The California water system is failing

California is the United States' most agriculturally productive state. It is in part thanks to the natural productivity of the San Joaquin-Sacramento valley (often called the Central Valley, Central California, or simply The Valley.) The agricultural production capacity of California has increased dramatically because of the construction of a complex system of channels over the last century. The California state water project (SWP) is a multi-purpose water storage and delivery system that extends more than 705 miles. A collection of canals, pipelines, reservoirs, and hydroelectric power facilities delivers clean water. (*California water timeline* 2022) The upper half of the system relies on snowpack from the Sierras, and southern California predominantly depends on the Colorado River basin.

Over the last two decades, drought conditions have adversely impacted the sierra snowfall. It has caused a shortage of water and left the California waters system unable to deliver the water needed to support agriculture and the needs of city residents. There is a growing fear that climate change has caused a permanent shift to a drier climate. The time has come for California to look elsewhere for water. (The Los Angeles Times' Editorial Board, 2021)

This paper will explore how this system functions and analyze its shortcomings. It will not focus on climate change as it is a complex problem beyond my ability to suggest a solution. Although the primary cause of the problem is drought, there are elements that we can remedy with more straightforward resolutions. I will focus on the more immediate issues with water management in California and suggest solutions in Project Two

History timeline

1933: Central Valley Project Act passed

1934: Construction started on All-American Canal in the Imperial Valley and on Parker Dam on the Colorado River.

1940: Colorado River Aqueduct completed.

1945: State Water Resources Control Board created.

1951: First deliveries from Shasta Dam to the San Joaquin Valley.

1964: Partially completed Oroville Dam helps save Sacramento Valley from flooding

1966: Construction begins on New Melones Dam on the Stanislaus River completed in 1978.

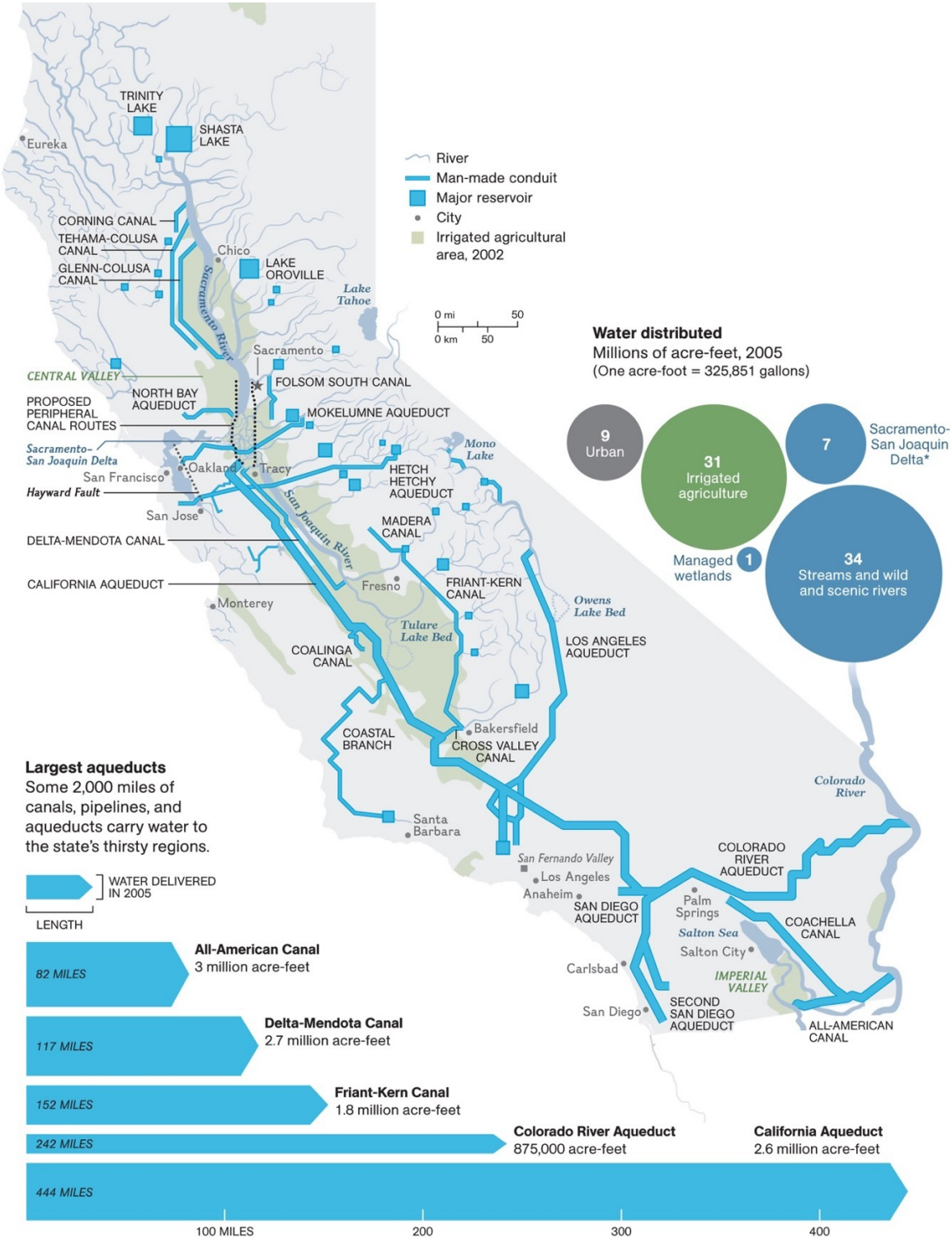
1973: First SWP deliveries to Southern California.

