



San Francisco Bay Area Skywarn

sfoskywarn.org

@sfoskywarn.bsky.social

Curt Kolovson, W6RQ (Volunteer Facilitator)

Outline



- What is Skywarn all about?
- The National Weather Service
- Why do we need Skywarn in the SF Bay Area?
 - We don't always have nice weather
- Being a weather spotter
- Weather spotter training resources
- Reporting criteria
- SF Bay Area Skywarn
 - Regions and activations
 - Amateur Radio communication options
- Skywarn Recognition Day (SRD)
- Get involved!
- Questions



What is Skywarn all about?

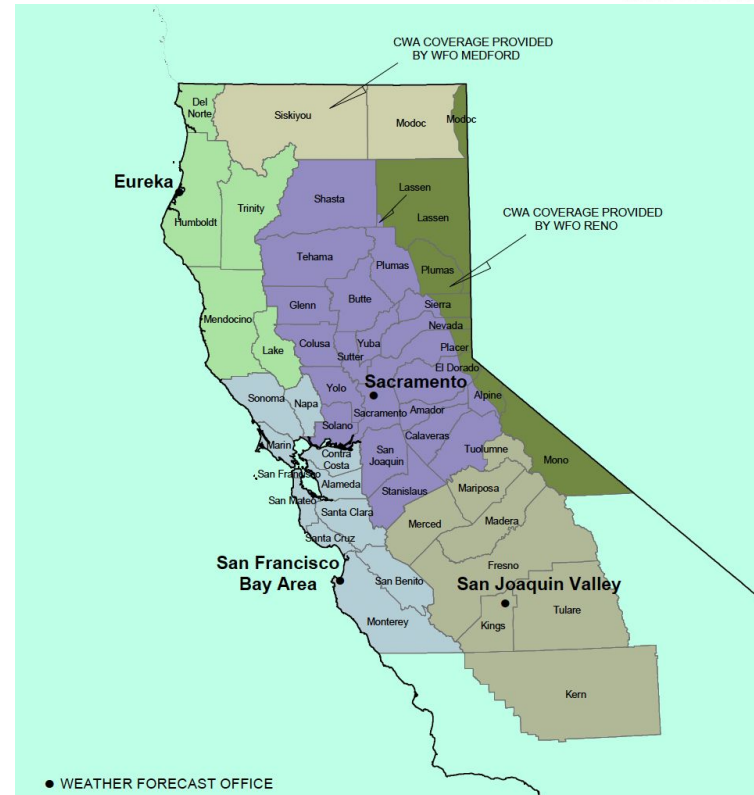
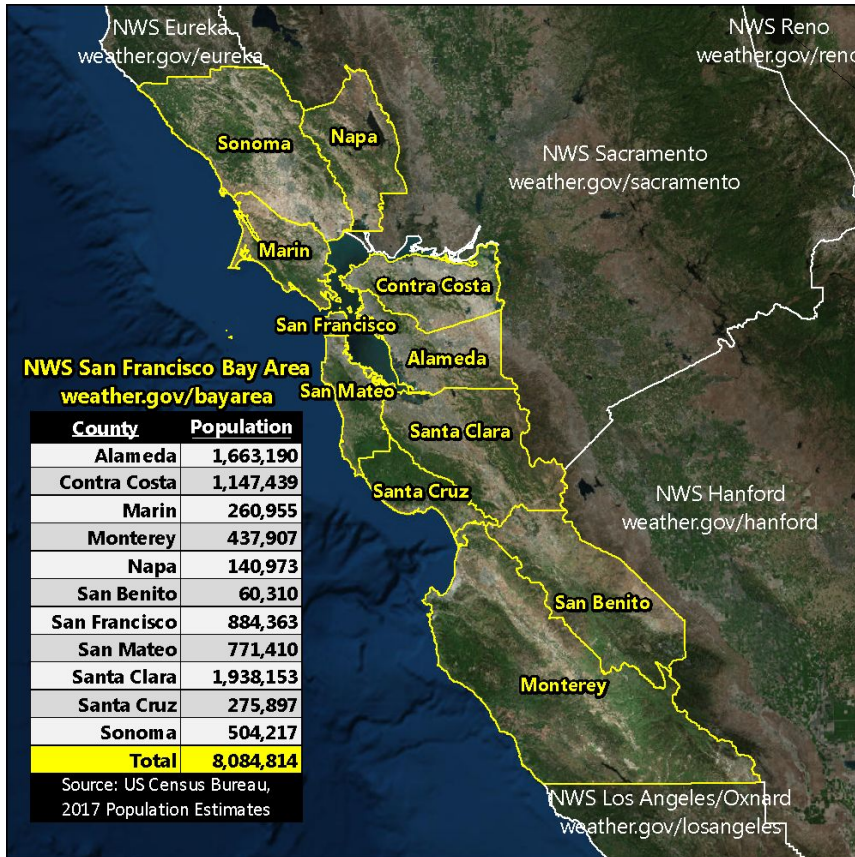
- Started in the 1970s by NWS with partner organizations, including ARRL
- Volunteer Weather Spotter program
 - initial emphasis on tornadoes, severe thunderstorms, flash floods
 - now covers all types of severe weather
- Training required to be an official spotter
- Amateur Radio operators have played a key role (and still do!)
- Many active Skywarn groups throughout the US
 - especially in “Tornado Alley”, Northeast, Mid-West, Southeast, Mountain West
- Need for weather spotters is still present, in spite of improvements in weather sources and remote sensing technology
- Weather spotters act as a “force multiplier” for the NWS
- You’re a Weather Spotter – not a Storm Chaser. **SAFETY FIRST!**

