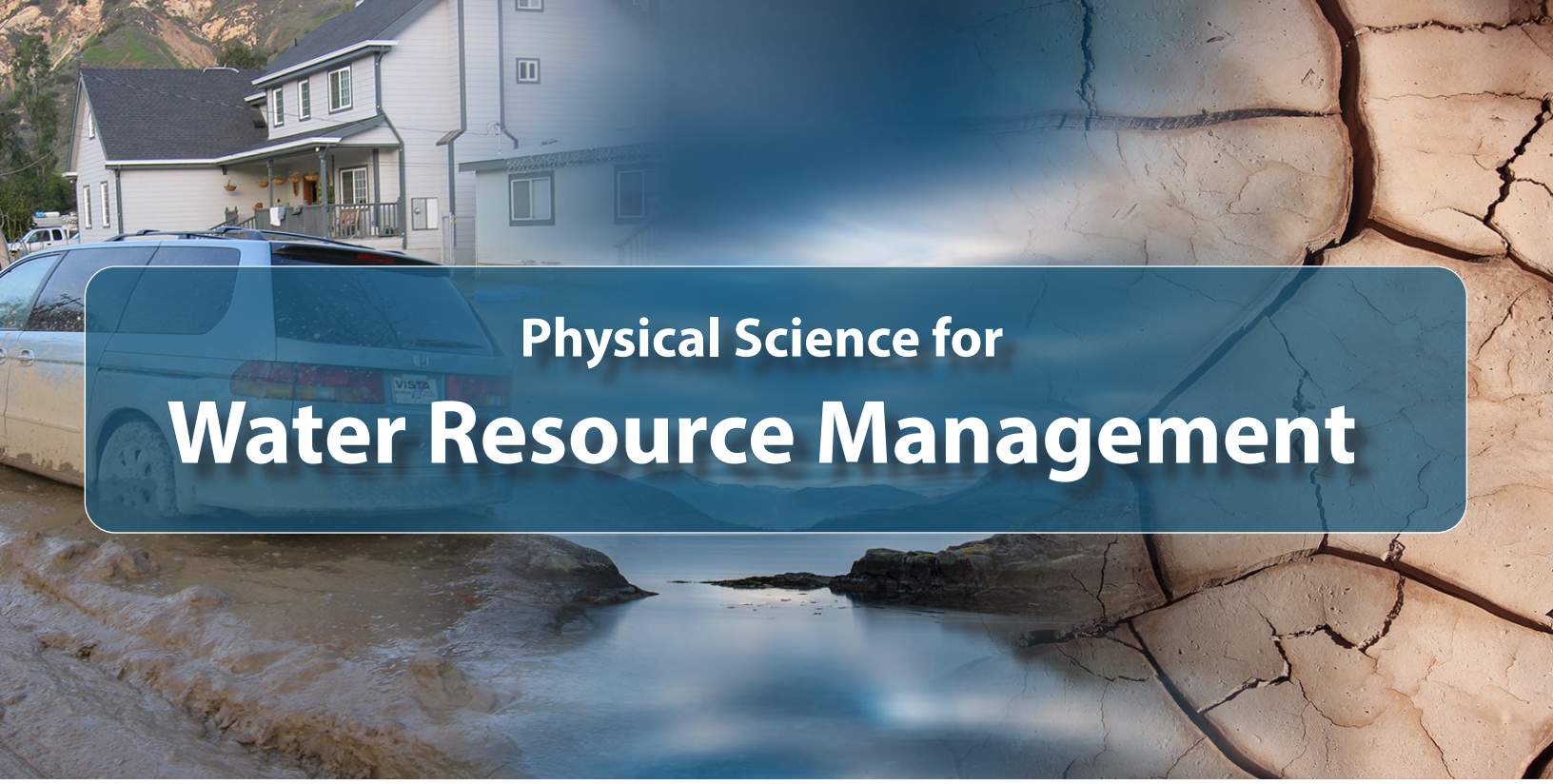

Physical Science for Water Resource Management

The stress of too little and too much water can be destabilizing at local, regional and national scales. Accurate water monitoring and predictions are critical for a variety of societal needs including agriculture, water supply, energy, water security, and public safety. Stakeholders need information ranging from current conditions to hours to seasons and beyond. NOAA's new National Water Model (NWM) provides an opportunity to improve water prediction at unprecedented time and space scales. However, significant challenges remain in terms of characterizing uncertainty in the hydrologic forcings, coupling between atmosphere-terrestrial-coastal systems, as well as how to communicate information to stakeholders to inform risk management.

Legislative Drivers

NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM ACT OF 2006 and REAUTHORIZATION ACTS of 2014 and 2019 establish and maintain a National Integrated Drought Information System within NOAA to improve drought monitoring, forecasting, and early warning capabilities and to determine the contribution of weather events to reducing the severity or ending drought conditions.