1986: Coordinated Operation Agreement for CVP and SWP operations in the Delta signed.

1995: State Board adopts a new water quality plan for the Delta and begins hearings on water rights.

1997: SWP's Santa Barbara Aqueduct completed.

Map



Map of California Water Channels(National Geographic Society, 2020)

Modern Day Functioning of The California Water System

The backbone of the California channel system is the California Aqueduct. The California aqueduct's primary water source is the Sacramento River Delta, a sprawling swampland of channels and islands east of the San Francisco Bay. Water pumped from the Delta to the Clifton Court Forebay feeds the California Aqueduct and Delta Mendota Channel. The California Aqueduct snakes southeast, frequently crossing Interstate Highway Five. When the aqueduct reaches the Tehachapi mountains near Tejon pass, you can see a series of pipes running up the mountain. The system is truly a marvel of modern engineering, a place where water runs uphill. Water is pumped through a series of pump stations and ponds and allowed to run down a channel on the other side to supply the city of Los Angeles with water.

The San Luis Reservoir is an artificial off-river reservoir that serves as auxiliary storage and source for the California Aqueduct. It is a pumped water storage reservoir that serves the dual purpose of storing water and stabilizing the electricity grid by pumping during periods of low electricity demand and generating electricity during periods of peak demand. Water is released and pumped from the O Neill Forebay that feeds or takes water from the California aqueduct.

Milnerton lake between Madera and Fresno Counties feeds into two channels used to irrigate farms all over the valley floor, the Madera Channel and the Friant-Kern County Channel. These channels can completely deprive the San Joaquin River of water at total capacity. Modern conservation thought would call depriving the valley's main river of water an ecological disaster. Reclamation efforts result in much less water flowing down these channels, and in some recent years, no water flowed in them at all.

The Delta Mendota channel serves as an irrigation channel and partially restores flow to the San Joaquin River deprived by lake Milnerton.

Cities and their large populations cause additional pressure on the state's water system. As such, some dedicated solutions exist to supply cities. One such example is the Hetch Hetchy Aqueduct that provides water to San Francisco.

As already mentioned, Los Angeles receives water from the California Aqueduct. The construction of the pump system across the mountains rendered the already insufficient Los Angeles Aqueduct obsolete. The LA Aqueduct is mostly dry these days. LA further receives water from the Colorado River Aqueduct that supplies San Diego and most of southern California's agriculture.

Many other smaller channels tap into this Statewide mega system.

