San Francisco Bay Area Skywarn

Pacificon 2026

sfoskywarn.org

@sfoskywarn.bsky.social

Curt Kolovson, W6RQ
ARRL Section SCV Emergency Coordinator (EC) for Skywarn
Member, South (San Mateo) County Amateur Radio Emergency Services (SCARES)
Member, West Valley Amateur Radio Association (WVARA)

Outline

- What is Skywarn all about?
- Being a weather spotter
- The National Weather Service
- Do we need Skywarn in the SF Bay Area?
- El Niño 2026-27
- Weather spotter training resources
- Reporting criteria
- SF Bay Area Skywarn
- Regional Committee
- 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 increases in the number of and improvements in meteorological measurement instruments
- Weather spotters act as a “force multiplier” for the NWS

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
    - https://sfoskywarn.org/alerts/
    - 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
- You’re a Weather Spotter – not a Storm Chaser. **SAFETY FIRST!**

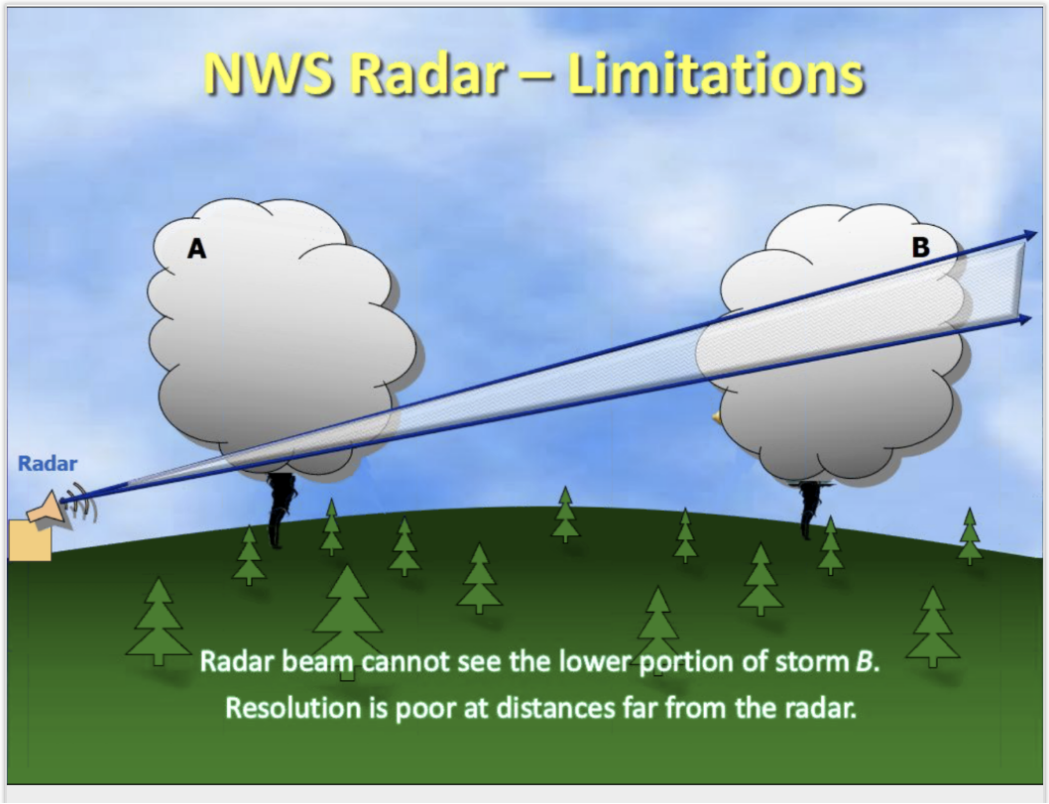
NOAA weather radio with S.A.M.E. technology



