Water Conservation's Role in California Water Transfers

Charles M. Burt, Ph.D., P.E.
Chairman, Irrigation Training and Research Center (ITRC)
California Polytechnic State University (Cal Poly)
San Luis Obispo, CA 93407 cburt@calpoly.edu

This paper describes various irrigation district water transfer projects. Water transfers have been of many types, including agriculture to agriculture, agriculture to urban, and agriculture to environment. In each case that will be described, the unique circumstances of each district will be described. Typical actions include developing a water balance to determine if "wet water" truly exists for conservation, then identifying the sources of that wet water. Subsequent actions include developing designs that will conserve the water, achieving board approval, and constructing and implementing the conservation measures.

California is "water challenged" because the water sources are often at opposite ends of the state from the large water users. Figure 1 clearly shows the geographical rainfall discrepancies.

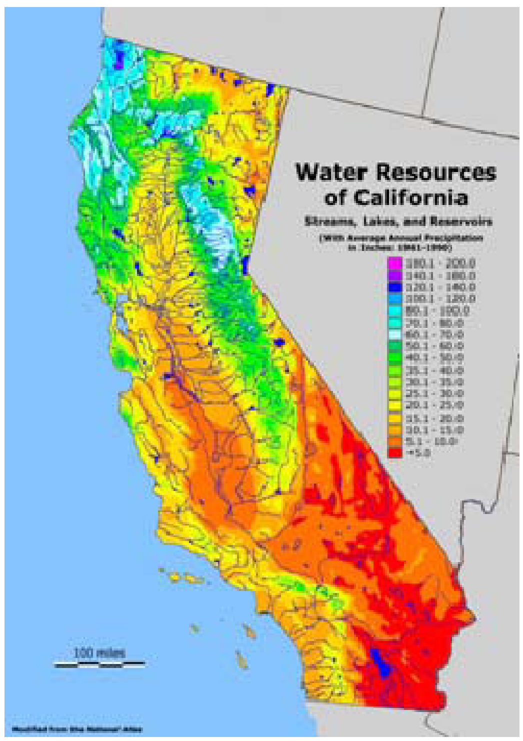

Figure 1. Geographical rainfall discrepancies of California.

On the other hand, California is fortunate because it has a system of canals that links the southern area of the state (with large urban areas such as the Los Angeles basin and San Diego) with the northern areas of the state and with the Colorado River. Therefore, assuming that there are not flow capacity restrictions (physical or regulatory), it is often possible to move water from one area of the state to another, through legal agreements called "water transfers". While the majority of transfers are fairly local in nature (between farmers within a single irrigation district, or between neighboring irrigation districts), others involve movement of water for many hundreds of miles.

Figure 2. California's Major Water Projects. Courtesy Calif. DWR.

The California Water Code treats water transfers as a "reasonable and beneficial use" of water that is held with a water right. Because most of the water resources in the state are controlled by irrigation districts or some type of quasi-public agency (such as a county water agency), most of the water transfers are from one agency to another. Individual farmers within an irrigation district do not generally have the right to sell their water (whether surface water or groundwater or "in-lieu of" water) as individuals. When an irrigation district decides to transfer water outside or within its boundaries, it may give financial incentives to individual farmers to release all or a portion of their individual water allocations. There are some cases in which individual farms, falling outside of irrigation district boundaries but with abundant surface water rights, have transferred water.

There must be some type of "win-win" arrangement between the two parties, and there must be a physical means of transferring the water. The benefits of water transfers are not always unanimously agreed upon within the members of the agency that is doing the selling. Roadside signs that argue against water transfers are common in California's northern Sacramento Valley, which is often seen as a potential water source by water users to the south. Lawsuits to prevent water transfers are common in the Imperial Valley. Regardless of location, both imagined and real fears can surface regarding eventual loss of water rights, groundwater overdraft, loss of local control, the price received for the water, protection against future environmental lawsuits, loss of income due to projects such as fallowing, arrogance of water agency staff, and just about any other issue.

The "win" for the purchaser is quite simple – water is obtained. In the summer of 2009, some farmers with permanent crops in the San Joaquin Valley were willing to pay as much as $500 per acre-foot or more for water. The alternative was dead trees or vines. In many agricultural areas there is no alternative to surface water supplies; groundwater is not available. The concept of individual farmers with no water being able to conserve their way out of a drought was, of course, unrealistic.

Municipalities must weigh the cost of purchasing water against the costs of alternative supplies such as from desalinization, recycling of treated wastewater, or eliminating discharges into the ocean. Municipalities near the ocean can truly conserve water with simple practices such as installing low flush toilets and low flow showerheads – assuming their wastewater is presently discharged into the ocean.

