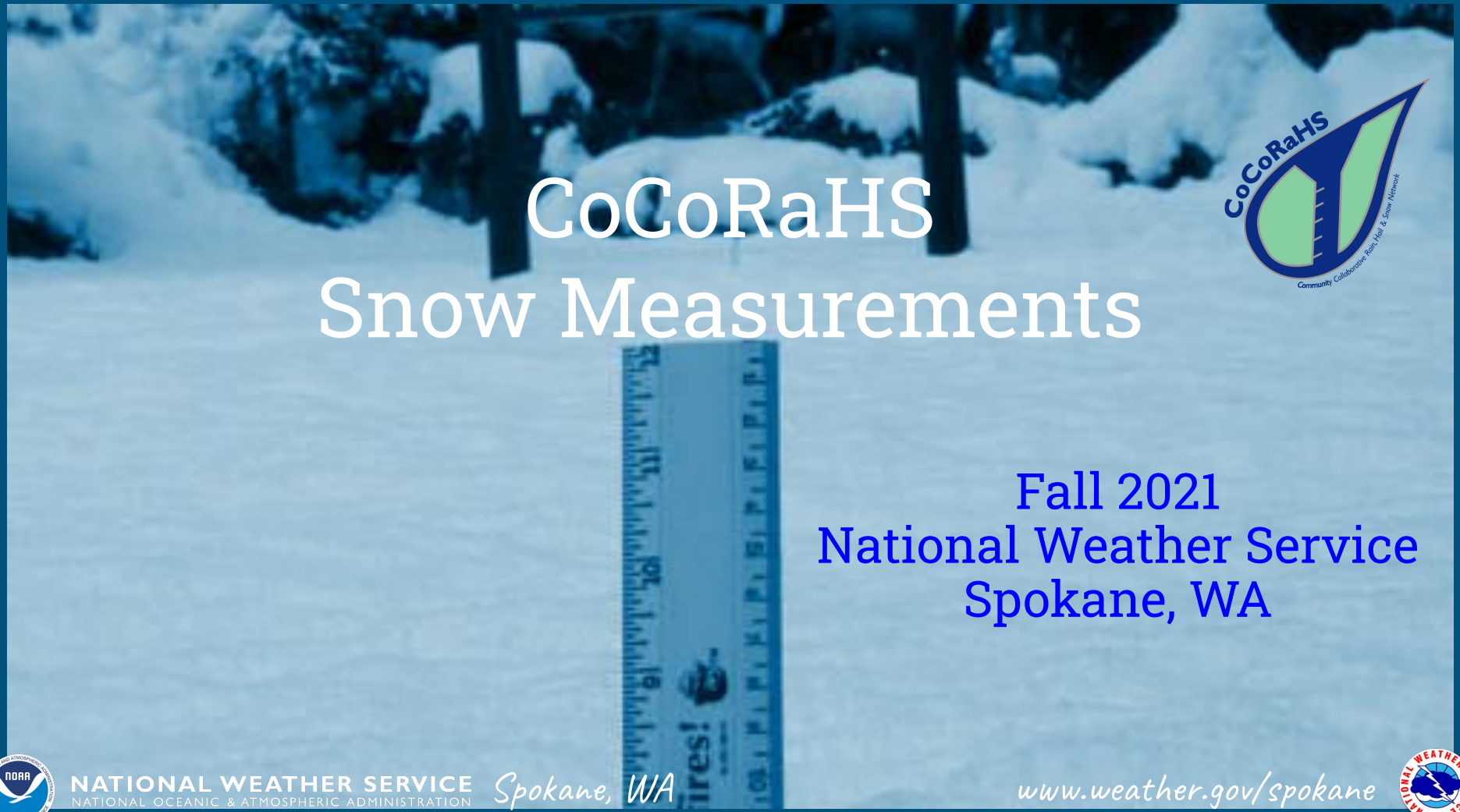
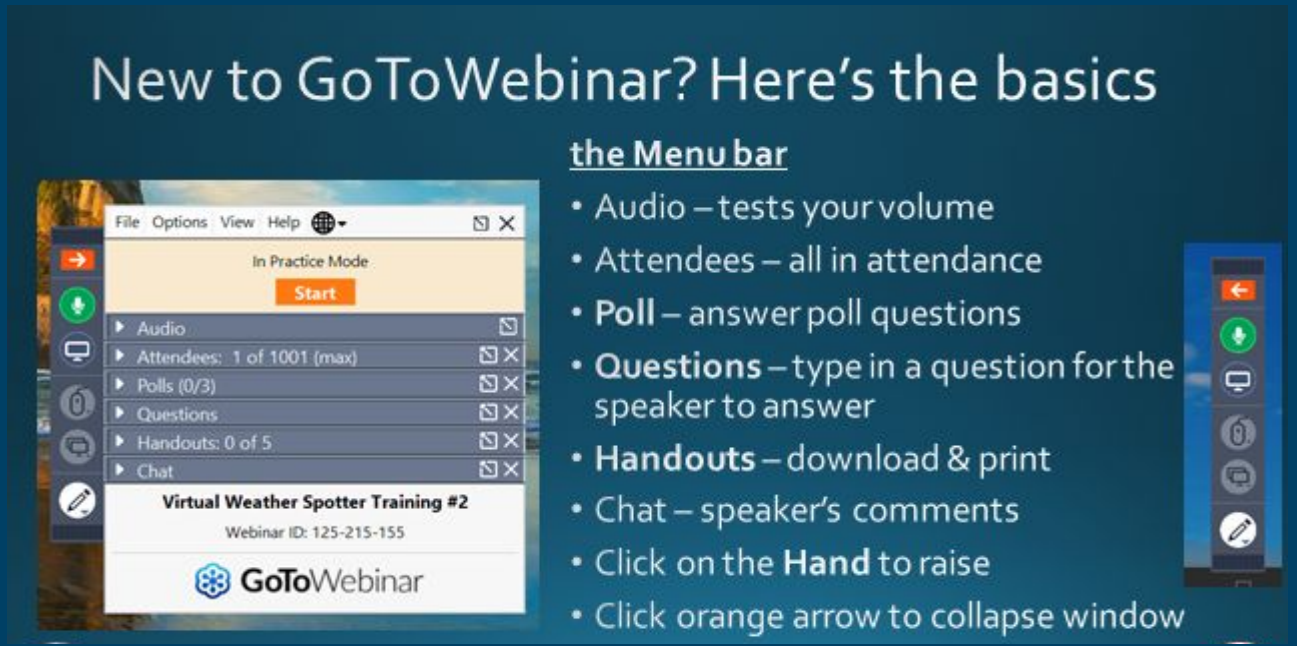


CoCoRaHS
Snow Measurements

Fall 2021
National Weather Service
Spokane, WA

This is a Live Virtual Class

- Voice in Computer - no phone needed - headphones helpful
- All are in listen mode until the end



Objectives

- Understand the importance of the Precipitation Observations
- Learn how to take accurate rain and snow reports
- Learn how to prepare and be safe during hazardous weather
- Receive the Winter Outlook 2021-2022

Now let’s look back at last year…..

October 23-24, 2020 - Early Snowfall

A few snow reports:

8.0” Malo
7.0” Colville
6.9” Spokane
5.0” Newport
5.0” Dover
3.0” Spirit Lake
2.0” Palouse

November 13-14, 2020 - Snow

A few snow reports:

12” Colburn
11.5” Elmira
9” Careywood
7.5” Dover
7” Newport
6” Mazama
3.9” NWS Spokane

January 11-13 - Snow

<u>A few snow reports:</u>

13.9” Lucerne

7.5” Leavenworth

7” Entiat

5.1” Republic

4.5” Boyds

2.5” Clayton

To our current CoCoRaHS observers..

THANK YOU!

Community Collaborative Rain Hail and Snow Network

- NWS Partner
- Fort Collins, Colorado
- Manages sites all over North America
- Began in WA/ID 2008 - 13 year!!!

What is CoCoRaHS?

CoCoRaHS is a national grassroots, non-profit, community-based, high-density precipitation network . . .

. . . made up of volunteers of all ages and backgrounds

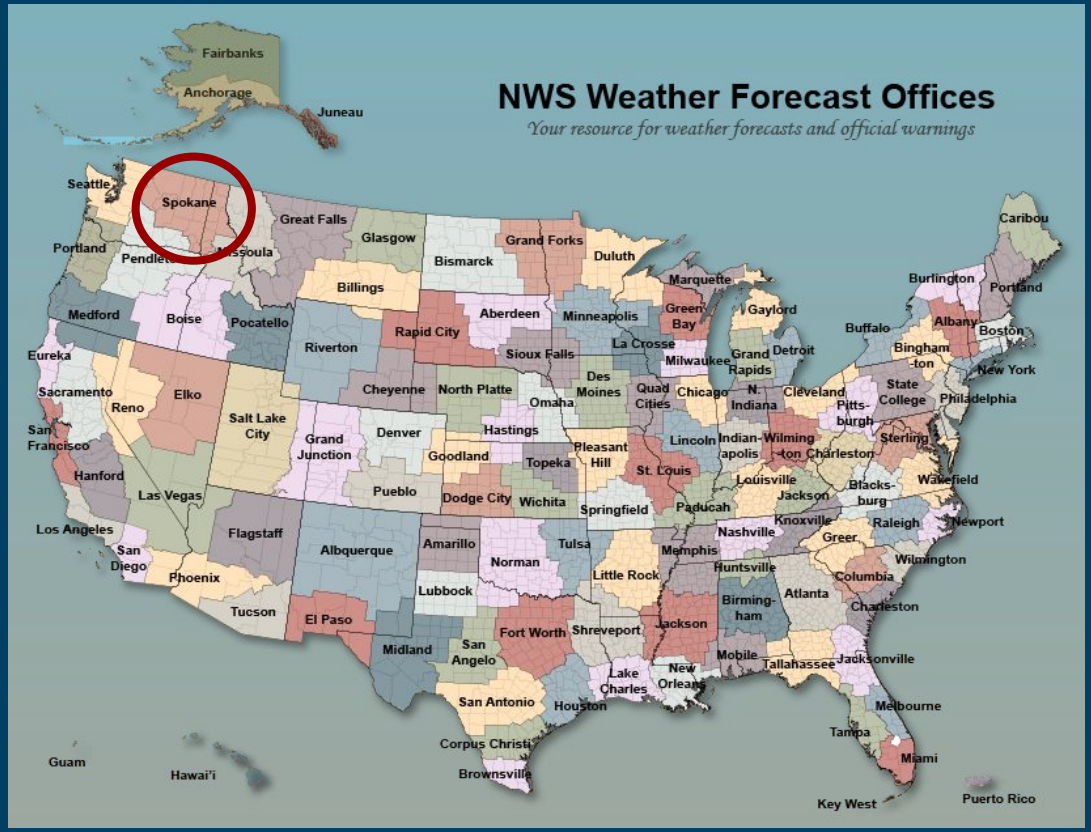
. . . who take daily measurements of precipitation right in their own backyards

National Weather Service (NWS)

- Part of the Federal Government – Dept of Commerce
- Responsible for all weather/water Watches & Warnings
- 126 offices across the country
- Works with local agencies
- Observe & Forecast
- "Behind the Scenes"
- Decision Support
- Preparedness & Education

Issue Weather and Water watches/warnings for the protection of life and property.

NWS Spokane Forecast and Warning Area

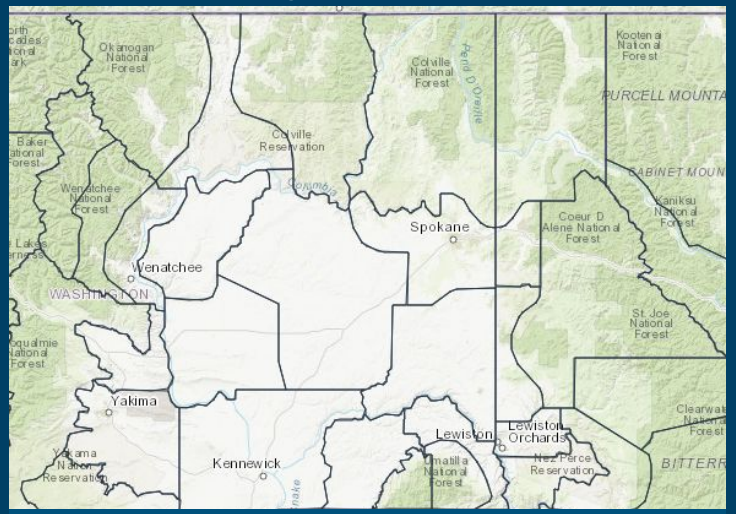


Includes 2 states

- 13 counties in eastern WA
- 8 counties in north Idaho

Elevations range

- 9500+ ft in the north Cascades
- 170 ft along the mid Columbia River



Public Forecast Zones

Issue watches/warnings for the protection of life and property

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NWS Tools

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NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

Spokane, WA

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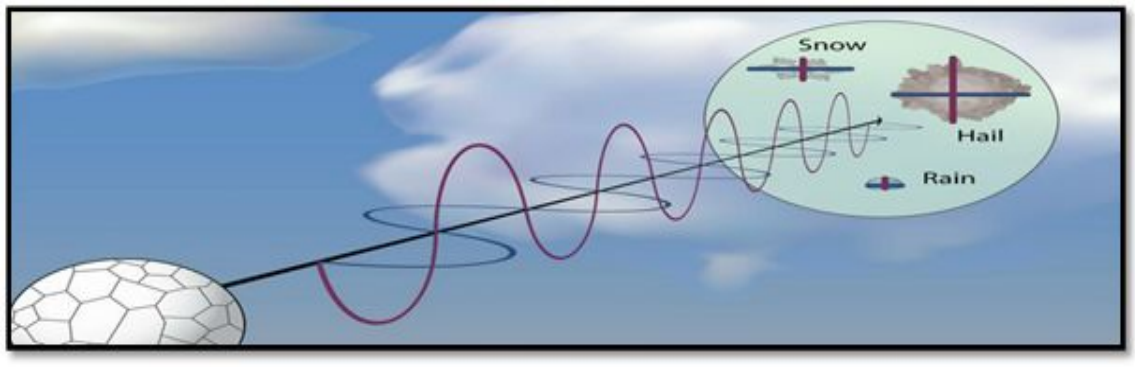
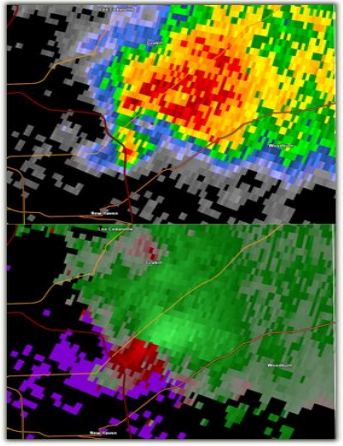
Doppler Weather Radar



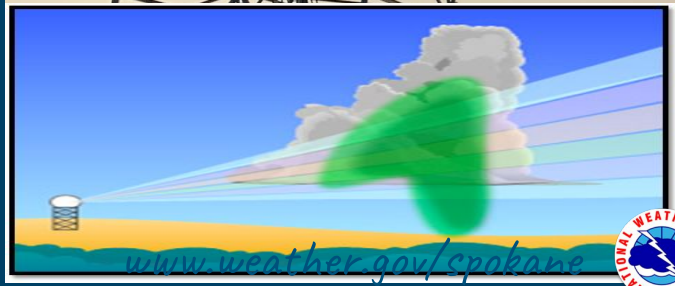


Reflectivity (dBZ)

Small Particles	Big Particles
Light Rain, Dust, Bugs	Hail, Big Rain Drops

Velocity (kts)

- Speed Moving Away from Radar
- Speed Moving Toward Radar



NATIONAL WEATHER SERVICE
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

Spokane, WA

Weather Balloon - Radiosonde

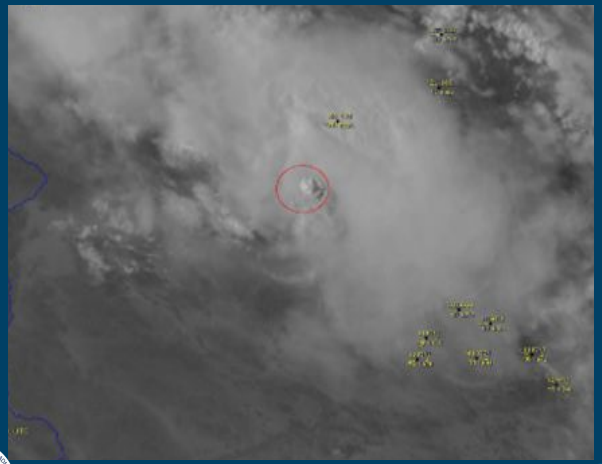
Twice a day - every day
92 Upper Air sites across the U.S.
Flight time ~ 1 hour 45 min

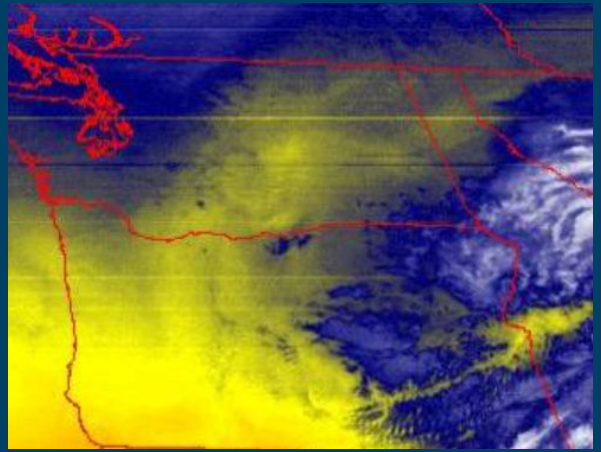
Weather Satellites

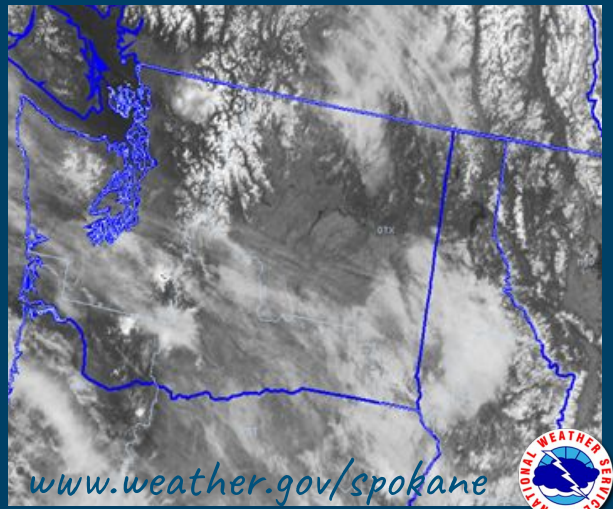
GOES 17 - 16 different channels
- IR, Water Vapor & Visible

