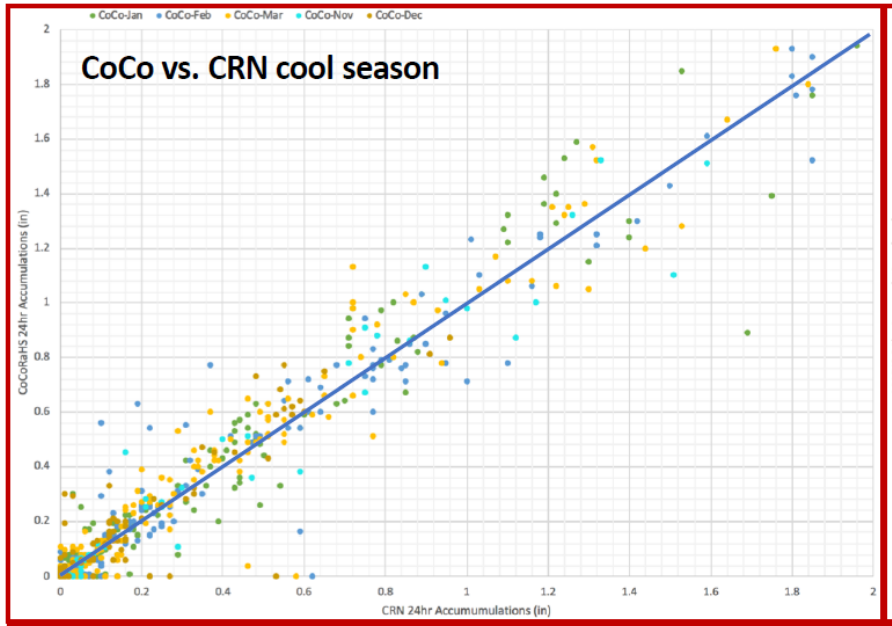


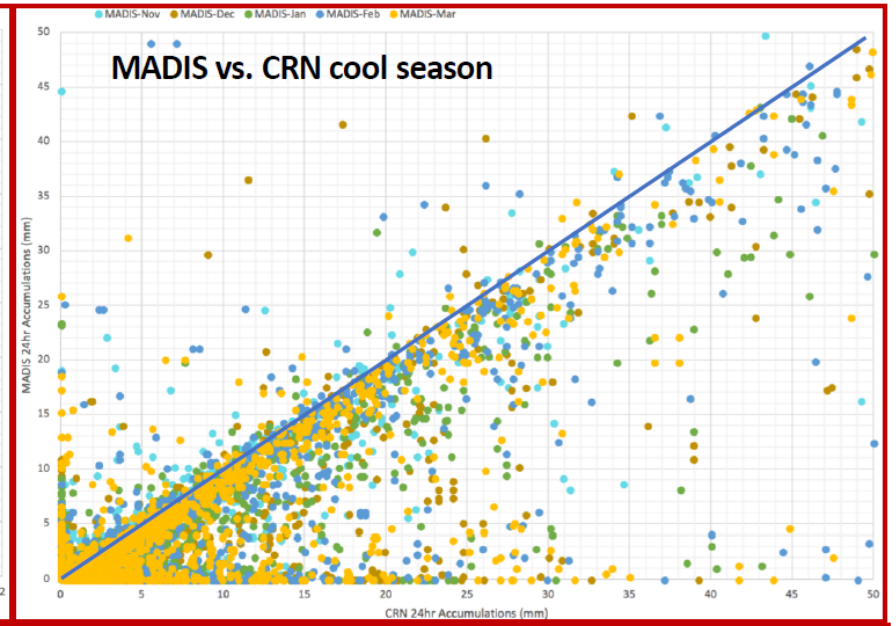


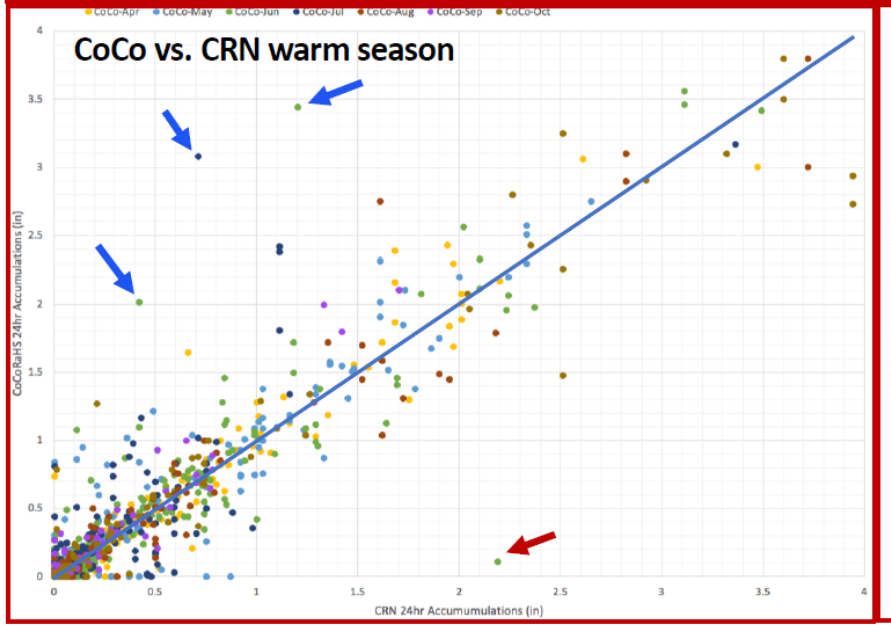


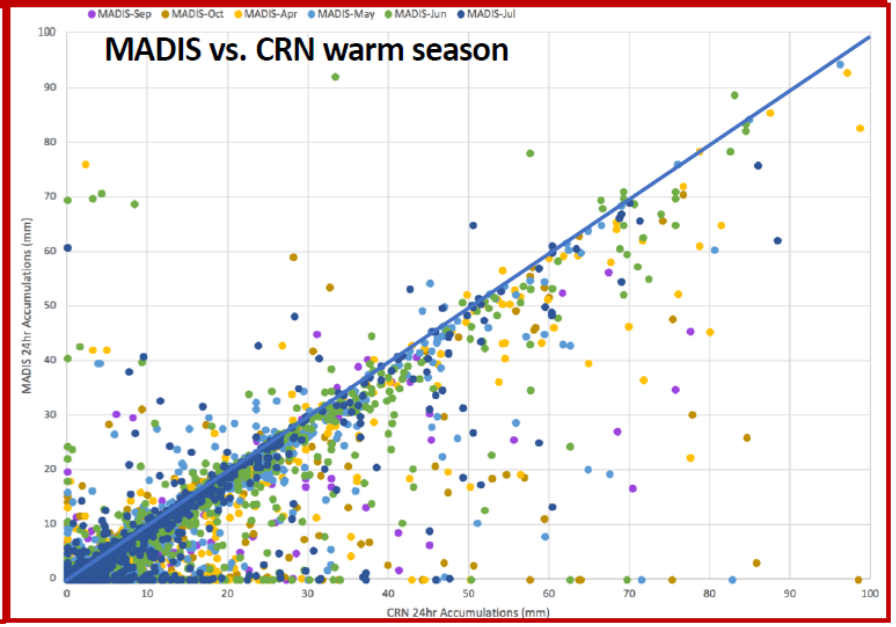
- CoCo matches CRN much better than does MADIS
- MADIS amounts are often lower than CRN indicating undercatch issue?
- abnormal high amounts in MADIS indicating malfunctioned sites?

CRN vs. CoCoRaHS and MADIS gauges: enlarged view





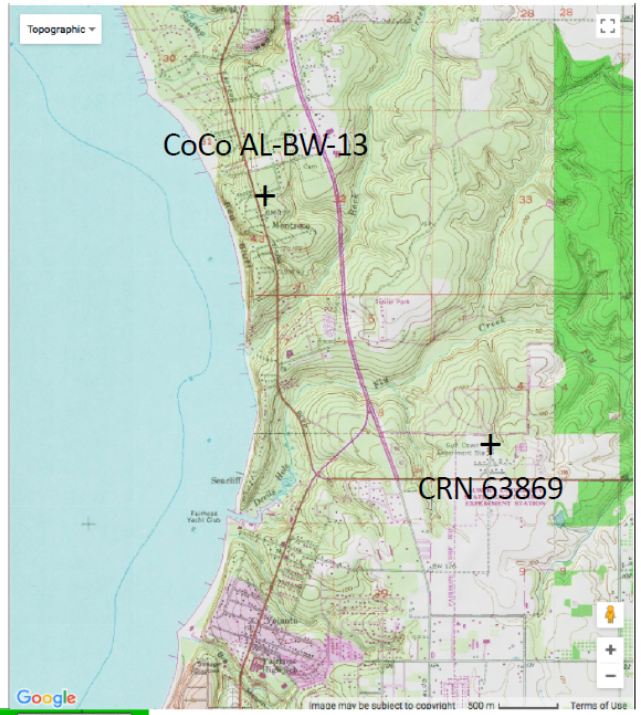


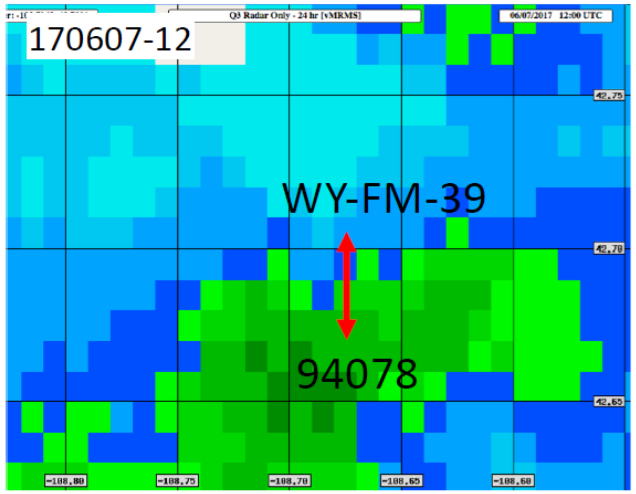


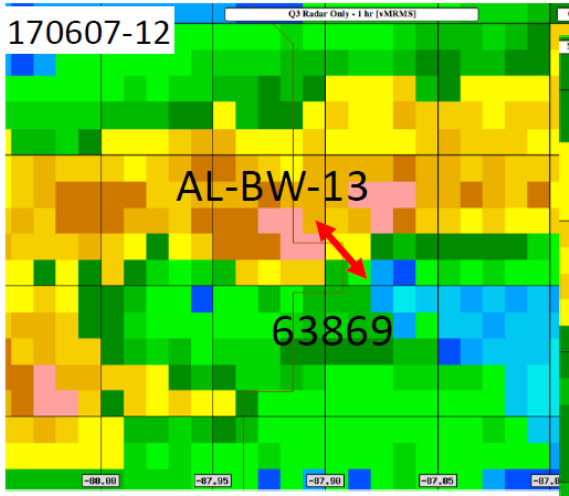
- CoCo matches CRN much better than does MADIS
- MADIS amounts are often lower than CRN indicating undercatch issue?
- A few outliers in warm season CRN-CoCo pairs (see arrows) are investigated further (next slide)

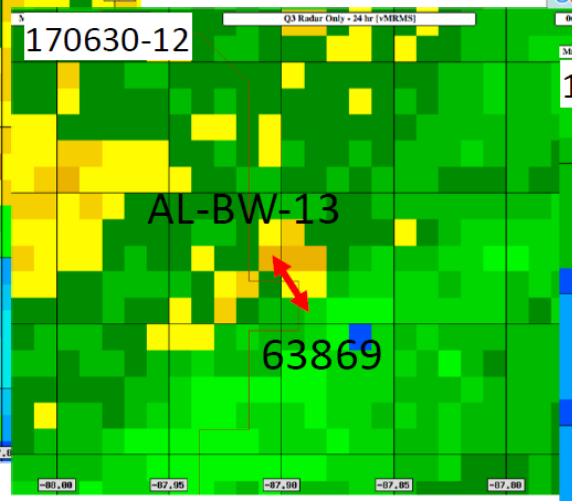
Four CoCo vs. CRN data pairs with large differences were analyzed, and all were real and attributed to large precipitation gradients between the gauge pairs.

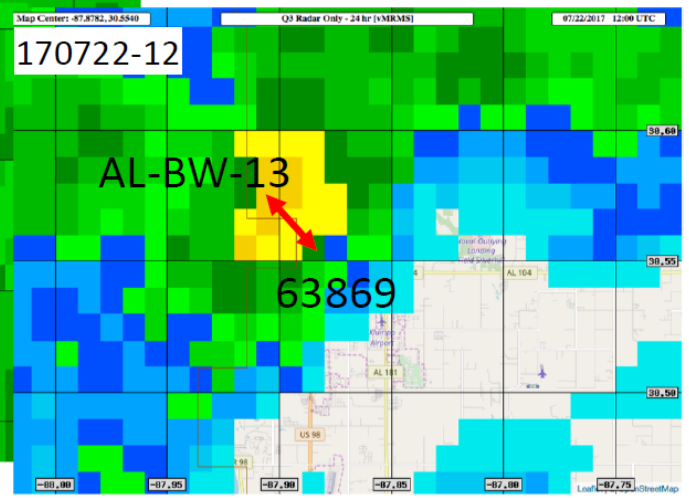
Date-hr	CRN	CoCo	Lat/lon	remark
170607-12	2.19	0.11	94078 42.6800 -108.6700 WY-FM-39 42.70168 -108.67567	radar QPE@CRN: 1.2in radar QPE@CoCo: 0.13in
170607-12	1.2	3.44	63869 30.5500 -87.8800 AL-BW-13 30.56674 -87.90053	Radar QPE @CRN: 1.63in radar QPE @CoCo: 3.59in
170630-12	0.42	2.02	63869 30.5500 -87.8800 AL-BW-13 30.56674 -87.90053	Radar QPE @CRN: 0.8in radar QPE @CoCo: 3.36in
170722-12	0.71	3.08	63869 30.5500 -87.8800 AL-BW-13 30.56674 -87.90053	Radar QPE @CRN: 1.6in radar QPE @CoCo: 2.8in



