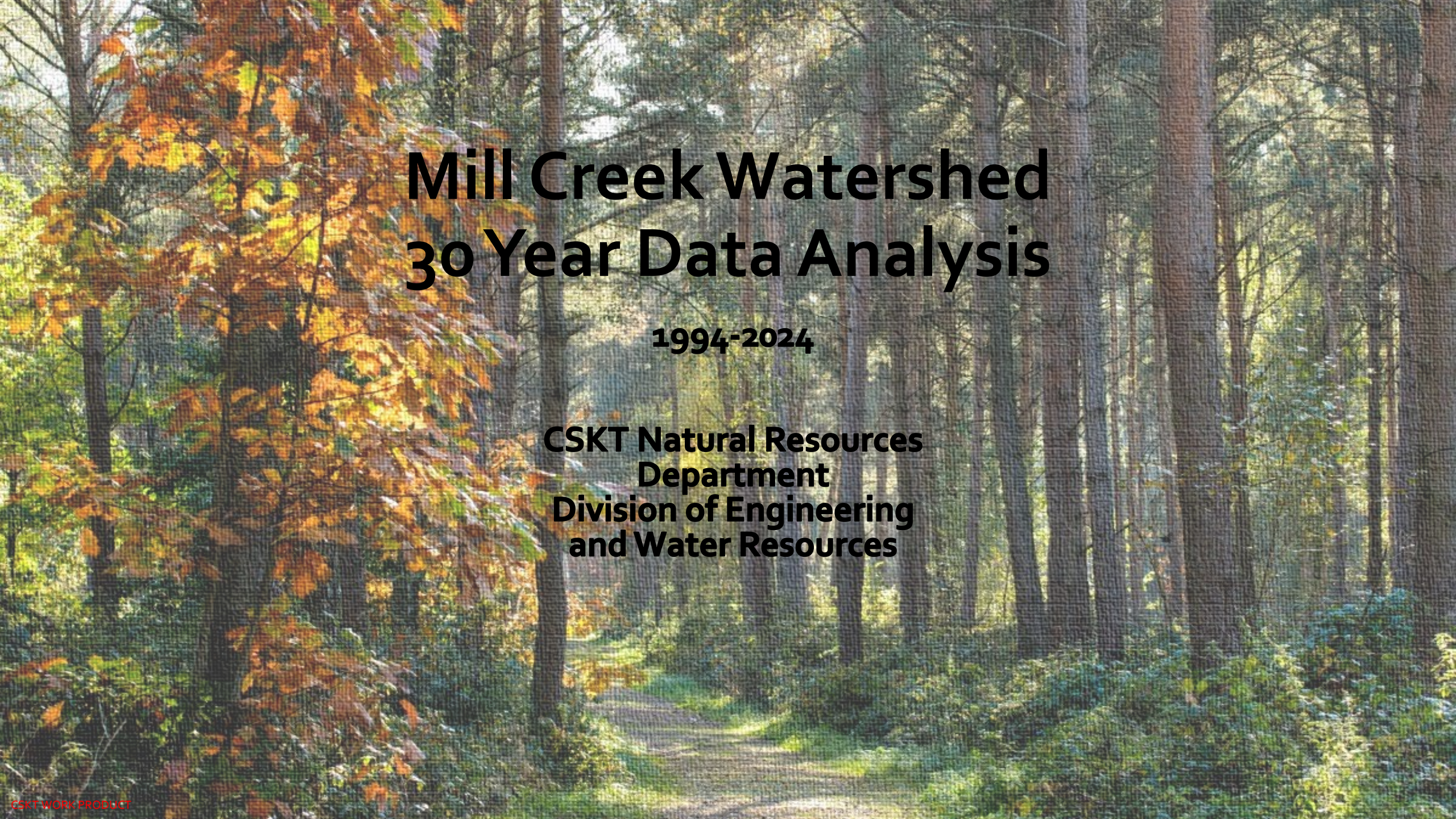


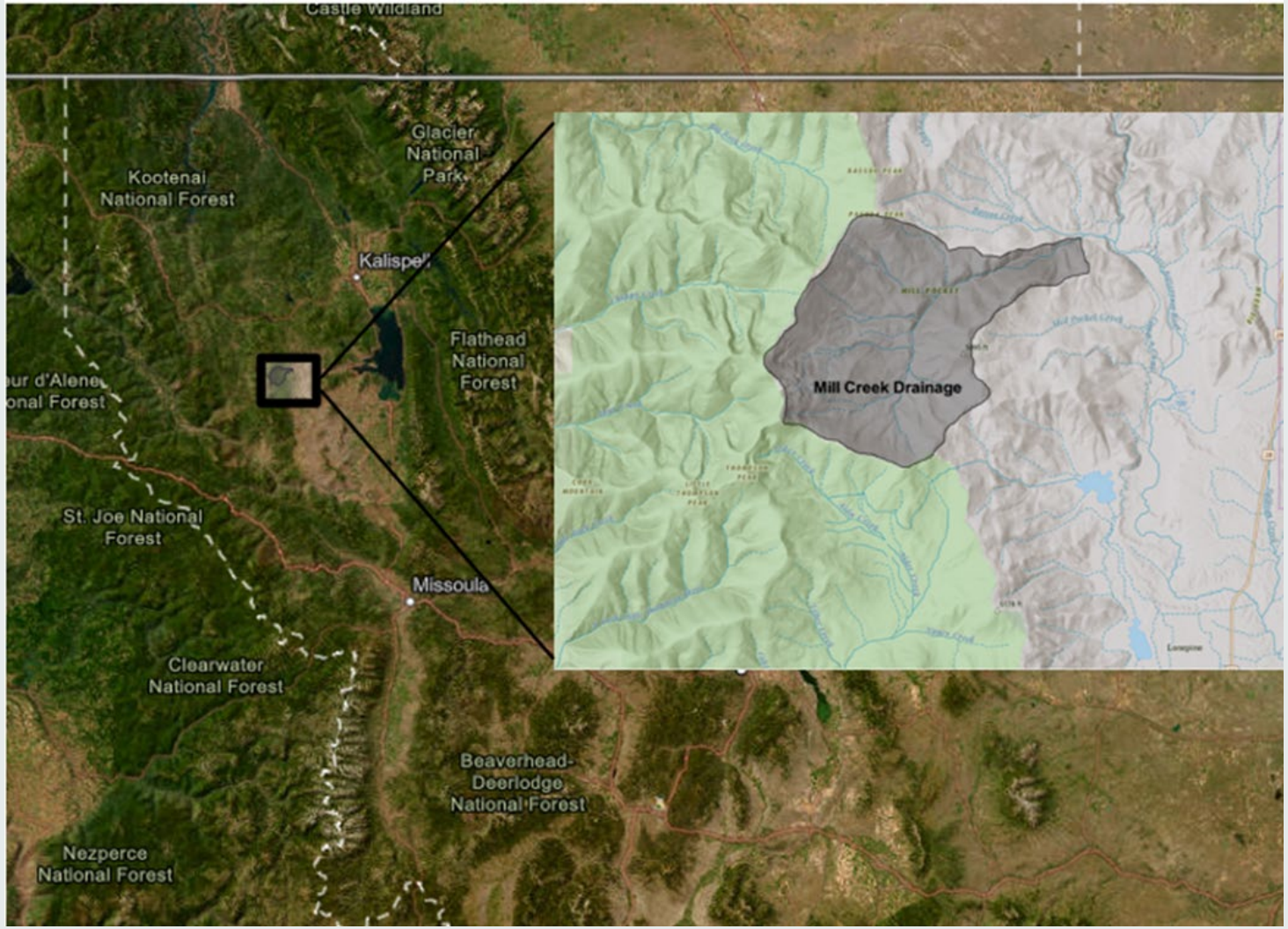
Mill Creek Watershed 30 Year Data Analysis