THE SECURE WATER ACT (SUBTITLE F OF PUBLIC LAW 111–11, MARCH 30, 2009) identified NOAA as a source for the credible science required by other agencies, state, and local decision makers, and the private sector, and to provide "the best available scientific information with respect to presently observed and projected future impacts of global climate change on water resources."

Physical Sciences Laboratory Capabilities

- Understanding, predicting, and assessing severity of water related extreme events such as droughts and floods (including linkages between them), and coastal inundation
- Use of observations to improve physical process understanding and guide model development for improved predictions
- Analysis of atmosphere, cryosphere, land surface, and air-sea interface processes
- Assess, improve, and then assimilate the data used to drive the National Water Model
- Provision of scientific information necessary for cost-effective decision making

Research Partnerships

Forecast-Informed Reservoir Operations (FIRO)
Collaborative research to take advantage of advances in the monitoring, understanding, and forecasting of extreme precipitation to better optimize reservoir operations to manage both flood and water supply risks. PSL is prototyping and assessing precipitation forecast tools and post-processing techniques that can eventually lead to improvements in operational forecasts.

Advanced Quantitative Precipitation Information (AQPI)
Collaborative research to improve monitoring and forecasts of precipitation, streamflow, and coastal flooding in the San Francisco

Bay Area. PSL is using state-of-the-art radars and surface monitoring networks to improve quantitative rainfall estimates, assessing the performance of the National Water Model, and working with local water agencies to deliver improved information for risk-based decision making.

National Integrated Drought Information System (NIDIS)

Collaborative research to examine the causes, predictability, and historical behavior of onset, duration, intensity and demise of drought in the U.S. and advance understanding on what aspects of drought are predictable. PSL's scientific advances provide the foundational knowledge needed to support the NIDIS interagency mandate to develop a coordinated national drought early warning information system.

NOAA NWS National Water Center (NWC)

Collaborative research to enhance NOAA's water forecast capabilities for floods and droughts, improve preparedness for water-related disasters, and inform high-value water decisions at the local, state, and national levels. PSL is working with the NWC to transition research advances in monitoring, understanding and modeling of hydrologic processes into operations.

Famine Early Warning Systems Network (FEWSNET)

Collaborative research to produce food security outlooks by incorporating regionally-specific assumptions of forecast rainfall, temperature, harvests, labor, livestock and government assistance. PSL applies its expertise in weather, water, and climate to support FEWSNET efforts to mitigate food shortages and avert unrest in geopolitical unstable and at risk regions of the world.

What's Next for PSL

During the next five to ten years, PSL will continue to support NOAA by:

» Explaining the underlying causes of recent weather, water, and climate extremes and assessing their predictability.

» Advancing the use of hydrometeorology observations, including remotely-sensed data for soil moisture and snow, and modeling in watersheds across the United States to deliver improved scientific information for managing water resources, for protecting lives and property, and informing preparedness.

» Improving forecasts and early warning of hydrologic extremes and their impacts, such as those associated with droughts and floods, and evaluating model forecast performance.

For more information, contact:

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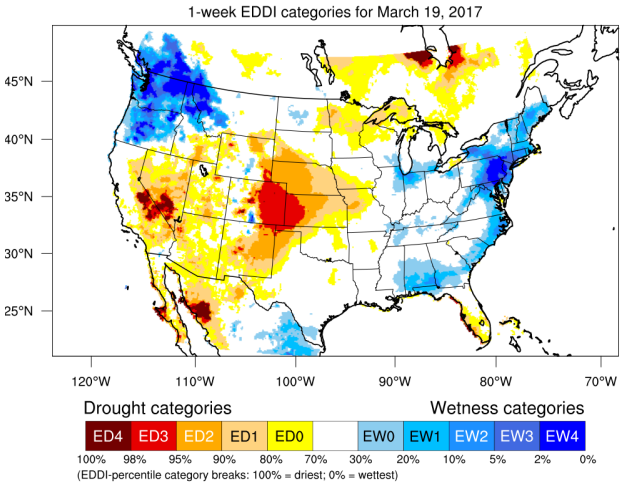

The Evaporative Demand Drought Index (EDDI) is an online guidance tool developed at PSL that provides early warning of agricultural and hydrologic drought and fire-weather risk by using near-real-time information about the "thirst of the atmosphere."

PSL researchers are evaluating the performance of the NWM for drought monitoring and nowcasting in support of the National Integrated Drought Information System (NIDIS) and the U. S. Drought Monitor.

PSL is evaluating the impact of experimental ensemble high resolution precipitation forecasts to better characterize uncertainty in streamflow predictions and improve flash flood forecasts.

PSL is conducting soil moisture research to evaluate the skill of the NWM's representation of land–surface processes to guide improvements in model forecasts of extreme events.