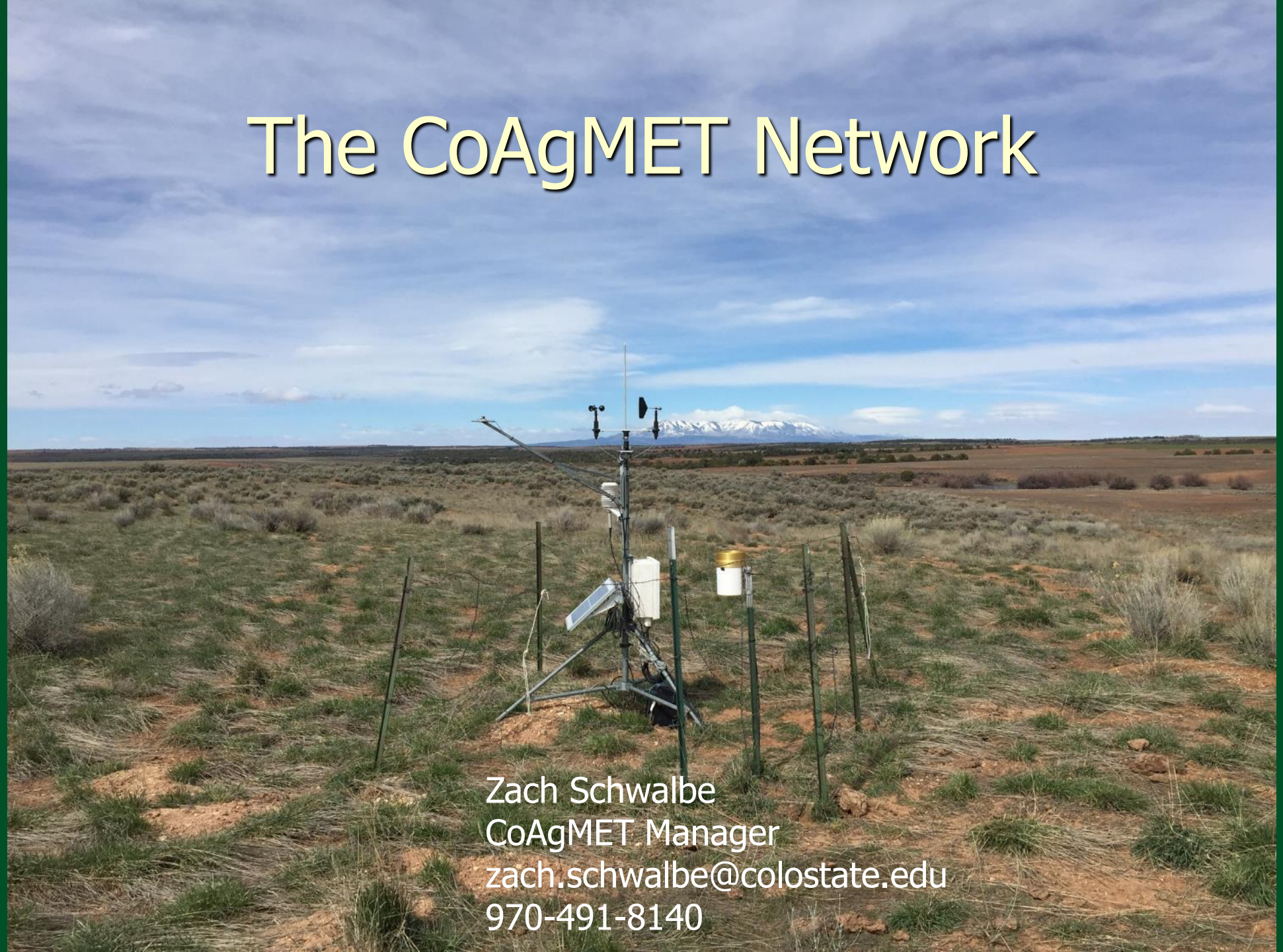








The CoAgMET Network



Zach Schwalbe
CoAgMET Manager
zach.schwalbe@colostate.edu
970-491-8140

CoAgMET =

Colorado Agricultural Meteorological Network

also known as “Colorado’s Mesonet”

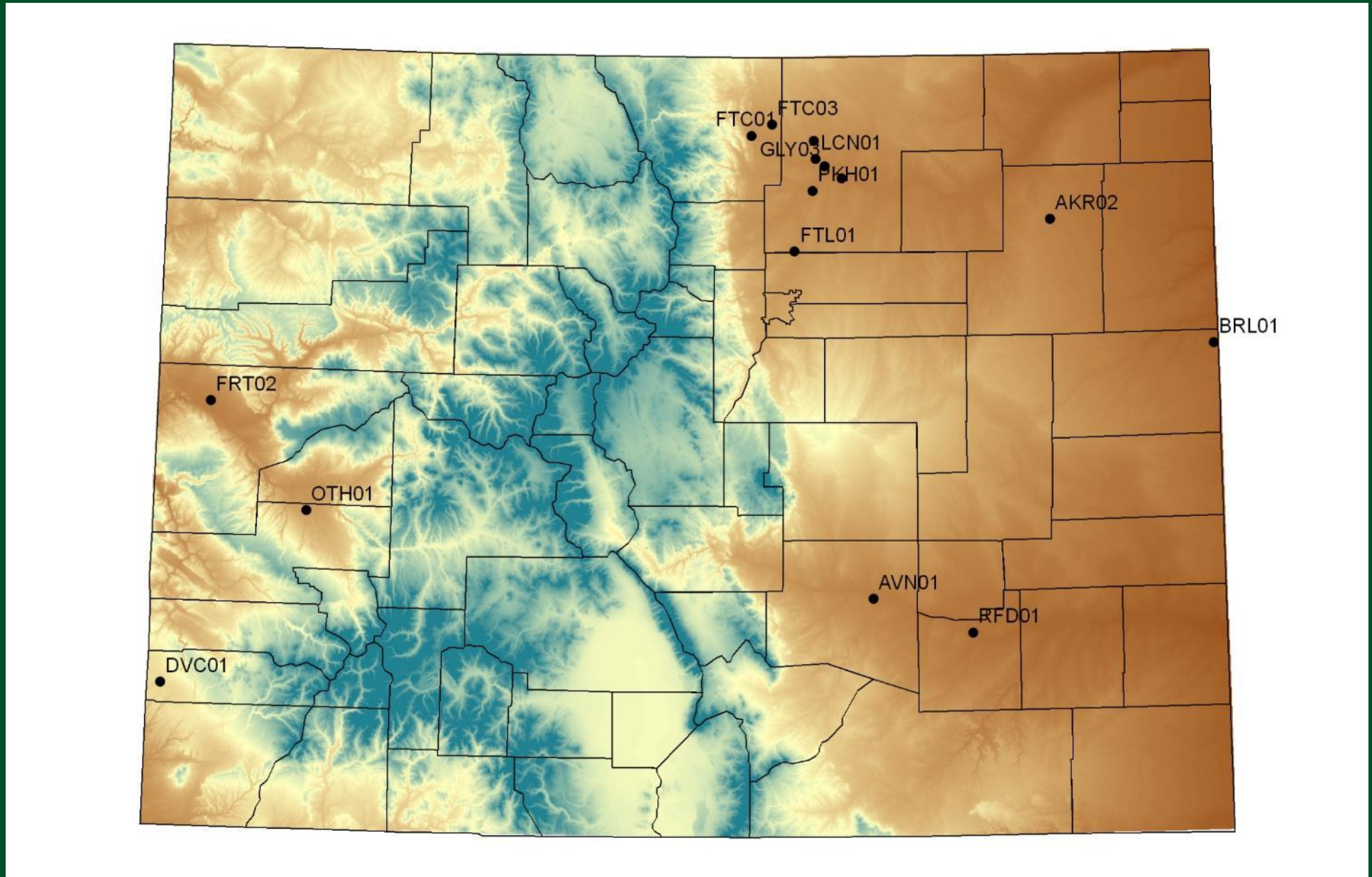
History

- In the early 1990's, CSU extension plant pathologists and ARS scientists decided to collaborate efforts to collect detailed agricultural weather data.
- Standard instruments and data collection platform were selected and a small network of stations were deployed in fully irrigated agriculture.
- As the network grew, the Colorado Climate Center became increasingly interested in using the data, began daily data collection, quality control and built a web interface to distribute data and products to users across the state.

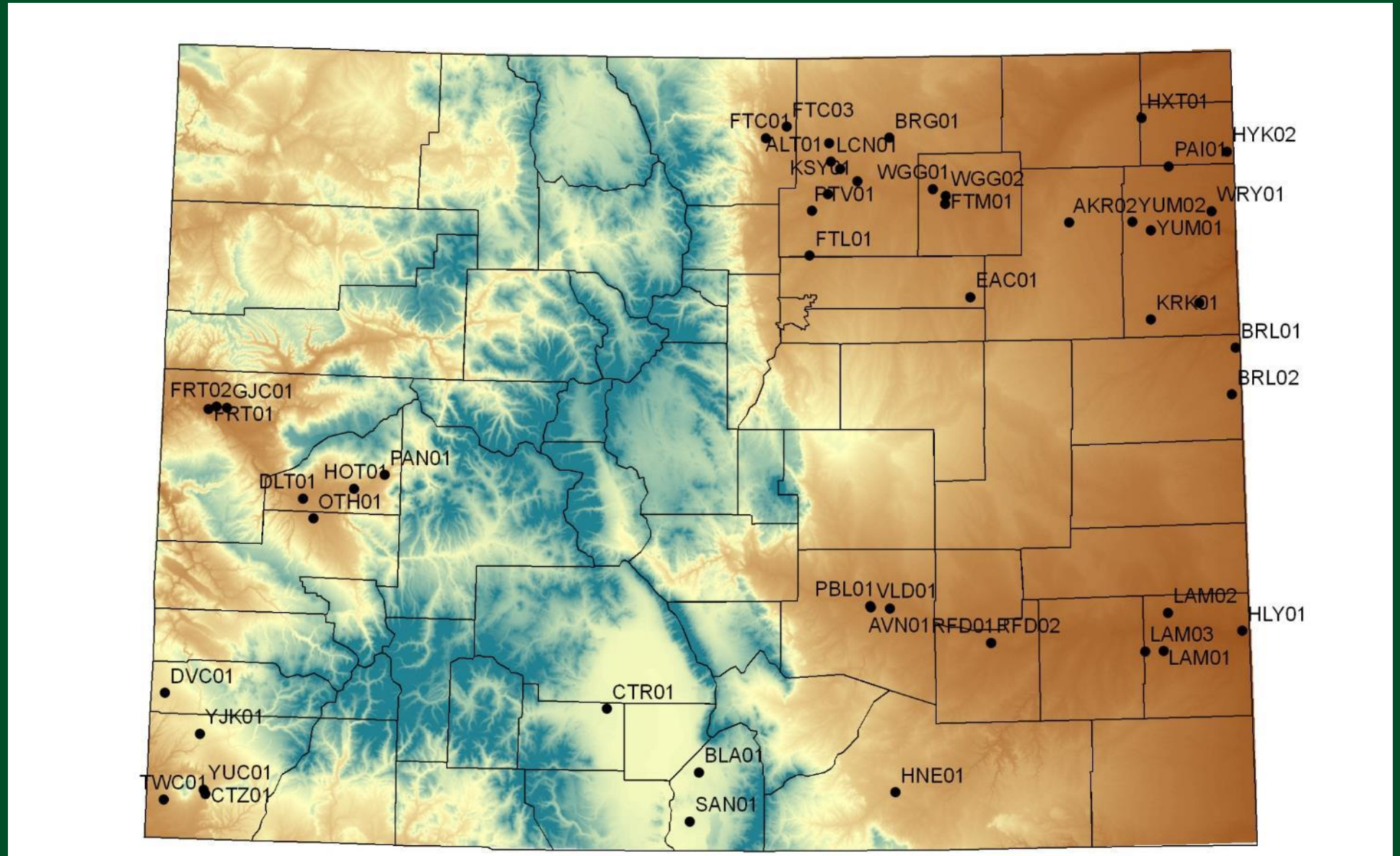
Colorado Climate Center's role

- Coordination, data management, web support
- We hosted annual meetings of key partners and data users – set priorities, secure commitments, prepare proposals (rarely funded but we persisted)
- We now run the network including station maintenance, product development, funding, etc.

