Report from the Water Task Force of Audubon Colorado Council

JoAnn Hackos July 29, 2019

Nine Colorado Audubon chapters have representatives on the Water Task Force of the Audubon Colorado Council, including Evergreen Audubon's Gerald Gasper. The Task Force has been following the Colorado River Drought Contingency Plan, the status of the Colorado State Water Plan, and potential water legislation. We know, for example, that climate change negative affects waterbirds in the American West.[1]

We have commented on the Environmental Protection Agency's proposed rule that re-defines "Water of the US." As Polly Reetz, Denver Audubon Conservation Chair explained, "the Trump administration's definition would leave many intermittent and ephemeral streams and millions of acres of wetlands without protection, contrary to EPA's own scientific studies that show these are all intimately connected with downstream waters. 68% of Colorado's streams are seasonal or intermittent, and allowing pollution of such streams would significantly degrade our drinking water supplies, the riparian vegetation they support, and the wildlife that depends on that vegetation (Colorado Parks and Wildlife estimates that 75% of our wildlife species spend at least part of their lives in riparian habitats, while National Audubon estimates that 90% of bird species use riparian habitats at some point too)."

With permission of the author, Brian Richter, we have reprinted his recent post explaining how we might increase water by changing the way farm fields are irrigated. Brian publishes a blog called Sustainable Water at sustainablewaters.org I hope that I can keep Evergreen Audubon members informed about the politics of water scarcity by reporting on the activities of the Water Task Force and information that chairman, Gene Reetz, regularly provides.

JoAnn Hackos, Evergreen Audubon Board Member and Conservation Chair

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Sustainable Water: Solutions in a Time of Scarcity–Growing Water.

Brian Richter on Jun 24, 2019 2:55 pm

Image: Flood-irrigated farm fields in the Imperial Irrigation District of southern California. Studies have shown that a switch from flood (furrow) irrigation to sub-surface drip irrigation can reduce consumptive water use by 34-57%. Photo by Brian Richter

In recent posts I've highlighted the stellar efforts of many cities in water-scarce regions[2] to reduce their water use as a strategy for avoiding water shortages.[3] But none of these water-smart cities is telling their citizens the whole truth.

Truth is, virtually none of these cities is going to enjoy a secure water future unless farmers are willing to conserve a lot of water as well. That's because most cities share their water sources[4] – rivers, aquifers, lakes – with farmers. And farmers consume the lion's share of the water: In the Western US, 86% of all consumptive water use goes to irrigated farms.

That means that even if Western cities such as Los Angeles, Phoenix, or Denver were able to cut their water consumption in half, it wouldn't do much to lessen the overall stress on the West's over-taxed water sources.

Consider what this means for a water source like the Colorado River. Since 2000, total consumptive use by all water users – cities, farms, industries – has been 20% greater than the total flow of the river, on average. In 2002, the volume consumed was twice the entire flow of the river (this was physically possible only because water stored in Lakes Mead and Powell could be depleted to cover the over-use gap). Even if all cities dependent on the river's water cut their use in half, the total volume of consumption would still exceed total river flow in many years.

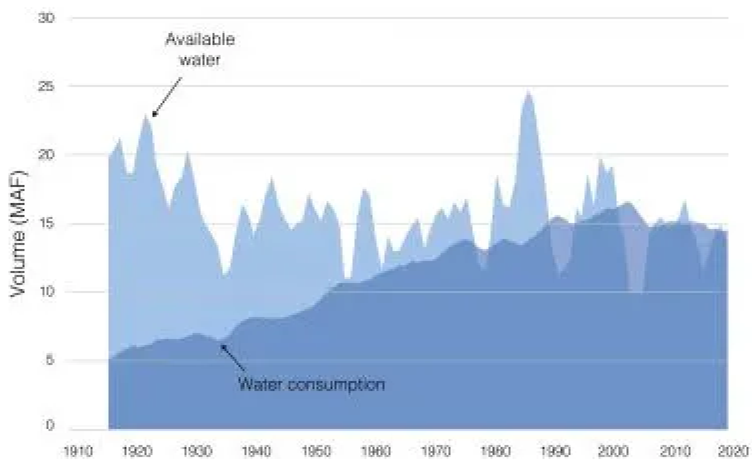

Image: In recent decades, water consumption has exceeded available water supplies in the Colorado River by 20% on average. In 2002, consumptive use was twice the volume of river flow. Graph lines indicate 3-year running averages, in millions of acre-feet. Data source: US Bureau of Reclamation.

