

# Advanced Weather Spotting for the Inland Northwest



**SKYWARN**

*Spring 2023*

*National Weather Service - Spokane*



*National Weather Service - Spokane, WA*

*Tornadic Thunderstorm viewed from Dishman Hills on May 6, 2022 (courtesy of Joe Bruce)*

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# This is a Live Virtual Class

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

## New to GoToWebinar? Here's the basics



### the Menu bar

- Audio – tests your volume
- Attendees – all in attendance
- Poll – answer poll questions
- Questions – type in a question for the speaker to answer
- Handouts – download & print
- Chat – speaker's comments
- Click on the **Hand** to raise
- Click orange arrow to collapse window



# Objectives

- Understand the roles & importance of the Weather Spotter
- Describe your community's severe weather threats
- Provide accurate and timely reports of severe weather
- Properly define a severe thunderstorm and basic thunderstorm structure
- Identify cloud types and features of thunderstorms.
- Learn how to prepare and be safe during severe weather

Concentration on Thunderstorms and Severe Weather Risk Awareness  
Now let's look back to last year...



# Wind & Tornado Damage - May 6, 2022

Spokane, WA

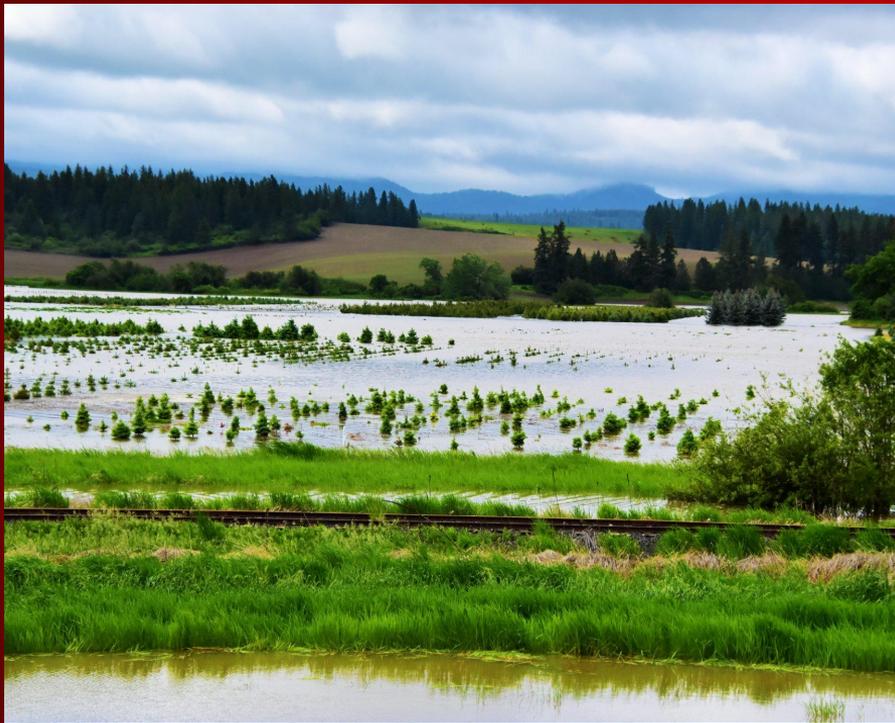


National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Flooding - June 13-14, 2022

Palouse River, St. Joe River and the Pend Oreille River



National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Flash Flooding - July 4, 2022

Conconully, WA



National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Large Hail - August 11, 2022

Rockford, Otis Orchards to Newman Lake



National Weather Service - Spokane, WA

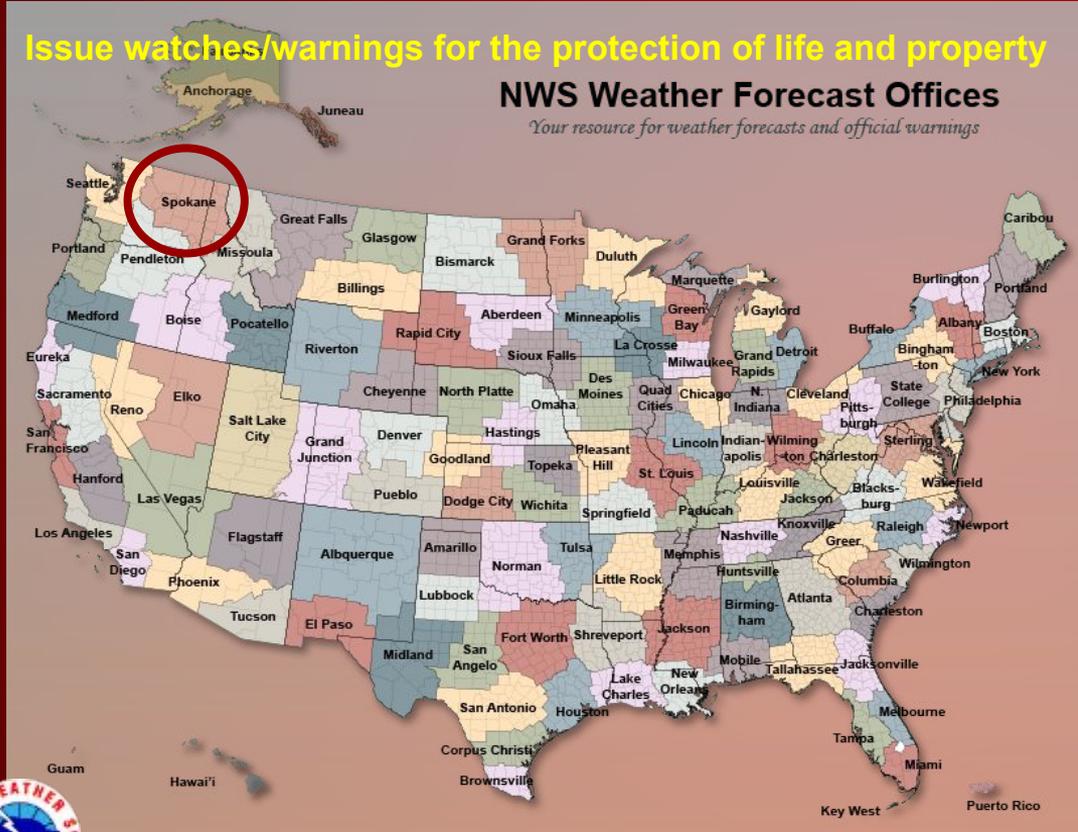
[www.weather.gov/spokane](http://www.weather.gov/spokane)

# National Weather Service (NWS)

- Part of the Federal Government – Dept of Commerce - NOAA
- Responsible for all weather/water Watches & Warnings
- Works with local agencies
- Observe & Forecast
- “Behind the Scenes”
- Decision Support
- Preparedness & Education



# NWS Spokane Forecast & Warning Area



Includes 2 states

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

Elevations range

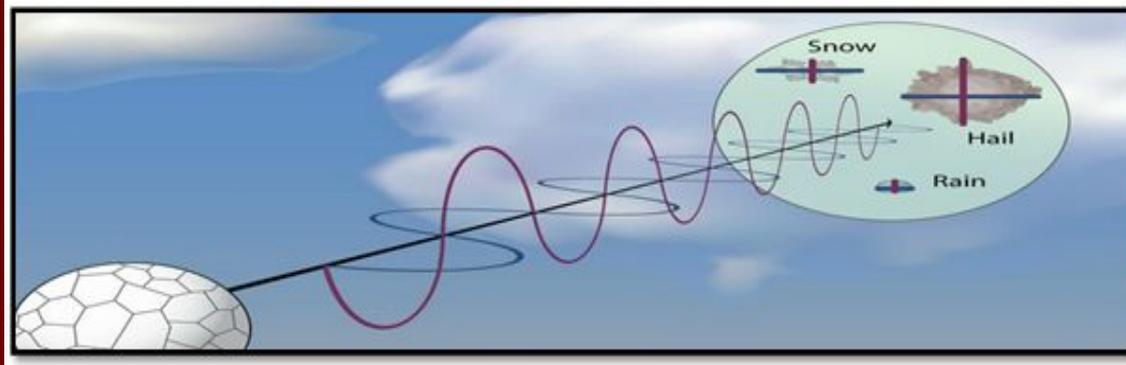
- 9500+ ft in the north Cascades
- 170 ft along the mid Columbia River



National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Doppler Weather Radar



## Reflectivity (dBZ)



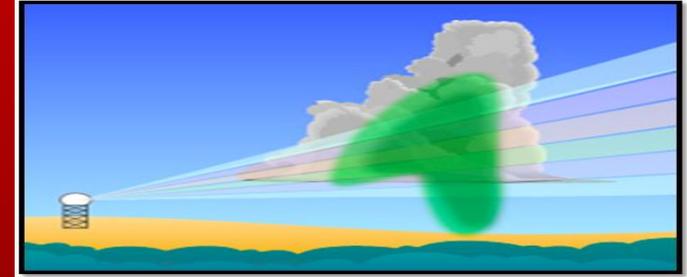
**Small Particles**  
Light Rain, Dust, Bugs

**Big Particles**  
Hail, Big Rain Drops

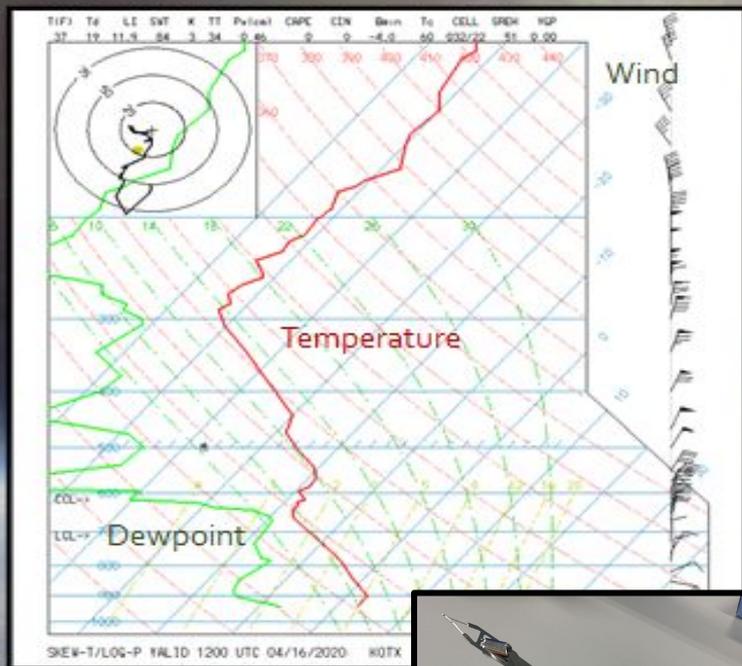
## Velocity (kts)

 Speed Moving Away from Radar

 Speed Moving Toward Radar



# Radiosondes



- Twice a day; every day
- 92 Upper Air sites across the U.S.
- About 100,000 ft (~19 miles) high
- One hour and 45 minutes flight
- After the balloon pops, a parachute opens and it falls back to the earth
- Less than 20% are recovered and mailed back
- Radiosonde chart gives a profile of temperature, dewpoint, winds through a column of the atmosphere.

Where to find this chart online?

<http://weather.rap.ucar.edu/upper/otx.gif>

NWS Spokane web page:

Forecasts tab – Forecast models



# Weather Satellites

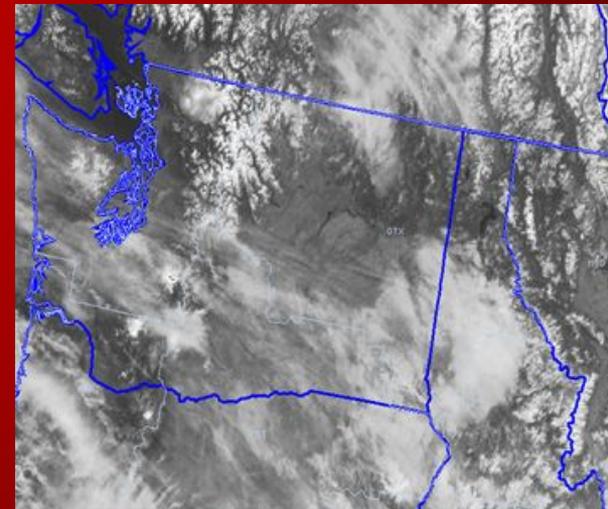
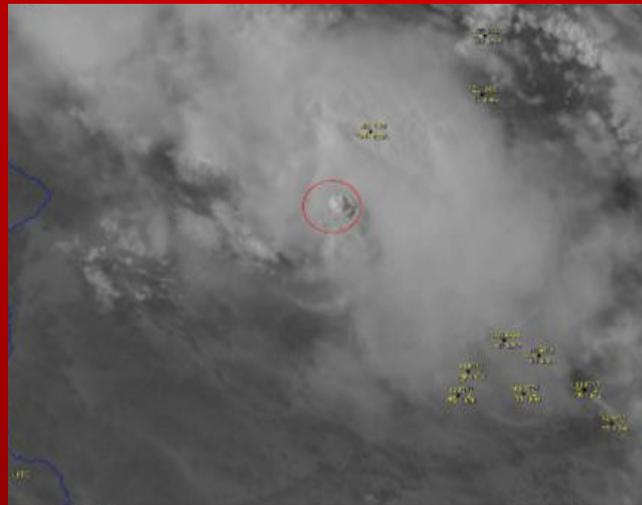
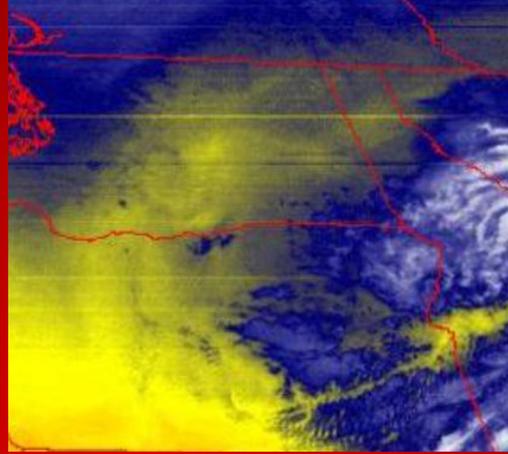
GOES 18 - 16 different channels

IR, Water Vapor & Visible

New images every 5 minutes

Aids in early detection

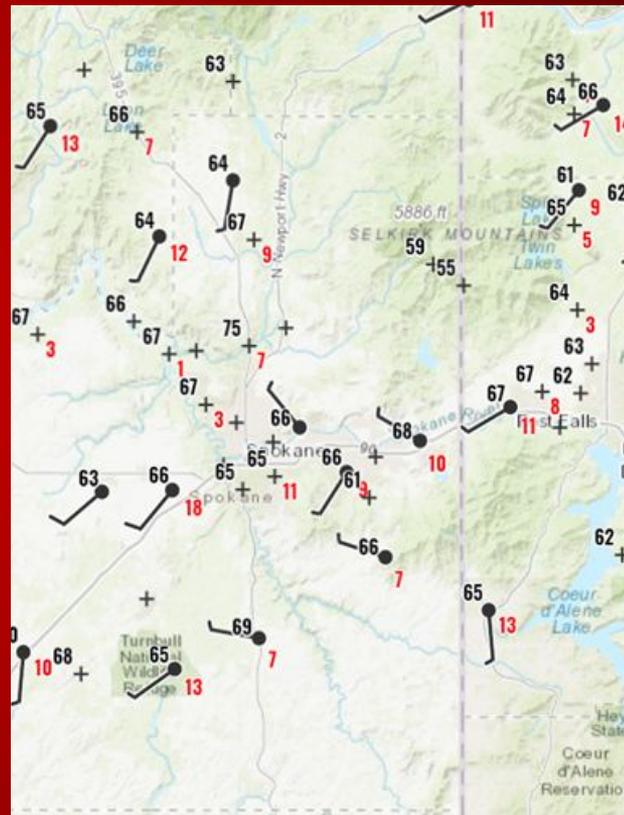
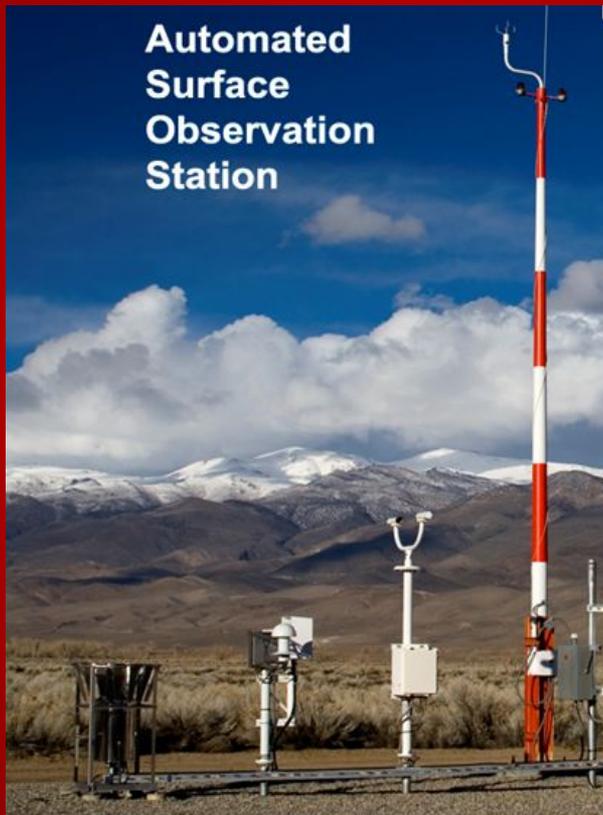
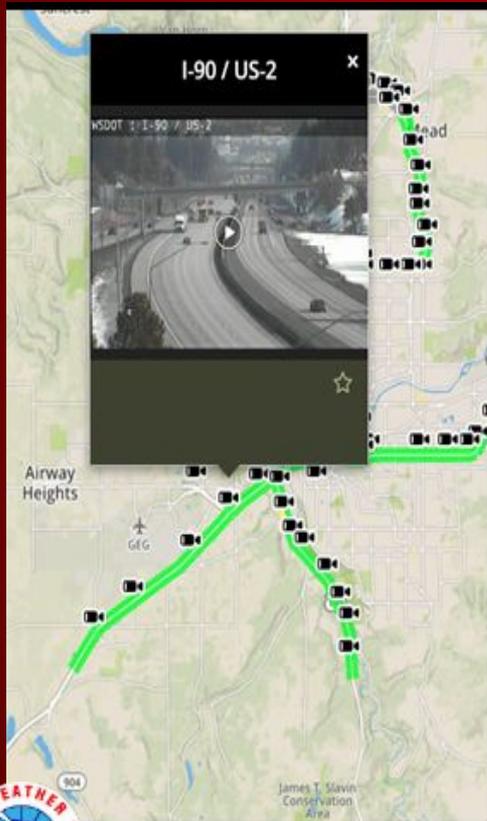
Thunderstorms & Wildfires