New images every 5 minutes

Aids in early detection
- Thunderstorms & Wildfires







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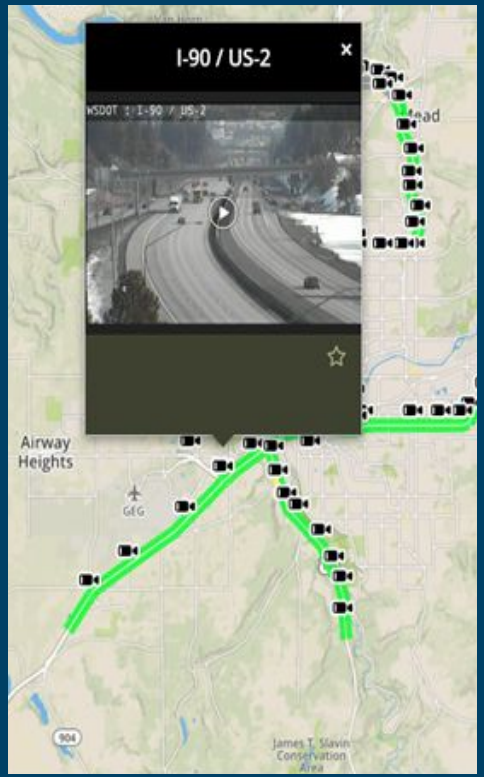
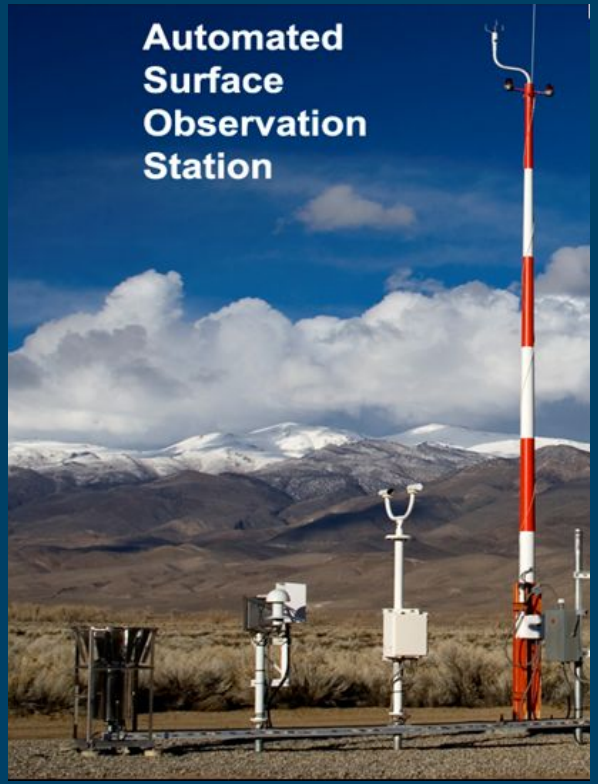
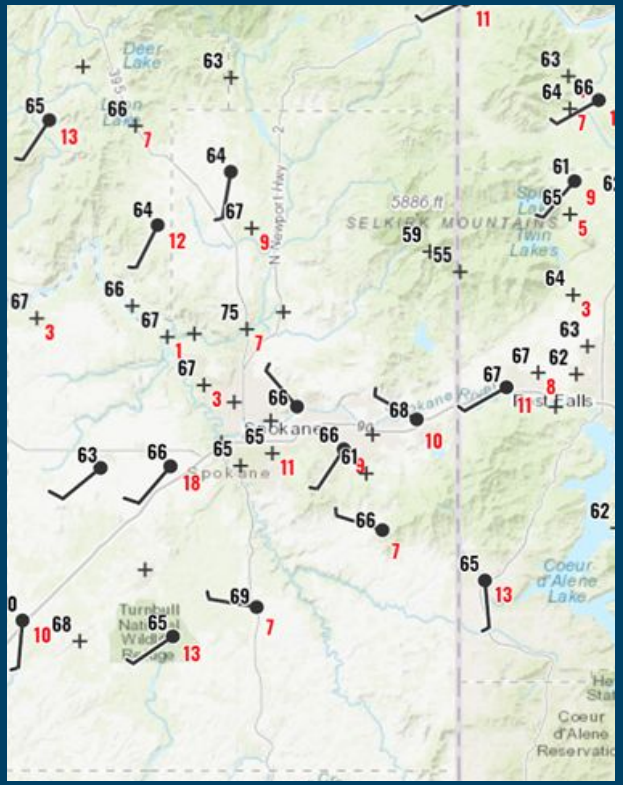
Spokane, WA

www.weather.gov/spokane

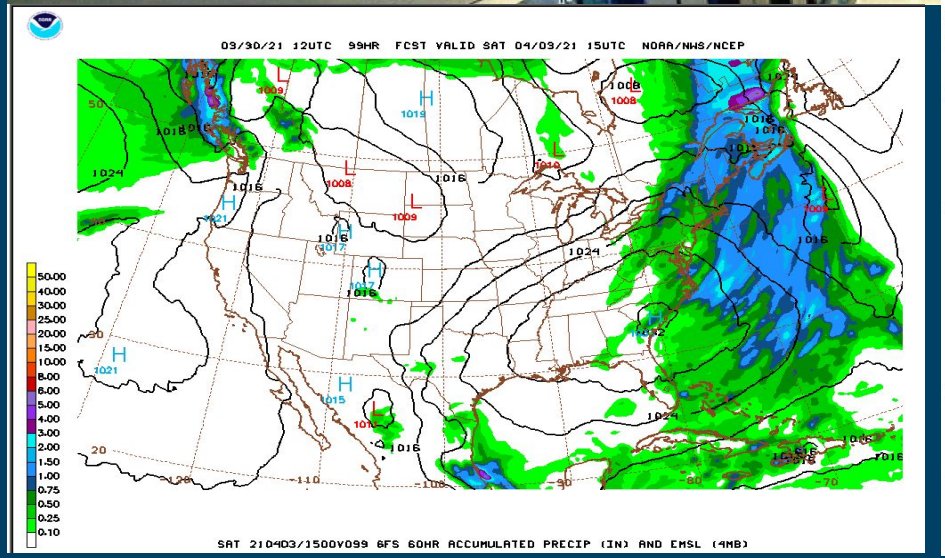
Surface Observations & Web Cams

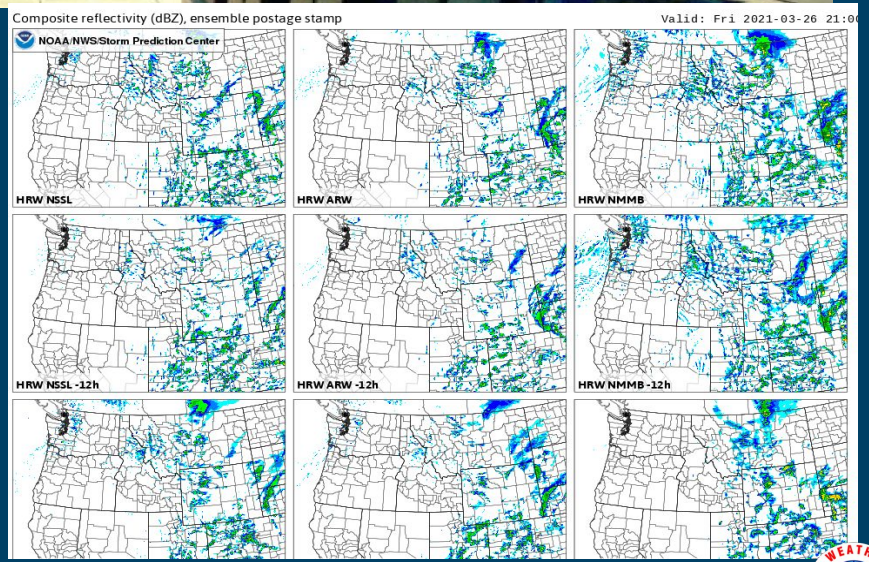




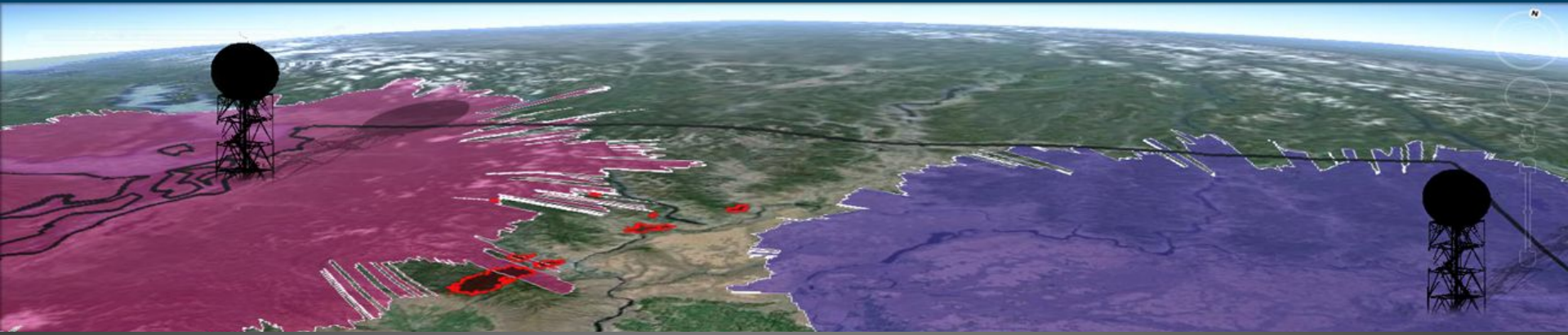


High Resolution Weather Models



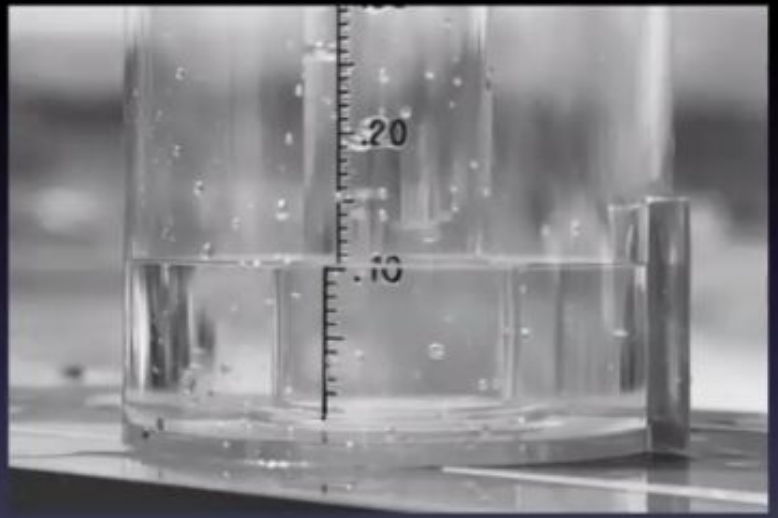


We need observers! Why?



- Limitations to radar, satellite, and surface observations
- Receive Ground Truth on events
- Fill in the “holes” not seen by observations
- Understand the many micro-climates in the region
- Maximize Warning effectiveness and Lead Times
- Add Credibility to NWS Warnings - Leads to Public Action!

Who else uses CoCoRaHS observations?



1. Weather Forecasters
2. Hydrologists
3. Water management
4. Researchers
5. Agriculture
6. Climatologists
7. Insurance Industry
8. Engineering
9. Recreation
10. Many others

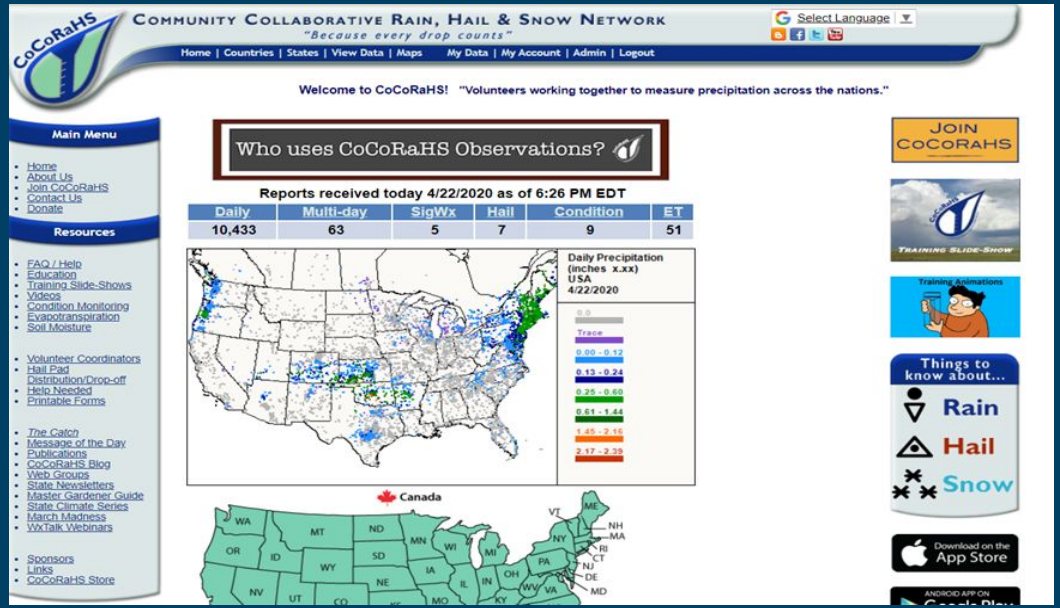
*"CoCoRaHS is **CRITICAL** (my emphasis) to hazardous weather operations at the NWS Austin-San Antonio Weather Forecast Office. We utilize the daily precipitation reports to produce maps such as the one attached, which are used extensively by the media (directly shown on TV broadcasts), our emergency management partners (for briefing officials and planning search and recovery operations), and the general public."*

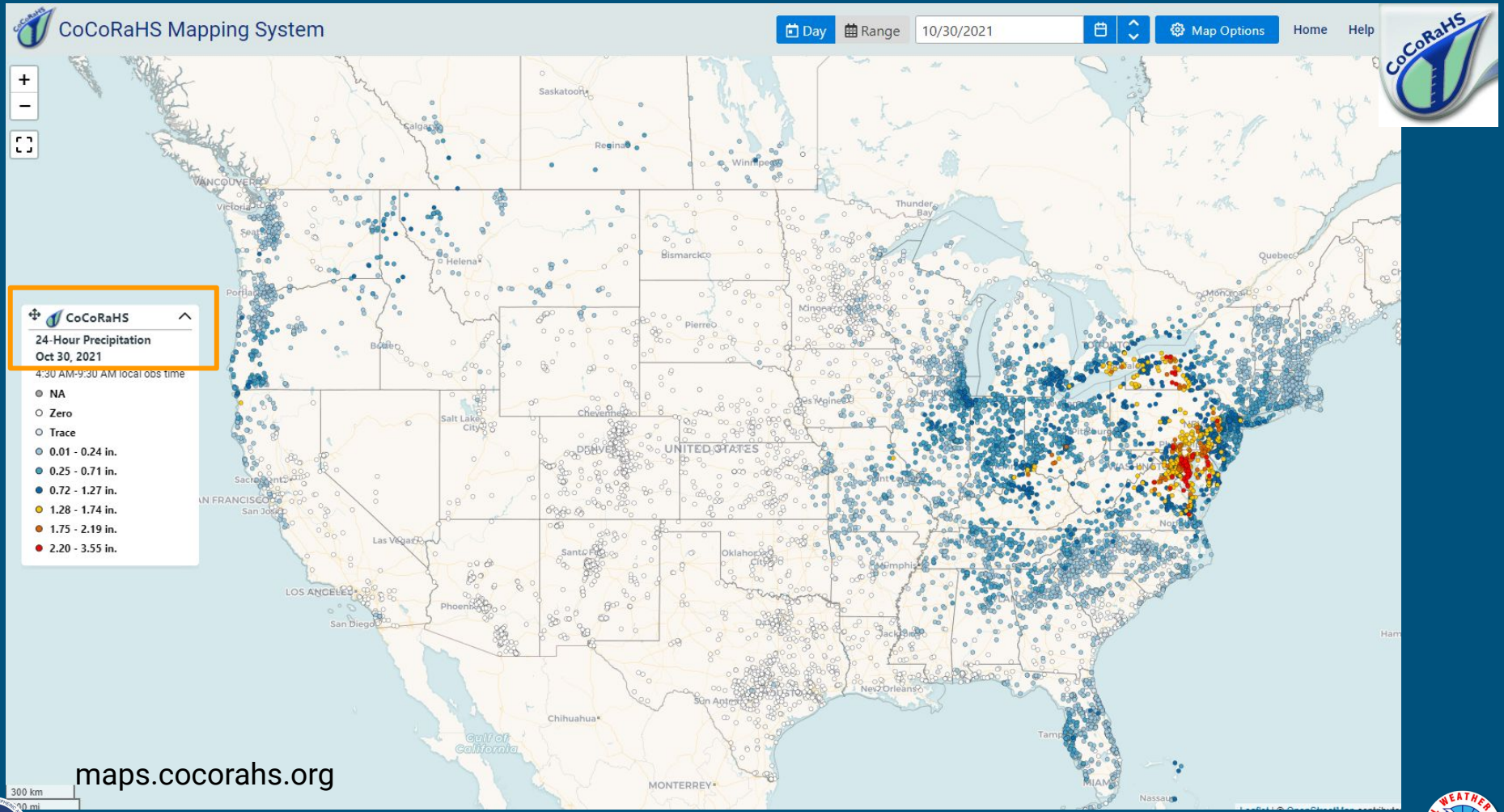
Jon Zeitler – *NWS Austin-San Antonio Weather Forecast Office*