CoAgMET 1992

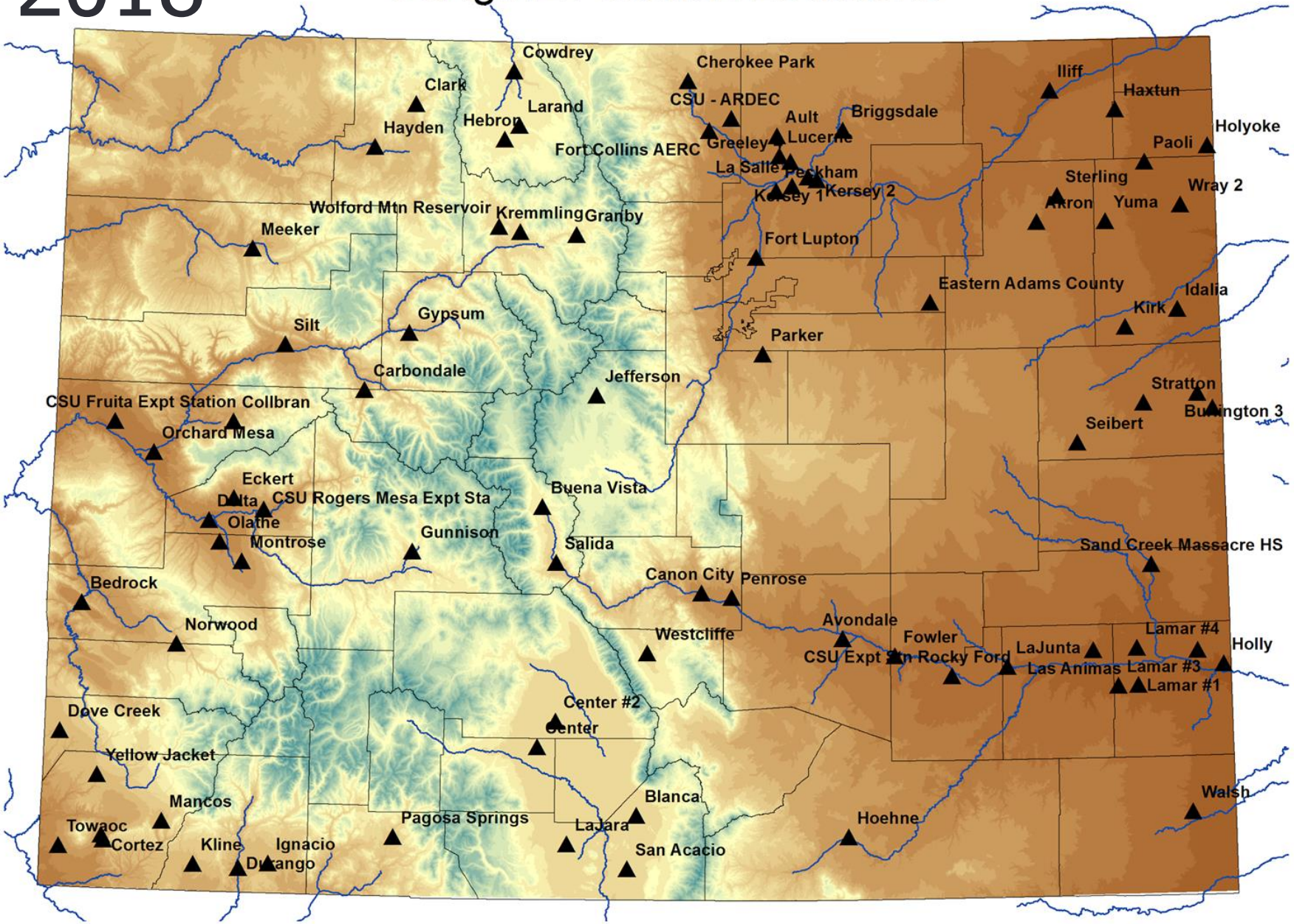


CoAgMET 2002



2018

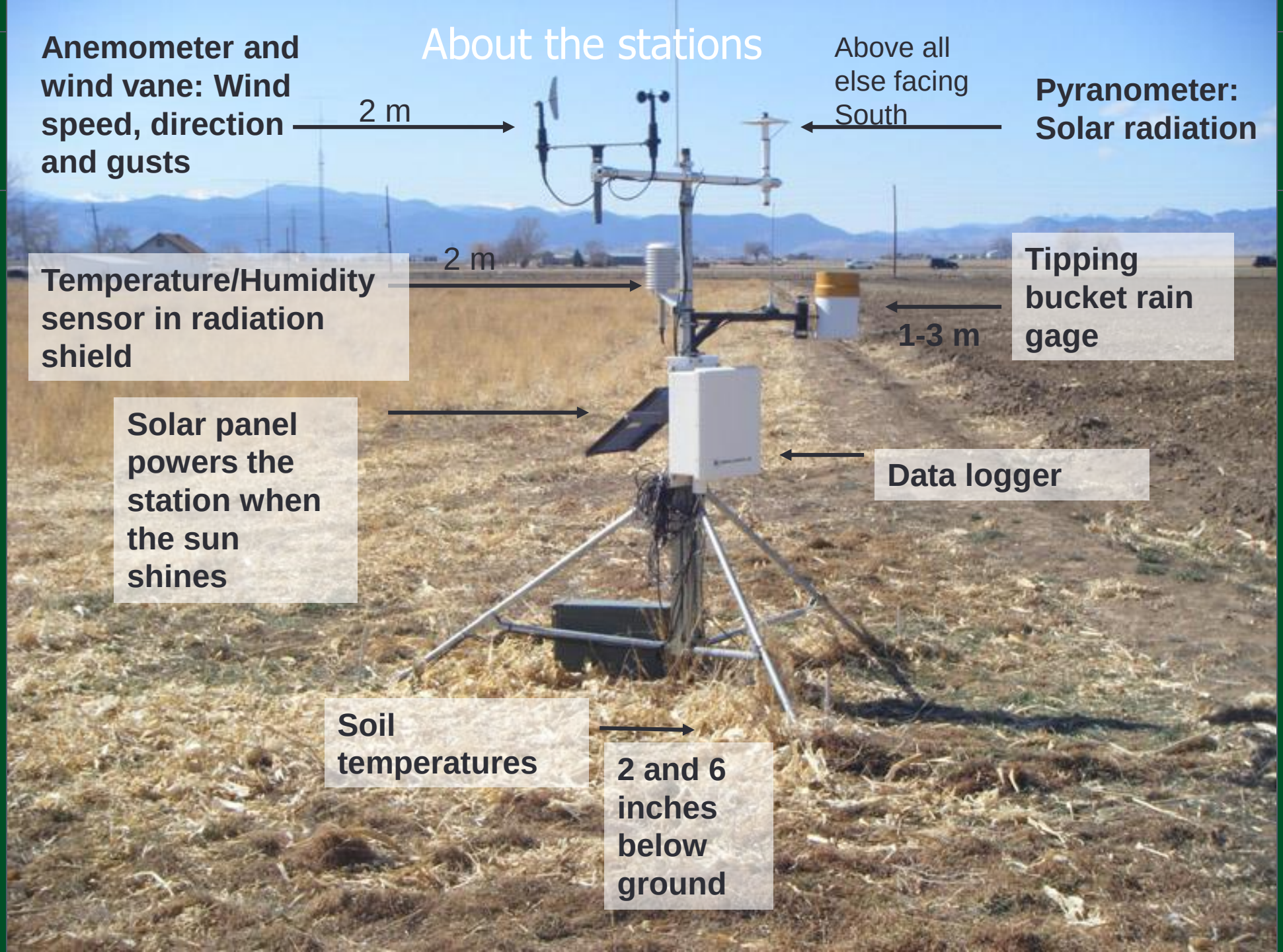
CoAgMET Station Locations



Overview of CoAgMET Network

- Currently there are 85 stations
- Data are collected hourly, daily and 60 stations with 5-minute data
- Data include: temperature, humidity, solar radiation, wind speed and direction, and soil temperatures.

About the stations



Why these measurements?

- The main goal of CoAgMET is to calculate evapotranspiration (ET) from meteorological measurements.
- The standard CoAgMET station collects the elements needed to calculate evapotranspiration.
- These are also very important data for real-time weather monitoring.

CoAgMET web access:

http://coagmet.colostate.edu/

Data are free and available to the public

COLORADO STATE UNIVERSITY | CoAgMET Colorado's Mesonet

USDA ars

Home | Daily Summaries | Hourly Plots | 5 Min Plots | Water Use (ET) | Map by eRAMS

CoAgMET Homepage

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- Our website has a new look! We hope you find it enjoyable and easier to navigate.
- A growing number of stations have 5 minute data available. You can view plots or read tabular data. In addition, our web services provide a machine-readable form of the data.

Services

- CoAgMET Crop Water Use (ET)
  Page for obtaining crop and turf water use information (Evapotranspiration).
- Evapotranspiration Reports
  ETRs are daily reports for selected stations by region.
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  An interactive web-based report for the 2017 growing season at our 7 long-term CoAgMET sites where we monitor ET accumulations.
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  Interactive access to the daily data set for a particular station and selected months.
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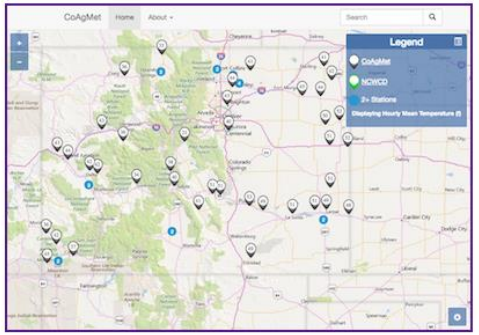
CoAgMET Mapping and Metadata by eRAMS



Daily Data

CoAgMet Daily Summary - 07/01/2016

Daily Summary

Sta	Mon	Day	Tmax Temp degF	Tmin Temp degF	Vapor Press mb	Solar Rad Lngly	Prec in.	Wind Gust mph	Wind Run mi.	Soil Temp degF	Min RH Pct	Grow DgDy F.	P-Kim ET in.	ASCE HLY ET in.
akr02	7	1	73.1	59.7	17.75	248	0.64	***	229	***	66.2	1270	0.161	0.123
alt01	7	1	78.5	60.4	17.62	391	0.04	27.9	127	70.0	49.0	1157	0.193	0.162
avn01	7	1	81.8	62.6	19.95	345	0.06	18.3	51	70.6	51.5	1510	0.163	0.132
bla01	7	1	74.4	53.5	12.93	373	0.00	30.4	117	62.1	36.3	957	0.190	0.168
bnv01	7	1	69.4	52.1	13.14	264	0.05	17.3	66	56.0	44.4	882	0.120	0.107
brg01	7	1	80.6	58.2	18.03	336	0.14	22.7	162	68.0	52.1	1243	0.200	0.140
brk01	7	1	72.8	62.3	16.63	224	0.05	13.5	58	74.2	50.9	1486	0.140	0.106
brl02	7	1	72.9	61.5	20.64	298	0.07	16.2	149	65.2	77.1	1342	0.131	0.103
brl03	7	1	72.2	61.5	20.18	325	0.31	15.8	153	67.7	78.6	1035	0.135	0.109
cbl01	7	1	68.5	57.8	17.07	251	0.01	9.7	38	59.8	68.1	1044	0.102	0.091
ckp01	7	1	76.9	56.4	15.70	370	0.76	17.2	72	64.8	49.2	997	0.166	0.140
cnn01	7	1	80.5	61.6	17.69	384	0.56	24.4	68	66.9	45.0	1420	0.185	0.161
cow01	7	1	69.5	50.0	12.71	415	0.00	17.2	49	60.5	43.0	589	0.148	0.149
ctr01	7	1	71.1	52.5	13.83	326	0.36	14.7	55	60.7	50.7	887	0.135	0.114
ctr02	7	1	73.9	53.4	13.60	378	0.12	21.0	94	67.1	43.2	943	0.171	0.145
ctz01	7	1	68.3	59.3	15.91	198	0.09	10.1	50	65.7	59.9	1261	0.111	0.081
dlt01	7	1	72.4	60.5	17.68	262	0.09	10.1	55	64.1	59.3	1400	0.132	0.106
dvc01	7	1	67.9	55.9	14.93	226	0.09	13.3	79	66.7	60.8	981	0.126	0.093
eac01	7	1	75.5	57.6	17.92	351	1.08	32.7	237	64.1	61.7	1250	0.198	0.138
ekt01	7	1	71.2	60.0	16.75	243	0.08	10.5	35	63.0	56.0	1241	0.121	0.097
frt02	7	1	72.6	61.3	18.92	223	0.07	11.7	78	67.1	63.3	812	0.094	0.090
ftc01	7	1	76.4	58.9	17.84	294	0.02	12.2	42	66.0	58.7	1087	0.130	0.112
ftc03	7	1	76.7	59.3	17.54	247	0.02	15.1	102	68.7	57.4	1126	0.138	0.111
ftl01	7	1	79.6	60.9	17.27	411	0.02	23.5	92	70.6	41.0	1176	0.198	0.176
fwl01	7	1	82.3	63.9	18.78	341	0.09	25.2	95	76.1	47.0	1526	0.191	0.156
gly04	7	1	80.6	60.5	18.19	415	0.20	17.8	111	69.2	47.6	1191	0.201	0.167

