

**CALIFORNIA COASTAL COMMISSION**

455 MARKET STREET, SUITE 228  
SAN FRANCISCO, CA 94105-2219  
VOICE (415) 904-5200  
FAX (415) 904-5400



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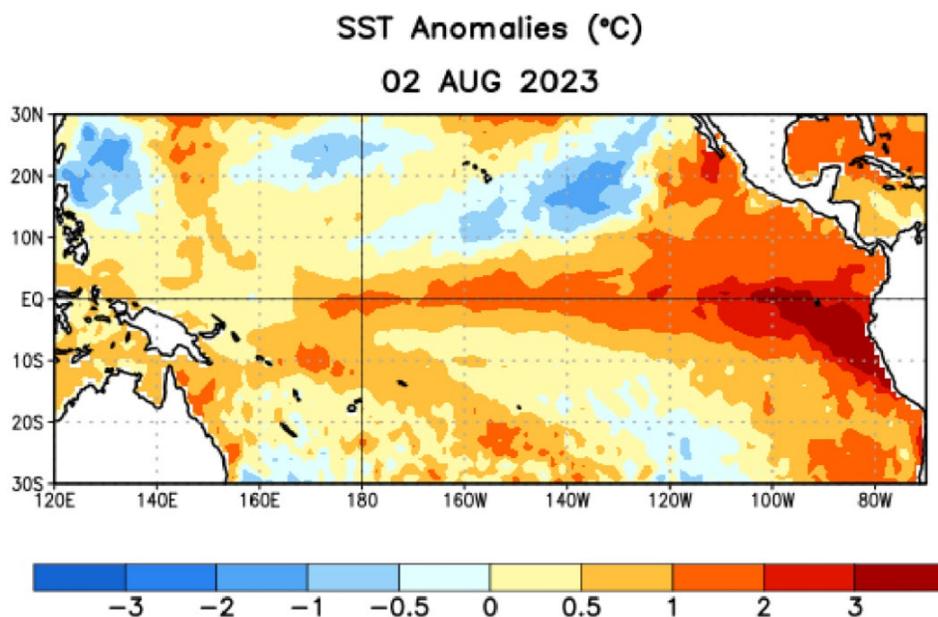
August 30, 2023

TO: California Coastal Commissioners and Interested Public

FROM: Kate Huckelbridge, Executive Director  
Cassidy Teufel, Director, Technical Services Unit  
Joseph Street, PG, PhD, Staff Geologist  
Jeremy Smith, PE, Staff Engineer

SUBJECT: **Emerging El Niño for 2023-2024 Winter**

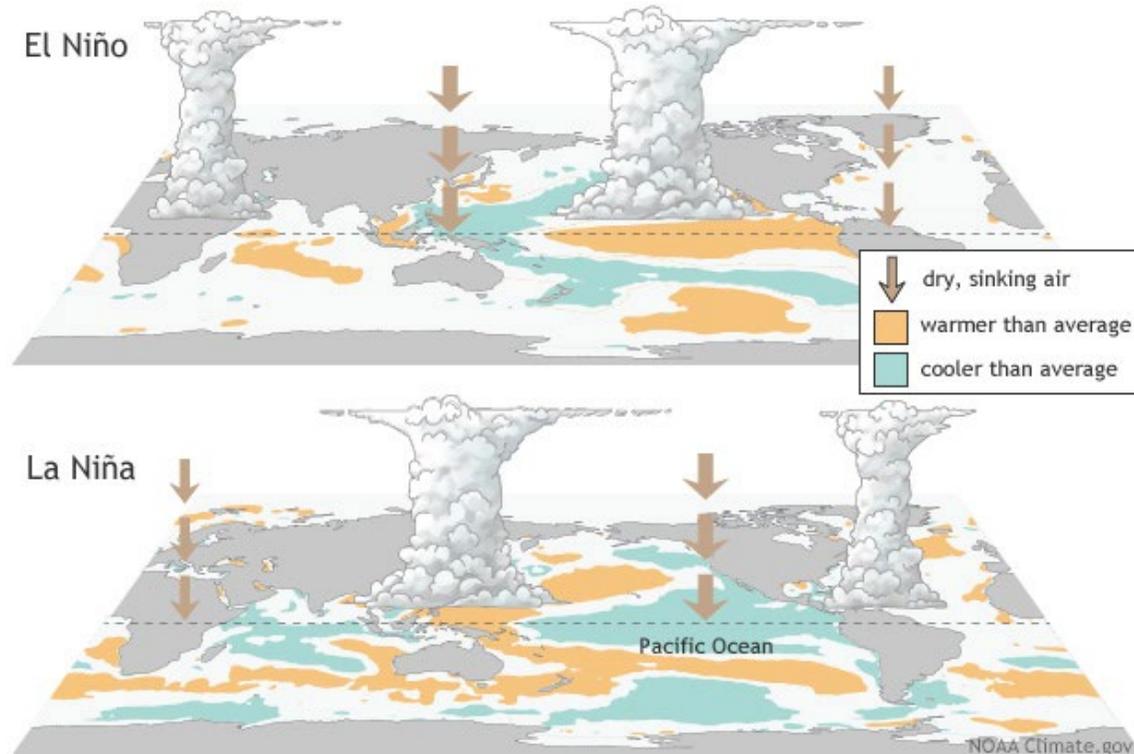
This memo is intended to alert the Commission and public about an emerging El Niño event (**Fig. 1**) that is likely to influence weather and coastal conditions in California during the winter of 2023-2024, and to advise coastal property owners and public agencies on basic preparatory measures and coastal permitting requirements in connection with winter storm preparedness and damage response. The memo also provides background scientific information that may be useful, as well as links to additional Commission resources related to El Niño, in particular several “checklists” for community and property preparedness developed by Commission staff. Given the increased odds of an active winter storm season, Commission staff encourages early coordination on desired preparedness measures, such as repair and maintenance work or protective structures, that could affect coastal resources and require a coastal permit; staff is ready to assist in any way possible. At the end of this document, we provide contact information for the [Coastal Commission offices](#).