CoCoRaHS - easy to report

Help Observe Precipitation in your Community www.cocorahs.org

Volunteer take readings once a day - transmit online or on a mobile device




CoCoRaHS Mapping System
Day
Range
10/30/2021
Map Options
Home
Help
CoCoRaHS
24-Hour Precipitation
Oct 30, 2021
4:30 AM-9:30 AM local obs time
NA
Zero
Trace
0.01 - 0.24 in.
0.25 - 0.71 in.
0.72 - 1.27 in.
1.28 - 1.74 in.
1.75 - 2.19 in.
2.20 - 3.55 in.
maps.cocorahs.org
300 km
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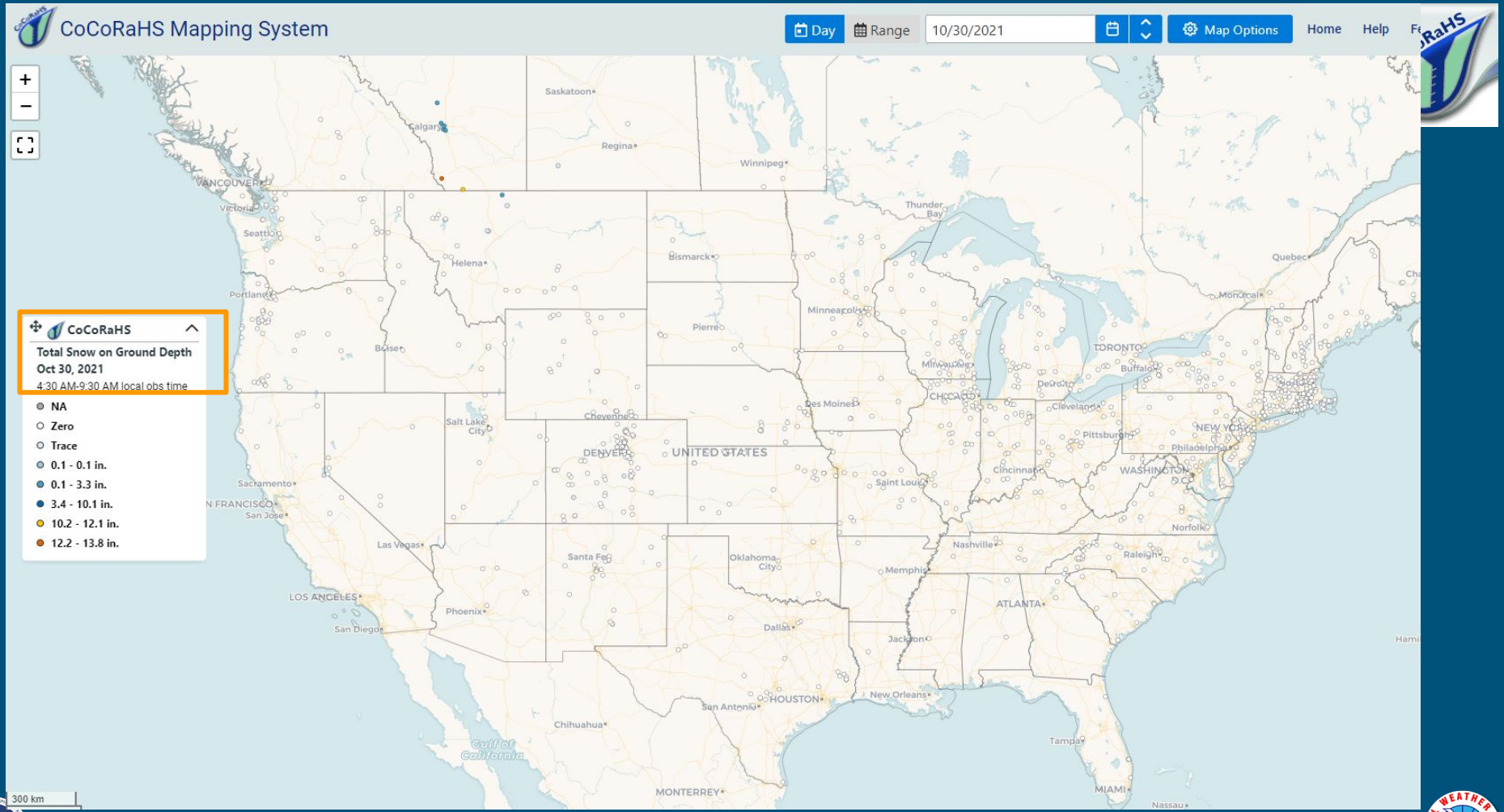
Spokane, WA
www.weather.gov/spokane



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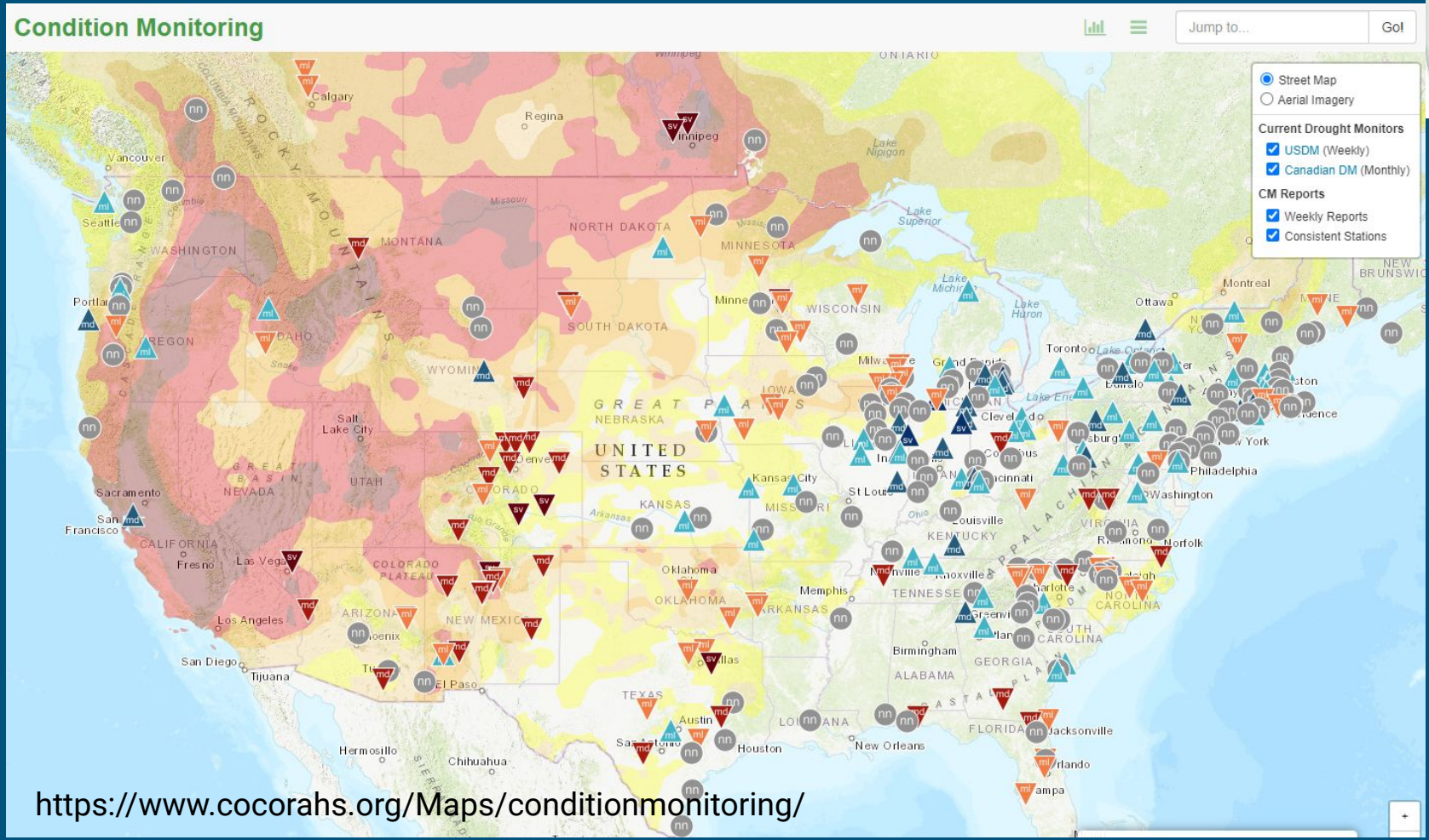

Condition Monitoring
Jump to...
Go!
Street Map
Aerial Imagery
Current Drought Monitors
USDM (Weekly)
Canadian DM (Monthly)
CM Reports
Weekly Reports
Consistent Stations
UNITED STATES
https://www.cocorahs.org/Maps/conditionmonitoring/

The Catch

NOLAN DOESKEN'S MONTHLY COCORAHS E-MAIL MESSAGE

CoCoRaHS -- Reflections by the Cottage about our Past, Present and Future

Cedarville, Michigan -- October 18, 2021

Some reflections by the lakeside cottage about our past, our present and our future

I have truly enjoyed the month we've just spent at our family cottage on the shore of Lake Huron in Upper Michigan – nearly free from internet and phone connectivity. I was able to send my last message to all of you on October 4th, ringing in the New Water Year by driving a few short miles to the lovely Les Cheneaux Community Library in Cedarville MI where they provide 24/7 internet access on "The Bench" of their cottage-style covered porch.

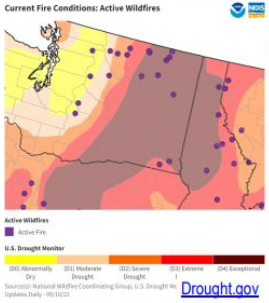
YOUR NATIONAL WEATHER SERVICE SPOKANE QUARTERLY REPORT

VOL XXVI, ISSUE 3
SEPTEMBER 2021

The Weather Watcher
of the Inland Northwest

www.weather.gov/Spokane

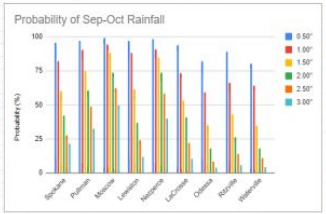
Drought and Fires



Drought.gov

Drought continues to grip the Inland NW. Despite the welcome August rains in parts of eastern Washington and north Idaho, deficits in precipitation still abound. In July, the U.S. Drought Monitor elevated most of the region to the D4 level or Exceptional Drought. For Washington, this was the first occurrence of D4 in over 20 years. The top drought impact has been dryland agriculture which reported historic low yields in both the winter and spring wheat, barley and pasture lands. Low stream flows were observed in many basins, especially those not used for irrigation. Wildfires and their smoke were other impacts. While summer storms did bring needed rain, they also brought lightning which led to fire starts from the timber lands to grasslands. This will be a concern when the wetter weather does return, elevating the risks of flash flooding and debris flows near burn scars.

The Seasonal Drought Outlook does not show much change in the coming months with drought likely to persist through the calendar year. This may impact agriculture into the next growing season. We're all looking forward to the fall rains. Based on past events, there are better odds of seeing light amounts of rain in September and October across the region. Chances of significant rainfall amounts of 2 to 3 inches look less likely as seen in the following graph. ☼ *Robin Fox & Ron Miller*



Seasonal Outlook

The NWS Climate Prediction Center is favoring a better chance for above normal precipitation and equal chance of at, below and above normal temperatures for October through December 2021.☼

INSIDE THIS ISSUE:

Editor's Notes

September marks National Preparedness Month. It's the time to get yourself, your family and household prepared for the change of seasons and any natural disasters. After a busy fire season, many of us have heard or even experienced the sudden alerts for evacuations. Having a Go-Bag or an Emergency kit prepared is important. Also knowing what to do when the power goes out is also a good idea and worth planning.

The Autumn Equinox arrives on Wednesday, September 22 at 12:20 PDT. This marks the equal time between day and night. After this date, expect shorter day hours and longer nights for the rest of the calendar year.

We're always looking for new ideas and stories for our publication. Please send to nws.spokane@ noaa.gov. Newsletters are available on the NWS Spokane web page.

The main purpose of this publication is to keep our readers informed about NWS

Emails

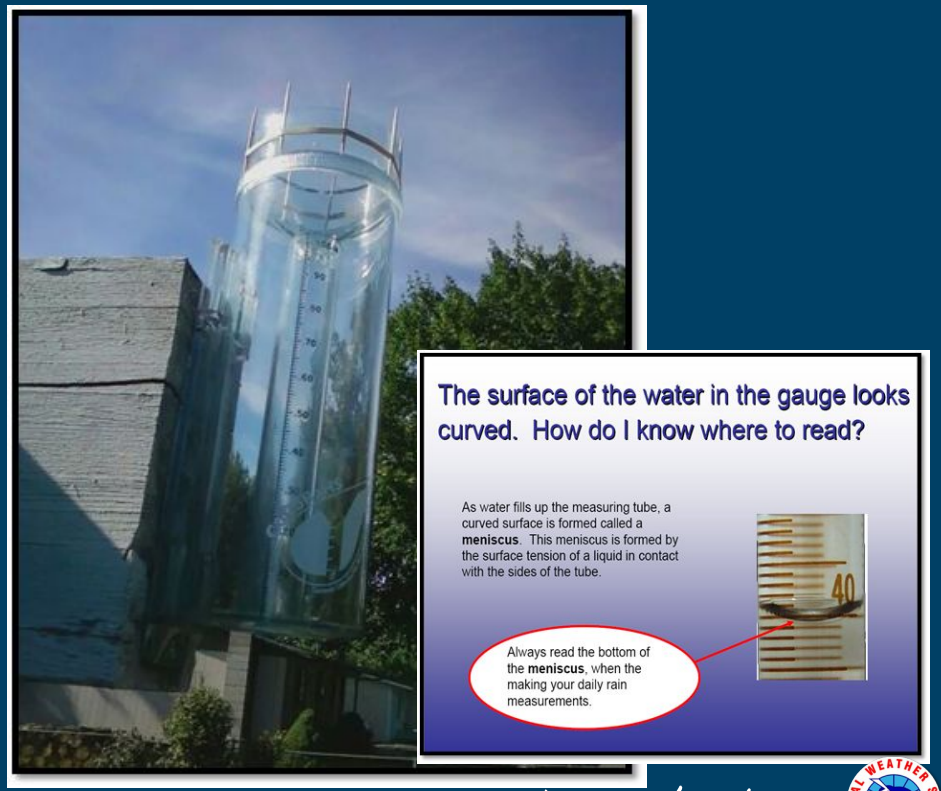
It's important to keep emails current. You may receive notifications on:

- Upcoming WIDESPREAD Severe Weather or Winter Storm events.
- Requests for SWE reports
- Training updates

Interested in CoCoRaHS? How to Start!

Five easy steps

1. Sign-up at on the CoCoRaHS web site www.cocorahs.org
2. Obtain a 4” plastic rain gauge
3. View the online “training slide show”
4. Set up the gauge in a “good” location in your yard - away from trees
5. Start observing precipitation and report online daily



Snow

NWS Spokane appreciates the many snow reports each year!

Yes, It can be challenging!

Before the snow flies, make sure you remove the inner tube and funnel.

Setting up for Measuring Snow

Video Courtesy of CoCoRaHS

Snow Tools

Snow Board

Snow Swatter

Ruler or yard stick,

Snow Measurements - 4 part observation

1. The depth of new snow (new snowfall)
2. Liquid water equivalent of new snow (either in the gauge or on the snowboard)
3. The total depth of new snow and old snow and ice at observation time
4. Snow Water Equivalent (SWE) of total snow on the ground (optional)

Snow Measurements - 4 part observation

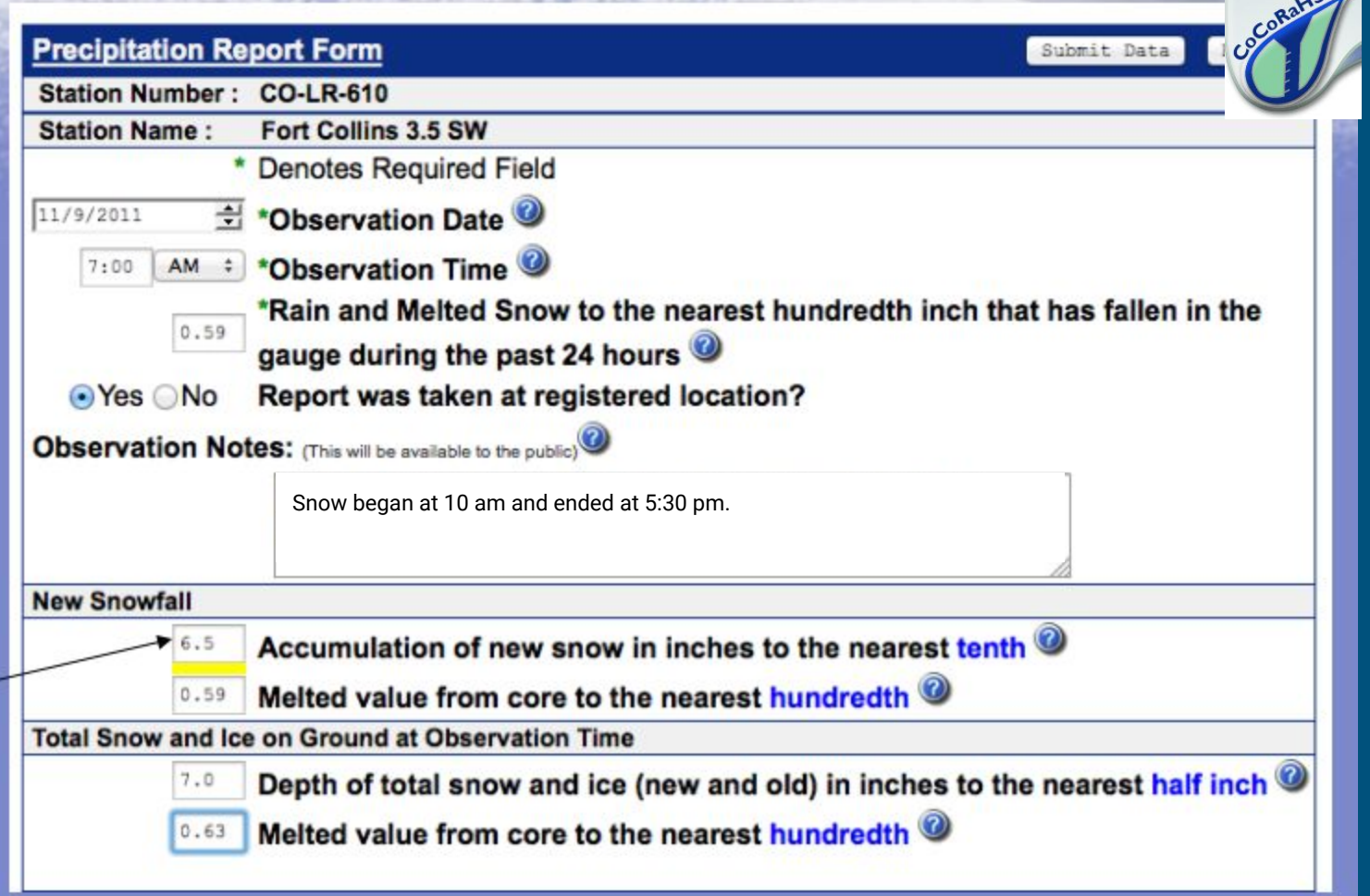
1. The depth of new snow (new snowfall)
2. Liquid water equivalent of new snow (either in the gauge or on the snowboard)
3. The total depth of new snow and old snow and ice at observation time
4. Snow Water Equivalent (SWE) of total snow on the ground (optional)

Snow Measurements - Depth of new Snowfall

- Snowfall is the accumulation of new snow (and ice) in the past 24 hours prior to melting or settling.
- Use a ruler and measure on the snow board or a level spot in your yard. Do not use a ruler in your gauge to measure snowfall.
- You can measure snowfall soon as it has stops snowing, it does not need to be at the observation time.
- Report snowfall to the nearest tenth of an inch.

