

FRIANT WATER AUTHORITY

A VALLEY IN CRISIS

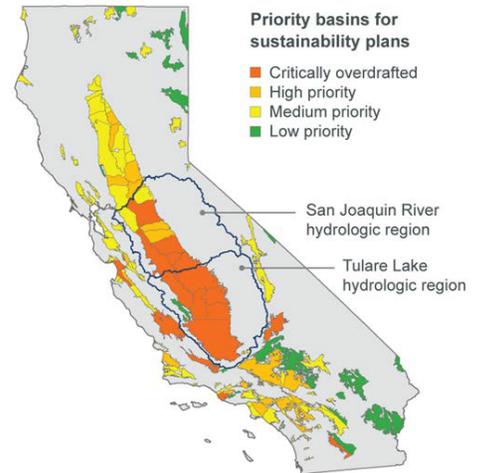
Water Imbalance in the San Joaquin Valley

2017 brought near record setting precipitation and the over-due reprieve from California's most severe drought on record. Despite the welcome rain, the compounded effects of the recent drought and three decades of increasing regulatory pressure on water resources have left the San Joaquin Valley in a state of severe overdraft. In fact, California's most urgent groundwater issues exist in the San Joaquin Valley, where the greatest extent of "Critically Overdrafted" basins exist. (See DWR figure to right.)

For decades, the successful design of the Friant Division's conjunctive use project had insulated its water users from the problems of an eroding water supply reliability throughout the San Joaquin Valley. This is no longer the case. The extent of groundwater overdraft

in the San Joaquin Valley connects all of the valley's water users in an urgent effort to comply with California's Sustainable Groundwater Management Act (SGMA). Friant water users have water contracts that presumed access to groundwater that is changing with SGMA implementation. Consequently, Friant districts are now drawn into the imbalance of the entire valley and the need to develop solutions.

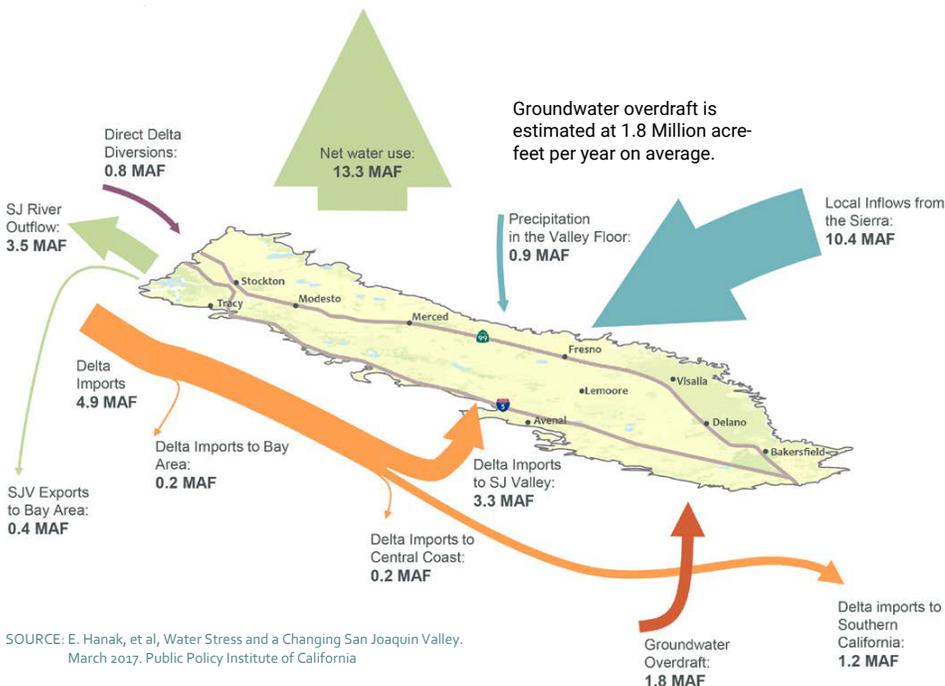
The reasons for this problem are complex, but the math is simple. The graphic below, developed by the Public Policy Institute of California in March of 2017, illustrates average conditions for water supply and demand that have contributed to imbalance in the San Joaquin Valley.