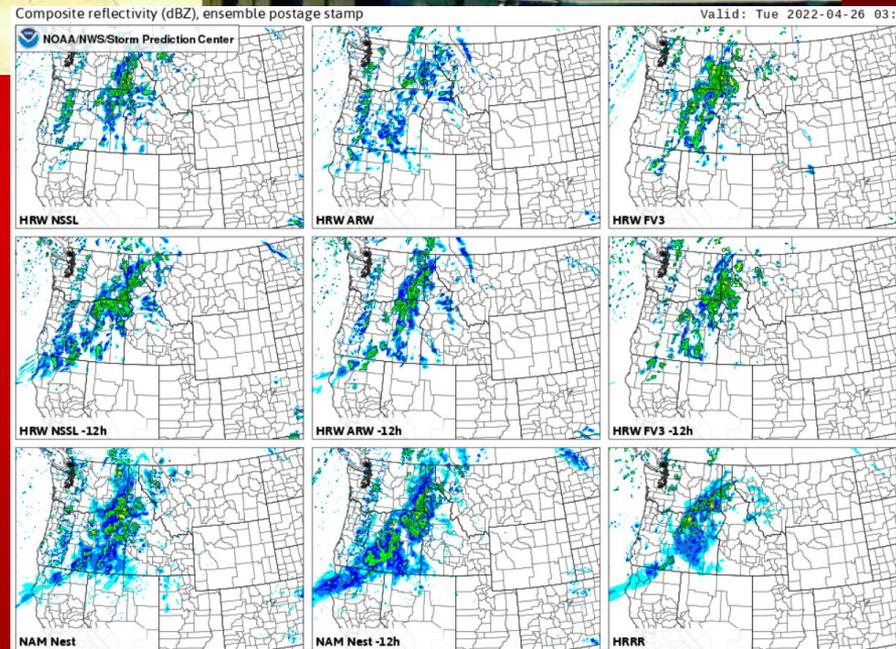
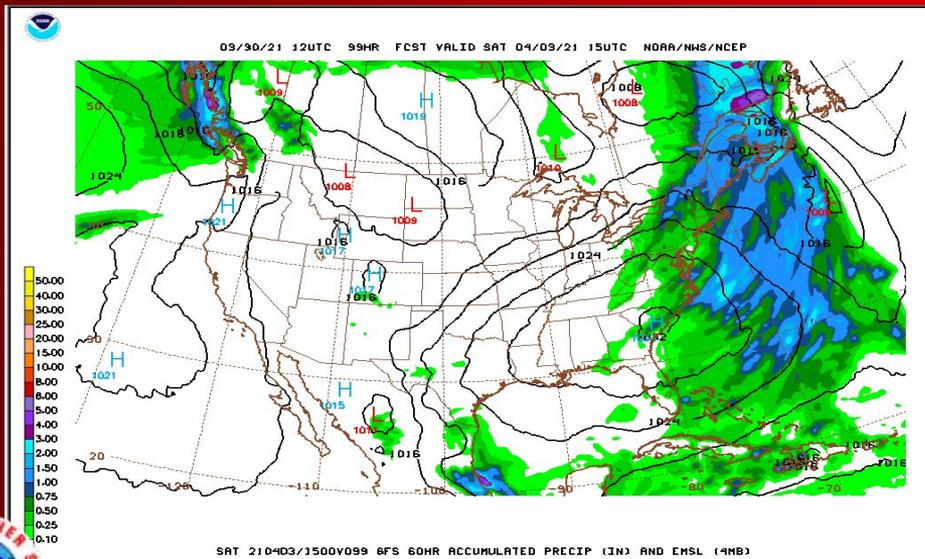
National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

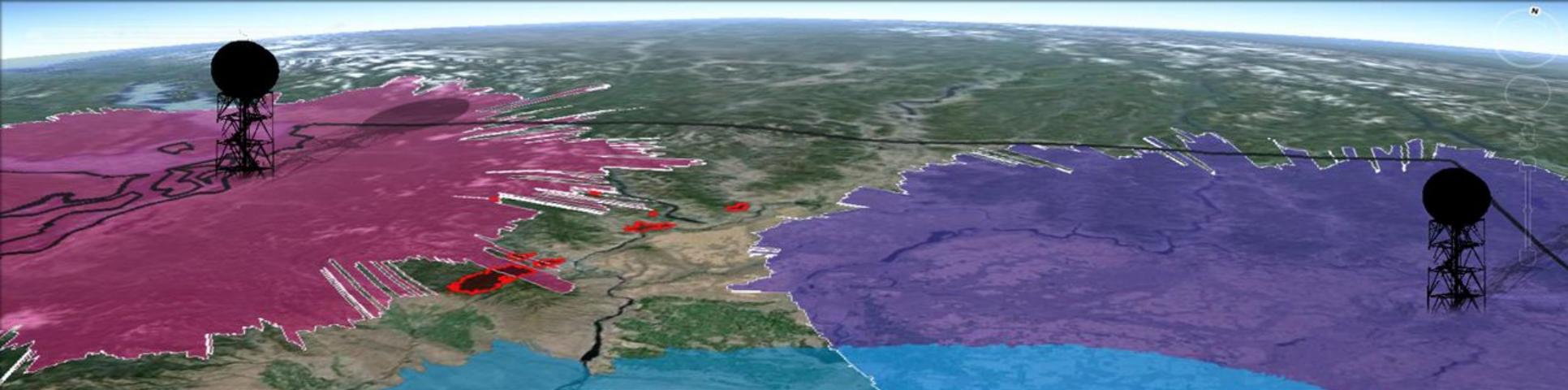
# Surface Observations & Web Cams



# Supercomputers & High Resolution Models



# We need weather spotters! 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!



# #1 Poll Question

Why are weather spotters important?

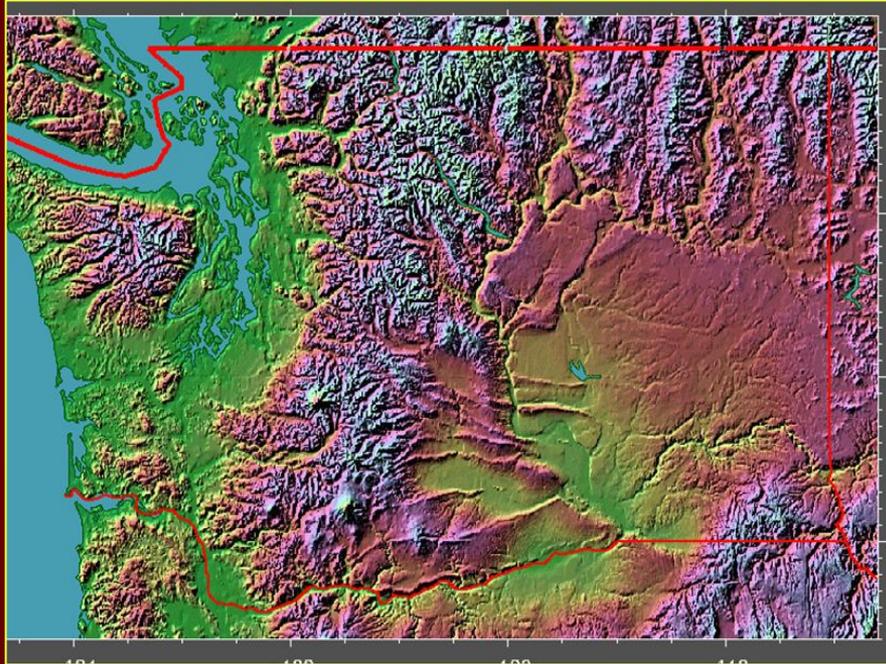


# Weather Hazards Change with the Seasons

- Flooding - river flooding and flash flooding
- Fire weather - wind and dryness - lightning and smoke
- Thunderstorms - hail, wind, rain and lightning
- Winter storms - snow, ice, rain and wind

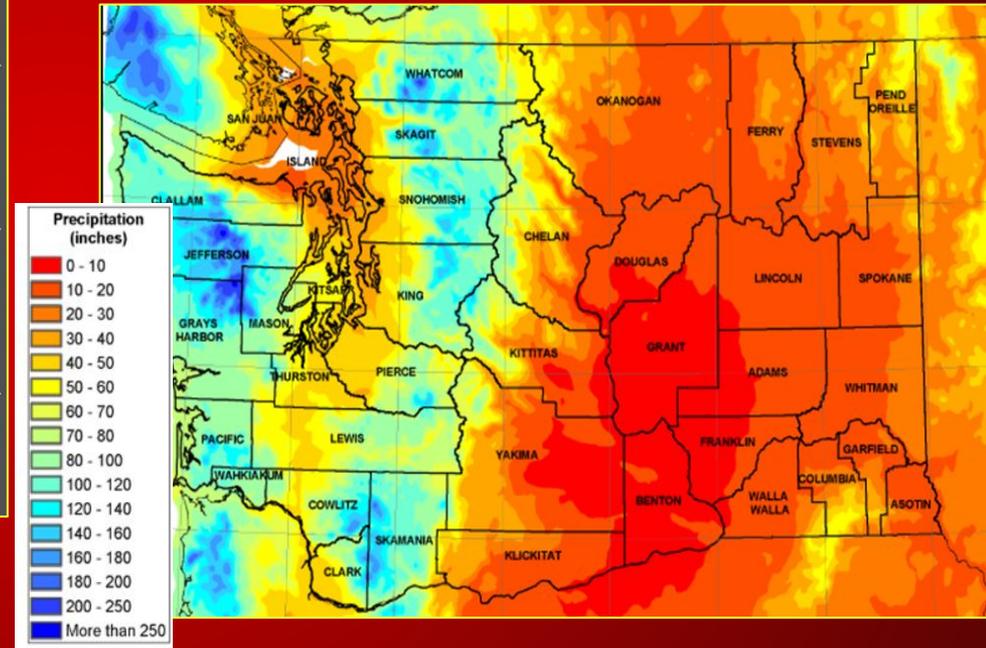


# Terrain Makes ALL the Difference



Topography Map

Average Annual Precipitation Map



# What's in a Spotter Report?

Specifics...Tell us the Story!

**Spotter ID & Location**

	<b>Inland Northwest Weather Spotter Checklist</b>	
<b>Tornado or Funnel Cloud:</b> ANY Kind		
<b>Strong Winds:</b> +40 mph/Damage (58mph severe)		
<b>Hail:</b> +3/4" in diameter (1" severe)		
<b>Heavy Rain:</b> +1/2" in 1 hr or +1" in 12 hrs		
<b>Flooding:</b> ANY Kind		
<b>Mixed Precipitation:</b> freezing rain or sleet		
<b>Snow:</b> +2" below 3K ft (valleys) or +6" abv 3K ft (mtns)		
<b>Poor Visibility:</b> 1/2 mile or less		
<b>Travel Problems:</b> due to weather		
<b>Damage, Injury or Loss of life:</b> ANY		
<b>Excessive Heat:</b> ANY		
<b>Excessive Cold:</b> ANY		

- Who...What...and Where
- When the event began and/or ended
- Estimates of wind speeds and hail size
- Damage and injury reports

If unsure - report your concertainty

Feel free to include reports while traveling and any delayed or second hand reports



# #2 Poll Question

What types of severe or hazardous weather do we NOT experience in the Inland NW?



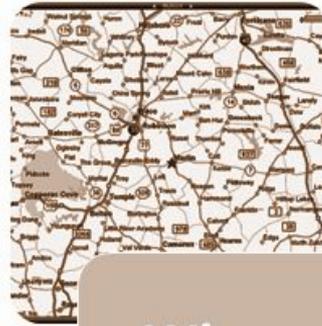
# How Spotters Report - Easiest Phone Call



**Dial :**  
**1-800-483-4532**  
Spotter ID



**What:**  
Event you  
Witnessed



**Where:**  
Location  
of event



**When:**  
Time of  
the event

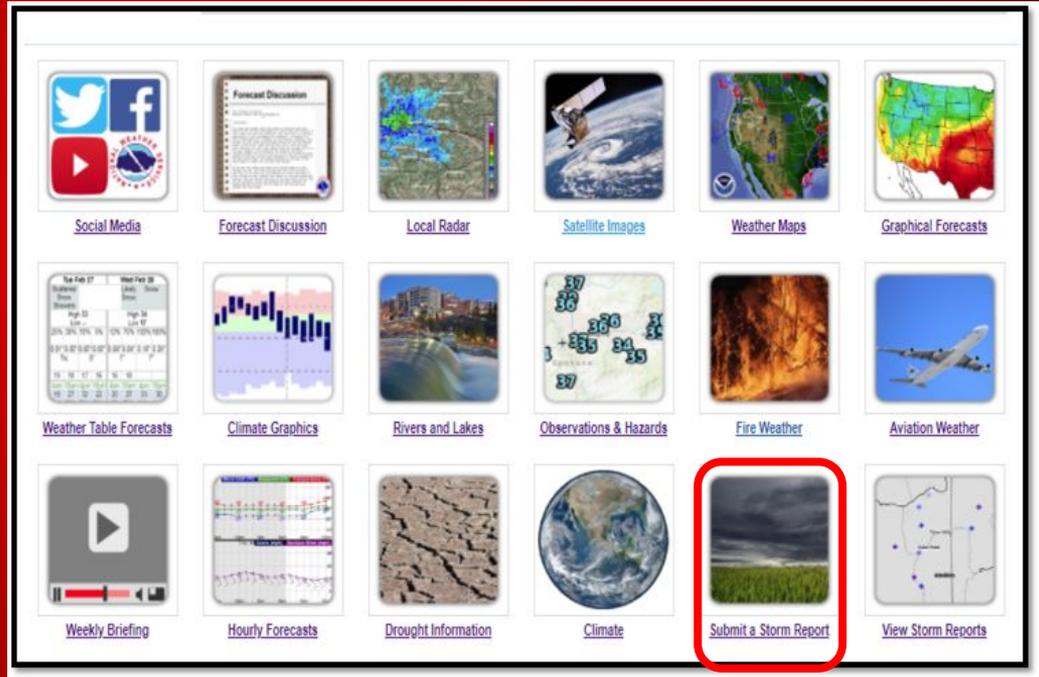


# How Spotters Report – Just as easy Online Reports

[www.weather.gov/Spokane](http://www.weather.gov/Spokane)



The screenshot shows the NOAA Storm Reports web form. At the top left is the NOAA logo with the text "NOAA Storm Reports Alerting the NWS to local weather". Below the logo is a navigation path: "Report Type -> Details -> Location -> Review and Send". A dropdown menu is labeled "Please select a report type". Below the dropdown are "Back" and "Next" buttons. At the bottom of the form area is a link for "Privacy policy for weather reports".



