

PROGRESSIVE WATER SOLUTIONS: INNOVATIVE MARKET SOLUTIONS FOR EFFICIENT GROUNDWATER MANAGEMENT

ON THE WEB AT: <http://fiesta.bren.ucsb.edu/~pws/>

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Introduction

Freshwater reliability is a critical challenge facing Californians. Population growth, urbanization, and climate change are expected to exacerbate the water scarcity problem in the future. Water is arguably our most valuable natural resource because it has no substitutes, we consume it directly, and it is used in virtually every segment of the economy. In order to ensure a prosperous future, Californians must ensure reliable water supplies.



Californians get about 1/3 of their water resources from groundwater. However, groundwater use in California is poorly regulated. Markets can be a useful tool for managing this resource, and informal markets have sprung up in several groundwater basins to reallocate water between users. These informal markets tend to be extremely inefficient, and there is an opportunity for improvement.

Structured markets in which groundwater rights holders can choose to buy, sell, or lease their pumping rights need to be an integral part of the solution to California's groundwater management problem. Our business, Progressive Water Solutions LLC (PWS), will be a groundwater rights brokerage and consulting firm. Through our innovative *H₂O Exchange* online market, PWS will provide groundwater rights holders with a centralized marketplace to trade pumping rights, offer historical market information to inform user bids, and streamline the process of transferring pumping rights.

California Groundwater

The majority of the water distributed through California's conveyance infrastructure is surface water from rivers, streams, and snowmelt. A second key source of water is groundwater. The groundwater stored in underground aquifers supplies 30% of the state's urban and agricultural water needs during average years and over 40% in drought years. Groundwater is clearly a vital resource, but sustainable management is challenging because of hydrological constraints, weak authority over the resource, and California's exceedingly complex water rights system.

California lacks a mandatory State groundwater management statute, so responsibility for groundwater management has been delegated to local agencies under the authority of the California Water Code. Most landowners in California have the right to pump as much groundwater as they can put to beneficial use. Thus, groundwater is over-pumped as individual landowners determine that the benefits of additional water outweigh the costs of a slightly lowered water table, and the aquifer is depleted for everyone. Groundwater rights can be limited and defined through the courts in a process known as *adjudication*, but this has only been accomplished in 22 of California's 512 groundwater basins. It is likely that with increased water demand, the number of adjudicated basins will also increase.



The relative lack of regulation on groundwater pumping has led to aquifer depletion and other adverse effects in many California groundwater basins. One mechanism for maximizing the availability of groundwater for users who need it most is a market system in which users can buy, sell, and lease



groundwater pumping rights. However, existing groundwater markets in adjudicated basins are inefficient and many groundwater users do not participate, even though it would be to their economic advantage.

Our Business: PWS, LLC

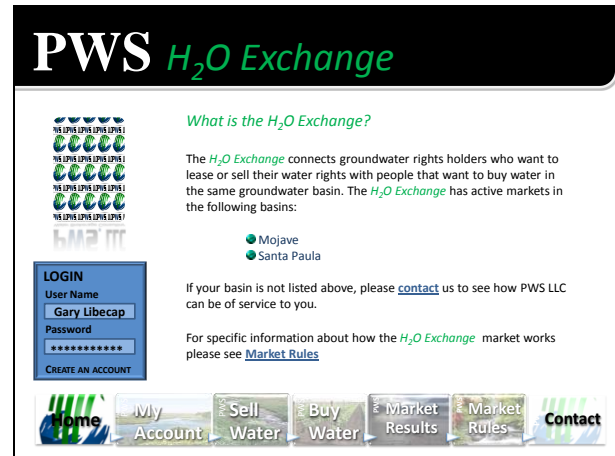
PWS will facilitate the efficient trading of groundwater rights between water users. PWS will harness the power of markets as a means of improving groundwater use efficiency in a way that provides benefits to all water users in a basin.



