FOUR STEPS TO ANALYZING WATER RISKS

Over the past decade, we have seen numerous shifts in the management of California water. However, none of those shifts have been as significant to California agriculture as we will see in the next few years. Policy, weather, the Sustainable Groundwater Management Act, and data management will forever change the risk profile of the agricultural economy in California. To effectively manage in this new paradigm, there are four steps considered best practice when analyzing water risk in California's agricultural economy:

1. **IDENTIFY**
2. **UNDERSTAND**
3. **MONITOR** *and*
4. **MITIGATE**

ANALYZING WATER RISKS

IDENTIFYING WATER RISK

The frequency of multi-billion-dollar climatic disaster events in the U.S. has been on an upward trend since the 1990s.[1] The largest impacts to water are felt in the agricultural sector.

The 2019 California Economic Summit reported that due to a combination of climate change and population growth an additional one-million acre-feet of water is needed each year for the next 10 years.[2]

The potential for increased land fallowing in the next few years from climatic and regulatory changes made 2018 the year of water risk awareness. Areas with higher groundwater reliance, a large number of permanent crops, and increased water demand inside of a Sustainable Groundwater Management Act (SGMA) designated high priority basin are likely to see increased rates of fallowing. To reduce fallowing, mitigation measures and augmented water supplies must be identified and implemented prior to potential reductions in groundwater pumping. Indeed, as dryer than average conditions continue through 2019,[3] a solid awareness and plan for monitoring and mitigating water risk is crucial for successful agricultural lending and operations.

California faces a harsh new reality of precipitation booms and busts that rival the gold rush days. Much of the state's water storage infrastructure is ill-adapted to capture the rapid run off and flood events that accompany boom phases. Increased uncertainty surrounding the quantity and quality of water is a certain risk, especially when groundwater makes up to 40% of agricultural and domestic water supplies in the U.S.[4] The intensity of groundwater reliance causes major disruption to the surrounding ecosystem when decreased water quality and quantity lead to ground subsidence and interference in the natural hydrological cycle.

High uncertainty, high risk scenario planning is becoming a necessity throughout the U.S. According to the *Fourth National Climate Assessment*, "There is high uncertainty associated with projected scenarios, as they include many future decisions and actions that remain unknown."[5] In the West, the Colorado River, once the artery of modern expansion to the Pacific, is experiencing unprecedented water stress. The Colorado River's flow "has declined by nearly 20% in the last 15 years alone and could plummet another 55% before 2100."[6]

California's agricultural sector is no stranger to dealing with the swings in water quantity from season to season. For example, after surviving an intense drought for several years, 2017 saw an extremely wet year, followed by 2018 as dryer than average year.[7] Figure 1 depicts the up and down nature of drought severity in California since 2000.

The inability to rely on a secure water supply will continue to impact the agricultural sector in California. Surface water supplies are increasingly variable and groundwater, absent signifi-cant recharge to aquifers, is not a long-term solution due to both regulation and damage to the ecosystem. For example, there was more than an acre-foot per acre swing in available water for Westlands Water District between 2016 and 2017, followed by a slightly less dry 2018.[8] This pattern of a one or more acre-foot per acre swing in surface water supply of agricultural land is common among the Central Valley water districts and their southern counterparts. In the past the variability was expected but changes were less extreme. The ongoing overdraft conditions in many basins results in a dwindling groundwater supply and an increase in groundwater quality issues.

Water supplies and quality are further impacted by atmospheric rivers: large storm events that dump extremely large amounts of precipitation in short time-frames. The resulting impact is higher rates of flooding at such an intensity that reservoirs must release more water to prevent large-scale flooding (meaning that the water is lost out to sea), and also reduced available supplies for dry months. Thirteen Atmospheric Rivers pounded the U.S. west coast from October 2017 to November 2018.[9]

UNDERSTANDING WATER RISK

2018 was a busy year for California and the Federal government. Issues related to water supply impacted water risk management the most in 2018 and continue into the foreseeable future. Understanding the climatic water risk must be done so in the context of policy and regulation. The Sustainable Groundwater Management Act (SGMA) and other water regulation are key aspects of water risk in California.