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

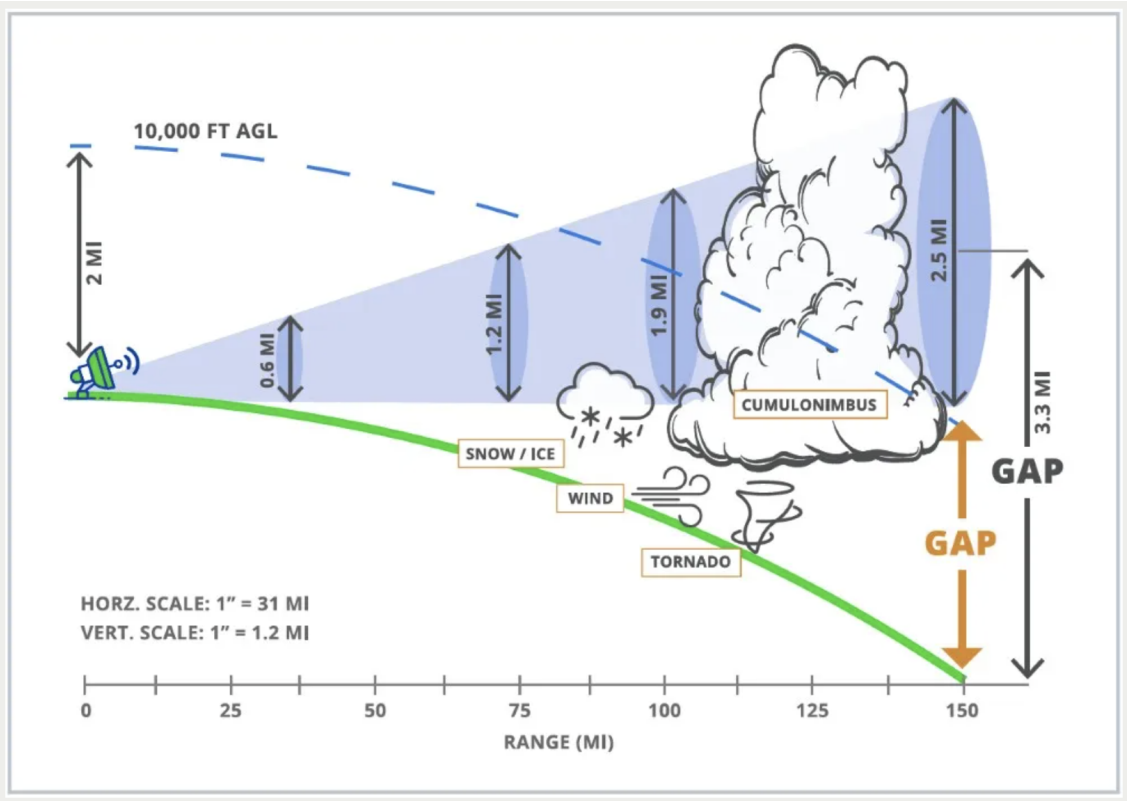
You can monitor for one or more County codes and specify which event types you are interested in receiving alerts for.

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/

Role of weather spotter

Provide assistance before, during, and after a major weather event

- BEFORE: provide information to the public about near-term impactful weather events.
- DURING: continue to provide the latest updates to the public, and submit storm reports to the National Weather Service Forecast Office in Monterey, CA (NWS MTR). Also, provide backup emergency communications services in the event of power or other infrastructure outages.
- AFTER: report storm damage to NWS MTR, and continue to provide backup emergency communications services as needed.

The National Weather Service



The origins of making systematic weather observations in the US date back to the mid 1800s. Formally, it became part of the US Army Signal Service: 1870-91.
US Weather Bureau: 1891-1970.
National Weather Service: 1970-present.

There are 122 NWS Weather Forecast Offices across the US, PR, Guam.

There are 9 NWS National Centers:
- Aviation Weather Center (AWC)
- Climate Prediction Center (CPC)
- Environmental Modeling Center (EMC)
- National Hurricane Center (NHC)
- NCEP Central Operations (NCO)
- Ocean Prediction Center (OPC)
- Space Weather Prediction Center (SWPC)
- Storm Prediction Center (SPC)
- Weather Prediction Center (WPC)

NWS Weather Forecast Office Products

Core Forecast Products

- **ZFP (Zone Forecast Product):** Detailed regional and county-based weather forecasts.
- **AFD (Area Forecast Discussion):** Technical meteorological reasoning and rationale behind the local forecast.
- **PFM / PFW (Point Forecast Matrices / Fire Weather Point Forecast):** Tabular numeric forecasts for specific points.
- **NOW (Short Term Forecast):** Rapidly-updating short-range forecasts for immediate weather changes.
- **HWO (Hazardous Weather Outlook):** Summary of potential significant weather hazards and storms.

Warnings, Watches, and Advisories

- **NPW (Non-Precipitation Warnings/Watches/Advisories):** Wind, heat, freeze, and fog advisories.
- **WSW (Winter Weather Warnings/Advisories):** Snow and ice alerts.
- **FLW / FFG (Flood Warnings / Flash Flood Guidance):** Hydrological and river flood notifications.
- **RFW (Red Flag Warning):** Critical fire weather conditions.
- **SVR / TOR (Severe Thunderstorm / Tornado Warnings):** Immediate severe convective storm alerts.
- **TSU (Tsunami Watch/Warning):** Coastal tsunami hazard bulletins.

Marine and Coastal Products

- **CWF (Coastal Waters Forecast):** Detailed marine forecasts for coastal waters.
- **NSH (Nearshore Marine Forecast):** Nearshore waters and bay wind/wave expectations.
- **SMW (Special Marine Warning):** Short-duration hazard warnings for mariners.
- **OMR (Other Marine Products):** Environmental buoy and coastal weather reports.