1994-2024

CSKT Natural Resources Department
Division of Engineering and Water Resources

Mill Creek Drainage Quick Facts

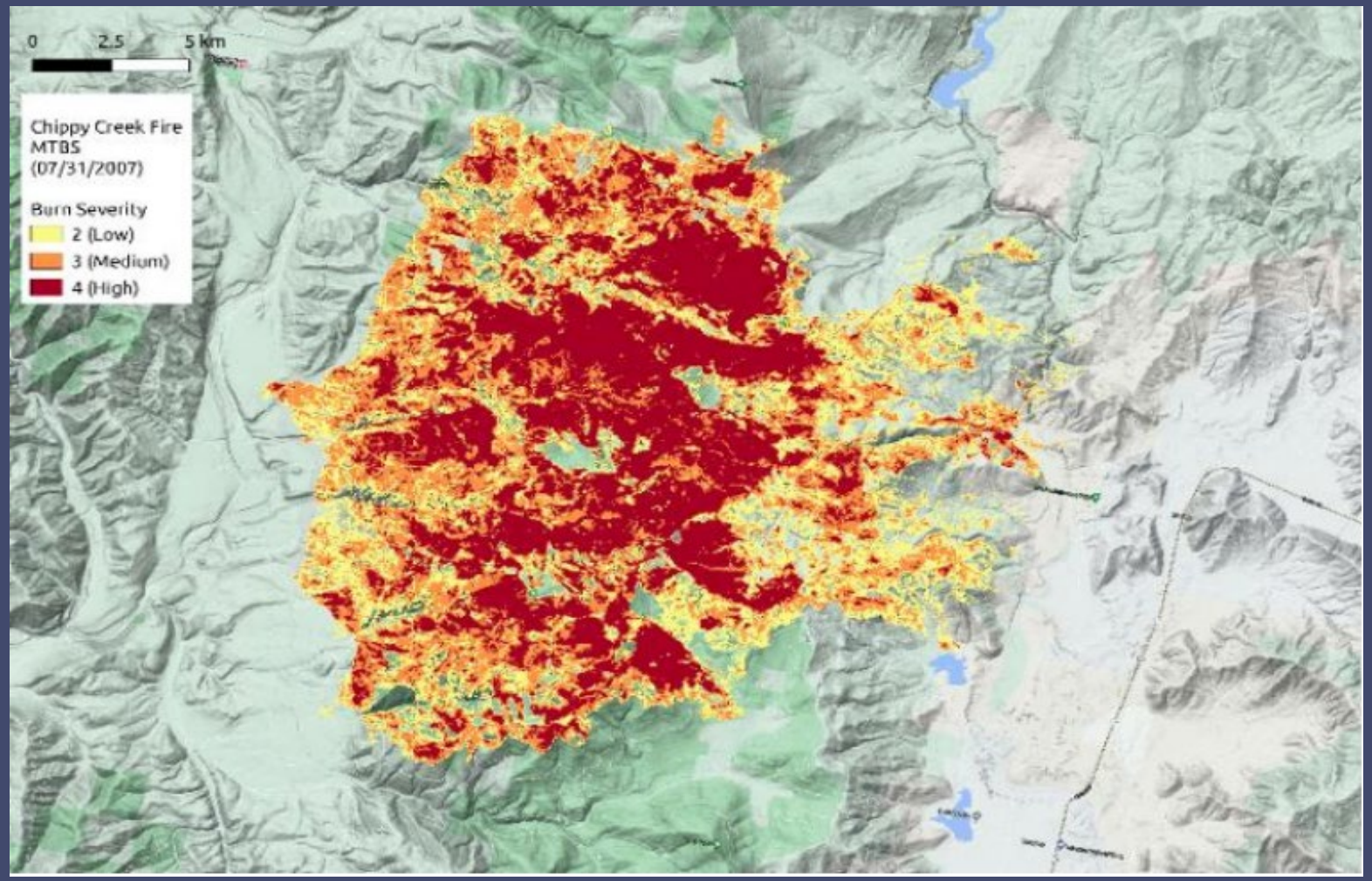
- 19.7 square miles (12,608 acres)
- 95% evergreen/conifer forest
- Average basin slope 29 %
- Elevations ranges from 2972-7050 ft amsl (4633 mean)
- Average precipitation ~23 inches (Bassoo Peak average=22 in)
- Mean daily flow of 3.30cfs (1994-2024)
- Average temperature 40.6F



Why Mill Creek?

- It supplies irrigation water to the Little Bitterroot River/Camas A Canal for the Hot Springs area
- Water supply forecasts have not reflected real-time, on the ground conditions
- Water supply for this area has been observed by water users/managers as "lower than normal" in recent years
- Ecological value to local terrestrial and aquatic species
- Mill Creek has the only natural flow gage in the area with long term data
- This basin evaluation looks at 30 years of data in an attempt to unravel a complicated mixture of factors that lead to inconsistent water supply

Fire



Burn Severity Map of Chippy Creek Fire, 2007

- The Mill Creek Drainage was significantly impacted by the Chippy Creek Fire in 2007, and, to a lesser degree by the Mill Pocket Fires in 2023 and 2024.
- Post fire conditions in headwater stream systems affect streamflow and snowpack