Daily data for a month

Station:Kersey 2

Location:4 mi SE Kersey

Elevation:4563

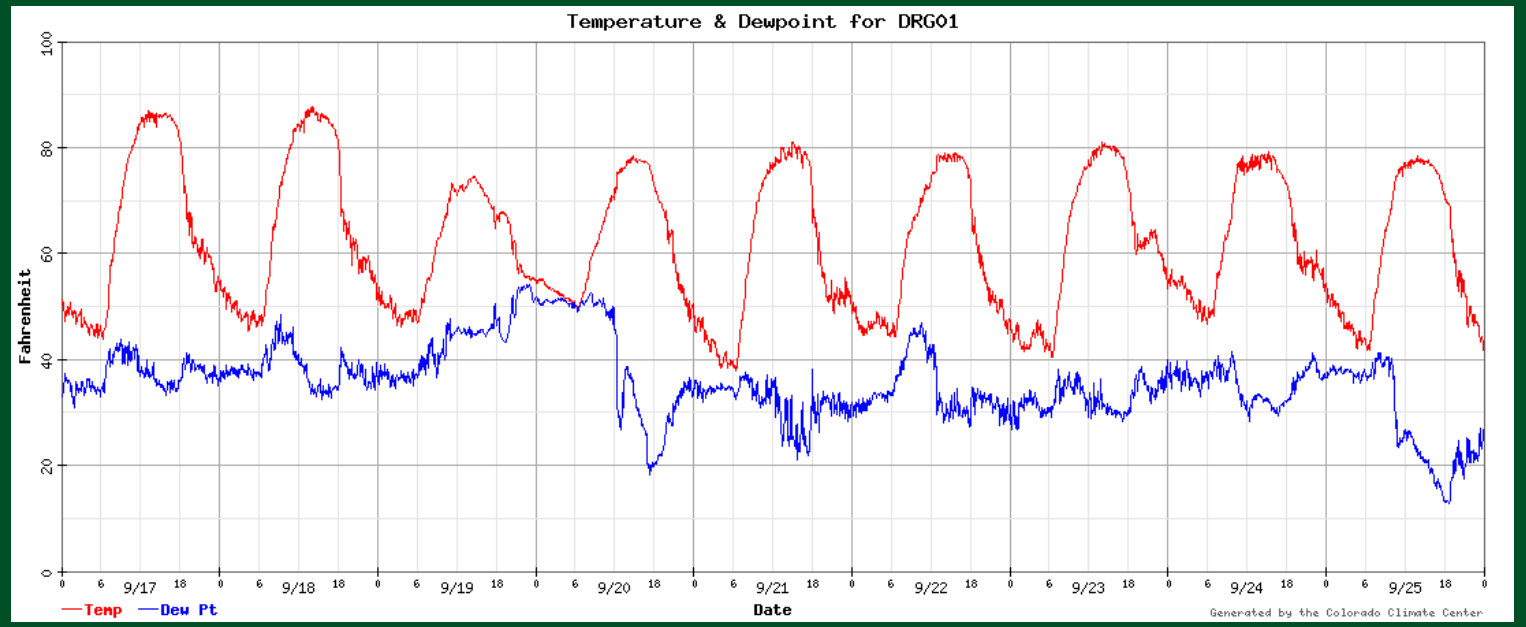
Longitude:104.478

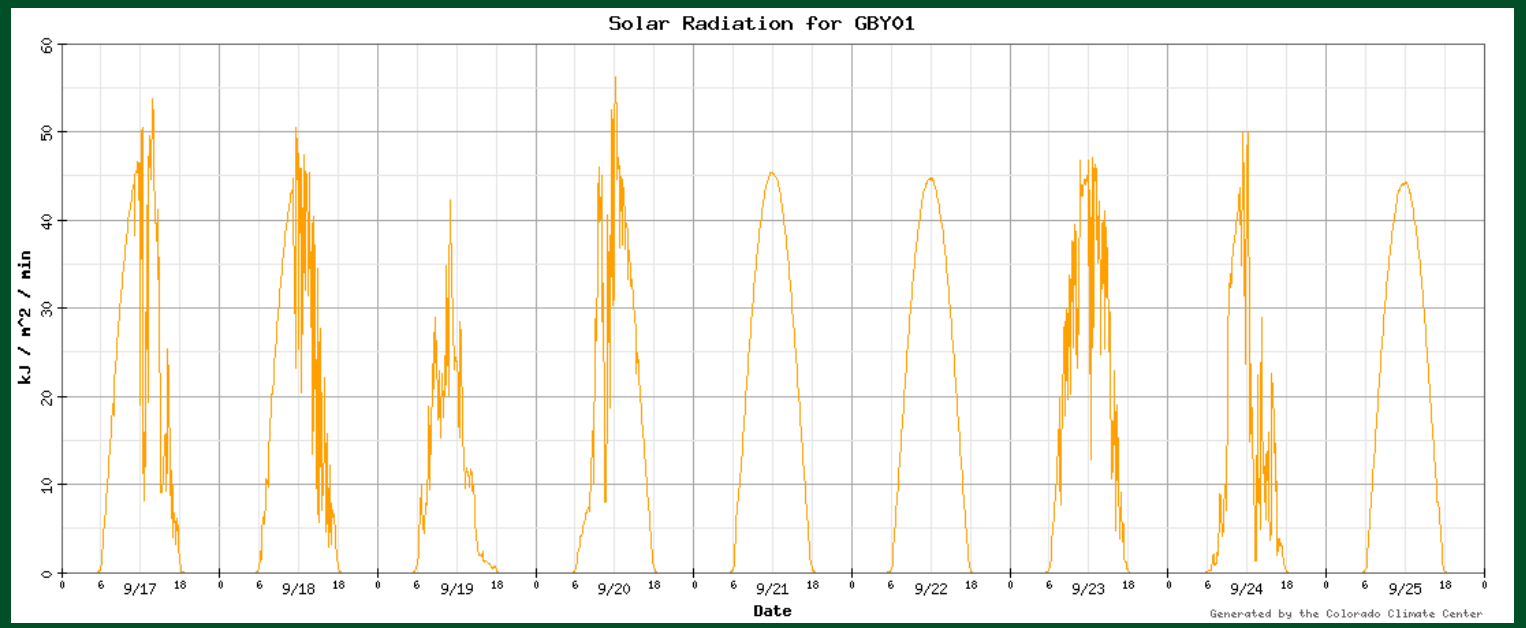
Latitude:40.3629

Summary for Kersey 2 - 06/2017

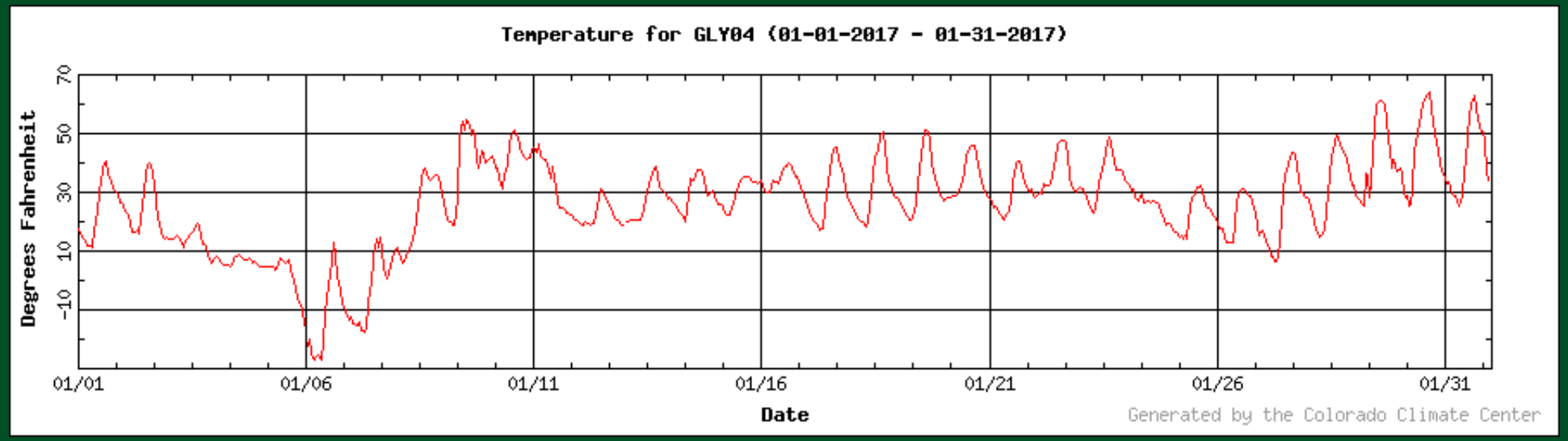
Station	Mon	Day	Tmax Temp degF	Tmin Temp degF	Vapor Press mb	Solar Rad Lngly	Prec in.	Wind Gust mph	Wind Run mi.	Soil Temp degF	Min RH Pct	Grow DgDy F.	P-Kim ET in.	ASCE HLY ET in.
ksy02	6	1	86.6	48.8	11.60	581	0.00	18.0	93	58.6	18.3	856	0.267	0.289
ksy02	6	2	83.9	47.1	11.40	554	0.00	25.0	139	58.7	22.4	873	0.286	0.333
ksy02	6	3	84.2	51.5	10.69	648	0.00	20.0	98	60.0	15.1	891	0.293	0.312
ksy02	6	4	86.8	46.2	10.06	721	0.00	14.0	82	59.7	16.4	909	0.317	0.317
ksy02	6	5	89.7	50.5	11.21	592	0.00	21.7	94	61.5	18.5	927	0.296	0.317
ksy02	6	6	82.8	58.3	13.15	587	0.00	15.5	94	63.2	33.1	947	0.264	0.276
ksy02	6	7	88.6	55.1	14.76	587	0.00	24.9	168	64.3	24.7	968	0.318	0.297
ksy02	6	8	90.2	49.6	13.83	664	0.00	16.0	103	63.5	22.0	986	0.318	0.326
ksy02	6	9	97.8	51.7	9.87	689	0.00	16.7	123	64.8	5.6	1005	0.395	0.406
ksy02	6	10	92.9	54.3	11.35	636	0.00	23.9	213	66.2	19.1	1025	0.424	0.488
ksy02	6	11	85.1	51.2	13.65	627	0.00	22.5	139	66.4	30.7	1043	0.314	0.317
ksy02	6	12	97.3	59.9	14.58	608	0.00	35.6	253	68.4	7.8	1066	0.445	0.487
ksy02	6	13	81.6	49.5	6.23	615	0.00	16.0	90	66.2	9.7	1082	0.324	0.292
ksy02	6	14	88.9	45.6	7.02	635	0.00	14.0	86	63.9	11.1	1100	0.342	0.321
ksy02	6	15	91.3	47.8	7.57	606	0.00	14.2	63	65.0	9.1	1118	0.317	0.286
ksy02	6	16	94.4	49.7	9.52	569	0.00	17.8	103	65.6	11.5	1136	0.336	0.352
ksy02	6	17	82.5	54.4	11.41	380	0.00	25.4	131	67.2	31.5	1154	0.258	0.237
ksy02	6	18	87.4	53.5	9.71	654	0.00	17.7	83	66.0	17.9	1174	0.318	0.290
ksy02	6	19	87.6	52.2	10.37	625	0.00	14.5	94	66.8	19.8	1193	0.318	0.302
ksy02	6	20	99.6	55.1	10.79	635	0.00	29.4	97	68.0	10.2	1214	0.360	0.321
ksy02	6	21	100.9	60.9	10.55	650	0.00	22.2	121	71.1	8.2	1237	0.393	0.424
ksy02	6	22	88.4	57.5	12.09	425	0.00	23.7	156	71.0	22.6	1259	0.323	0.335
ksy02	6	23	68.7	50.7	11.44	485	0.25	22.9	105	66.3	41.3	1269	0.237	0.175
ksy02	6	24	79.8	48.8	10.92	637	0.00	21.2	110	63.3	30.3	1284	0.301	0.278
ksy02	6	25	75.1	53.2	13.38	379	0.00	12.0	104	64.3	46.3	1298	0.191	0.152
ksy02	6	26	90.3	50.9	13.25	689	0.00	20.5	128	63.3	18.7	1316	0.333	0.327
ksy02	6	27	99.7	55.7	12.05	602	0.00	27.0	126	66.6	9.0	1337	0.367	0.338
ksy02	6	28	91.8	51.2	9.97	633	0.02	33.4	112	66.6	14.1	1356	0.357	0.353
ksy02	6	29	86.8	52.3	11.26	561	0.26	19.7	127	67.2	18.0	1375	0.326	0.302
ksy02	6	30	77.0	53.8	12.45	633	0.06	11.5	60	64.8	32.1	1390	0.260	0.220

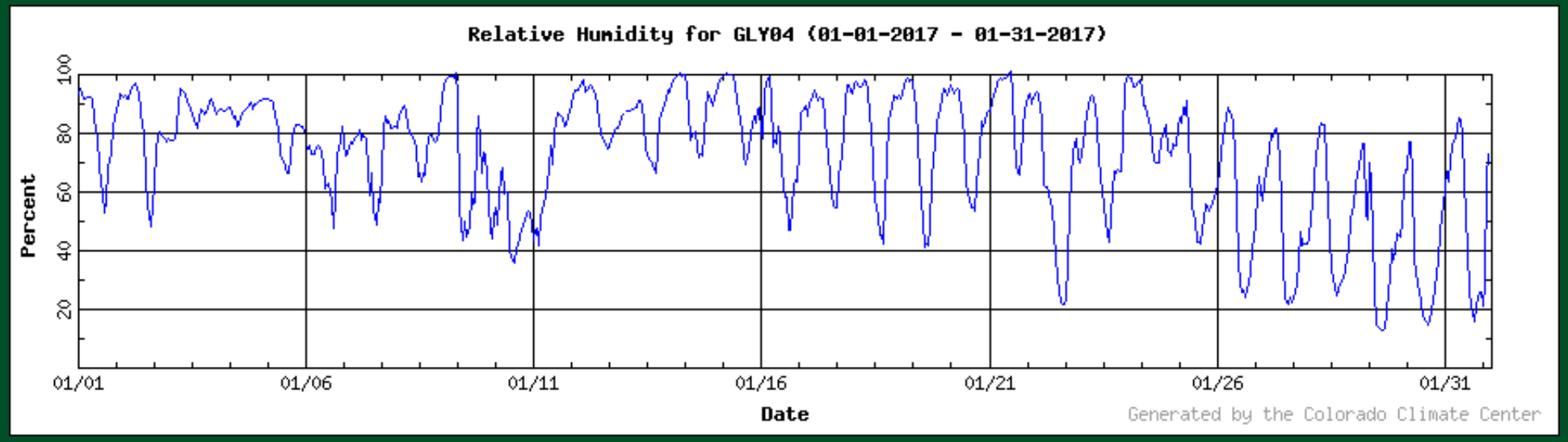
Five minute data



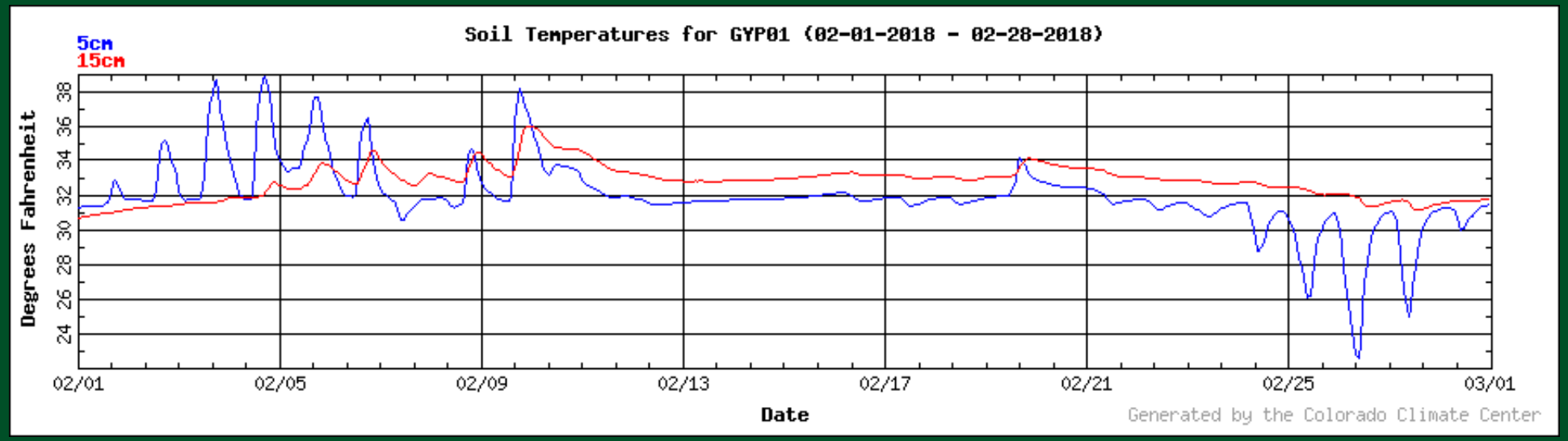


Hourly Data


Temperature for GLY04 (01-01-2017 - 01-31-2017)
Degrees Fahrenheit
70
50
30
10
-10
01/01
01/06
01/11
01/16
01/21
01/26
01/31
Date
Generated by the Colorado Climate Center

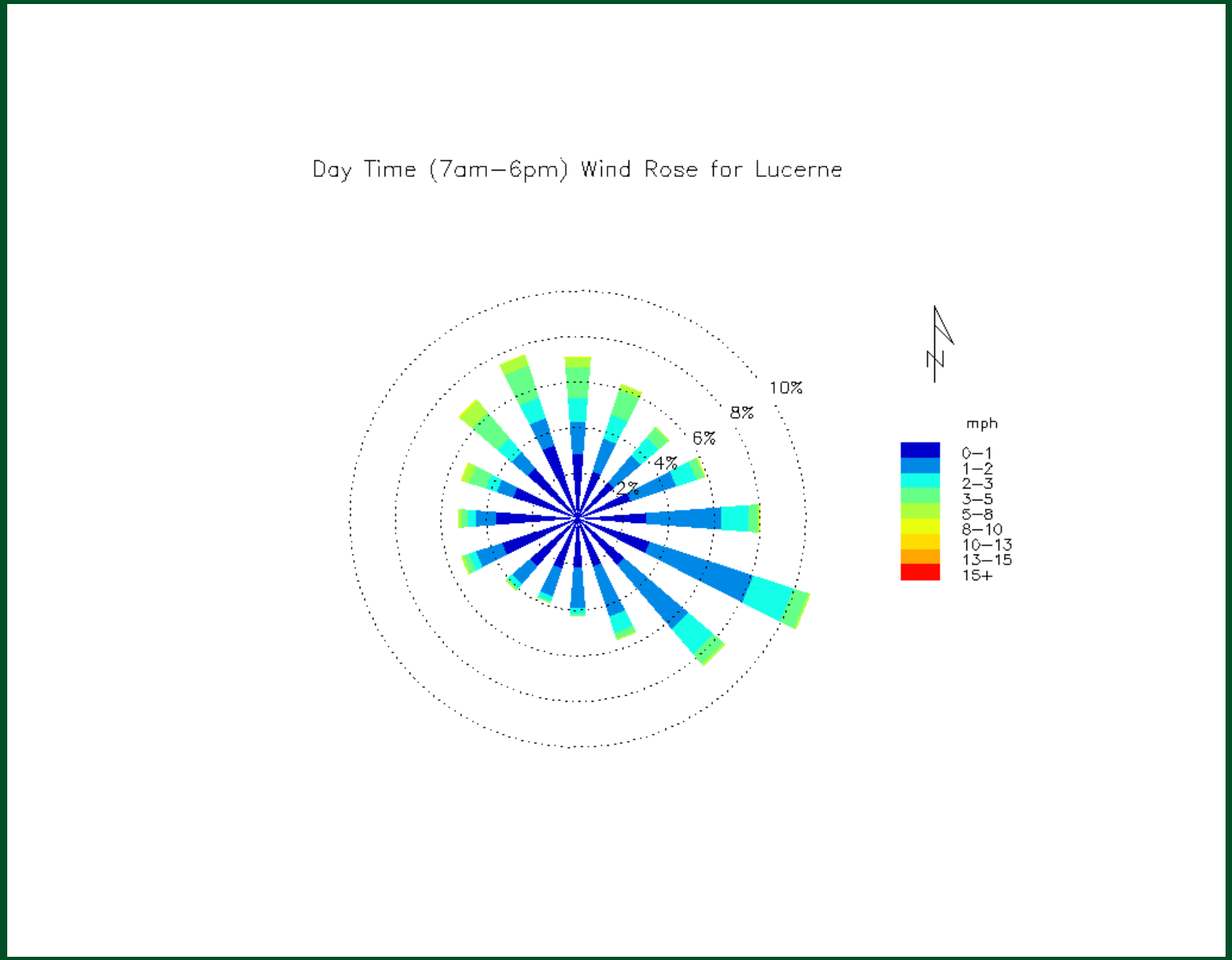

Relative Humidity for GLY04 (01-01-2017 - 01-31-2017)
Percent
100
80
60
40
20
01/01
01/06
01/11
01/16
01/21
01/26
01/31
Date
Generated by the Colorado Climate Center

