The NHWC Transmission

December 2015

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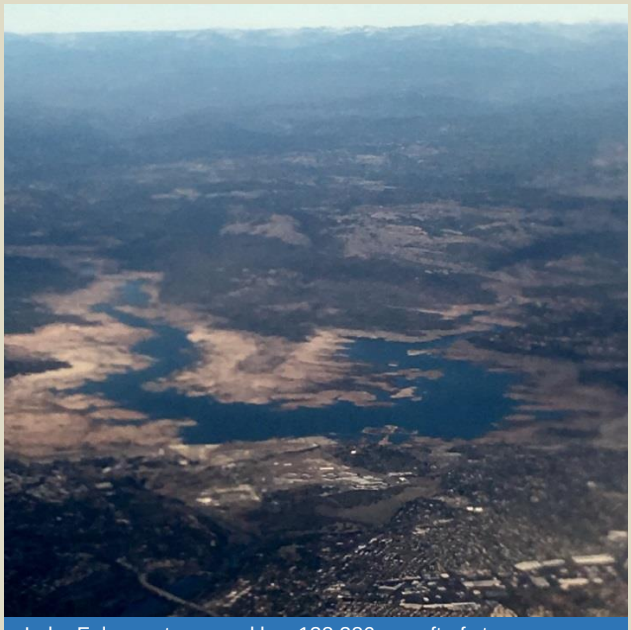
NHWC 2015-17 Officers and Directors

Challenges of Messaging El Niño Impacts during California's Drought

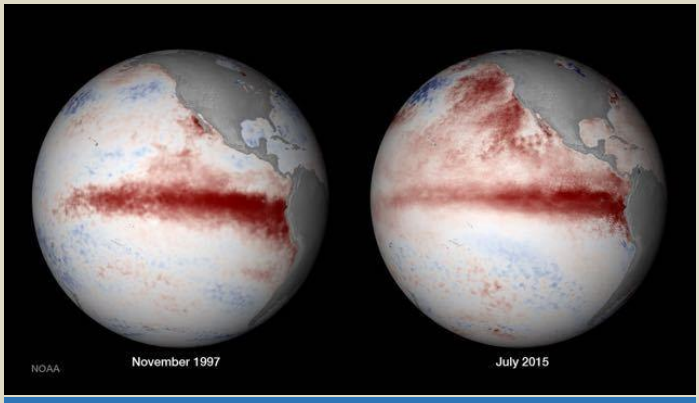
Alan Haynes and **Michelle Mead,** National Weather Service
Jeanine Jones and **Michael Anderson,** California Department of Water Resources

In the winter of 1997/1998, a very strong El Niño was forecast, prompting the National Oceanic and Atmospheric Administration's (NOAA) Climate Prediction Center to confidently call for above normal precipitation in Southern California. This forecast had a lead time measured in months and was made in an era when weather forecasts were only reliable out to seven days. The El Niño forecast ended up being a huge success as flood control agencies in Southern California were able to take preparatory actions that helped mitigate potential flood damages that winter.

This winter, a very strong El Niño is again in place, the first of this magnitude since the winter of 1997/1998. Once again, confidence is high in wetter than normal winter seasonal conditions for Southern California. Given the ongoing drought in California, the increased chances of wet conditions caught the media's attention. While this increased attention is good for flood preparedness, it has presented some challenges for agencies charged with hydrologic prediction, such as the California Department of Water Resources (DWR) and the National Weather Service (NWS). The potential for a strong El Niño this winter was detected in the late spring of 2015, with a great deal of uncertainty regarding its magnitude as well as the timing and duration of its peak. Monthly updates over the summer of 2015 helped reduce the uncertainty, but as the message got out, expectations grew for a wet winter across all of California, while at the same time the severity of the drought finally registered with a majority of Californians who responded to calls for significant water conservation measures. Furthermore, a large area of anomalously warm water remained over much of the Northern Pacific into late 2015 as a result of the persistent high pressure system that helped create California's multi-year drought. This warm water came to be referred to as "The Blob" and was the source of much erroneous speculation in the blogosphere around it eclipsing the effects of the "Godzilla" El Niño.