SOURCE: California Department of Water Resources

Four Factors Drive the Water Imbalance

AVERAGE ANNUAL WATER-BALANCE FOR RECENT DECADES (1986-2015)



SOURCE: E. Hanak, et al, Water Stress and a Changing San Joaquin Valley. March 2017. Public Policy Institute of California

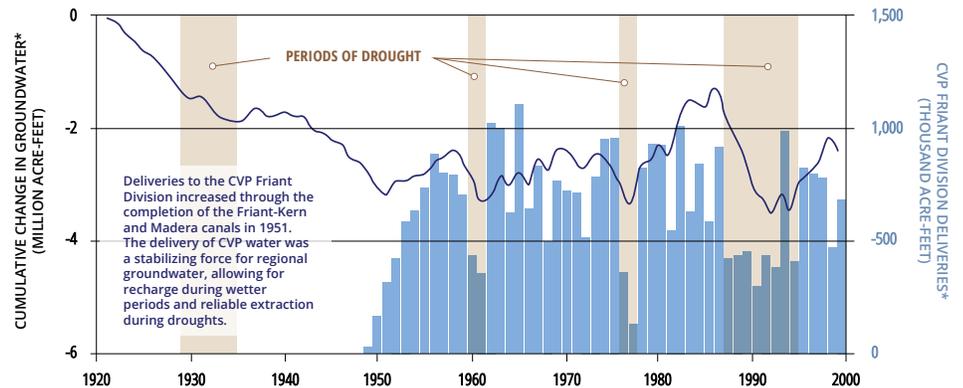
- 1** Net water use, 13.3 million acre-feet per year (MAF). This is the historical "demand" for water in the San Joaquin Valley, principally driven by agriculture, but inclusive of cities like Fresno and dozens of disadvantaged communities that support the agricultural economy.
- 2** San Joaquin River Outflow, 3.5 MAF. Releases to the San Joaquin River are tightly managed and driven largely by regulatory requirements that are becoming more stringent for all of the rivers that flow to the Delta. California's State Water Resources Control Board (Water Board) is considering increasing outflow requirements to 40 percent of natural inflow.
- 3** South of Delta Imports, 4.9 MAF. Imports are subject to future reductions as species in the Delta decline. Imports are expected to diminish to 3.8 MAF in the decades ahead in a continuation of policies aimed at restoring aquatic ecosystems that have been failing – despite increasing reductions in imports – for the past 30 years. This means the San Joaquin Valley can expect further reductions in surface water by perhaps 0.5 MAF in the short-term.
- 4** Groundwater Overdraft, 1.8 MAF. Overdraft expresses the scale of water imbalance of the San Joaquin Valley. Groundwater is drafted to backstop shortfalls in surface water, but is being extracted at rates that exceed replenishment, hence the term "over" draft. With the expected reductions in South of Delta Imports, imbalance in the valley would increase to 2.9 MAF per year. The imbalance could grow further still, if the Water Board requires additional outflows from the San Joaquin River and its tributaries.

THE VALLEY'S GROUNDWATER IS OF VITAL IMPORTANCE

Overdraft occurs when groundwater is extracted faster than it is replenished. Overdraft, if done only in dry years, can be part of a balanced conjunctive use project. The Friant Division, as one example, was designed with the expectation that groundwater would serve as a backstop for dry conditions, and that heavy surface water deliveries in wet years would allow the regional groundwater to replenish.

The Friant Division was designed to bring stability to groundwater in the eastern San Joaquin Valley, which was threatened in the 1930s by decades of groundwater overdraft. The Friant Division's two canals – the Friant-Kern and the Madera – deliver high-quality surface water from the San Joaquin River to support crops and cities, and in doing so brought balance to groundwater within the region for over 50 years. For a half-century, the Friant Division maintained a stable surface and groundwater supply that supported a world-class agricultural sector that in turn supports numerous communities and businesses. (See figure to the right.)

