

WATER MARKET INSIDER

Q2, 2020

Supply & Demand: An Update on California's Spot-Market Responses to Hydrologic, Institutional, and Management Indicators

Overview

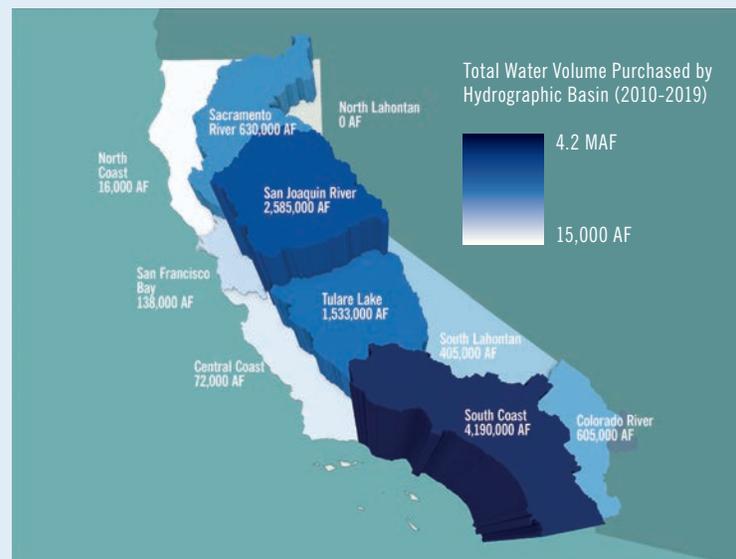
This issue of the Water Market Insider explores how the spot-market price of water observed across California responds to certain hydrologic, institutional, and management indicators. Scarcity, whether a result of policy decisions or natural conditions, directly influences market prices. The water market has often experienced a lack of readily available information for buyers, sellers, and observers alike – particularly when it comes to price. However, as a result of a partnership between Nasdaq, Veles, and WestWater Research, the transparency of California's water market has increased significantly with the launch of the Nasdaq Veles California Water Index (NQH20). The first of its kind, this index provides a benchmark for the spot-market price of water rights transacted across the state.

California's Water Market

California is home to one of the most active and dynamic water markets in the western United States. In 2019 alone, the state saw over \$1.1 billion in water market activity. The purchases included surface water, groundwater, stored, and other supplies spanning several market regions and water systems. Transaction structures are also relatively dynamic. Market participants actively transact through exchanges, single-year and multi-year leases, and permanent sale arrangements. The market is expansive, with many participants transacting across hundreds of miles of well-plumbed and interconnected systems. Consistent and competing demands stemming from urban growth and hardening crop water needs, among other factors, have driven a growth in participation in California's water market in recent years.

Where is the Water Going?

Between 2010 and 2019, over 10 million acre-feet (MAF) was transferred in the California water market. The greatest number of transactions by volume were located in the state's agricultural and urban centers south of the Sacramento-San Joaquin River Delta (Delta). These are also the areas that rely most heavily on imported supplies through major infrastructure projects, such as the Federal Central Valley Project (CVP), State Water Project (SWP), Los Angeles Aqueducts, and Colorado River Aqueduct.



Long-Term Spot-Market Trends

Since the early 1990s, the average spot-market price of water in California has trended steadily upwards and experienced greater volatility. Part of this price volatility is due to more variable supply allocations resulting from both hydrological and regulatory conditions, impacting SWP and CVP contractors. California's extreme drought, which extended from 2013 – 2017 resulted in the sharpest increase in price volatility observed in the market's history. Additionally, price appreciation and volatility are being driven by the entry of new market participants. Some of these entrants have joined the marketplace as part of ongoing efforts to optimize their water supply management strategy. Others have joined out of necessity driven by record-low allocations and the Sustainable Groundwater Management Act, the latter of which is anticipated to reduce the overall supply of water available to wide swaths of California as groundwater basins are brought into balance through reductions in groundwater pumping and other actions.