Lake Folsom at a record low 138,386 acre-ft of storage on Nov. 18th 2015



Thermographic illustration shows the massive blob of warm water off the West Coast that didn't exist during the last major El Niño.

The DWR and NWS were challenged by assertions that El Niño was going to both bring significant drought relief and an elevated flood threat, while "The Blob" created confusing background noise. The public seemed to be hearing two primary points around El Niño that presented messaging challenges. The first was that El Niño was going to bring wet conditions everywhere in California with a high degree of certainty. The second was that Californians need to be prepared for flooding due to El Niño. Throughout the summer there was a great deal of uncertainty regarding wet conditions for California, especially for the northern half of California, where the El Niño signal is much weaker. This has been a subtlety that was difficult to convey, given the excitement generated around the potential for El Niño to relieve the drought. This message was further complicated by the fact that wet conditions in Southern California don't easily translate into drought relief, given that much of California's water is stored in the climatologically much wetter north. The high year to year variability in precipitation statewide, regardless of the ENSO phase, means that Californians need to be prepared for flooding every winter. While it may be beneficial for the public to take preparatory actions for flooding in response to the expected strong El Niño, it isn't desirable to have them be complacent during future non-El Niño winters, especially in Northern California.

The situation around messaging prompted both the DWR and the NWS to work closely in coordinating their communication around the developing El Niño conditions. It also resulted in both agencies frequently speaking to the media and public agencies regarding the winter outlook and taking to social media to help bring the message directly to the public. These efforts are expected to continue this winter, as El Niño appears to be shaping up to be at least as strong as the strongest events (1982/1983 and 1997/1998) measured, with peak impacts expected to be realized in mid to late winter. The DWR and NWS will continue to coordinate their efforts and help everyone understand drought and water management, along with the proper interpretation of how the ENSO cycle plays into expected seasonal precipitation patterns. A good understanding of these issues is helpful when the time comes to take action as the DWR and National Weather Service will always be there to warn people when flooding is likely or imminent, usually starting about one week ahead of an event.

Warning the Public; What Really Matters?

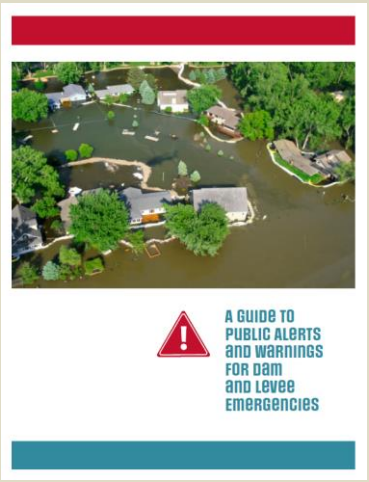
William Lehman, US Army Corps of Engineers
Hydrologic Engineering Center

The objective of alerting the public of impending disaster is to motivate the largest audience possible to take action to protect themselves. Doing this effectively requires spreading the right message as quickly as possible. Understanding how messages are received and what motivates people to follow guidance in those messages is critical to ensuring the public take the proper personal protective actions. To that end, we engaged with well-respected social scientists in the areas of warning and evacuation to better understand how flood warnings spread through a community and what causes an individual to delay their decision to take a protective action based on those warnings. This understanding will not only allow us to better assess the existing rate of the community taking the proper actions, but also provide us with important insights regarding implementing or recommending efficient and effective measures to increase participation, and speed the rate of the participation relative to warning issuance.

Dr. Dennis Mileti and Dr. John Sorenson, both renowned social scientists in the areas of emergency warning and evacuation, wrote three white papers that cover the areas of warning issuance delay, warning diffusion, and protective

action initiation delay. These papers, which are a culmination of existing social science research on the topic, discuss the primary factors that influence each aspect, and also provide guidance on how to develop inputs to our life loss modeling products. In addition, they developed a facilitator guide that describes how to interview local emergency managers and gain an understanding of the existing evacuation potential in their area in the event of a major flood event.