How to Measure New Snow Depth

Video Courtesy of CoCoRaHS



Report your measurement of new snowfall to the nearest tenth of an inch

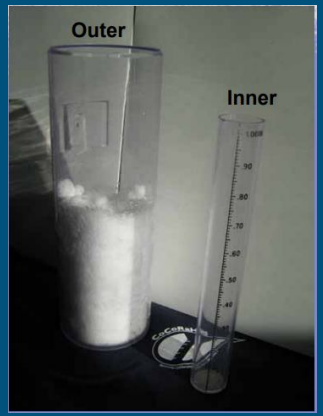
Snow Measurements - 4 part observation

1. The depth of new snow (new snowfall)
2. Liquid water equivalent of new snow (either in the gauge or on the snowboard)
3. The total depth of new snow and old snow and ice at observation time
4. Snow Water Equivalent (SWE) of total snow on the ground (optional)

Daily Precipitation When It Snows

Video Courtesy of CoCoRaHS

Snow Measurements - Liquid Water Equivalen

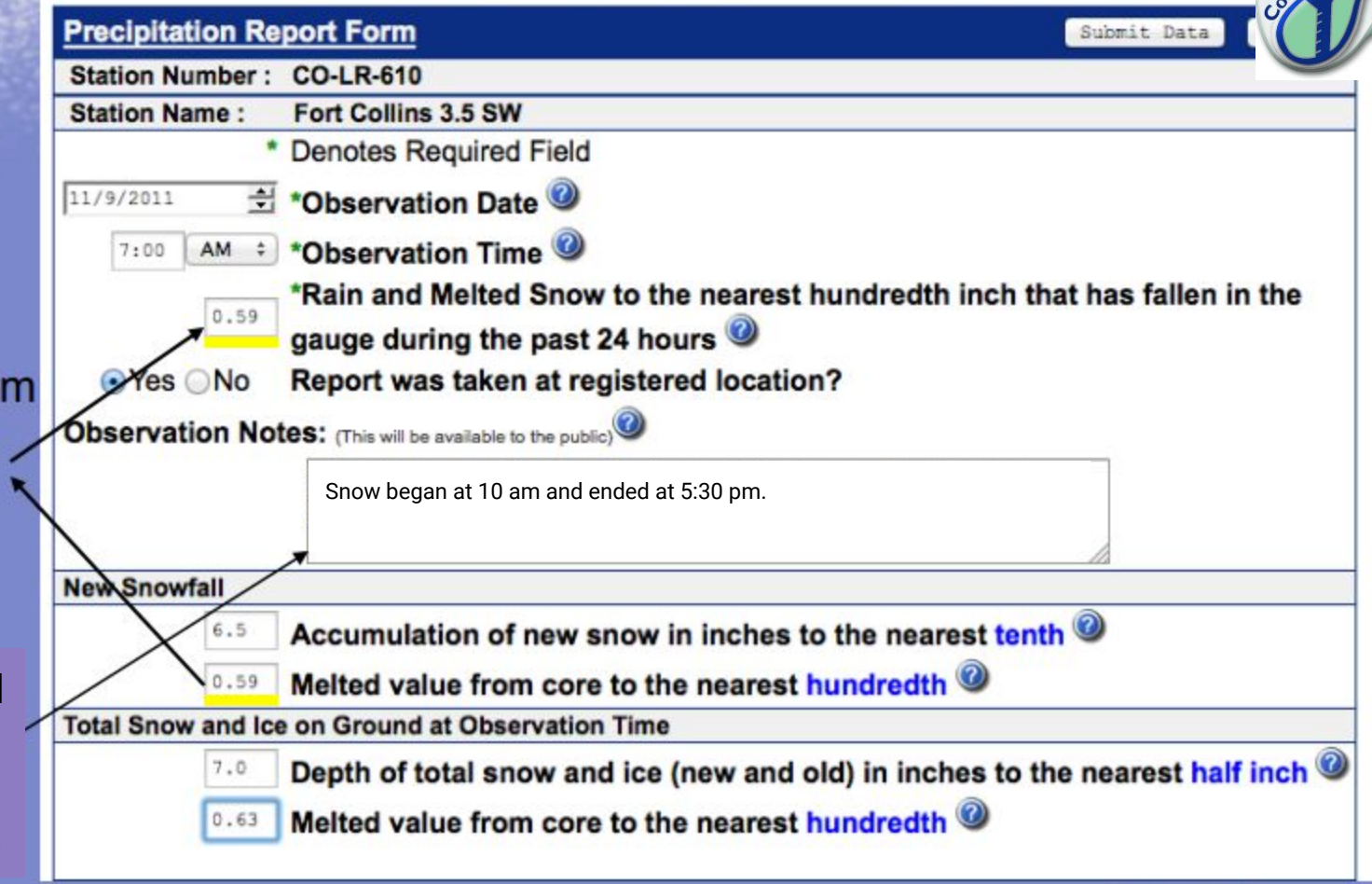


1. Swat excess snow from gauge
2. Bring outer gauge inside.
3. Fill inner gauge with warmer water
4. Pour a measured amount of warm water into the tube to melt the snow.

5. Once melted, pour contents of the snowmelt and warm water into the inner measuring tube.
6. Read the measurement, remember to subtract what you added!

Water melted from core is reported as the daily precipitation

Remember to add notes in the Comments section if needed.



Precipitation Report Form Submit Data

Station Number : CO-LR-610

Station Name : Fort Collins 3.5 SW

* Denotes Required Field

11/9/2011 *Observation Date

7:00 AM *Observation Time

0.59 *Rain and Melted Snow to the nearest hundredth inch that has fallen in the gauge during the past 24 hours

Yes No Report was taken at registered location?

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

Snow began at 10 am and ended at 5:30 pm.

New Snowfall

6.5 Accumulation of new snow in inches to the nearest tenth

0.59 Melted value from core to the nearest hundredth

Total Snow and Ice on Ground at Observation Time

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

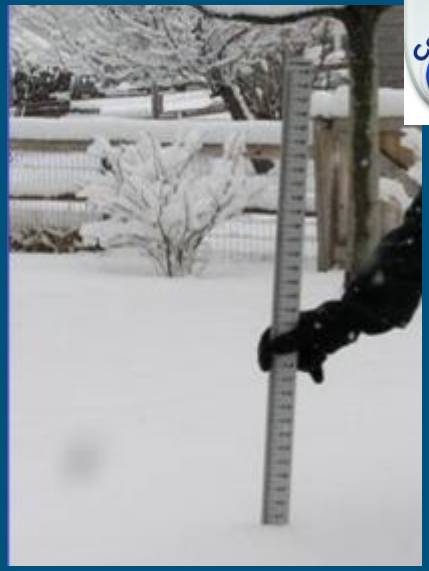
0.63 Melted value from core to the nearest hundredth

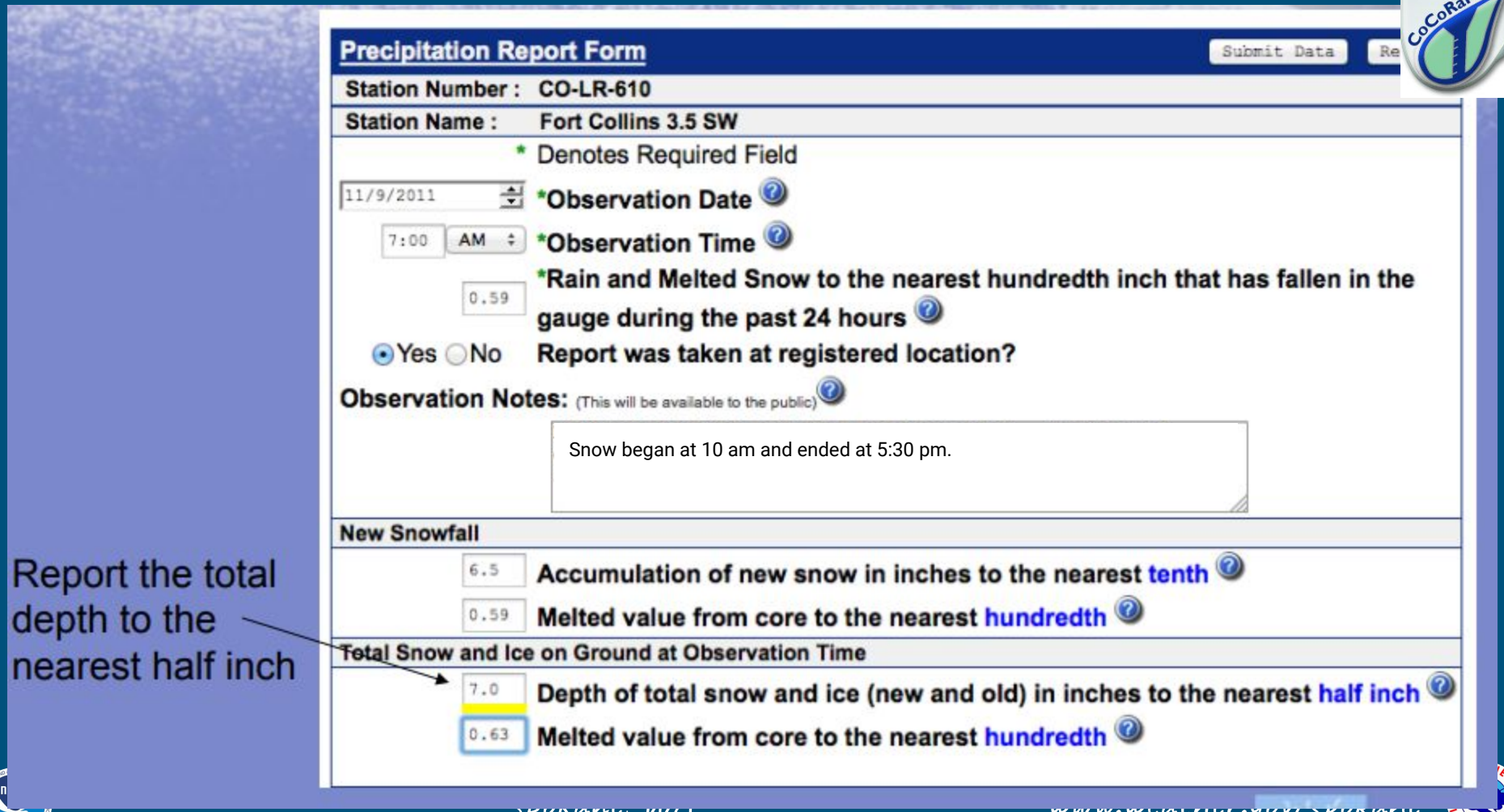
Snow Measurements - 4 part observation

1. The depth of new snow (new snowfall)
2. Liquid water equivalent of new snow (either in the gauge or on the snowboard)
3. The total depth of new snow and old snow and ice at observation time
4. Snow Water Equivalent (SWE) of total snow on the ground (optional)

Snow Measurements - Total Depth

- The Total Snow = **Old snow + New Snow**
- The average depth of snow (including old snow and ice and new snow) that remains on the ground at observation time.
- Total depth of snow can be done in a flat portion of your yard, away from drifts or snow piles.
- Take several measurements and average them
- Report Total Snow Depth to nearest half inch





Report the total depth to the nearest half inch

Measuring Total Depth and SWE

Video Courtesy of CoCoRaHS

Snow Measurements - 4 part observation

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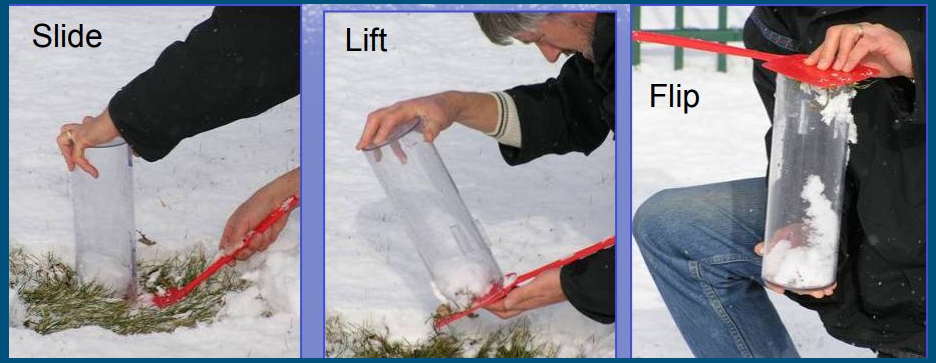
4. Snow Water Equivalent (SWE) of total snow on the ground (optional)

Snow Measurements - Snow Water Equivalen

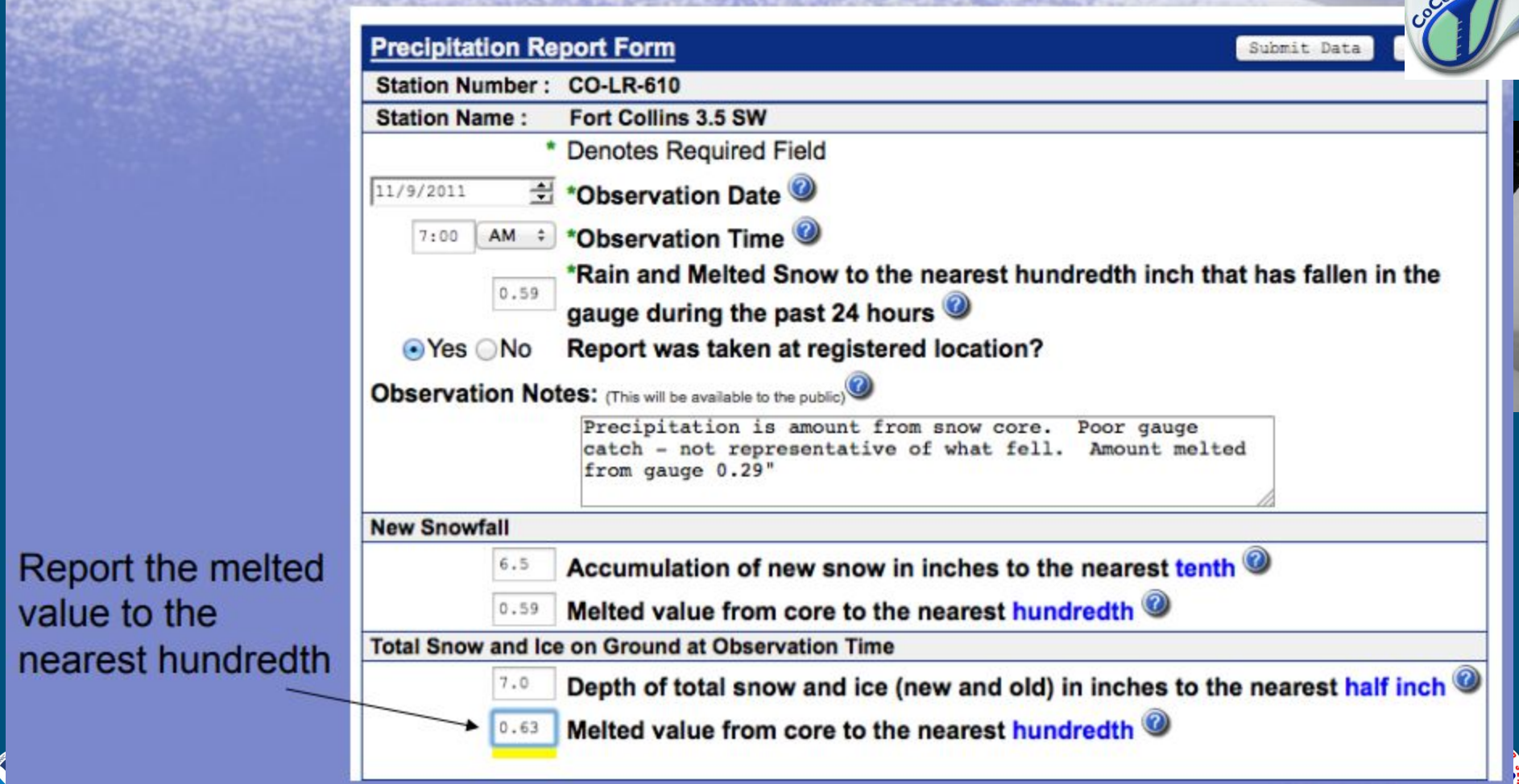


Light snow events

Deeper snow events

Once you have a core sample, melt it down with warm water and measure the liquid. Remember to subtract what you added!

SWE is important to know how much water is in the snow pack. It is usually done weekly (SWE Mondays) or when the snowpack is deep in an area.



Report the melted value to the nearest hundredth

CoCoRaHS Post It Notes

Even if there is **No New precipitation**, please send a report. Even zeros are important!

Windy conditions may lead to increased blowing and drifting. May need to take a core sample in a location more representative in your yard and not your gauge.

If snow melts as it lands, report a **Trace (T)** of snow for the day and add it to comments

If **Heavy Snow** is falling, you can send in a Significant Weather Report (available through the web page only)

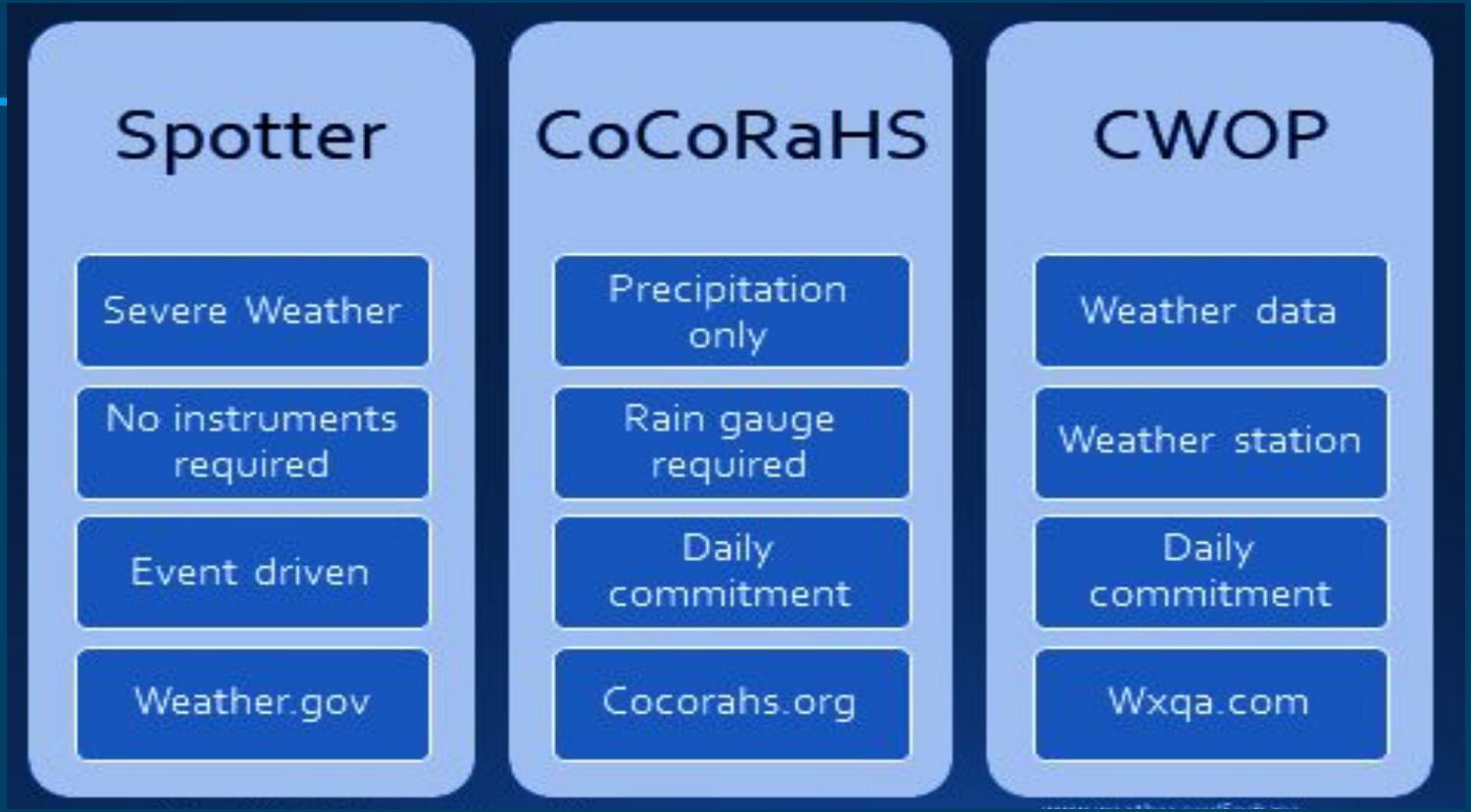
CoCoRaHS Post It Notes

What if you are **gone for a few days**? Send in a multi-day report

Freezing Rain This is a liquid that freezes. Do not report it as snow. Meltdown what is frozen in the gage and report it as rain. Leave a note in comments section. New snowfall =0. Total Snow Depth= ice thickness.

