the Watershed Watch

Newsletter of Salt Lake County's Watershed Planning & Restoration Program

Fall 2023, Issue 26

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Salt Lake County Watershed Program
November 15-16

SALT LAKE COUNTY WATERSHED

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Our 2023 snowpack broke records, so where did all the water go?

by Bob Thompson, Watershed Planning & Restoration

Growing up in Salt Lake City, I often heard the phrase "The weather in Salt Lake is great. If you don't like it, wait five minutes and it will change." Winter 2023 reminded me of those days back in the 1980's when that phrase rang true. 2023 was a throwback to the past, when snow piled up not in inches but in feet, and winter was once again a polarizing topic between winter sports enthusiasts and those who live here and merely tolerate the cold months.

Then, as historic floods were expected during spring runoff, all the snow seemed to magically disappear. Only a few neighborhoods in the greater Salt Lake area dealt with flooding in the aftermath of such an eventful winter season. This series of events begs the question: what happened? The answer is somewhat complex, but there are a few patterns worthy of discussion in an attempt to explain this unusual season.

Amount & Timing

First and foremost, we need to look at the amount of precipitation received this year, as well as the timing of its arrival. As folks who live here know, we tend to have both wet seasons and dry seasons in the Salt Lake Valley. According to Weather Underground, the wet seasons are typically early

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Hollow tubes are used to measure snowpack depth and density up Big and Little Cottonwood Canyons. We broke out our longest tubes yet in 2023!

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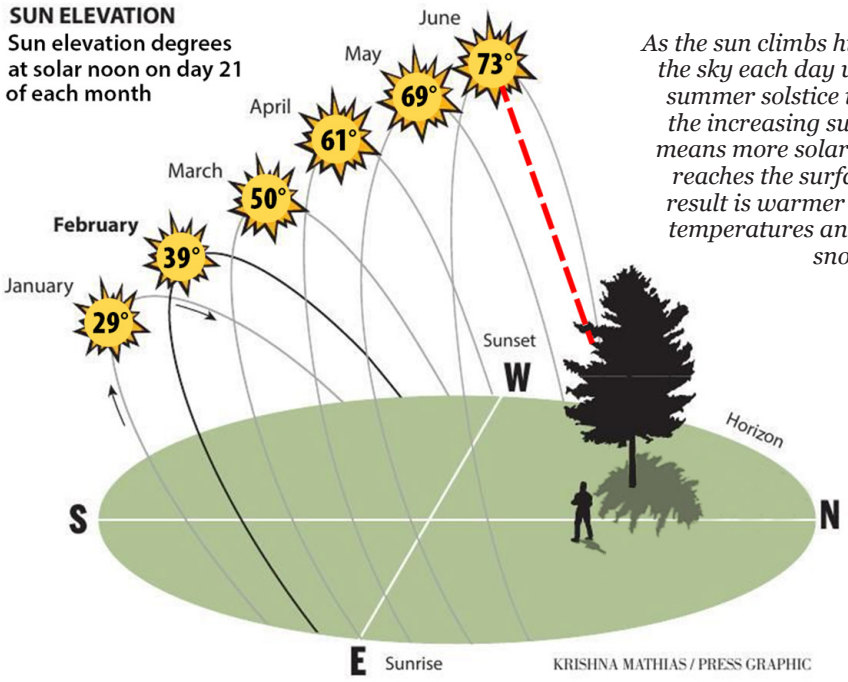
winter through early spring (late October-late May) and summer tends to be much drier. In fact, April and May average over 2" of rain per month on the valley floor, more than double what is expected in summer months. Often, we will see those numbers exceeded in wet years even though the overall pattern remains intact.

In 2023 there was an abrupt shift of pattern where the winter months of November-March more than delivered their payload of precipitation, then in April and May the proverbial spigot shut off two months early and the Salt Lake valley was left enjoying beautiful temperate weather from April 6 through June. To illustrate this phenomenon, see the graph below which compares rain accumulation for the water years 2019 and 2023, both very wet years by most standards. In 2019, the precipitation kept accumulating until early June when the curve flattens out as the dry season began. Compare that to 2023, when the dry season began in early April as rain accumulation slowed significantly. The abrupt change in slope on the 2023 curve in early April shows the difference. (Data source: Salt Lake County precipitation sensor at the Olympus Cove Fire Station.)