Finally, and perhaps most importantly, they developed a document titled "A Guide to Public Alerts & Warnings for Dam and Levee Emergencies". The guidebook's purpose is to assist those involved with emergency management in issuing more timely and effective public alert and warning messages for floods caused by dam breaches, controlled dam releases, and levee breaches or overtopping. It is based on findings from decades of research on disaster warnings and presents best practices derived from these findings. Finally, while the guidebook is targeted toward dam and levee safety emergencies, it can be used to prepare a plan in such a way that allows successful implementation of emergency message communication for a wide range of emergency events.



Visualize Flood Risk with FloodSmart's Flood Risk Scenarios Tool

FloodSmart

The consequences of a flood can be devastating to families, businesses, finances, and the overall health of a community. It is something we hope that people will never have to live through or recover from. But because we know that floods are the most common natural disaster in the United States—in fact, all 50 states have experienced flooding in the last 5 years—it is a safe bet that most people and communities are at risk of flooding in the near future. Using the free Flood Risk Scenarios Tool available on FloodSmart.gov demonstrates that anywhere it can rain, it can flood.

This tool demonstrates the different risk scenarios in which a flood can occur, including:

- Snowmelt is a common cause of flooding during the winter and early spring months. During these times, large amounts of excess runoff cannot be absorbed into the ground. The water accumulates into lakes, streams, and rivers, causing excess water to spill over their banks.
- Flash floods are the most common severe weather emergency. A flash flood is caused by intense rainfall from one or more downpours, and can also be caused by the failure of a man-made structure.
- Construction and new development can change the natural drainage patterns in areas around buildings, parking lots, and roads, meaning less land is available to absorb excess water.
- Dams and levees also pose a flood risk. While these structures assist in the prevention of flooding, there are instances when it can still occur. Dams can become jammed with debris or can fail with the build-up of water pressure—or they can weaken over time and crack or collapse altogether. Levees can be overtopped or breeched.
- Tropical storms, hurricanes, and Nor'easters can bring several inches of precipitation in just hours. These heavy rains can lead to severe flooding by oversaturating the ground, overfilling storm drains, or causing rivers to spill over their banks or levees.

All of these examples are demonstrated in the Flood Risk Scenarios Tool and can help residents understand the many ways they may be at risk.

Since floods can happen anywhere that it can rain, it's important that everyone is financially protected from the dangers of floodwaters. Flood insurance is available to residents and business owners in both high- and moderate- to low-risk areas. And because most policies take up to 30 days to go into effect, the time to act is now.

For those interested in using this tool, it is easily embedded into websites. In addition to other tools and resources on FloodSmart.gov, this tool can assist in educating communities about flood risks and educating residents about the need to purchase flood insurance that will help reduce the financial impact of flooding.

The Flood Risk Scenarios Tool is available for download through FloodSmart's Community Resource page.

FloodSmart is the marketing and education campaign of the National Flood Insurance Program.

Internet Data Used For Automated Flasher Control

Rob Niedenzu, Water and Earth Technologies
Barb Utley, Campbell Scientific
Sam Utley, Campbell Scientific

On behalf of Laimer County, automated flasher control systems were installed and are operated by Water and Earth Technologies (WET) in two popular recreation areas near Fort Collins, Colorado for the purpose of alerting users to the possibility of flash flooding. The Redstone and Rist Canyons were outfitted with the warning systems because of their vulnerability to flooding conditions. Both canyons were impacted by the High Park fire in June of 2012, which burned over 87,284 acres—the second largest fire in Colorado history. Post-fire landscapes, such as these, are very vulnerable to flooding, with the water flow increasing to 5 to 10 times the pre-fire levels for any given rainfall.