What if you **run out of time** to finish your snow report? Put NA in the Rain and Melted snow box and leave a note in the comments box and then send in your report. You can return to the report to edit it later in the day.

Different programs - All useful to the NWS



Weather Spotter

Weather enthusiast who volunteers time to report severe or hazardous weather

- As needed basis
- No weather equipment is necessary
- Simply call, email or send a report online
- Checklist provided on weather to report

Register:
nws.spokane@noaa.gov

Citizen Weather Observers Program
CWOP

Register: www.wxqa.com

- Have a weather station and want to share data online
- Has a PC and Internet access
- Register Online & Receive a weather station ID
- Transmits data every 15 mins

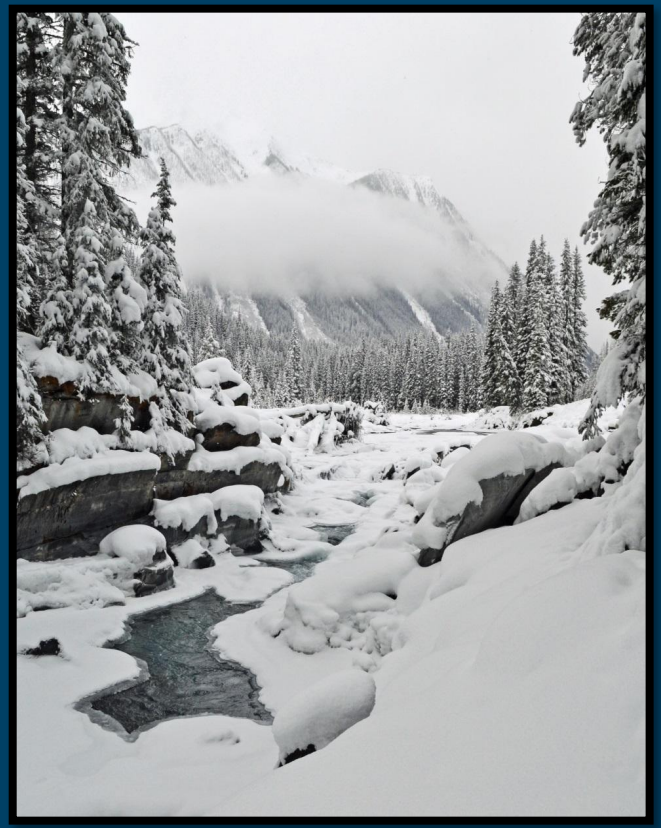
Additional Training

Cocorahs.org

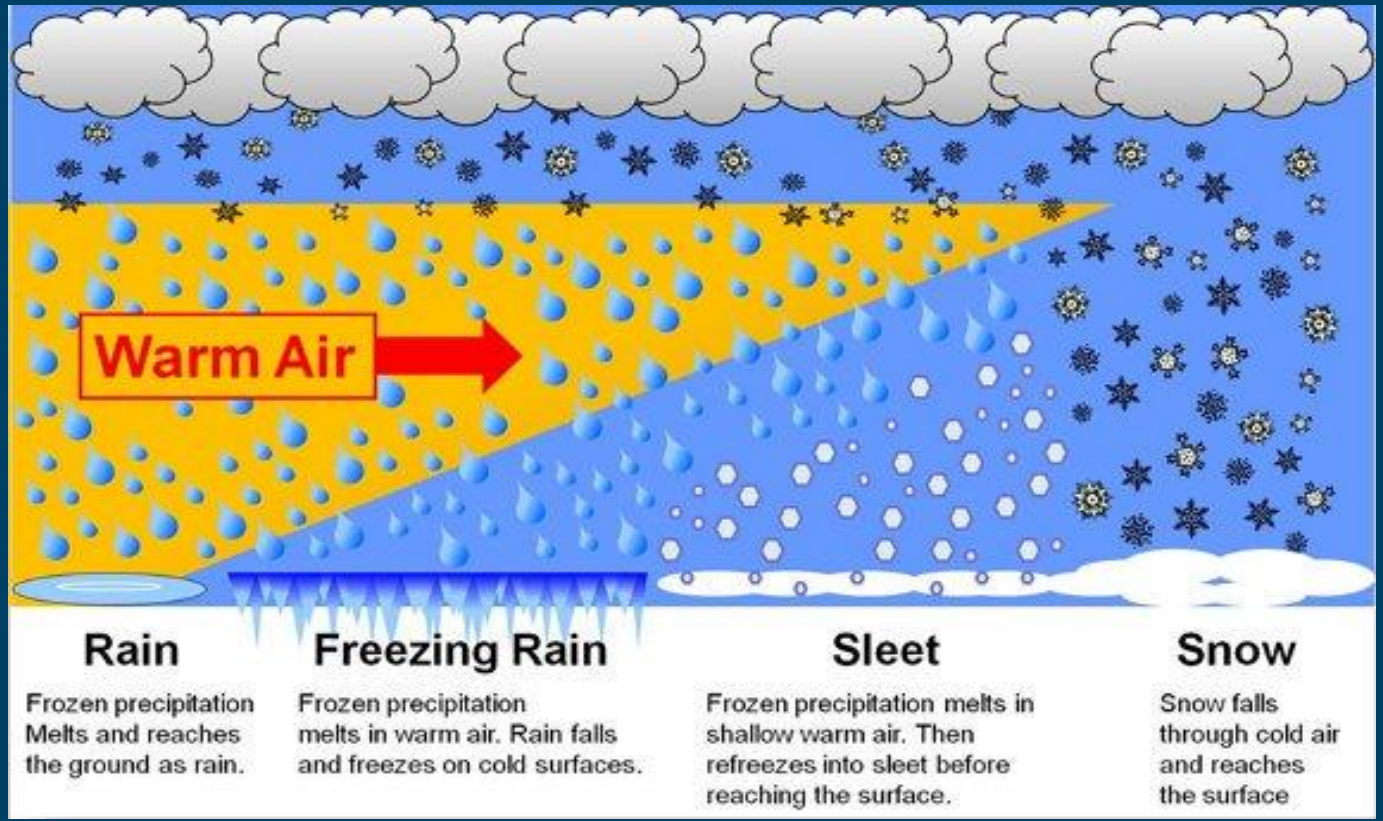
Slideshows
Notes
Videos

Typical Winter Storm Scenario

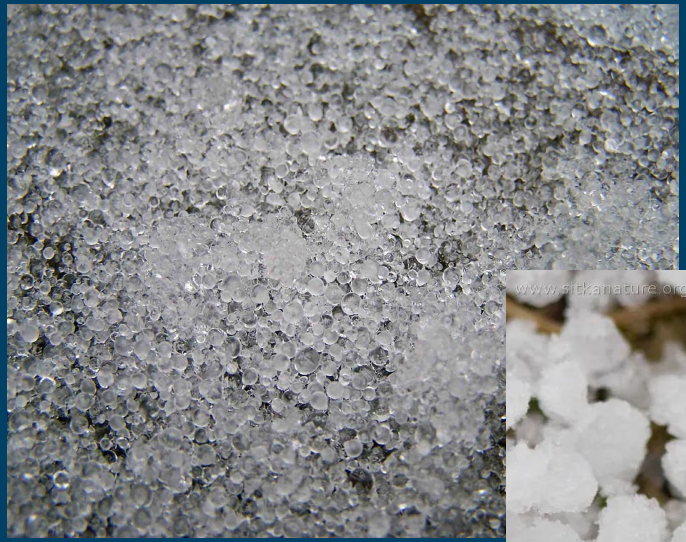
- Cold air in place over the Inland Northwest, especially in the valleys
- Warm Pacific Air rides over the cold air
- Precipitation begins as snow, occasionally changes to rain with possible freezing rain



Vertical Temperature Profile is Critical!



Winter Precipitation



Sleet

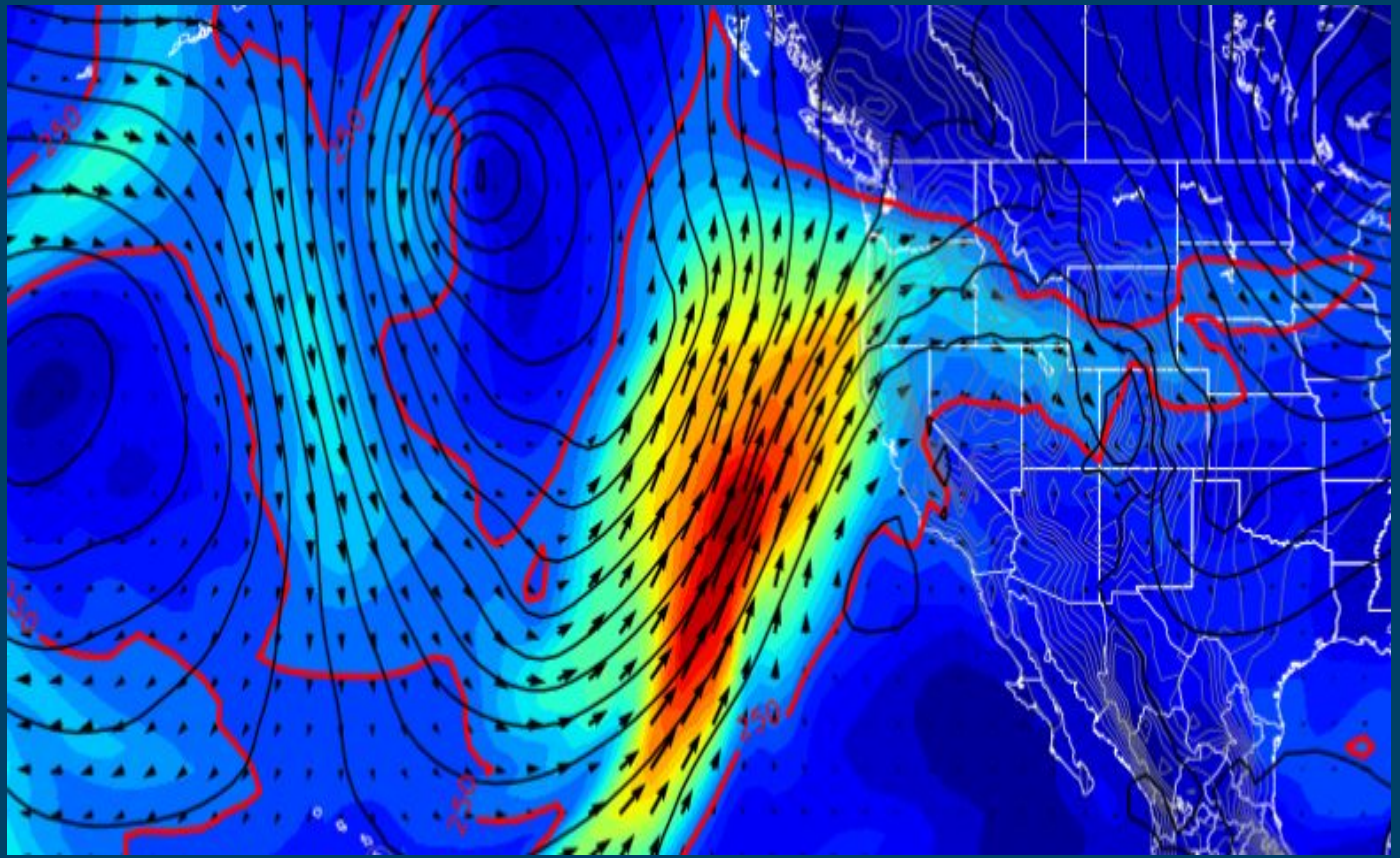
Graupel

Hail

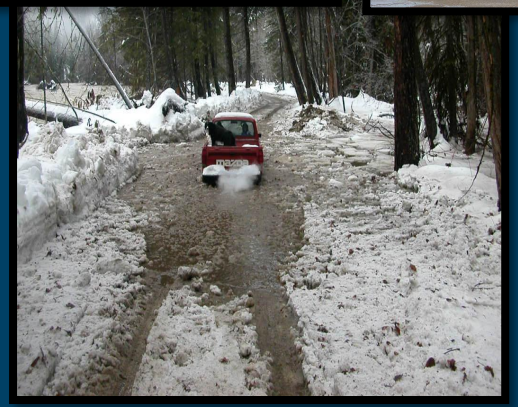
Atmospheric Rivers

Plumes of atmospheric moisture

Mild & Wet Weather

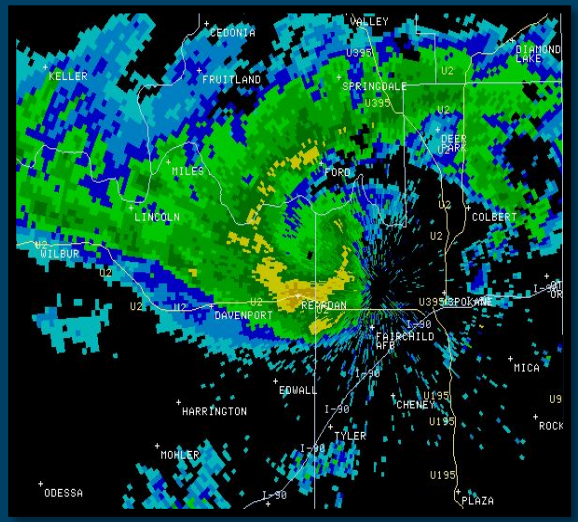


Atmospheric River Events



Small Scale Unstable Lows

- Develop Behind Strong Cold Fronts
- May not be well forecast by models
- Potential for ~1 ft of snow in a short time

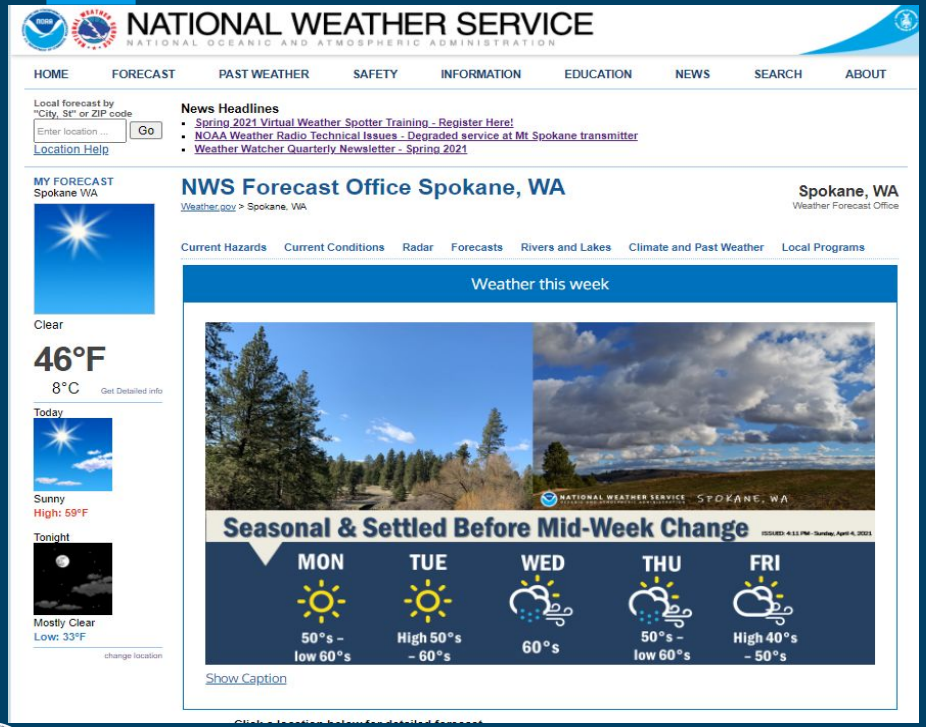


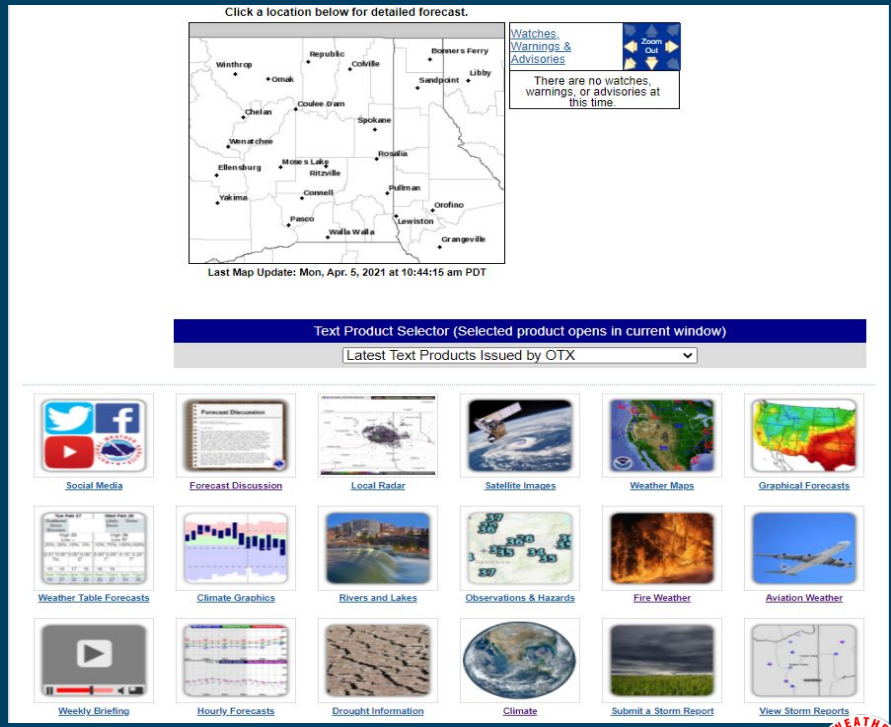
Safety

- Personal Safety is the Primary Objective of every observer
- Protect You and Your Family First
- Do NOT put yourself in harm's way
  - Don't walk or drive over obstructions as flooded roads or downed power lines
  - Don't put yourself under objects that have the potential to fall or be blown over
- **ACES - Awareness, Communication, Escape Route and Safe Zones**

