

GOES-PRWEB-ESTIMATED SOIL MOISTURE AND CROP STRESS-RELATED PARAMETERS DURING THE 2015 PUERTO RICO DROUGHT

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During 2015, Puerto Rico experienced a severe drought, thought to be associated with a strong El Niño event. The greatest impacts from the drought occurred in the eastern half of the island. Many of the island's water supply reservoirs dropped to levels not seen since the devastating drought of 1994. In response to the 2015 drought, the Government established the Puerto Rico Scientific Drought Committee (Comité Científico de Sequía de Puerto Rico), whose task is to provide short and long-term recommendations to the Governor of Puerto Rico and his Secretaries, with the goal of improving the island's response to the extreme drought events. Participants on the Committee included the National Weather Service, U.S. Geological Survey, U.S. Forest Service, USDA Natural Resource Conservation Service, the University of Puerto Rico, the Puerto Rico (PR) Department of Natural Resources and the Environment, PR Department of Agriculture, PR Department of Emergency Management, Puerto Rico Electric Authority and Puerto Rico Aqueducts and Sewer Authority.

From May through December 2015, the Committee met weekly to discuss the progress of the drought, the various ways it was impacting the island, and to develop recommendations for managing the island's water resources. Data evaluated included rainfall amounts, regional weather forecasts, drought classifications by the U.S. Drought Monitor, water supply lake levels, groundwater levels, stream flows, stream and lake biological health, forest fires, agricultural damage, etc. To assist in the evaluation of the hydrologic and agricultural impacts of the drought, soil moisture and crop-stress-related parameters, derived from the daily operational water and energy balance model GOES-PRWEB, were evaluated by the Committee. Specific output considered included volumetric soil moisture, soil moisture saturation, crop stress factor, ratio of the actual to potential evapotranspiration, Bowen ratio and the agricultural rainfall deficit.

The 1-km spatial resolution GOES-PRWEB results indicated that soils throughout much of the eastern half of the island were close to the soils' wilting point. In these same areas, the Bowen ratio indicated that most of the dissipation of net radiation by the land/vegetation surface was by sensible heat transfer and that latent heat transfer was negligible. Significant crop stress was occurring based on values of the crop stress factor less than 0.2 over large areas of the eastern side of the island. Values of the crop stress factor less than 1 are indicative of stress conditions. The agricultural rainfall deficit, defined as the weekly rainfall minus the weekly reference evapotranspiration, revealed deficits on the order of 50 mm, week after week throughout late spring and early summer 2015.

Of practical interest is the fact that the northwest part of the island received more or less normal rainfall amounts in 2015. A preliminary evaluation of rainfall in this area, considering 17 drought years, revealed that the average rainfall during those years was only slightly less than non-drought years, suggesting that the northwest part of the island may be a potential source of water for the east when severe drought is experienced in the eastern side of the island. In this presentation, examples of the soil and water-related parameters from GOES-PRWEB used by the Scientific Drought Committee are presented.