Soil Temperatures

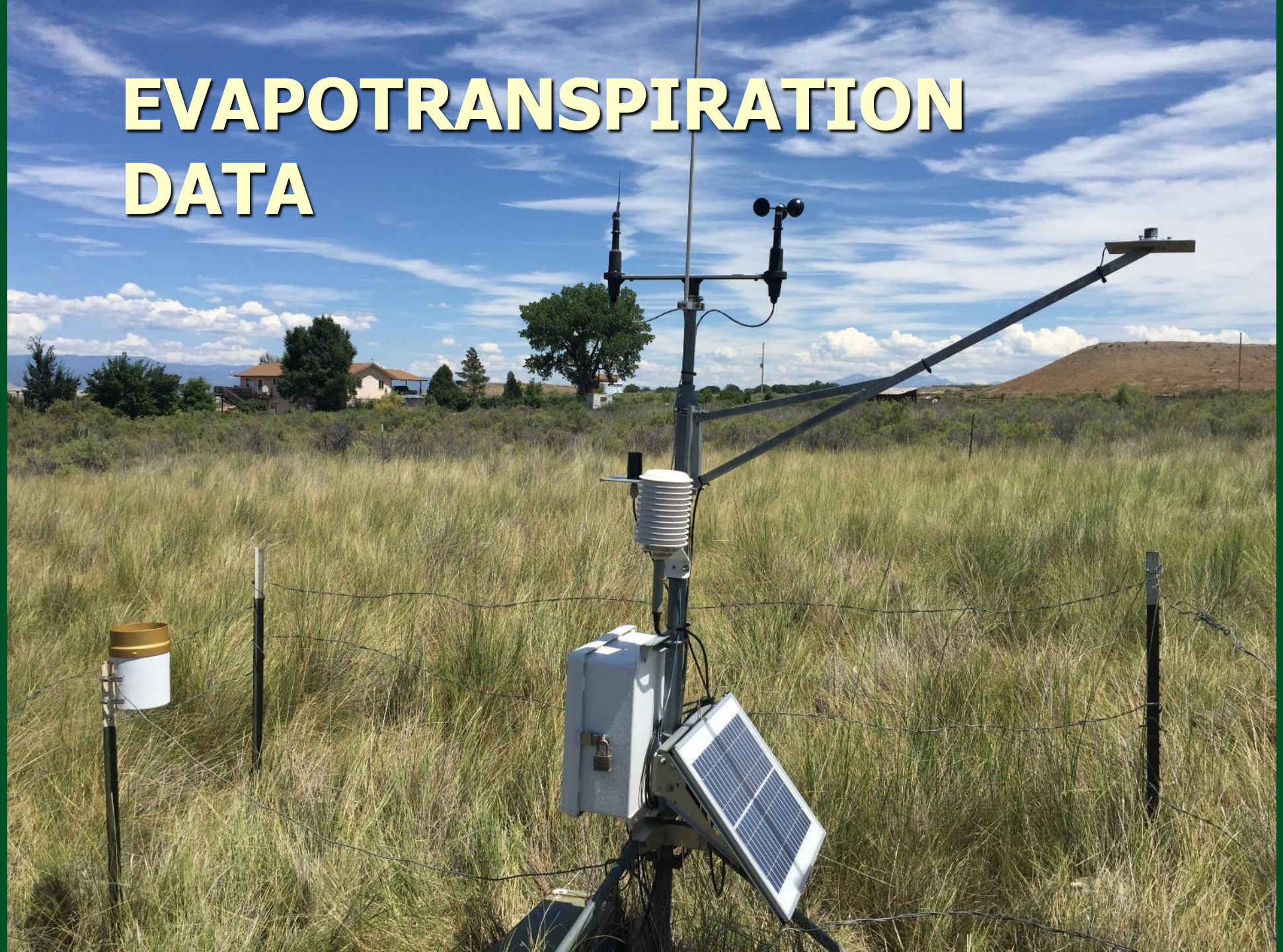


Can you see the difference between when the ground was snow covered and when it was free of snow?

Wind summaries



EVAPOTRANSPIRATION DATA



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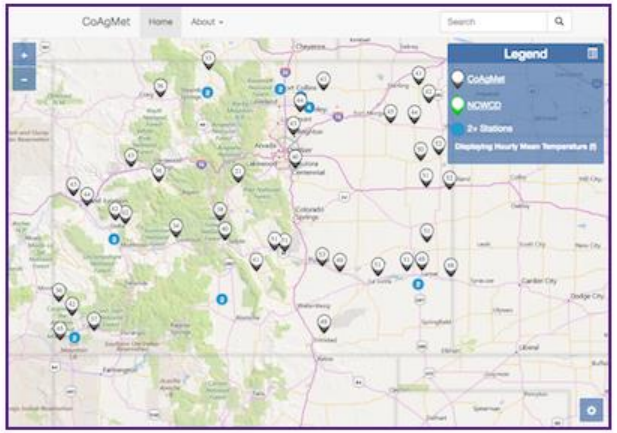

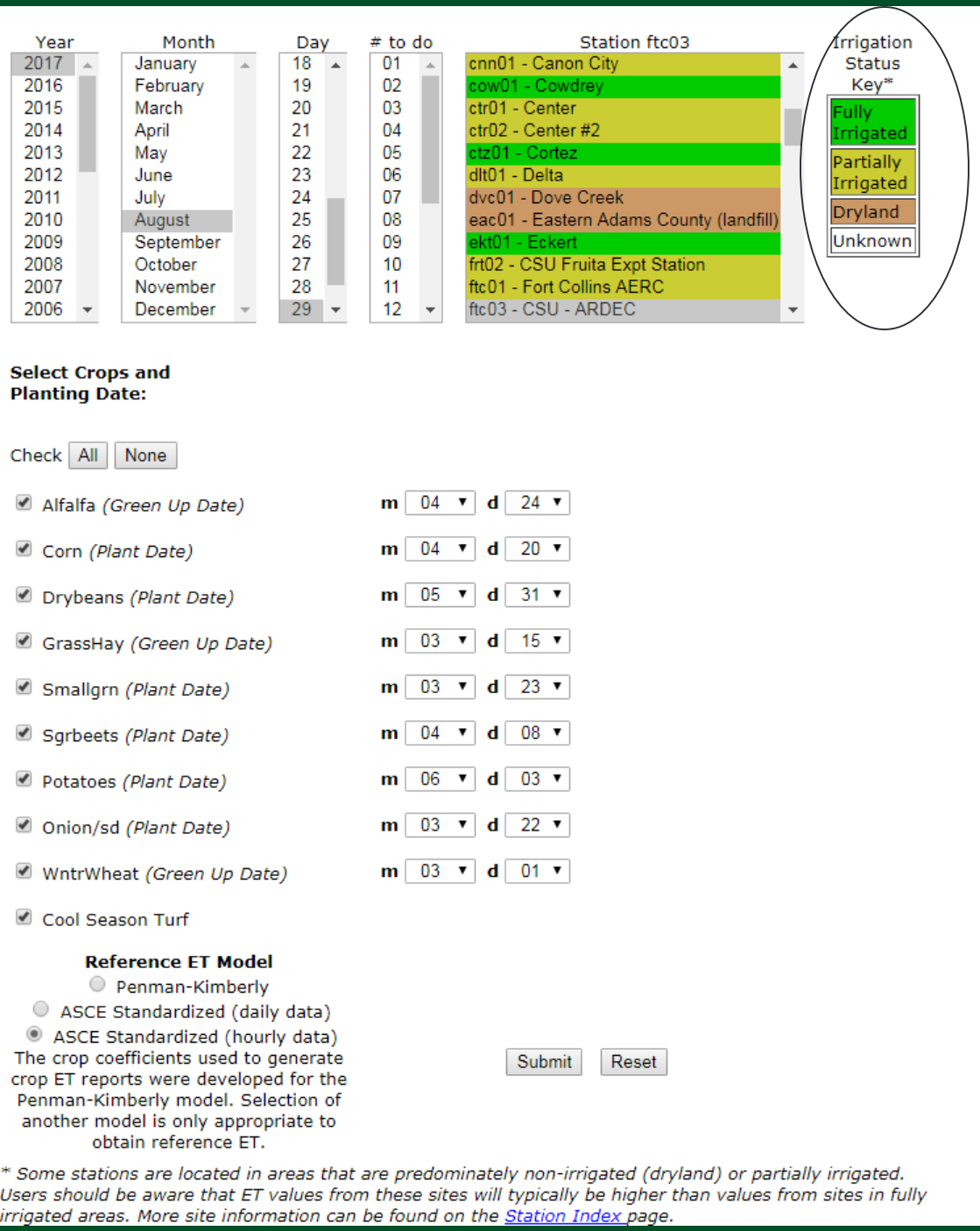

Key gives irrigation status by color

Select from a number of crop types.

Select Ref ET Model

CoAgMET Extended Crop Evapotranspiration

Station: Fort Collins AERC
Location: Fort Collins AERC
Elevation: 5120
Longitude: 105.1370
Latitude: 40.5947

Crop Evapotranspiration in Inches

Date	Alfalfa	Corn	Drybeans	GrassHay	Smallgrn	Sgrbeets	Potatoes	Onion/sd	WntrWheat	Turf	ETr	ETo	Precip
09/06/2018	0.15	0.13	0.15	0.13	0.03	0.15	0.13	0.12	0.03	0.10	0.15	0.13	0.00
09/07/2018	0.18	0.16	0.18	0.15	0.04	0.18	0.16	0.14	0.04	0.12	0.18	0.15	0.00
09/08/2018	0.17	0.15	0.17	0.15	0.04	0.17	0.16	0.14	0.04	0.12	0.17	0.15	0.00
09/09/2018	0.18	0.16	0.18	0.16	0.04	0.18	0.17	0.15	0.04	0.12	0.18	0.16	0.00
09/10/2018	0.20	0.17	0.20	0.17	0.04	0.19	0.18	0.16	0.04	0.13	0.20	0.18	0.00
09/11/2018	0.16	0.13	0.16	0.14	0.03	0.15	0.14	0.13	0.03	0.11	0.16	0.14	0.00
09/12/2018	0.23	0.19	0.23	0.20	0.05	0.23	0.21	0.18	0.05	0.16	0.23	0.19	0.00
09/13/2018	0.25	0.20	0.25	0.22	0.05	0.24	0.22	0.19	0.05	0.17	0.25	0.21	0.00
09/14/2018	0.24	0.20	0.24	0.21	0.05	0.24	0.22	0.18	0.05	0.16	0.24	0.19	0.00
09/15/2018	0.22	0.17	0.22	0.19	0.05	0.21	0.20	0.16	0.05	0.15	0.22	0.18	0.00
09/16/2018	0.20	0.16	0.20	0.17	0.04	0.19	0.18	0.14	0.04	0.13	0.20	0.17	0.00
09/17/2018	0.18	0.14	0.18	0.16	0.04	0.18	0.16	0.13	0.04	0.12	0.18	0.17	0.00
09/18/2018	0.19	0.14	0.19	0.16	0.04	0.18	0.17	0.13	0.04	0.12	0.19	0.16	0.00
09/19/2018	0.16	0.12	0.16	0.14	0.04	0.16	0.15	0.11	0.04	0.11	0.16	0.14	0.44
09/20/2018	0.20	0.15	0.20	0.17	0.04	0.19	0.18	0.13	0.04	0.13	0.20	0.17	0.00
09/21/2018	0.17	0.12	0.17	0.15	0.04	0.16	0.15	0.11	0.04	0.11	0.17	0.13	0.00
09/22/2018	0.19	0.13	0.19	0.16	0.04	0.18	0.17	0.11	0.04	0.12	0.19	0.15	0.00
09/23/2018	0.15	0.10	0.15	0.13	0.03	0.14	0.13	0.08	0.03	0.09	0.15	0.12	0.00
09/24/2018	0.18	0.12	0.18	0.15	0.04	0.17	0.16	0.10	0.04	0.11	0.18	0.15	0.00
09/25/2018	0.18	0.12	0.18	0.15	0.04	0.17	0.16	0.09	0.04	0.11	0.18	0.13	0.00
Sum	3.77	2.97	3.77	3.28	0.83	3.64	3.39	2.67	0.83	2.49	3.77	3.16	0.44
Average	0.19	0.15	0.19	0.16	0.04	0.18	0.17	0.13	0.04	0.12	0.19	0.16	0.02