The National Weather Service

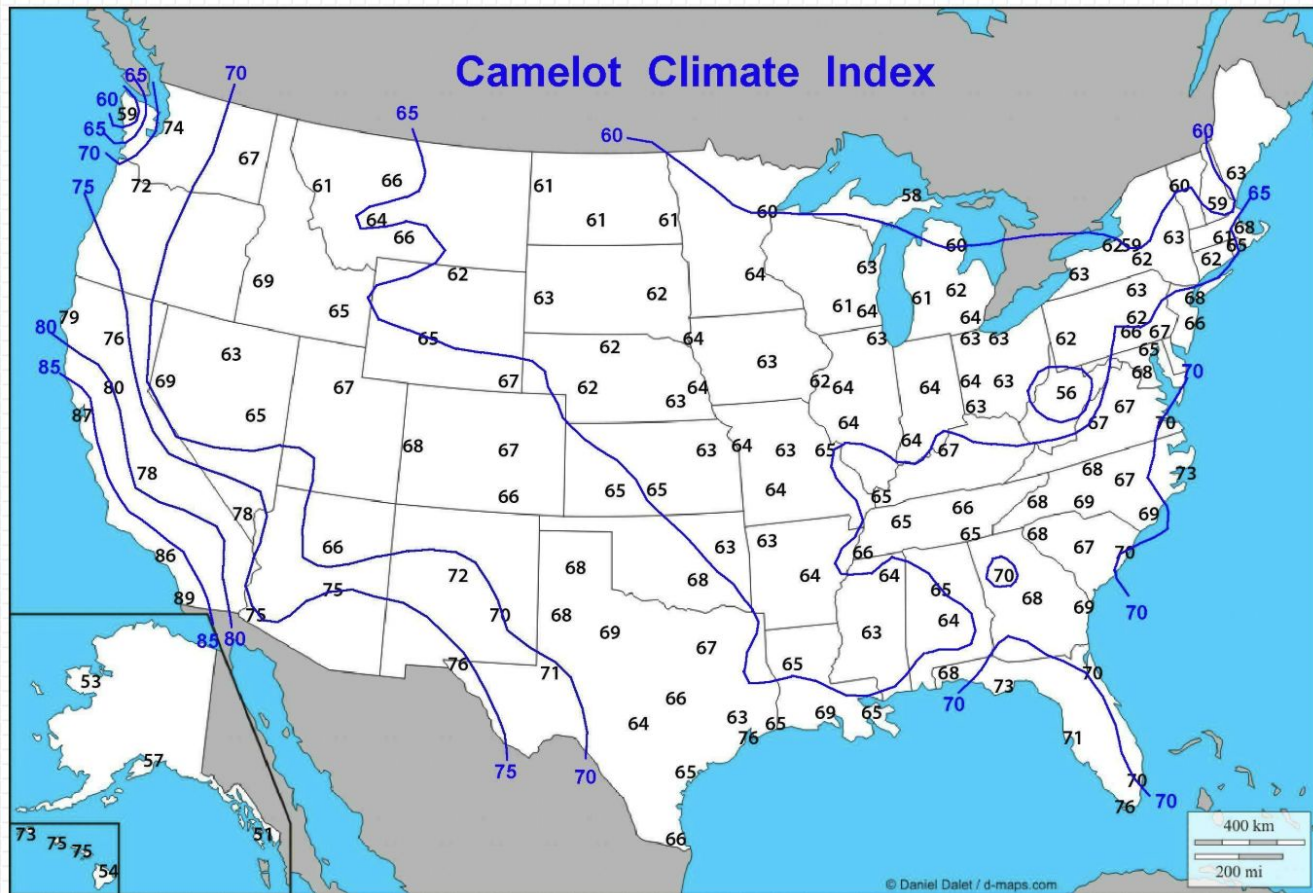


NWS Weather Forecast Office in Monterey, CA (MTR)

County Warning Area (CWA) – 11 Bay Area counties – 8M+ people



We have beautiful weather, a lot of the time...



We're not like Tornado Alley. Why do we need Skywarn?

Data for this project was extracted from the Comparative Climatic Data for the United States (NCDC, 2010) and updated 1981-2010 Normals (2011). Nine different weather elements were used in constructing an index of ideal weather; a Camelot Climate Index (CCI). These parameters are: maximum temperatures, minimum temperatures, mean number of days with minimum temperatures less than 32° F, mean number of days with maximum temperatures greater than 90° F, mean annual rainfall, mean number of days with precipitation, mean annual snowfall, average percent of sunshine, and average relative humidity. The average monthly maximum temperature and corresponding afternoon relative humidity were combined to derive a monthly temperature humidity index (THI) which is a measure of "discomfort".