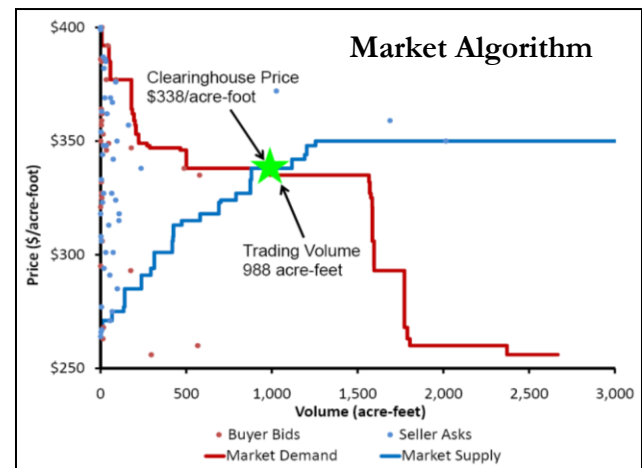
PWS will have two primary business lines. First, we will broker groundwater rights transfers using our proprietary *H₂O Exchange*. Second, we will use our market expertise to consult for basins in the process of adjudication.

Brokerage

The centerpiece of our brokerage business is the *H₂O Exchange* website and market algorithm. It is an easy-to-use online market that operates as a clearinghouse for groundwater rights transfers. It will be available to all water users within an adjudicated basin who hold groundwater rights. Rights holders will be able to trade short-term, long-term, and permanent rights to pump groundwater. This centralized exchange will reduce transaction costs associated with looking for a trading partner, negotiating over price, and filing paperwork.



Our market algorithm balances supply and demand to maximize the benefit to both buyers and sellers of groundwater rights. It provides incentives for buyers and sellers to bid fairly, while ensuring that no single user or group of users can dominate the market.



Consulting

Well-designed groundwater markets can be a tool for increasing conservation and groundwater use efficiency. PWS will provide its expertise in developing groundwater markets to water managers, attorneys, and other stakeholders in basins undergoing or considering the adjudication process. Our *H₂O Exchange* can provide the necessary *physical solution*, or means for water users to obtain additional water, which is required by the courts in order to adjudicate.

Market Potential

Markets for goods with poorly defined rights are not stable and have a high risk of inefficiency or failure. Therefore, implementation of the *H₂O Exchange* requires that groundwater rights be defined in a basin, which limits our market potential to California’s 22 adjudicated basins. Some of these basins already have markets for groundwater, operating at various levels of efficiency. Markets are best suited for adjudicated basins with a large number of parties eligible to trade rights and a large volume of groundwater available for trading. We classified California’s 22 adjudicated basins according to the number of rights holders, the volume of adjudicated water rights, and the revenue we expect to generate by brokering trades. We used four case study basins (Chino, Mojave, Santa Paula, and West Coast) to inform our classifications.



Based on this analysis, we estimate that our market will be viable in 12 of the 22 adjudicated basins in California.

The Triple Bottom Line

PWS will provide economic, social, and environmental benefits to groundwater basins. PWS will benefit water users by allowing them to capture the value of transferring water rights through the *H₂O Exchange*. The *H₂O Exchange* will increase transparency and make returns on efficiency investments more predictable in adjudicated basins with existing groundwater markets as well as adjudicated basins where groundwater markets have not developed.

Triple Benefits

- Economic**
 - PWS LLC maximizes producer and consumer surplus, enabling transfers of water to the highest valued use and generates profits for our business.
- Social**
 - PWS LLC provides politically neutral information about groundwater value and use, enabling water managers and water users to improve long-term planning, increase water supply reliability, and manage risk.
- Environmental**
 - PWS LLC provides better access to local water supplies which are typically less energy-intensive and destructive to ecosystems than imported water. The *H₂O Exchange* also provides a mechanism for qualified conservation groups to purchase water rights for conservation projects.

This provides sellers with an additional revenue mechanism, made available through increased efficiency in water use. In addition to short-term revenue, the ability to sell rights through a transparent market adds value to unsold water as an asset. Buyers of water benefit from increased security in long-term planning through knowledge of market price trends and groundwater availability, and increased efficiency of water use. Potential buyers of groundwater rights via the market can better manage risk through increased flexibility in the supply of water that can be used in short-term and long-term planning.