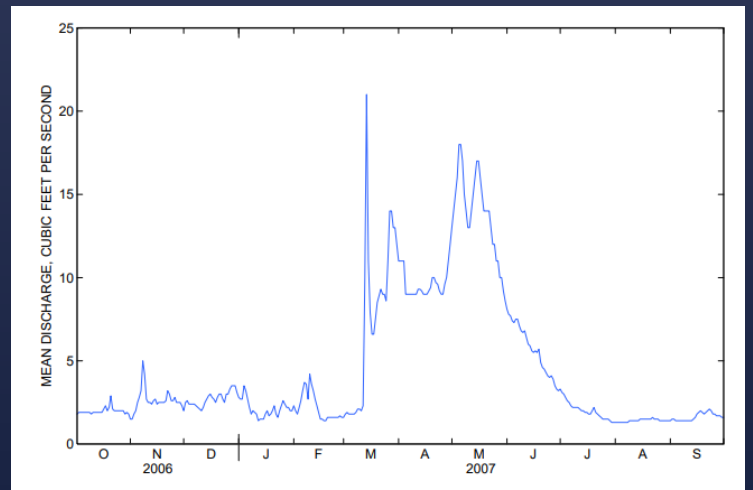
How Fire Impacts Water Supply

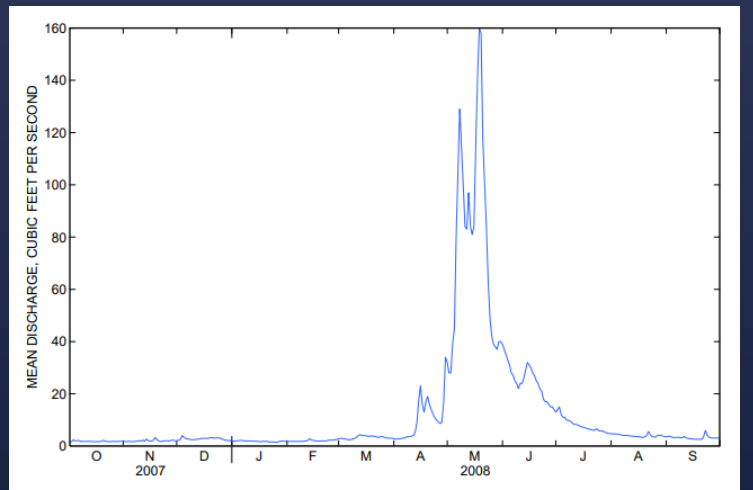
Decreases vegetative cover

- Decreases evapotranspiration/interception, leading to increased magnitude and impacts timing of runoff after precipitation events
- Less groundcover to protect snowpack impacts the magnitude and timing of snowmelt
- Increases stream temperatures

Changes soil structure/stability

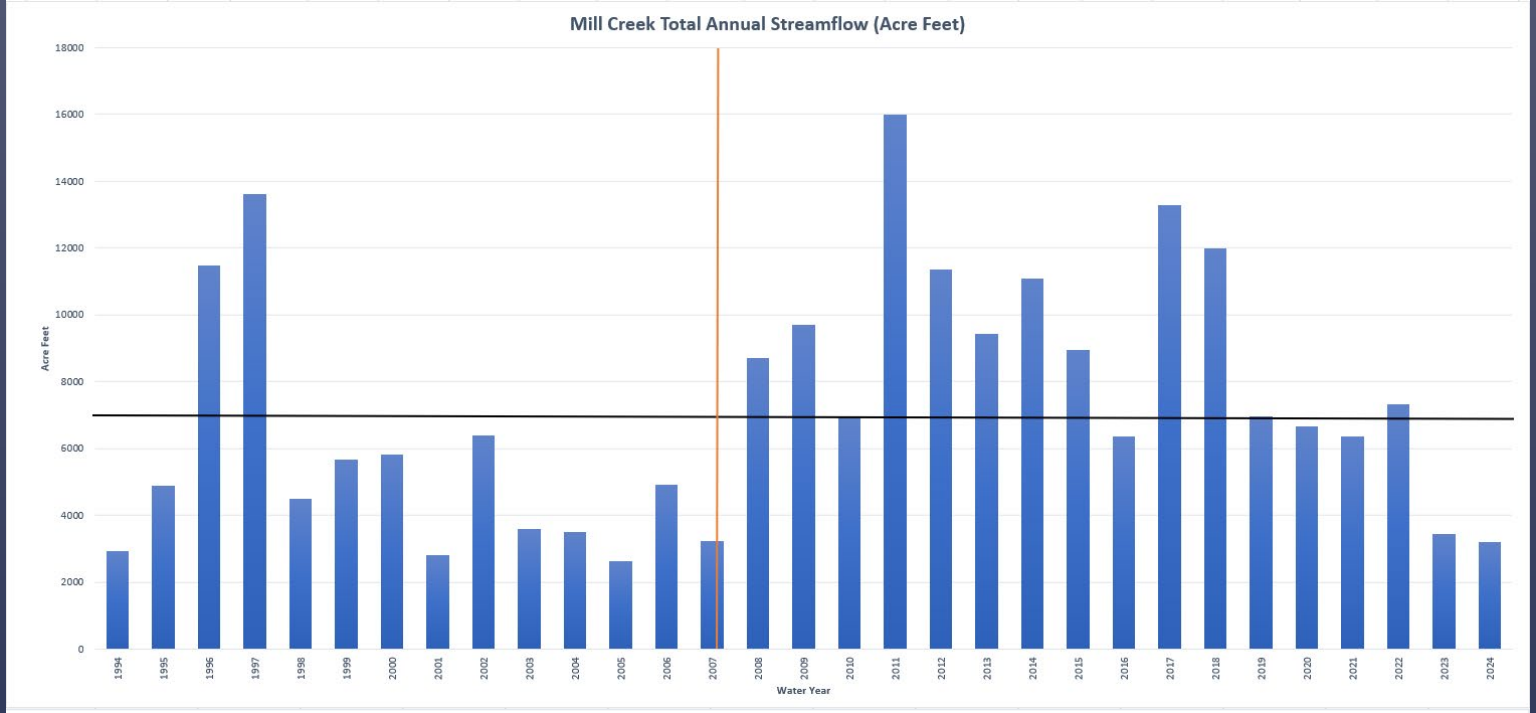
- Decreases water's ability to infiltrate= depleted soil moisture
- Water repellant soil leads to increased runoff
- Increases flood risk