Thanks to Jan Null.
<https://ggweather.com/camelot.htm> 6

Based on 1981-2010 Normals

But we do get storms!

Maintained by NWS WFO in
Monterey (MTR) since 2008.
Reports contain a lot of information.

<https://www.weather.gov/mtr/Stormsummaries>



- [Scotts Valley EF1 Tornado - December 14, 2024](#)
- [Bomb Cyclone, Fujiwhara Effect, and Atmospheric River November 20-23, 2024](#)
- [Bomb Cyclone - Wind and Rain February 3-5, 2024](#)
- [Winter Weather and Very Low Snow Levels February 22-25, 2023](#)
- [Atmospheric Rivers - late December 2022 to mid January 2023](#)
- [Atmospheric River - historic rainfall - October 24-25, 2021](#)
- [USGS - Northern and Central California Debris Flows - January 2021](#)
- [Atmospheric River - Debris flows and mudslides - January 26-29, 2021](#)
- [Offshore Flow Wind Event - Red Flag Warning and Wind - January 17-19, 2021](#)
- [Record Breaking Fire Season of 2020 - GIS Story Maps Review](#)
- [Bomb Cyclone - Rain and Snow - November 26-28, 2019](#)
- [Historic Fire Weather conditions October 2019](#)
- [Historic Early Season Heat Wave June 9-11, 2019](#)
- [Historic Flooding across the North Bay February 25-27, 2019](#)
- [Winter Weather and Low Snow Levels February 1-5, 2019](#)
- [Heavy Rain, Wind and Thunderstorms - January 16-17, 2019](#)
- [Waterspouts and Tornadoes - January 6, 2019](#)
- [Hail Storm - April 16, 2018](#)
- [Historic Atmospheric River Event - April 5-7, 2018](#)
- [North Bay Fires 2017 Story Map](#)
- [North Bay Fires 2017 \(not written by NWS Bay Area\)](#)
- [Heat Event - August 31-September 4, 2017](#)
- [Heat Event - June 17-23, 2017](#)
- [Heavy Rain, Thunderstorms, Snow and record breaking Surf - January 18-23, 2017](#)
- [Three Atmospheric Rivers - January 2-10, 2017](#)
- [Rain, Flooding and Wind Event - December 15, 2016](#)
- [Thunderstorms and a Waterspout - April 27, 2016](#)
- [Hollister EFO Tornado - January 6, 2016](#)
- [Rain and Wind Event - December 11, 2014](#)
- [Atmospheric River Event - February 6-9, 2014](#)
- [Wind Event - October 27-28, 2013](#)
- [Record Rainfall Event - June 23-25, 2013](#)
- [Wind Event - April 8, 2013](#)
- [Watsonville EFO Tornado - December 22, 2012](#)
- [Heat Event - October 1/2, 2012](#)
- [Winter Storm - March 11/18, 2012](#)
- [Noctilucent Clouds - October 28, 2011](#)
- [Tornado/Thunderstorms - March 18/23, 2011](#)
- [Winter Storm - February 26, 2011](#)
- [Brentwood Tornado - January 23, 2010](#)
- [Thunderstorms - January 20, 2010](#)
- [Winter Storm - January 4, 2008](#)

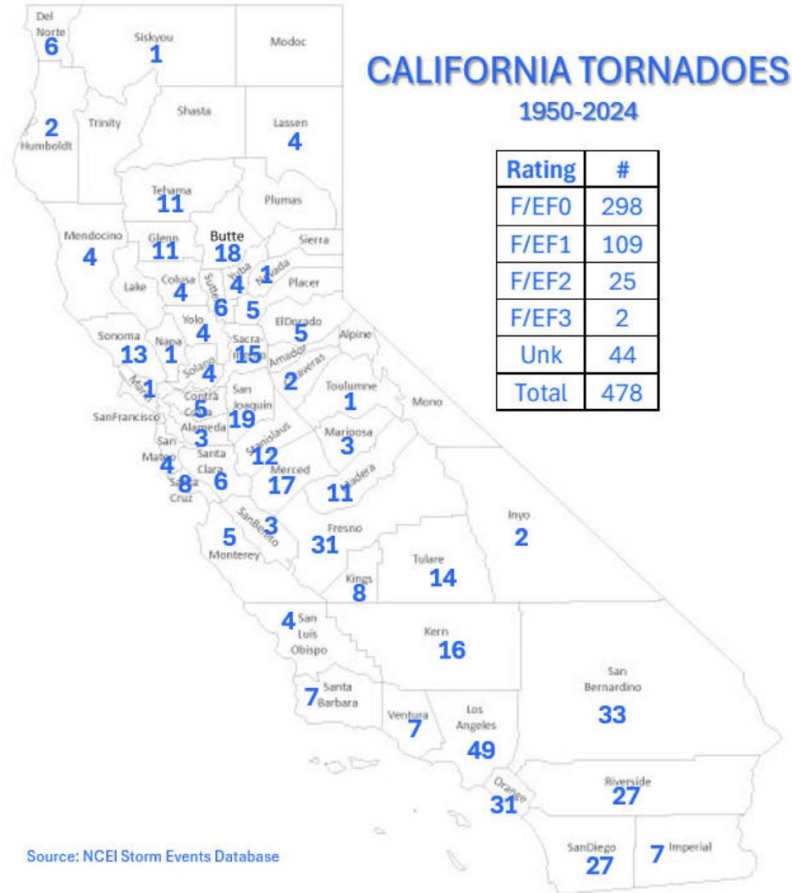
Scotts Valley EF1 Tornado, December 14, 2024