Stay Informed

NWS Spokane Web Page www.weather.gov/Spokane

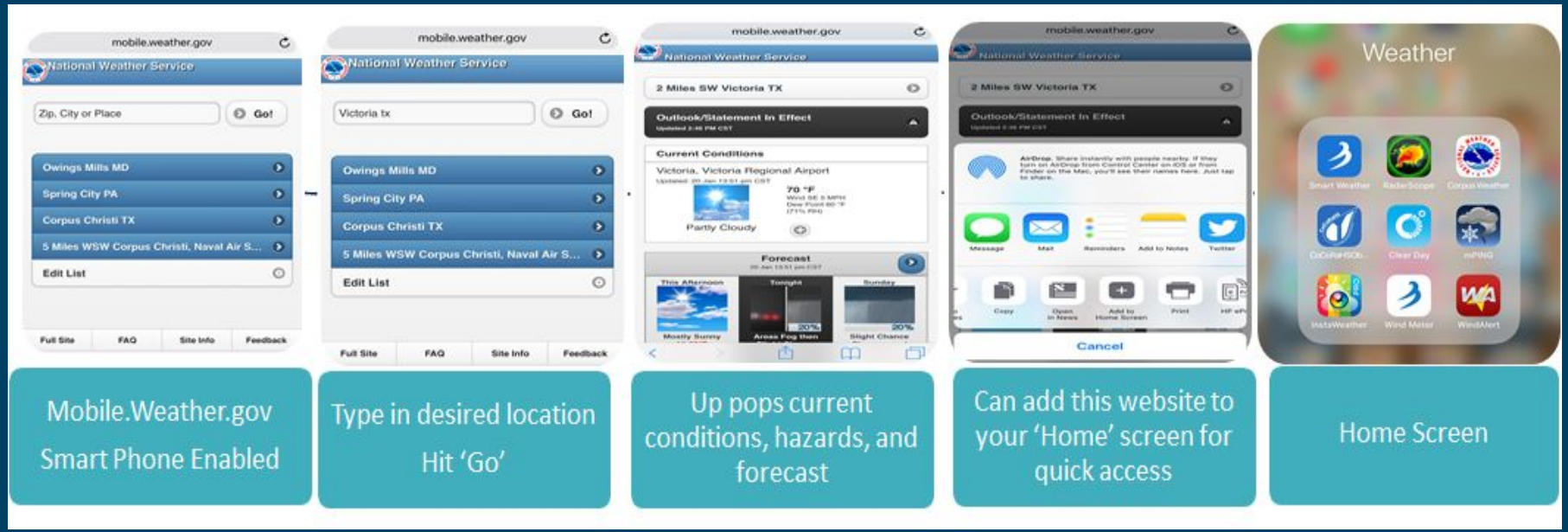




Stay Informed

On your Smartphone

mobile.weather.gov



Staying Informed
On Your Phone!

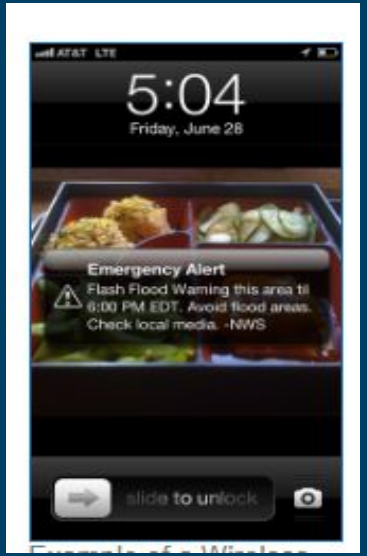
WIRELESS EMERGENCY ALERTS CAPABLE

Weather Warnings

- Tornado Warnings
- Flash Flooding Warnings
- Extreme Wind Warnings
- Dust Storm Warnings
- Snow Squall Warnings

Alert Categories

Extreme Weather & Water Warnings
Local emergencies & Evacuations
AMBER Alerts
Presidential Alerts – National emergency



Stay Informed

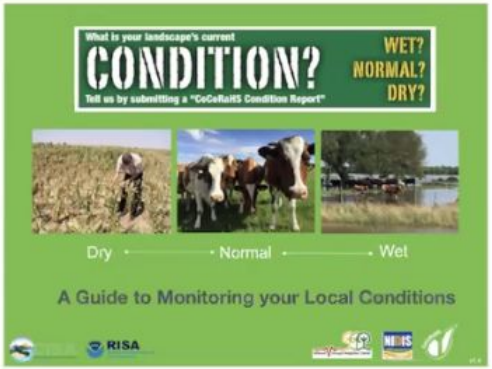
Be Prepared - Disaster Kits and Disaster Plans

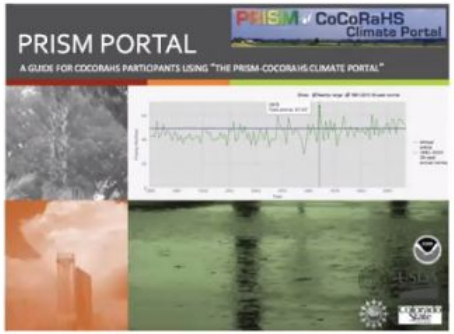
- Water, one gallon of water per person per day for at least three days
- Food & medicine/prescriptions, at least a three-day supply
- Radio, battery-powered or hand crank radio and a NOAA Weather Radio with tone alert and extra batteries for both
- Flashlight and extra batteries
- First aid kit
- Whistle to signal for help
- Dust mask to help filter contaminated air and plastic sheeting and duct tape to shelter-in-place
- Moist towelettes, garbage bags and plastic ties for personal sanitation
- Wrench or pliers to turn off utilities
- Manual can opener for food
- Local maps
- Cell phone with chargers, inverter or solar charger

http://www.ready.gov/kit

Introduce your observers to our wealth of learning products

Training Animations





Climate Records

After 100 reports, your site becomes a climate site!

Water Year reports are available each year

First time, CoCoRaHS stations have been incorporated into the new Climate normals. - NCEI Normals (5448 CoCoRaHS stations)

2008 Water Year Report	2009 Water Year Report	2010 Water Year Report	2011 Water Year Report
2012 Water Year Report	2013 Water Year Report	2014 Water Year Report	2015 Water Year Report
2016 Water Year Report | Certificate	2017 Water Year Report | Certificate	2018 Water Year Report | Certificate	2019 Water Year Report | Certificate
2020 Water Year Report | Certificate	2021 Water Year Report | Coming Soon	Current Water Year Report	

National Centers for Environmental Information (NCEI)

Love the snowy & rainy days?
Want to join a team of volunteer precipitation observers?

Join CoCoRaHS Today!

(Community Collaborative Rain Hail and Snow Network)

It takes four easy steps!

1. Register

2. View online training

3. Purchase rain gauge & snow ruler

4. Record and report observations

Learn more and register at cocorahs.org

Test your knowledge

What is included in the Total Snow Depth measurement?

What is SWE?

When there is no precipitation, a CoCoRaHS report is not needed?

What is your main source of weather information?

Winter Outlook 2021-2022

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

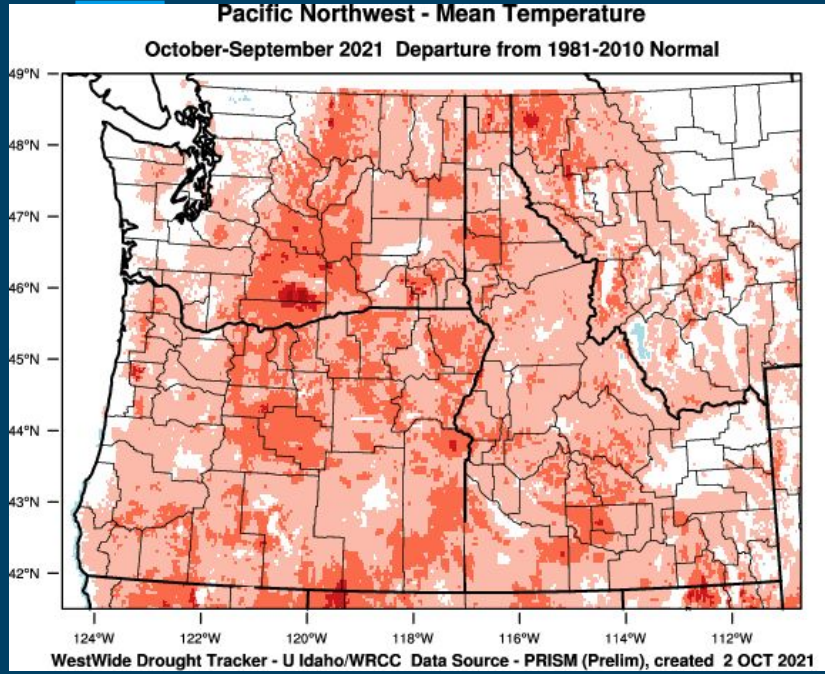
Spokane, WA

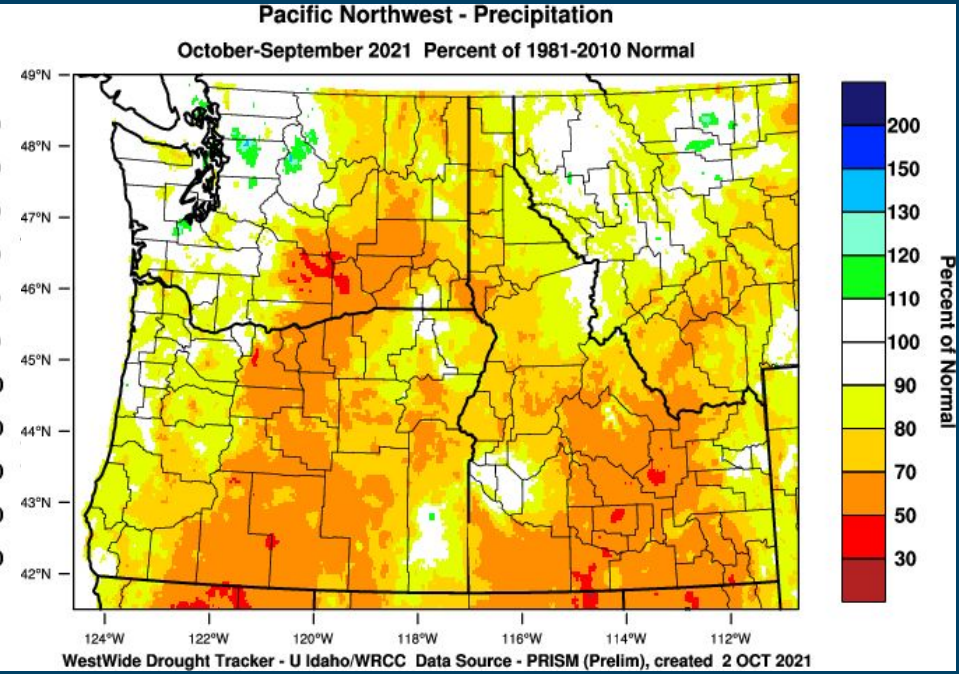
www.weather.gov/spokane

So far in 2021…

wrcc.dri.edu/

Water Year 2021, temperatures were above normal and precipitation below normal, and this includes a Record HOT & DRY Summer.

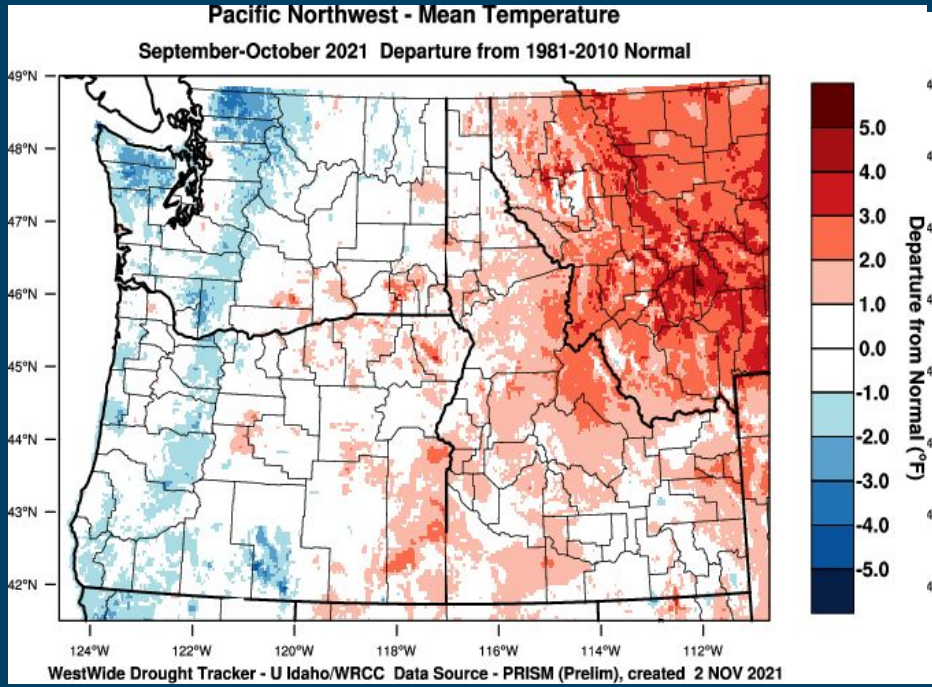


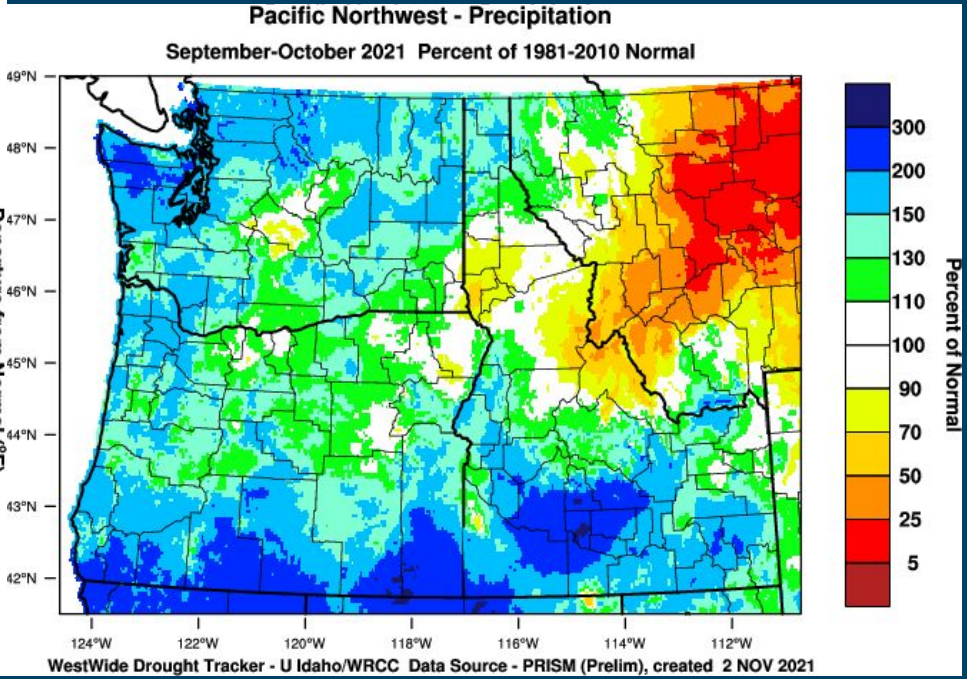


Fall 2021...

wrcc.dri.edu/

Now in Water Year 2022, temperatures trending cooler to near normal and Precipitation trending wetter than normal!

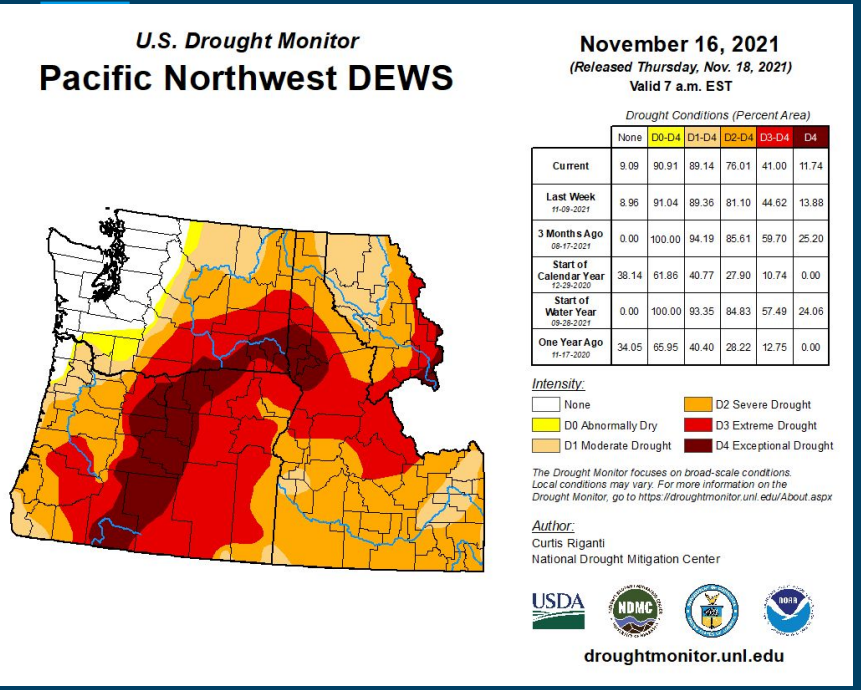


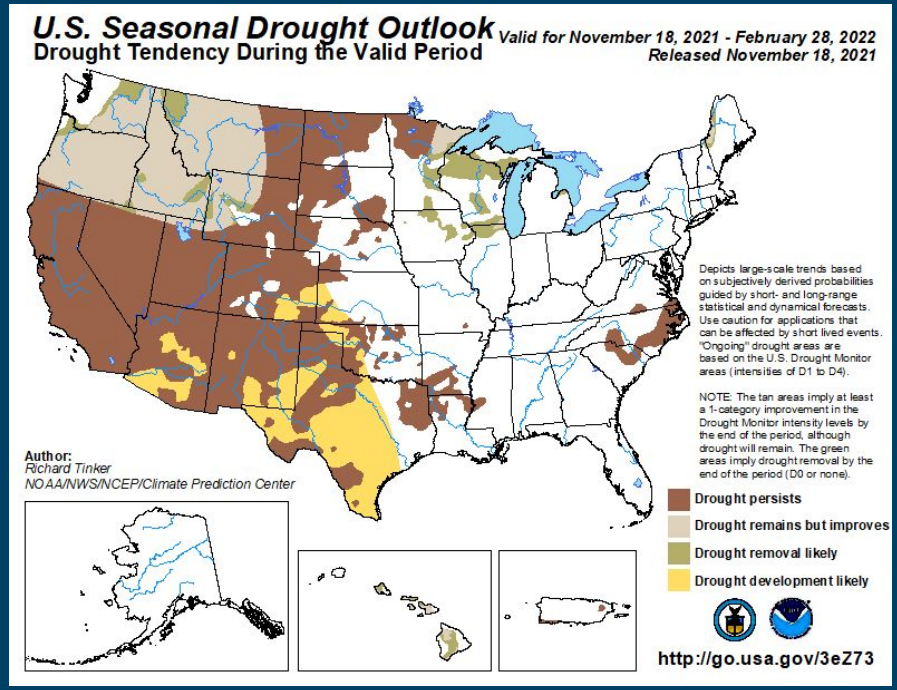


Drought Update

US Drought Monitor & Seasonal Outlook

www.cpc.noaa.gov





La Nina Status

ENSO Alert System Status: La Niña Advisory

- Equatorial sea surface temperatures (SSTs) are near-to-below average across most of the Pacific Ocean.
- La Niña conditions have developed and are expected to persist especially from December 2021 to February 2022 in the Northern Hemisphere.