Frequency of drought increasing

The following charts show how California drought conditions have become more and more frequent over the last two decades. (Current U.S. Drought Monitor Conditions for California 2022) A trend many fear will continue if nothing gets done to avert the effects of

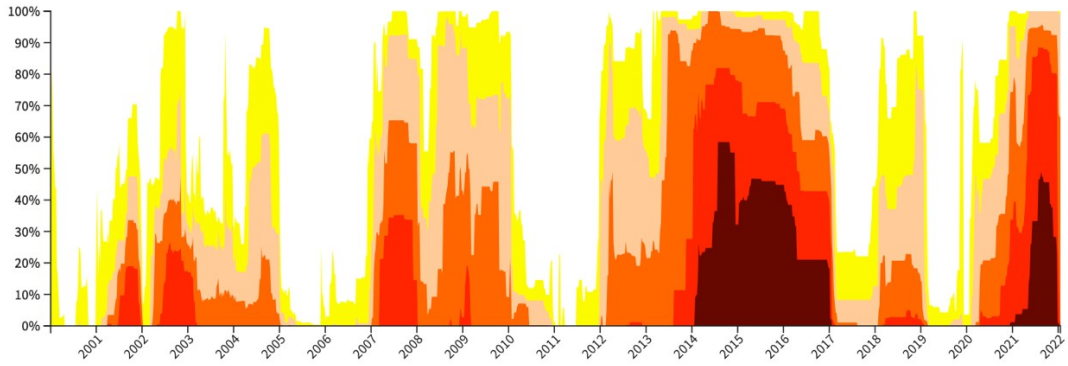
climate change. The most prolonged duration of drought (376 weeks) lasted from December 27, 2011, till March 5, 2019. At its peak on July 29, 2014, it affected 58% of California.

2000 - Present (Weekly) 1895 - Present (Monthly) 0 - 2017 (Yearly) **Explore Historical Maps**

The U.S. Drought Monitor (USDM) is a national map released every Thursday, showing parts of the U.S. that are in drought. The USDM relies on drought experts to synthesize the best available data and work with local observers to interpret the information. The USDM also incorporates ground truthing and information about how drought is affecting people, via a network of more than 450 observers across the country, including state climatologists, National Weather Service staff, Extension agents, and hydrologists. Learn more.

Time Period (Years): to **Update Graph** **Reset Graph**

Latest Available Data:2022-01-18



D0 D1 D2 D3 D4

Click or hover on legend boxes to interact with the graph.

Image **JSON** **XML** **CSV**



D0 - Abnormally Dry

- Soil is dry; irrigation delivery begins early
- Dryland crop germination is stunted
- Active fire season begins

100.0% of CA (D0–D4)



D1 - Moderate Drought

- Dryland pasture growth is stunted; producers give supplemental feed to cattle
- Landscaping and gardens need irrigation earlier; wildlife patterns begin to change
- Stock ponds and creeks are lower than usual

99.3% of CA (D1–D4)



D2 - Severe Drought

- Grazing land is inadequate
- Fire season is longer, with high burn intensity, dry fuels, and large fire spatial extent
- Trees are stressed; plants increase reproductive mechanisms; wildlife diseases increase

66.4% of CA (D2–D4)



D3 - Extreme Drought

- Livestock need expensive supplemental feed; cattle and horses are sold; little pasture remains; fruit trees bud early; producers begin irrigating in the winter
- Fire season lasts year-round; fires occur in typically wet parts of state; burn bans are implemented
- Water is inadequate for agriculture, wildlife, and urban needs; reservoirs are extremely low; hydropower is restricted

1.4% of CA (D3–D4)



D4 - Exceptional Drought

- Fields are left fallow; orchards are removed; vegetable yields are low; honey harvest is small
- Fire season is very costly; number of fires and area burned are extensive
- Fish rescue and relocation begins; pine beetle infestation occurs; forest mortality is high; wetlands dry up; survival of native plants and animals is low; fewer wildflowers bloom; wildlife death is widespread; algae blooms appear

0.0% of CA (D4)

Southern California's new drought problems



" The Whitsett Intake Pumping Plant is the start of the 242-mile Colorado River Aqueduct." (The Los Angeles Times' Editorial Board, 2021)

The water shortages are often seen as a central California issue as the Colorado river channel primarily supplies Southern California. Although the LA area is somewhat reliant on the California aqueduct, it also has access to Colorado River water. (The Los Angeles Times' Editorial Board, 2021)

Unprecedented drought in the Midwest now complicates the California water situation by depriving southern California of Colorado River water.