SGMA

The SGMA's first major deadline looms for GSAs in critically overdraft groundwater basins on January 31, 2020. Entering the final phases of Groundwater Sustainability Plan (GSP) drafting, 2018 saw the finalization of most GSA boundaries and an intensive focus on groundwater mod-eling, budgets, sustainable yields and allocation criteria. Expect draft GSPs to appear and circu-late for comment in the summer of 2019. The Impact to water risk will not be felt immediately in 2019, but indications of how the GSP will impact each lender and farmer will become clearer. 2019 will also feature increased activity by organizations as they either support or reject the draft GSPs. Additionally, the option to initiate a groundwater adjudication may be exercised in GSAs that are unable to strike a balance between the various stakeholders within their boundary.

One can expect SGMA to drive an increase in groundwater banking, both to improve thresholds for sustainable yields and simply because banked water can be sold at a later date for profit. Understanding how GSAs are regulating groundwater, and who is banking what, where, and how much will inform water risk decisions and shine a light on the problem of long-term overdraft in some of the highest value agricultural regions in the country. Careful planning on augmenting surface water supplies while either drawing very lightly upon, or even replenishing, groundwater is a best practice as we move further into 2019.

OTHER REGULATORY TRENDS

One of the largest impacts to water supply for agricultural use is the Bay Delta Plan, together formerly called the Bay Delta Conservation Plan. The State Water Resources Control Board (SWRCB) adopted the plan and accompanying environmental documents on December 12, 2018. This means more water must be used for inflows to support fish and the Delta ecosystem. While there is agreement that the ecosystem needs improvement, the science and calculations are typical targets of dispute. There is "wiggle room" built into the requirements that will allow a science-data driven case for reducing or raising the percentage of flows dedicated to the environment highlighting the importance of monitoring, data collection, and actionable analysis.

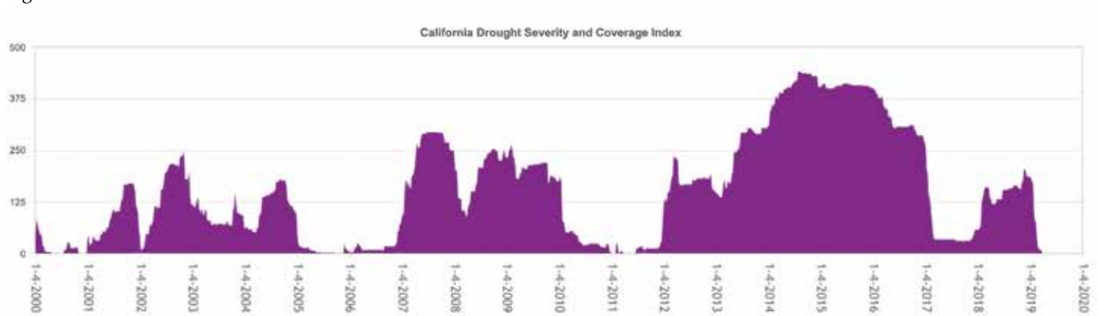
The CalWaterFix and California EcoRestore projects increases uncertainty for the future of agricultural water supplies in the Central Valley. This past year saw a multitude of hearings at the SWRCB as interests from farming, industry, public agencies, and environmental groups testified to the impact these projects would have on their respective constituencies. Recent chang-es in leadership at the SWRCB continue the trend of uncertain policy enforcement from the State. Legal challenges and regulatory changes will continue to increase risks for future investment in water infrastructure.

MONITORING WATER RISK

Analyzing the heap of data now becoming available produces valuable insights. Data analysis can result in a general high-level risk assessment using environmental indicators to get a snap-shot of the ongoing risk associated with a water district or groundwater basin. It can also enable "drill-downs" to individual ranches or land parcels. Data supplied through public sources, collaborative exchanges, and private databases, combined with steady improvements in the preci-sion, range and accuracy of weather forecasts, can assist with tackling a problem that impacts the entire agricultural industry.

We enter unprecedented times; it is no longer the case that a lender or farmer can rely purely on a historical understanding of water supplies in

Figure One



a district. Changes related to climate change, population and regulation require a modern approach utilizing advanced technologies. Trusted partnerships to monitor water risk to lenders and farmers throughout California are essential. The truth is 2019 will require collaboration among diverse parties as we enter our new water reality that encounters high water risks at an alarming rate.