**Figure 1.** Average sea surface temperature (SST) anomalies (°C) in the tropical Pacific Ocean for the week of August 2, 2023. Anomalies represent the difference from average with respect to the 1981-2010 base period weekly means. *Source:* NOAA Climate Prediction Center.

### What is El Niño?

El Niño is the popular term for one phase of the El Niño-Southern Oscillation (ENSO), a recurring climate pattern spanning the tropical Pacific Ocean that affects ocean conditions and weather worldwide. The ENSO pattern shifts back and forth irregularly (typically every two to seven years), bringing predictable shifts in ocean surface temperatures, atmospheric circulation, and wind and rainfall patterns across the tropics, along with a broader cascade of global climate effects. An El Niño event is characterized by the weakening or reversal of the dominant easterly trade winds in the tropical Pacific, and a related migration of warm ocean water from the western Pacific (near Indonesia) into the eastern Pacific, leading to anomalously warm ocean surface temperatures in the eastern tropical Pacific and along the coasts of South America, Central America, and California (**Fig. 1**). This unusually warm water can affect fisheries and coastal ecosystems and cause a persistent elevation of sea level. In the Western Hemisphere (i.e., the eastern Pacific) El Niño is sometimes referred to as the “warm” phase of the ENSO cycle. The opposite, “cool” phase of ENSO, called La Niña, is characterized by intensified easterly trade winds and cooler than average sea surface temperatures in the eastern tropical Pacific.



**Figure 2:** Schematic diagram of typical sea surface temperature and atmospheric circulation patterns during El Niño and La Niña events. *Source:* NOAA/Climate.gov

During El Niño, these changes in ocean temperature and surface winds are accompanied by major shifts in atmospheric pressure patterns (i.e., the “Southern Oscillation”), with the dominant zone of low pressure (rising air and deep convection) shifting from the western to the central-eastern tropical Pacific, with concomitant shifts in rainfall (**Fig. 2**). In the North Pacific, atmospheric circulation changes caused by El Niño often lead to a more southerly winter storm track, bringing more rainfall to the southern United States, and somewhat less reliably, California. Some studies suggest climate change could alter the frequency and strength of ENSO cycles, potentially resulting in stronger and more frequent El Niños<sup>1</sup>. In coastal California, the temporarily elevated

sea levels and intense winter storms typical of a strong El Niño event may provide a preview of how sea level rise can increase coastal hazards. NOAA staff scientists provide in-depth information and discussion about the expected 2023-24 El Niño and related forecasting on their “ENSO Blog” at <https://www.climate.gov/enso>.