The agricultural suppliers of water for a water transfer have a variety of motivations. Three examples will be provided here:

Case 1: Imperial Irrigation District. The Imperial Irrigation District (IID) supplies Colorado River water to about 500,000 acres of irrigated land in the Imperial Valley in southern California, at the border with Mexico. Its only drainage outlet is the Salton Sea, which is a land-locked salt lake that has increasing salinity levels. Any water that enters the Salton Sea is truly lost for future use in agriculture or in municipalities.

IID has commissioned several water balance studies over the years – spending millions of dollars on the studies themselves, plus the collection of the data that are required for study inputs. IID has a good quantification of inflows, rain (almost none), lateral inflows, and outflows. It also has good information on the source of the outflows to the Salton Sea. Specifically, it knows the volumes that originate as canal seepage, farm surface runoff, farm tile outflows, and canal spills (main and lateral). Over the years, IID has invested heavily in various conservation measures to minimize outflows to the Sea, some of which have been successful and others of which have been less successful.

IID has several motivations to conserve water. On one hand, it is almost always the subject of some court ruling, mandate by the California Water Resources Control Board, requirement by the US Bureau of Reclamation, or orders from some other group or agency that demands water conservation. Furthermore, the Public Trust Doctrine in California implies that if a water right holder does not make reasonable and beneficial use of its water, then it will lose that portion of water that is used unreasonably.

By finding an urban purchaser of conserved water, IID can satisfy the external demands for water conservation yet simultaneously receive the funds needed to implement the conservation efforts – which are not trivial. This is an extremely important point – if IID simply fallows land to conserve water, the economy will be negatively impacted. If, on the other hand, IID can invest in infrastructure improvements that truly conserve water both on-farm and in its delivery system (now and in the future), then it can safely function with less imported water. Agriculture will remain strong, the farmers will not need to pay for the improvements that are demanded by external entities, and IID will position itself as a conservation leader that is helping to solve water shortages in urban areas. Furthermore, under current California law, IID retains ownership of the transferred water.

In the late 1980's, IID entered into an historic water transfer agreement with Metropolitan Water District of Southern California (MWD). MWD paid in advance for water conservation measures such as tailwater return systems, canal lining, and canal automation. Approximately 108,000 acre-feet were conserved and transferred; IID received about $100.5 million (1988 dollars), all of which was spent for the purposes of planning, executing, and verifying water conservation measures. The average (1988 $) cost per acre-foot conserved was $127.

More recently, IID entered into a new agreement with San Diego County Water Authority. Under this agreement, IID must first conserve the water before SDCWA pays. The agreement is to transfer about 300,000 acre-feet per year by 2026, at an annual cost of about $270/acre-foot (including administration, loan payback, annual on-farm expenses, maintenance, construction, etc.) Approximately two-thirds of the conserved water is envisioned to come from on-farm savings; the remainder will come from seepage collection from canals and from canal spill reduction.

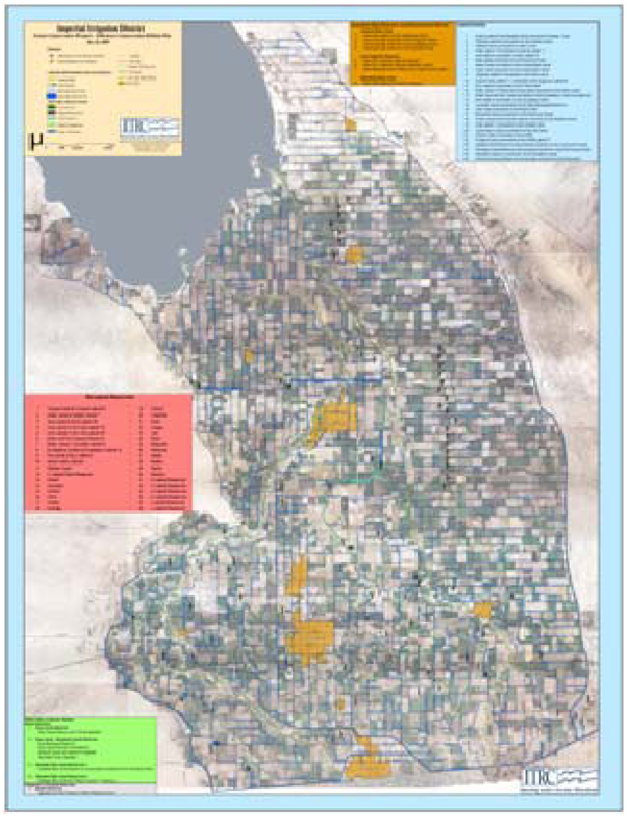

Figure 3. Early plan for spill reduction in IID.