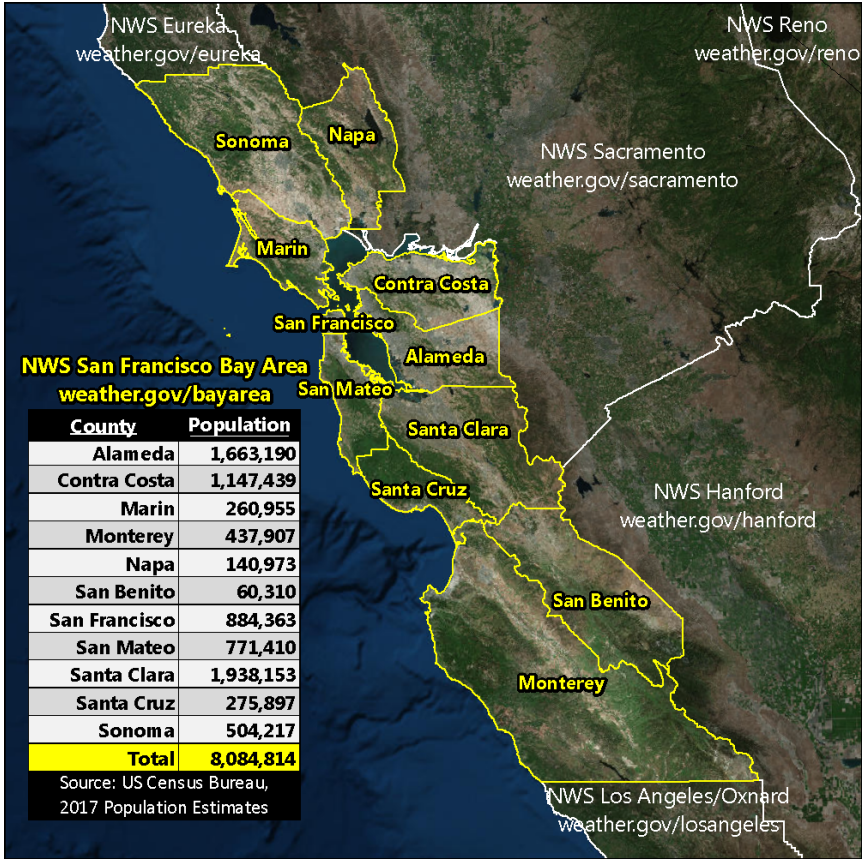
Climatological and Public Information

- **CLI / CLM (Climatological Report / Local Climatological Data):** Daily and monthly climate summaries.
- **RTP (Regional Temperature and Precipitation Table):** Highs, lows, and rainfall totals across local stations.
- **PNS (Public Information Statement):** General NWS announcements, storm damage reports, or local rainfall tallies.

This is a partial list.

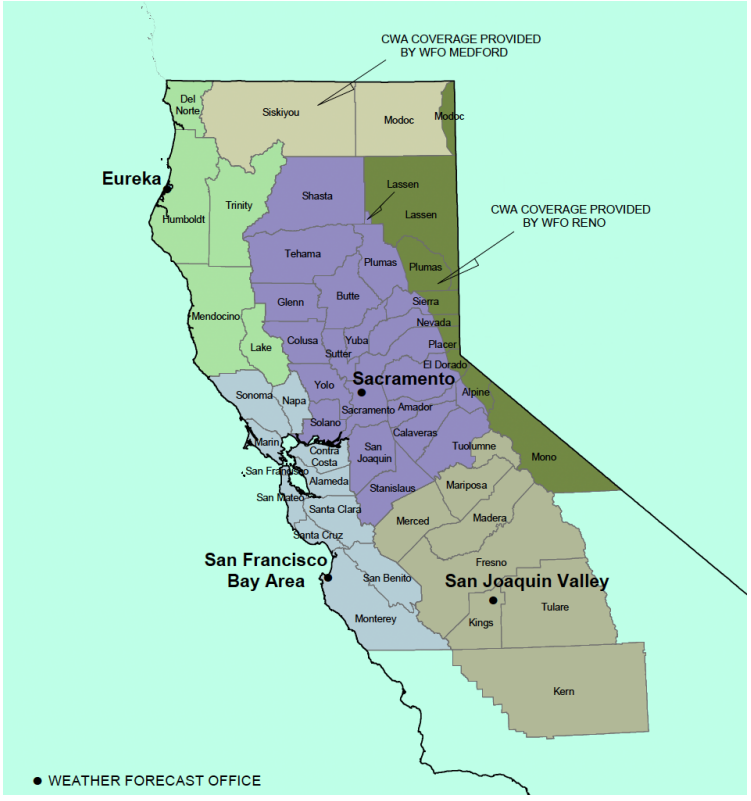
NWS Weather Forecast Office in Monterey, CA (MTR)