WATER DELIVERIES TO THE FRIANT DIVISION KEPT REGIONAL GROUNDWATER STABLE THROUGH MULTIPLE CYCLES OF DROUGHT



*Conditions represented for eleven Friant Division contractors with early participation in the CVP, and collectively representing about half of the Friant Division (55-percent of Class 1 and 46-percent of Class 2 contracts). Information for the combination of conditions at: Delano-Earlimart Irrigation District (ID), Ivanhoe ID, Lindmore ID, Lower Tule ID, Porterville ID, Saucelito ID, Shafter Wasco ID, South San Joaquin Municipal Utility District, Stone Corral ID, and Tulare ID.

However, changes in recent decades have eroded the previous stability of the Friant Division. Challenges include the record-setting drought, implementation of a settlement agreement that reduces Friant water supplies to restore salmon below Friant Dam, and

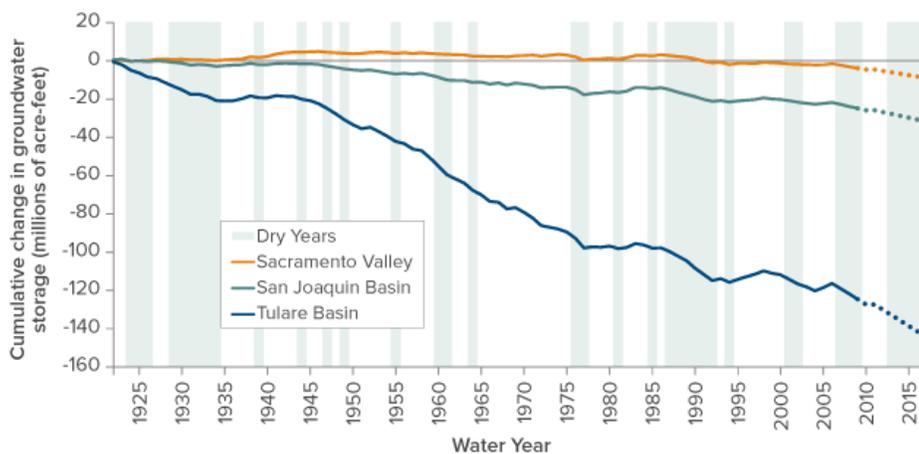
sustained regional groundwater overdraft throughout the greater San Joaquin Valley. Together, these factors have impacted the ability of the Friant Division to serve the eastside of the San Joaquin Valley.

THE PERILS OF SUSTAINED REGIONAL GROUNDWATER OVERDRAFT

Groundwater connects nearly all water users in the San Joaquin Valley, including the Friant Division. The valley has experienced sustained groundwater overdraft for the past century, exacerbated by reductions in South of Delta Imports and development of additional lands that lack access to surface water (also known as "White Lands" because

they appear as blank spaces on maps depicting districts with surface water).

The San Joaquin Valley as a whole has experienced sustained overdraft for the past century, evidenced by groundwater storage for the San Joaquin and Tulare basins.



Sustained overdraft leads to significant problems such as the dewatering of wells (as experienced by communities throughout the valley in 2016) and land subsidence – where the voids that otherwise contain water in aquifers physically collapse. Dewatered wells can leave communities and farmers without any dry-year water supplies and result in a race to drill deeper and deeper wells – at least for farms and communities that can afford the expense. Land subsidence can permanently reduce the holding capacity of aquifers, and the physical displacement of the terrain can damage roads, bridges, and canals. In the past two years alone, segments of the Friant-Kern Canal have subsided almost three feet; these segments now convey less than 40 percent of their designed operating capacity.

Download materials on subsidence effects on the Friant-Kern Canal, here:
<http://bit.ly/FKC-Sub17>

SOURCE: Historical data through 2009 from the California Department of Water Resources; PPIC estimates after 2009. E. Hanak, et al. "What if California's Drought Continues?" August 2015. Public Policy Institute of California.

A LOOK AT THE OPTIONS: SOLUTIONS FOR IMBALANCE IN THE SAN JOAQUIN VALLEY

To address groundwater overdraft, the California Legislature enacted the Sustainable Groundwater Management Act (SGMA) in 2014. This legislation directs local agencies and stakeholders to develop and implement strategies to sustainably manage their groundwater resources by specified dates. If local agencies fail to act, SGMA directs the State to intervene. The SGMA legislation is intended to guard against the undesirable effects of sustained overdraft, such as subsidence and dry wells.

