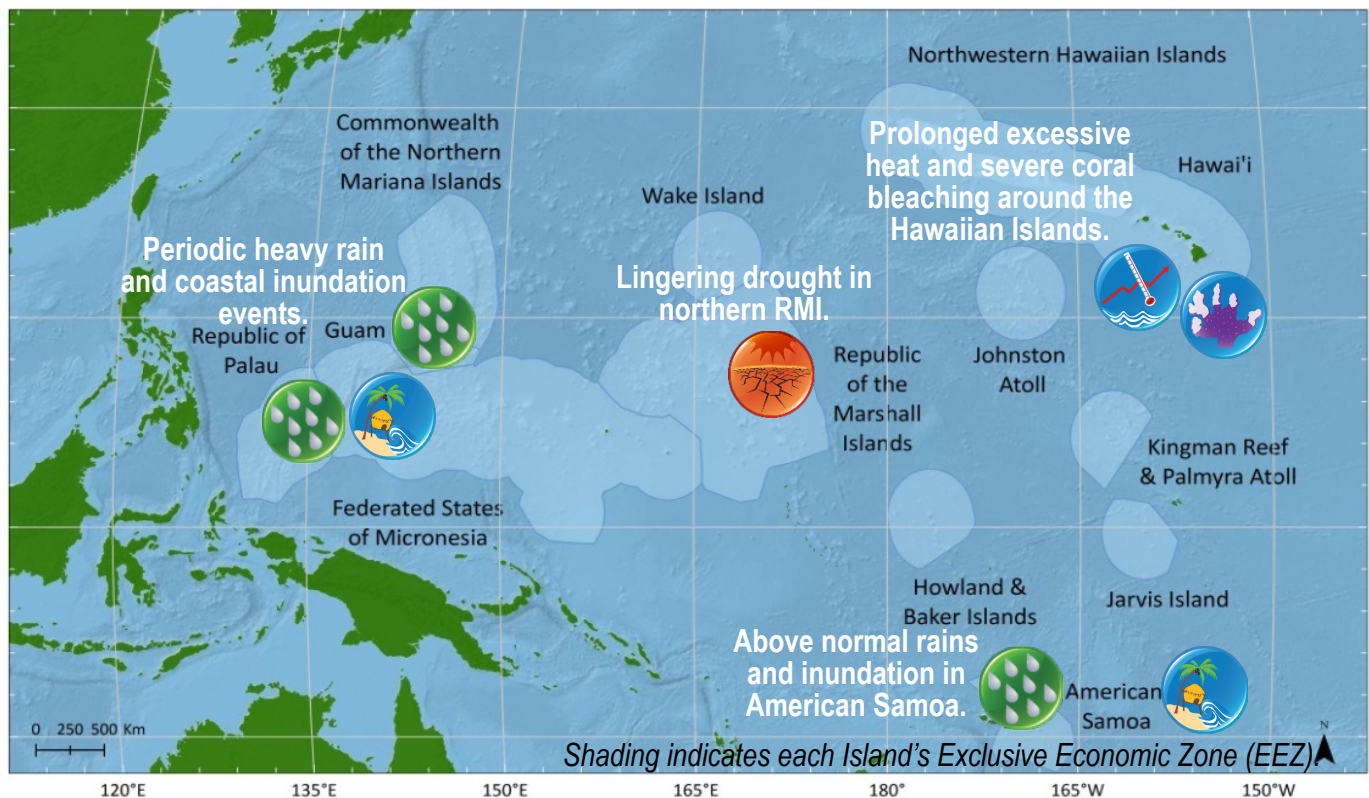




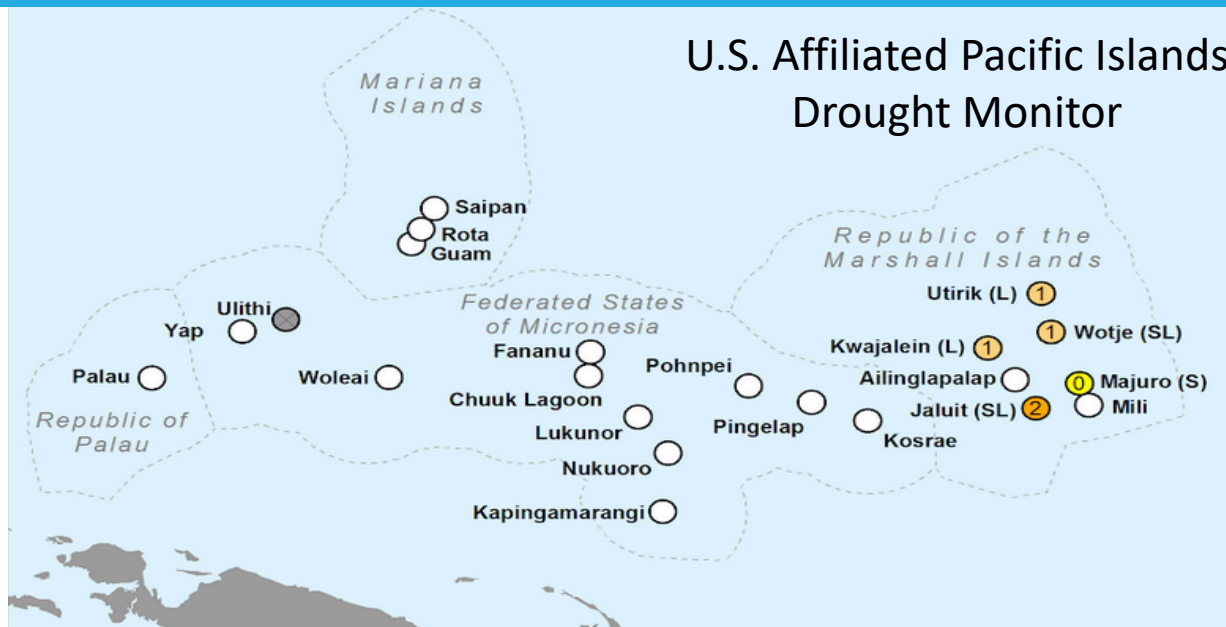
Significant Events – For June – August 2019



Highlights for Hawaii and the U.S. Affiliated Pacific Islands

- Extended period of unusually hot weather in Hawaii, breaking multiple single and multi-day heat records at Lihue, Honolulu, Kahului, and Hilo.
- Drought conditions have greatly improved across much of Yap State and Palau, and northern islands of the Federated States of Micronesia.
- Isolated areas of drought continues across the Republic of the Marshall Islands.
- Heavy rains fell in Palau and Yap States while drought conditions lingered in the Hawaiian Islands.
- Sea-levels in parts of the Federated States of Micronesia, Yap, and Guam have risen dramatically in the last few months. Several islands reported salt water inundation on account of the rebounding sea levels.
- In the Hawaiian archipelago coral bleaching had been reported at Lisianski Island and at French Frigate Shoals, at Kealakekua Bay on Hawaii, and at Kaneohe Bay and Hanauma Bay on Oahu.

U.S. Affiliated Pacific Islands Drought Monitor



The 2 September Niño 3.4 region anomaly was -0.2°C , and the overall coupled ocean-atmosphere system reflects ENSO neutral conditions.

Sea-surface temperatures are above normal across the central and western Pacific with $+0.5^{\circ}\text{C}$ anomalies over FSM and RMI. Waters around American Samoa are $+0.75^{\circ}\text{C}$ warmer than average. Additionally, **warm anomalies $>2^{\circ}\text{C}$ have surrounded the Hawaiian Islands** and a mass of anomalously warm water ($3\text{--}4^{\circ}\text{C}$ above average) has developed off the west coast of the United States. However, a growing area of cold anomalies (between -1 and -2°C) has emerged along the equator to South America east of 140°E . **Above average surface air temperatures have baked the Hawaiian Islands this period**, with 64 days over 32°C (90°F) in Honolulu, which is 492% of normal.

Satellite and model analyses show sea levels rising in the tropical western and central Pacific, whereas sea levels are falling in the equatorial eastern Pacific. The sea level at Yap rose 25 cm since March. The equatorial pattern is consistent with the end of El Niño conditions. Around Hawaii, which is near the western edge of a broad region of above-normal sea levels, sea levels rose about 5 cm during July.

