AMENDED IN SENATE APRIL 24, 2025

AMENDED IN SENATE MARCH 24, 2025

SENATE BILL No. 599

Introduced by Senator Caballero

February 20, 2025

An act to amend Section 347 of the Water Code, relating to atmospheric rivers.

LEGISLATIVE COUNSEL'S DIGEST

SB 599, as amended, Caballero. Atmospheric rivers: research: forecasting methods: experimental tools.

Existing law establishes the Atmospheric Rivers Research and Forecast Improvement Program: Enabling Climate Adaptation Through Forecast-Informed Reservoir Operations and Hazard Resiliency (AR/FIRO) Program in the Department of Water Resources. Existing law requires the department 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. Existing law requires the department to research, develop, and implement new observations, prediction models, novel forecasting methods, and tailored decision support systems to improve predictions of atmospheric rivers and their impacts on water supply, flooding, post-wildfire debris flows, and environmental conditions.

This bill would, for novel forecasting methods researched, developed, and implemented by the department, require the department to include the use of experimental tools that produce seasonal and subseasonal atmospheric river forecasts, as defined.

Vote: majority. Appropriation: no. Fiscal committee: yes. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. The Legislature finds and declares all of the following:

(a) Atmospheric rivers are long narrow bands of concentrated moisture ~~that form over the Pacific Ocean.~~ *in the atmosphere that often originate over tropical oceans and bring sustained, heavy precipitation, especially to the west coast of North America.*

(b) Atmospheric rivers have been identified as major drivers of floods and precipitation, responsible for up to one-half of the annual precipitation in California and 94 percent of all flood damages, totaling around $620 million annually.

(c) Climate change is resulting in more intense and more frequent atmospheric rivers.

(d) In southern California, around Prado Dam, atmospheric rivers have caused the 10 largest events on record. Additionally, precipitation in the Yuba-Feather watershed is strongly tied to atmospheric river activity.

(e) Winter storms from late-December 2022 to mid-January 2023 caused massive flood damage in 40 of California's 58 counties, resulting in 20 deaths and significant devastation to homes, roads, infrastructure, agriculture, businesses, *and* the ~~economy, and~~ *economy. AccuWeather estimates that the storms have likely* caused over $30 billion in ~~damages.~~ *damages and economic losses, including job and wage losses, crop losses, evacuation costs, airline delays, lost business, and supply chain interruptions.*

(f) One in five Californians live in flood-prone areas, and all 58 counties have a history of severe flood damage. Homes and buildings worth approximately $900 billion are at risk of flooding.

(g) Flooding is the most widespread natural hazard in California, and is more pervasive than wildfires or earthquakes.

(h) Low-income communities of color are disproportionately at risk due to limited financial capacity for flood control upgrades and recovery.

(i) Over 250 aging dams and outdated flood infrastructure increase the likelihood of catastrophic flooding.

(j) California spends $1.8 billion annually on flood control operations and maintenance, and $1 billion annually on new

~~investments, but investment needs range from $2 to $4.5 billion, inclusive, annually for the next 25 years.~~ *investments.*

(k) Since 2006, ~~only~~ *more than* $4.5 billion *in state funding* has ~~been allocated to~~ *become available for* new flood ~~infrastructure.~~ *infrastructure from bonds and recent budget surpluses. However, investment needs cost estimates range from $50 billion to $115 billion, or approximately $2 billion to $4.5 billion annually for 25 years.*

(*l*) Atmospheric River Reconnaissance (AR Recon), a Research and Operations Partnership ~~(RAOP) with NOAA~~ *within the National Oceanic and Atmospheric Administration's (NOAA)* National ~~Center~~ *Centers* for Environmental ~~Prediction (NCEP),~~ *Prediction and* led by the Center for Western Weather and Water Extremes, leverages ~~National Oceanic and Atmospheric Administration~~ *NOAA* and United States Air Force investments in aircraft-based ~~observations. It~~ *observations to improve predictions for various weather conditions, including atmospheric rivers and their intensity. AR Recon* is now the leading effort within the National Winter Season Operations Plan for airborne weather reconnaissance.

(m) The AR Recon Partnership has *provided* improved forecasting ~~skill. Statewide,~~ *skill for the Department of Water Resources (DWR) and California water agencies. With the use of AR Recon, statewide,* five-day atmospheric river forecasts in water year 2020 were better than four-day forecasts in 2017.

(n) ~~The Department of Water Resources is~~ *Although DWR has already* invested in extended forecasts, such as subseasonal (two to six weeks) and seasonal (one to six months) ~~forecasts.~~ *forecasts, it is critical that the Legislature specifically recognize the use of these experimental tools as a key part of the solution to improving predictions about atmospheric river patterns and their impact on the state.*

(o) Better atmospheric river forecast accuracy and lead time enhances the state's resiliency to flood and drought.

(p) According to the Public Policy Institute of California, a major flood event, like the flood in 1861–62, could displace 1,500,000 people and cause over $1 trillion in damages and business losses.

(q) With minimal investment in the use of tools that help predict seasonal and subseasonal atmospheric river forecasts, California

can save billions of dollars in flood damages through advanced warning, effective local planning, and effective emergency management.

~~(q)~~

(r) With effective *seasonal and subseasonal* atmospheric river forecasting, California can maximize its efforts to recharge more groundwater and boost our water supply for communities across the state, and protect communities from catastrophic flooding.

SEC. 2. Section 347 of the Water Code is amended to read:

347. (a) The Atmospheric Rivers Research and Forecast Improvement Program: Enabling Climate Adaptation Through Forecast-Informed Reservoir Operations and Hazard Resiliency (AR/FIRO) Program is hereby established in the Department of Water Resources.

(b) (1) The department shall research, develop, and implement new observations, prediction models, novel forecasting methods, including the use of experimental tools that produce seasonal and subseasonal atmospheric river forecasts, and tailored decision support systems to improve predictions of atmospheric rivers and their impacts on water supply, flooding, post-wildfire debris flows, and environmental conditions.

(2) The department shall ~~utilize~~ *use* all relevant information produced pursuant to paragraph (1) 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 other storms. The goals of integrating forecast-informed reservoir operations into department operations shall be to increase water supply, hydropower availability, and water supply reliability. The department may use research generated by this program to refine climate projections of extreme weather and water events and changes in Sierra snow.

(3) Information produced pursuant to paragraph (1) shall be available to relevant federal, state, and local agencies.

(c) For purposes of this section, both of the following definitions apply:

(1) “Seasonal forecast” means a forecast that covers a period of approximately one to six months into the future.

(2) “Subseasonal forecast” means a forecast that covers a period of approximately two to six weeks into the future.

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