USGS confirms valley water budget

New study overturns old assumptions

Carter Pape Aug. 23, 2019

Water flows through Mill Creek as it approaches Moab. This water likely started as snowmelt in the La Sal Mountains months ago, melting into the ground and moving through sandstone on its way toward the Colorado River. *Photo by Carter Pape*

Since U.S. Geological Survey Hydrologist C. T. Sumsion completed the first comprehensive study of Moab's groundwater system in 1971, the scientific understanding of how much water flows through the local watershed has changed dramatically—specifically, by 30% to 40%—in the wake of a recently finalized groundwater study also by the USGS.

Despite the new science, estimates of the amount of water available for human consumption have not changed so dramatically; the Utah Division of Water Rights has known for the last half-century that roughly 14,000 acre-feet of water annually are available for use, and the new study corroborates that budgeting figure.

In large part, the differences in the studies are the result of more advanced techniques available to today's hydrologists that were not available 40 years ago, and whereas the earlier study was primarily concerned with groundwater flowing through the valley, the newer study has a more broad focus looking as far south as the mountain source of Kane Springs Creek.

How do the studies differ?

USGS Hydrologist Melissa Masbruch was the lead author on the newly released groundwater study, the findings of which overturn a large portion of what Sumsion concluded in 1971 about how water flows through the local watershed, from the moment it falls in the La Sal Mountains to the moment it flows out to the Colorado River.

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GEOLOGY AND WATER RESOURCES OF THE SPANISH VALLEY

AREA, GRAND AND SAN JUAN COUNTIES, UTAH

by

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U. S. Geological Survey

Prepared by the U.S. Geological Survey
in cooperation with
the Utah Department of Natural Resources
Division of Water Rights

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USGS
science for a changing world

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Evaluation of Groundwater Resources in the Spanish Valley Watershed, Grand and San Juan Counties, Utah

U.S. Department of the Interior
U.S. Geological Survey

The covers of C. T. Sumsion's study, completed in 1971, and Melissa Masbruch's study, which was recently finalized and released, differ. More importantly, their contents differ, as well.

The major difference in understanding regards the intermediate step that water takes in its path from the mountains to the Colorado River.

Whereas Sumsion concluded in 1971 that a large share of water flowed from the mountains into the uplands northeast of town and then into Moab, Masbruch concludes that most of the water coming into Moab takes a more southerly path, coming instead through Pack and Mill creeks, both of which originate high in the La Sal Mountains.

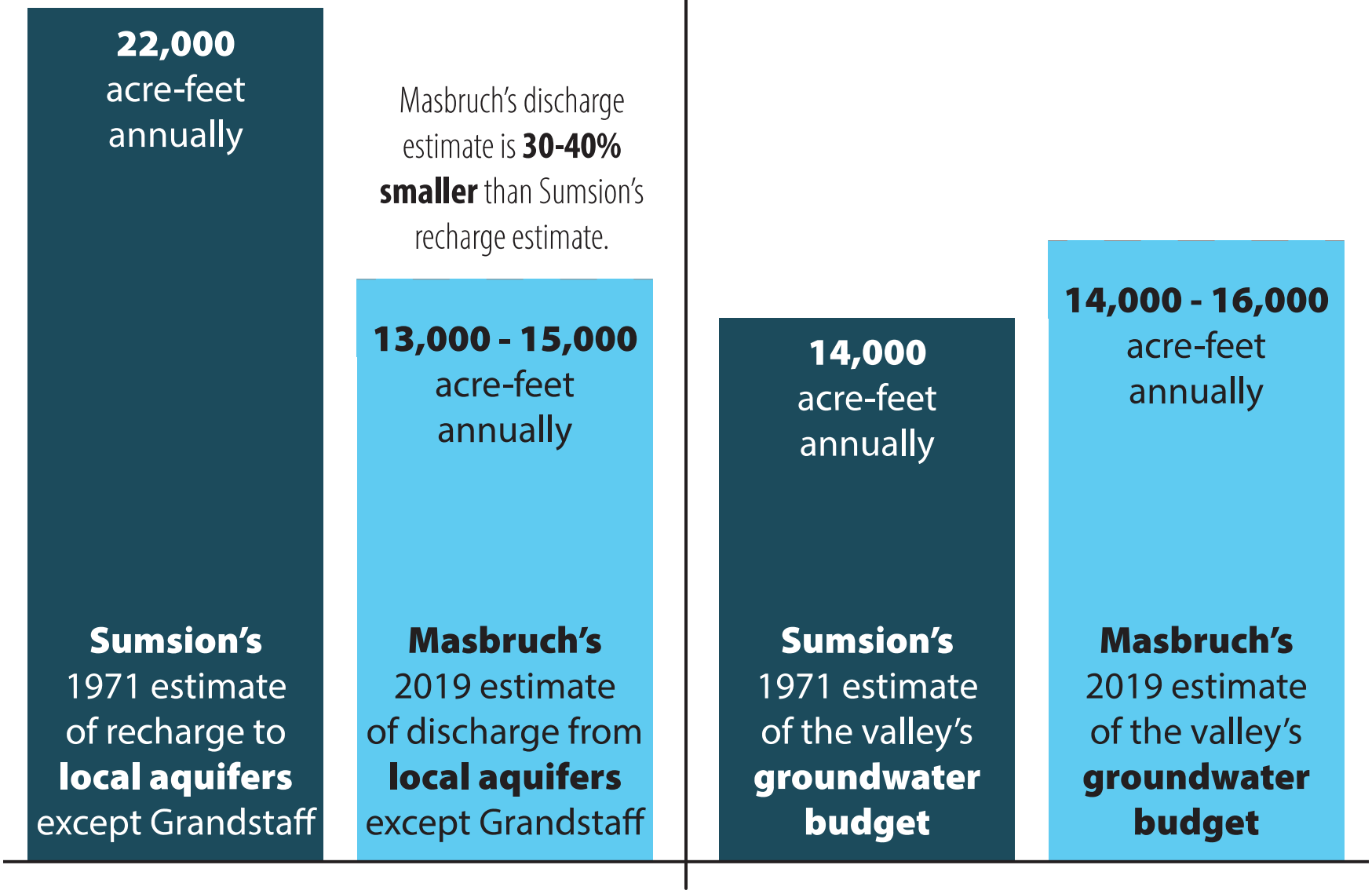
Another major difference between the two studies: How much water they estimate to pass through the whole watershed.