Bottom line: A sustainable water future cannot be secured for the 40 million people dependent upon the Colorado River unless the volume of water consumed by irrigated farms can be reduced substantially. Without greatly reduced water use on both farms and in cities, the total volume of water use – and risk of catastrophic shortages – remains dangerously high.

The same can be said for most river basins and aquifers across the West. Or in the Midwest. Even in the Southeast.

We really need farmers to help us distance ourselves from water scarcity, to help us build a buffer between water availability and consumption, and to restore water flows to depleted freshwater ecosystems.[5] Here I'll share some thoughts on how this can be done.

Reducing Water Use on Farms

There are three basic strategies for reducing consumptive use on farms, thereby freeing up water that can be used for other purposes; I'll collectively refer to these three strategies as "growing water":

- **Tighten Up** – We can apply practices and technologies that enable us to consume less water while growing a crop
- **Crop Shift** – We can shift to a different crop that is less water-intensive and ideally, more lucrative at the same time
- **Resting the Farm** – We can reduce the area and amount of crops we are growing by temporarily fallowing some portion or all of a farm

There are some serious challenges in successfully implementing each of these strategies, however. Perhaps most importantly, we need to be very clear about the goals we are trying to attain with our water-saving efforts. ***To understand whether a water-saving program will produce the outcome we're seeking – for example, enhancing a river's flow, or refilling a depleted aquifer or reservoir – we must carefully follow the water.*** If a farmer decides not to extract water from a river, an irrigation canal, or from an aquifer, where does the 'saved' water end up? Does another farmer or a city use it instead, does it stay in the original water source, does it reach the section of the river or the reservoir you want to enhance?

Another really important principle is that ***we can't expect to grow more crops and reduce consumptive water use at the same time***. This is commonsensical, of course, but it's also the most common reason why farm water efficiency programs (i.e., tightening up) fail to reduce water scarcity. When the application of water to a crop becomes more efficient, it can result in greater plant growth. The farmer may realize a more bountiful crop but the net consumptive water use can actually *increase* (a counter-intuitive phenomenon referred to as the "irrigation efficiency paradox"[6]). Also, any water not used by one farmer may be taken by another farmer to increase their own crop yield, resulting in no net water savings.

However, it is possible for farmers to collectively produce the same amount of crop using less water overall. Farmers can also make more money while using less water, such as by switching from a low-value, water-intensive crop to a higher-value, less-thirsty crop.

My research group has carefully reviewed case studies[7] from around the world that claim to have reduced the consumptive use of water in irrigated agriculture. We found that the vast majority of these studies failed to pay adequate attention to the two principles highlighted above, so we rejected them.

We did, however, find compelling evidence to suggest that water consumption can be reduced on farms as long as crop production is not allowed to increase. While our journal paper goes into much more detail, here's some of the highlights (please see our paper[8] for descriptions of the following approaches). The large range in water savings associated with each strategy below results from differences in soils, crops, climates, and types of equipment used.

Water-Saving Measure	Savings in Consumptive Use
Soil management (mulch, no-till)	13-54%
Irrigation equipment improvements	6-57%
Deficit irrigation	14-33%
Irrigation scheduling, timing	18-27%

Canal lining	Depends on canal length
Crop shifting	54-87% (Depends on crop types)
Fallowing	95-100%

While a variety of strategies exist for reducing consumptive water use in irrigated agriculture, Resting the Farm is quickly gaining popularity across the Western US as a water-saving approach largely because: it can be implemented intermittently and on a voluntary and rotational basis on a single farm or among farmers within an irrigation district; capital requirements are minimal; it maximizes water savings on farmland by eliminating irrigation; and resultant water savings are easier to calculate as compared to other measures such as deficit irrigation or irrigation scheduling. When managed and targeted carefully, fallowing can be accomplished with minimal to no impacts on food security.

