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Cabin on the East Fork. Photo: Linda F. Baker ©2022

The Unseen Upper Green – Groundwater

by Linda F. Baker

My first home in the Upper Green River Basin was a one-room log cabin with two wood-burning stoves, three kerosene lamps and a pitcher pump in the front yard. The well water was abundant, clear and cold, but when winter dove down to minus 40, the pump head froze. So we melted snow and chopped ice from the river — a simple exchange of groundwater for frozen surface flows.

When you can see the source of your water from your front porch, the ice and snow in the Wind River Range, the ground/surface water connection is as palpable as a hand on a pump handle.

Now we face a scarcity of surface waters as the headwaters and tributaries of the Colorado River shrink, and we siphon water from Flaming Gorge Reservoir for delivery downstream to Lake Powell and Lake Mead. Wyoming's glaciers, our frozen, fresh water caches, are quickly disappearing. To provide for the water rights of future generations, and preserve river recreation and healthy fisheries, we cannot overlook the value of our groundwater, and the hidden river we may ultimately need.

As Western states review the Colorado River Compact amid a crippling drought supercharged by climate change, it seems we should know more about the secrets of our "blue gold": how much of it we have and how much we are losing.

Using a 2007 model, the Wyoming State Engineer's Office (WSEO) estimated a maximum volume of 31,900 acre-feet per year of groundwater produced for commercial, domestic, drilling, industrial, irrigation and other uses[1]. Another study estimated between 5,300 and 7,200 acre-feet per year of groundwater produced. Ultimately, WSEO estimated that 8,000 to 16,000 acre-feet per year of groundwater are withdrawn in the Upper Green River Basin.

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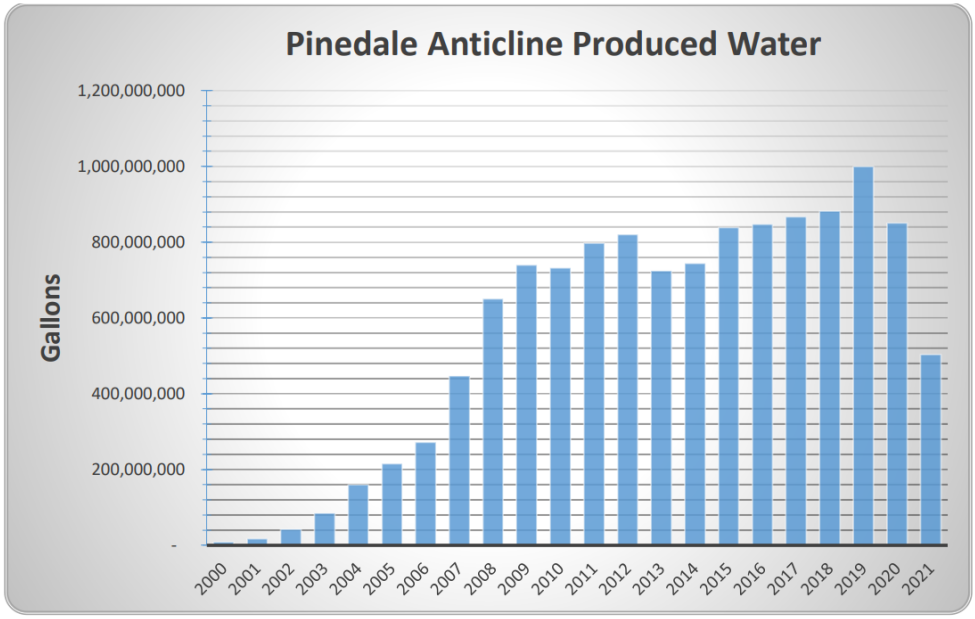
In 2010 the Wyoming State Geological Survey estimated a groundwater withdrawal rate of 7,000-15,000 acre-feet per year, including annual recharge, discharge, and use.[2]

But there is another estimate of groundwater withdrawal that is not considered by either the Wyoming State Engineer's Office or the Wyoming State Geological Survey.

Over the past twenty years, this quiet corner of western Wyoming has drawn natural gas drillers from around the U.S. and the world. The Pinedale Anticline and Jonah natural gas fields are two of the state's largest with a combined 7,499 permitted gas wells.

Groundwater withdrawal rates have increased exponentially with the number of gas wells drilled in these two gas fields. The Wyoming Oil and Gas Conservation Commission records barrels of "produced" groundwater withdrawn in each gas field. In the Pinedale Anticline gas field, 292,623,878 barrels (37,700 acre-feet) have been "produced" since the year 2000. In the Jonah gas field, 73,630,122 barrels (9,486 acre-feet) of water have been produced since 1998.[3] This produced water, deemed worthless, is a by-product of natural gas production, and is "reinjected" thousands of feet underground.



The Oil and Gas Commissions in Colorado and Utah also record the amount of "produced" groundwater, showing even greater amounts withdrawn each year. But there is no agency or organization that recognizes a complete tally of groundwater withdrawn from aquifers within the entire Colorado River Basin. While our state agencies can only guess at how much groundwater we have, how much we are using, and how much is left, our rivers depend on the recharge capabilities of our groundwater now more than ever.

The river we can see is a water commonwealth: physically, chemically, and biologically connected through migration of fish, amphibians, plants, and microorganisms. The river we cannot see beneath us is a network of trickles and streams, lakes and pools.

It is difficult for the average water user to understand the collective knowledge of every state water agency in the Colorado River Basin, and to contribute to thoughtful, informed river management. For example, the states' oil and gas commissions measure water by the barrel, while the engineers measure water in acre-feet. Still other agencies measure water in gallons per minute. Now in our twenty-second year of drought, water managers are encouraging irrigators to reduce water use, while planning to build more dams for irrigation. But Las Vegas has taken water conservation seriously, and one small town in Utah has a moratorium on new building because there is not enough water.[5]

A River Management Roundtable discussion might begin to assemble what we know and what questions remain. Does the Wasatch aquifer connect to those in other states? How much groundwater are downstream aquifers estimated to collectively hold, and how much is withdrawn? To collectively organize a future of water wisdom, an inter-basin "Colorado River Collaborative" that focuses on the river *water*, including its groundwater, rather than its political divisions, may face this water emergency with better potential solutions. A top-to-bottom comprehensive plan for the entire Colorado River Basin might include more public outreach focused on water conservation, and broader accountability on actual water use from all sources in all industries.

Every water user should have a clear view and strong handle on where our water comes from and where it's going: all the riverine connections that give us life. From the Wind River Range to the Grand Canyon and beyond, every water source is significant and every drop is priceless. ♦

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[1] https://waterplan.state.wy.us/plan/green/2010/gw-finalrept/gw-ch03.html. p. 3-12.
[2] https://sales.wsgs.wyo.gov/available-groundwater-determination-wwdc-green-river-basin-water-plan-ii-groundwater-study-level-i-2007-2009-2010/. p. 10
[3] Source: http://pipeline.wyo.gov
[4] 1 barrel = 42 U.S. gallons
[5] https://www.nytimes.com/2021/07/20/us/utah-water-drought-climate-change.html