Putting things simply, there are two general strategies for making up for the present 2 to 3 million acre-feet per year in sustained overdraft: 1) increases in surface water recharge, and/or 2) reduce groundwater use. In truth, a combination is needed.

STRATEGIC APPROACH 1

INCREASE SURFACE WATER USE TO RECHARGE GROUNDWATER

Additional surface water can be used to increase groundwater recharge by either (a) ponding up surface water on land and allow the water to infiltrate into the ground, which can have benefits for wildlife, or (b) reductions in pumping groundwater and instead use a like amount of additional surface water. This second method, known as “in-lieu recharge,” is the most effective way to immediately reduce overdraft without retiring land.

INCREASE RECHARGE FLOOD WATER

Are increases in the capacity to infiltrate flood water the answer?

In part, with the right investments. The only NEW surface water that can be captured from the Valley is water in excess of regulatory outflow requirements. Wet conditions occur in three or four years per decade, and for shorter durations than are required to infiltrate them. If these high flow events were captured and stored for later use, the offset to groundwater overdraft could range between 100 to 400 thousand acre-feet per year. The higher end of that range would require significant improvements in surface storage, conveyance, and/or groundwater banking facilities.

IMPROVING RELIABILITY OF DELTA SUPPLIES

Can the restoration of Delta water supply reliability reduce groundwater use?

In part, but it will require new infrastructure and/or legislation. A core purpose of the Friant Division was to address groundwater overdraft in the San Joaquin Valley with additional surface water diverted from the Delta. Currently, water users in the San Joaquin Valley hold approximately 7.4 million acre-feet water delivery obligations from the Delta. However, the current average annual delivery capability is around 4.1 million acre-feet. The proposed California WaterFix tunnels are intended to deliver water more effectively South of the Delta, and could increase reliability from the Delta to the San Joaquin Valley by as much as 1 million acre-feet. The only other way to increase this reliability is by changing regulations that have required more flows from reservoirs to bypass the pumps in the Delta, which are in place to increase habitat for fish. Federal legislation could also increase the reliability of Delta deliveries by approximately 1 million acre-feet per year, and with appropriate application of science or investment in core habitat needs, can be done without significant impacts to Delta species.

STRATEGIC APPROACH 2

REDUCING TOTAL GROUNDWATER USE

Of the methods for reducing groundwater use, the following three approaches are perhaps the most prevalent in discussions for how to manage the demand for groundwater in the San Joaquin Valley. However, each has important limitations that affect their ability to fully address the overdraft.

WATER RECYCLING

Will recycling water (e.g. using treated wastewater instead of returning it to rivers) help?

Probably not. Recycling only works when there are no regulatory requirements for river flows. In the San Joaquin Valley, most outflows to the Delta are required under Federal and State law.

WATER CONSERVATION

Will using less water per acre of crops (or lawns or showers) help?

Not without land retirement or restrictions on municipal growth. Achieving reductions in total demand is the goal, and conservation will not be successful if each water user reduces their net use, but the total acreage or number of water customers increases. Further, some agricultural practices are a source of groundwater recharge, and their elimination will have severe local effects on groundwater that were seen in disadvantaged communities during the recent drought.

CROPLAND RETIREMENT

Can reducing irrigated land help with groundwater overdraft?

Yes, but at a large cost to the Valley and its communities. Although it varies by crop and cultural practices, land retirement can reduce groundwater overdraft between 2 and 5 acre-feet per acre of land retired. The impacts of land retirement are significant, as reduced agricultural activity directly affects the State and local economies. Further, agriculture jobs tend to be concentrated in disadvantaged communities, where few alternatives for employment exist, placing these communities at an elevated risk.