ET reports by region

CoAgMet/NCWCD Meteorological Data for 8/29/2017

	North Front Range							
	FtColl	ARDEC	HortFm	Lovlnd	Cherpk	Lngmnt	Parker	
HiTemp	91	89	89	91	88	91	94	degF
LoTemp	52	53	50	54	56	51	62	degF
Precip	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in
P/Month	2.16	2.14	3.26	2.00	2.17	1.11	1.66	in
P/Year	10.17	4.02i	11.42	11.44	9.68	9.00	3.41i	in
WindGst	12.5	16.8	19.2	13.5	18.8	19.1	25.0	mph
Ref ET	0.20	0.26	0.25	0.20	0.26	0.23	0.32	in
GrowDD	2347	1191	2357	2594	2109	2331	1635	degF
5cm Soil	62.6	68.3	m	m	66.1	m	71.6	degF
Crop Evapotranspiration								
Alfalfa	0.21	0.26	0.25	0.20	0.26	0.23	0.32	in
Corn	0.20	0.24	0.15	0.19	0.20	0.18	0.11	in
Drybeans	0.21	0.26	0.25	0.20	0.26	0.23	0.32	in
GrassHay	0.18	0.22	0.22	0.17	0.22	0.20	0.28	in
Smallgrn	0.05	0.06	0.05	0.04	0.06	0.05	0.07	in
Sgrbeets	0.21	0.26	0.22	0.20	0.25	0.23	0.26	in
Potatoes	0.18	0.23	0.22	0.18	0.23	0.21	0.29	in
Onion/sd	0.16	0.21	0.11	0.16	0.18	0.17	0.14	in
WntrWheat	0.05	0.06	0.15	0.04	0.06	0.05	0.32	in

CoAgMet/NCWCD Meteorological Data for 8/29/2017

	North Central									
	Peckhm	Kersey	Kersey	Lucern	Greely	Gilcrs	FtLptn	Ault	Brigsd	
HiTemp	93	94	96	92	m	92	95	91	95	degF
LoTemp	52	50	52	50	m	50	58	51	47	degF
Precip	0.00	0.00	0.00	0.00	m	0.00	0.00	0.00	0.45	in
P/Month	2.11	1.58	1.85	0.63	1.84i	1.72	1.04	3.40	2.11	in
P/Year	2.28i	12.78i	8.75i	15.53i	11.37i	11.06	8.74i	13.08	8.85i	in
WindGst	14.3	19.3	18.2	14.8	m	17.0	19.2	14.2	25.9	mph
Ref ET	0.23	0.25	0.25	0.23	m	0.22	0.28	0.27	0.26	in
GrowDD	665	2363	2576	2442	m	2347	2701	2358	2392	degF
5cm Soil	70.0	67.4	70.1	71.3	m	m	72.4	66.1	65.8	degF
Crop Evapotranspiration										
Alfalfa	0.23	0.25	0.25	0.23	m	0.22	0.28	0.27	0.26	in
Corn	0.10	0.22	0.15	0.18	m	0.20	0.16	0.19	0.18	in
Drybeans	0.23	0.25	0.25	0.23	m	0.22	0.28	0.27	0.26	in
GrassHay	0.20	0.22	0.22	0.20	m	0.19	0.24	0.23	0.23	in
Smallgrn	0.05	0.05	0.06	0.05	m	0.05	0.06	0.06	0.06	in
Sgrbeets	0.19	0.24	0.23	0.22	m	0.22	0.25	0.25	0.25	in
Potatoes	0.21	0.22	0.23	0.20	m	0.20	0.25	0.24	0.24	in
Onion/sd	0.10	0.20	0.11	0.16	m	0.17	0.12	0.17	0.12	in
WntrWheat	0.23	0.05	0.08	0.05	m	0.05	0.24	0.06	0.08	in

CoAgMet/NCWCD Meteorological Data for 8/29/2017

Lower South Platte

COLORADO STATE UNIVERSITY | CoAgMET Colorado's Mesonet

USDA ars

Home | Daily Summaries | Hourly Plots | 5 Min Plots | Water Use (ET) | Map by eRAMS

CoAgMET Homepage

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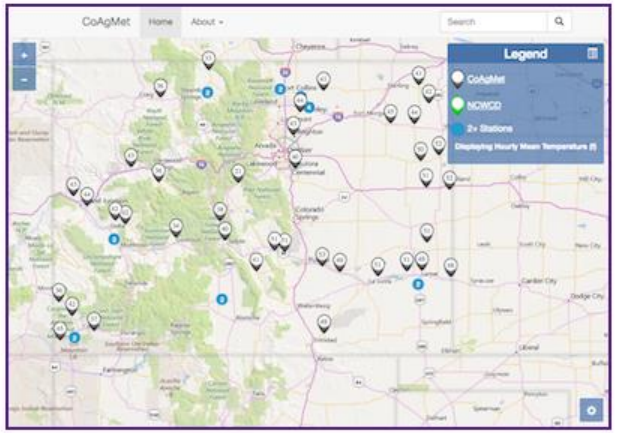
CoAgMET Mapping and Metadata by eRAMS



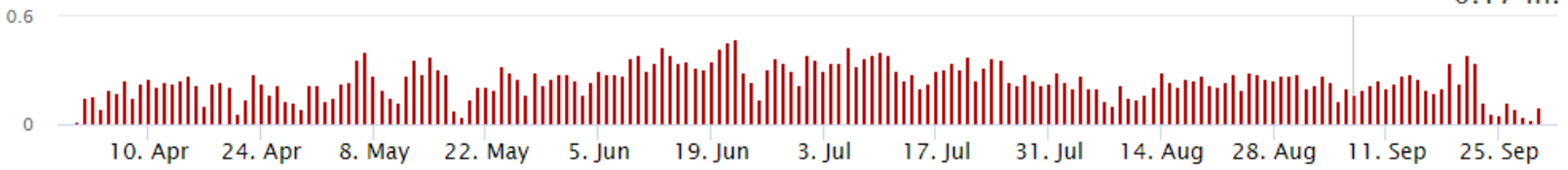
COLORADO CLIMATE CENTER
Providing information and expertise on Colorado's complex climate

Idalia

View Magnitudes | View Anomalies | Change station...

Daily Evapotranspiration

0.17 in.

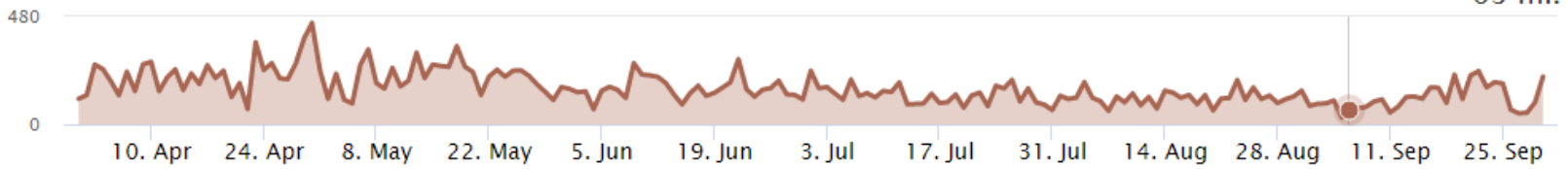


Daily Temperature Range

● : 46.5°F – 84.2°F

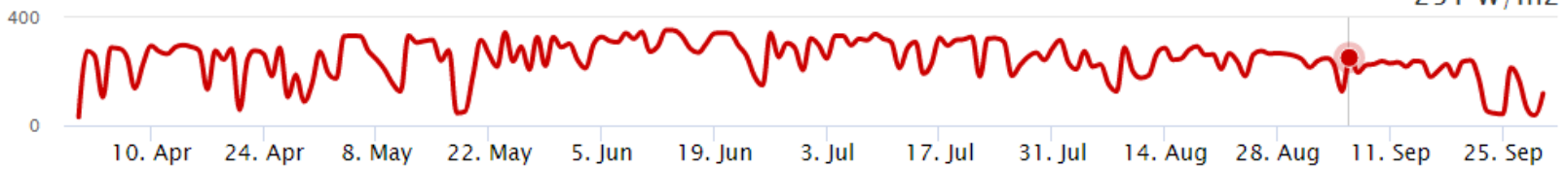
Daily Wind Run

63 mi.



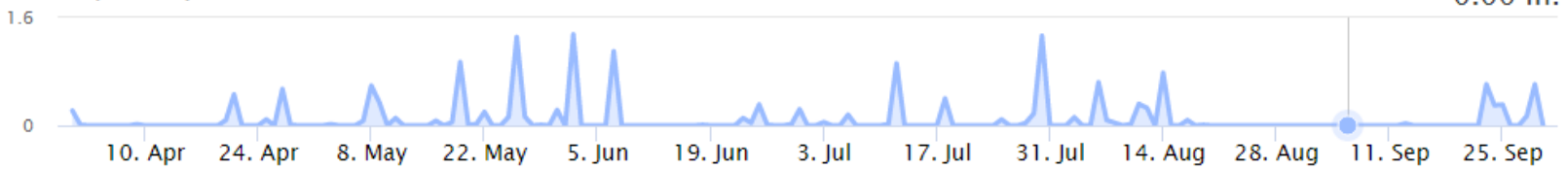
Solar Radiation

251 W/m2



Daily Precipitation

0.00 in.



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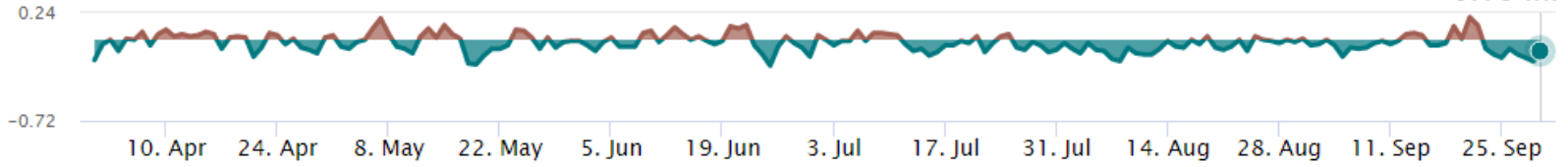
Idalia

View Magnitudes | View Anomalies | Change station...

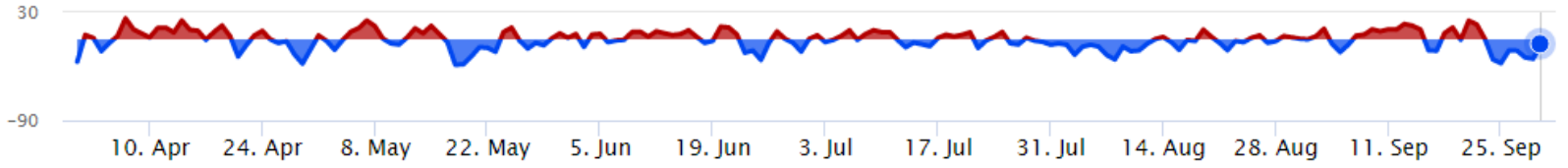
Daily ET Anomalies

-0.10 in.



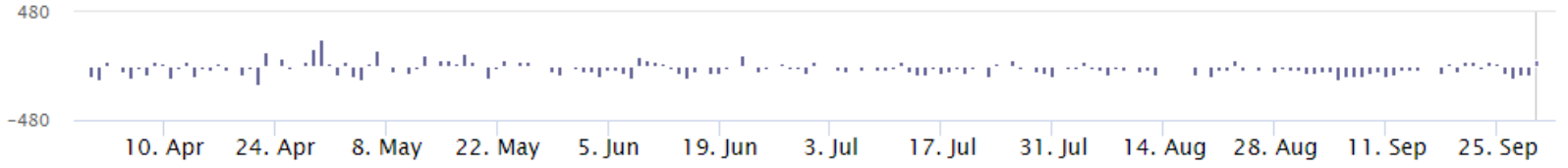
Daily Max Temperature Anomalies

● : -5.0°F



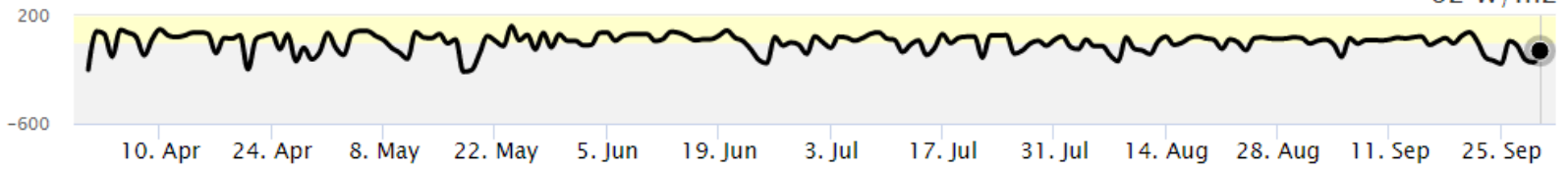
Wind Run Anomalies

58 mi.



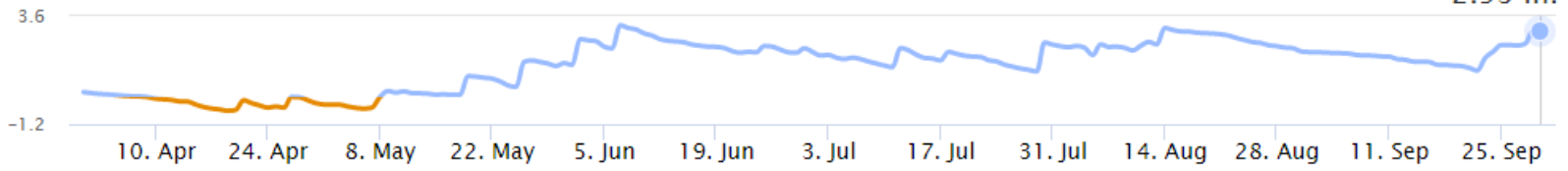
Solar Radiation Anomalies

-62 W/m2



Cumulative Precipitation Anomaly

2.93 in.