A grid of 18 weather-related links and images. The links are: Social Media, Forecast Discussion, Local Radar, Satellite Images, Weather Maps, Graphical Forecasts, Weather Table Forecasts, Climate Graphics, Rivers and Lakes, Observations & Hazards, Fire Weather, Aviation Weather, Weekly Briefing, Hourly Forecasts, Drought Information, Climate, Submit a Storm Report (highlighted with a red box), and View Storm Reports.

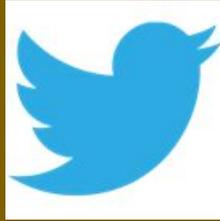


National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Share weather data - Social Media

## Twitter



- @NWSSpokane
- #wawx & #idwx
- Share reports & pictures
- Monitored 24/7

## Facebook

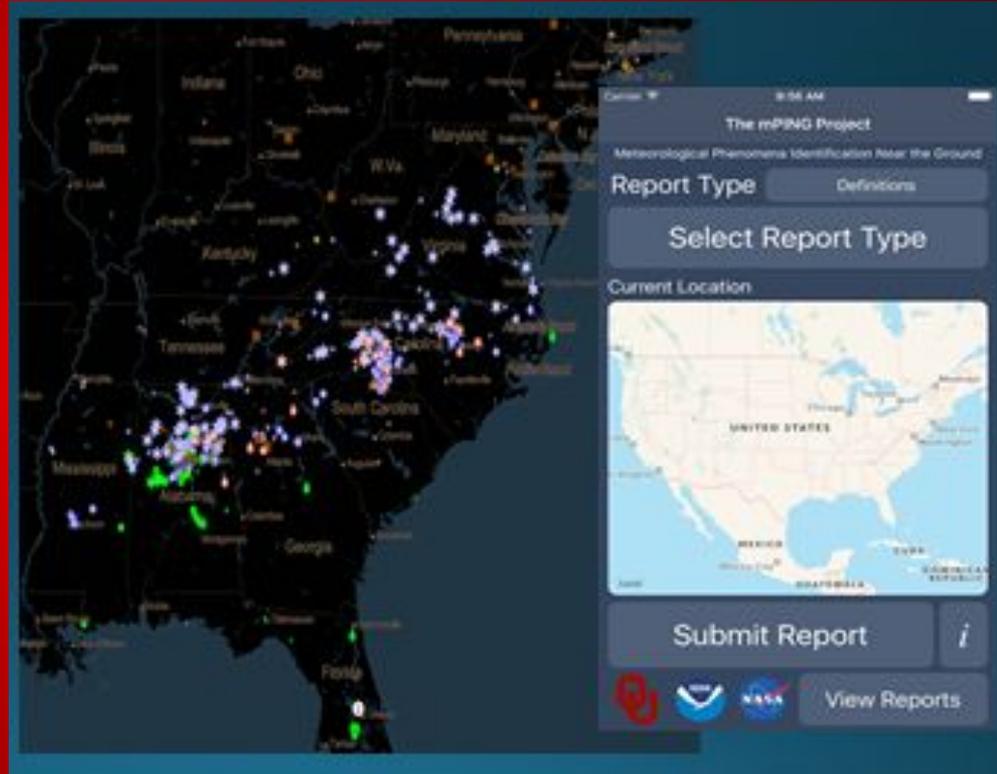


- NWS Spokane
- Send reports & pictures
- Monitored 24/7



# Share weather data - mPING

- Smartphone App
- Available on IOS and Android
- Reports sent to NWS
- Reports are anonymous
- Crowdsourcing
- Very easy to use
- <https://mping.nssl.noaa.gov>



# Share weather data - Email Photos

nws.spokane@noaa.gov



# Emails are Important

Besides a phone number, it's important to share your email address!

You will likely be notified by email before there is a WIDESPREAD Severe Weather Risk or Thunderstorm Outbreak.

We send periodic emails to share quarterly newsletters and upcoming training opportunities.

YOUR NATIONAL WEATHER SERVICE SPOKANE QUARTERLY REPORT

Vol XXVIII Issue 1

## **The Weather Watcher**

**Of the Inland Northwest**

[www.weather.gov/Spokane](http://www.weather.gov/Spokane)



March 2023



*National Weather Service - Spokane, WA*

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# NWS may Contact You!



As a registered weather spotter, you'll share your phone number with the NWS.

If we see severe or hazardous weather near your location...

We will likely try to call you to get information on what you are experiencing (ground truth) based on what is seen on radar!



# #3 Poll question

What would be your preferred way to send reports to the NWS?



# Thunderstorm Hazards

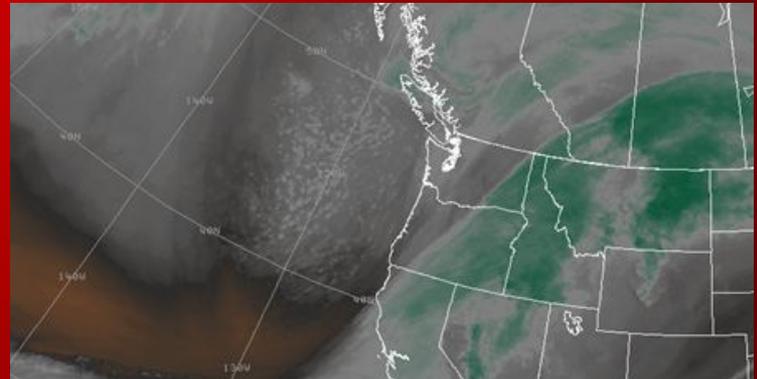
## Main Ingredients

- Moisture
- Lift
- Instability
- Vertical Wind Shear



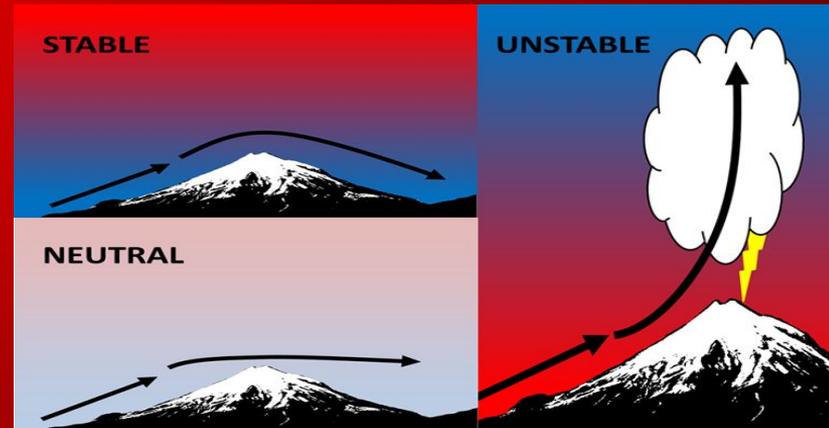
# Ingredient #1: Moisture

- Forms the clouds and precipitation associated with thunderstorms
- **Primary Sources:** Pacific Ocean
- **Occasionally:** Gulf of California/Mexico during Monsoon Season
- Monitor with satellite, upper level soundings and surface observations
- Terms: Precipitable Water, Dewpoint, Relative Humidity



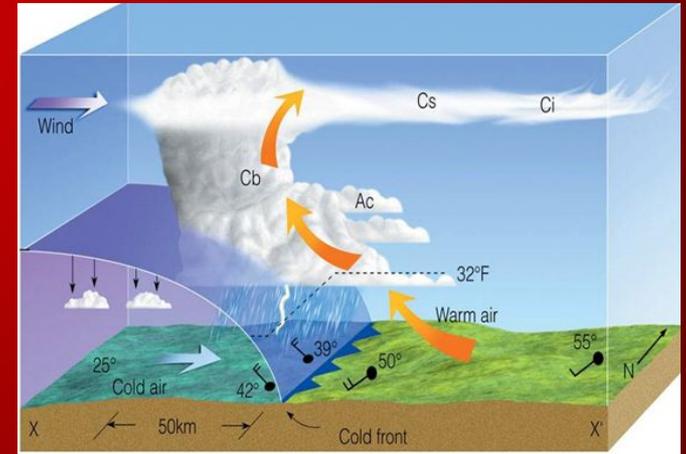
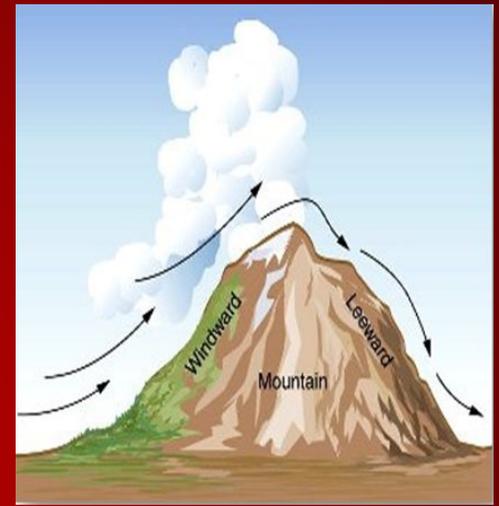
# Ingredient #2: Instability

- How the atmosphere naturally mixes
- **Unstable:** warm moist air near the ground with cold air above
- **Stable:** cold air at the surface and warm air above
- Monitor with upper level soundings and surface observations
- Terms: CAPE, Lifted Index, Lapse Rates



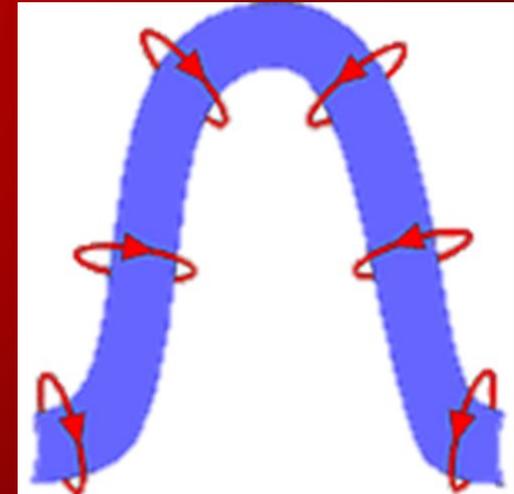
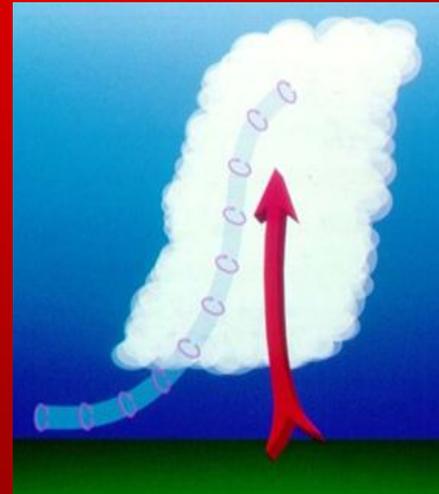
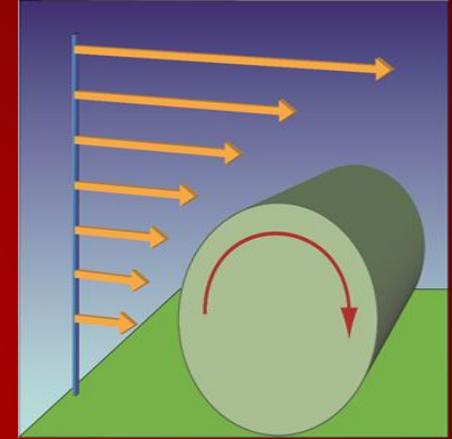
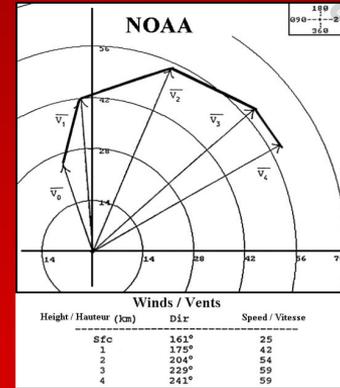
# Ingredient #3: Lifting Mechanism

- Something to force the air upward in the atmosphere
- **Mountains/Terrain:** air forced up a slope
- **Cold Front:** air is forced up by a frontal boundary
- Monitor with satellite, radar, upper level soundings and surface observations
- Terms: vertical velocity, vorticity, fronts



# Ingredient #4: Wind Shear

- Creating the rotation
- Changes in wind speed & direction with height
- Monitor with radar, upper level soundings and surface observations
- Terms: Helicity, Shear, Hodograph

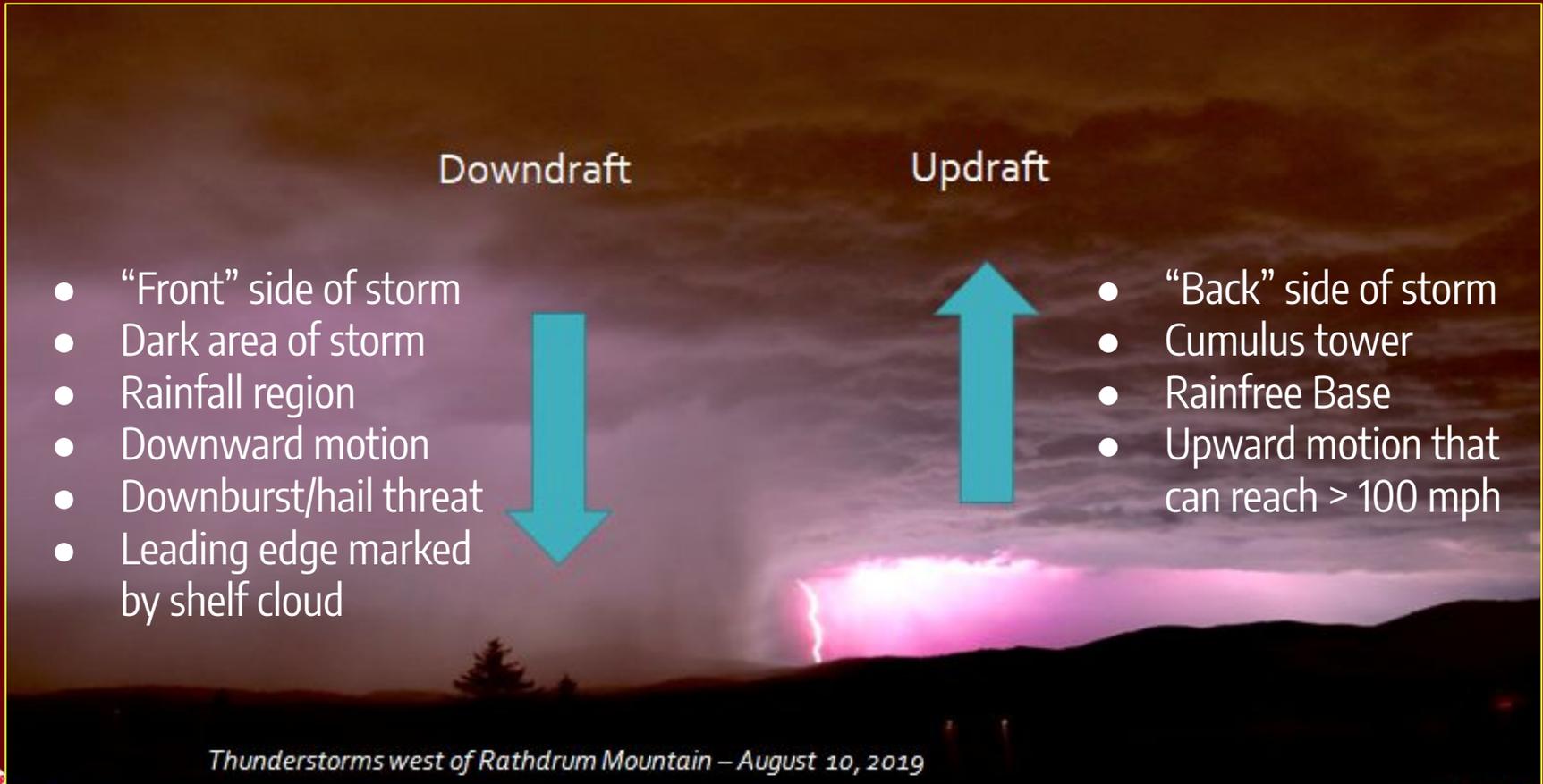


# S-L-I-M – Basic Thunderstorm Elements

Shear	Lift	Instability	Moisture
Changing wind speed and direction with height	Mechanism to force air upwards	“Energy” for thunderstorms	Obviously!
Helps storms become better organized, increasing severity and longevity	Creates a focus for where storms can develop	Ability for air to rise or sink as storms develop	Needed to produce clouds and storms
Common ahead of or along a front	Cold Front, Warm Front, Leftover storm boundary, Lake Breeze	Warm surface, cool upper levels (cools at a very fast rate as you go up)	Use Dew Point



# Thunderstorm Basics



Downdraft

- “Front” side of storm
- Dark area of storm
- Rainfall region
- Downward motion
- Downburst/hail threat
- Leading edge marked by shelf cloud