News report video:

[Scotts Valley Tornado \(news report\), 12/14/2024](#)

CALIFORNIA TORNADO STATISTICS



Thanks to Jan Null.
https://ggweather.com/ca_tornado.htm

Bay Area Storm Index (BASi) (created and maintained by Jan Null)

"The index is based on only three weather elements. The first is the 24-hour rainfall for downtown San Francisco and this makes up 40% of the BASi. The wind component of BASi is composed of two elements, the sustained wind speed at San Francisco International Airport and the peak wind gust in the Bay Area at elevations below 1500 feet. These two wind factors each account for 30% of BASi." (Jan Null)



All Storms greater than BASi 6.2 since 1950

Top 20 BASi Storms (1950-present)

Bay Area Storm Index (1950-present)

Rank	BASi	Date	SF City 24-hour Rain		SFO Max Sustained Wind		Bay Area Max Wind Gust*	
			in.	pts	mph	pts	mph	pts
1	10.0	12/12/1995	3.27	4.0	54	3.0	108	3.0
2	9.8	12/22/1955	2.57	4.0	42	3.0	90	2.8
3	9.7	12/11/1995	3.61	4.0	43	3.0	85	2.7
4	9.7	10/12/1962	3.11	4.0	43	3.0	86	2.7
5	9.5	10/24/2021	4.02	4.0	41	3.0	82	2.5
6	9.5	3/31/1982	2.57	4.0	40	3.0	81	2.5
7	9.5	10/13/1962	3.56	4.0	41	3.0	83	2.5
8	9.3	10/13/2009	2.48	3.9	41	3.0	77	2.4
9	9.3	12/16/2002	2.07	3.5	43	3.0	91	2.8
10	9.3	2/14/2000	2.50	4.0	39	2.9	79	2.4
11	9.3	12/22/1982	2.00	3.5	47	3.0	94	2.8
12	9.3	1/30/1963	1.87	3.3	51	3.0	101	3.0
13	9.3	2/4/2025	2.89	4.0	39	2.9	78	2.4
14	9.2	1/4/2008	2.01	3.5	53	3.0	87	2.7
15	9.2	12/31/2005	2.80	4.0	38	2.8	77	2.4
16	9.2	2/14/1986	1.83	3.3	48	3.0	97	2.9
17	9.2	1/21/1967	2.45	3.9	39	2.9	78	2.4
18	9.1	1/20/1964	1.86	3.3	45	3.0	90	2.8
19	9.1	12/23/1955	2.18	3.6	41	3.0	83	2.5
20	9.0	2/18/1986	1.87	3.3	44	3.0	87	2.7

Top 20, sorted by BASi score.
Note: since 1/1/2000, 7 storms in the top 20.
<https://ggweather.com/basi.htm>

Date	BASi	SF City 24-hour Rain		SFO Max Sustained Wind		Bay Area Max Wind Gust*	
		in.	pts	mph	pts	mph	pts
2/13/2025	8.2	1.81	3.3	36	2.6	72	2.3
2/4/2025	9.3	2.89	4.0	39	2.9	78	2.4
2/4/2024	8.6	1.60	3.1	41	3.0	82	2.5
1/31/2024	7.0	2.56	4.0	25	1.5	50	1.5
1/4/2023	6.4	1.06	1.2	38	2.8	76	2.4
12/31/2022	7.1	4.56	4.0	26	1.6	52	1.5
12/27/2022	8.0	1.61	3.1	36	2.6	72	2.3
12/13/2021	8.4	2.56	4.0	33	2.3	66	2.1
10/24/2021	9.5	4.02	4.0	41	3.0	82	2.5
2/13/2019	8.3	2.49	3.9	33	2.3	66	2.1
1/16/2019	6.7	1.14	1.4	39	2.9	78	2.4
2/20/2017	6.3	1.84	3.3	25	1.5	53	1.5
1/8/2017	8.2	1.46	2.8	44	3.0	77	2.4
12/11/2014	8.2	3.40	4.0	29	1.9	71	2.3
3/24/2011	7.3	1.56	3.0	33	2.3	61	2.0
12/28/2010	6.7	1.30	2.2	35	2.5	60	2.0
10/13/2009	9.3	2.48	3.9	41	3.0	77	2.4
1/4/2008	9.2	2.01	3.5	53	3.0	87	2.7
2/27/2006	7.9	1.29	2.0	55	3.0	97	2.9
12/31/2005	9.2	2.80	4.0	38	2.8	77	2.4
12/18/2005	8.9	2.99	4.0	36	2.6	71	2.3
12/1/2005	7.1	1.16	1.6	43	3.0	81	2.5
2/25/2004	8.6	2.01	3.5	38	2.8	73	2.3
1/1/2004	8.6	1.84	3.3	44	3.0	72	2.3
12/29/2003	7.9	2.15	3.6	33	2.3	61	2.0
12/16/2002	9.3	2.07	3.5	43	3.0	91	2.8
11/7/2002	8.7	1.47	2.8	40	3.0	96	2.9
12/2/2001	8.8	2.14	3.6	38	2.8	76	2.4
12/1/2001	7.8	2.00	3.5	32	2.2	65	2.1
2/14/2000	9.3	2.50	4.0	39	2.9	79	2.4
2/3/1998	8.0	3.00	4.0	30	2.0	60	2.0
1/1/1997	8.3	2.00	3.5	35	2.5	70	2.3
1/16/1996	6.6	1.27	2.0	35	2.5	69	2.1

