Date of Hearing: March 13, 2023

ASSEMBLY COMMITTEE ON EMERGENCY MANAGEMENT
Freddie Rodriguez, Chair
AB 277 (Rodriguez) – As Introduced January 23, 2023

SUBJECT: Extreme Weather Forecast and Threat Intelligence Integration Center

SUMMARY: This bill would require the California Office of Emergency Services (Cal OES) and the Department of Water Resources (DWR) to establish and lead the Extreme Weather Forecast and Threat Intelligence Integration Center for the purpose of collecting, assessing, and analyzing extreme weather data and atmospheric conditions, as specified. Specifically, **this bill**:

1. Requires the California Office of Emergency Services (Cal OES) and the Department of Water Resources (DWR) to establish and lead the Extreme Weather Forecast and Threat Intelligence Integration Center for the purpose of collecting, assessing, and analyzing extreme weather data and atmospheric conditions.

2. Requires the center be composed of representatives from Cal OES, DWR, the Public Utilities Commission (CPUC), the Military Department, the California State University, the California Utilities Emergency Association, at least one representative of investor-owned utility companies, appointed by the President of the CPUC, and at least one representative of publicly owned utilities, appointed jointly by the Director of Cal OES and DWR.

3. Provides the Director of Cal OES and the Director of DWR to add additional members and may invite the National Weather Service, United States Army Corps of Engineers, and University of California to designate representatives to the center.

4. Requires the center to share intelligence and data relevant to weather threat, forecasting, detection, and prevention activities received from utility weather and emergency operations centers, partner academic institutions, private companies, and other sources in coordination with certain organizations, as specified.

5. Requires the center to develop and disseminate timely and actionable intelligence products and would permit use of those products by emergency managers, public safety officials, and local public and private sector entities engaged in emergency preparedness efforts.

6. Requires the center to develop a statewide extreme weather forecast and threat intelligence strategy and would authorize use of that strategy by agencies to improve how extreme weather threats are identified, understood, and shared for the purpose of reducing threats to California government, businesses, and consumers.

7. Prescribes the manner in which the center would conduct information sharing, including the protection and safeguarding of sensitive information.

EXISTING LAW:

1. Under the California Emergency Services Act, establishes the California Office of Emergency Services (Cal OES) within the office of the Governor for the purpose of mitigating the effects of natural, manmade, or war-caused emergencies. (Government Code 8550)

2. Establishes the Department of Water Resources (DWR) within the Natural Resources Agency and sets forth its powers and duties relating to water resources. (Water Code 120)

3. Establishes the Atmospheric Rivers: Research, Mitigation, and Climate Forecasting Program in the DWR. (Water Code 347)

4. Requires the DWR, upon an appropriation for purposes of the program, to research climate forecasting and the causes and impacts that climate change has on atmospheric rivers, to operate reservoirs in a manner that improves flood protection, and to reoperate flood control and water storage facilities to capture water generated by atmospheric rivers. (Water Code 347)

5. Establishes the Department of Forestry and Fire Protection (Cal FIRE) and establishes various programs for the prevention and reduction of wildfires. (Public Resources Code 701)

6. Requires Cal OES and Cal FIRE to jointly establish and lead the Wildfire Forecast and Threat Intelligence Integration Center, and sets forth the functions and duties of the center, including serving as the state's integrated central organizing hub for wildfire forecasting. (Government Code 8586.7)

FISCAL EFFECT: Unknown.

COMMENTS:

Purpose of the bill: According to the author, "The recent series of atmospheric rivers brought unanticipated devastation across California and has led to multiple fatalities. In response to the storms, over 40 counties proclaimed a local emergency. Subsequently, the Governor declared a state of emergency and ultimately requested a major disaster declaration from the President to provide federal assistance to communities and individuals who suffered damages. Clearly, California would benefit from more accurate forecasts to determine the extent to which extreme weather events, such as atmospheric rivers and extended periods of extreme heat would result in significant damages or disruptions to lifeline infrastructure systems."

The author continues, "Earlier this year, the Committee on Emergency Management, the Committee on Water, Parks and Wildlife, and the Committee on Utilities and Energy Committee, convened a joint oversight hearing to evaluate California's preparedness for extreme atmospheric river incidents. The hearing was an opportunity to hear from the leading climate scientists and researchers on what type of incidents our emergency managers should be prepared for and how the State could improve local forecast models to more accurately predict local impacts and the need to quickly warn residents of any danger from flooding or extended power outages. This bill

will improve California's forecasting capabilities and provide state and local emergency management with the information they need to prepare for these extreme atmospheric river incidents."