The IID/SDCWA water transfer agreement was part of a complex process called the Quantification Settlement Agreement (http://www.bbklaw.com/news-press-168.html) that has involved numerous federal and state agencies along with lawsuits against IID by farmers, Imperial County, and others. The execution of the agreement is targeted to begin in 2010. Land fallowing is not part of the program.

A key point is that conserved water in IID can be transferred to the Los Angeles and San Diego areas via the Colorado River aqueduct. That canal/pipeline system begins near Lake Havasu on the Colorado River.

Case 2: Palo Verde Irrigation District (PVID). PVID (near Blythe, California) is another large irrigation district on the Colorado River, but it is in an entirely different hydrologic situation than IID. PVID has downstream water users – the Yuma area irrigation districts, IID, and Coachella Valley Water District. Canal spill and tailwater runoff from within PVID is recycled (albeit with a slightly lower water quality) back into the Colorado River and is therefore available for usage by downstream users. As opposed to IID, reducing spill and tailwater runoff in PVID will not conserve water. Instead, the only way to truly conserve water is to reduce evapotranspiration (ET).

In PVID, farmers have been receptive to water transfer programs that require them to fallow land (i.e., not irrigate the land). This is a politically unacceptable option in Imperial Valley, which has a high unemployment rate.

PVID has had several land fallowing programs in the past, including an on-going 35-year program. Land fallowing can be relatively simple to administer and verify. If land is not irrigated, there must be a water savings. In terms of true water conservation, however, actual benefits depend on what crop has been fallowed. For example, a short term winter crop of wheat will not consume the same ET as a full year crop of alfalfa. Land fallowing programs in some districts (e.g., in the Klamath Basin) incorporate a detailed study of historical cropping patterns on fields, and allocate a water conservation volume depending upon that history.

This year PVID entered into a short-term program with MWD. Every farmer irrigating land in the Palo Verde Valley with Priority 1 Colorado River water supplies was eligible to enroll up to 15% of that land. The enrolled land must be fallowed for one continuous year, commencing between April and August 2009. MWD paid farmers $1,665 for each acre enrolled, with an additional payment of $35/acre to PVID. Farmers are responsible for minimizing weed growth and avoiding wind erosion.

<u>*Case 3: Glenn-Colusa Irrigation District (GCID)*</u>. GCID is located in the Sacramento Valley of California – upstream of the California Delta. This location is important, because the people and entities that need the water are south of the Delta, and there are serious limitations to pumping from the Delta. Water must be pumped from the Delta into the California Aqueduct or Delta-Mendota Canal in order to reach southern users. Various environmental court rulings have restricted pumping flow rates, with the goal of recovering endangered fish species in the Delta.

Figure 4. Location of GCID

In general, there are strong anti-transfer sentiments in some communities in northern California. Specifically, people are often concerned that a substitution of groundwater for surface water, by farmers, will deplete the groundwater aquifers.

In 2009, GCID's board of directors approved a voluntary short-term agreement between GCID and the California Dept. of Water Resources, to transfer up to 6,843 acre-feet of water to the "2009 Drought Water Bank". There are three items of interest:

- The flow rate into GCID is in the 2000 CFS range, which means that the water transfer represents about 3 days of water diversion for GCID. This is not a huge percentage.
- GCID did not allow groundwater substitution; only idled land was eligible.
- The state of California facilitated the deal with its "Drought Water Bank".

California's 2009 Drought Water Bank

The California Dept. of Water Resources initiated emergency dry year water purchasing programs in the past, such as in the early 1990's, and in 2001-2004. In 2009, DWR purchased water from willing sellers upstream of the Sacramento-San Joaquin Delta. The goal was to move that water through the Delta by gravity, and then pump into the California Aqueduct or the Delta-Mendota Canal. The policies that DWR adopted included (from DWR's website http://www.water.ca.gov/drought/docs/2009water_bank.pdf):