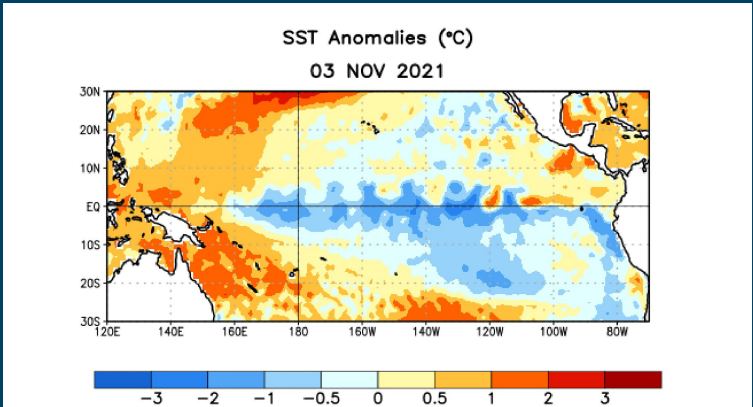
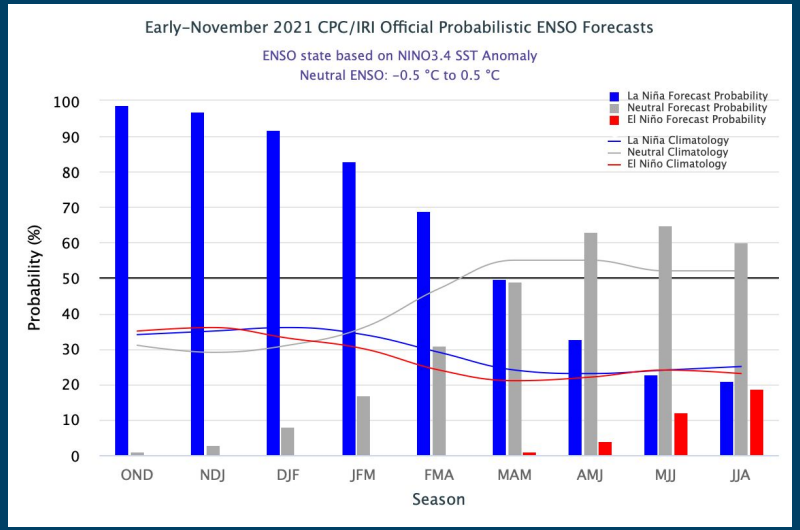
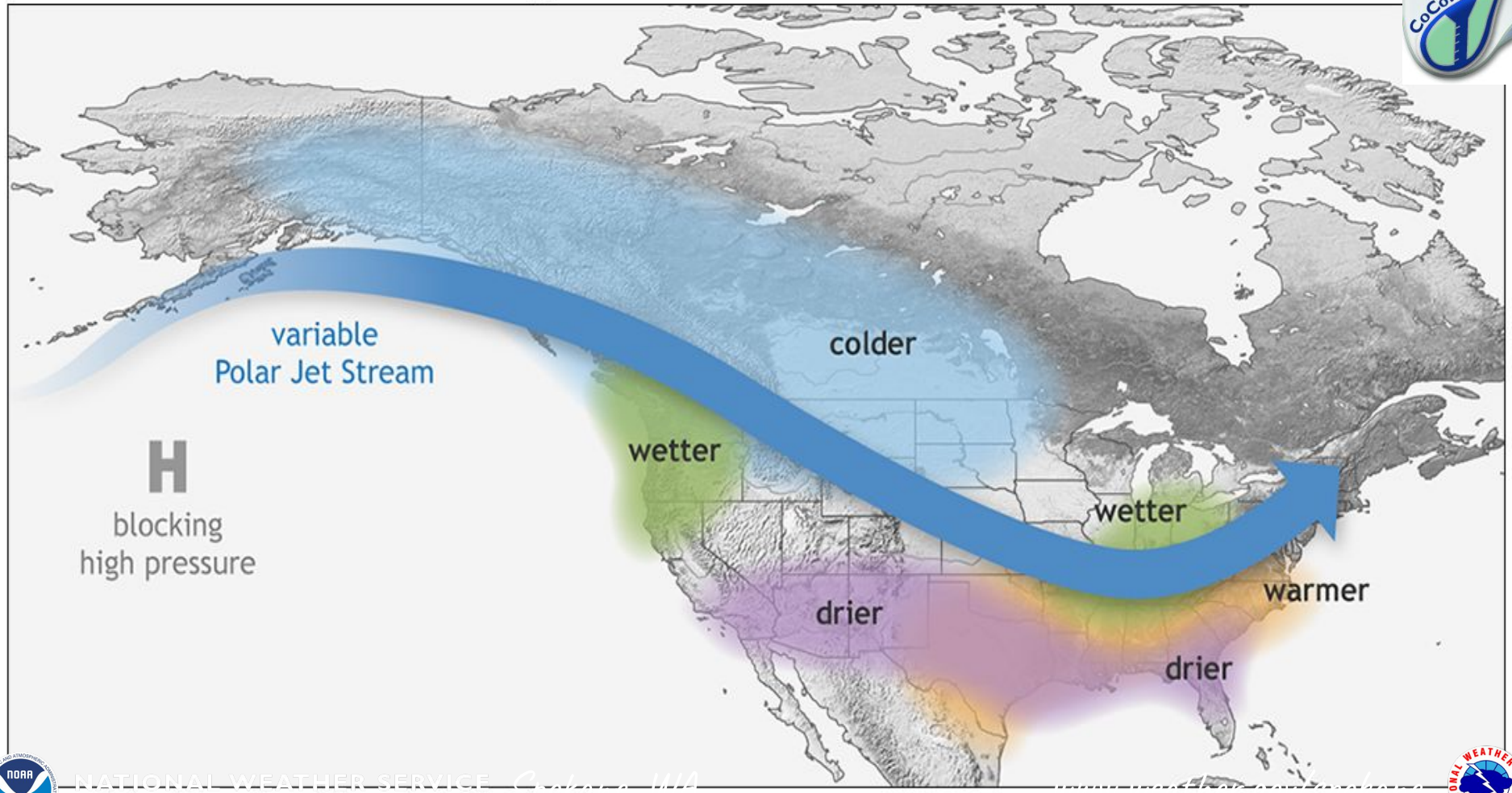


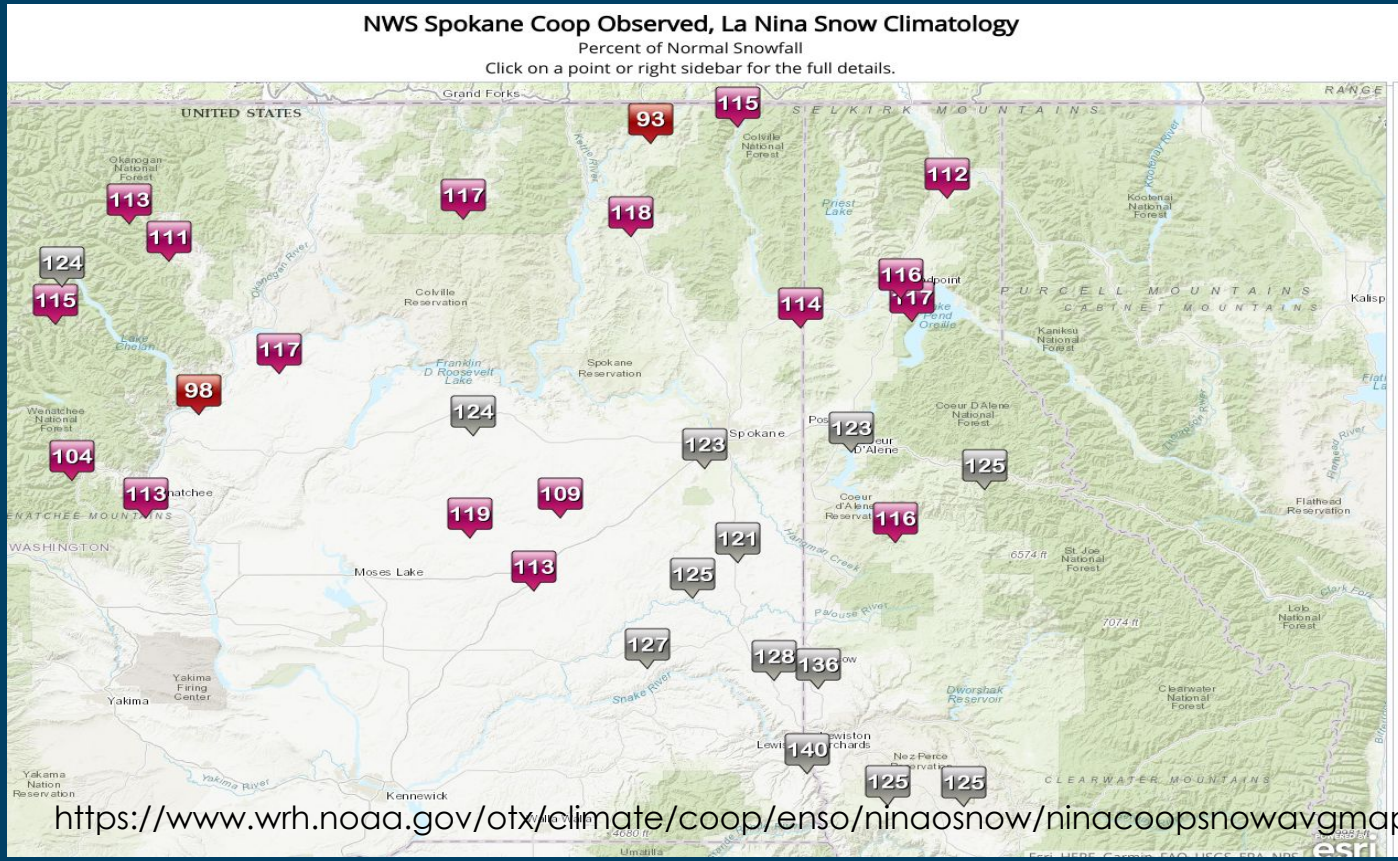
Figure 1. Average sea surface temperature (SST) anomalies (°C) for the week centered on 3 November 2021. Anomalies are computed with respect to the 1991-2020 base period weekly means.