Short-Term Scarcity Indicators

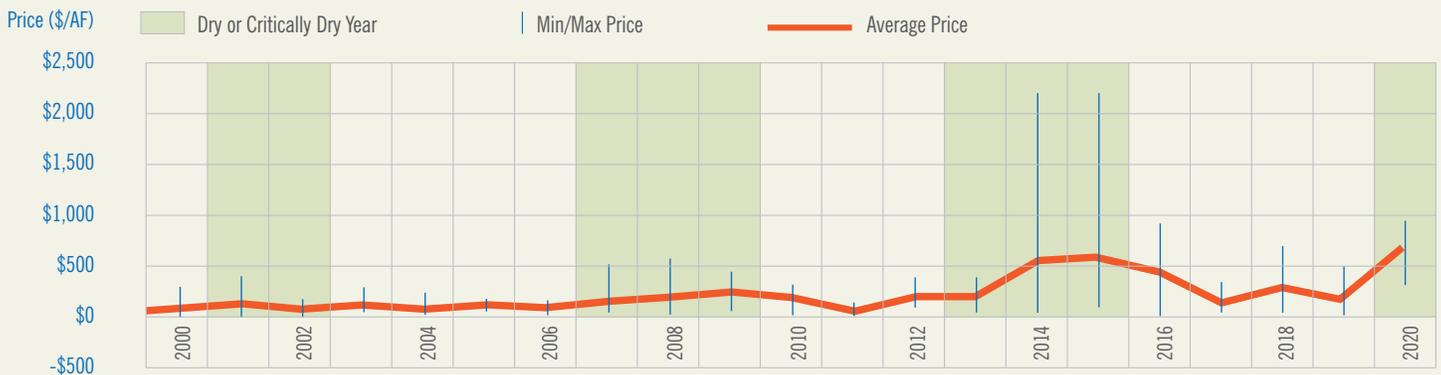
The California water market, like many other markets, operates in cycles. While there are numerous factors that are likely to influence the spot-market price of water, three key indicators provide valuable

insights regarding California's short-term water scarcity and exhibit a strong relationship with NQH20's price index:

- **Hydrologic Indicator:** Snowpack, as observed according to percent of long-term average across various key California regions and statewide.
- **Institutional Indicator:** Water project allocations, per the announced SWP Table A and CVP South-of-Delta Agricultural Contract (SOD) allocation rates.
- **Management Indicator:** Reservoir storage, as reflected by the percent of long-term average of major reservoirs managed by the SWP and CVP systems.

Each of the above indicators exhibit a negative correlation with the spot-market price of water, as reflected by NQH20. For example, in years that experience low SWP and CVP allocations, prices trend higher. The spot-market price is also responsive to weekly changes in supply conditions. As snowpack and reservoir storage trend lower than their historical averages (i.e. less than 100%), spot-market prices generally begin to increase. CVP and SWP allocation announcements resulting in higher allocations, increasing overall supply available in the market, also typically correlate with a lowering of the NQH20 index price.

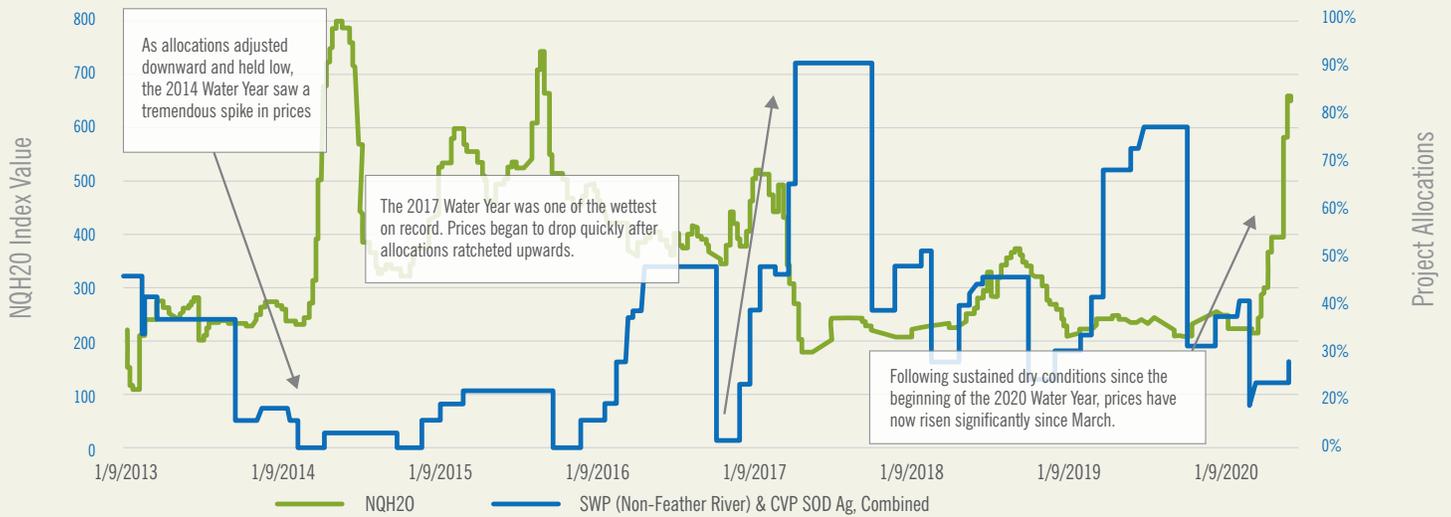
SPOT-MARKET PRICES AND VOLUMES TRANSFERRED