- Local water needs are considered as a priority before water is transferred out of the region.
- Transfers will be made without injuring other legal water users and without unreasonably affecting fish, wildlife, or other instream beneficial uses.
- Transfers will be made without unreasonably affecting the overall economy or the environment of the county from which the water is transferred.
- No more than 20% of the cropland in any county may be idled due to the 2009 Drought Water Bank, unless additional evaluations are conducted related to both the economic and environmental impacts.
- Transfer water will be those water supplies that would not have been available in the Delta absent the transfer.
- Water will be allocated in accordance with priority of need, with health and safety considerations paramount.
- Transfers and related actions need to be in compliance with federal and state environmental laws as applicable and local ordinances consistent with State law.
- Transfers through State Water Project (SWP) facilities for use in a SWP contractor's service area will be conveyed under existing SWP long-term water supply contracts and through SWP Contractors.
- Transfers involving water supplies made available pursuant to the Federal Central Valley Project (CVP) water service and/or water right settlement contracts must comply with the terms and conditions of the existing CVP contract.
- Transfer recipients are expected to have and implement an adopted water management plan including conservation measures designed to result in a minimum of 20% overall savings.

A key point for the irrigation districts was that DWR provided California Environmental Quality Act (CEQA) and Endangered Species Act (ESA) compliances.

DWR allowed willing sellers to make water available in four main ways:

- Reservoir releases above normal operations
- Groundwater substitution
- Cropland idling (fallowing)
- Crop substitution

Other Transfers

ITRC is involved with a number of other water conservation and water transfer efforts by districts. In some cases, districts see the water transfers as an opportunity to be proactive, and to upgrade their distribution systems with someone else paying the bill.

Some districts see water transfers as a means of reducing water rates inside their own boundaries. Some crops have low returns this year, and a water transfer is seen as a viable means of keeping some farming operations afloat.

The biggest concerns by districts that transfer water seem to be:

1. Will the water right eventually be lost? Those districts that believe this are investing in better infrastructure so that they can survive with less water. The districts that are simply paying their farmers are not investing in the future, and may have serious problems later.
2. Is groundwater substitution healthy? California has a groundwater overdraft of more than 2 million acre-feet per year. So in general, groundwater substitution is sounding less and less attractive. Farmers are beginning to see increased salinity in groundwater supplies, and the water tables are dropping – raising pumping bills. Some (including the author) are concerned that some farmers are building up salt in their root zones for short-term profits.
3. Will fallowing land hurt the local economy? Third party impacts can be large.

The Future

California uses more water than it has. There is a need for all users to be more efficient – farmers, urban areas, and environmental users. At first glance this will sound like a pro-agriculture, biased statement – but it is true that there is very little conservation potential in California's irrigated agriculture. The reason is simple: there is tremendous under-irrigation at present, and much of the losses are recirculated in the hydrologic basins. The big exceptions are the Imperial Valley and Coachella Valley (which drain into the Salton Sea) and some limited areas near the Coast.

Another exception is irrigated lands that overlie salty groundwater. It is somewhat coincidental that these lands, generally found on the western side of the San Joaquin Valley, suffer from under-irrigation and expensive water. Therefore, the amount of deep percolation is "relatively" small in those areas.

So where will irrigated agriculture go in California? Here are some predictions:

1. More irrigated land will be abandoned. Large areas of Westlands Water District, and the complete Broadview WD, have been permanently idled. This abandonment will increase – and will be focused in areas that have some combination of a shortage of water, overdrafted groundwater basins, and serious drainage problems (the tile drainage flows into rivers is restricted because of high salt loads or especially toxic salts such as selenium or boron). Perhaps an additional 300,000 – 500,000 acres of such land will be abandoned over the next 20 years.
2. Yields/acre will increase. This is already happening. Large acreages of processing tomatoes have yields greater than 70 tons/acre (as opposed to 40 tons being high 10 years ago). Almond yields are regularly passing 4000 lb/acre (compared to 2000 as a high number 20 years ago). This is due to better irrigation design and management, plus improved varieties, pest management, and overall agronomic practices.
3. The California Delta problem will largely be resolved with new conveyance systems that allow efficient transportation of water through and around the Delta – providing both environmental protection and more reliable water transfers from north to south.

4. More agricultural land will be urbanized. In general, urbanization into ranchettes results in less evapotranspiration per acre because the ranchettes are poorly managed and weedy after a few years.
5. Cities will become more efficient, with new restrictions on landscape irrigation and more recycling of water instead of dumping sewage into the ocean. Desalination will accelerate. This will stabilize the urban requirements for water.

The bottom line with more efficient environmental usage of water, less agriculture, and more efficient urban usage will be a stabilization of acreage for irrigated agriculture – but with higher overall yields than we currently have. Much of the art of irrigation will disappear, and be replaced with transferrable knowledge associated with science and engineering.