Water Shortages

Water shortage is a problem that affects my local community—the causes of drought due to not enough snow. Additionally, there's excessive water use due to the development and expansion of farmland and cities.

There are two kinds of end consumers dependent on the California state water project: inhabitants of large cities who depend on the system for drinking and washing water and farmers who use the water to grow food for economic gain. Many Californians use the large bodies of

natural water and those created by artificial dams for recreation. As such, a tourist industry has sprung up around water.

Indirectly most of North America is affected by the water problems in California. Elected officials represent these stakeholders, from local county supervisors to the state legislature. These leaders balance the economy's needs, the right to water for daily activities, and environmental conservation. If we pump the rivers and lakes dry, it leads to the collapse of the natural ecosystem and is ultimately dire.

Calling for Californians to voluntarily reduce use is generally ineffective, and calls for more severe measures are increasing. (The Los Angeles Times' Editorial Board, 2021) In 2021 Governor Newsome called for a 15% voluntary reduction over the previous year, but only a six percent reduction was achieved from July to November. (Ronayne, 2022) Some suggestions include more water-friendly landscaping, for example, doing away with lawns.



"Water flows down a sidewalk from water sprinklers running at a home Thursday, April 2, 2015, in Rancho Cordova, Calif. The State Water Resources Control Board voted Tuesday, January 4, 2022, to adopt mandatory water use restrictions that prohibit excessive runoff from sprinklers. "(Ronayne, 2022)

Two years ago, the prolonged drought was broken by an abnormally wet season with a good snowpack, leaving Californians wondering why the system initially capable of lasting through more than three years of drought failed after just two years.

Many politicians like state senator Dahle (2021) argue that we are letting too much water simply run into the ocean. The tricky balance between water for farms and homes and maintaining the river ecology is becoming more and more of a political Hotpoint. It seems that part of the problem is that the initial design of the system did not allow for the maintenance of healthy ecology.

Dahle argues that enough water would be available with more infrastructure and better management. He argues that current regulations let too much water run into the ocean.

A lack of water in the system also hurts power generating capability. Maybe California has historically been over-reliant on hydropower. The water system might consume more power than it generates in the future. New questions are arising about the nature of hydropower; Is it a true renewable. How reliable is it if we can't use it during a drought? Hydropower is proving to be an excellent complement to solar and wind power, allowing for pumped storage to stabilize the grid. However, is it still effective as a primary power source?

Despite funding secured for many water projects, the hold-up seems in regulatory and environmental requirements. It might be time to consider projects from conception focused on serving both the environment and us. Some call for the governor to expedite these processes, but ultimately projects that are not good for the environment are not suitable for anyone.

Cuts for Residential and city areas

After the failure of voluntary water reductions, California faced its second-ever mandatory restrictions on outdoor water use. (Ronayne, 2022) The rules adopted on January 4 would fine residents $ 500 for certain violations:

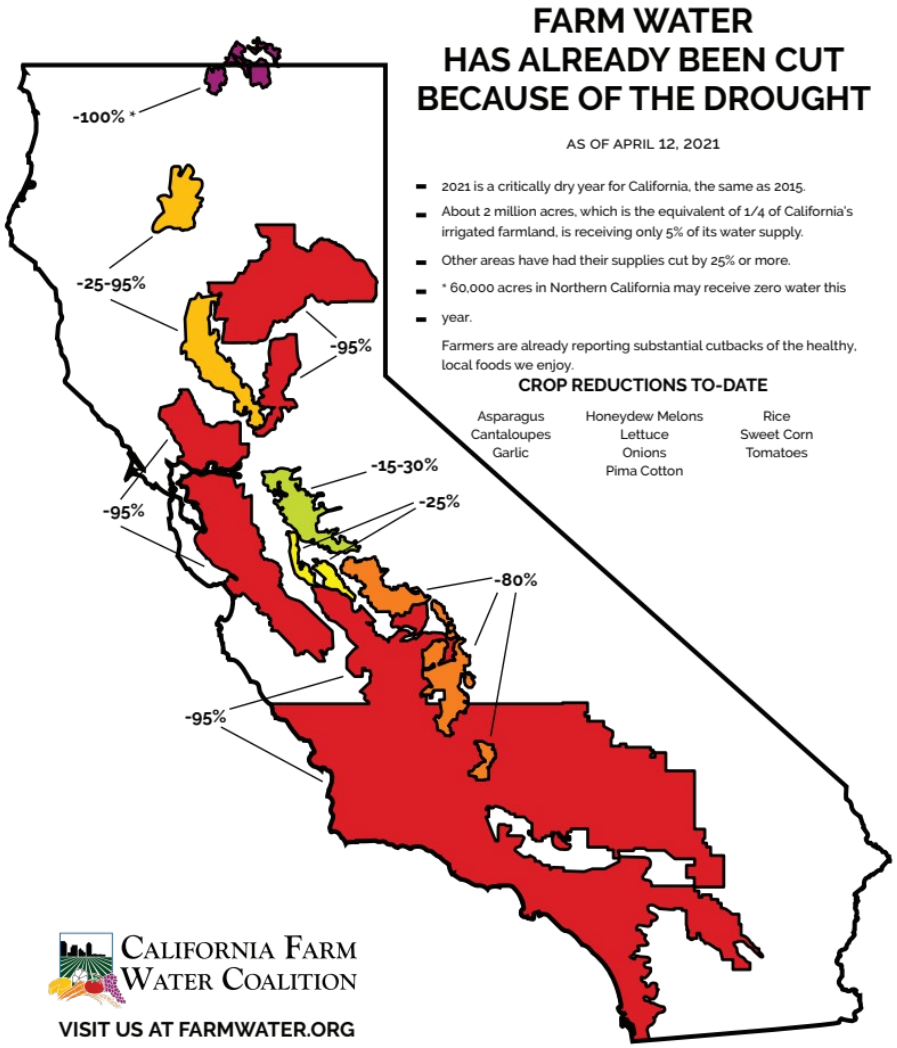
- Watering lawns 48 hours after rain (at least .25 inches) would not be allowed,
- and sprinklers must be prevented from producing excessive runoff.
- No washing your car without shutting off the hose or using a nozzle to do so.
- No drinking water to wash driveways, sidewalks, patios, or streets.
- No filling of ornamental lakes and ponds with potable water.
- Watering trees on street medians are allowed but not grass.