BASi Archive, sorted by date (descending).
https://ggweather.com/basi_archive.htm

12/12/1995	10.0	3.27	4.0	54	3.0	108	3.0
12/11/1995	9.7	3.61	4.0	43	3.0	85	2.7
3/22/1995	6.6	1.28	2.0	35	2.5	69	2.1
1/10/1995	6.8	1.33	2.2	35	2.5	69	2.1
1/13/1993	8.4	1.94	3.4	37	2.7	74	2.3
2/16/1990	8.6	1.40	2.6	55	3.0	110	3.0
2/13/1987	8.6	2.22	3.7	36	2.6	71	2.3
2/18/1986	9.0	1.87	3.3	44	3.0	87	2.7
2/17/1986	8.8	1.68	3.1	44	3.0	87	2.7
2/16/1986	8.2	1.74	3.2	37	2.7	74	2.3
2/15/1986	8.8	1.88	3.3	41	3.0	83	2.5
2/14/1986	9.2	1.83	3.3	48	3.0	97	2.9
2/8/1985	7.8	1.70	3.2	35	2.5	69	2.1
11/12/1984	7.7	1.68	3.1	35	2.5	69	2.1
12/22/1982	9.3	2.00	3.5	47	3.0	94	2.8
3/31/1982	9.5	2.57	4.0	40	3.0	81	2.5
11/13/1981	8.3	1.43	2.6	45	3.0	89	2.7
1/21/1967	9.2	2.45	3.9	39	2.9	78	2.4
1/20/1964	9.1	1.86	3.3	45	3.0	90	2.8
1/31/1963	7.3	1.26	2.0	39	2.9	78	2.4
1/30/1963	9.3	1.87	3.3	51	3.0	101	3.0
10/13/1962	9.5	3.56	4.0	41	3.0	83	2.5
10/12/1962	9.7	3.11	4.0	43	3.0	86	2.7
12/1/1960	8.8	1.68	3.1	44	3.0	87	2.7
9/18/1959	8.4	2.01	3.5	36	2.6	71	2.3
1/5/1959	7.2	1.44	2.6	35	2.5	69	2.1
1/12/1957	6.8	1.25	1.8	37	2.7	74	2.3
12/23/1955	9.1	2.18	3.6	41	3.0	83	2.5
12/22/1955	9.8	2.57	4.0	42	3.0	90	2.8
1/14/1952	8.7	1.71	3.2	41	3.0	83	2.5
12/3/1951	8.2	1.58	3.0	38	2.8	76	2.4
12/1/1951	8.7	1.59	3.0	43	3.0	85	2.7
11/18/1950	8.2	1.88	3.3	36	2.6	71	2.3

Upcoming storm season – Very Strong El Niño



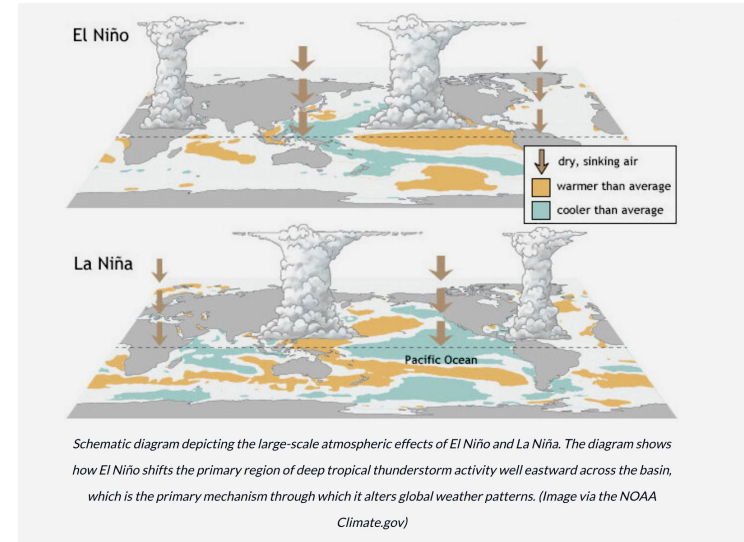
A developing strong-to-historic "super" El Niño is expected to significantly impact California with potential for extreme winter rainfall, coastal flooding, and marine disruptions, particularly in SoCal. Federal forecasters estimate an 81% chance that this climate pattern will reach "very strong" status later this year.