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

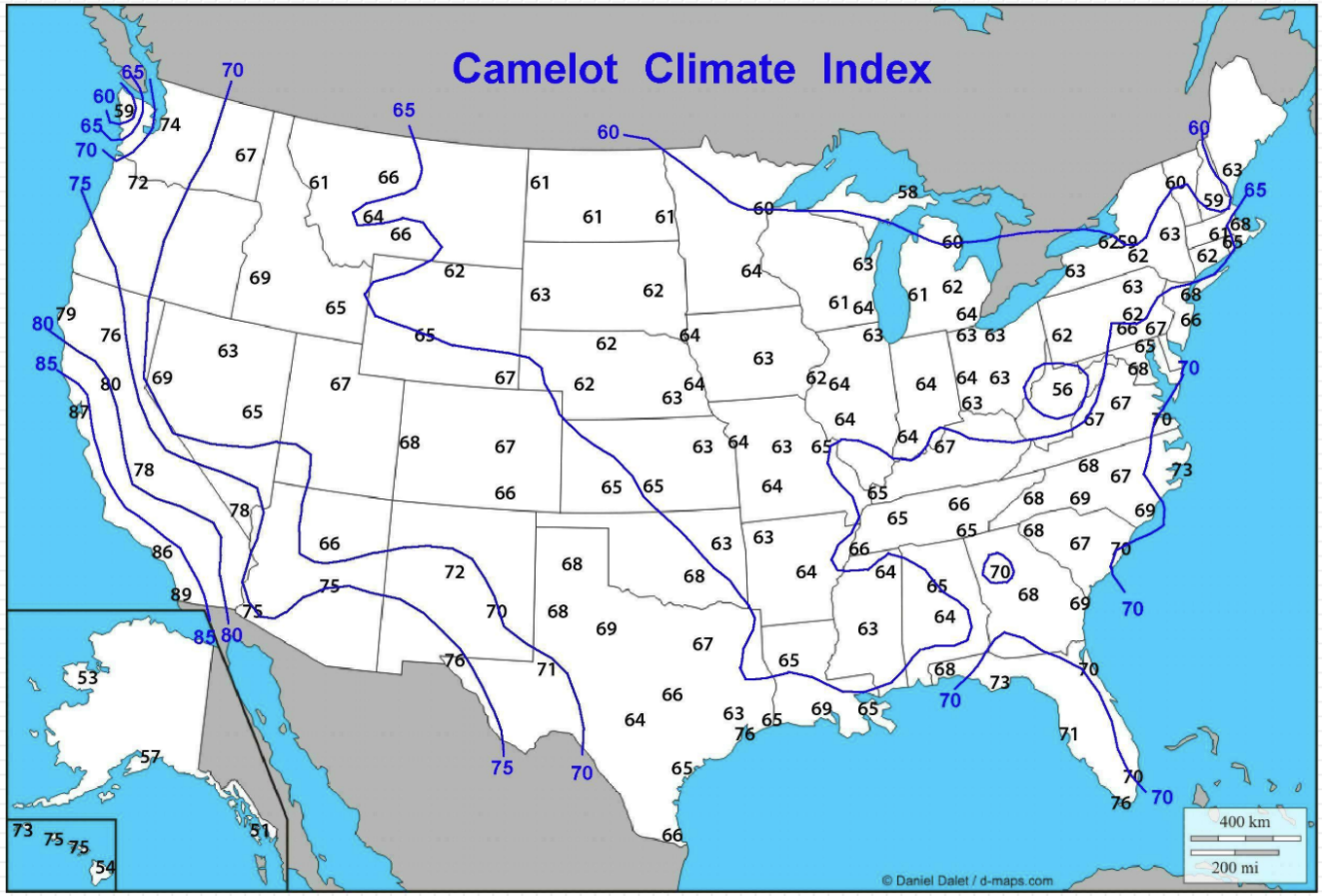


County	Population
Alameda	1,663,190
Contra Costa	1,147,439
Marin	260,955
Monterey	437,907
Napa	140,973
San Benito	60,310
San Francisco	884,363
San Mateo	771,410
Santa Clara	1,938,153
Santa Cruz	275,897
Sonoma	504,217
Total	8,084,814

Source: US Census Bureau, 2017 Population Estimates



We have beautiful weather, a lot of the time…



Based on 1981-2010 Normals

SKYWARN

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
- average relative humidity

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

But we do get storms!