Growing the Farming Economy While Saving Water

Our group's research has also revealed that growing water through participation in voluntary, compensated water-saving programs can be financially attractive – and thereby motivational– for farmers. For example, two very large irrigation districts (Imperial and Palo Verde) situated along the Colorado River in southern California have been successfully implementing water-saving programs for more than a decade. All three strategies described above are being practiced within these irrigation districts. The participating farmers have received a level of compensation (supplementary income) that has enabled them to realize 35% profits on average by growing water as well as crops on their farmland, as compared to the 10-12% they were receiving from only growing crops. The farmers are being paid by large urban water utilities that share the same water source (the Colorado River).

The primary water-saving strategy deployed in these districts is to rest farms through voluntary, temporary, rotational farm fallowing. Alfalfa and grass hay (cattle-feed crops) are the most commonly fallowed crops. Net water savings have averaged 4 feet of water per year (4 acre-feet per acre).

The idea of paying farmers to conserve water has its detractors, however. They question why we need to pay farmers not to 'waste' water, or they argue that farmers are to blame for water scarcity because they're consuming most of the water.

I don't see it that way. The reality is that it takes a helluva lot more water to grow our food than it takes to flush our toilets, generate our electricity, manufacture our computers and clothing, or fill our drinking water glasses, so farmers will always use more water than is used within cities.

We want farmers to continue growing our food. We just want them to do that while using as little water as possible.

We also need to consider the value and importance of keeping farmers and the culture of farming part of our American society. Many farmers — particularly small-scale family farmers — are struggling financially. Financial stress has caused many family farmers to sell their farms to larger entities that can make sufficient profit by consolidating farms and capturing efficiencies of scale.[9]

By providing small-scale farmers with supplemental income from growing water we can preserve a source of livelihood and cultural heritage important to many rural areas.

Incentivizing farmers to use less water is an essential and smart way to move away from water scarcity and to restore river flows that support healthy freshwater ecosystems.[10] It is also the least costly way to achieve water security, and if executed carefully it can enhance rural economies and strengthen communities.

If someone has a better idea for resolving water scarcity than paying farmers to grow water, I'm all ears.

Brian

valley bottoms like this one situated in an otherwise sere landscape have long been an integral aesthetic component of the Western landscape. Photo by Brian Richter

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[1] "Climate change negatively affects waterbirds in the American West." Chris Branam. **Phys.org**. March 18, 2019. https://phys.org/news/2019-03-climate-negatively-affects-waterbirds-american.html

[2] Sustainable Waters, **A Water Plan for the 22nd Century.** Brian Richter. 30 May 2019. https://www.sustainablewaters.org/a-water-plan-for-the-22nd-century/

[3] Sustainable Waters, **The Great Race Between Water Conservation and Climate Change**. Brian Richter. 15 May 2019. https://www.sustainablewaters.org/the-great-race-between-water-conservation-and-climate-change/

[4] Tapped out: how can cities secure their water future? Brian D. Richter et al. *Water Policy* (2013) 15 (3): 335-363. https://doi.org/10.2166/wp.2013.105

[5] Sustainable Waters, **Swimming with Mastodons**. Brian Richter. 10 Jun 2019. https://www.sustainablewaters.org/swimming-with-mastodons/

[6] "The paradox of irrigation efficiency," R. Q Grafton et al. **Science**, 24 August 2018. https://science.sciencemag.org/content/361/6404/748

[7] "Opportunities for saving and reallocating agricultural water to alleviate water scarcity." Brian Richter et al. **Water Policy** (2017) 19 (5): 886-907. https://iwaponline.com/wp/article-abstract/19/5/886/20588/Opportunities-for-saving-and-reallocating

[8] [8] "Opportunities for saving and reallocating agricultural water to alleviate water scarcity." Brian Richter et al.

[9] "Farming and Farm Income," USDA Economic Research Services. https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/farming-and-farm-income/

[10] "Swimming with Mastodons."