Updraft

- “Back” side of storm
- Cumulus tower
- Rainfree Base
- Upward motion that can reach > 100 mph

*Thunderstorms west of Rathdrum Mountain – August 10, 2019*



# What is a Severe Thunderstorm?

Winds  $\geq$  58 mph or Wind Damage



Hail  $>$  1" in diameter



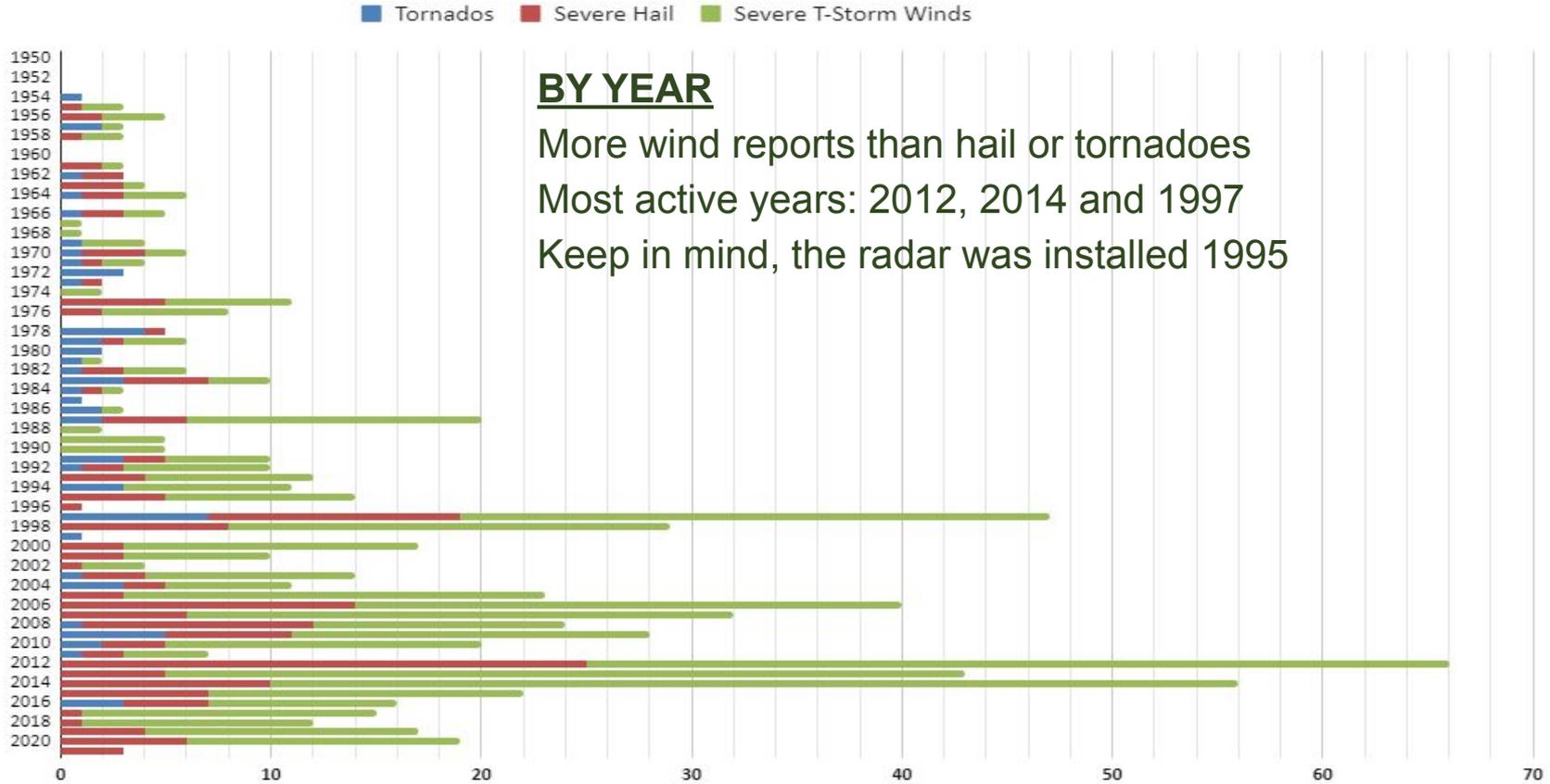
Tornado



- Less than 10% of all thunderstorms are Severe
- Though Lightning is ALWAYS extremely dangerous, the amount of lightning does not make a storm SEVERE.



# Local Severe Weather Climatology



## BY YEAR

More wind reports than hail or tornadoes

Most active years: 2012, 2014 and 1997

Keep in mind, the radar was installed 1995



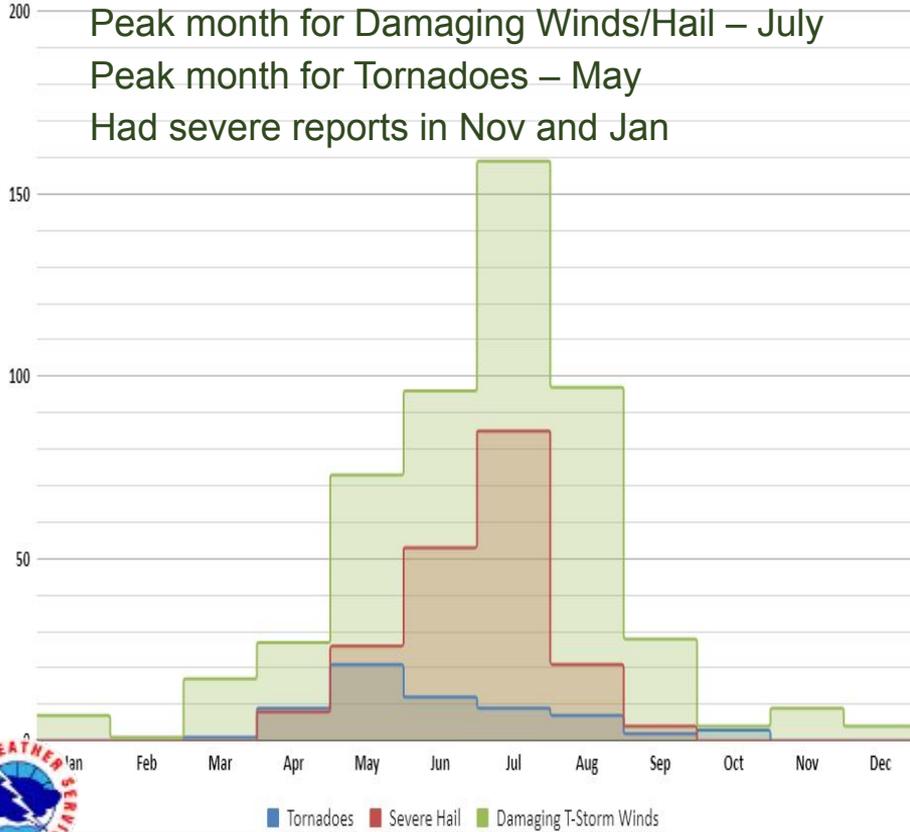
# Local Severe Weather Climatology

## BY MONTH

Peak month for Damaging Winds/Hail – July

Peak month for Tornadoes – May

Had severe reports in Nov and Jan

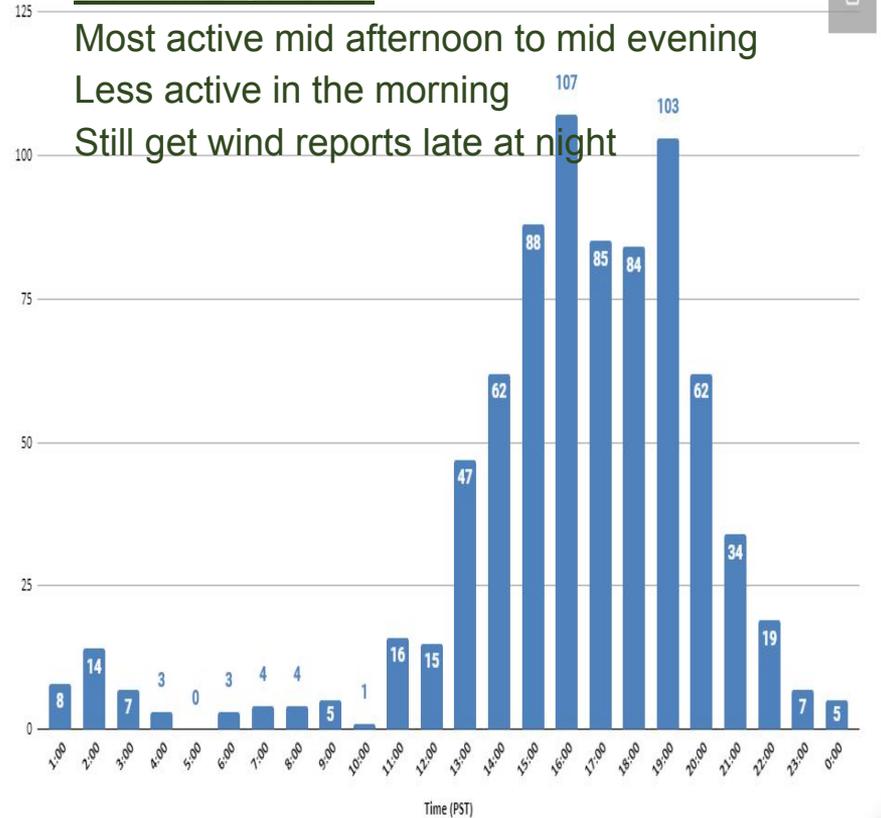


## BY TIME OF DAY

Most active mid afternoon to mid evening

Less active in the morning

Still get wind reports late at night



# #4 Poll Question

What would be a good ingredient for thunderstorm development?



# Types of Thunderstorms

Single Cell



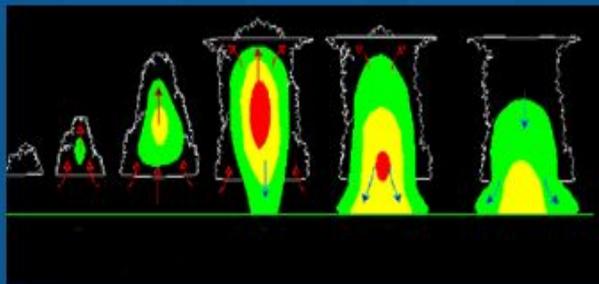
Multi-Cellular



Supercell



# Single Cell Thunderstorm



## Mostly Non-Severe

Life Cycle of < 30 minutes

May Contain Small Hail  
& Gusty Winds



National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Heavy Rain

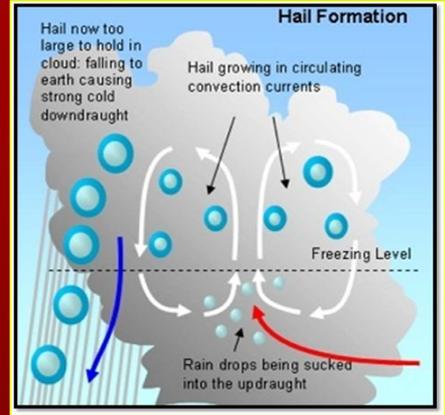
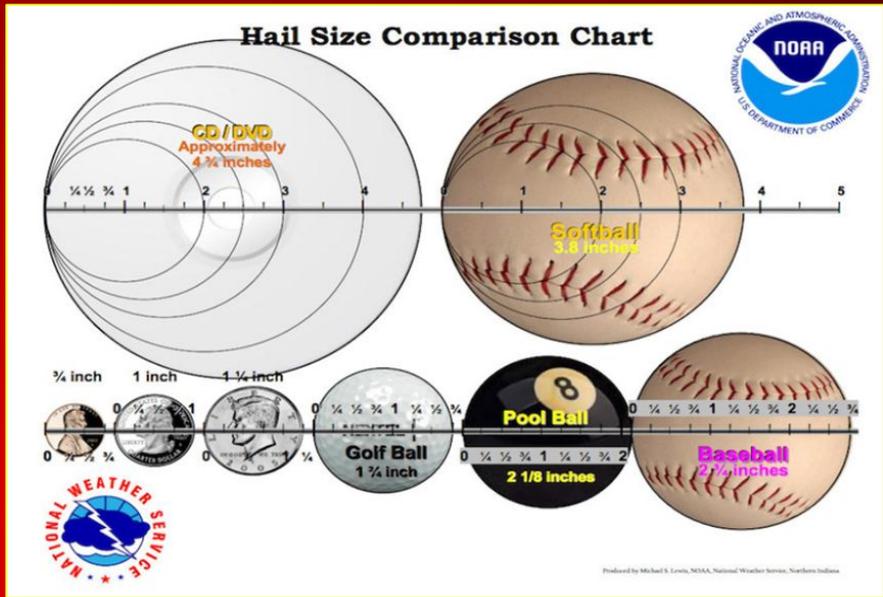
Report heavy downpours or long periods of steady rain  
Give specific locations - streets and creeks

- 0.50"+ in 1 hour - convective
- 1.0" in 12 hours or 1.5"+ in 24 hours - stratiform



# Hail

- Strong updraft keeps chunks of ice aloft
- Circulated within a storm and collects layers of water and freezes
- Can fall to the ground at > 100 mph
- Severe hail  $\geq 1$ " diameter
- Always report the largest Hailstone you see in the pile.



Service - Spokane, WA

# Damaging Winds

- Strong downburst winds or straight line winds
- Can be convective or sustained strong winds
- Report any winds estimated to be over 40 mph
- Winds that product any damage
  - Downed trees, power lines, structure damage
- Remember, severe/high winds  $\geq 58$  mph



Windstorm 2015



April 27, 2019



January 13, 2021

Beaufort Number	MPH		Terminology	Description
	Range	Average		
0	0	0	Calm	Calm. Smoke rises vertically.
1	1-3	2	Light air	Wind motion visible in smoke.
2	4-7	6	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19-24	22	Fresh breeze	Smaller trees sway.
6	25-31	27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	35	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	42	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	50	Severe gale	Light structure damage.
10	55-63	60	Storm	Trees uprooted. Considerable structural damage.
11	64-73	70	Violent storm	Widespread structural damage.



# Dust Storms

- Prolonged dry spell + strong winds + plowed fields
- Sudden reduction in visibility
- Give locations of roads and intersections
- Also called Haboobs



# Multicell Thunderstorms

Overall Severe Weather  
Threat Level:

**Low - Moderate**

Wind



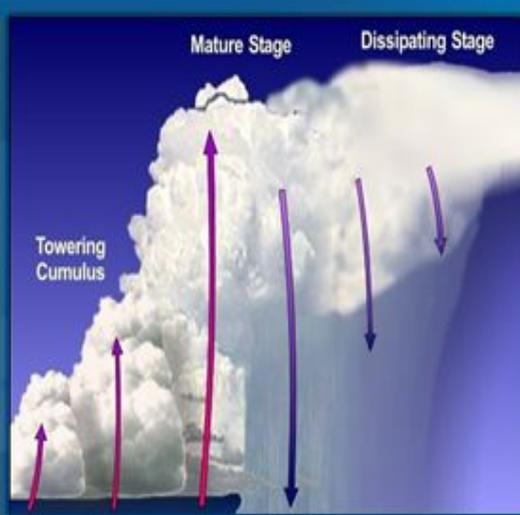
Hail



Heavy  
Rain



Tornado



- Flash flooding due to slow movement
- Downbursts, straight-line winds, small-med sized hail, lightning



# Downburst & Straight Line Winds



Microburst: affecting an area *less than 2.5 miles* across.

Macroburst: winds extending in excess of *2.5 miles* across.