COLORADO STATE UNIVERSITY | CoAgMET Colorado's Mesonet | USDA ARS

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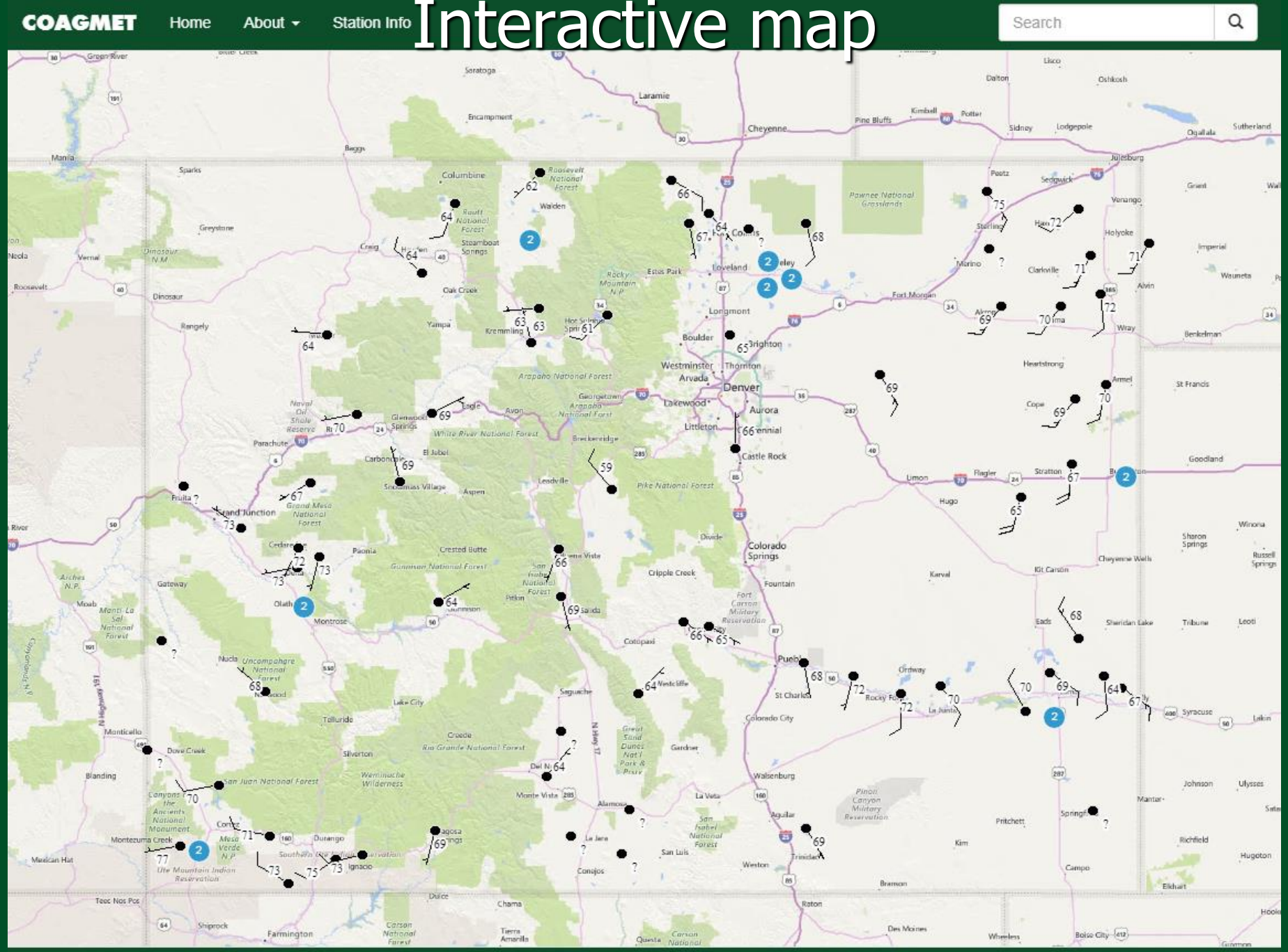
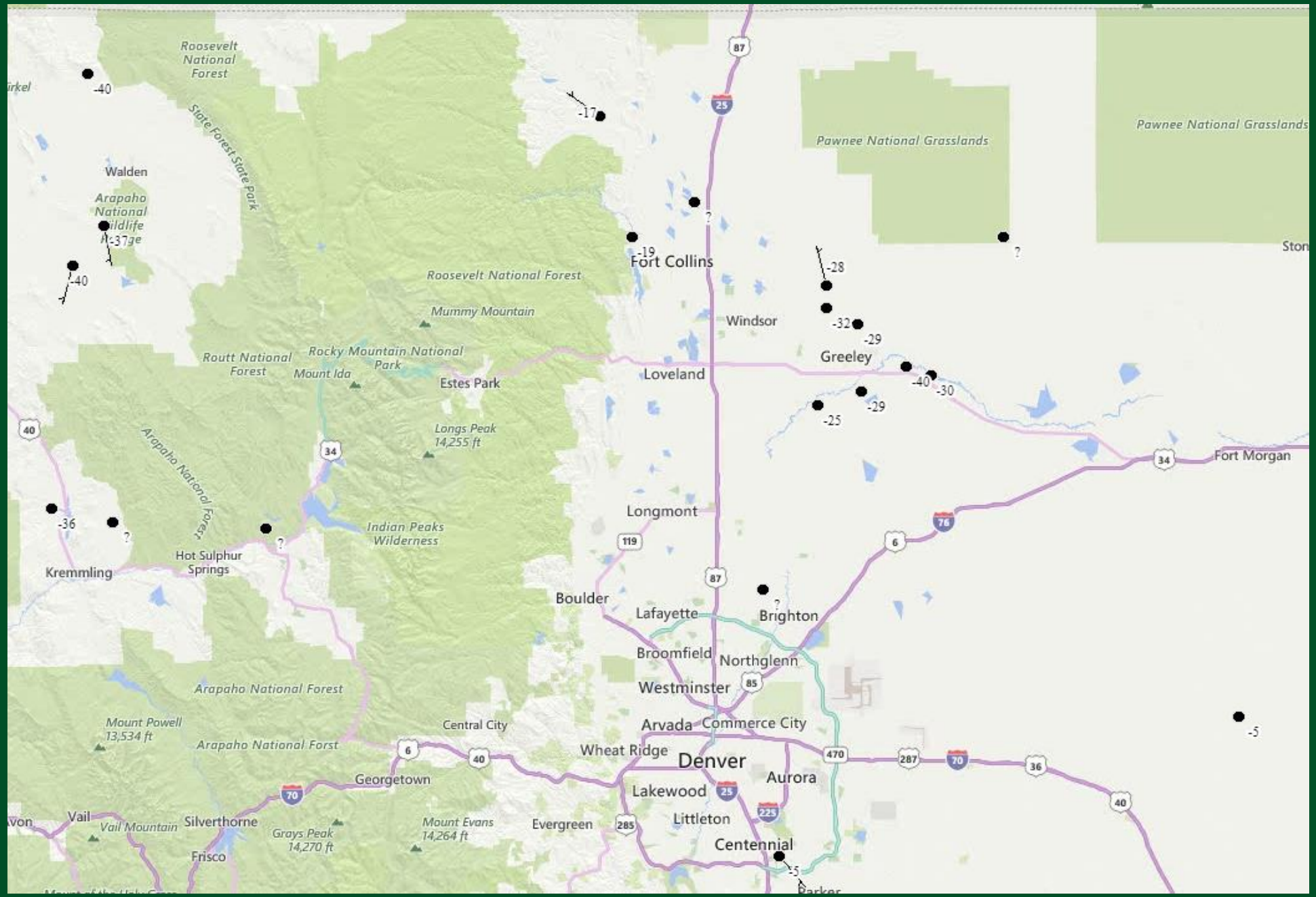
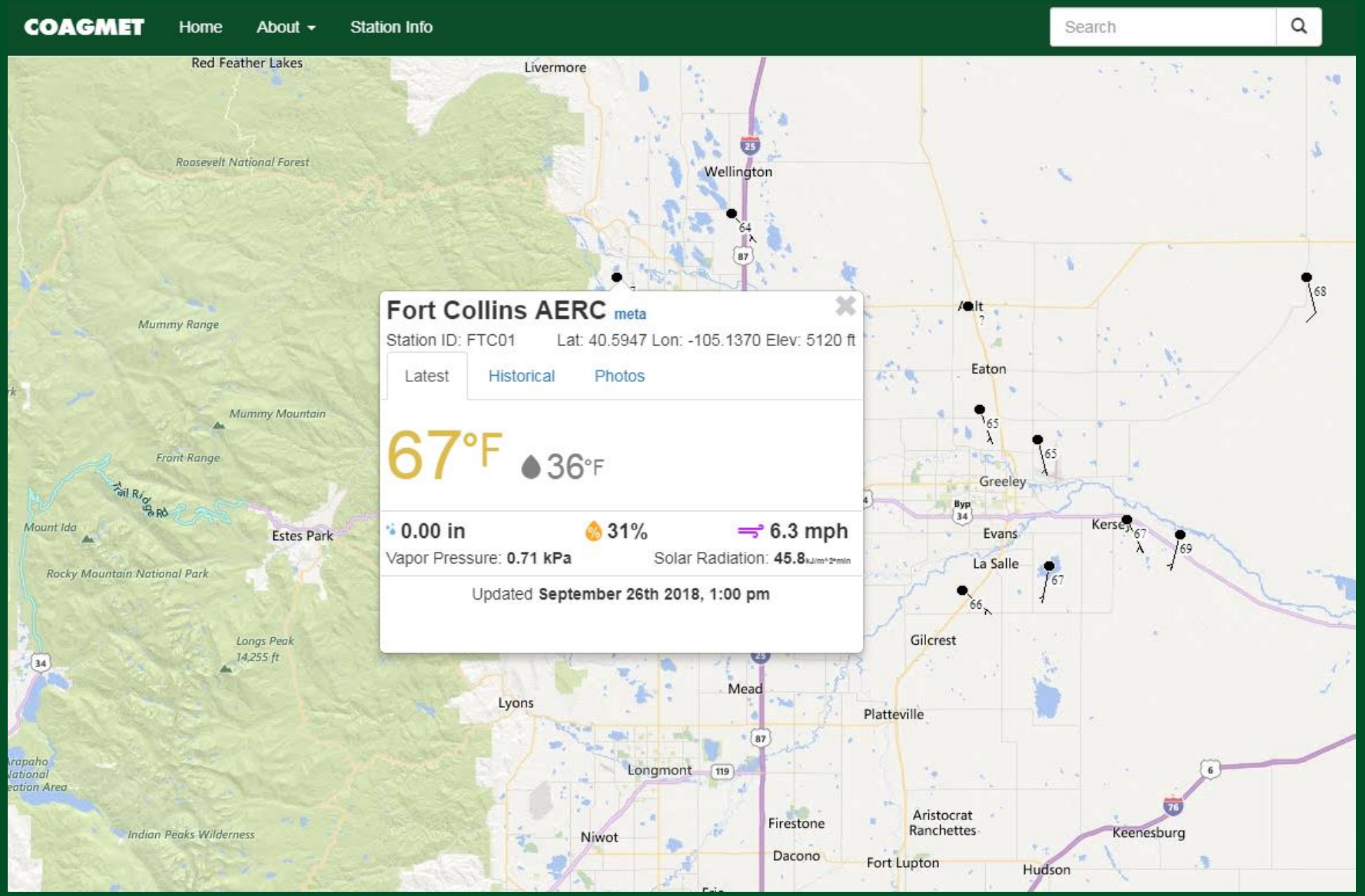
Interactive map




Roosevelt National Forest
State Forest State Park
Walden
Arapaho National Wildlife Refuge
Pawnee National Grasslands
Fort Collins
Windsor
Greeley
Loveland
Roosevelt National Forest
Mummy Mountain
Routt National Forest
Rocky Mountain National Park
Mount Ida
Estes Park
Longs Peak 14,255 ft
Arapaho National Forest
Indian Peaks Wilderness
Fort Morgan
Longmont
Kremmling
Hot Sulphur Springs
Boulder
Lafayette
Brighton
Broomfield
Northglenn
Westminster
Arvada
Commerce City
Denver
Aurora
Lakewood
Littleton
Centennial
Wheat Ridge
Central City
Georgetown
Mount Powell 13,534 ft
Arapaho National Forst
Vail
Vail Mountain
Silverthorne
Frisco
Grays Peak 14,270 ft
Mount Evans 14,264 ft
Evergreen

Real-time data



Maintaining the data

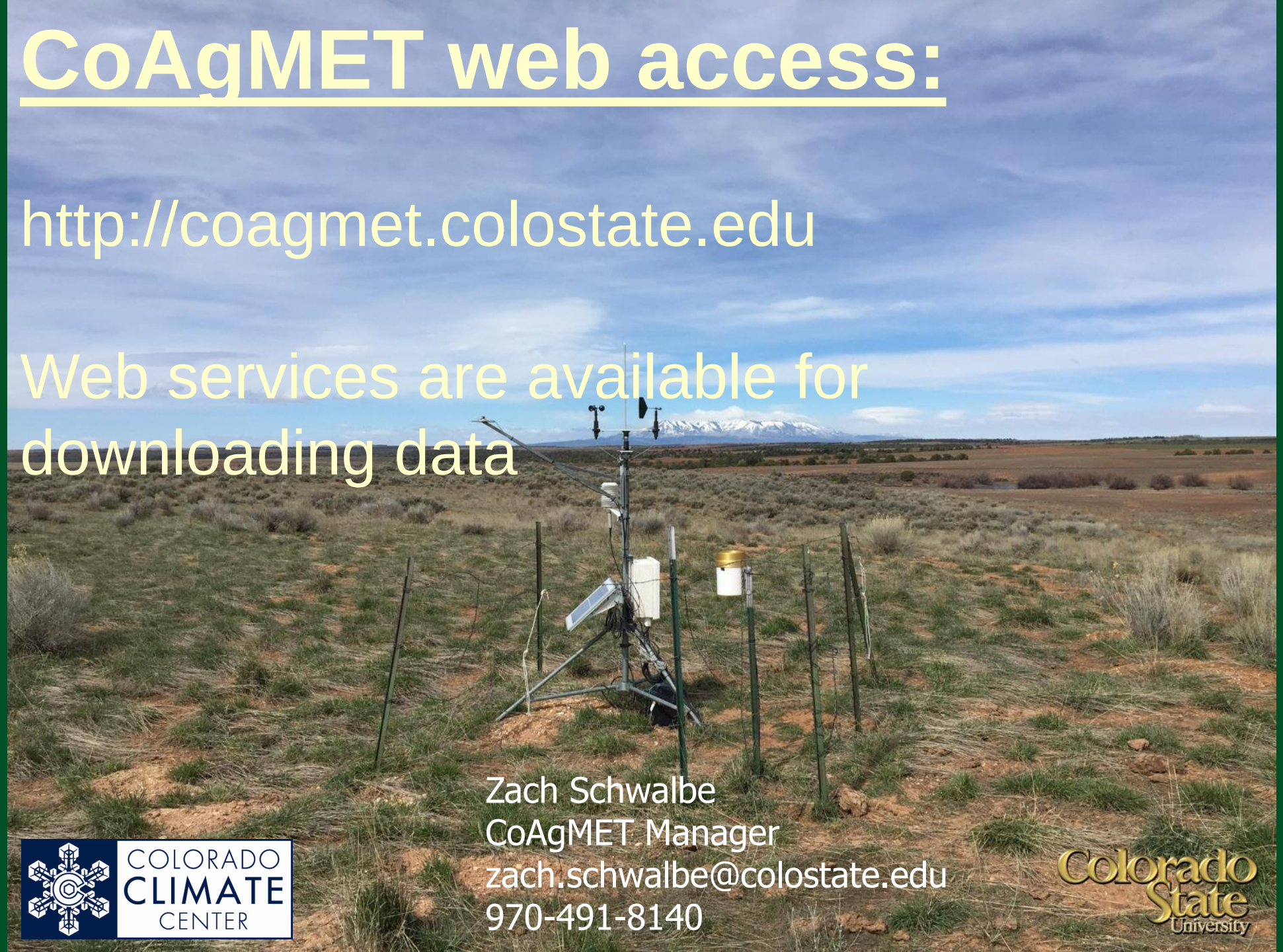
- Our goal is to visit each station at least once a year to make sure the station is operating properly.
  - Sensor are swapped out once every 2 years.
  - Emergency visits to stations when there is a problem with the station causing bad data or an interruption of data.