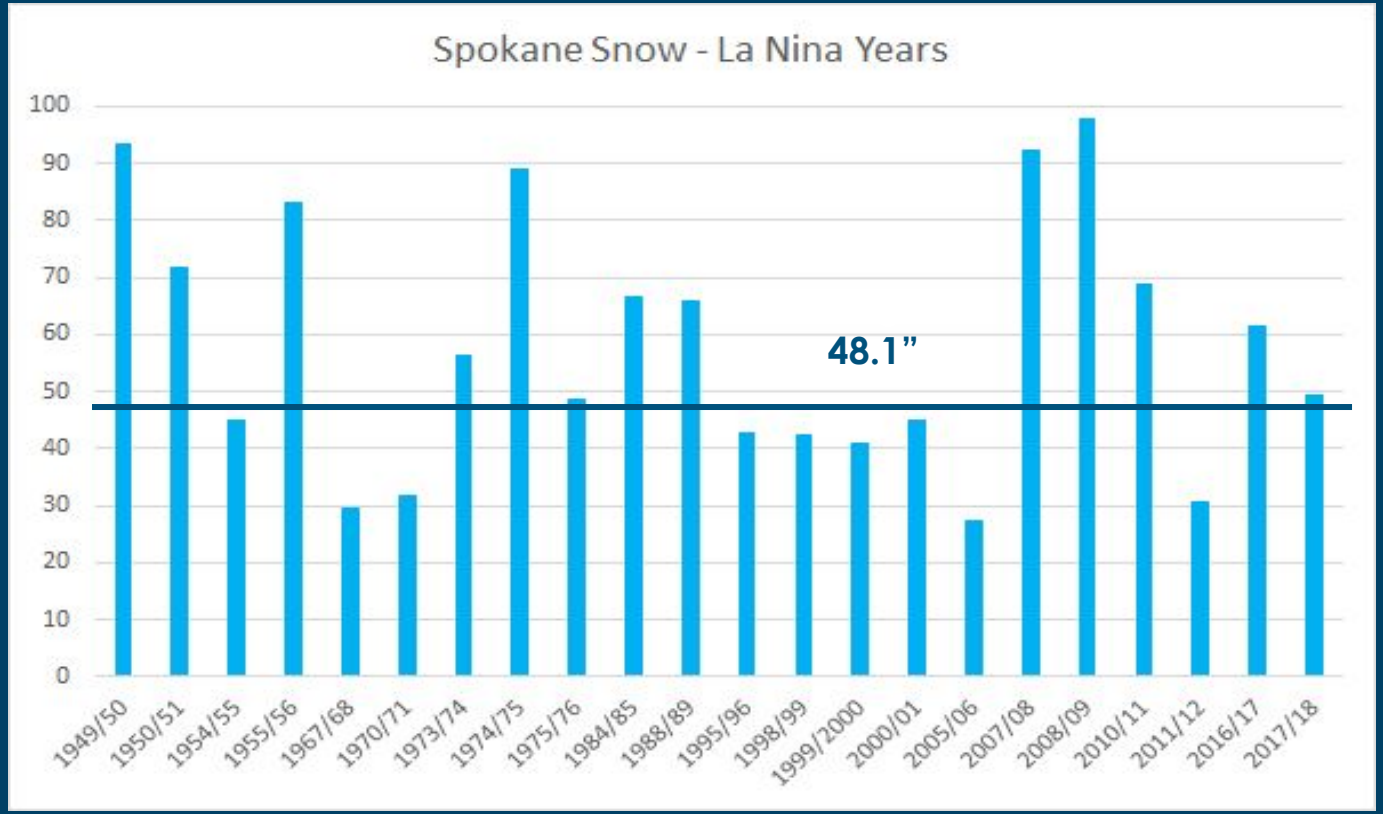
Typical Wintertime La Nina Pattern



Interactive La Nina Snow Climatology

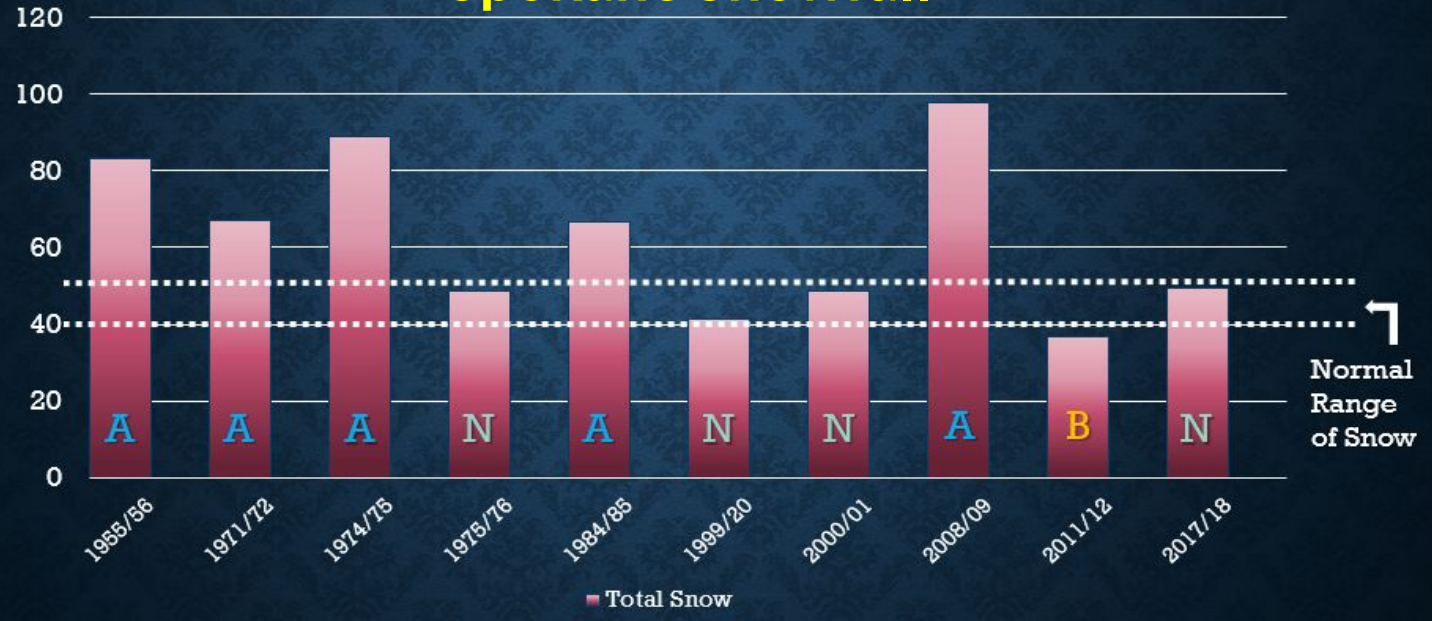


Spokane La Nina Snowfall



CONSECUTIVE LA NINA WINTERS

Spokane Snowfall

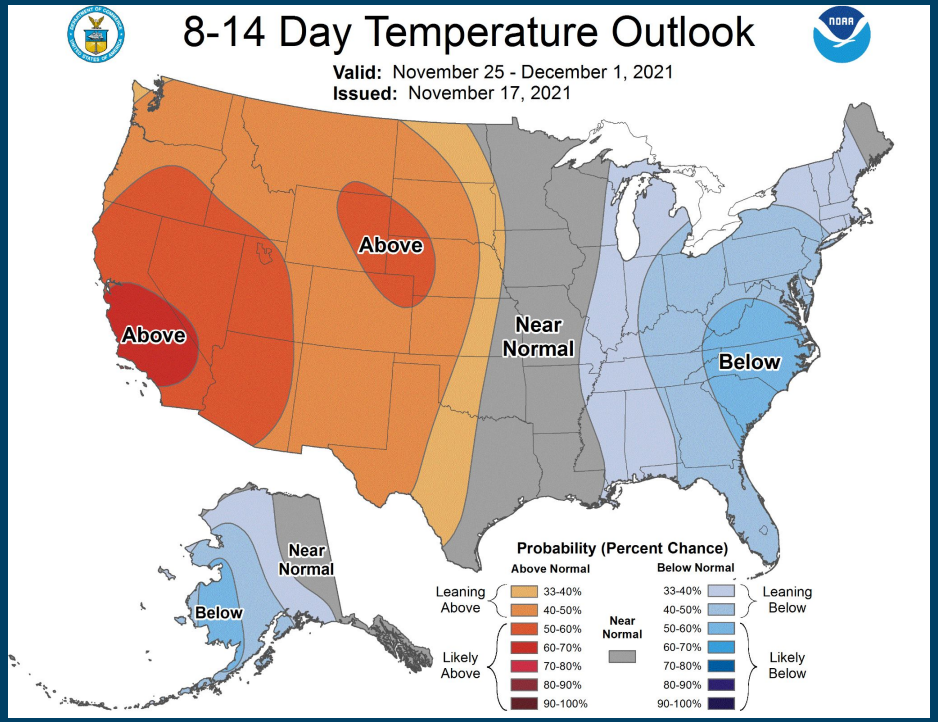


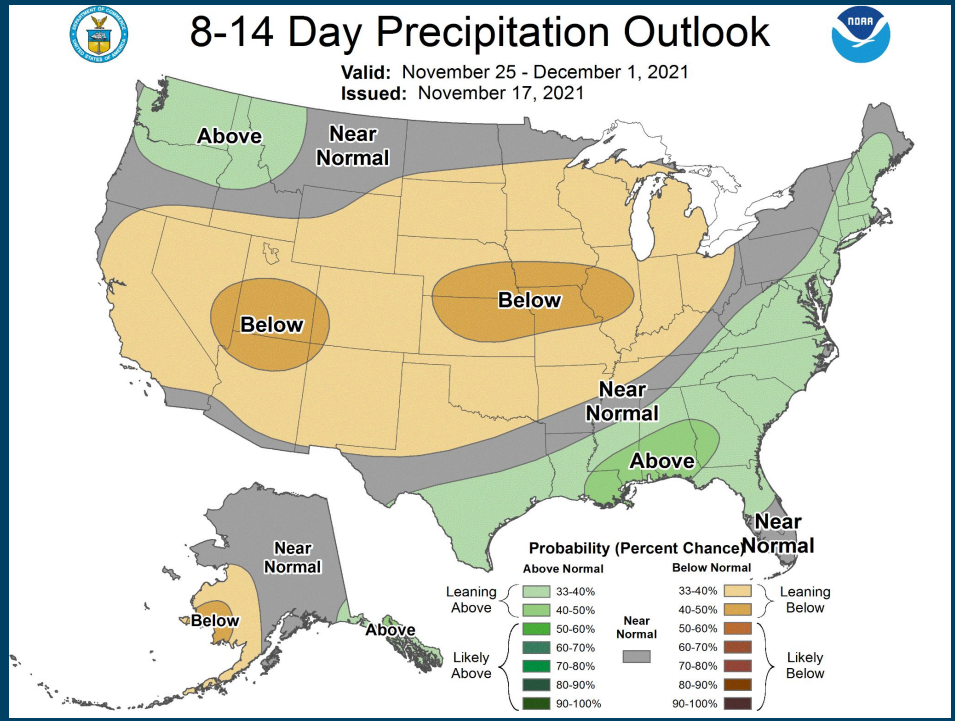
Above Normal (A) = 5 Normal (N) = 4 Below Normal (B) = 1

8-14 Day Outlook

Rest of November

www.cpc.noaa.gov

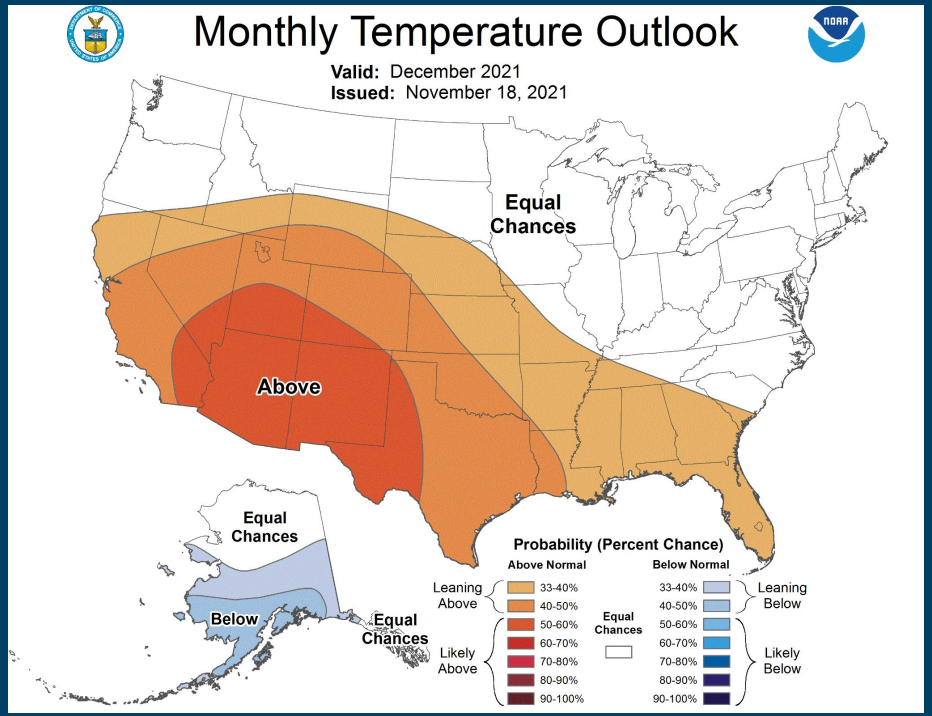


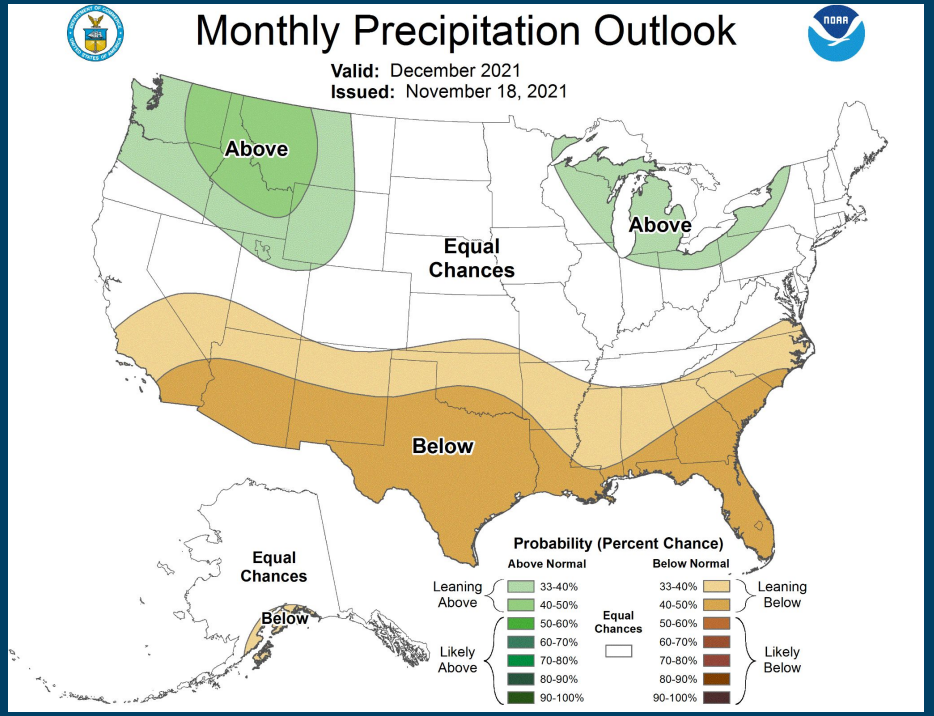


One Month Outlook

December

www.cpc.noaa.gov

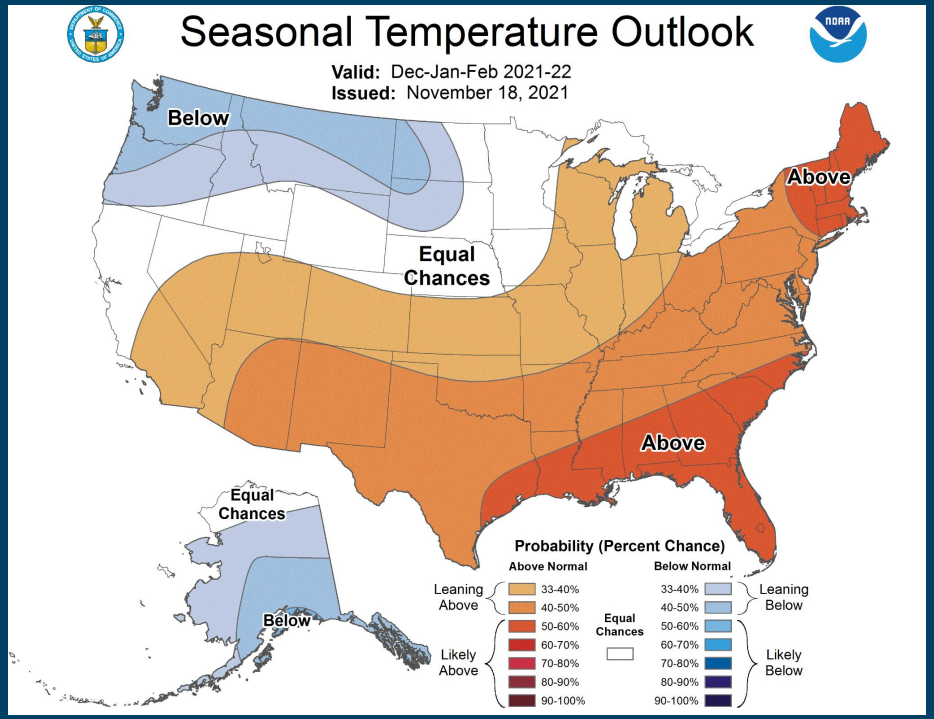


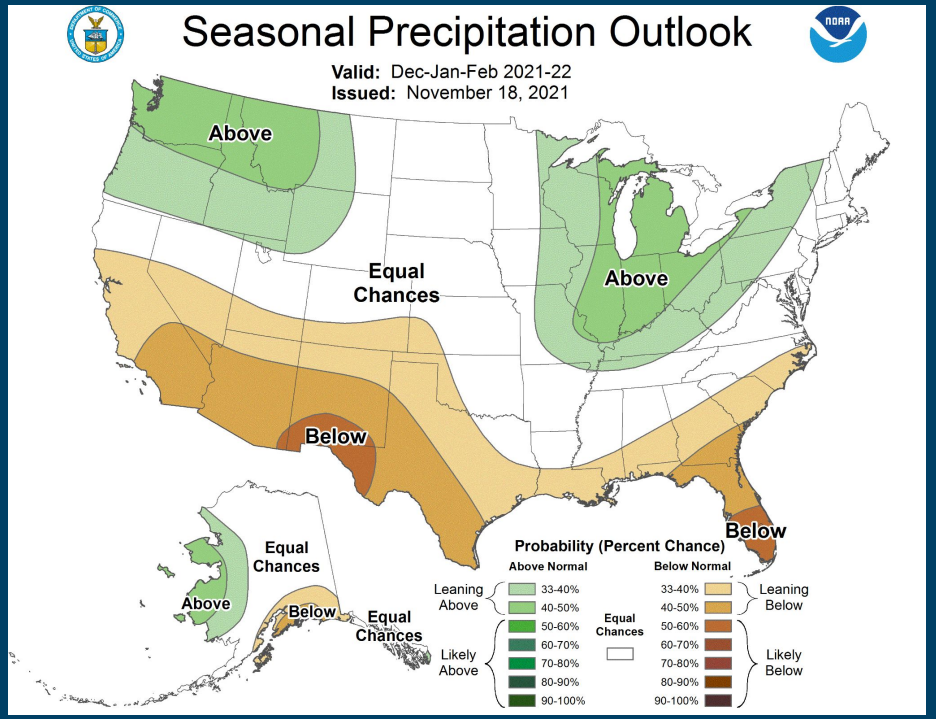


Three Month Outlook

December through February

www.cpc.noaa.gov





NATIONAL WEATHER SERVICE
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION
Spokane, WA

www.weather.gov/spokane

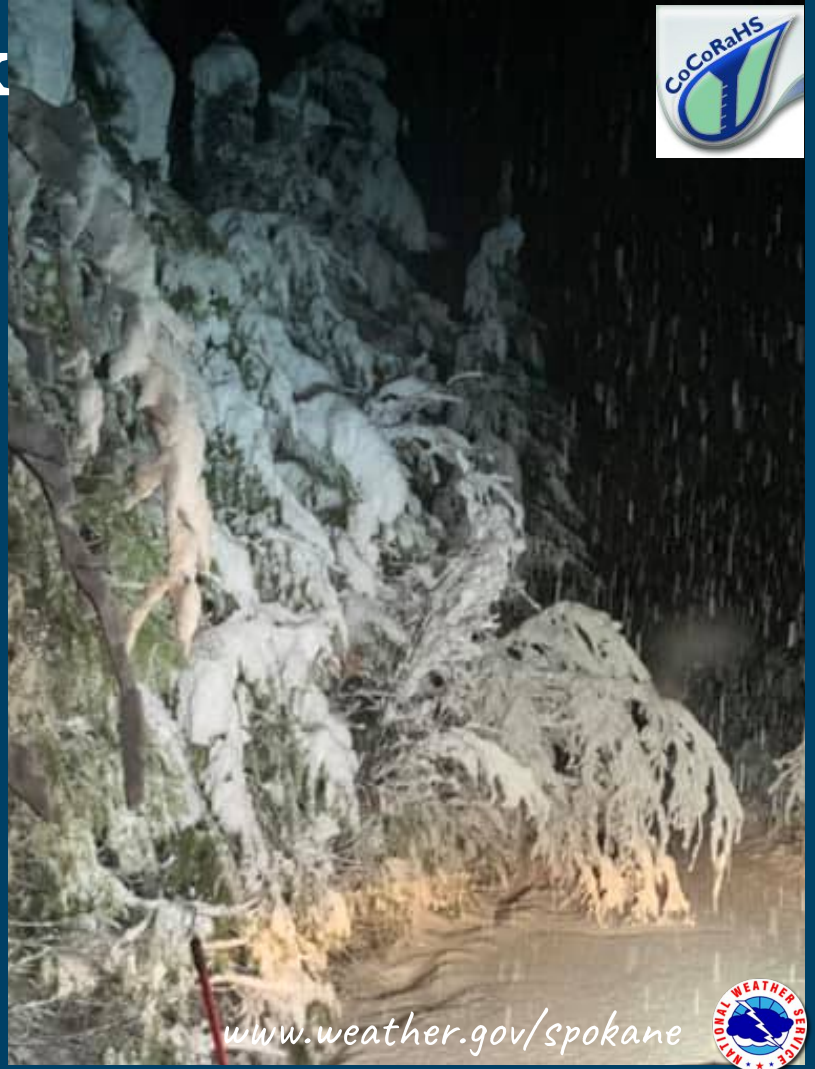
Key Points – Winter Outlook

- Drought continues, but may see a slow improvement through the winter.

- La Nina favored for the upcoming winter
  - Winter outlook - Slightly elevated odds of cooler, wetter & snowery than normal

- Winter is coming….Anticipate storms with snow, ice, rain and wind, but not one storm makes a season.

- We look forward to your reports!



nws.spokane@noaa.gov

THANK YOU!

What's Next?

Visit cocorahs.org

- Register if you want to join
- Review training videos and slides
- Check out the latest precipitation maps

Any Questions?

Unmute yourself to talk

Observer appreciation certificates

Once a year send a certificate from your state

OR-CS-7	Coos Bay 1 NNW	4356
OR-JS-1	O'Brien 2 SW	4185
OR-CS-11	Bandon 7.1 NNE	4163
OR-CS-3	Coos Bay 2.1 ESE	4145
OR-DG-10	Glide 1.1 SE	4138
OR-DG-27	Oakland 0.1 NNE	4126
OR-DG-22	Oakland 4.5 W	4049
OR-JC-11	Jacksonville 10 S	4039
OR-JC-27	Jacksonville 8.9 WSW	4021
OR-DG-26	Glide 2.9 SSW	3985
OR-CS-14	Coos Bay 1.7 WNW	3963
OR-KL-5	Klamath Falls 3.4 ESE	3943
OR-CY-1	Brookings 4.2 ENE	3929
OR-JC-29	Gold Hill 0.2 WSW	3877
OR-DG-30	Roseburg 4.6 NNW	3784
OR-JC-8	Central Point 10 N	3760
OR-DG-12	Idleyld Park 4 ESE	3693
OR-CY-3	Bandon 11.4 S	3675
OR-JC-13	Ashland 1 WNW	3665
OR-DG-3	Days Creek 1 N	3642
OR-JC-16	Prospect 7 SW	3614
OR-JC-1	Williams 1 N	3608
OR-DG-33	Roseburg 1.2 WNW	3552
OR-DG-16	Tenmile 1.8 NE	3485
CA-SK-5	Yreka 0.9 WNW	3414
OR-JC-2	Ashland 1.4 ESE	3260
OR-JC-18	Shady Cove 0.2 S	3225
OR-JC-5	Ashland 1 SE	3222
CA-SK-3	Weed 5.4 N	3177
OR-JS-5	Cave Junction 3.7 E	3176
OR-KL-14	Bonanza 7.0 N	3083
OR-JC-38	Medford 5.0 SSW	2794
OR-KL-4	Klamath Falls 8 SE	2787

Stations with over 3,000 CoCoRaHS observations in their CWA!

9 > 4,000 . . . TERIFFIC!
31 > 3,000
52 > 2,000

Celebrate their dedication!!

You can download this information from the Station History Report

ficates and celebrates it's COOP observers, for 5, 10, 20 .... years of service.
S coordinators can do so as well . . . Observers really appreciate this!

Poll questions and answers