**Figure 3:** Topanga Creek after one of the El Niño storms of 1997-98. *Photo credit:* L. Ewing

***How is El Niño expected to affect weather, rainfall, and coastal conditions this year?***

According to the August 2023 ENSO forecast by NOAA, there is a greater than 95% chance that El Niño conditions will continue through the 2023-24 Northern Hemisphere winter. Ocean warming is one indicator of El Niño strength, and the springtime sea surface temperatures in the equatorial eastern Pacific, off the coast of Ecuador and Peru, have been among the warmest recorded. The NOAA forecast estimates a 66% percent chance of a strong El Niño (east-central tropical Pacific SSTs > 1.5 °C above normal). However, there are many varieties or ‘flavors’ of El Niño that can contribute to different climate outcomes in California, and only time will tell if this winter has above or below average rains and coastal storms.

During El Niño conditions, North Pacific storms often take a more southerly track than normal, bringing above average precipitation to the southern and central parts of the state. Past strong El Niños have also been characterized by extended periods of high intensity rainfall, triggering heavy runoff, floods, and landslides both inland and along the coast. Mudslides and debris flows are of special concern for watersheds that contain areas that have recently had fires and still have unvegetated slopes. Along the California coast, past strong El Niño winters have experienced more frequent severe storm events, with the combination of elevated water levels, higher wave energy and west to southwesterly shifts in wave direction driving severe coastal erosion in many locations (e.g., as observed during El Niño winters of 1982-83, 1997-98, 2009-10 and 2015-16).

A key observation from past El Niño events is that the most damaging storms are often those that coincide with the highest tides. Storms that peak during high tides are far more likely to cause damage than if the same storm peaked during low tide. For example, the widespread coastal damage that occurred during the winter of 1982-83 was due in part to the combination of large storm waves with very high tides. Some of the highest tides for the 2023-24 winter will occur close

to holidays (see table on p. 9). This highlights the need for early preparation since holidays are times that people tend to travel and go on vacation.

The current low sand volumes and narrow beach conditions at some locations along the California coast (e.g., southern Orange County, Santa Cruz County) may leave coastal development and infrastructure in such areas especially vulnerable to the combined effects of waves and high tides during a strong El Niño winter.

***What have been the effects of past El Niño events?***

The very strong 1982-83 and 1997-98 El Niños brought heavy rainfall and large waves to coastal California during multiple winter storms. There was extensive flooding, landsliding, coastal erosion, and damage to coastal structures. These storms were viewed as being extraordinary and have often been used as the "design" events for new development. The strong El Niño event of 2015-16 also resulted in extreme wave energy and shoreline retreat along California coast, but caused less damage to structures, due in part to the more northerly storm tracks and wave directions during this event.<sup>2</sup> On a statewide basis, rainfall during the 2015-16 El Niño was unexceptional, slightly above normal in northern California and somewhat below normal in southern California. During 1976-77, a weak El Niño, California experienced much lower than average rainfall due to a persistent high-pressure system over southern California that diverted winter storms to the north. Each El Niño is different; nonetheless, strong El Niño conditions *increase the odds* of wet winter weather and high waves along the coast.



**Figure 4:** Cardiff State Beach, San Diego County, winter 1997-98. (Photo: L. Ewing)

***What can people do to prepare for El Niño?***

If, as expected, the emerging El Niño continues to strengthen through the fall and winter, the California coast may experience elevated sea level and severe winter storms, with high waves and heavy rainfall. Local governments and coastal property owners should undertake inspections of their property to identify prudent maintenance activities to minimize potential storm damage. Such activities are of particular importance in locations that experienced storm damage and coastal erosion this past winter season. Even if there are no severe storms this winter, it is almost certain

that, in the next few years, some parts of the California coast will be battered by intense storms and that some areas will experience flooding, landslides or coastal erosion. Property inspections and periodic maintenance are sensible winter preparation, regardless of the current El Niño development. Commission staff have prepared several Preparedness Checklists to assist communities and property owners in preparing for the upcoming El Niño:

- [General Checklist for Community Preparedness](#)
- [General Checklist for Property Preparedness](#)
- [Shoreline Property Preparedness Checklist](#)

***What is meant by repair and maintenance; what coastal permits do I need?***

Repair and maintenance for storm protection encompasses a broad range of activities. For flood protection, it could involve clearing out debris basins or dredging a flood control channel; for homes and businesses, it may include cleaning out gutters and down drains, inspecting roofs, or planting ground cover on bare areas; for shore protection, it could include patching shotcrete, refacing concrete, cleaning drains or placing displaced rock back on an existing revetment.