The Recharge Challenge

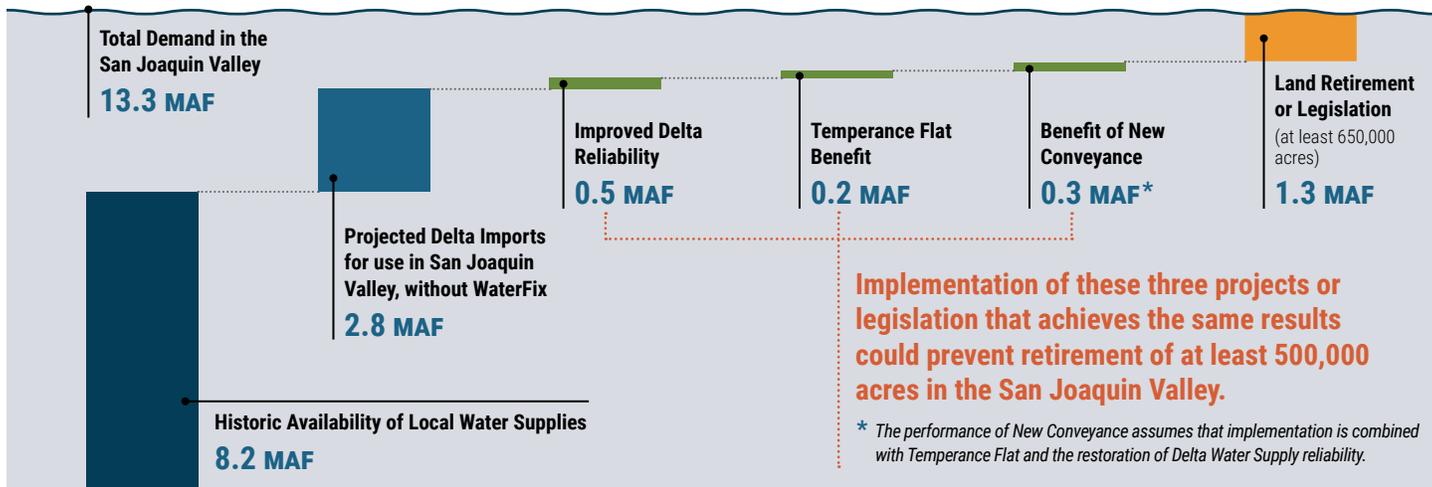
A critically important point is that increases in surface water must come from flows that are otherwise unnecessary for meeting regulatory streamflow requirements, such as outflows to the ocean. If those flows were otherwise meeting outflow requirements, then a like amount of water will be needed from some other source to meet the flow requirement and the net result is no benefit to recharging groundwater.



MOVING FORWARD

The San Joaquin Valley is running out of time to reach sustainability and end the overdraft of groundwater. The solutions, however, are not entirely in the hands of those in the Valley. State and federal elected officials and agencies ultimately dictate the ability to implement the solutions necessary to solve the problems. We should not overcomplicate this, the math is simple and the solutions are limited. Too many interest groups have been distracting decision-makers with potential solutions that won't solve the problem (e.g., conservation) and potential environmental impacts of water resource operations that are either overstated or could be mitigated without further reductions to water supplies.

CLOSING THE GAP: MAXIMIZING OUR RESOURCES PORTFOLIO TO MINIMIZE LAND RETIREMENT



THE TIME IS NOW FOR THE STATE AND FEDERAL ADMINISTRATIONS, CALIFORNIA LEGISLATORS, AND THE U.S. CONGRESS TO TAKE CLEAR AND TRANSPARENT POSITIONS ON HOW THEY WANT TO SOLVE THIS PROBLEM.

FRIANT WATER AUTHORITY

For more information or media inquiry, please contact: info@friantwater.org

Download a PDF of this handout, here: <http://bit.ly/Friant-Balance>

How Subsidence Threatens Sustainability

Why is land subsidence occurring?

Groundwater overdraft occurring near the Friant-Kern Canal has re-initiated a rapid pace of land subsidence on the east side of the San Joaquin Valley. The re-emergence of subsidence threatens the sustainability of the Friant Division through the formation of a capacity constriction on the Friant-Kern Canal at milepost 100, approximately two-thirds of the way down the canal. Primarily, the recent subsidence is driven by groundwater overdraft occurring outside of the Friant Division.