Time

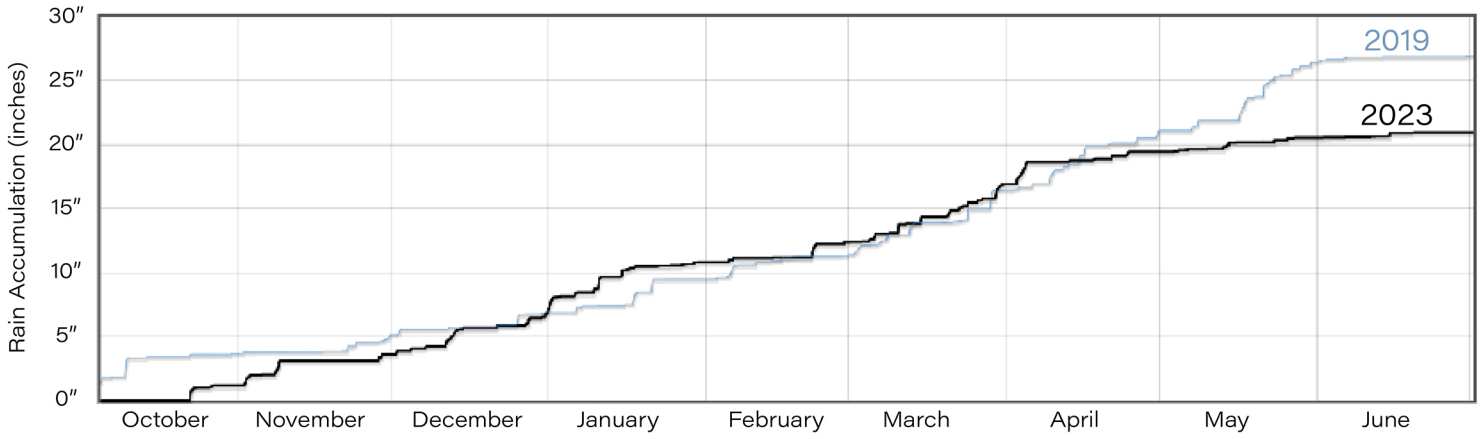
Time is another big factor that needs to be considered, to explain where all the water went in the 2023 spring runoff. While time might seem like an unusual factor regarding snowmelt and spring runoff, it does play a huge role in how fast snowmelt enters streams. There's a reason why peak runoff always tends to happen around the same time of year, regardless of how much snow there is to melt. Time affects snowmelt in a few ways but one of the big ones is how the apparent path of the sun changes over time. The sun climbs higher in the sky each day at noon until the solstice on June 21, when the sun reaches its maximum angle of approximately 73 degrees at our latitude (see solar angle diagram). The higher in the sky the sun appears, the more direct the radiation shining on the snow and thus, more capable of producing melt in the snowpack.



As the sun climbs higher in the sky each day until the summer solstice in June, the increasing sun angle means more solar energy reaches the surface. The result is warmer ground temperatures and faster snow melt.

Believe it or not, snow tends to insulate itself quite well, so early season warm temperatures (like we experienced this spring) do not have a great ability to melt the snowpack. But when high temperatures mix with solar radiation at more direct angles to the snowpack, the melt happens much more efficiently.

In 2023 we had a very inefficient melt cycle that lasted over two months. From a flood control perspective, the terms "inefficient" and "extremely favorable" can be used interchangeably. Moderate temperatures, sunny skies, and minimal snow accumulation (after April) allowed the record-breaking



Precipitation data shows how rain accumulation slowed significantly in early April 2023, versus 2019 where precip continued accumulating until early June. (Data source: Salt Lake County precipitation sensor at the Olympus Cove Fire Station).

snowpack of 2023 to melt really, *really* evenly. Compare that with most other years, where the melt typically happens over only a few weeks. As you can imagine, the amount of water from melting snow entering streams will be vastly different if the length of the melt cycle is stretched out two or even three times longer.

