



Climate

Nine Pacific Island National Park Units *2010 data*

Background

Climate and weather influence every aspect of ecosystem health. For example, warmer ocean temperatures affect coral growth, and therefore, whole reef ecosystems. Climate/weather variations affect how invasive species spread, and influence the composition of terrestrial plant communities. Precipitation directly impacts groundwater dynamics, freshwater animals, and water quality. Insects are affected by changes in temperature, precipitation, and seasons which, in turn, affect bird communities. In short, climate affects everything. The primary goal of climate monitoring is to determine the status and trends of weather patterns and long-term climate regimes so managers can make informed decisions about resources.

Climate is generally mild on equatorial Pacific islands. Weather patterns in the national parks are largely controlled by island topography and events like El Niño/La Niña Southern Oscillation. Two seasons prevail in Hawaii; the April through October dry season, and the November through March wet season. The wet season in American Samoa is from October through April and from July through November in the Marianas (Saipan and Guam).

In 2010, data was collected from 18 weather stations in or near parks across the Pacific Island Network. Many of the national park units in the Pacific islands contain multiple and various types of weather stations (COOP and/or RAWS stations). These stations take different measurements but are becoming increasingly standardized as the National Park Service installs new and replaces older models. Although weather measurements are not consistent among all parks, data collection and integration is improving each year. Measured variables typically include temperature, precipitation, wind speed and direction, humidity, solar radiation, barometric pressure, fuel temperature, and fuel moisture.

Summary Points

- The 2010 October through April wet season in Hawaii was the driest in 30 years. The northern area of Kohala on the Big Island was classified in the exceptional drought category; the first time any area in the state has been classified as such.
- Most parks in the Pacific Island Network were substantially drier and somewhat cooler than normal with the exception of the National Park of American Samoa. American Memorial Park and War in the Pacific National Historical Park were also drier, but slightly warmer than normal.
- Rainfall and temperature data for the islands in the PACN showed strong El Niño conditions until April 2010 with a transition to La Niña conditions as spring progressed.
- In Hawaii, late wet season rain fell at nearly normal monthly rates and abated drought conditions in most areas. A record single-day rainfall total of 5.41 inches fell at the Honolulu International Airport on Sunday, December 19th, breaking the old record of 5.28 inches set in 1955. This one day event pushed the annual total much closer to normal conditions.
- The number of tropical cyclones in the North Pacific Basin during 2010 was far fewer than has ever been recorded, making 2010 a very remarkable year.

Results by National Park

There can be substantial differences between weather variables among stations in any given park. Temperatures, winds, and precipitation measured on top of a mountain, for example, will vary considerably from measurements taken at sea level. Generalized and condensed weather data on a park by park basis is presented in the table below.

National Park	Precipitation	Temperature	Notes
American Memorial Park	69%	Less than 1°F warmer	
Haleakalā National Park	48% - 67%	Less than 1°F cooler	A March tropical depression brought rain, but not enough to reverse the year's drought trend
Hawai'i Volcanoes National Park	17% - 46%	3° - 12°F cooler*	The 17% precipitation and 12°F cooler temperature data were recorded at the Mauna Loa Observatory station
Kalaupapa National Historical Park	71%	Less than 1°F cooler	Strong winds from the N and NE dominated in Jan. - Feb., and strong E winds prevailed the rest of the year
Kaloko-Honokōhau National Historical Park	84%	Less than 1°F cooler	Appears to be the park in Hawaii with the closest to normal conditions
Pu'uhonua o Hōnaunau National Historical Park	62%	N/A	Temperature data will be collected at the park beginning in 2012
Pu'ukoholā Heiau National Historic Site	56%	Less than 1°F cooler	Very dry all year with the exception of a slighter wetter Nov. and Dec.
National Park of American Samoa	109%	1°F - 2°F warmer	The only park to record wetter and up to 2°F warmer conditions
War in the Pacific National Historical Park	30% - 85%	1°F warmer	The Agat weather station received only 30% of normal rainfall with no rain from Aug. - Sept.

This table approximates the average temperature and precipitation for all of the weather stations in each park. These figures compare 2010 data with long-term "normal" conditions derived from historical data. Therefore, "69%" precipitation and "Less than 1°F warmer" temperature were the 2010 weather conditions as compared to the long-term average conditions for that park unit.

*The 3°F cooler average temperature was taken from three lower elevation stations, whereas the 12°F cooler average was recorded at the summit of Mauna Loa.

The Weather/Climate Data Summary 2010 is a snapshot in time of weather data. After decades of similar weather data are collected and compared to weather data from both NPS and partner agencies on the islands, a long-term trend in climate pattern changes can be established for the national park units. Understanding how climate is changing helps National Park Service managers to adapt strategies for managing natural and cultural resources of all of the parks in the Pacific Island Network.

For the full report on weather patterns and data from individual weather stations, download: [Annual Weather/Climate Data Summary 2010](#)