Equipment

Each flasher consists of two lights and an informational sign mounted to a break away traffic pole. The lights are controlled using a Campbell Scientific CR1000 datalogger, which is in turn connected to the Internet via a cellular gateway. The entire system is battery powered with solar recharge.

Using Internet-Driven Data

While alerting people to existing flash flood conditions can be critical to their safety, using flood forecasts to communicate the potential of future danger can also be a vital precaution before entering remote areas. For this reason, WET and Larimer County wanted to use autonomous flasher stations that were not based on current, localized measurements. Rather, they wanted their stations to operate based on credible data from wide-area forecasting to determine the potential for near-future, severe weather conditions.

The warning systems in Redstone and Rist Canyons operate based on flash flood warnings issued by the National Weather Service (NWS). Because there is cell reception at the stations, the CR1000 dataloggers use cellular modems to access the Internet, download the NWS flash flood warnings, and parse the reports for keywords, such as the county name. Specifically, the datalogger downloads the Atom Syndication Formatted XML (ATOM) feed which contains information from the National Weather Service Common Alerting Protocol (CAP). With this information, the dataloggers can activate the flashing lights in advance of a storm, thus providing ample warning to people who are currently using, or who may want to use, the canyons.

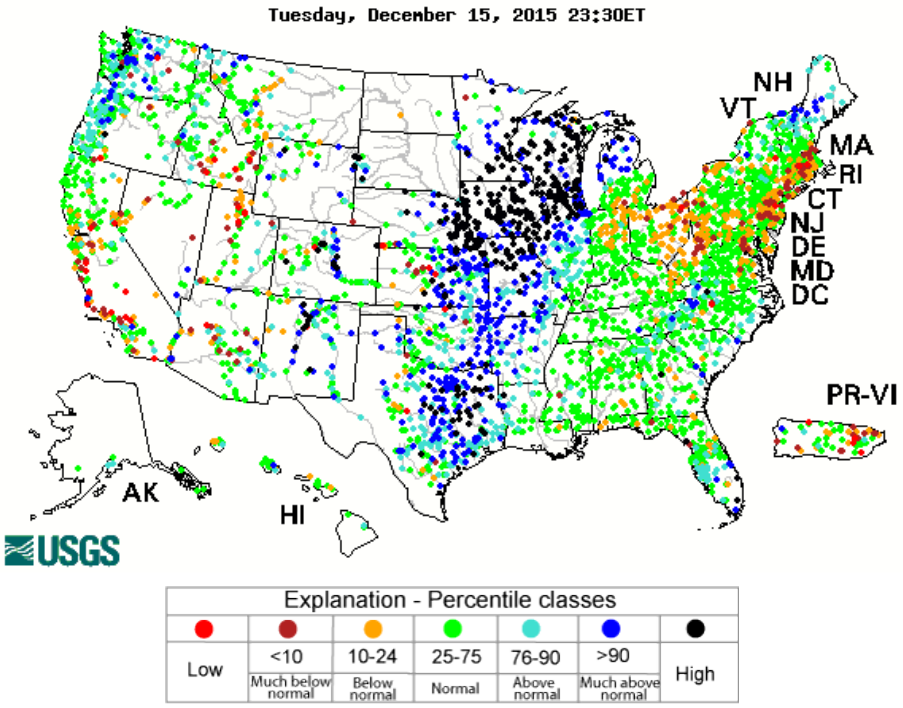
Additional Methods of Control

In addition to reacting to NWS flash flood warnings, the Colorado canyon systems offer additional methods of control. Emergency responders at the flashing stations can turn the systems on or off manually, and the systems can be controlled remotely using the mobile LoggerLink or desktop LoggerNet software. When either flashing station is activated via the weather forecast data, a notification email message is sent to the station owners. Additionally, all data are communicated to TriLynx NovaStar over the Internet connection.