Drought conditions have significantly diminished across the region during the period. While some drought continues across portions of the northern Marshall Islands, the rest of the Islands are drought free. Meanwhile, drought continues across the Hawaiian Islands with severe drought depicted on Kauai, Ohau, Maui, and the Big Island. *Rainfall* from June through August was quite varied: Honolulu (450%, due to exceptionally wet conditions in June), Lihue (165%), Kahului (38%), and Hilo (82%). Elsewhere, Saipan was above normal at 109% and Guam was below normal (75%). In Kwajalein and Majuro in the RMI, rainfall was below normal, with 70% and 91% of average respectively. In the FSM, rainfall from June through August was distributed as follows: Chuuk (82%), Kosrae (59%), and Pohnpei (90%). Further west, Yap was 85% of normal and Palau was 100%. In American Samoa, rainfall was above normal for the quarter (174%). 5.27" of rain fell in Honolulu on 26 June, setting a new daily and monthly record. Over 20" of rain fell in the month of July across parts of Palau during an active phase of the monsoon.

Tropical Cyclone (TC) activity in the western North Pacific basin was normal with eight named storms. To date, most activity has been north of Saipan and west of all of the Mariana islands. From June-August, the southwest Pacific basin was very quiet and there were neither any named storms nor any documented depressions reported.



Flooded areas of Aunuu in American Samoa in August. Photo courtesy of Radio New Zealand.



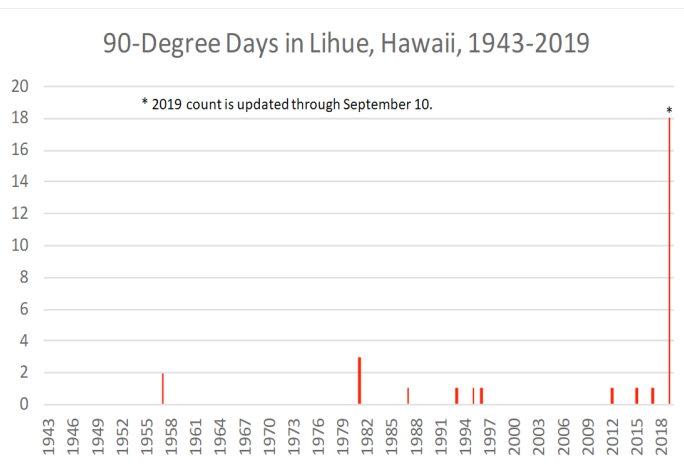
Inundation event in Ikesiil Village, Yap. Photo courtesy of Xavier Erbai.

Facilities and Infrastructure – Honolulu firefighters responded to three stalled vehicles and four water evacuations due to the heavy rain on 26 June. In early July, a wildfire broke out in Maui County, Hawaii, burning over a thousand acres and engulfing tens of homes. Local area shelters were opened and several hundred people sought refuge. The blaze caused power outages, road closures, and air quality issues. In mid August, sea conditions were rough with sand and rocks washed onto parts of local roads. The early July and mid-August, American Samoa experienced periods of strong winds and large swell combined with high tides. Floodwaters covered roads with rocks and debris and covered and Coconut Point in Nu'uuli was especially hard hit. Two boys were swept out to sea by strong surf on the south shore during one of these episodes. The last new moon in August brought King Tides to many coastlines in Palau that lasted a few days creating tidal surges, inundation and coastal erosion.

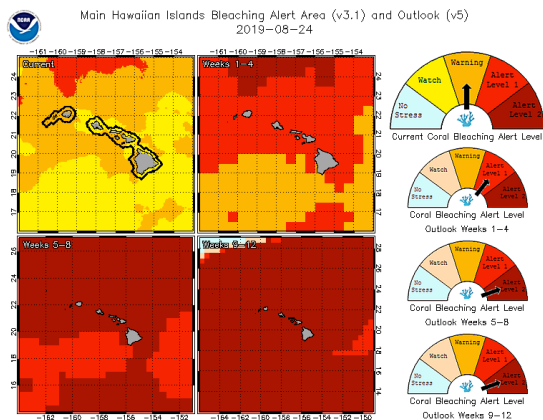
Water Resources – The moderate monsoon surge that occurred from Palau to the Mariana Islands the week of 5-10 August caused considerable coastal and beach erosion in the Mariana Islands, especially on Guam and Saipan. High Surf Warnings for surf 15 feet or greater were issued several days for the Mariana islands. Majuro's reservoir storage climbed to 30.685 million gallons (85 percent of capacity) by September 3.