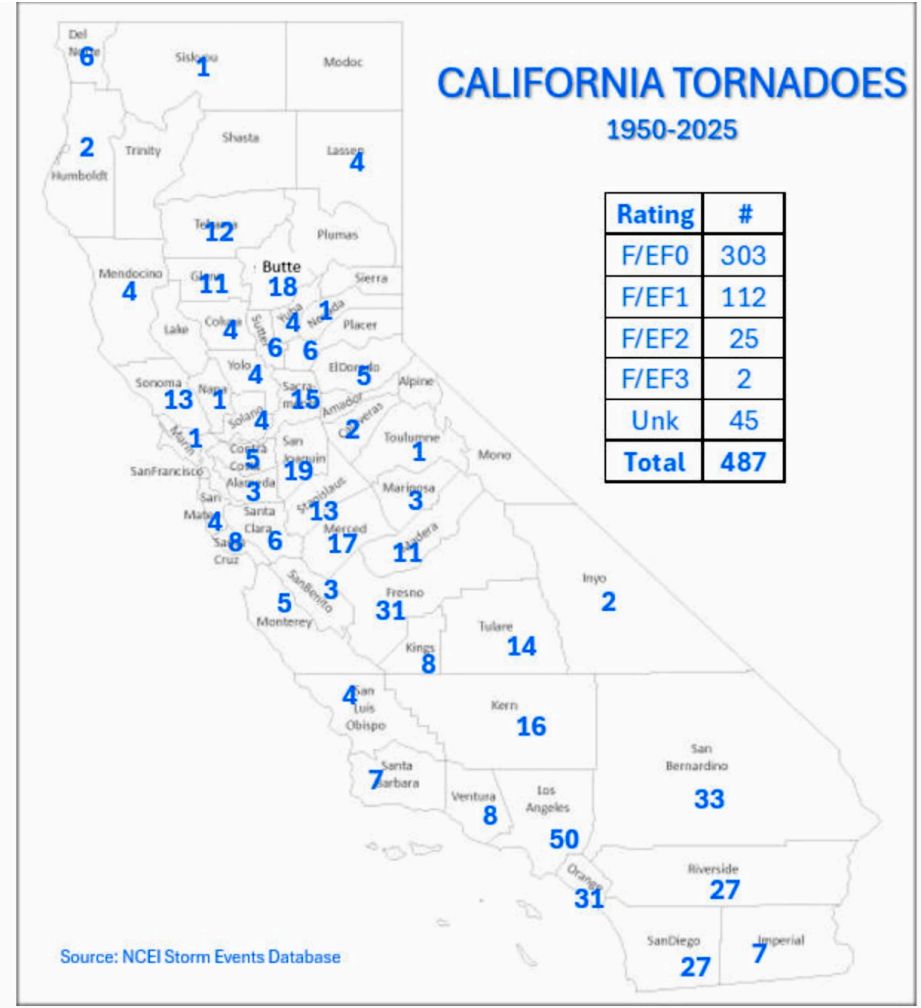
https://www.weather.gov/mtr/Stormsummaries

42 storm summaries dating back to 2008

Scotts Valley EF1 Tornado, December 14, 2024

News report video:

Scotts Valley Tornado (news report), 12/14/2024
https://www.youtube.com/watch?v=8HtyAQSiNi0



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 (40%).
The wind component is composed of two elements:
- the sustained wind speed at SFO (30%),
- the peak wind gust in the Bay Area at elevations below 1500 feet. (30%).

See https://ggweather.com/basi.htm for BASI criteria and points scales.

Top 20, sorted by BASI score.
Note: since 1/1/2000, 7 storms in the top 20.

From: https://ggweather.com/basi.htm

Updated 8/21/2026

Top 20 BASI Storms (1950-present)
Bay Area Storm Index

			SF City 24-hour Rain		SFO Max Sustained Wind		Bay Area Max Wind Gust**	
Rank	BASI	Date	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

* 2nd day of a multiday storm

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.

2026-27 — Very strong El Niño

What is El Niño?

- El Niño refers to the warm phase of the El Niño-Southern Oscillation (ENSO) climate pattern, characterized by unusually warm ocean surface temperatures in the central and eastern tropical Pacific Ocean.
- El Niño is an oceanic phenomenon. It is not a storm or a series of storms.
- El Niño can significantly influence atmospheric steering currents and storm track, often altering typical seasonal precipitation, ocean temperatures, and coastal weather hazards in California.

What is the Forecast for 2026-2027?

- El Niño is present and continues to strengthen in the eastern tropical Pacific Ocean.
- There is a 100% chance of a very strong El Niño event through the fall and winter.
- There is a high likelihood (83% chance) of a historic event that would exceed the strength of previous El Niño events dating back to 1950.
- Stronger El Niño events can more significantly tilt the odds in favor of expected outcomes but even very strong El Niño events do not lead to the expected impact everywhere.

What are the *Potential* Weather Hazards during El Niño? (These are not a guarantee!)

- **Coastal Erosion & Storm Surge**: Higher ocean levels due to warmer than normal waters can lead to more severe coastal erosion and coastal flooding, especially during periods of high tides and winter storms with surge and large waves. *This has already been occurring.*
- **Enhanced Heavy Rainfall:** A warmer ocean increases the amount of available moisture in the atmosphere. This can shift global storm tracks and enhance precipitation in winter storms, leading to prolonged rain events, flash flooding, and urban drainage overflow.
- **Landslides and Debris Flows**: Heavy rainfall on saturated hillsides can increase the risk of mudslides and debris flows—especially in recent burn scars and steep topography across coastal ranges.
- **Snowpack Dynamics**: While warm ocean temperatures often bring warmer storm systems (raising rain-snow elevations), strong El Niño cycles can yield heavy Sierra Nevada snowpack at higher elevations, impacting spring melt runoff.