There are many other factors that influence snowmelt such as the color of the snow surface, density of the snowpack, density of trees in a particular watershed, saturation of the soils under the snowpack, and so on. We would need a much longer newsletter to discuss each of these factors. There is original research taking place examining many of those factors to better understand how the changing climate may influence snow melt in the future.

In the meantime, feel free to follow the Salt Lake County precipitation and stream flow gauge program page at: https://rain-flow.slco.org. □

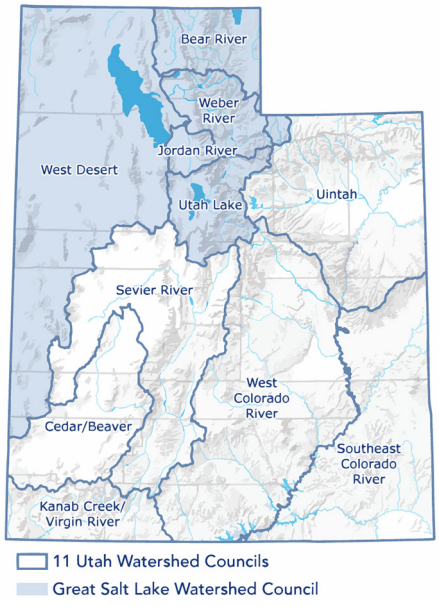
Salt Lake County Watershed collecting snowpack data at one of the season's last snow sampling days in early June (elevation 10,385 feet).

Implementation of Utah's Watershed Councils Act (HB 166)

In 2020, the Utah Legislature passed the Watershed Councils Act to facilitate diverse and balanced stakeholder forums to discuss water policy and resource issues at both the state and local watershed levels.

Per the act, Utah Division of Water Resources created the Utah Watershed Council (a state council) and twelve local watershed councils. Eleven based on hydrologic basins and a 12th comprised of the five basins that drain into Great Salt Lake–the Bear River, Weber River, Jordan River, Utah Lake, and West Desert. The state council began meetings January 2022 and the local councils began to convene in spring 2023.

Learn more. Get involved. Go to: https://water.utah.gov/watershed-councils/



SUBMIT an ABSTRACT by SEP 22

17th Annual Salt Lake County Watershed Symposium

November 15-16, 2023

Free and open to all, the Watershed Symposium is one of the best local opportunities to network and build relationships toward supporting a healthier watershed.

Registration & details:

https://watershedsymposium2023.eventbrite.com/

Measuring streamflow safely with a high-tech miniature boat. Go Tiny Dancer, go!

by Watershed Planning & Restoration

Knowledge of the flow of water in our streams plays a vital role in flood protection, water supply, pollution control, and ecosystem management. During average and low flow times of the year, Salt Lake County's Watershed Program uses traditional flow measurement methods while standing in the stream with a flow-tracker device. But when streams are running too fast or too high, we'll use a high-tech miniature boat to collect critical flow data from the safety of the shore. Christened "Tiny Dancer", this little boat uses modern electronics in a portable and lightweight package. It's cute and tiny, at just two feet long.

To measure streamflow (or Q), the Watershed team must do two things. First, check the staff gauge in the stream to obtain a quick and easy visual indicator of the water level. The staff gauge is essentially a big ruler installed in the creek. Second, deploy the mini boat to measure the flow. The relationship between the water level and the flow measurement provides a data point on the 'rating curve' for the stream. Multiple measurements at different flow levels are required to keep the rating curve, and corresponding viewable data, accurate.

Tiny Dancer's results are accurate and instantaneous. Onboard is an Acoustic Doppler Current Profiler (ADCP) which uses a 5-beam bottom-tracking sonar system to produce a record of water current velocities, widths, and depths. A dedicated vertical beam for measuring the depth directly under the system allows for measuring the most accurate channel cross-section possible. Up top, the boat has antennas for the global positioning system (GPS) and Bluetooth radio. One or two people operate the boat from the safety of the riverbank using ropes and tethers. The river flow data is transferred directly to a laptop computer on shore, via enhanced Bluetooth communications. Watch Tiny Dancer in action on YouTube!

See realtime streamflows in Salt Lake County at https://rain-flow.slco.org. □

Christened "Tiny Dancer", this little boat uses modern electronics in a compact, portable, and lightweight package to easily and accurately measure river and stream flows from the safety of the shore.