Many repair and maintenance activities may require a coastal permit, especially if there will be grading, landform alteration, or the use of mechanized equipment on the beach or near a coastal stream, wetland or bluff. For projects in the coastal zone, property owners should contact both the Commission staff and local government to determine 1) if a coastal permit is necessary, and 2) what information will be needed to file an application for a permit. Many repair and maintenance activities can be reviewed quickly, and, in some cases, permits can be waived, but to avoid violations it is important to contact staff before proceeding.



**Figure 5:** Oxnard Shores after 1983 El Niño storms. (Photo: R. McCarthy)

***What permits are needed to install a new protective structure to address ongoing safety concerns?***

In some situations, property owners seek to undertake new projects to address pre-existing site conditions or safety concerns — for example, a new or reactivated landslide, bluff failures, or an existing structure which is in danger from erosion. These situations usually require permanent

solutions — e.g., regrading of a landslide, slope reconstruction, retaining walls, new revetments or seawalls. These actions almost always require a coastal permit. Property owners should contact both the Commission staff and their local government to determine 1) if a coastal permit is necessary, and 2) what information will be needed to file a permit application. Permits for new permanent structures require detailed information on site characteristics, design constraints, engineering concerns, etc. If there is an existing imminent threat or if there has been damage that requires action more quickly than the regular permit process will allow, there are provisions in the [Coastal Act](#), and in most local coastal programs, to authorize emergency permits. A perceived threat from upcoming storms is not generally considered an emergency under the Coastal Act. Rather, the Commission's implementing regulations deem an emergency to be "a sudden unexpected occurrence demanding immediate action to prevent or mitigate loss or damage to life, health, property or essential public services." If an emergency occurs, the emergency permit process is meant to allow for the minimum amount of work necessary to abate the emergency. For example, temporary measures such as easily removable sandbags are often more appropriate in an emergency context than a concrete seawall). In that context, the objective is to abate the emergency, not to use the emergency process to install substantial protective works that might not otherwise be allowed under the Coastal Act. In all cases, emergency coastal permits only authorize development temporarily, and anything that is intended to be kept for the longer term requires a follow-up regular coastal permit. For these reasons, the emergency coastal permit process is used judiciously, including to avoid significant investments in unapprovable infrastructure. The Commission will evaluate each request on a case-by-case basis.

***What about new protective work to address safety concerns from potential extraordinary threats, such as this year's El Niño?***

Many properties will be safe during "normal" storms, but could be at risk during an extreme event. Because the current El Niño event may cause extreme storm conditions, property owners and communities may wish to take steps to add temporary protection to prevent damage in the winter. These types of preventive actions are generally not considered emergencies, but may need expedited approvals to enable them to be installed prior to the winter storm season. It may be possible to expedite projects that: 1) have little or no environmental impact; 2) have little or no effect on public access and recreation; 3) are temporary; 4) are removable; and 5) pose no risk to coastal resources or public safety. Contact Commission staff for more information.

Temporary shore protection options include beach nourishment, sand or cobble berms, sandbags, and other easily removable options. Temporary slope protection could include revegetation, sandbags or geotubes to redirect drainage to appropriate areas; or slope coverings such as visqueen, jute or light weight concrete matting. There are few temporary options for landslides other than drainage controls and removal of toe debris, or in some cases, temporary debris walls. Most landslide problems require permanent protection measures. Most of these temporary measures will require some type of permit, so contact Commission staff for more information.

***How do I get permits for temporary protection options?***

Temporary measures for shore protection, slope protection and landslides may not be suitable in every situation. For example, it may be harmful to use slope covering over a slope that contains sensitive resources; or an articulated concrete mat may not be a good option for a shallow bedrock platform area where the matting cannot be keyed without excavation of the platform material. Prior to proceeding with temporary protection, property owners should contact both the Commission staff and their local government to determine 1) if a coastal permit is necessary, and 2) what information will be needed to file an application for a permit. In many situations, early consultation with staff can avoid problems and enable you to proceed with your plans in a timely manner while minimizing environmental impacts.

**When should I contact Commission staff?**

Commission staff are prepared to consider each situation independently and review the conditions and facts of each problem on a case-by-case basis. We encourage local governments and property owners to assess their situations or properties now and contact your local Commission office as soon as possible for consultation and direction. A brief written description, and a drawing and site plan of any proposed project, if time permits, would allow Commission staff to review requests more efficiently.

- Follow this link to a fillable emergency permit application [form in PDF](#).

A [list of commission offices](#), addresses and telephone numbers is provided below and on the Commission's web site at [www.coastal.ca.gov](http://www.coastal.ca.gov). If there is a certified local coastal program, property owners should contact the local government staff directly. If the work involves any shoreline protective work or bluff work, property owners should contact *both* local government staff and Commission staff.