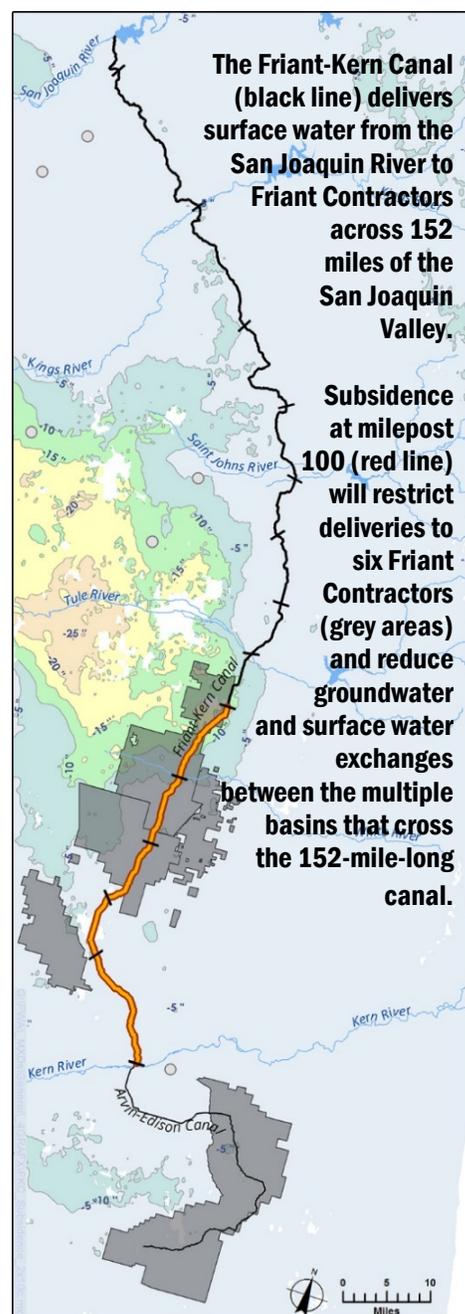
Who is affected?

The loss of capacity to this 152-mile-long canal will limit exchanges across the region that are likely to become more important with the implementation of SGMA. Currently, groundwater banks are more plentiful beneath the constriction, including those that can be accessed through an intertie with the Cross-Valley Canal. Districts throughout the Friant Division will lose access the groundwater facilities downstream of the constriction, hampering water supply exchanges that will affect the region.

Within the Friant Division, **six districts are most acutely impacted** by subsidence on the Friant-Kern Canal. Collectively, **these districts irrigate more than 330,000 acres in Tulare and Kern counties** and have over one-third of the Friant Division Class 2 contract volume. The availability of Class 2 water supplies varies year to year, from zero to 100 percent of contract volumes. This variability serves a foundational role in the Friant Division's conjunctive management design, providing sustainability by allowing groundwater to recharge when surface water is available.

Ironically – or rather, tragically – **the most pronounced effect of subsidence will be a limitation in surface water deliveries that were designed to recharge groundwater.** The Class 2 supplies are the most likely to be reduced because of their relatively lower priority in the canal. Friant Water Authority (FWA) estimates that **the current constriction will reduce long-term deliveries of Class 2 by around 100,000 acre-feet per year.** These reductions are most likely to occur in years with high inflows to Millerton Lake: for example, FWA estimates that **an additional 300,000 acre-feet could have been delivered in 2017, but for the recent subsidence.**

This reduction in surface water deliveries threatens the sustainability of up to 50,000 acres of Friant land. If implementation of the California Sustainable Groundwater Management Act (SGMA) requires that these lands to be pulled out of production, then **subsidence currently threatens 15 percent of otherwise sustainable Friant lands below the constriction.**



