

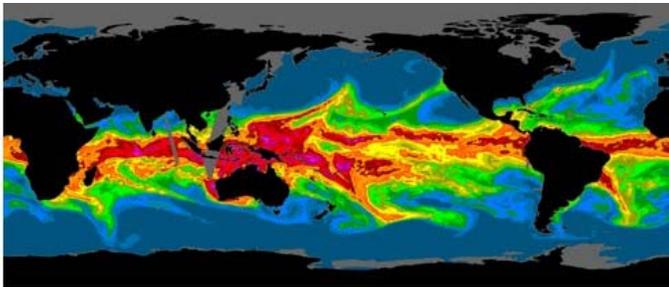
AQPI

San Francisco Bay Area

Advanced Quantitative Precipitation Information System

The Problem: Inadequate Precipitation Forecasting Information

Water resources, flood protection, emergency response and other managers require accurate and timely quantitative precipitation information in order to make decisions regarding public safety, infrastructure operations, and resource allocations. Accurate information is lacking for mapping what rainfall has occurred and what rainfall amounts will be in the near future. This is particularly true with respect to atmospheric rivers (ARs) like the Pineapple Express that originates in the tropics, sometimes near the Hawaiian Islands.



In addition, forecasting sea level rise and more extreme weather events require better modeling of storm surge and river and stream levels if coastal and Bay flood inundation forecasts are to be accurate.

Standard weather radars operated by the National Weather Service (NWS) are located on or blocked by mountainous terrain and can overshoot precipitation falling in the San Francisco Bay region. Also, current numerical forecast models have neither the spatial or temporal resolution to capture the details in rainfall required to drive hydrologic, hydraulic, and hydrodynamic models needed by decision makers.

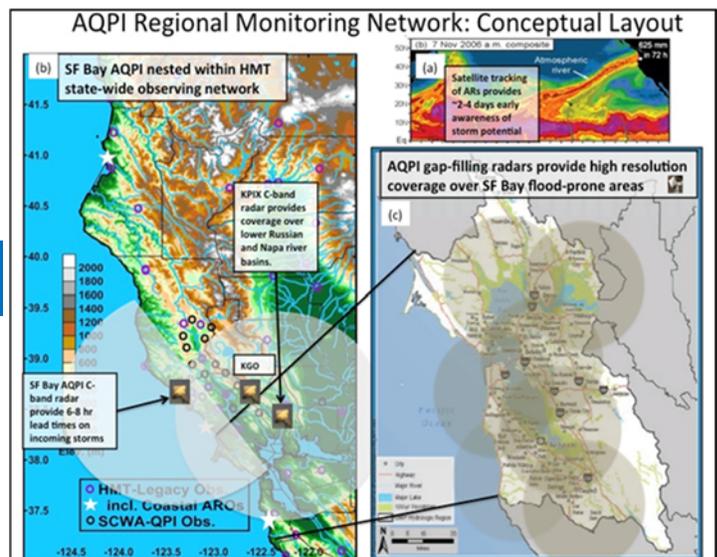
The Solution: The AQPI System

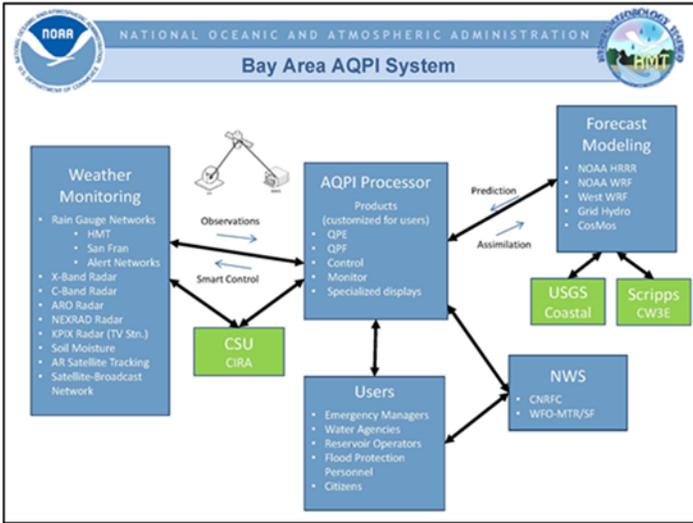
The Advanced Quantitative Precipitation Information (AQPI) System is a regional project activity of the Bay Area Integrated Regional Water Management Plan (BAIRWMP). The AQPI System consists of improved weather radar, atmospheric river observatories and other observing systems and a suite of numerical forecast

modeling systems that will provide much more accurate and timely information that will be of greatly more significant value to a variety of decision makers, allowing them to mitigate flood risks; better manage reservoirs to secure and preserve water supplies; minimize water quality impacts to the Bay from combined sewer overflows; anticipate air, sea and land transportation challenges; and have improved lead-time on coastal and Bay inundation from severe storms, especially high-moisture-laden ARs.