**Table 1: Contact Information for Coastal Commission Offices**

District Office	Coverage Areas	Address	Phone/Fax Number & E-mail
North Coast	Del Norte, Humboldt & Mendocino	1385 8 <sup>th</sup> St., Suite 130 Arcata, CA 95521	(707) 826-8950 (707) 826-8960 (fax) <a href="mailto:NorthCoast@coastal.ca.gov">NorthCoast@coastal.ca.gov</a>
North Central Coast	Sonoma, Marin, San Francisco & San Mateo	455 Market St., Suite 300 San Francisco, CA 94105	(415) 904-5260 (415) 904-5400 (fax) <a href="mailto:NorthCentralCoast@coastal.ca.gov">NorthCentralCoast@coastal.ca.gov</a>
Central Coast	Santa Cruz, Monterey & San Luis Obispo	725 Front St., Suite 300 Santa Cruz, CA 95060	(831) 427-4863 (831) 427-4877 (fax) <a href="mailto:CentralCoast@coastal.ca.gov">CentralCoast@coastal.ca.gov</a>
South Central Coast	Santa Barbara, Ventura & Los Angeles	89 S. California St., Suite 200 Ventura, CA 93001	(805) 585-1800 (805) 641-1732 (fax) <a href="mailto:SouthCentralCoast@coastal.ca.gov">SouthCentralCoast@coastal.ca.gov</a>
South Coast	Los Angeles & Orange	301 E. Ocean Blvd., Suite 300 Long Beach, CA 90802	(562) 590-5071 (562) 590-5084 (fax) <a href="mailto:SouthCoast@coastal.ca.gov">SouthCoast@coastal.ca.gov</a>
San Diego	San Diego	7575 Metropolitan Dr., Ste. 103 San Diego, CA 92108	(619) 767-2370 (619) 767-2384 (fax) <a href="mailto:SanDiegoCoast@coastal.ca.gov">SanDiegoCoast@coastal.ca.gov</a>
Headquarters	Statewide	455 Market St., Suite 300 San Francisco, CA 94105	(415) 904-5202 (415) 904-5400 (fax) <a href="mailto:executivestaff@coastal.ca.gov">executivestaff@coastal.ca.gov</a>

		<b>Dates of Significant High Tides at Major Tide Stations, Winter 2023-24</b>						
		<b>San Diego</b>	<b>Los Angeles</b>	<b>Santa Barbara</b>	<b>Monterey</b>	<b>San Francisco</b>	<b>Humboldt</b>	<b>Crescent City</b>
NOV	Tides > 6 ft	13 – 16 24 – 29	12 – 16 24 – 29	13 – 16 24 – 29	14 – 15 24 – 29	1, 12 – 16 23 – 29	most of month	most of month
	Tides > 7 ft						1, 11 – 17 23 – 30	1, 11 – 17 23 – 30
	Tides > 8 ft						26 – 27	25 – 27
DEC	Tides > 6 ft	11 – 15 23 – 27	10 – 16 23 – 28	11 – 15 23 – 27	11 – 15 23 – 27	10 – 16 21 – 28	most of month	most of month
	Tides > 7 ft						9 – 17 21 – 29	9 – 17 21 – 29
	Tides > 8 ft						12 – 14 24 – 26	12 – 13 24 – 25
JAN	Tides > 6 ft	9 – 13	9 – 14 23 – 25	9 – 13	9 – 13 22 – 23	7 – 14 18 – 25	most of month	most of month
	Tides > 7 ft						7 – 14 17 – 27	7 – 14 16 – 27
	Tides > 8 ft						10 – 13	10 – 13
FEB	Tides > 6 ft	7 – 11	7 – 11	7 – 11	7 – 10	6 – 11 14 – 16	most of month	most of month
	Tides > 7 ft						5 – 18, 22	5 – 17
	Tides > 8 ft						8 – 10	8 – 10
MAR	Tides > 6 ft	8 – 9	8 – 10	8 – 9		7 – 15	most of month	most of month
	Tides > 7 ft						7 – 15	7 – 15
APR	Tides > 6 ft	9	8 – 10	9 – 10		9 – 12	most of month	most of month
	Tides > 7 ft						7, 9 – 13	7, 9 – 13

Source: Developed from NOAA Tide Predictions ([https://tidesandcurrents.noaa.gov/tide\\_predictions.html](https://tidesandcurrents.noaa.gov/tide_predictions.html))