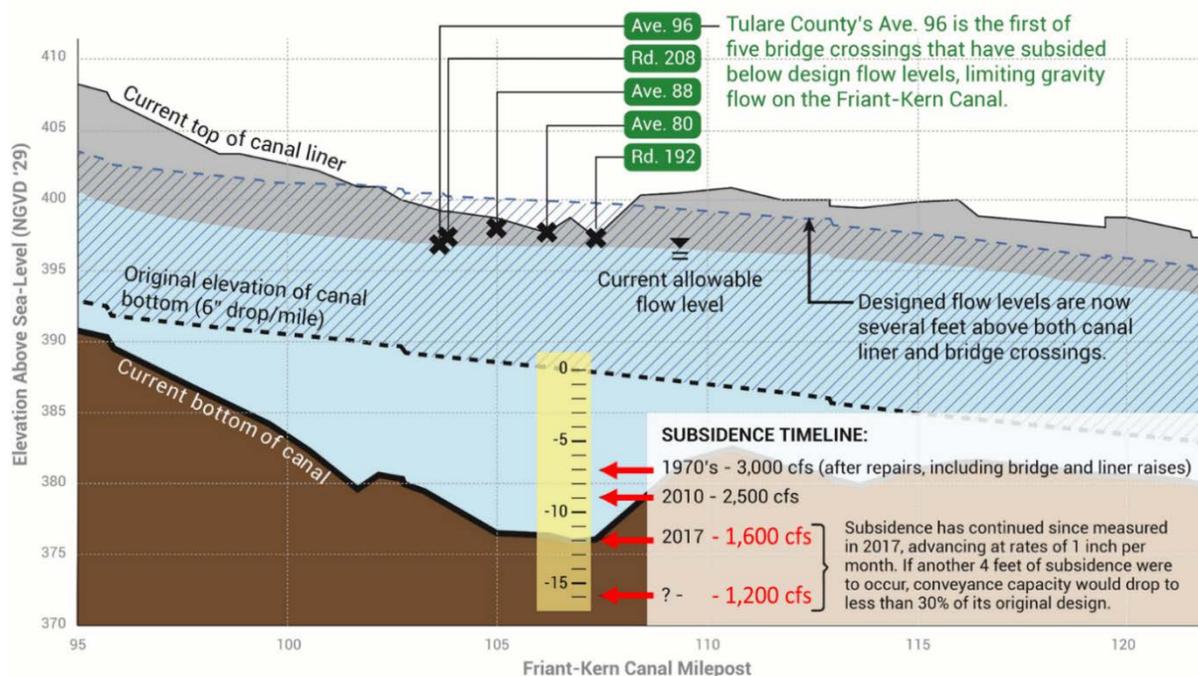
What does the problem look like?

Approximately 90 miles downstream from Friant Dam, the Friant Division's access point to surface water from the San Joaquin River, the Friant-Kern Canal has subsided twelve feet below its original design elevation – including three feet of subsidence experienced within the past three years, alone. As a result, **by April 2017 subsidence had reduced conveyance capacity to 40 percent of its original capacity** (from 4,000 to 1,650 cubic-feet per second; cfs).

Unfortunately, **the high rates of subsidence have continued** along the canal. In 2017, subsidence was continuing at a rate of one inch every month. This may seem trivial, but minor changes in land elevation can have large impacts to the Friant-Kern Canal's capacity because of its "gravity" design. The canal has never used pumps to move water downstream, but instead was designed with a continual slope of 6 inches per mile. This slight grade was just enough to move 4,000 cfs of water when it was designed and built. **If current rates of subsidence are sustained, the canal will be reduced to 30 percent of its original capacity within three years** (1,200 cfs). This would make the delivery of Class 2 supplies below the constriction nearly impossible. As one third of the Class 2 contracts exist below the constriction, this would threaten the sustainability of one third of the conjunctive management capability of the Friant Division as a whole.

In the subsidence areas, this has the effect of reducing canal flows so that water in the canal stays safely below the abutments of several large county bridges (see figure below). The solution, therefore, is complicated by the expense of any construction involving the bridges and the difficulty of predicting future land subsidence.

Friant-Kern Canal: Comparison of Current Conditions to Original Construction



How can I learn more?

Maintaining the Friant-Kern Canal is the primary mission and highest priority of FWA. **This issue will be discussed at upcoming FWA Board of Directors meetings until the Board implements a solution.** These meetings are announced on our website, www.friantwater.org, and the public is welcome. Separately, FWA will also engage with stakeholders throughout the related planning, design, and construction efforts.

Media inquiries may contact: abiering@friantwater.org. Obtain an electronic copy, here: <http://bit.ly/FKC-Impacts>

FWA is a joint-powers authority formed in 2004 by a majority of the water agencies receiving water from the Friant Division of the Central Valley Project. Its primary purposes are to operate and maintain the Friant-Kern Canal and to serve the information and representation needs of its member agencies.