Expected Weather Impacts

- **Heavy Rainfall:** Shifts the Pacific jet stream south, increasing the odds of above-average precipitation and flood risks, especially in Southern California. Too early to predict effects in Northern California at this time.
- **Sierra Snowpack:** Boosts the likelihood of higher winter snowpack levels for skiers and snowboarders.
- **Sea Levels and Coast:** Triggers temporary sea level rises alongside heightened risks of coastal erosion and flooding.

Marine and Ecological Effects

- **Ocean Warming:** Combines with an ongoing marine heat wave to increase coastal water temperatures.
- **Fisheries Turmoil:** Threatens commercial crab and salmon fleets due to disrupted marine life behavior and reproduction.



For more info, go to:

<https://www.weather.gov/mtr/>
<https://weatherwest.com/>

El Niño and La Niña



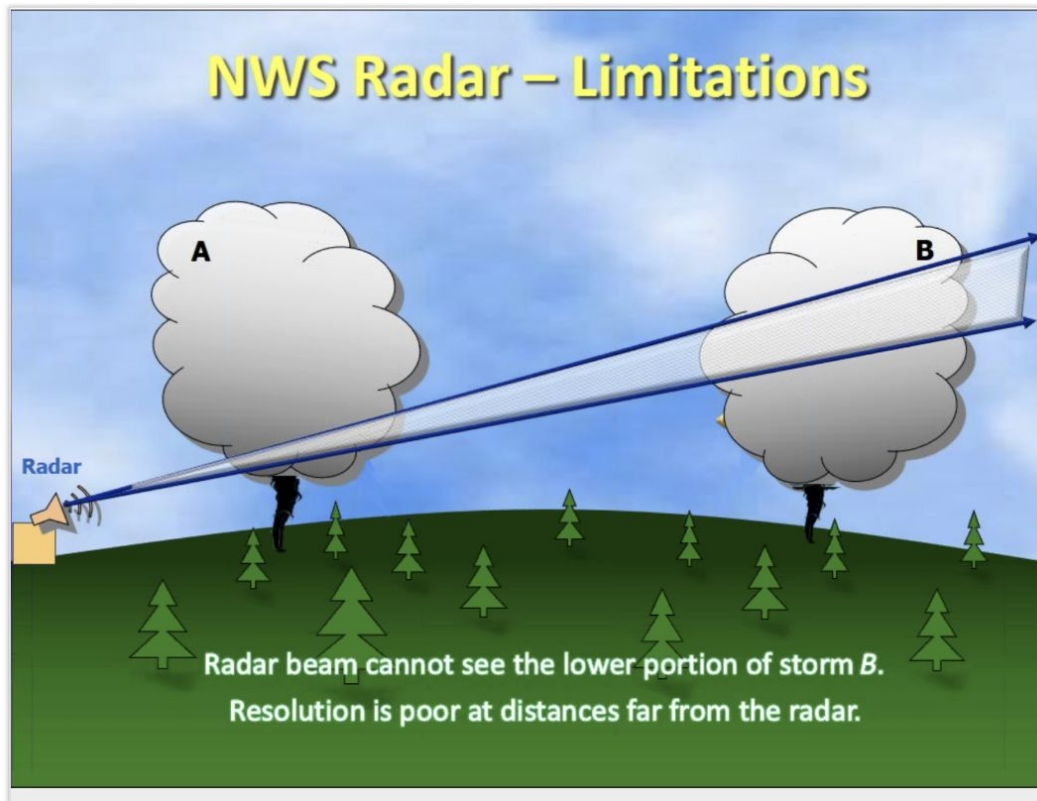
- El Niño and La Niña are opposing phases of the El Niño-Southern Oscillation (ENSO) cycle in the Pacific Ocean, significantly altering global climate.
- **El Niño (Warm Phase)**
 - **Conditions:** Warmer-than-average sea surface temperatures in the east-central equatorial Pacific.
 - **Winds:** Trade winds weaken or reverse direction.
 - **Impacts:** Often brings wetter, cooler conditions to the Southern U.S./California and warmer/drier conditions to the North.
 - **Hurricanes:** Reduces Atlantic hurricane activity due to higher wind shear.
- **La Niña (Cold Phase)**
 - **Conditions:** Cooler-than-average sea surface temperatures in the same region.
 - **Winds:** Stronger than normal trade winds.
 - **Impacts:** Typically causes drier, warmer conditions in the Southern U.S. and colder, wetter winters in the Northern U.S. and Canada.
 - **Hurricanes:** Increases Atlantic hurricane activity by reducing wind shear.
- Both phenomena occur irregularly every 2–7 years and can significantly affect agriculture, water supplies, and global weather patterns.

