El Niño and Long-Lead Fire Weather Prediction for Hawaii and US-affiliated Pacific Islands

PFX Fact Sheet 2015_1

Clay Trauernicht

El Niño and Climate Variability

The current El Niño event (2015-2016) is projected to be one of the strongest in recorded history. Also known as the El Niño-Southern Oscillation, this climate pattern occurs every 2-7 years and results in unusually warm ocean temperatures in the equatorial Pacific Ocean that alters weather and climate patterns around the world. For the Pacific Island region, El Niño events are typically associated with an increase in tropical storm activity and a shift in convective patterns that changes rainfall delivery to the islands.

El Niño and Wildfire in the Pacific

The El Niño rainfall patterns have important consequences for wildfire on Pacific Islands:

- Wetter summer/fall increases fuel loads, particularly in dry areas
- Drier winters increase the potential for wildfire occurrence and spread

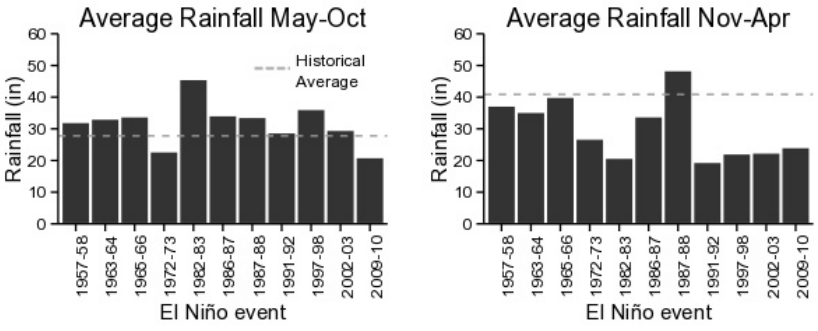

Figure 1. In Hawaii, statewide rainfall tends to be slightly above average for summer months and well below average for winter months during moderate to strong El Niño events.

Wildfire records from Hawaii and Guam demonstrate an increase in annual area burned during El Niño events[1,2]. These patterns suggest we can anticipate late onset drought during the winter months following El Niño development, and the subsequent need to ramp up preparedness for higher fire danger throughout the winter.

Figure 2. Savanna fires in Micronesia, like the one pictured here in Yap, often self-extinguish at the forest edge. However, reports indicate that severe drought during El Niño events increases fire intensity and the potential for forest loss.

A Closer Look

In Hawaii, large wildfires are most prevalent in the drier, leeward parts of the state and more likely to occur during summer months[3]. During El Niño, however, summers can have above average rainfall that extends the growing season and increases fuel loads, especially in drier areas where plant growth is usually limited by lack of rainfall. Extended drought through the winter months then causes vegetation to dry out, or 'cure', which can dramatically increase wildfire risk, especially for windward parts of the state that are typically wet year round. For example, following the 1997-1998 El Niño, the strongest on record to date, over 37,000 acres burned in Hawaii, which included a 13,000 acre fire on Molokai and several large fires in the Puna district, one of the wetter areas of Hawaii Island.

In the Western Pacific, strong El Niños result in drought and intensified annual winter dry seasons. Human-caused fires on Guam, Palau, Yap, and the Northern Marianas often occur during the dry season from January to March and are typically restricted to open savanna vegetation. Lack of moisture and increased fire intensity under El Niño conditions can result in fires spreading from savannas into adjacent forest areas. Severe drought during the strong 1997-1998 El Niño resulted in nearly 10% of Guam's total land area (>13,000 acres) burning, which is the island's worst fire year on record. Similarly, dramatic increases in wildfire occurrence during the 1997-1998 El Niño were documented in Palau, Yap, and the Northern Marianas, as well as on Pohnpei, which is one of the wettest islands in Micronesia[4].

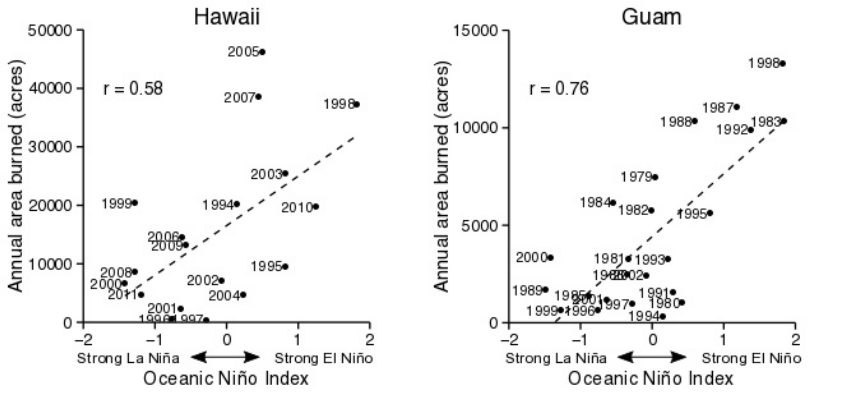

Figure 3. Annual area burned increases on Guam and Hawaii with increasing intensity of El Niño events. Larger Oceanic Niño Index values indicate stronger El Niños and each data point is labeled with its corresponding year (Pearson's correlation coefficients (r) shown).

An Opportunity for Preparedness

The correlation between El Niño events and increases in annual area burned, as demonstrated for both Hawaii and Guam[1,2], provides advanced warning to ramp up fire management efforts. Preparedness can be increased by developing evacuation plans, mapping valued resources on large landholdings, improving the availability of water and access for fire vehicles, maintaining fire breaks and, importantly, communicating in advance with county, state and federal fire response agencies. Fire risk on private property can be directly reduced using fire breaks to disrupt continuous cover of fine, grassy fuels, trimming low-lying tree branches and shrubs to prevent fire from spreading into tree canopies, and clearing brush piles in and around structures. Fire risk to the home can be further reduced by clearing all vegetation within a 50-foot (15 m) radius of the structure, removing leaves and debris from rooftops and gutters, clearing flammable materials next to and below structures, and covering eaves and vents with 1/8" mesh screening. More information can be found at PacificFireExchange.org.

Additional Resources

Pacific Islands El Niño facts: http://www.ioos.noaa.gov/regions/pacioos_elnino.pdf

National Weather Service Pacific Region Forecasts: http://www.prh.noaa.gov/

National Weather Service Hawaii Outlook: http://www.prh.noaa.gov/hnl/

Hawaii Drought Monitor: http://state.hi.us/dlnr/drought/

Author info:

Clay Trauernicht is the Wildland Fire Specialist at the College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa.

References

1. Chu P-S, Yan W, Fujioka F. 2002. Fire-climate relationships and long-lead seasonal wildfire prediction for Hawaii. International Journal of Wildland Fire 11:25-31.

2. Minton D. 2006. Fire, erosion, and sedimentation in the Asan-Piti watershed and War in the Pacific NHP, Guam. Technical Report 150, Pacific Cooperative Studies Unit, University of Hawaii at Manoa, Honolulu, HI

3. Trauernicht C, Pickett E, Giardina C, Litton C, Cordell S, Beavers A. 2015. The contemporary scale and context of wildfire in Hawaii. Pacific Science 69: 427-444.

4. Pacific Island Forest Resource Assessment and Strategy Reports. 2010. Available at http://wflccenter.org/about-us/member-directory/island-forestry/pacific-island-committee/