Sumsion estimated that precipitation recharges the entire watershed with roughly 22,000 acre-feet of water annually, suggesting that roughly this amount is also discharged from the whole watershed. Sumsion framed this in the study as one of the more minor findings and mentions the figure only once.

Masbruch's study estimates that this figure is actually 30% to 40% smaller than Sumsion thought. The new study concludes that between 14,000 and 16,000 acre-feet of groundwater is discharged each year from the whole watershed, including Grandstaff Canyon, which Sumsion excluded from his study.

Budget largely unchanged

Despite the major correction in how and how much groundwater flows through the valley's watershed, the Utah Division of Water Rights' understanding of how much water is available for Moabites' consumption, according to Marc Stilson, regional engineer in Southeast Utah for the division, is largely unchanged.



This graph shows the difference in various measurements and estimates made by Masbruch in her 2019 study and Sumsion in his 1971 study. The study area in Sumsion's study differed from the one in the Masbruch study; the graphs on the left represent estimates from Sumsion's study area, which was smaller. *Graphic by Carter Pape*

Stilson said that the division has, since the 1970s, based its water budget for southeastern Utah on Sumsion's estimate in his 1971 study; he approximated that 14,000 acre-feet of groundwater passes through the valley annually.

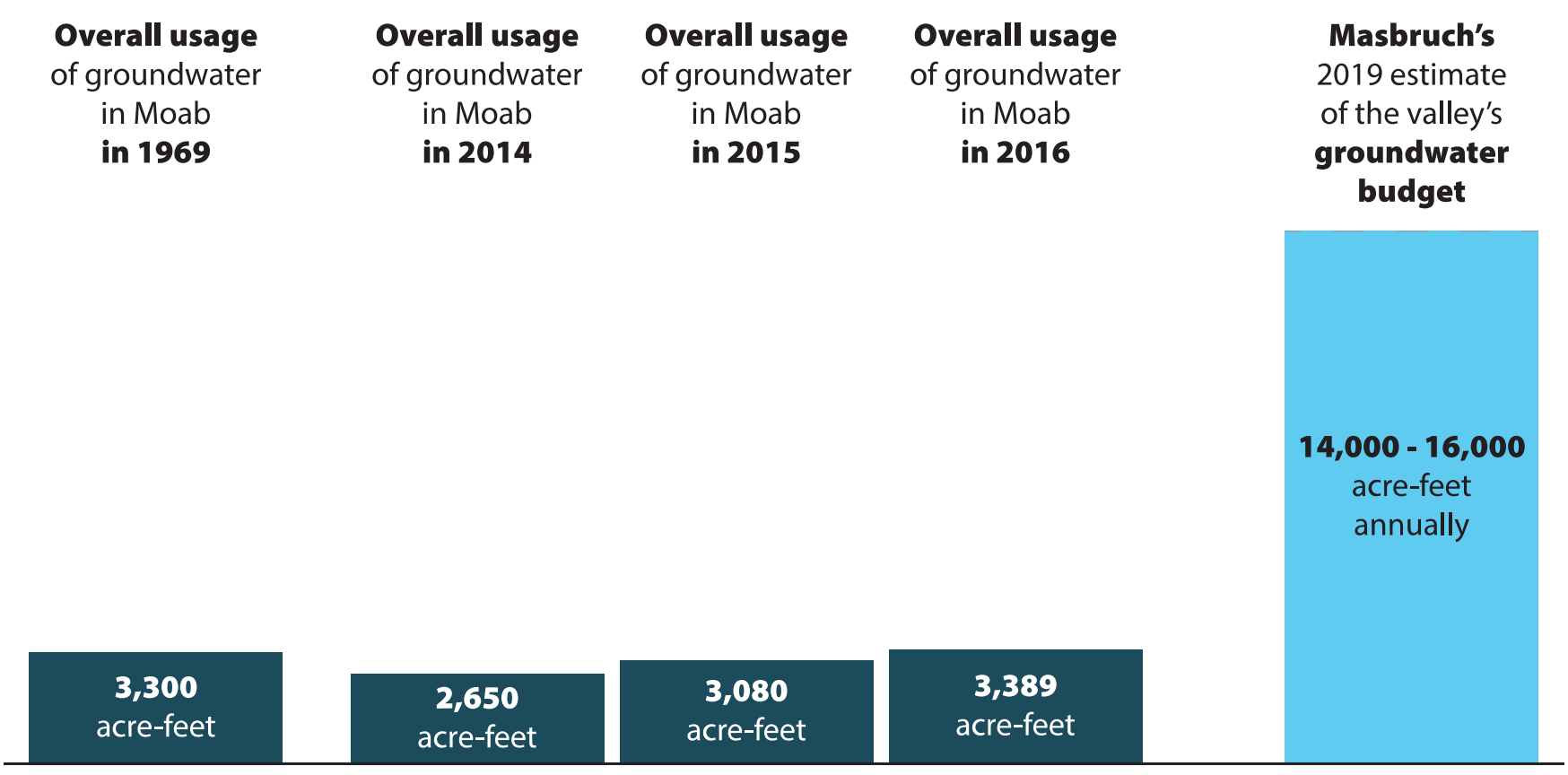
Stilson said this 14,000 acre-foot figure represented the maximum amount of groundwater that Moabites could withdraw from the valley's groundwater store, and the new study makes essentially no revision to that particular figure.

According to Masbruch, Sumsion's 14,000 acre-foot estimate did not include groundwater that flowed strictly through the uplands. Instead, the figure represented more easily accessible groundwater that flows underneath the valley through what is called the valley-fill aquifer.

So, although Sumsion miscalculated how most water gets from the La Sal Mountains into Moab, and although he had the wrong numbers for how much water flowed through the overall watershed, his estimate of how much water is available for human consumption—14,000 acre-feet annually—was largely accurate to what Masbruch's study shows today—14,000 to 16,000 acre-feet annually.

How much water are we using?