Being a weather spotter



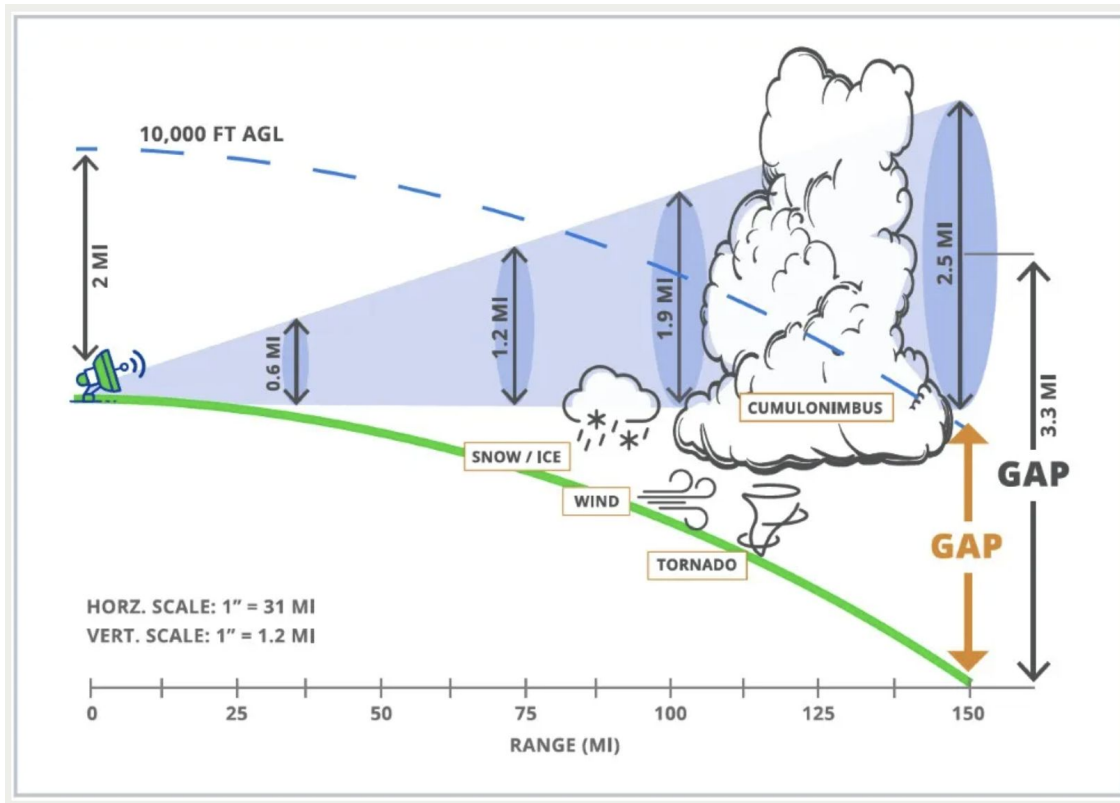
- Radar, satellites, and other remote sensing technologies have limitations
 - No substitute for trained human weather spotters on the ground
- “Eyes and ears” of the NWS
- Observe. Identify. Report.
- Decide. Be timely. Be accurate.
- What’s happened + What’s happening now – NOT What’s going to happen
- Stay informed. Be weather wise!
 - Keep up with NWS issued Watches, Warnings, Advisories
 - www.weather.gov/wwamap/wwatxtget.php?cwa=mtr&wwa=all
 - Wireless Emergency Alerts (www.weather.gov/wrn/wea) – no sign-up needed
 - Local county alerts (e.g. www.smcgov.org/dem/smc-alert) – sign-up required
 - NOAA Weather Radio, with Specific Area Message Encoding (S.A.M.E.)
 - www.weather.gov/nwr/stations?State=CA

Radar has blind spots



Source: <https://oxfordobserver.org/8573/community/national-weather-service-looks-for-storm-spotter-volunteers/>

Radar has blind spots



Source: <https://bridgemi.com/michigan-environment-watch/michigan-weather-radar-blindspots-meant-no-warning-for-deckerville-tornado/>

NOAA weather radio with S.A.M.E. technology



Specific Area Message
Encoding (S.A.M.E.)

You can monitor for
one or more County
codes and specify
which event types you
are interested in
receiving alerts for.



Weather Spotter Training Resources

- On-line SKYWARN Spotter Training (requires registration)
 - <https://learn.meted.ucar.edu/> (search for "Skywarn Spotter")
- NWS Basic Storm Spotter Field Guide
 - https://www.weather.gov/media/bis/Weather_Spotter_Field_Guide.pdf
- NWS Advanced Storm Spotter Field Guide
 - <https://www.weather.gov/media/oun/spottertraining/advancedspotterguide.pdf>
- Storm Spotter Glossary
 - https://www.weather.gov/otx/Glossary_of_Weather_Terms
- An Introduction to Storm Observing and Reporting (NWS in Norman, OK)
 - https://www.youtube.com/watch?v=v7f2_YxYPL0
- Printable Cloud Chart
 - <https://spaceplace.nasa.gov/review/posters/clouds/NOAA-NASA-CloudChart.pdf>
- JetStream – An Online School for Weather
 - <https://www.noaa.gov/jetstream>

Reporting criteria

- Tornado, funnel cloud, or water spout
- Thunderstorm (lightning seen or thunder heard)
- Hail (any size)
- Flooding
- Strong winds >35mph (at lower elevations)
- Heavy rain (>1/2"/hr or >2"/6hr)
- Dense fog (<1/4 mi - where public safety affected)
- Snow of any amount
- Passage of weather front
- Other things:
 - Ominous clouds, e.g. Towering Cumulus (TCu, seen on 9/2/2025 over Central Valley)