MITIGATING WATER RISK

AQUAOSO Technologies recently partnered with California Chapter ASFMRA to provide a free water map to assist the community in identifying, understanding, and monitoring water risk. When analysis indicates water supplies are low, and poor conditions are likely to occur, a miti-gation strategy is needed. One interesting development linked to the implementation of the SGMA is the power of a GSA to facilitate groundwater transfers within its boundaries, such as conjunctive use programs that utilize the exchange of water between surface and groundwater supplies to balance agricultural need and groundwater basin health. We may also see groundwater credits and surface water markets take hold in California allowing flexibility in water management as swings in climate continue to disrupt water management strategies.

Advanced technologies allow for the increased collection and analysis of data that is required for flexible water management solutions such as conjunctive use programs and water markets. Under California Water Code Section 1011.5(a), the state declares, "policy of this state to encourage conjunctive use of surface water and groundwater supplies and to make surface water available for other beneficial uses." Conjunctive use contemplates using water supplies only when needed, which made water right holders uneasy due to concerns over forfeiture or diminishment of their water rights for nonuse. However, the legislature ensures participants in conjunctive use programs would not forfeit or diminish their surface water rights by relying on stored groundwater.

The legislature allows water that is saved as a result of conjunctive use program to be "sold, leased, exchanged, or otherwise transferred" if it complies with laws governing transfers. As a management tool, it allows flexibility in utilizing surface and groundwater to meet users' needs and is an inexpensive way to store groundwater or reserve surface water in a stream for various beneficial uses.

A better picture of water risk and the ability to move water between surface and ground will allow water markets to base their operations on solid data. Water markets offer a flexible water management solution for water districts, GSAs, andwater right holders to move water when needed and provide an economic incentive for doing so. Having the programs and agreements in place prior to major swings in precipitation can effectively mitigate many risks that continue to threaten California Agriculture.

FOUR STEPS AWAY

Looking at our ever-evolving water landscape can be overwhelming as regulatory requirements and natural conditions are always on the move. AQUAOSO's four-step framework uses sound data and advanced technology to increase your knowledge and give you the tools to make better informed water management decisions. Implementing the four steps, building relationships, and working with your community on mitigation measures is a recipe for success.

AQUAOSO Technologies, PBC is a Public Benefit Corporation with a mission to build a water resilient future. AQUAOSO provides advanced water risk management and mitigation tools for the agricultural economy. Farmers, brokers, appraisers, lenders, insurers and water managers use our tools daily to identify, understand and mitigate water related risks.

www.AQUAOSO.com

1 Lall, U., T. Johnson, P. Colohan, A. Aghakouchak, C. Brown, G. McCabe, R. Pulwarty, and A. Sankarasubramanian, 2018: Water. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.). U.S. Global Change Research Program, Washington, DC, USA, pp. 145–173.doi: 10.7930/NCA4.2018. CH3.

2 Lall, U., T. Johnson, and P. Colohan et al., pp. 145–173.doi: 10.7930/NCA4.2018. CH3.

3 University of California San Diego, Scripps Institute, Odds of Reaching 100% Normal Rater Year, http://cw3e.ucsd.edu/odds-of-normal-water-year -precipitation/

4 Lall, U., T. Johnson, and P. Colohan et al., pp. 145–173.doi: 10.7930/NCA4.2018. CH3.

5 Id. P.160

6 Paige Blankenbuehler, "How best to share the disappearing Colorado River," quoting Brad Udall of the Colorado Water Institute. Dec. 20, 2018 https://www.hcn.org/articles/water-how-best-to-share-the-drought-plagued-colorado-river.

7 Paige Blankenbuehler, "How best to share the disappearing Colorado River," quoting Brad Udall of the Colorado Water Institute. Dec. 20, 2018 https://www.hcn.org/articles/water-how-best-to-share-the-drought-plagued-colorado-river.

8 Analysis of water supply data supplied by Westlands Water District.

9 Center for Western Weather and Water Extremes, University of San Diego Scripps Institute, http://cw3e.ucsd.edu/wp-content/uploads/2018/12/WY2019NovSummary/WY2019NovSummary.pdf.