Equity Impact: According to the author's staff, "since disasters have a disproportionate impact on vulnerable individuals and communities, this bill seeks to mitigate risks posed by extreme atmospheric river incidents and make communities more resilient.

Background: California began 2023 with as many as nine major storm events in around three weeks. These storms brought 8–15 inches of rain in the valleys, 20–30 inches of rain in the foothills, and 10–15 feet of snow in the Sierra. While this precipitation did provide much-needed drought relief, it was accompanied by intense floods and winds reaching up to 90 mph that caused over $1 billion in damage and the tragic loss of at least 22 lives. The phenomenon responsible for exacerbating the impact of these storms: atmospheric rivers. Atmospheric rivers are long corridors that transport concentrated water vapor through the air from the tropics to California; these events can be either hazardous or beneficial depending on their intensity. When atmospheric river-fed storms approach land and encounter high elevation mountain ranges, such as the Sierra Nevada, moist air rises and cools producing copious amounts of precipitation. Some of these atmospheric rivers can carry 25 times the average flow out of the Mississippi River.

Based on forecasts of the high winds, excessive rainfall, and the potential for flooding, local operational areas (counties) began proclaiming local emergencies prior to the damaging New Year's Eve storm. On January 4, 2023 the Governor requested and secured an Emergency Declaration for direct Federal Assistance from the Federal Emergency Management Association. As the series of atmospheric rivers continued to cause floods, extended power outages, and displace thousands of residents, a majority of California's counties proclaimed local emergencies and ultimately the Governor requested an Expedited Major Disaster Declaration on January 12, 2023. President Biden approved the Major Disaster Declaration on January 14, 2023.

History of Floods in California: California has experienced destructive flood events throughout its history. Before January 2023, the last major, widespread flooding event was 1997 (the New Year's Day floods, when 120,000 people were evacuated and 23,000 homes and businesses flooded). More recently, more local flood disasters include the Oroville Spillway in 2017 and the Russian River floods in 2019. Even before this year's floods, every county in California has been declared a federal disaster area at least once for a flooding event over the last 30 years.

Estimates suggest more than 7.3 million people and structures valued at nearly $600 billion statewide are located in areas that have at least a 1-in-500 probability of flooding in any given year. In the Central Valley, 1.3 million people, $17 billion in agriculture economic activity, and $223 billion in homes, businesses, and structures are in flood risk areas. Factoring in future development, climate change, and potential losses to key infrastructure, those figures could climb much higher. Current projections indicate that peak flood flows will increase up to five times by 2072 in the Central Valley compared to past records. Despite their damaging potential, in some cases floods can have positive effects including replenishing groundwater basins, creating habitat for fish and wildlife, and improving water quality by flushing out contaminants

ARkStorm Scenario: In 2010, the United State Geological Survey (USGS) led a multidisciplinary team of leading earth scientists, engineers, and social scientists to create the ARKStorm Scenario: a detailed and realistic depiction of how a severe winter storm could affect

the state. The ARkStorm Scenario shows that atmospheric rivers represent a nearly existential threat to California's people, economy, and culture. It is well established that climate change is raising the ocean temperatures that power atmospheric rivers, making an event like the ARkStorm more realistic, the threat more grave, and the likely losses greater.

The 2010 ARkStorm is patterned after the 1861–62 historical events but uses modern modeling methods and data from large storms in 1969 and 1986. The ARkStorm draws heat and moisture from the tropical Pacific, forming a series of atmospheric rivers that approach the ferocity of hurricanes and then slam into the U.S. West Coast over several weeks.

In contrast to U.S. East and Gulf Coast hurricanes, only recently have scientific and technological advances documented the ferocity and strength of possible future West Coast storms. ARkStorm is intended to elevate the visibility of the very real threats to human life, property, and ecosystems posed by extreme storms on the U.S. West Coast. This enhanced visibility will help increase the preparedness of the emergency management community and the public to such storms. The ARkStorm analysis suggested that such an event would likely produce widespread, catastrophic flooding and subsequently lead to the displacement of millions of people, the long-term closure of critical transportation corridors, and ultimately up to nearly $1 trillion in overall economic losses (2022 dollars).