AQPI observing assets will include a coastal Doppler C-band weather radar along the Sonoma County coast which will point off shore to improve tracking of incoming storms (1-6 hours lead time) and four gap-filling X-band radar units (one-hour lead time) strategically located to provide high-resolution coverage over populated and flood prone urban areas throughout the San Francisco Bay region. The AQPI System also will improve runoff predictions. This will be valuable to wastewater and flood protection managers, and will provide better inputs to urban hydrologic and hydraulic models.

To address climate change and sea level rise with possibly more extreme storms the System will implement the Coastal Storm Modeling System (CoSMoS). This system will simultaneously forecast flooding along the coast and the San Francisco Bay margin caused by tributary discharge and elevated Bay water levels from the increased run-off, along with waves, tides and storm surge associated with approaching storms.





A Phased Approach to the AQPI System

The AQPI System to be partially funded with \$19 million under the BAIRWMP represents the first three phases of a four-phase project that leverages more than a decade of NOAA weather and hydrology research, prototyping and implementing a statewide state-of-the-art network of observations to improve weather and climate monitoring. This value of NOAA work to date and funds already or to be expended by San Francisco Public Utilities Commission and Sonoma County Water total more than \$40 million.

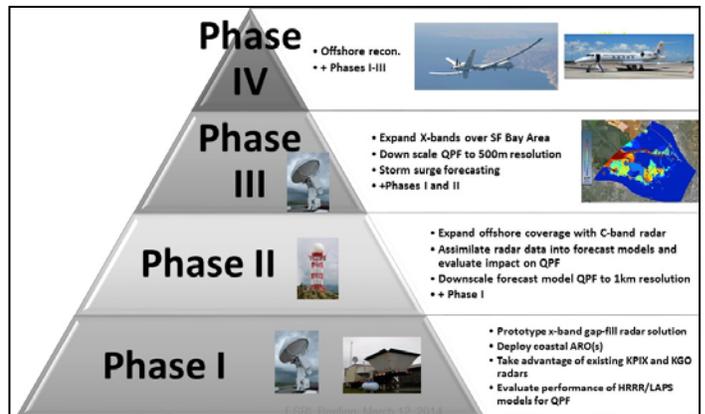
Prop 1 or other funding will be sought for Phase IV that will include offshore observations to reduce errors in precipitation forecasting and significantly increase the lead time.

Anticipated AQPI Benefits

The San Francisco regional AQPI System can be expected to provide benefits exceeding costs by a ratio of at least 4:1. Among the benefits to accrue are the following:

- Avoided flood damage costs from earlier and more precise warnings.
- Forecast-informed reservoir operations (FIRO) to maximize reservoir capture for water supply and fisheries flows.
- Minimization of water quality impacts from combined wastewater and sewer systems.
- Enhancement of public safety for the various transportation modes (pedestrian, highways, rail, marine and aviation).

These benefits will become increasingly important as costs associated with extreme weather events continue to escalate. In 2011 and 2012 alone, weather related disasters across the U.S. caused 1,107 fatalities and \$188 billion in economic damages. Between 1954 and 2013, California received 79 presidential disaster declarations of which more than half (46) were related to flooding.



For More Information

For more information contact any of the following:

Jennifer Krebs, SFEP, 510-622-2315

Carl Morrison, BAFPA and SCWA, 760-724-9580

Rob Cifelli, NOAA, 303-497-7369

Marty Ralph, CW3E, 858-822-1809

A collage of logos for various organizations involved in the AQPI system, including NOAA, HMT, National Weather Service, San Francisco Water Power Sewer, Sonoma County Water Agency, UC San Diego, Colorado State University, USGS, and Flood Protection Agencies Association.