Water consumption in 2016, according to Masbruch's report, was oddly similar to the same estimate from Sumsion in 1971.



This graph compares historical water usage derived from the 2019 and 1969 studies along with the water budget outlined by Masbruch. Trend lines are not shown due to a lack of available data. *Graphic by Carter Pape*

In his report, Sumsion estimated that locals, on net, consumed 3,300 acre-feet of water in 1969; Masbruch's estimate of net water consumption in 2016 was approximately 3,400 acre-feet.

In the 1970s, most groundwater taken out of wells and springs in the Moab Valley went toward irrigation; roughly 3,800 acre-feet of water was withdrawn from aquifers to irrigate crops, and about half of that went back

into the ground to be withdrawn again for other purposes, giving a net irrigation consumption of 1,900 acre-feet.

Today, irrigation represents a minority of water usage; only 89 acre-feet of water went toward irrigation in 2016, according to Masbruch's report.

Trends in water usage cannot be divined from two or three data points, said Stilson, so it is hard to know how exactly water usage is changing. Although Masbruch's study showed increasing water usage from 2014 to 2016, more data is needed to truly know.

Exact figures hard to find

State law requires that municipalities report their annual water usage, which is why data on Moab City and the Grand County Water and Sewer Service Agency is public. Private wells, on the other hand, do not have the same metering requirements.

Because of this, Stilson said, estimates of total groundwater usage in the valley can have a relatively high degree of error; withdrawals from private wells can be estimated and approximated based on ongoing water rights adjudication processes, but exact numbers cannot be achieved.

However, Stilson said, metering of Mill and Pack creeks can offer local and state policymakers valuable insights into how much water is available in the valley. Such metering, which is now installed on Mill Creek and possibly in the future for Pack Creek, gives hydrologists key indicators regarding how much water is available.

Stilson said that the centralization of well measurements can also provide a look at how the water table is changing and whether, in particular, the local aquifers are being depleted. Based on Masbruch's study, that trend does not seem to be present, but a more collaborative approach to well-watching will be required for monitoring the water table going forward.

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