A new ARkStorm scenario (ARkStorm 2.0) has recently been analyzed to reflect climate change data and advances in modeling to investigate the impact of a 30-day storm in a future climate (2071–2080), called ARkFuture. This new modeling shows that climate change will increase the severity of storms bringing more intense moisture transport and more overall precipitation, along with higher elevation freezing levels and decreased snow-to-rain ratios that together yield runoff that is much higher than that during historical events. Additionally, projected increases in hourly rainfall rates during individual storm events have high potential to increase the severity of geophysical hazards such as flash flooding and debris flows. This is especially true in the vicinity of large or high-intensity wildfire burn areas, which are themselves increasing due to climate change and yielding large increases in associated compound hazards.

The plausibility of the ARkStorm scenarios has been demonstrated over the last several years, including during winter-spring 2017, when a drought-busting and record-breaking series of 68 atmospheric-river storms reached the West Coast.10 Neither the 2017 and 2023 storms approached the severity of the megaflood modeled by ARkStorm: a flood 200 miles long and 12 to 20 miles wide that would effectively be an inland sea in the Central Valley. However, the cascading consequences associated with the atmospheric rivers, floods, wildfire fuel production, and fire and debris-flows, aligned closely with the ARkStorm scenario.

In an August 12, 2022, ScienceAdvances Research Article entitled “Climate change is increasing the risk of a California megaflood,” Dr. Daniel Swain, a climate scientist at the University of California Los Angeles, and researcher Xingying Huang of the National Center for Atmospheric Rivers, develop two additional ARkStorm scenarios: ArkHist and ARkFuture. Both scenarios are capable of causing a megaflood in California based on recent historical climate data (ARkHist) and from a hypothetical warmer future climate (ARkFuture). Each of these scenario are based on a 3-4 week long sequence of atmospheric river storms affecting California. Under these scenarios, atmospheric rivers, over a 3-4 week period, would deliver 80-100 plus inches of water in the mountains.

At the February 1, Joint Oversight hearing, Dr. Swain testified, "In warming climate, there will be more rain than snow and the dramatic shift toward rain in CA's mountains, except at highest elevations will have major implications for immediate surface runoff. A modern megaflood would be an unprecedented California disaster. A megaflood would be California's "Other Big One" and there is no modern precedent for an 1862-like great flood." In offering his recommendations to mitigate flood and drought risk simultaneously, Dr. Swain suggested, among other things, "improved public and agency awareness of risks, tabletop disaster response exercises, and improved data visualization and dissemination."

At the same oversight hearing, Dr. Marty Ralph, Director and founder of the Center for Western Weather and Water Extremes (cw3e.ucsd.edu) at UC San Diego/Scripps Institution of Oceanography, testified on experiences over nearly 20 years in exploring the science of atmospheric rivers, and improving predictions of ARs to provide solutions to managing water supply and flood in California and across the west. He described the key traits of ARs that determine whether they are likely to be mostly beneficial versus hazardous, how to improve predictions of them from hours to days, and weeks, and how such information can be used to benefit decision makers. (For example, the ranking of incoming storms on the AR Scale is predicted by CW3E and is available online - http://cw3e.ucsd.edu/arscale_forecasts/.

He introduced to the committee key new programs he has developed to observe ARs by flying weather reconnaissance aircraft into the storms (AR Recon; https://cw3e.ucsd.edu/arrecon_overview/; 36 missions flown this winter), by creating a specialized regional weather forecast model tailored to AR forecasting and a range of AR forecasting decision support tools (West-WRF; https://cw3e.ucsd.edu/iwv-and-ivt-forecasts/) and by working with CA DWR, USACE and local water agencies to integrate these data into reservoir operations to increase flexibility in reservoir operations that can increase water supply reliability and flood risk management capacity through use of AR forecasts.

According Mary Jo Flynn, the Director of the Sacramento County Office of Emergency Services, "improved flood forecasting from a weather science perspective is great and a valuable path for local emergency managers. However, that information without an impact analysis and decision support tools may still be a gap." Director Flynn continued, "using state DWR funds, Sacramento County has been working with DWR and Delta County partners on the development of the Flood Operation Decision Support System Tool could be hosted by the state, accessible by local agencies, and fully supported with continued investments.

