Kaweah Subbasin Water Marketing Strategy
Introduction for Committee Members: Case Studies of Existing Water Markets

Jeremy Barroll, Assistant Engineer
Tulare Irrigation District

December 14, 2020

Introduction

This report is meant to be an informative introduction for Kaweah Subbasin Water Marketing Strategy Committee members on different possible water marketing approaches using case studies of existing water markets in Nebraska, Australia, San Bernardino County and Texas. While these studies provide examples of the sheer variety of possible approaches, each has its own strengths and weaknesses concerning measurement accuracy, degree of oversight, administrative overhead, quantification of allocations, geographic limitations, participant limitations and pricing.

Case Study 1: Twin Platte Natural Resources District, Western Nebraska

Most of Nebraska sits over the High Plains (Ogallala) Aquifer. While groundwater level decline is not severe on the whole, the main concern in this area is that stream depletion, resulting from unsustainable groundwater use, negatively impacts both the ecosystems and the growers that rely on surface water for habitat and irrigation. In 2007, the Twin Platte Natural Resources District issued a well-drilling moratorium. The District was opposed to well metering, so they instead created a water market where the units of exchange are irrigated acres. The exchange of irrigated acreage represented the first so-called "Smart Market" in the world, in which water allocations are traded through online software. The District certified all of the existing irrigated acreages and allowed growers to anonymously and permanently buy and sell units of irrigated acreage. This approach is only feasible, however, because growers in this area almost exclusively grow corn and soybeans, and therefore irrigation demand per acre is fairly consistent. While it may be an inexact method of trading, it requires very little monitoring or administrative oversight. The District also created a scaling factor for exchanges to account for the degree to which pumping on a given field contributes to stream depletion (i.e. someone can exchange a smaller number of irrigated acres near a stream for a larger number of acres further away from a stream). Transactions are steadily declining as field placement is reaching optimization given the market function, so the market is essentially running its course.[1]

[1] Smart Markets for Groundwater Trading in Western Nebraska: The Twin Platte. https://static1.squarespace.com/static/56d1e36d59827e6585c0b336/t/5805463315d5dbb1ab599f36/1476740670534/Nebraska-Smart-Markets-Young.pdf

Case Study 2: Murray-Darling Basin Authority, Southeastern Australia

Australia has extremely variable rainfall, and over-allocation led the government to implement a national cap-and-trade system for surface water in over-allocated basins over the course of the 2000s. The Murray-Darling River Basin (west of Sydney and north of Melbourne), which includes parts of Victoria, South Australia, New South Wales and Queensland, is the most over-allocated. In most regions of the country, exchange distance is limited, however the geographic limits of exchanges in the Murray-Darling River Basin are more generous due to its high degree of hydrologic connectivity. Australia's surface water rights consist of entitlements and allocations (allocations being a set percentage of the entitlement dependent on rainfall conditions each year), similar to in California. However, both entitlements and allocations can be traded; thus, a trade of entitlement generally represents a permanent trade while a trade of allocation generally represents a temporary trade. In water year 2016-2017, the Murray-Darling River Basin accounted for 97% of the country's allocation trade and 77% of its entitlement trade.[2] Note that for the most part, only surface water can be traded, while groundwater allocations in over-allocated basins are set at sustainable diversion limits calculated for each Subbasin by regional Basin Authorities such as the Murray-Darling Basin Authority. Groundwater trade is only allowed in specific situations, which must be approved by the Basin Authority.[3] State governments in Australia have the authority to measure extraction and enforce sustainable diversion limits and generally require metering.[4] Water can be traded freely on the open market, whereby individuals define the entitlement or allocation that they are selling and ask for a price. Basin Authorities are generally required to allow free trade as long as the exchange is within the geographic limits of hydrologic conductivity that they establish. Therefore, a variety of private-sector platforms have arisen to enable participants to find exchange partners and execute exchanges.[5]

Case Study 3: Mojave Water Agency, San Bernardino County, California

The Mojave Water Agency (MWA) was formed in 1960 to manage and allocate imported water supplies from the State Water Project (SWP) for the high desert communities of San Bernardino County, including areas surrounding Barstow, Victorville, and Yucca Valley, where groundwater

[2] Australian Government Department of Agriculture, Water and the Environment: Snapshot of Australian Water Markets.
https://www.agriculture.gov.au/abares/publications/insights/snapshot-of-australian-water-markets#australian-water-markets-why-where-who-and-how

[3] Murray-Darling Basin Authority: Guidelines for the Water Trading Rules.
https://www.mdba.gov.au/publications/policies-guidelines/guidelines-water-trading-rules

[4] Government of South Australia, Department for Environment and Water: Metering Water Use.
https://www.environment.sa.gov.au/topics/water/water-licences-and-permits/metering-water-use