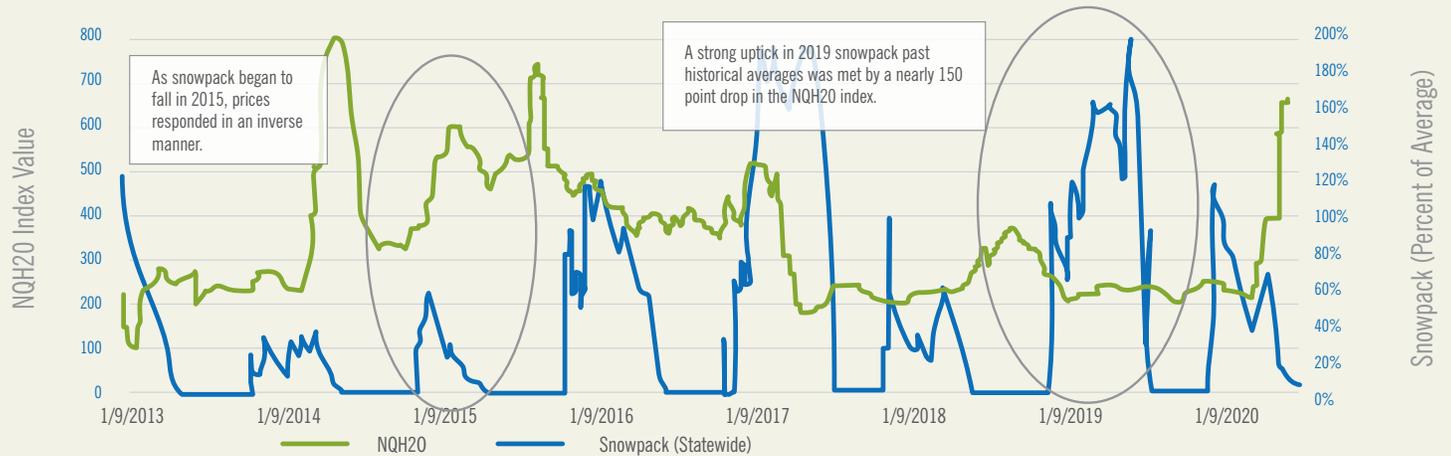
UNIQUE MAJOR WATER MARKET PARTICIPANTS BY YEAR



NQH2O & MAJOR PROJECT ALLOCATIONS



NQH2O & CALIFORNIA SNOWPACK



NQH2O & RESERVOIR STORAGE





Snow fall around Lake Tahoe and Donner Pass

This Year's California Market Outlook – Dry and Expensive

California is off to a dry start for Water Year 2020. The recent May 1 forecasts of the Sacramento Valley and San Joaquin Valley Indices both projected a Dry hydrologic year. CVP SOD Ag and SWP allocations, as of early-June, are also both holding at 20%. The water market has responded accordingly. While the NQH20 index held relatively stable through the beginning of the year, particularly as water suppliers awaited better project allocations, the index value began to rise significantly in March as water supply conditions failed to dramatically improve.

What do these indicators mean for California water suppliers this year?

- **Current Supplies:** Allocated surface water project and river supplies, derived from contracts or water rights, are likely to be well below their historical running averages.
- **Stored Supplies:** California is entering this water year with an extremely wet year in close hindsight. While dry conditions will reduce current year inflow, reservoir storage provides a decent buffer, particularly when comparing current year reservoir levels to those experienced during the most recent drought.
- **Future Prices:** The availability of stored supplies has muted some of the potential price shock. However, conditions over the next few months are likely to keep prices high as irrigation and municipal demand rise through the summer. Additional price increases beyond those already observed would not be unlikely.

ABOUT WESTWATER RESEARCH

WestWater Research (“WestWater”) is the leading economic and financial consulting firm specializing in water rights and water resource development in the United States. With a national practice and offices in four western states, WestWater provides market intelligence, valuation, transaction advisory, economic and strategic planning, and asset management services relating to water resources. The firm has a reputation for rigorous analysis, and information-driven water rights investment strategy formulation and execution. This reputation has been earned over 15 years through advising private, public, and non-profit sector clients on over \$700 million in water rights transactions. Recent transactions have included public-private partnerships for acquisition and development of reclaimed water in the southwestern United States, two of which have been nominated by Global Water Intelligence for “Water Deal of the Year.”

www.waterexchange.com or 208.433.0255