How water ends up in Moab
It starts in the La Sals, but the middle steps are vital

Carter Pape   Aug. 23, 2019

Much of the water that enters Moab’s aquifers starts as snow. This early-December precipitation last year in the Sand Flats Recreation Area was already beginning to melt into the rocks as it hit the ground. Photo by Carter Pape

A recently finalized study by the U.S. Geological Survey has corroborated state estimates for Moab’s water budget, the amount of consumable groundwater that passes through the valley each year. Melissa Masbruch, a USGS hydrologist and the lead author on the study, overturned many big assumptions from the previous groundwater study in 1971, led by USGS hydrologist C.T. Sumsion, including the path that groundwater travels as it makes its way from the La Sal Mountains into the underlying valley.

This report explains the journey that groundwater takes between the La Sal Mountains and Moab, why hydrologists’ understanding of that journey has
changed over time and how the science for studying it has evolved.

**Moab’s two major aquifers**

Aquifers are permeable bodies of rock that hold and transmit water underground. These bodies of rock can consist of sandstone, gravel, sand and other materials. Groundwater fills the cracks between aquifer materials the same way seawater saturates sand at the beach.

This map depicts which aquifers are exposed at the ground surface in the study area. Green areas represent the Glen Canyon Group aquifer; pale yellow areas represent the valley-fill aquifer. Click to see the full-size image, or
Wells built throughout Moab and Spanish Valley access what hydrologists call Moab’s valley-fill aquifer. This aquifer and the wells built into it capture and transmit water that has trickled down, sometimes over the course of years, from the La Sal Mountains. A small portion of this aquifer is also recharged by precipitation over the valley.

The area’s other major aquifer is the Glen Canyon Group aquifer. This aquifer comprises much of what Sumsion called in his study the uplands, the area northeast of the valley that includes Sand Flats Recreation Area and Grandstaff Canyon.

**Sumasion’s false assumption**

Groundwater in the Glen Canyon Group aquifer is remote to Moab, but the valley-fill aquifer is directly underfoot throughout the valley. In part because he believed it was more relevant, Sumsion focused on the valley-fill aquifer in his 1971 study, opting not to focus on the Glen Canyon Group aquifer.

Fast forward to 2012, and Masbruch’s study is setting out with a broader focus, including a closer look at the Glen Canyon Group aquifer and how it transmits water. The answer in the end was that Sumsion’s conclusions about groundwater transmission through the uplands was largely flawed, a result mainly of less advanced research techniques.

Sumasion concluded in his study that much of the water that flows through the valley-fill aquifer came in from the Glen Canyon Group aquifer. That is, he believed that water came into the valley primarily from the northeastern uplands.

Water, he thought, primarily started as snowmelt in the La Sal Mountains (an assumption that was later proven correct), entered the Glen Canyon Group aquifer flowing roughly northeast (for the most part, not accurate),
and from there transferred into the valley-fill aquifer that in-town wells tap.

A graphic from the Sumsion study summarizes how he thought about this process with a figure depicting the valley-fill aquifer, which is long and slender, stretching from Moab southwest to Spanish Valley, all between the sandstone rims.

Sumision drew on this map arrows that he believed represented the flow of water into the valley; nearly all of the arrows point southwest, into the valley, from the Glen Canyon Group aquifer.

The Moab valley, shown here with the Colorado River at top left, was the main object of Sumision’s 1971 study. This map shows what he concluded was the major source of groundwater to the valley: The Glen Canyon Group Aquifer northwest of the valley. Map courtesy of the Utah Division of Water Rights
Sumsion’s assumption would later prove to be wrong after Masbruch’s team of hydrologists conducted field tests that showed most of the water takes a different, more southerly path into town.

**Updated techniques yield an updated model**

Masbruch’s team used molecular-level analysis of water and soil around Moab to determine how water gets from the La Sal Mountains into Moab’s and Spanish Valley’s valley-fill aquifer. The conclusions overturned Sumsion’s findings from a half-century earlier, indicating most water takes a different path than he had thought.

Masbruch said that the reason for the stark contrast between her findings and Sumsion’s were the availability of methods used in her groundwater study; the molecular analysis, she said, did not gain traction until around the 1980s and 1990s.

As previously mentioned, hydrologists used methods in the Masbruch study that measured the prevalence of what they call environmental tracers. These tracers include chlorine, noble gases like argon, rare isotopes of hydrogen and oxygen, all of which show up in scarce amounts in all sources of water, and which are useful indicators for the age and source of water.

Masbruch’s findings showed strong evidence that the water in the valley-fill aquifer shared many of the same characteristics with (i.e. contained similar levels of tracers as) Mill and Pack creeks rather than water from the Glen Canyon Group aquifer.
The finding suggests that most of the water in the valley comes from the creeks, which flow into town from the southeast, rather than from the uplands, as Sumsion concluded.

**Why is the water’s journey important?**
The primary reasons to identify groundwater flow paths are to inform policymakers and holders of water rights where groundwater is available for use, how mineralized that water is, and what the consequences could be of withdrawing it.

Showing that the valley-fill aquifer is primarily linked to Mill and Pack creeks, as Masbruch did, rather than the Glen Canyon Group aquifer, as Sumsion believed, leads to two major conclusions.

First, the fate of most snowmelt in the La Sals is a journey through highly mineralized materials. This means that snowmelt ends up as hard water as it makes its way down into the valley through Mill and Pack creeks.

Second, as valley dwellers make more withdrawals from the valley-fill aquifer, Mill and Pack creeks will shrink in size, as they are directly linked to the aquifer and are the primary destination of discharge from it.

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By Jeff Richards
Contribution Writer

The U.S. Geological Survey (USGS) intends to sponsor and conduct a new comprehensive groundwater study of the Moab area, officials said this week. David Susong, supervisory hydrologist at the USGS Utah Water Science Center, talked about the proposed three-year study during a 90-minute public presentation and...
USGS study shows Moab has less water than previously thought

By Rose Egelhoff

The Times-Independent USGS scientists reported the findings of a three-year study on Moab and Castle Valley groundwater in a public meeting on September 21. The results indicate that the safe yield for the area is likely between 12,000 and 14,000 acre-feet of water per year, rather than the...