Source: El Niño in California, Oct Update (NWS MTR)
https://sfoskywarn.org/wp-content/uploads/2026/10/ElNinoinCalifornia_OctEd.pdf

Last 4 Very Strong El Niños

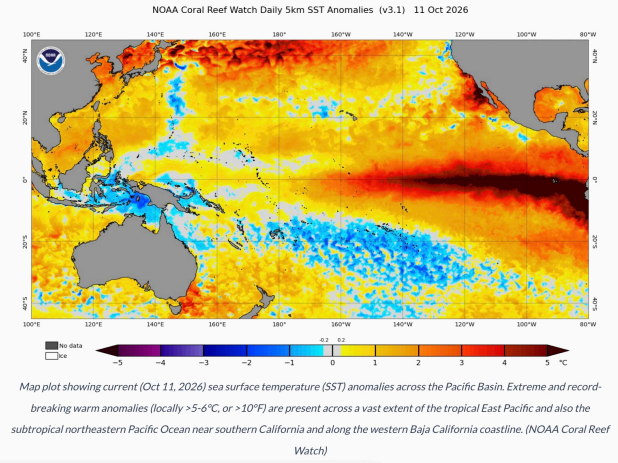
- 1982-83 — Heavy precipitation in CA
- 1991-92 — Below normal precipitation
- 1997-98 — Heavy precipitation
- 2015-16 — Near normal precipitation

  There are many factors that how much precipitation occurs in California, even during Very Strong El Niños.

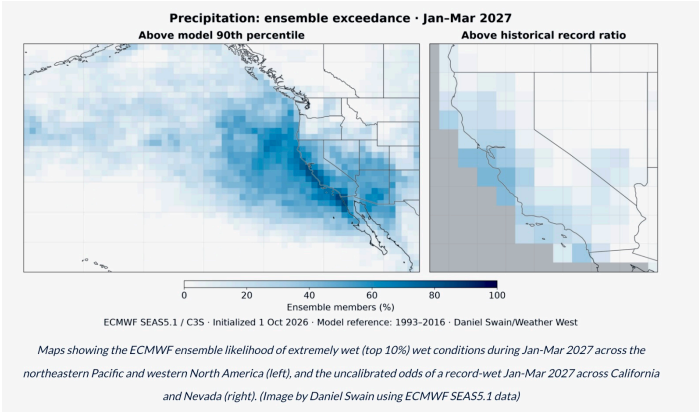
"… However, this year's exceptionally strong event will likely result in a strong tilt in the odds toward a wetter than average winter …"
— Daniel Swain, PhD — Climate scientist and associate researcher with the California Institute for Water Resources at University of California Agriculture and Natural Resources (UC ANR). His in-depth blog at: weatherwest.com

El Niño will further strengthen to historic level and likely bring major California & SW U.S. winter impacts (Daniel Swain)
https://weatherwest.com/archives/44119

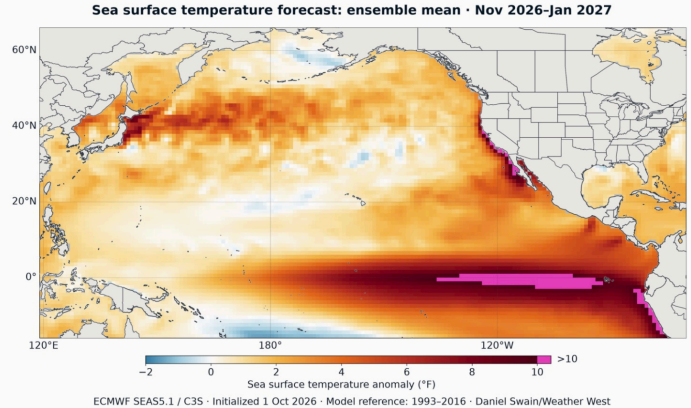
Recent updates from Daniel Swain (weatherwest.com)



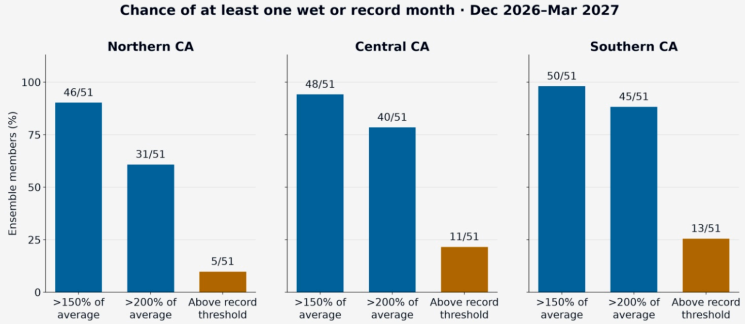
Map plot showing current (Oct 11, 2026) sea surface temperature (SST) anomalies across the Pacific Basin. Extreme and record-breaking warm anomalies (locally >5-6°C, or >10°F) are present across a vast extent of the tropical East Pacific and also the subtropical northeastern Pacific Ocean near southern California and along the western Baja California coastline. (NOAA Coral Reef Watch)