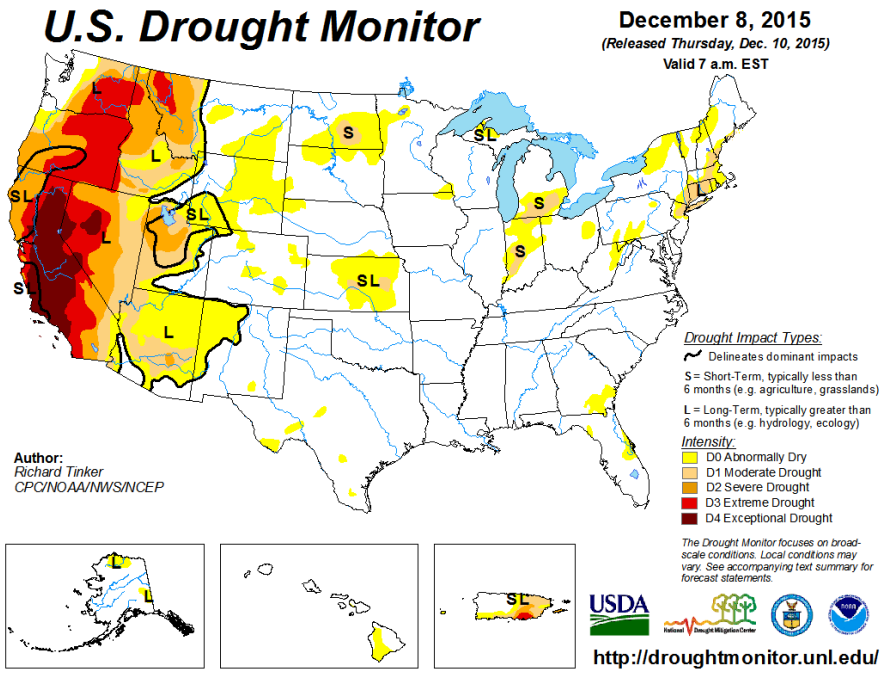
Membership Renewal

It's time to renew your Annual NHWC Membership. New members are welcome. Click **here** to join/renew your membership.

Hydrologic Conditions in the United States
Through December 15, 2015



Latest stream flow conditions in the United States. (courtesy USGS)



Latest drought conditions in the United States.
(courtesy National Drought Mitigation Center)

January Newsletter Articles Focus:

Modeling & Analysis

The NHWC is requesting articles that focus on practices, technologies and tools used to model, predict and analyze hydro-meteorological events and to support decision making for emergency response and floodplain management.

Submit your article to:

editor@hydrologicwarning.org

January 8th is the deadline for inclusion in the January issue.

Future Newsletter Articles Focus

To give you more time to prepare articles, below is the article focus schedule for the next four months:

Jan - Modeling/Analysis
Feb - Data Collection
Mar - Hydrology
Apr - Hazard Communication & Public Awareness

NHWC Calendar

General Interest Calendar

January 10-14, 2016 – The American Meteorological Society 96th Annual Meeting, New Orleans, Louisiana

April 18-22, 2016 - ALERT Users Group Training Symposium and Preparedness Workshop, Tenaya Lodge at Yosemite National Park, California

May 22-26, 2016 – World Environmental & Water Resources Congress 2016, West Palm Beach, Florida

August 21-26, 2016 – HIC 2016, 12th International Conference on Hydroinformatics, Incheon, Korea

September 28-October 1, 2016 – ASCE National Conference, Portland, Oregon

(see the event calendar on the NHWC website for more information)

Parting Shot

New ALERT Station at Silver Creek Fish Hatchery, Arizona

This ALERT Station was completed in November, 2015 along with two others for the Arizona Game and Fish Department to monitor stage, water temperature, discharge and precipitation at the Silver Creek Fish Hatchery. Data produced by this station may be observed at:

http://jefullerdata.com/AGFD/SilverCreek/

and

http://jefullerdata.com/AGFD/ALERT/mapfs.html

Photo by **Brian Iserman**
JE Fuller
NHWC Editor