[5] Waterfind: Water Trading Explained. https://www.waterfind.com.au/water-trading-explained/

levels have generally been falling since the 1950s. The Agency currently has a SWP allocation of 85,000 acre-feet. MWA's service area also includes a modest native supply in the form of the Mojave River, an ephemeral stream originating in the San Bernardino Mountains and running north across a portion of the Mojave Desert to the Barstow Area. The Mojave River's surface flow is insignificant compared to its subsurface flow. In 1990, the City of Barstow and Southern California Water Company (Barstow's drinking water contractor) sued the Cities in the upper part of the Mojave River Drainage (Victorville Area) for causing a reduction of natural Mojave River flow to the Barstow Area. After multiple cross-complaints by various water users in the Region, as well as MWA's pointing out that the entire area is in overdraft, a Stipulated Judgement was arrived at in 1993 binding all parties involved and excepting all water users using less than 10 acre-feet per year. After several years of additional parties becoming involved, the case was settled by the California Supreme Court in 2000.[6] In this Judgment, the Mojave River Drainage was divided into five (5) Subareas. Each Subarea is responsible for its respective downstream Subareas to receive a set fraction of the Mojave River's average natural flow. Thus, each subarea is granted a "Free Production Allowance", decreasing over the first five years after the Judgment to sum to the average natural flow of the Mojave River, and adjustable by the Court. Within each Subarea, each extractor (not including extractors under 10 acre-feet per year) has an allocation based on their "Base Annual Production," or their maximum annual extraction from 1986-1990. This Base Annual Production is then set as a fraction of the Subarea's total Free Production Allowance to calculate the allowance for the individual extractor. Extractors are required to measure their extraction with either a meter or a combination of a pump test and electrical records; measurement methods must be approved and inspected by Mojave Water Agency. When extractors use more than their annual allocation, they can pay for a transfer from another extractor or pay for MWA's corresponding amount of SWP water. These water transfers are all coordinated by submitting water transfer forms to the MWA.[7]

[6] Mojave Water Agency: History of the Adjudication. http://www.mojavewater.org/history.html
[7] Mojave Water Agency: Summary of the Mojave Basin Area Judgment. http://www.mojavewater.org/judgment_summary.html

Case Study 4: Edwards Aquifer Authority, Central Texas

The Edwards Aquifer is a karst aquifer with a contributing recharge zone feeding into a downstream artesian zone which underlies San Antonio. A federal court ruled that the aquifer's excessive pumping threatened several endangered species that depend on flows at artesian springs fed by the Aquifer, and it created the Edwards Aquifer Authority (EAA) as a special district to address the issue. The EAA was required to cap total pumping at a limit of 572,000 acre-feet per year from 2007 onward, which was formulated as the sum of all permits in 2005 (Texas requires permitting for all wells with the exception of domestic and livestock wells up to 25,000 gallons per day/28 acre-feet per year, however these wells must be physically unable to pump more). All permitted wells in the EAA's service area are required to have meters installed, and EAA staff inspect them annually.[8] The EAA assigned allocations giving preference to historic users, with historic irrigators entitled to up to 2 acre-feet per acre annually, with only 1 acre-foot of their 2 acre-feet annual allocation being transferable. Transfers are conducted privately, although the EAA has a page on their website for sellers. Because sellers can set any asking price, prices have steadily increased with increasing demand, and the EAA estimates that a typical price for a pumping right is $5,000 per acre-foot. Transfers out of the aquifer are not allowed. Initially, water could be transferred anywhere within the aquifer as it has very high transmittivity due to its karst composition. However, a limitation was added because of impacts on the springs caused by large transfers from West to East called the Cibolo Creek Prohibition, which limits the amount of water that can be transferred from the west side of Cibolo Creek to the east. Therefore, water on the East Side has become more valuable, selling for as much as $10,000 per acre-foot.[9]

[8] Edwards Aquifer Authority: Automated Meter Reading.
https://www.edwardsaquifer.org/business-center/meters-reporting-your-use/automated-meter-reading/
[9] Amy Hardberger: Texas Water Markets and the Edwards Aquifer.
https://static1.squarespace.com/static/56d1e36d59827e6585c0b336/t/5805468415d5dbb1ab59a3a9/1476740751543/Texas-Groundwater-Markets-Hardberger.pdf

Conclusion

There are many possible takeaways from these four (4) cases studies:

- Twin Platte Natural Resources District defines allocations by irrigated acreage; Murray-Darling Basin Authority defines allocations by surface water rights; Edwards Aquifer Authority defines allocations by historic usage; and Mojave Water Agency defines allocations by a combination of surface water rights and historic usage.
- Mojave Water Agency has a very centrally-controlled Market in which the Agency itself handles the individual exchanges and sets prices, while the others are relatively hands-off free market systems. Twin Platte Natural Resources District provides the platform for exchanges, however Murray-Darling Basin Authority and Edwards Aquifer Authority do not.
- Mojave Water Agency and Edwards Aquifer Authority both have corollaries to the *de minimus user* concept present in the Kaweah Subbasin Groundwater Sustainability Plans, in which extractors that use less than 2 acre-feet per year are exempt from extraction reporting and extraction limitations; however, both Mojave Water Agency and Edwards Aquifer Authority are substantially more generous in how they define exempt users.
- All of the agencies in the above case studies define geographic limits of exchanges by subbasin hydrogeology except Twin Platte Natural Resources District, which attaches a geographically defined exchange factor to each irrigated property to encourage exchanges in certain directions.
- All of the agencies in the above case studies require metering or a similar alternative except for Twin Platte Natural Resources District, which quantifies irrigated acreage rather than groundwater extraction.