SF Bay Area Skywarn



- Regions and activations
 - SF, North Bay, East Bay, Peninsula, South Bay, Central Coast – or by County
 - MTR CWA counties are: Sonoma, Napa, Marin, San Francisco, Contra Costa, Alameda, Santa Clara, San Mateo, Santa Cruz, San Benito, Monterey
 - Self-activate or activations may be declared by SF Bay Area Skywarn
- Amateur Radio communication
 - High-level repeaters (analog or digital) – see: <https://sfoskywarn.org/hamradio/>
 - WinLink messages to your local coordinator
 - NorCal Talkgroup on DMR
 - HF Near Vertical Incidence Skywave (NVIS) on 40m
- Possible focus area for local ARES / RACES groups
 - ARES (Amateur Radio Emergency Service)
 - RACES (Radio Amateur Civil Emergency Service)



Skywarn Recognition Day (SRD)

- It celebrates the contributions that Skywarn volunteers make to the NWS mission
- SRD started in 1999, by the National Weather Service and the American Radio Relay League
- Always the first Saturday of December, 00-2359 UTC
- Exchange: Call sign, name, location, signal report, a one or two-word description of the weather occurring at your site ("sunny", "partly cloudy", "windy", etc.), temperature reading if available and SRD Number if the station has one
- Modes: NWS stations will work various modes including SSB, FM, AM, RTTY, Winlink, CW, FT8, FT4, and PSK31. While working digital modes, special event stations will append "NWS" to their call sign (e.g., N0A/NWS)
- Skywarn Recognition Day (SRD) 2025 was officially cancelled by the National Weather Service due to a lack of resources and time to plan a comprehensive national event. Everyone hopes it will return in 2026 and beyond.



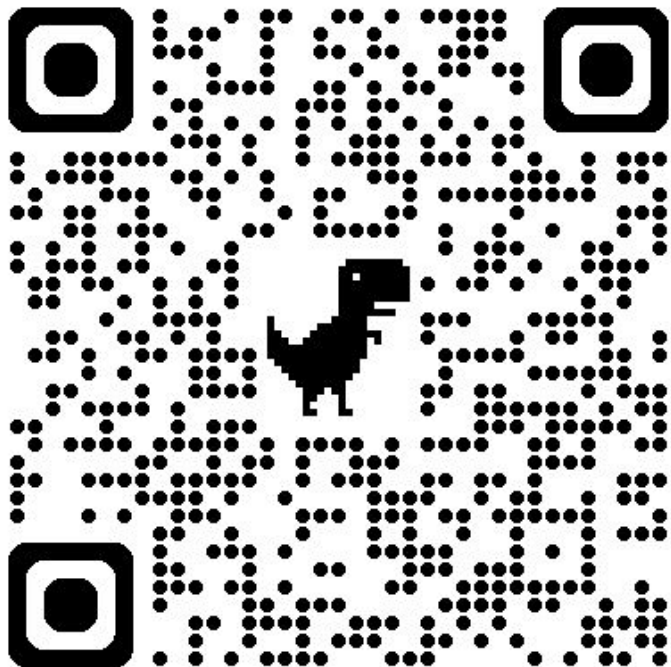
Get involved!

- Become a trained weather spotter
- Become a ham (if you're not already)
- Join a local ARES / RACES group
- Keep learning about weather and Meteorology
- Report notable weather events to the NWS according to the reporting criteria
- Have fun!

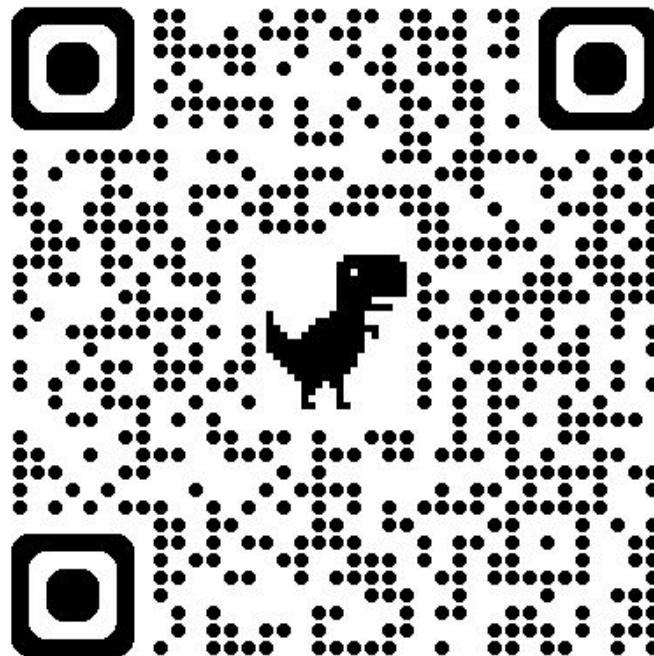
More info:

sfoskywarn.org
@sfoskywarn.bsky.social (BlueSky)
www.weather.gov/mtr/
weatherwest.com
ggweather.com/home.html

<https://sfoskywarn.org>



<https://www.weather.gov/mtr/>



Questions?