Director Flynn added, "I would like to see more education and sharing of the probabilistic and deterministic data and decision making in some of those river level forecasts. I'd also like to see funding that supports local level flood planning that takes into consideration the probabilistic and deterministic data sets along with gauge readings to improve action triggers for alert and warning with evacuation warnings, orders, and shelter-in-place."

Kelly Hubbard, the Santa Barbara County Director of Emergency Management, told the Committee, "Identifying burn scar debris flow risk thresholds past 2 years. Currently there are only 2 years of identified and agreed upon risk for post fire burn scars, but we know that historically within our county we have had debris flows up to 5 years post fire. Having a matrix or guidance on risk based on rain rates for years 3 -5 would be extremely helpful." Director Hubbard also suggested, "Supporting the ArkStorm re-evaluation based on climate change, but

also funding localized analysis for specific watersheds based on ArkStorm would be extremely helpful for planning, mitigation, exercises and even response."

According to the author's staff, in addition to meeting these emergency management needs, the extreme weather center could build on CW3E's well established capabilities in AR science, prediction and decision support and further develop tools/methods that provide OES-needs-specialized hi-space-and-time resolution atmospheric rivers and precipitation modeling for floods, post-wildfire debris flow weather radars, scientific research work longer range (2 to 3 weeks) forecasts of atmospheric rivers and related triggers of natural hazards with a focus on meeting local emergency management needs, climate change impacts on cool-season hazards, and identifying and sharing emerging technologies and opportunities.

Cal OES's Wildfire Forecast and Threat Intelligence Integration Center: In 2019, the Governor signed into law SB 209 (Dodd), which established Cal OES's Wildfire Forecast and Threat Intelligence Integration Center: SB 209 requires the deployment of a state-wide network of automated weather and environmental monitoring stations designed to observe mesoscale meteorological phenomena, specifically conditions that increase the threat of wildfires. Additionally, SB 209 requires the development of a statewide fire weather forecasting, monitoring and threat assessment capability and the establishment of the California Wildfire Warning Center (CWWC) to be responsible for ongoing monitoring of fire weather and threat conditions.

Center for Western Weather and Water Extremes, Scripps Institution of Oceanography: Among other initiatives, the Center for Western Weather Extremes coordinates an Atmospheric River Reconnaissance program with US Army Corps of Engineers, DWR, US Air Force 53rd Weather Reconnaissance Squadron, and NOAA. The goal of this program is to support water management decisions and flood forecasting by developing and testing the potential of targeted airborne and buoy observations over the Northeast Pacific to improve forecasts of the landfall and impacts of atmospheric rivers on the U.S. West Coast at lead times of 1-5 days. Innovations in targeting methods, data assimilation and regional forecast skill requirements are pursued through collaborative, cross-disciplinary, science-based strategies.

Double referral: This bill is set to be heard by the Committee on Emergency Management on March 13, 2023. Should the bill be approved by this committee, it will be referred to the Assembly Committee on Water, Parks and Wildlife.

Related legislation: AB 30 (Ward) of this Session. Would require DWR to take all actions within its existing authority to operate reservoirs in a manner that improves flood protection in the state and to reoperate flood control and water storage facilities to capture water generated by atmospheric rivers and would make other changes to DWR's work related to atmospheric rivers, as specified. (Referred to the Committee on Water, Parks and Wildlife)

SB 231 (Hurtado) of this Session. Would state the intent of the Legislature to enact subsequent legislation to require the Department of Water Resources to modify its predictive models as necessary to account for California's persistent drought. (Pending referral in the Senate.)

SB 262 (Hurtado) of this Session. Would, subject to an appropriation by the Legislature, require DWR to administer the California Farmworkers Drought Resilience Pilot, as specified. (Referred to Committees on Human Services and Government and Finance. Set to be heard by the Senate Human Services Committee on March 20, 2023.)

Prior legislation: SB 209 (Dodd) of the 2019-2020 Session. Established a multi-agency California Wildfire Warning Center (CWWC) to monitor fire-weather and threat condition and to enhance fire-weather forecasting models. (Chapter 405, Statutes of 2019.)

REGISTERED SUPPORT / OPPOSITION:

Support

None on file.

Opposition

None on file.

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