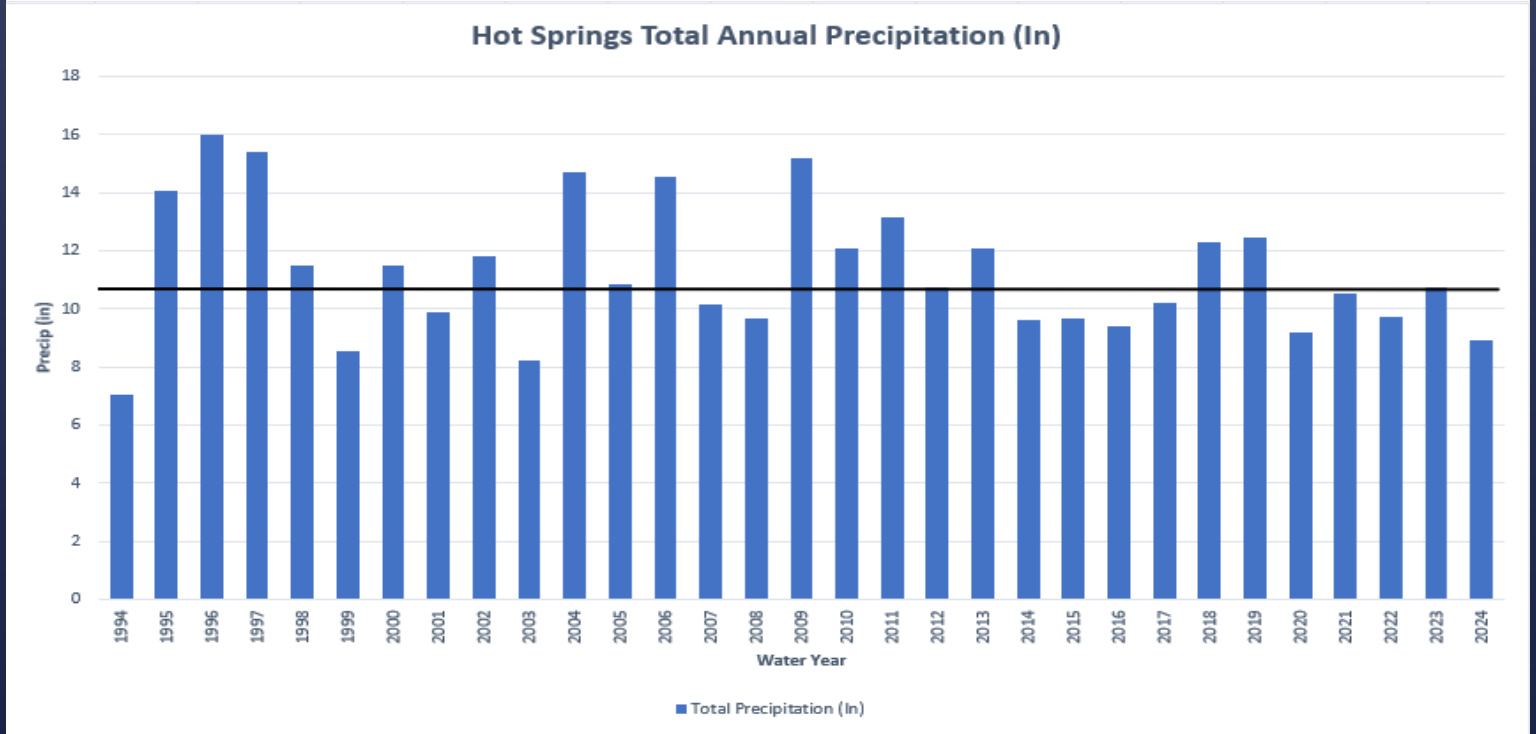


Source: wdr.water.usgs.gov

Fire Influences Streamflow Volume

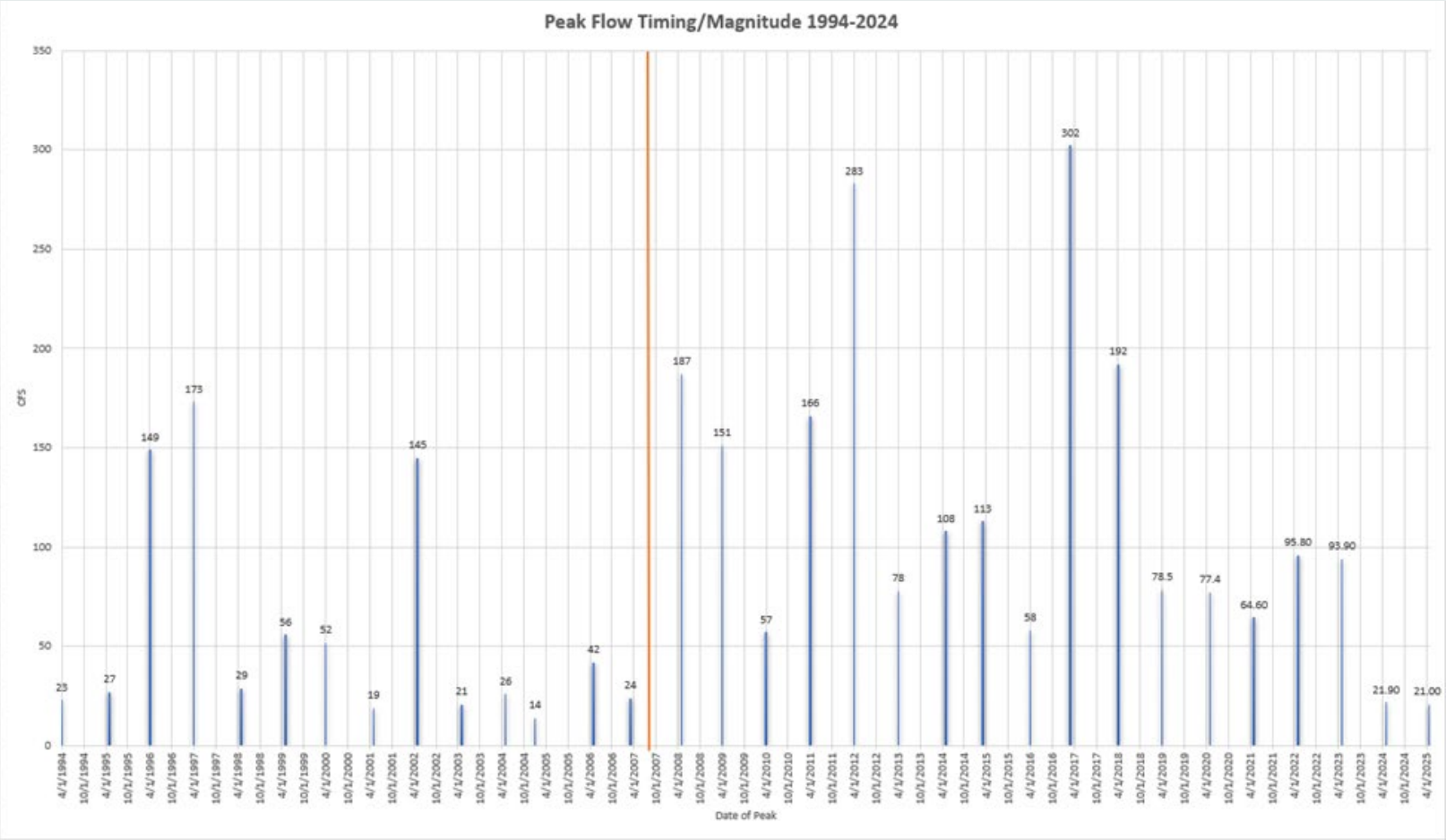


Total Annual Streamflow per water year from Mill Creek in Acre Feet (1994-2024). Orange line depicts timing of Chippy Creek Fire, black line is average 6964.6 AF. (from CSKT site #312100 Mill Creek above Bassoo Creek near Niarada, MT.)