Maps showing the ECMWF ensemble likelihood of extremely wet (top 10%) wet conditions during Jan-Mar 2027 across the northeastern Pacific and western North America (left), and the uncalibrated odds of a record-wet Jan-Mar 2027 across California and Nevada (right). (Image by Daniel Swain using ECMWF SEAS5.1 data)



Map showing predicted ECMWF ensemble average sea surface temperature (SST) anomaly for Nov 2026-Jan 2027. It shows highly extreme SST anomalies near or exceeding 10F along the entire California coast and in the equatorial Pacific. (Image by Daniel Swain using ECMWF SEAS5.1 data)



Histograms showing ECMWF ensemble likelihoods of various extreme wet month statistics across northern, central, and southern California. While the strongest tilt toward extremely wet months this winter will be in central and southern California, a notable signal still emerges in the northern third of the state. (Image by Daniel Swain using ECMWF SEAS5.1 data)

Weather Spotter Training — See Resources menu at sfoskywarn.org

- On-line SKYWARN Spotter Training (requires registration)
https://learn.meted.ucar.edu/ (search for “Skywarn Spotter”)
- NWS Bay Area Specific Storm Spotter Training (5 min video — watch this!)
https://www.youtube.com/watch?v=yZoRHGHqDKo
- 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

- Website: sfoskywarn.org
- Activations
  - Spotters may self-activate
  - Activations may be declared by your regional coordinator or SF Bay Area Skywarn
- Amateur Radio communication
  - High-level repeaters (analog or digital) – see: https://sfoskywarn.org/hamradio/
  - WinLink messages to your regional coordinator
  - NorCal Talkgroup on DMR
  - HF Near Vertical Incidence Skywave (NVIS) on 40m
- Other methods of communication
  - Bluesky: @sfoskywarn.bsky.social
  - MeshCore: #sfoskywarn channel

SF Bay Area Skywarn Regional Committee

- We are forming a Skywarn Regional Committee throughout Bay Area.
- Depending on level of participation, organization may be either…
  - By Region: SF, North Bay, East Bay, Peninsula, South Bay, Central Coast
  - By County: Sonoma, Napa, Marin, San Francisco, Contra Costa, Alameda, Santa Clara, San Mateo, Santa Cruz, San Benito, Monterey
- If you are interested, please contact: W6RQ@arrl.net

Skywarn Recognition Day (SRD)

- Celebrates the contributions that Skywarn volunteers make to the NWS mission
- SRD started in 1999, by the NWS and the ARRL
- 1st Saturday of December, 0000-2359 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 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 cancelled by the National Weather Service due to a lack of resources and time to plan a comprehensive national event.
- Announcement TBD as to whether it will return in 2026 and beyond.

Get involved!

