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The Values of Colorado River Water Use

Numerous proposals and ideas have been presented as the delegations representing the Colorado River Basin states have been working on the development of the new Colorado River management guidelines that will go into place in 2026 when the 2007 interim guidelines expire.

In the 20 September 2023 issue of this University of Arizona (UA) Vegetable Integrated Pest Management (IPM) Newsletter, I posted an article describing an analysis and set of proposals regarding future management of the Colorado River that was presented by Wheeler et al., 2022 in *Science* (Silvertooth, 2023 and Wheeler et al., 2022).

Wheeler et al. (2022) recognized that agriculture is responsible for more than 70% of the Colorado River water use and noted that the Lower Basin has been irrigating less than one-half of the area irrigated by the upper basin, but the agricultural revenues of the Lower Basin are more than three times that of the Upper Basin (USBR, 2015).

The lower basin states and Mexico have been fully utilizing their water allocations from the Colorado River in contrast to the upper basin which has not been using its full 7.5 MAF/year allocation. For example, between 2000 and 2020 the upper basin consumptive use averaged 3.7 MAF/year plus at least 0.7 MAF/year of reservoir evaporation. The upper basin states have plans for further development and utilization of their full allocation and they want to protect their Colorado River water allocation to support these development plans.

Additional upper basin development and water use from the river exposes a much higher level of uncertainty on Colorado River water management for the future and there are concerns that it could violate the non-depletion obligation in the 1922 Compact which states the upper basin will not deplete the river's flow to less than 75 MAF during any 10-year consecutive period. This implies an assumption on the part of the 1922 Compact negotiators that a short-term drought could be managed within a 10-year period, but we are now dealing with drought extending over 23 years. In addition, the 1944 Treaty requires all seven states to share in the obligation to Mexico.

The upper basin states have been adamant that the responsibility of balancing the shortages on the river rests fully with the lower basin states and Mexico. The upper basin states have consistently emphasized the importance of equality between basins as outlined in the Compact but that has not actually happened in 100 years.

Wheeler et al. (2022) presented a good argument supporting the position that the loss of an established agricultural industry in the Lower Basin is much more harmful than reducing plans for future development in the Upper Basin. Thus, they proposed that further development and use of more Colorado River in the Upper Basin is objectively quite questionable.

Wheeler et al. (2022) ran a series of hydrological models, including the USBR Colorado River Simulation System (USBR CRSS, 2021) and developed a set of 100 scenarios. They used this model since it is being used in the basin-wide negotiation process. More details are provided in their article (Wheeler et al., 2022) and summarized in the article I put in this newsletter last September (Silvertooth, 2023).

Many other articles have been published recently regarding how the Colorado River water is used (Dunphey, 2024; Frisvold and Duval, 2024; Richter et al. 2024; Richter, 2024; James, 2024; and Schmelzer, 2024). Agriculture accounts for about three-quarters of human use of Colorado River water (Richter, et al. 2024). This water is used to support approximately 15% of the farmland in the United States and it supports the production of 90% of the winter vegetables consumed in the United States and Canada from November to March every year.

I believe some of the best analyses on this topic have been done by Dr. George Frisvold and Dari Duval from the University of Arizona (UA) Department of Agricultural and Resource Economics (AREC). George and Dari are part of the UA Cooperative Extension Economic Impact Analysis (EIA) Team.

The Frisvold and Duval report provides a strong analysis of the crops and water productivity for the Upper and Lower basins of the Colorado River. They provide important contrasts between the upper and lower basins of the Colorado River in terms of water productivity measures associated with the crop production systems. These measures include total crop sales per unit of water, crop sales minus crop-specific inputs per unit of water, and a blue water footprint (BWF).

The BWF is defined as “the volume of surface and ground water consumed (evaporated) as a result of the production of a good” (Mekonnen and Hoekstra, 2011). Frisvold and Duval provided an excellent analysis on the agricultural use of the Colorado River water revealing a BWF of 1.2 acre-feet/\$1,000.00 (U.S. dollars) in the Lower Basin and 7.6 acre-feet/\$1,000.00 in the Upper Basin. The counties with the highest consumption of water per acre have lower BWF values. It is important to recognize the sixfold difference in the value of agricultural production per acre-foot of water used in crop production in the Lower Basin states versus the Upper Basin states.

Wheeler et al. (2022) found that the Lower Basin states of the Colorado River are more than three times as productive as the upper basin. In contrast, Frisvold and Duval determined with a strong and appropriate economic analysis that the BWF in the Lower Basin is 6X greater than the upper basin.

Frisvold and Duval have provided an important set of facts and analyses in their recent work. In my view, they present a strong and fully legitimate line of consideration that is hopefully utilized in the negotiations and broader discussions in the western water arena for future management of the Colorado River. These are important points in the storm of emotions that are emanating from

many sources and those who do not recognize the value to the population that is being provided from the agricultural systems in the lower Colorado River basin.

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