Hot Springs Total Annual Precipitation (1994-2025, WRCC) Black line depicts average 10.75in

Fire Impacts on Peak Flows



Annual Peak Streamflow Timing and Magnitude from Mill Creek in CFS (1994-2025). Orange line depicts Chippy Creek Fire.
(Instantaneous data **from CSKT site #312100 (USGS site #12374250) Mill Creek above Bassoo Creek near Niarada, MT)**

Pre-Chippy Creek Fire:
Average date of peak discharge: **May 7**
Average value of peak discharge: **28 cfs**

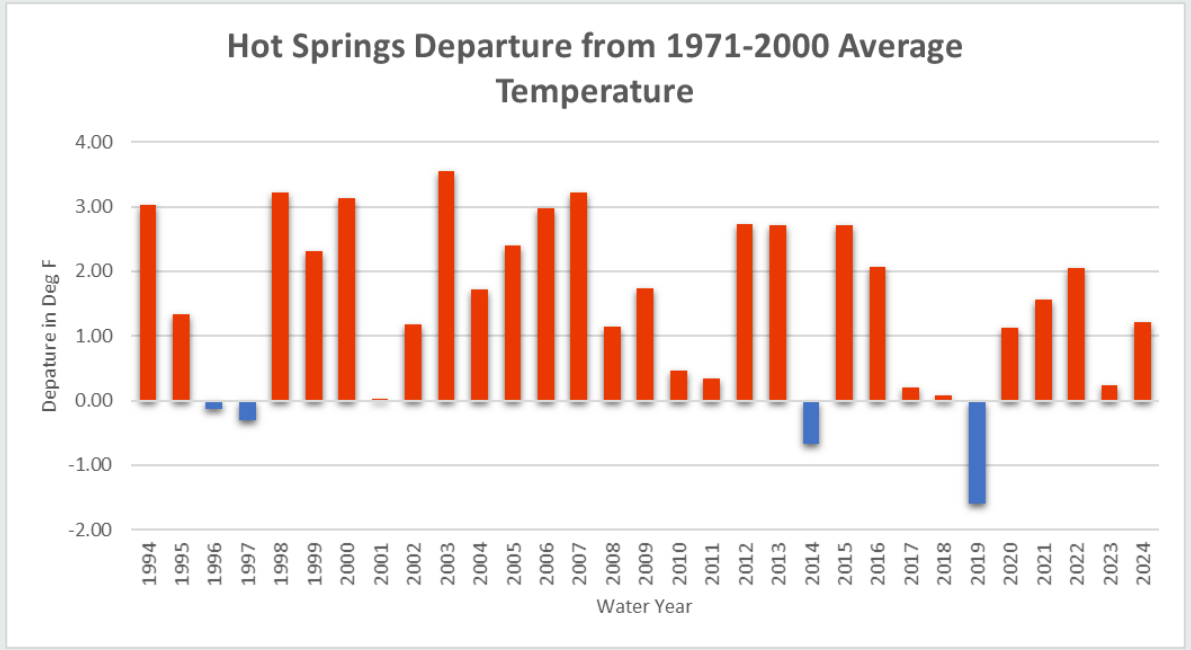
Post Chippy Creek Fire:
average date of peak discharge: **April 28**
Average value of peak discharge: **94.85 cfs**

This demonstrates that post-fire conditions can not only affect the magnitude of peak flows, but also the timing.