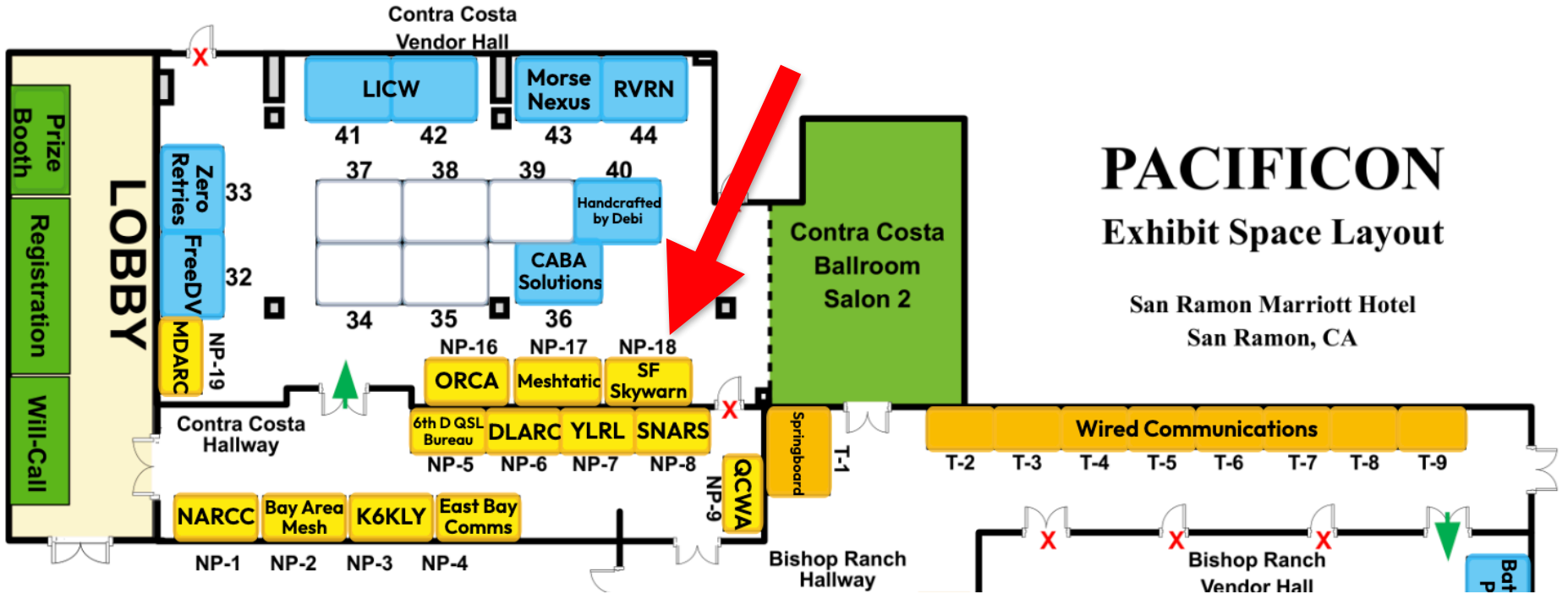


- Become a trained weather spotter
- Become a ham (if you're not already)
- Join a local ARES / RACES group
- Keep learning about weather and Meteorology
- Report notable weather events to the NWS according to the reporting criteria
- Have fun!

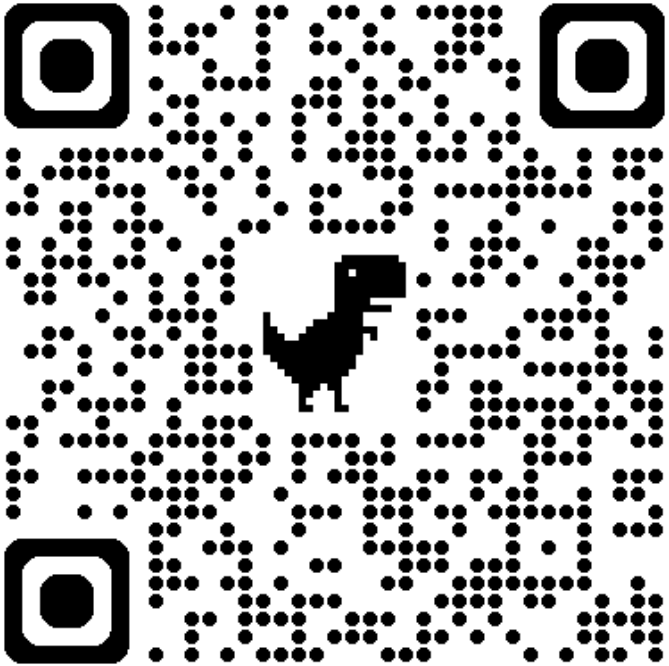
More info:

sfoskywarn.org
www.weather.gov/mtr/
weatherwest.com
ggweather.com/home.html

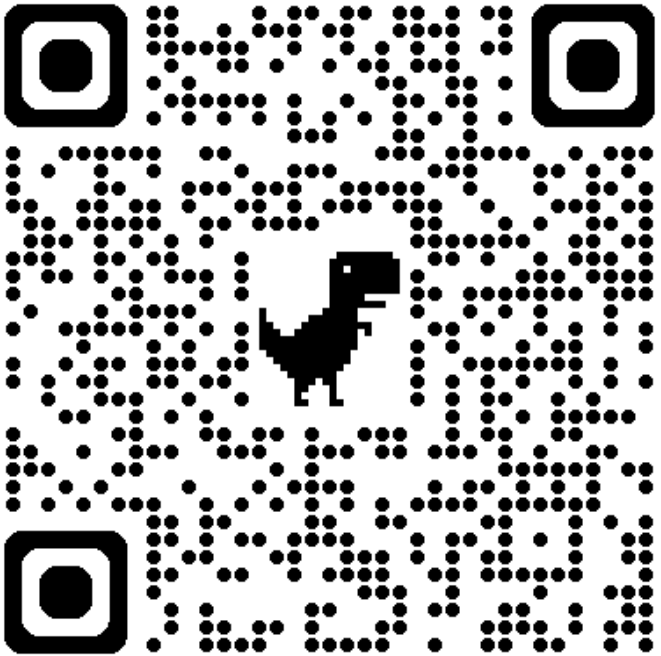
Come visit our table



https://sfoskywarn.org



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



Questions?