# Flooding & Flash Flooding

Rising water on rivers, streams & low lying areas  
Give specific locations of streams & streets



Wenatchee - Sept 2019



Moscow - April 2019



Moscow, - Dec 2022

**Turn Around, Don't Drown**



Williams Flats Fire Flood - Aug 11, 2019



April 9, 2019 - Pullman





*National Weather Service - Spokane, WA*

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Mud & Debris Flows

Water-saturated rock, mud and debris moving down a slope

Give specific locations, roadways or intersections

Post-fire Floods



*Kamiah - April 2019*



*June 27, 2019 Wenatchee*



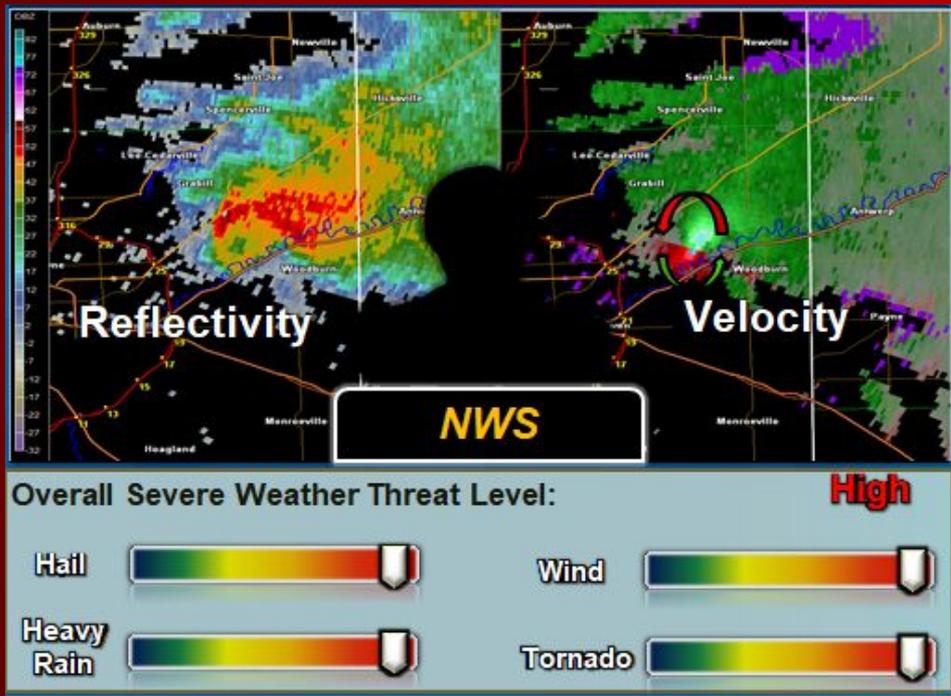
*May 16, 2019 Spokane*



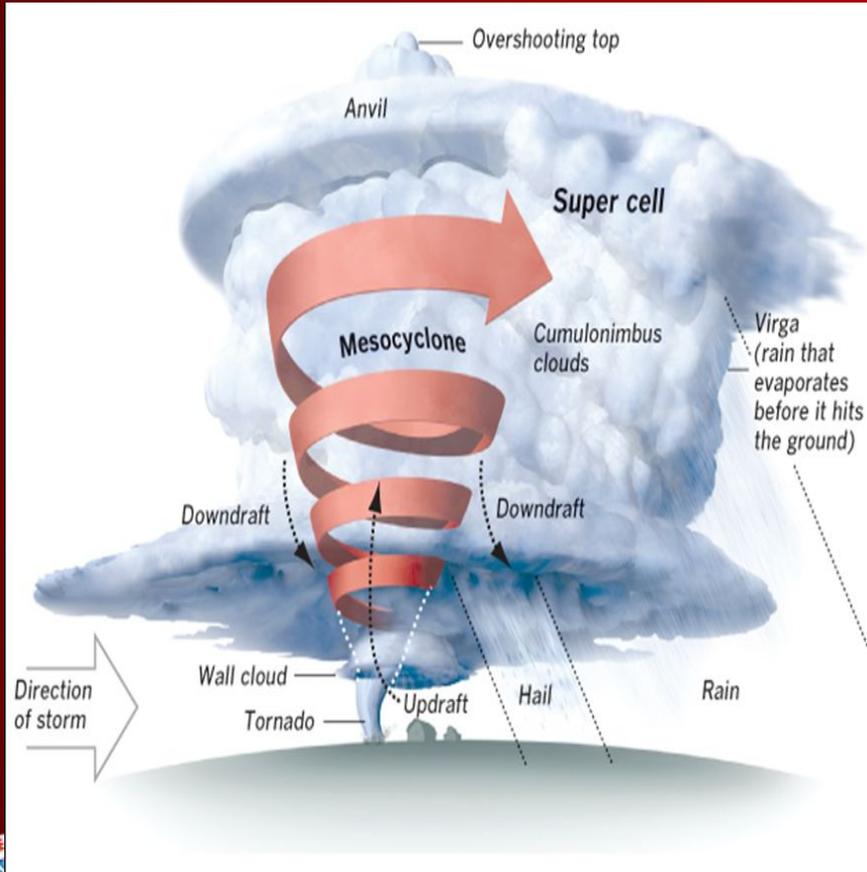
*Bonaparte Creek Rd - June 2022*



# Supercell Thunderstorms



# Supercell Thunderstorm Clues



Overshooting Tops



Cauliflower shaped towers



Mesocyclone or Wall Cloud



Kamiah, ID July 2016

[pokane](#)



# Cloud Types

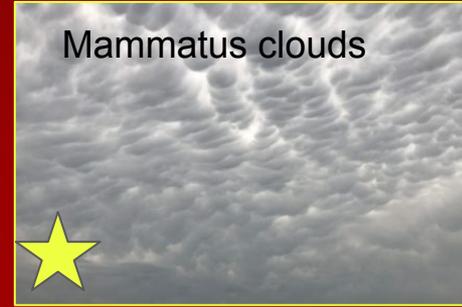
Scud clouds - ragged



Cumulus



Mammatus clouds



Stratus clouds - stable, hugs mountains



Wall Cloud - lowering cloud with rotation



Towering Cumulus



# Tornado

A violently rotating column of air, attached to a thunderstorm and touching the ground.

## Typical Inland NW Tornado

- Less than 5 minutes on the ground
- 100 yards in diameter
- ¼ mile track
- Max wind speeds of 85-115 mph
- Mostly EF0 to EF1

*Spokane - May 2022*



*Airway Heights - May 2004*



*Spokane - July 2016*



Posted by **KREM 2 News**  
408,129 Views

Press **Esc** to exit full screen



*/spokane*



National Weather Service - Spokane, WA

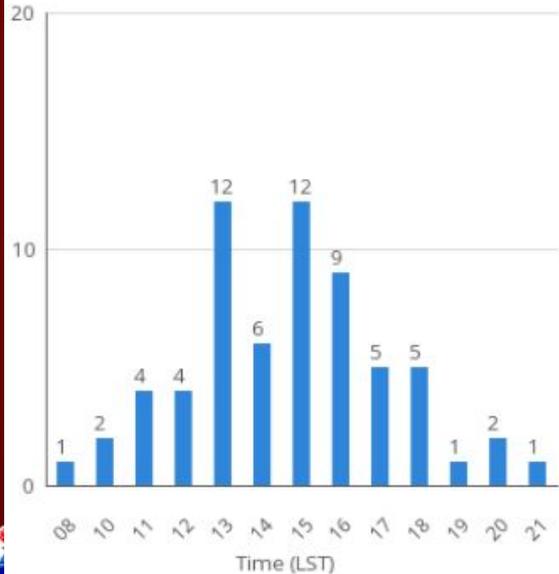
[www.weather.gov/spokane](http://www.weather.gov/spokane)



# Inland NW Tornado Stats ~ 64 reports (1936-2016)

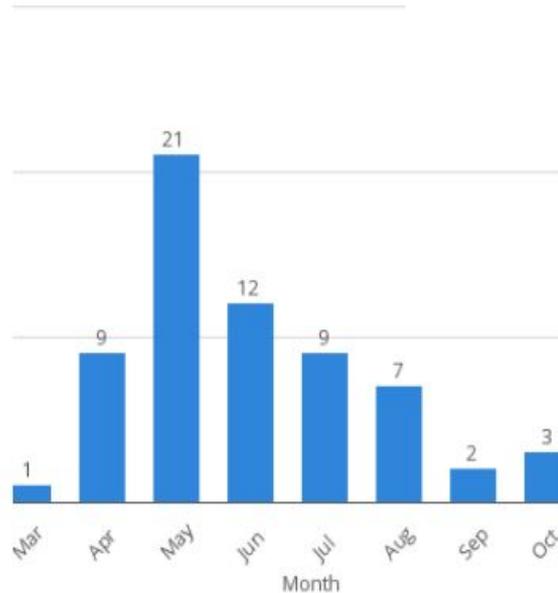
## Tornadoes by time of day

Total number of tornadoes by time of day



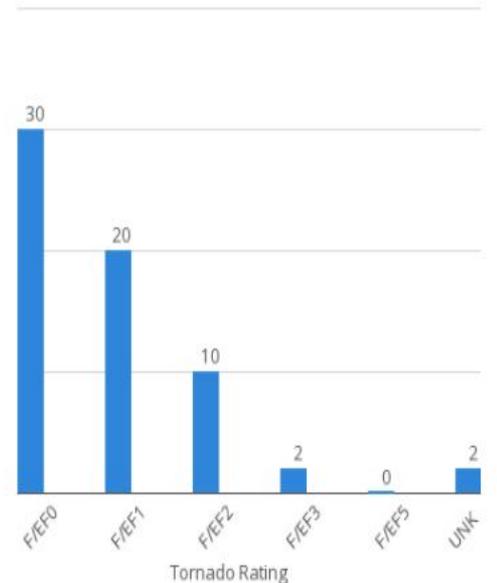
## Tornadoes by month

Total number of tornadoes by month



## Tornadoes by rating

Total number of tornadoes by RATING from 1936 to 2016



# Tornado Tracks, 1950-2017

Show Touchdown Points

## Filter by Magnitude:

- F/EF 0 —
- F/EF 1 —
- F/EF 2 —
- F/EF 3 —
- F/EF 4 —
- F/EF 5 —

## Filter by Year Range:

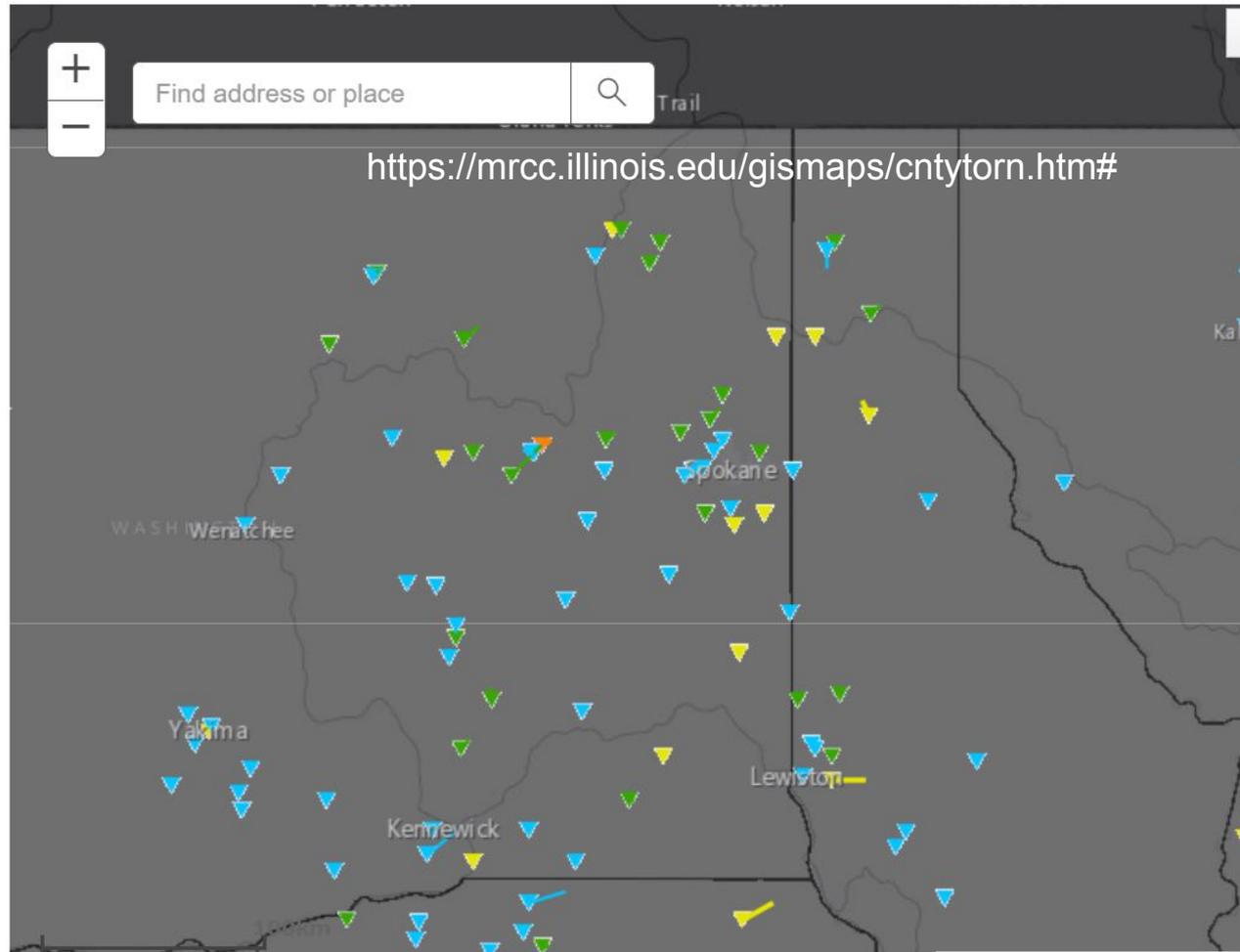
1950 through 2017

## Filter by Month:

All Months

## Filter by Casualties:

- Injuries > 0
- Fatalities > 0



# What about Funnel Clouds & Dust Devils?

- Funnel clouds stay aloft attached to storm cloud
- Dust devils start at the ground and extend upward
- Tornadoes extend from storm cloud to the ground
- In doubt, check for cloud cover and debris on ground
- Take a picture and share!



# Cold Air Funnels - May 2020 Pullman

- No reports of damage or touchdowns
- Additional reports in Ritzville & Columbia Basin
- Weather pattern - upper level trough



# #5 Poll Question

Identify this image.



*National Weather Service - Spokane, WA*

# #6 Poll Question

Identify this image.



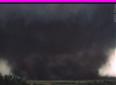
*National Weather Service - Spokane, WA*

[www.weather.gov/spokane](http://www.weather.gov/spokane)

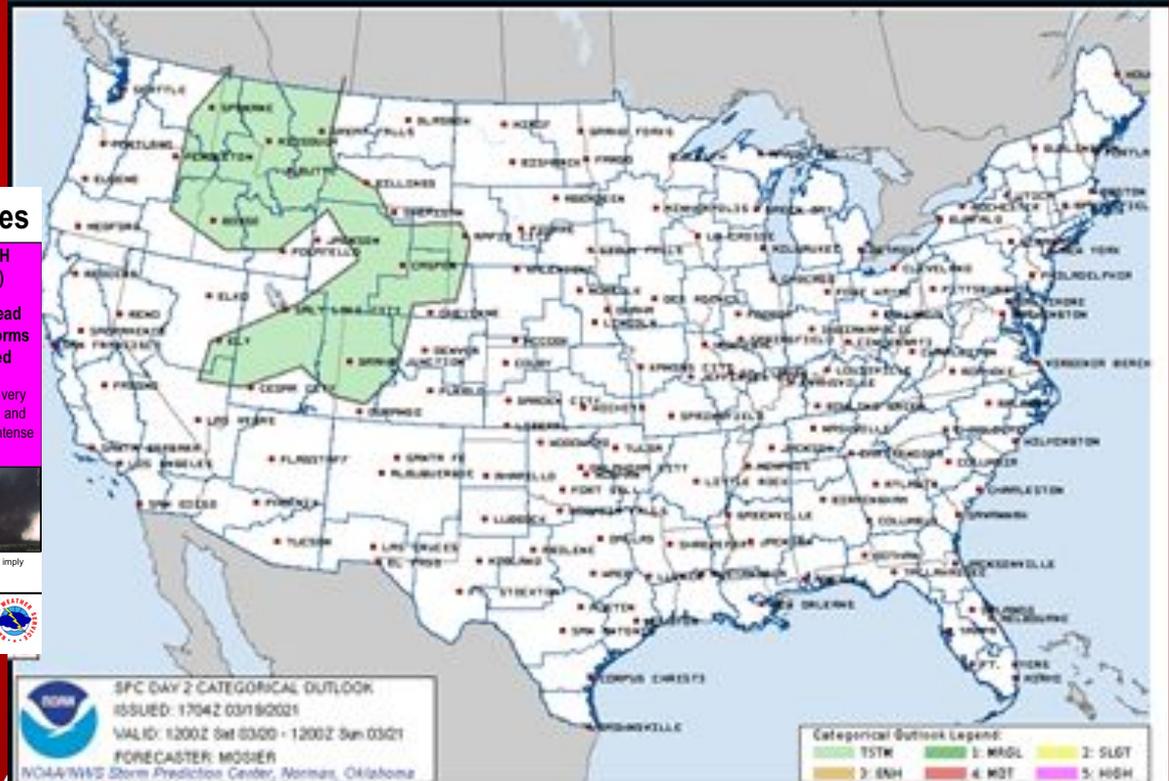
# Stay Informed

National Storm Prediction Center [www.spc.noaa.gov](http://www.spc.noaa.gov)

## Understanding Severe Thunderstorm Risk Categories

THUNDERSTORMS (no label)	1 - MARGINAL (MRGL)	2 - SLIGHT (SLGT)	3 - ENHANCED (ENH)	4 - MODERATE (MDT)	5 - HIGH (HIGH)
No severe* thunderstorms expected	Isolated severe thunderstorms possible	Scattered severe storms possible	Numerous severe storms possible	Widespread severe storms likely	Widespread severe storms expected
Lightning/flooding threats exist with all thunderstorms	Limited in duration and/or coverage and/or intensity	Short-lived and/or not widespread, isolated intense storms possible	More persistent and/or widespread, a few intense	Long-lived, widespread and intense	Long-lived, very widespread and particularly intense
					

\* NWS defines a severe thunderstorm as measured wind gusts to at least 58 mph, and/or hail to at least one inch in diameter, and/or a tornado. All thunderstorm categories imply lightning and the potential for flooding. Categories are also tied to the probability of a severe weather event within 25 miles of your location.