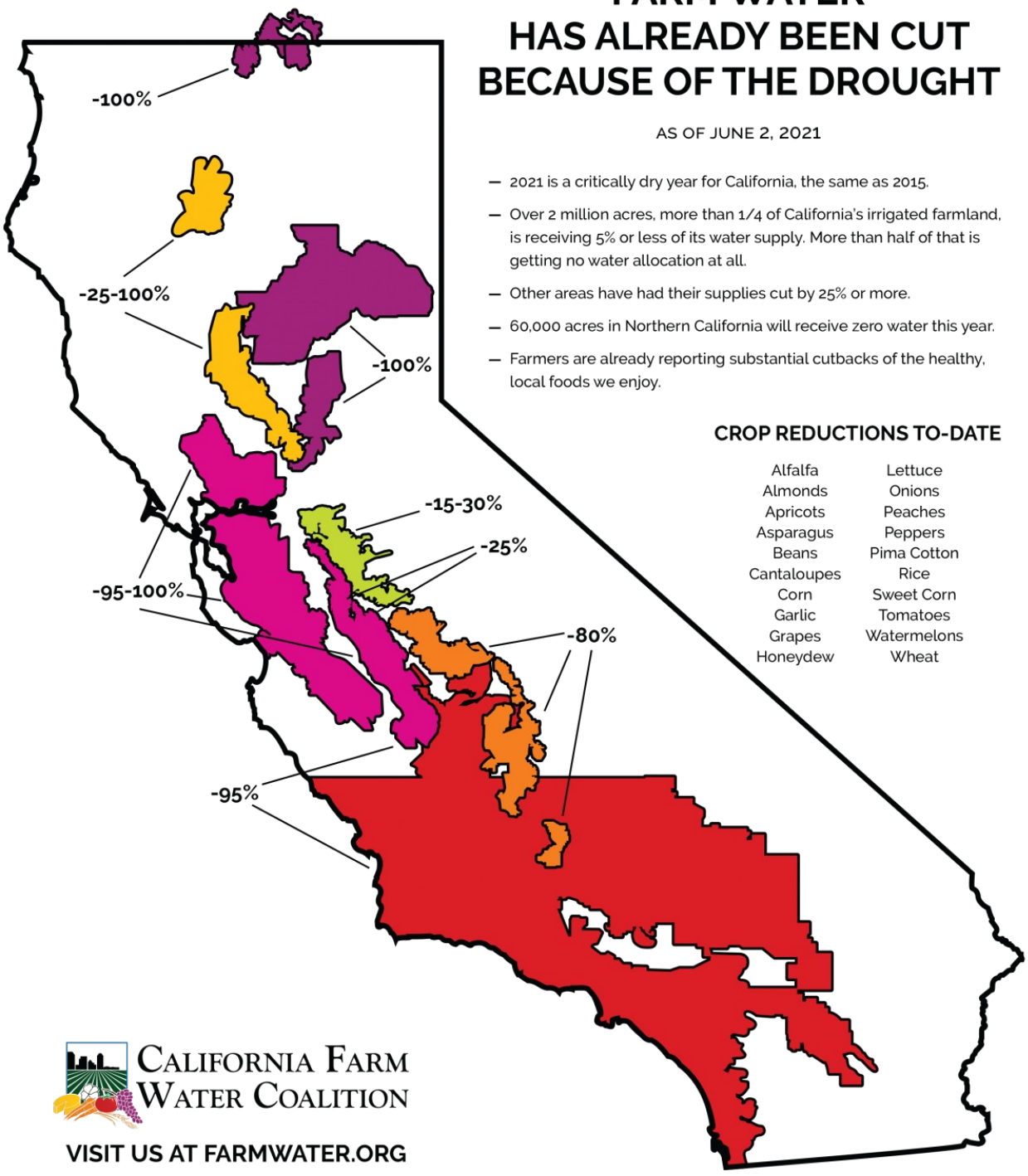
The previous time restrictions were implemented was during the five-year drought ending in 2017. Many local regulations have remained in place since.

Cuts for farmers

Due to the drought situation, farmers get their irrigation quotas cut. It means crops that are already planted are lost; some others were never planted. Fruits might wither on the trees; wine

grapes are often turned into raisins. It often leads to an overproduction of dried fruits and a collapse in demand and prices. It to financial losses to farmers and hurts the national food security. Food shortages caused by drought lead to soaring prices and high inflation. The maps below show how much water allowances had been cut by April 12, 2021, and June 2, respectively. (*Map shows 2021 Farm Water Supply Cuts* 2021) They also list the crop types likely affected. Farmers will pull up entire vineyards and orchards and replace them with more drought-resistant crops in the long run.




FARM WATER
HAS ALREADY BEEN CUT
BECAUSE OF THE DROUGHT
AS OF JUNE 2, 2021
— 2021 is a critically dry year for California, the same as 2015.
— Over 2 million acres, more than 1/4 of California's irrigated farmland, is receiving 5% or less of its water supply. More than half of that is getting no water allocation at all.
— Other areas have had their supplies cut by 25% or more.
— 60,000 acres in Northern California will receive zero water this year.
— Farmers are already reporting substantial cutbacks of the healthy, local foods we enjoy.
CROP REDUCTIONS TO-DATE
Alfalfa
Almonds
Apricots
Asparagus
Beans
Cantaloupes
Corn
Garlic
Grapes
Honeydew
Lettuce
Onions
Peaches
Peppers
Pima Cotton
Rice
Sweet Corn
Tomatoes
Watermelons
Wheat
-100%
-25-100%
-100%
-15-30%
-25%
-95-100%
-80%
-95%
CALIFORNIA FARM WATER COALITION
VISIT US AT FARMWATER.ORG

In Conclusion

It is all but sure that droughts will continue to increase in California and that the snowpack in the sierras can no longer be relied on. Thus, there is a need to look for other sources to supplement the water supply. It is not practical to build more dams if we cannot fill them already there. There is already a lack of water flow in many natural rivers, and further restricting natural flow will hurt the ecology beyond repair.

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