- Data are quality controlled daily to catch data errors and catch issues with stations before it becomes a problem.

CoAgMET web access:

http://coagmet.colostate.edu

Web services are available for downloading data



Zach Schwalbe
CoAgMET Manager
zach.schwalbe@colostate.edu
970-491-8140

COLORADO CLIMATE CENTER

Colorado State University

The Historic Fort Collins Weather Station

First established in 1872, on the CSU campus since 1879, consistent data since 1889
At current location since 1961

Station Locations

1	R. Q. Tenney's Farm (1872-1874)
2	South of Old Main (1879-1885?)
3	Between Old Main and The Oval (1887-1910)
4	Civil Engineering Bldg. SW of the Oval (1911-1939)
5	The Lagoon (1940-1961)
6	Current position (May 15th, 1961- present)

Nolan Doesken discussing the history of the station:
https://www.youtube.com/watch?v=c-Za8TPTvlc

Collaboration with Colorado Wine Industry Development Board

Photo Credit: Canyon of the Ancients Guest Ranch

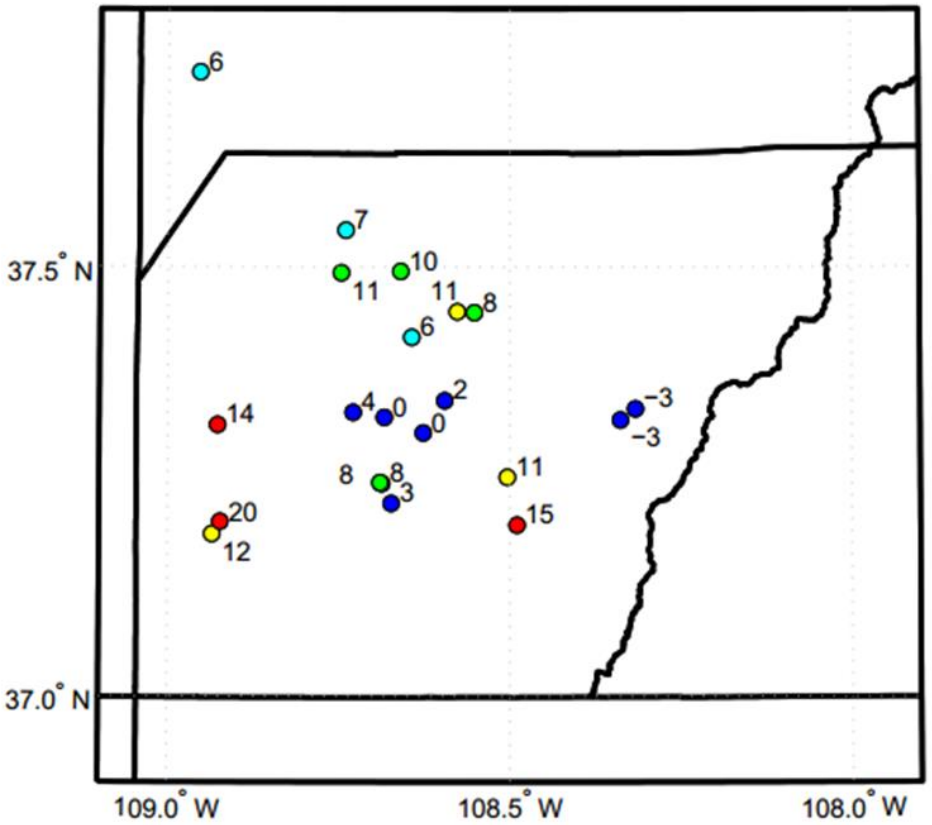
Peter Goble

Climatologist and drought specialist

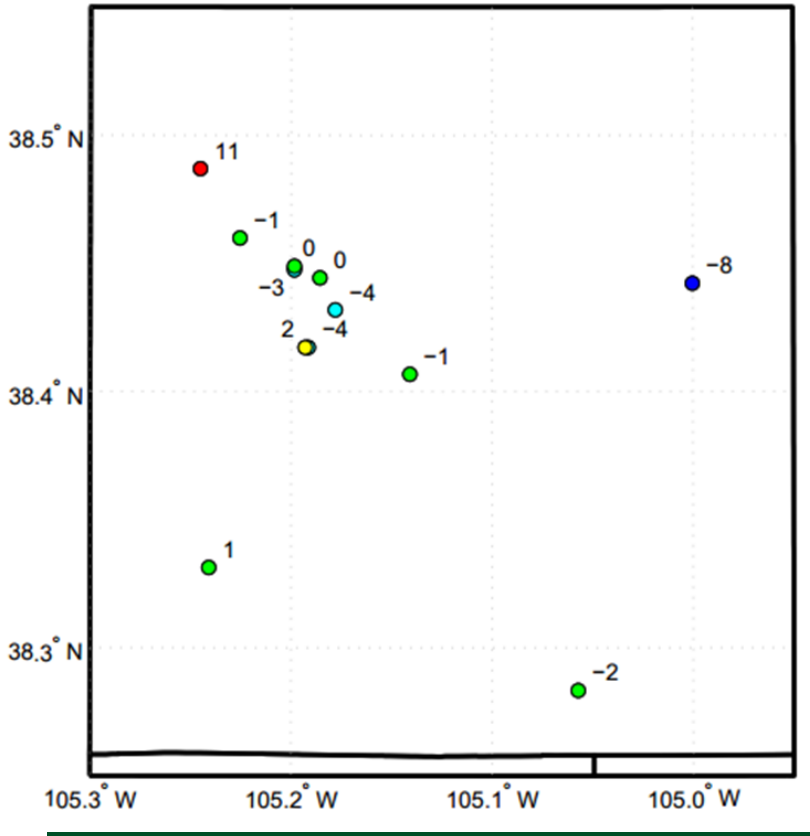
CWIDB

- The largest constraint on wine grape growth in Colorado is plant hardiness
- As the climate warms, more pockets of the state become suitable for an increased quantity and diversity of grapes
- Because of the complexity of western Colorado topography, this involves carefully-placed temperature observations

Montezuma County Minimum Temperatures: January 22nd, 2018

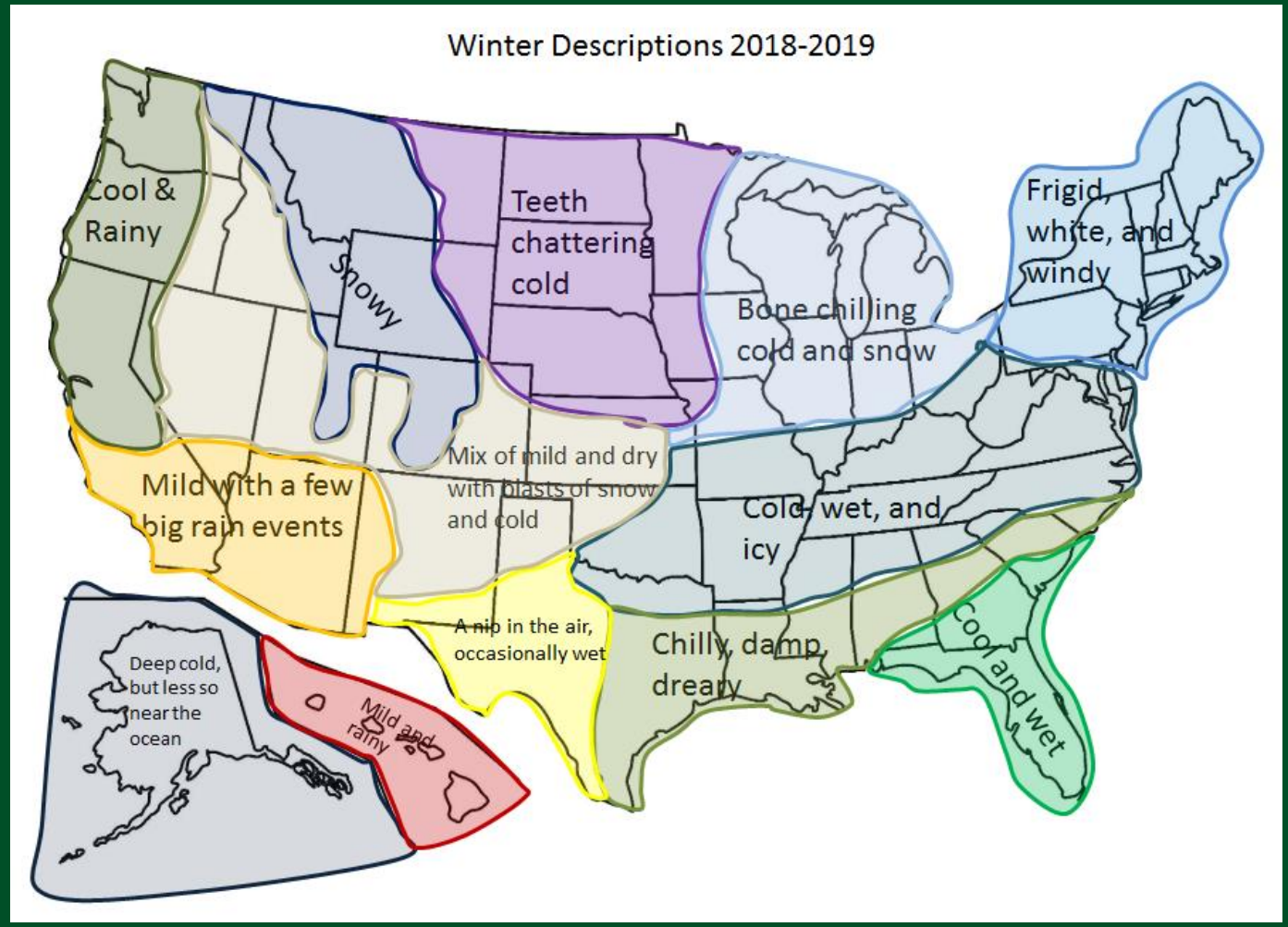


Fremont County Minimum Temperatures: February 11th, 2018

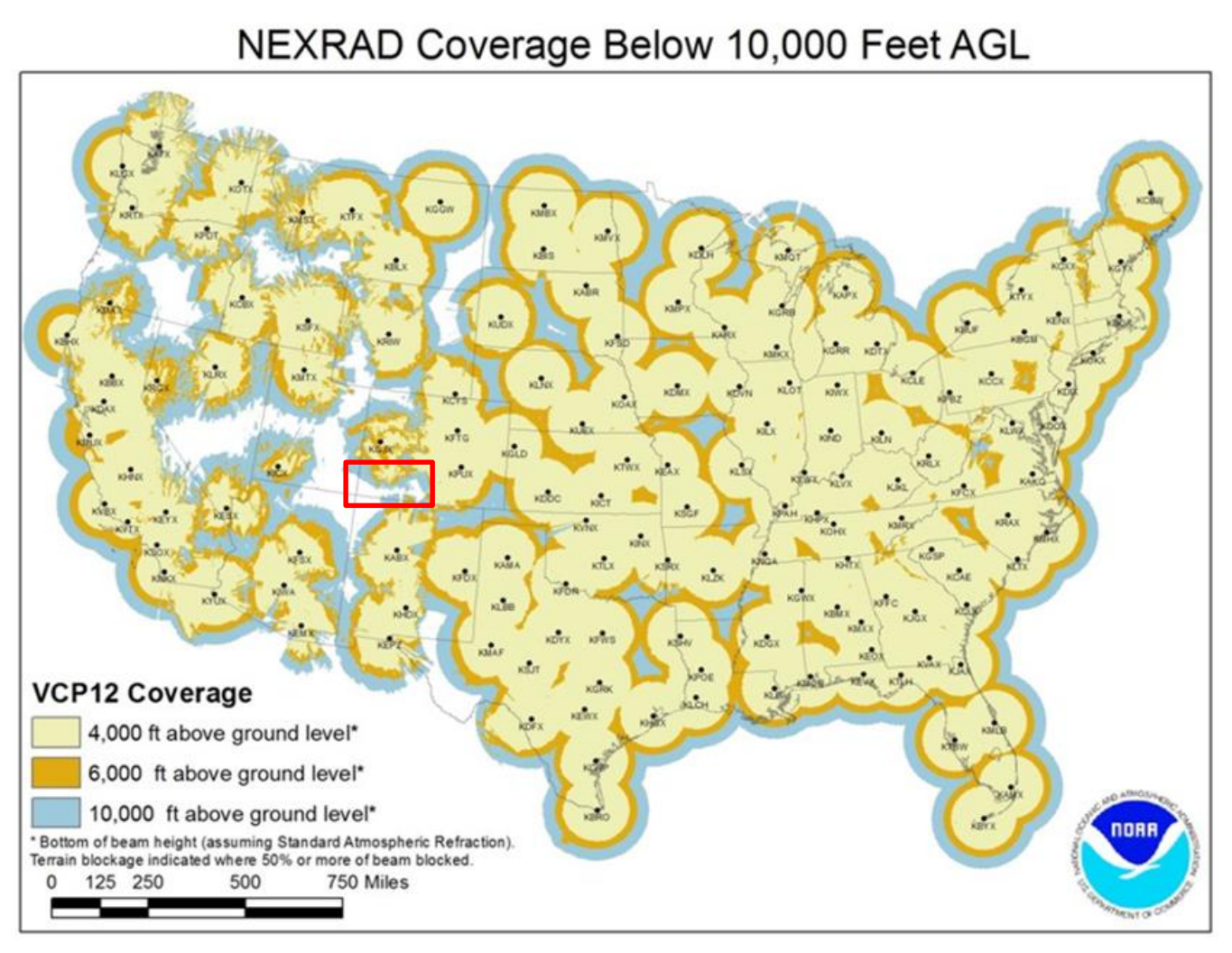


- Dangerous cold winter and spring nights can produce surprising variation in surface temperature
- In general, the coldest nights occur under synoptic high pressure conditions with near-surface inversions where wind patterns are dominated by cold air drainage
- Odds of avoiding freeze damage increase on hill slopes, and near the mouths of canyons where mixing is continuous

Social Media



Hazard Mitigation Grant Program



- The Colorado Climate Center lead a FEMA-commissioned study to assess the biggest data collection gaps in the state for emergency weather events
- Top recommendations were radar coverage in SW CO, and rain/stream gage flood alert networks for the cities of Colorado Springs and Pueblo

Thank you!

- We welcome collaboration ideas and opportunities with the department – please don't hesitate to get in touch (or just walk across the "wind tunnel" to the annex!)

http://climate.colostate.edu/

Follow us on Facebook and Twitter!
@ColoradoClimate

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