**National Weather Service**  
[www.spc.noaa.gov](http://www.spc.noaa.gov)


**SPC DAY 2 CATEGORICAL OUTLOOK**  
 ISSUED: 1704Z 03/19/2025  
 VALID: 1200Z Sat 03/20 - 1200Z Sun 03/21  
 FORECASTER: MOGIER  
 NOAA/NWS Storm Prediction Center, Norman, Oklahoma

**Categorical Outlook Legend:**  
 TSTM (Light Green)    1: MRGL (Green)    2: SLGT (Yellow)    3: ENH (Orange)    4: MDT (Red)    5: HIGH (Purple)



National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Stay Informed

## Watch, Warning, Advisory

TYPE	DEFINITION	THREAT	ACTION
<b>WARNING</b>	Hazard is occurring, imminent, or very likely	Threat to life & property	Take protective action
<b>WATCH</b>	Conditions are <u>favorable</u> for hazard to occur	Threat to life & property	Have a plan of action
<b>ADVISORY</b>	Hazard is occurring, imminent, or very likely	Threat of significant inconvenience	Use caution



# Stay Informed

NWS Spokane Web Page [www.weather.gov/Spokane](http://www.weather.gov/Spokane)

The screenshot shows the NWS Spokane website interface. At the top, there are navigation links: HOME, FORECAST, PAST WEATHER, SAFETY, INFORMATION, EDUCATION, NEWS, SEARCH, and ABOUT. Below this is a search bar and a "Special Avalanche Bulletin" alert. The main content area is titled "NWS Forecast Office Spokane, WA" and includes a navigation menu with links for "Current Hazards", "Current Conditions", "Radar", "forecasts", "Rivers and Lakes", "Climate and Past Weather", and "Local Programs". The "Current Hazards" and "forecasts" links are circled in red. Below the navigation menu, there are several product tiles: "Special Avalanche Bulletin", "70 Degree Climate Stats", "Big Warm-Up", "Cold Water", and "Weather Spotter Training". The main content area features a "WARMING UP HIGH TEMPERATURE FORECAST" table with columns for days of the week (WED, THU, FRI, SAT, SUN) and rows for locations (SPOKANE, COLVILLE, WENATCHEE, LEWISTON, PULLMAN, SANDPOINT). The current temperature is 66°F (19°C) and the forecast for tonight is "Mostly Cloudy" with a low of 46°F. The forecast for Thursday is "Mostly Sunny" with a high of 70°F.

	WED	THU	FRI	SAT	SUN
SPOKANE	71	66	73	79	76
COLVILLE	69	67	76	81	79
WENATCHEE	73	71	77	83	75
LEWISTON	74	72	79	84	81
PULLMAN	67	64	71	78	73
SANDPOINT	64	64	71	76	75

Important NWS products to follow

- Current Hazards
- Radar data
- Forecast Computer Models
- River and Lake - forecasts

# Stay Informed

NWS Spokane Web Page [www.weather.gov/Spokane](http://www.weather.gov/Spokane)

## Important NWS products to follow

- Area Forecast Discussion (AFD)
- Radar images
- Satellite Images
- Current Observations
- Submit a Spotter Reports
- View Storm Reports

Click a location below for detailed forecast.

Watches, Warnings & Advisories  
There are no watches, warnings, or advisories at this time.

Last Map Update: Mon, Apr. 5, 2021 at 10:44:15 am PDT

Text Product Selector (Selected product opens in current window)  
Latest Text Products Issued by OTX

	Forecast Discussion	Local Radar	Satellite Images	Weather Maps	Graphical Forecasts
Weather Table Forecasts	Climate Graphics	Rivers and Lakes	Observations & Hazards	File a Report	View Storm Reports
Weekly Briefing	Hourly Forecasts	Drought Information	Climate	Submit a Storm Report	View Storm Reports



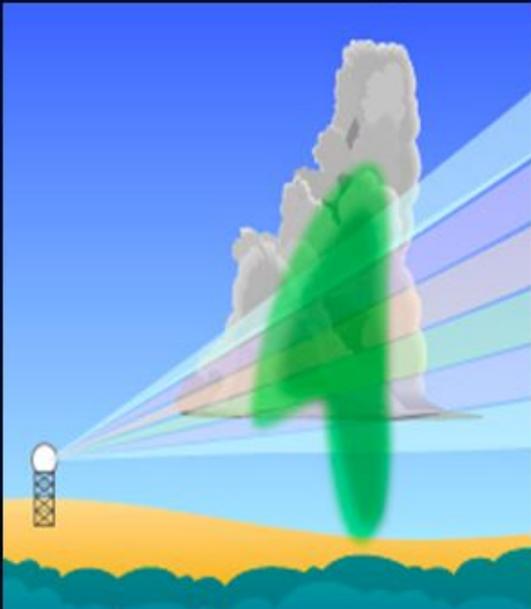
National Weather Service - Spokane, WA

# Basic Radar Interpretation

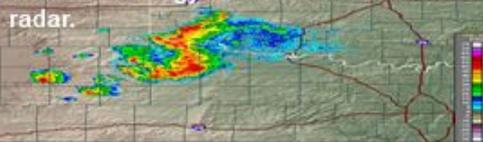
Updated Radar Map

Local Radar - Select Site

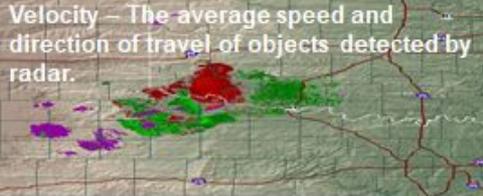
### Doppler Weather Radar



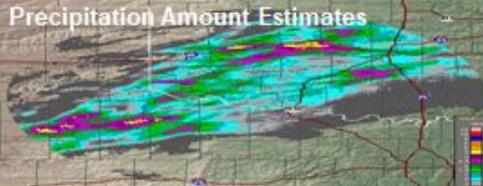
**Reflectivity** - A picture of the weather based on energy reflected back to the radar.



**Velocity** - The average speed and direction of travel of objects detected by radar.



**Precipitation Amount Estimates**



☑ KOTX ▾ CREF (NCR) ^ ⚠ No Alerts ▾

Select the radar product:

- Super Resolution Base Reflectivity
- Super Resolution Base Velocity
- Dual-Pol Precipitation Type
- Dual-Pol Differential Reflectivity
- High Resolution Echo Tops
- One Hour Precipitation Accumulation
- Storm Relative Motion
- Digital Storm Total
- Storm Total Precipitation
- Base Velocity
- Composite Reflectivity
- High Resolution VIL



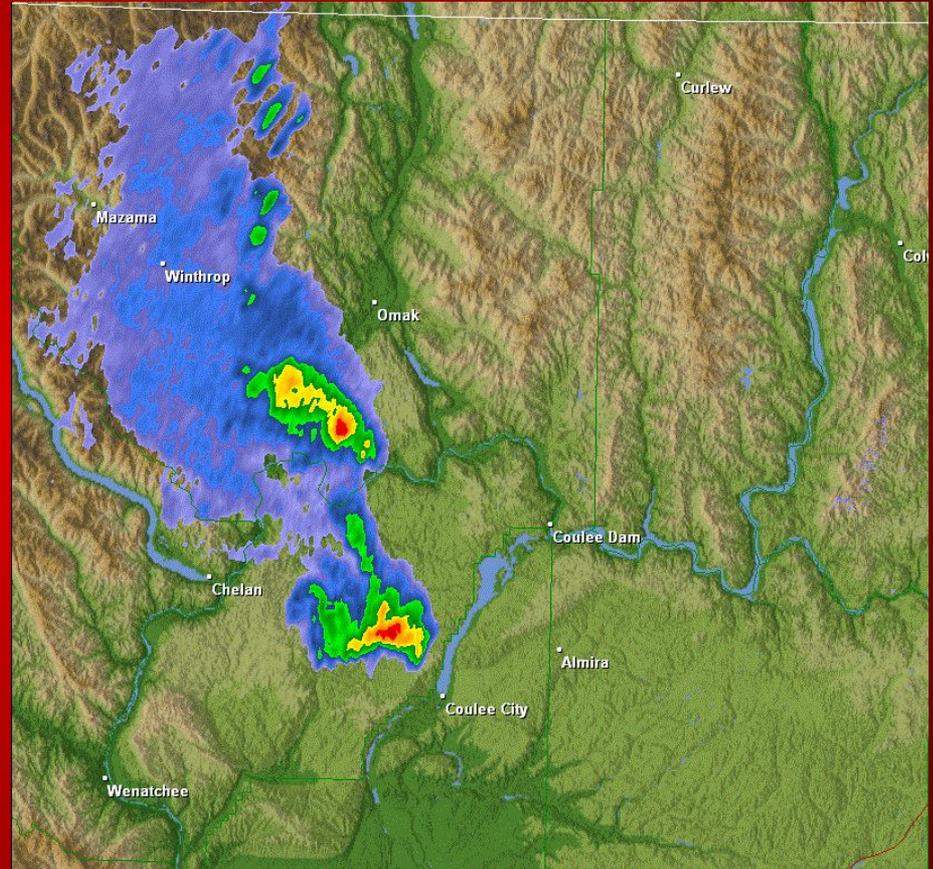
# Radar Products - Reflectivity

Raw measure of how reflective targets within the beam are - typically (BUT NOT ALWAYS) indicates precipitation intensity

Measured in dbZ

“Base” or “Tilt X” = One Slice

“Composite” = Worst of all Slices



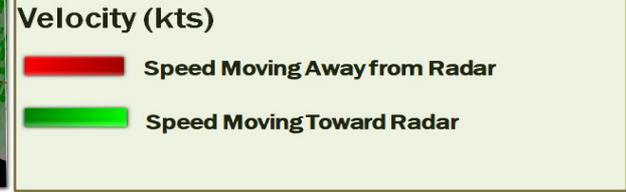
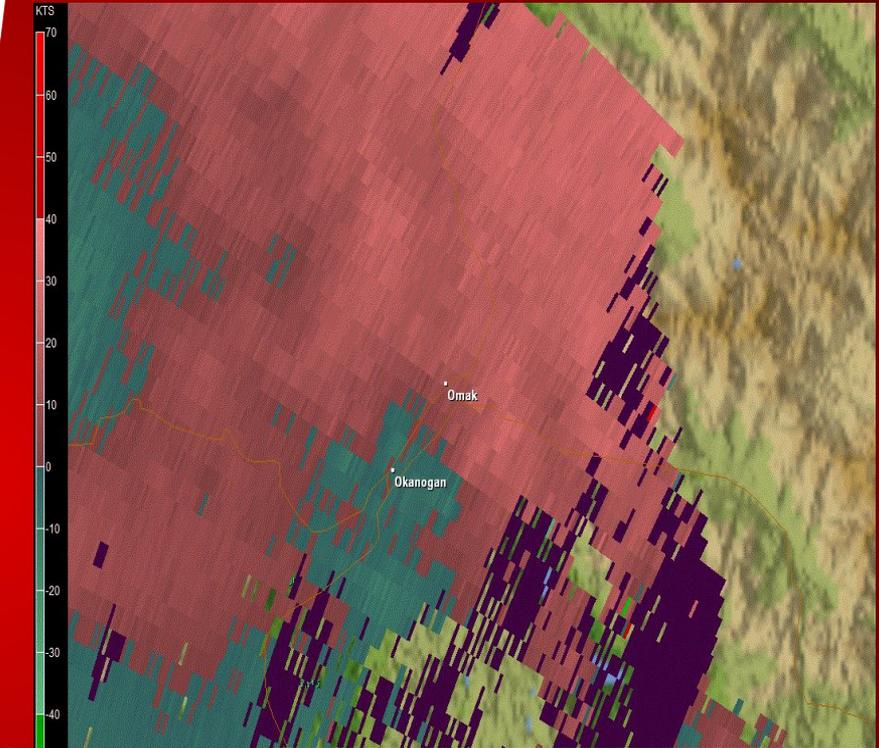
# Radar Products - Velocity

Speed and direction of targets - rain, snow, hail, debris or other biological particles. Measured in knots.

Reds = outbound motion  
Green = inbound motion

“Base” = ground relative motion  
Good for straight line winds

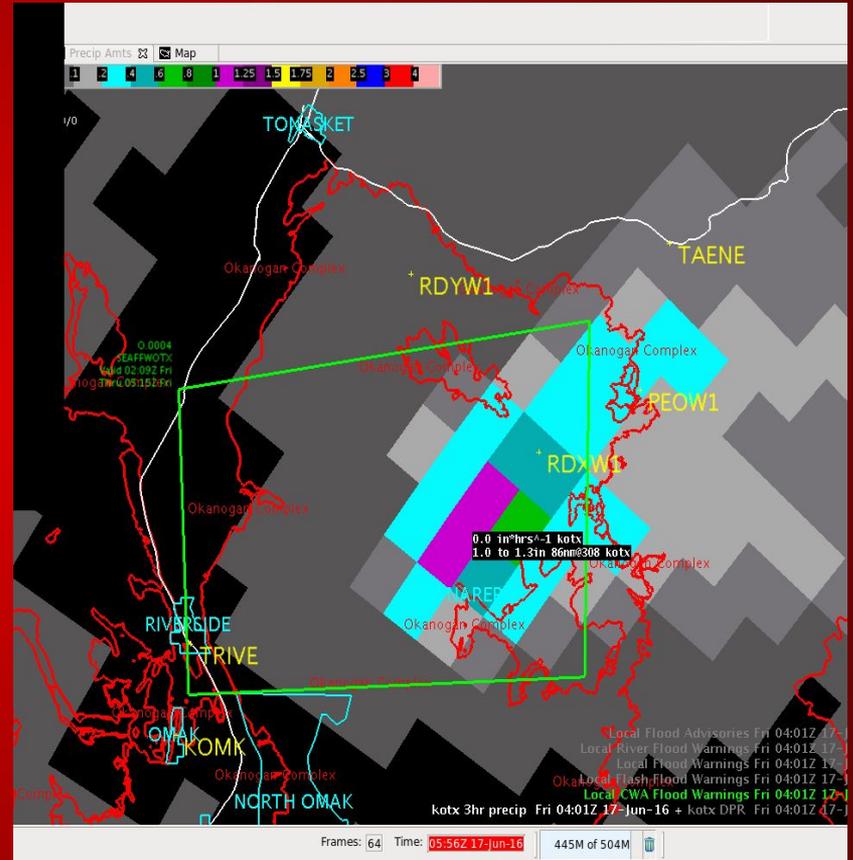
“Storm Relative” = storm motion removed  
Good for rotation in storms



# Radar Products - Precipitation

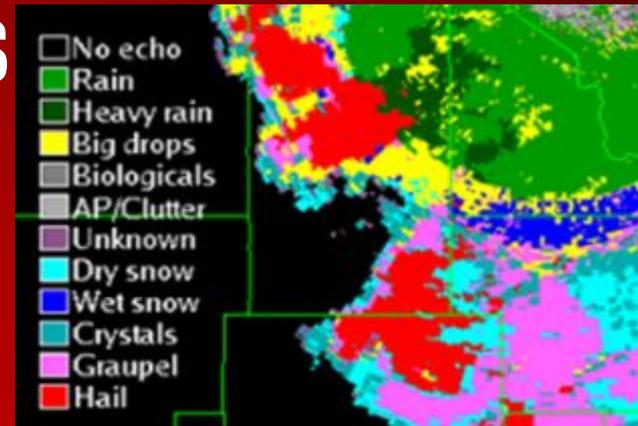
Radar estimate of precipitation reaching the ground. This can be overestimated from hail contamination

Hourly - 1 hour precipitation  
Storm Total - total precipitation through the storm



# Radar Products - More Products

- Precipitation Type
  - Estimate of type of precipitation
- Echo Tops
  - Estimate of height above ground of the 18 dBz echo or storm top
- Vertically Integrated Liquid - VIL
  - Estimate of the liquid water content - hail size



# Stay Informed

Do you have the time?