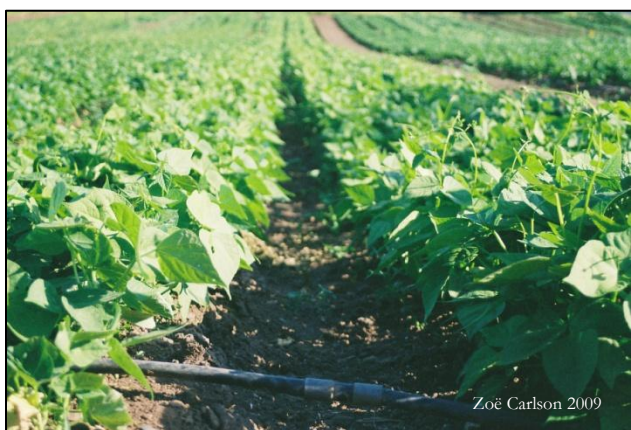
Water is a critical input for nearly every industrial and commercial sector of the economy and essential for residential areas. When a region’s water supply is fixed through natural or legal impositions, there should be a way to shift use over time depending on the needs of the community. Some sectors may wish to expand and will need additional water, while others will contract and use less water. Water markets provide this **flexibility** in supply through time because individuals or sectors can purchase more water when it is needed and sell it when they no longer need it or find economic advantages in doing so.

Water markets can facilitate the **management** of water resources. Many water agencies are looking to take advantage of the vast potential for groundwater storage. Aquifer storage and recovery systems and banking agreements are vulnerable if water agencies are not sure that they will get their water back at a later



time. In non-adjudicated basins, any overlying land owner could pump groundwater that may have been purchased from another water purveyor and stored in the aquifer. That overlying land owner may not have to pay anything for the water because rights are undefined and ownership is unenforceable. In an adjudicated basin, water injected into the aquifer for later use would be protected by pumping limits and fees imposed by the adjudication.

The *price signal* created through water markets will allow water allocation to remain efficient without the need for centralized planning. Markets will move water to those who need it the most and are willing to purchase it at a specific price, time, and place. This access to additional water provides the opportunity for *risk management* that is absent from centralized control of water resources. Furthermore, reallocation can occur in a *politically neutral* manner, avoiding conflicts between sectors. This political neutrality and ability to manage risk becomes increasingly important in the context of inter-annual variation in water supply, and even more so with the uncertainties associated with drought and climate change.



Zoë Carlson 2009

In addition to social/political and economic benefits, the application of our online market to a groundwater basin will provide *environmental benefits* to the basin. The clear price signal from the *H₂O Exchange* provides a strong incentive for conservation of water. If a user can use less water and sell it to another for a profit, he/she will reduce the amount of groundwater

he/she pumps. By providing compensation for those best able to reduce their use, a financial incentive for conservation is created.

Many heavy water users, such as municipal water purveyors, have portfolios of water supplies which include some combination of local groundwater, surface water, imported water, or recycled water. If groundwater trading becomes easier and more transparent, water users in adjudicated basins will have better access to groundwater resources. A real-time price for groundwater will allow for direct comparisons of the costs of various water sources. A local, reliable, and clearly-priced supply of water will be extremely attractive to water users and should encourage shifting of portfolios. This could lead to a greater reliance on local sources rather than imported sources. Local water is much less energy-intensive than imports, and does not require withdrawing water from the already strained Delta ecosystem or depleting the Colorado River.

If the *H₂O Exchange* becomes accepted by the initial participants within a basin, it may be expanded to include parties without adjudicated rights. Qualified conservation groups could then purchase groundwater, either for pumping and discharge to streams for in-stream flows or wetlands restoration, or for maintenance of water table levels for ecological purposes.

Conclusion

California's groundwater management system is broken, but PWS provides an opportunity for improvement. A centralized, online market that yields a clear price signal for groundwater will provide multiple benefits for water users within a basin. By using the power of markets, PWS will be extremely profitable while providing social, economic, and environmental benefits, proving that it is possible to do well while doing good.