Public Health– Due to the Pacific-wide outbreak of dengue fever and 200 suspected cases across the RMI (with over 1500 cases recorded in Fiji) all passenger travel to remote outer islands of RMI have been curtailed. The RMI Red Cross received hundreds of mosquito nets for distribution on Ebeye island to curb the spread of dengue fever. The rise in the disease may be linked to the recent increase in rainfall across the region.

Lihue, Kauai has set or tied a daily record high temp for 17 consecutive days thru 9/9. Hawaiian Electric data shows a sharp rise in the percentage of households using air conditioning on Oahu and Hawaii island and in Maui County with double-digit increases in air-conditioner installations across all three counties. The trade winds have been light and ocean temperatures have been exceptionally warm. This has resulted in the hottest summer ever for Hawaii.



Number of 90° F days by year for Lihue, Hawaii. Plot courtesy of Brad Rippey, USDA.



Coral bleaching outlook for the Hawaiian Islands, Sept through Nov 2019. Source: <http://coralreefwatch.noaa.gov>

According to ENSO prediction models, **there is a 65% chance of ENSO neutral conditions through January 2020.**

The SST anomaly outlook indicates **+0.5° to 2.0° C anomalies continuing and spreading across much of the Western Pacific**, including American Samoa. Cold anomalies to **-1.0° C** are projected for the far eastern equatorial Pacific. **NOAA's Coral Reef Watch 4-month bleaching outlook projects high heat stress (up to Alert Level 2) in the central and western Pacific Ocean**, around the Hawaiian archipelago, in September and October. During November and December, the high heat stress is expected to migrate to the southwest, potentially affecting the central and western equatorial Pacific Islands.

Over the next six months, dynamical forecast models continue to suggest rising sea levels in the northwestern Pacific (continued above normal around Majuro and Pohnpei) and steady sea levels in the southwestern Pacific (above normal around Funafuti and Pago Pago; near normal around Suva and Rarotonga). Around Hawaii, a small rise in sea levels are projected during the next three months, however typical ocean eddy activity will continue to cause subseasonal variability.

During the period September through November, rainfall is projected to be near normal in Yap, Palau, most of FSM, northern RMI, Guam, and CNMI. Below normal rainfall is projected for southern RM and far southern FSM. Above normal rainfall is projected for both Hawaii and American Samoa.

Tropical cyclone (TC) activity in the western North Pacific is expected to pick up in late September through November and possibly into December. In the southwest Pacific, the southern hemisphere spring season is climatologically the second quietest part of the entire year with a historical total of only 5 named storms from 1981-2010. There are no indications that the upcoming period will be above the normal climatological average.

NOAA NWS Weather Forecast Office Honolulu:

<http://www.prh.noaa.gov/pr/hnl/>

NOAA NWS Weather Forecast Office Guam:

<http://www.prh.noaa.gov/pr/guam/>

NOAA National Centers for Environmental Information:

<http://www.ncei.noaa.gov/>

NOAA NMFS Pacific Island Fisheries Science Center:

<http://www.pifsc.noaa.gov/>

NOAA OceanWatch - Central Pacific:

<http://oceanwatch.pifsc.noaa.gov/>

NOAA Coral Reef Watch:

<http://coralreefwatch.noaa.gov/>

USGS Pacific Islands Water Science Center: <http://hi.water.usgs.gov/>

USGS Science Center – Pacific Coastal and Marine Science Center:

<http://walrus.wr.usgs.gov/>

University of Hawaii - Joint Institute of Marine and Atmospheric Research:

<http://www.soest.hawaii.edu/jimar/>

University of Guam - Water and Environmental Research Institute:

<http://www.weriguam.org/>

University of Hawaii Sea Level Center:

<https://uhslc.soest.hawaii.edu/>

University of Hawaii Asia Pacific Data Research Center (APDR) -

<http://apdr.soest.hawaii.edu/index.php>