- Many weather products use the UTC/GMT/Z time zone
- UTC = PDT + 7 or PST + 8
  - 10:00 AM PDT is 17:00 UTC
  - 10:00 AM PST is 18:00 UTC
- 00z and 12z are common times for models, weather balloons and other important weather information



00z = evening

12z = morning

24 hour clock is used for UTC/Z

Based off the lines of longitude

0 degrees = Greenwich, England



## Cold Air Funnel

- Circulation on Radar near I-90 where it was seen around 4:45 pm TO 4:50 pm May 26<sup>th</sup>
- “Red Shading” moving away from radar
- “Green Shading” moving away from radar

### What is a “Cold Air Funnel”?

A funnel cloud that can develop from a small shower or thunderstorm when the air aloft is unusually cold (hence the name). They typically do NOT touch the ground and do not cause damage. But always be alert if you see one.



# #7 Poll question

What are some useful radar products?



# Spotter Safety

Even the most careful and conscientious driver may have problems under severe weather conditions

Sadly 3 OU students were killed in a traffic accident while storm chasing

## Number 1 Threat: Driving on the highways!

- Spotters are prone to:
  - Drive with less than 100% attention
  - Drive above the speed limit
  - Drive down rain/hail covered roads
  - Make sudden stops and starts without warning
  - Drive in adverse conditions, i.e. low visibilities, strong gusty winds etc.
  - Distractions due to various in-car devices, i.e. cell phone, laptop, PDA, GPS, camera etc.



# Spotter Safety - Lightning

Close Enough to Hear Thunder,-  
Close Enough to be Struck!

- Lightning can strike as far as 10 miles from the thunderstorm.
- More than 50% of lightning deaths occur AFTER the storm has passed

## When Thunder Roars, Go Indoors

Seek Safe Shelter indoors - or vehicle if needed  
Stay away from windows & doors  
Don't use a corded phone or take a bath/shower



Spokane, WA April 2017



Kahlotus - May 2020



Ritzville - May 2020



# Lightning Safety

1. Be Aware  
of your  
Surroundings!



*National Weather Service - Spokane, WA*

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Spotter Safety - Standing Water on Roads



Photos by: J. Gotthard



- Hydroplaning is a serious threat.
- During a storm, water will likely collect along the tire paths.
- If you are hearing water splashing under your car, then you are on the verge of hydroplaning, if you are not doing so already.
- Use your headlights.



# Spotter Safety - Night Spotting

Be extra cautious at night

Obviously, it is more dangerous to deal with something you cannot clearly see. Storms at night present special problems for spotters and you should be extremely cautious when observing storms after dark.



# Spotter Safety - Storm Damage

## Stay out of damage areas

- Damage paths are full of hazards; downed power lines, jagged pieces of sheet metal, broken boards, etc.
- Avoid such places unless you have been asked to participate with cleanup or rescue efforts.
- Hindering cleanup – too many people in the way.
- Folks who have been hit by storm damage tend to be suspicious of strangers in their area.
- Gawkers are usually not appreciated and you could be taken for a potential looter.



# Spotter Safety

## Responsible Spotting...

- **Effective spotting is a constant learning process, and responsible spotters should always be aware of the latest science relating to severe thunderstorms and tornadoes.**
  - *Attend as many storm spotting classes as you can.*
  - *Each time you attend, you WILL learn something new.*
  - *Do additional research on your own (join blogs, forums etc)*



# Additional Training

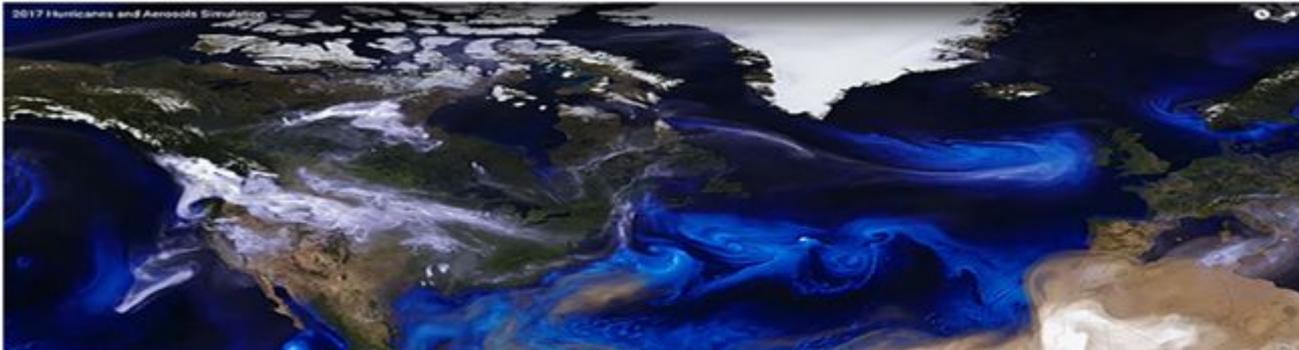


Spotter Resources

[www.weather.gov/Spokane/Spotter\\_Resources](http://www.weather.gov/Spokane/Spotter_Resources)



## JetStream - An Online School for Weather



### JetStream's Topics

- The Atmosphere
- The Ocean
- Global Weather
- Clouds
- The Upper Air
- Upper Air Charts
- Synoptic Meteorology
- Thunderstorms
- Lightning
- Derechos
- Tropical Weather
- Doppler Radar
- Remote Sensing
- Tsunamis
- The National Weather



# #8 poll question

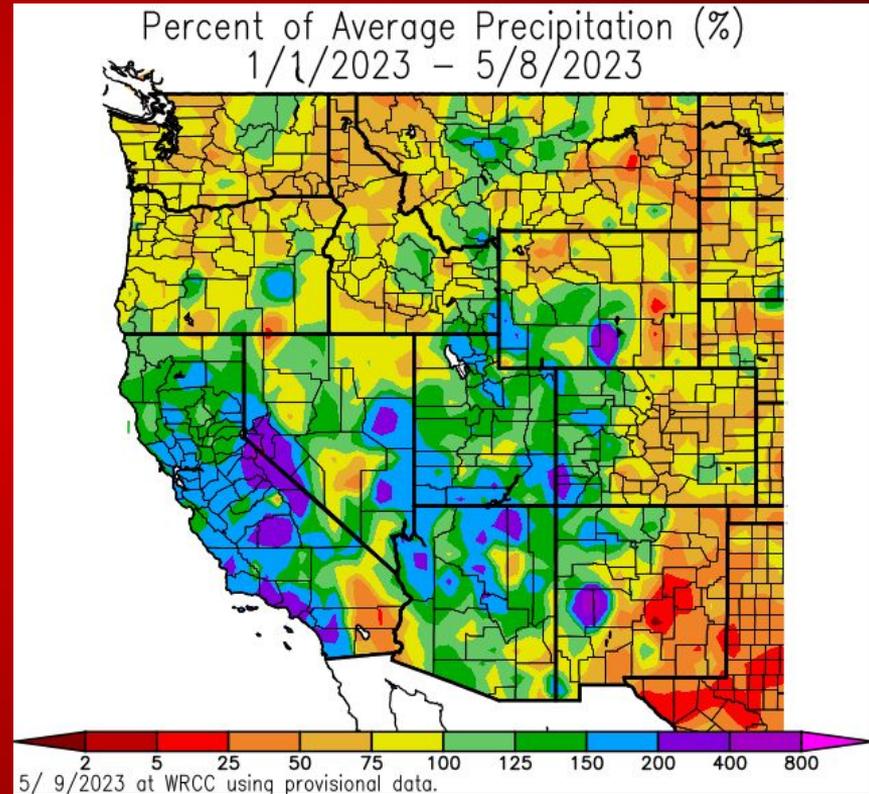
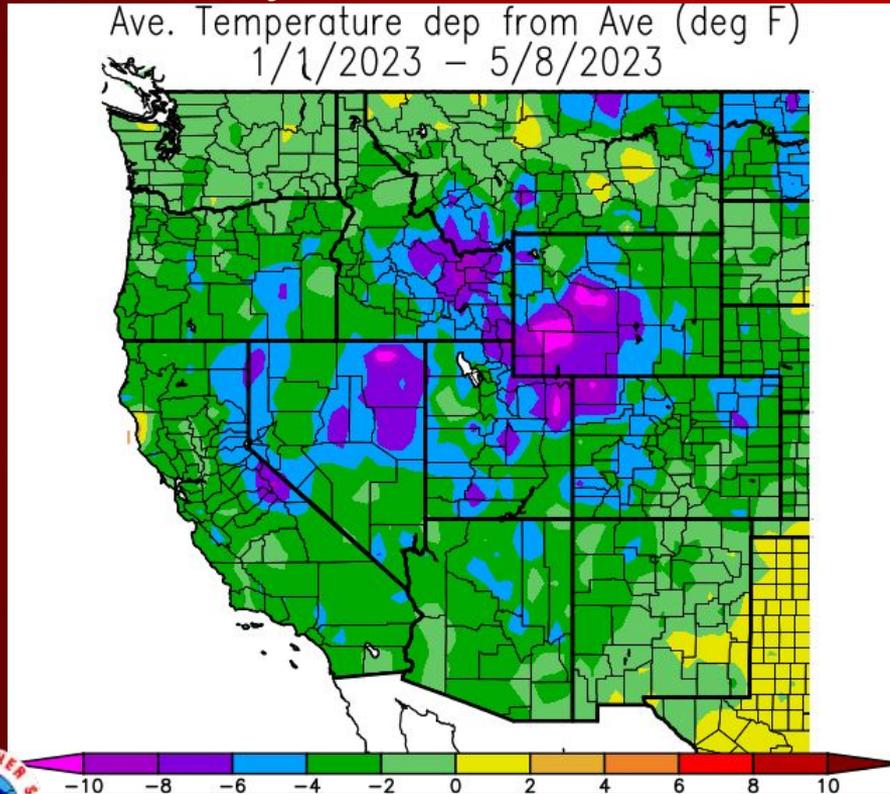
What would be a SAFE weather spotting scenario?



# Seasonal Outlook 2023

[wrcc.dri.edu/](http://wrcc.dri.edu/)

So far this year...

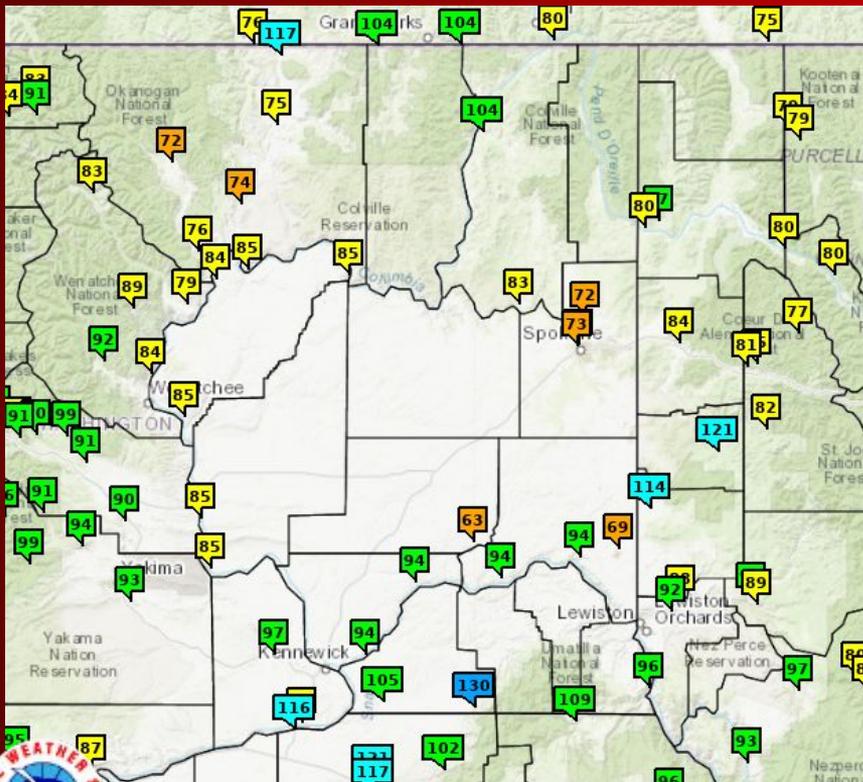


National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

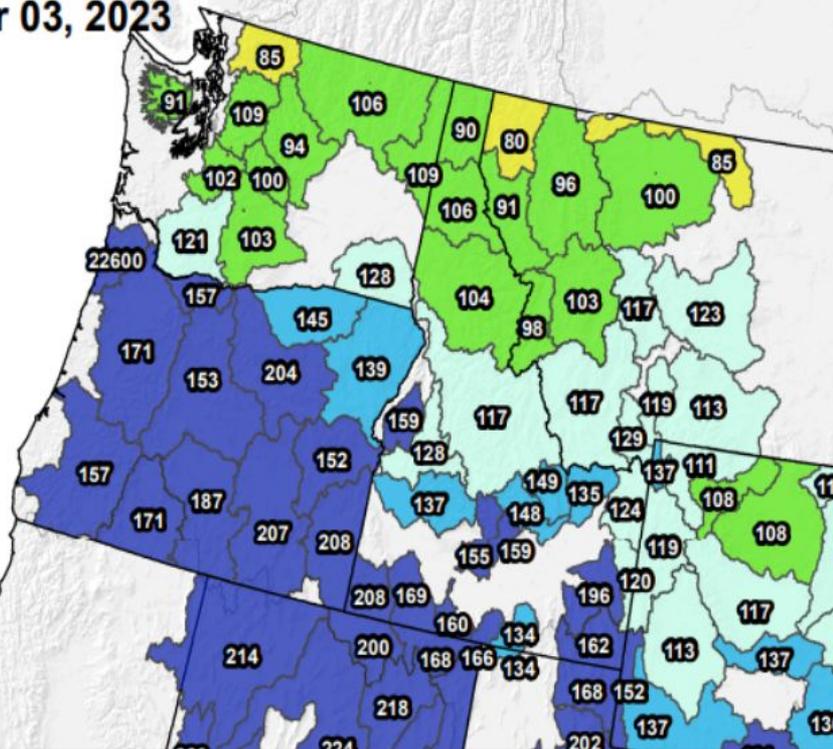
# Seasonal Outlook 2023

## Water Supply Outlook



## Mountain Snowpack

Apr 03, 2023

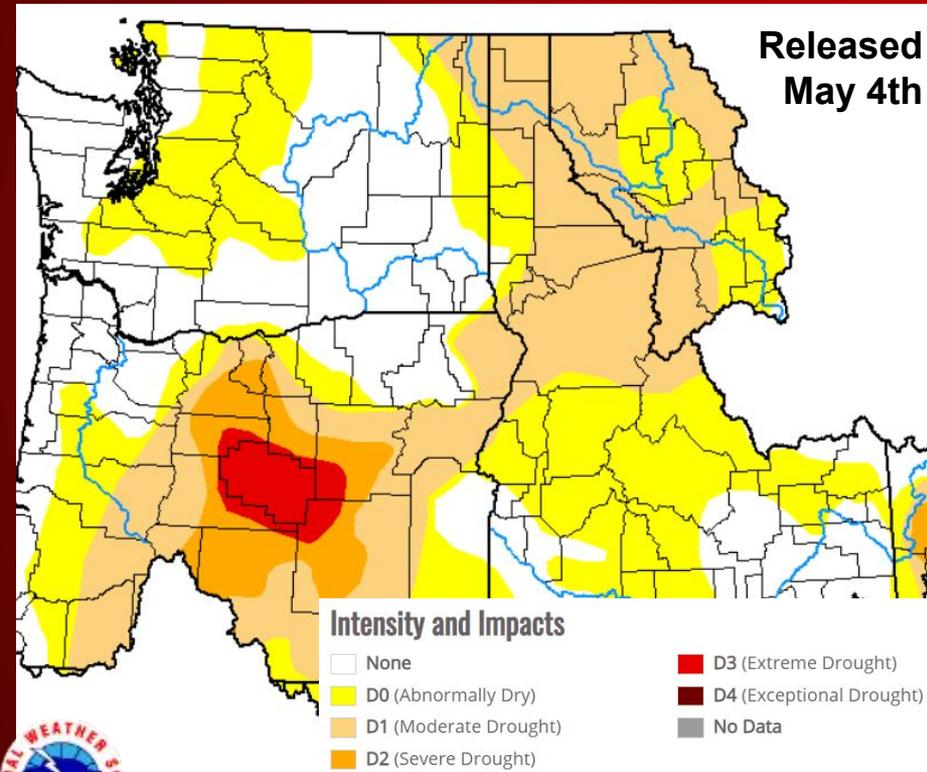


# Seasonal Outlook 2023

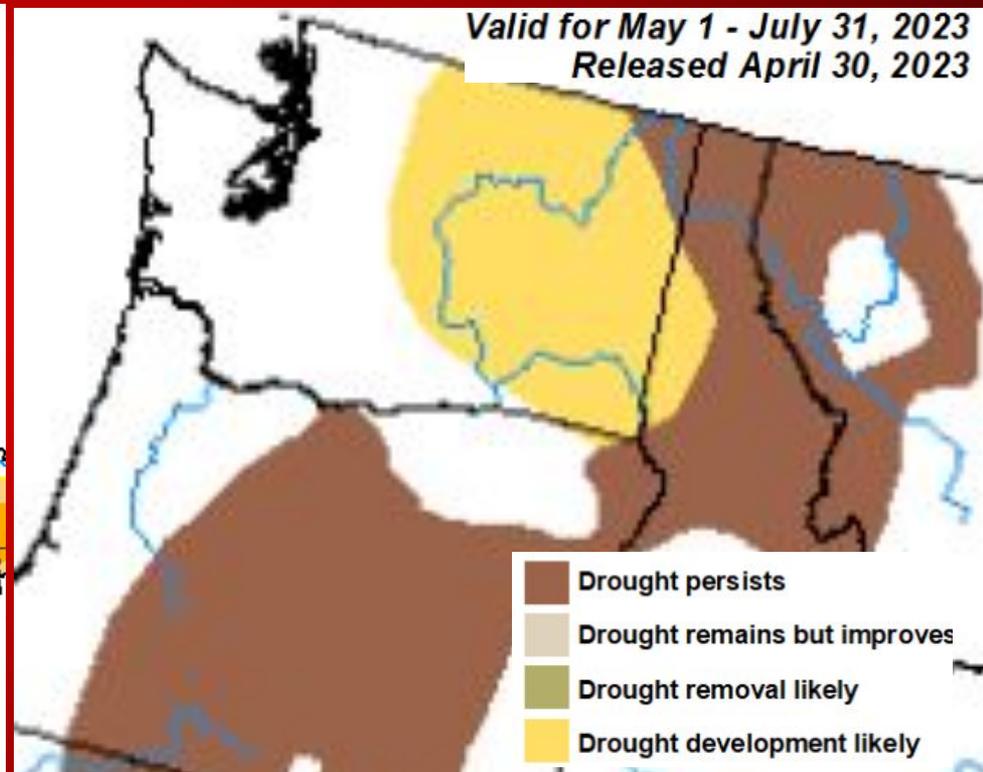
US Drought Monitor & Seasonal Outlook

[www.cpc.noaa.gov](http://www.cpc.noaa.gov)

Released  
May 4th



Valid for May 1 - July 31, 2023  
Released April 30, 2023



National Weather Service - Spokane, WA

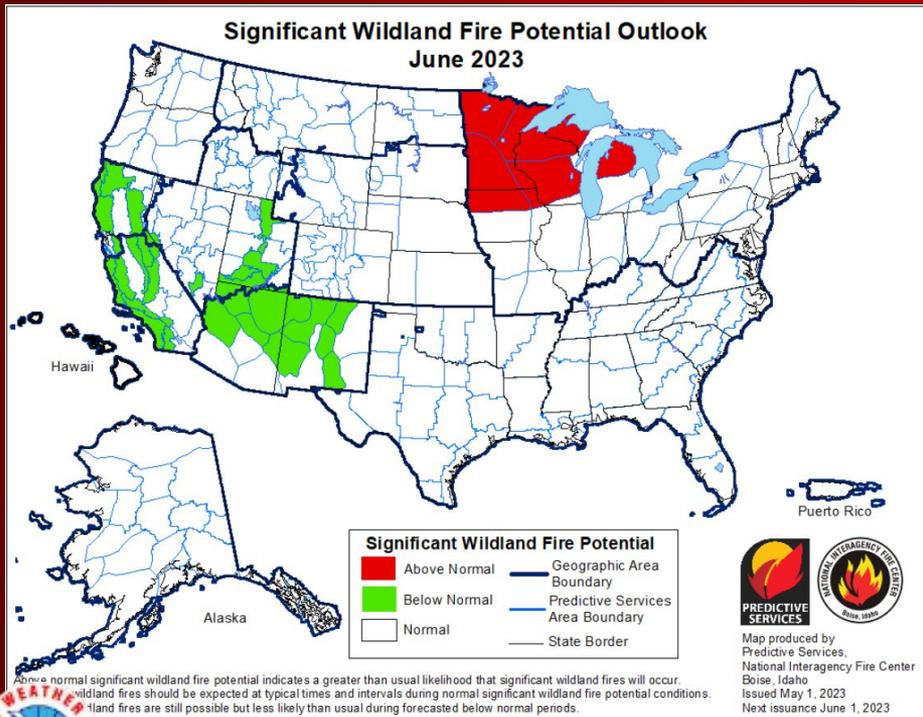
[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Seasonal Outlook 2023

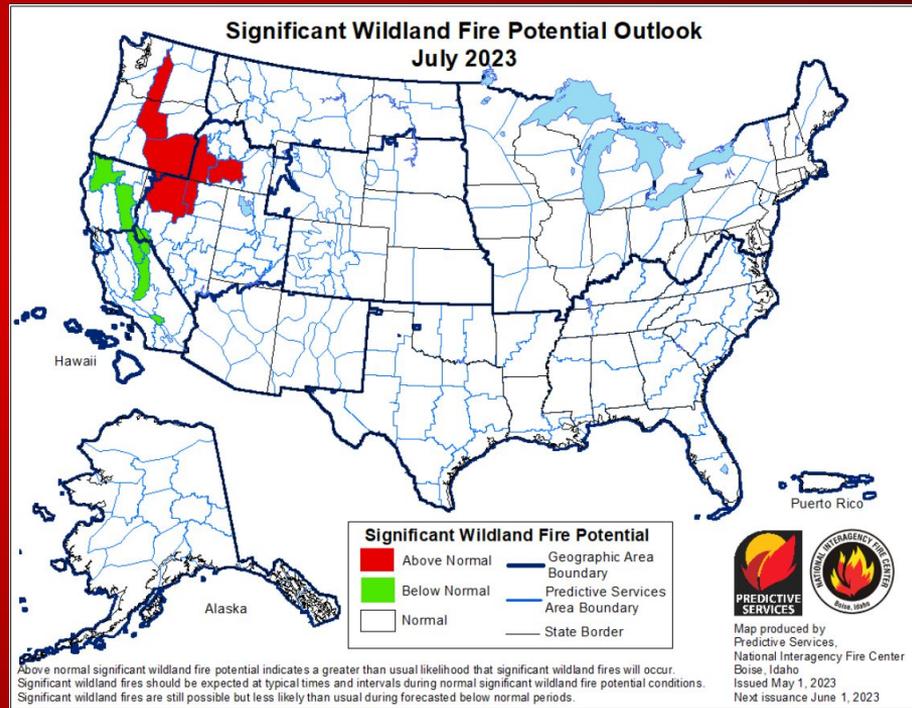
## Wildland Fire Potential

[www.nifc.gov](http://www.nifc.gov)

Significant Wildland Fire Potential Outlook  
June 2023



Significant Wildland Fire Potential Outlook  
July 2023



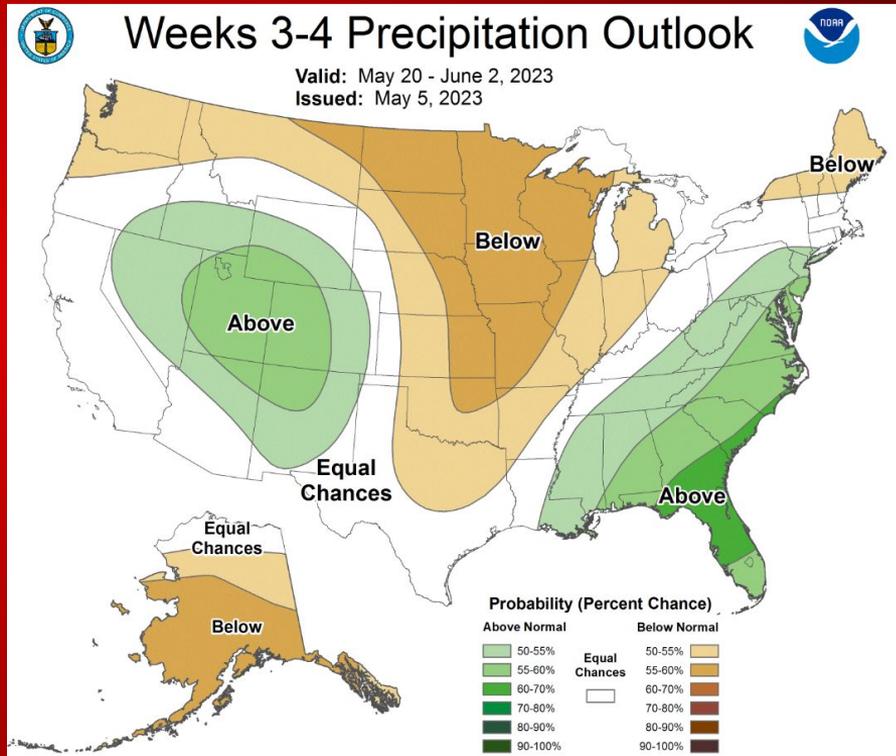
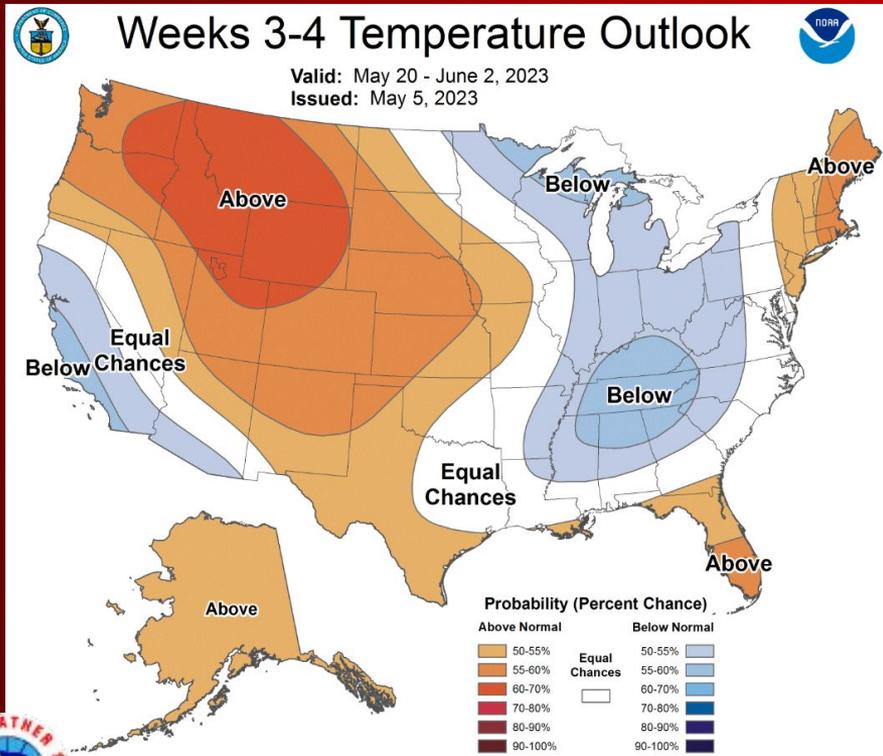
National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Seasonal Outlook 2023 - May

## 3-4 Week Outlook

[www.cpc.noaa.gov](http://www.cpc.noaa.gov)



National Weather Service - Spokane, WA

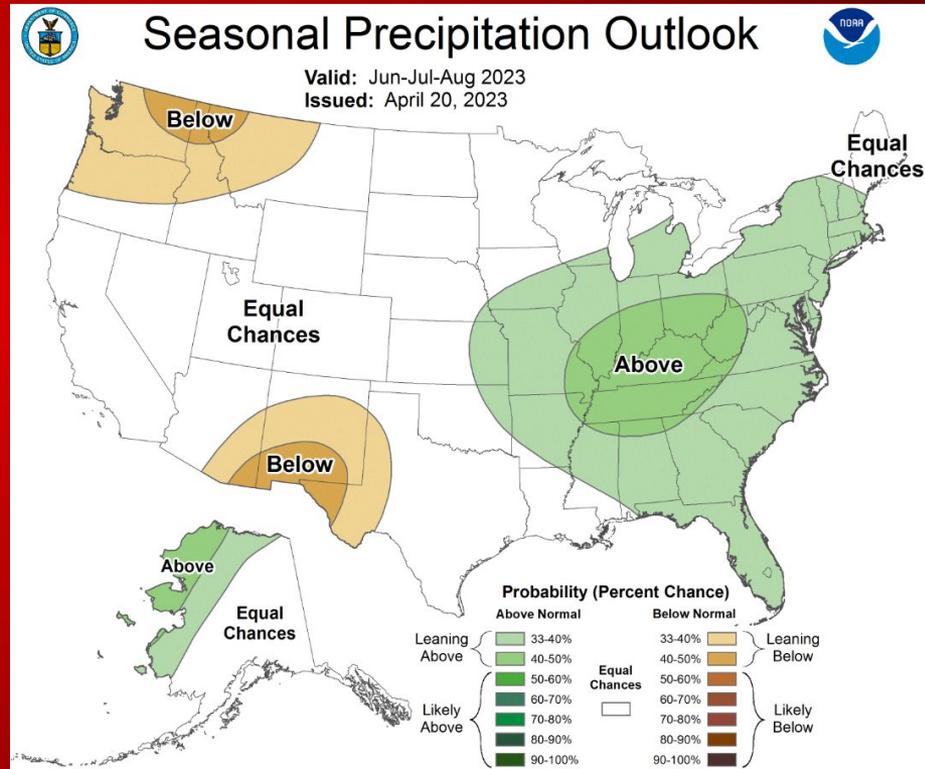
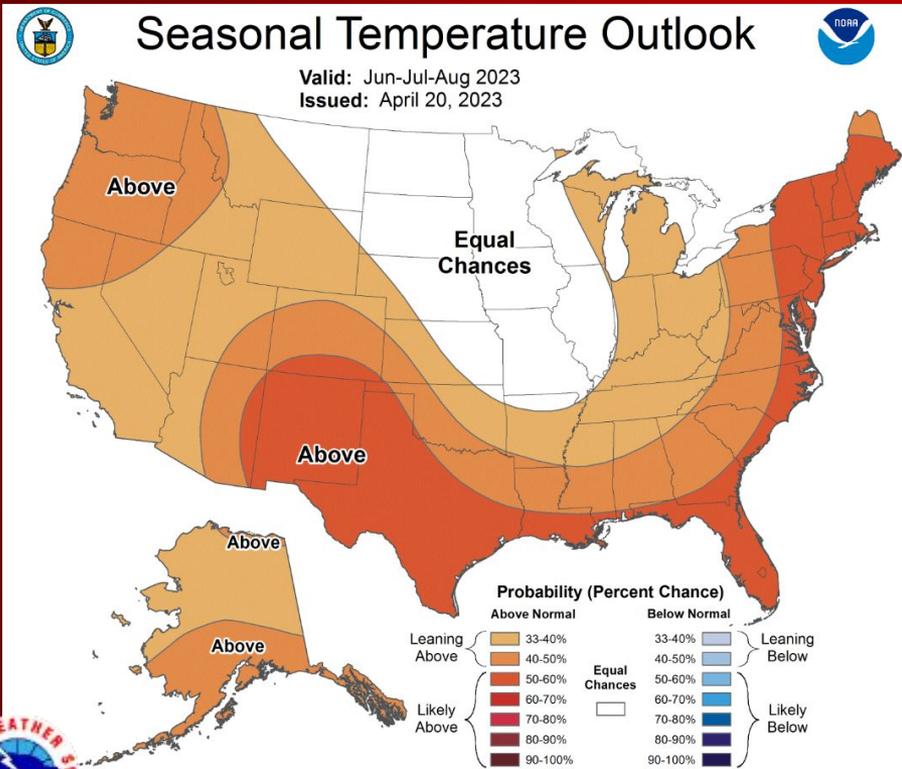
[www.weather.gov/spokane](http://www.weather.gov/spokane)

# Seasonal Outlook 2022 - May thru July

**El Nino  
coming!**

## 3 Month Outlook

[www.cpc.noaa.gov](http://www.cpc.noaa.gov)



National Weather Service - Spokane, WA

[www.weather.gov/spokane](http://www.weather.gov/spokane)

**NWS + Weather Spotters = Saved Lives**

**[nws.spokane@noaa.gov](mailto:nws.spokane@noaa.gov)**

**THANK YOU!**

**Any Questions?**

I will unmute you - then you unmute yourself to talk.

**What's Next?**

You will receive a follow-up email

- register as a weather spotter
- Spotter ID
- Spotter training certificate



*National Weather Service - Spokane, WA*

[www.nws.gov/spokane](http://www.nws.gov/spokane)