Climate Data

Average Temperature

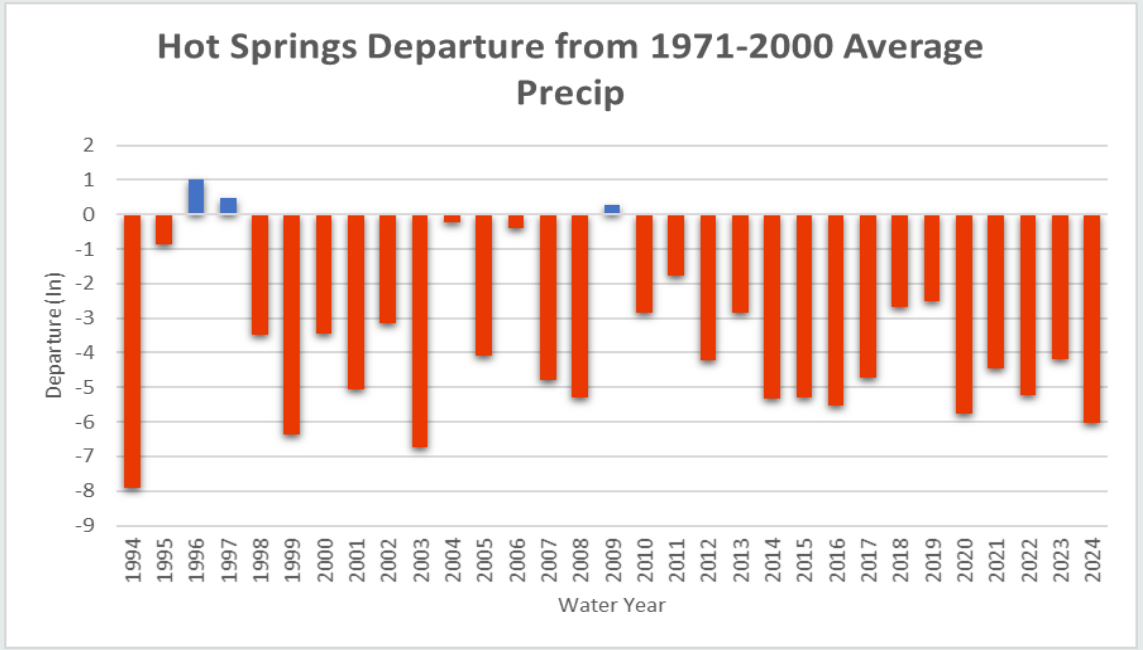
1971-2000 **45.5 ° F** 1994-2024 **47 ° F**



+1.5°F

Average Precipitation

1971-2000 **14.95 in** 1994-2024 **11.3 in**

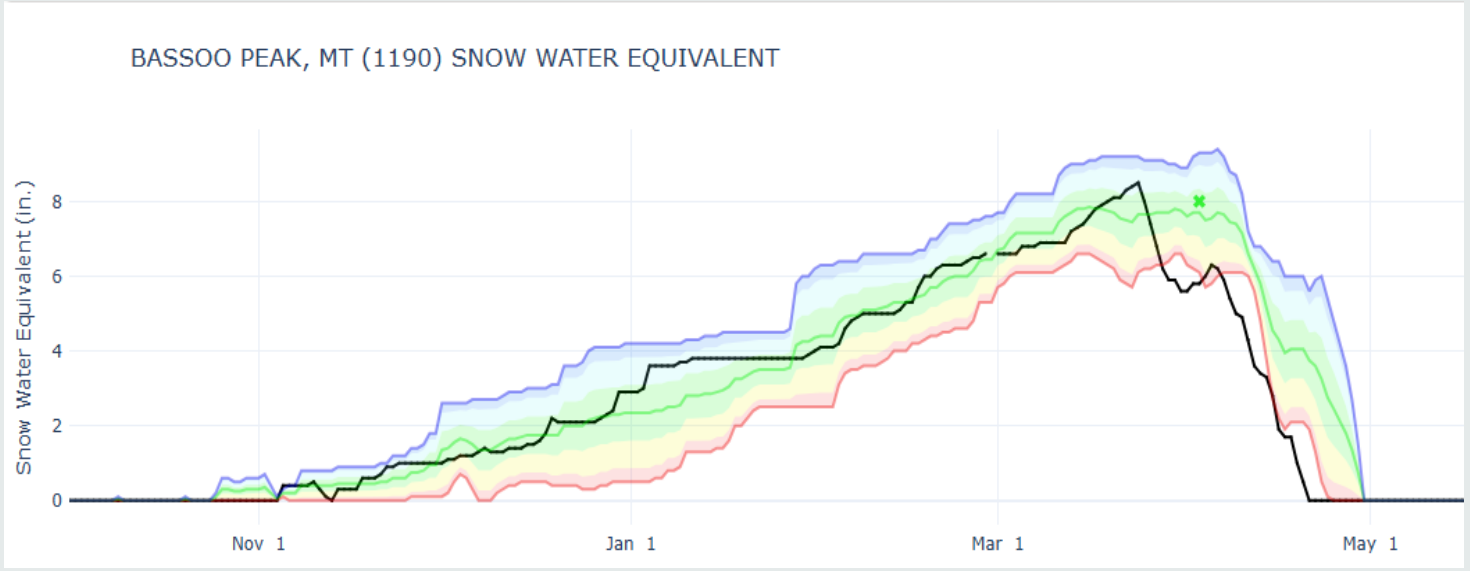


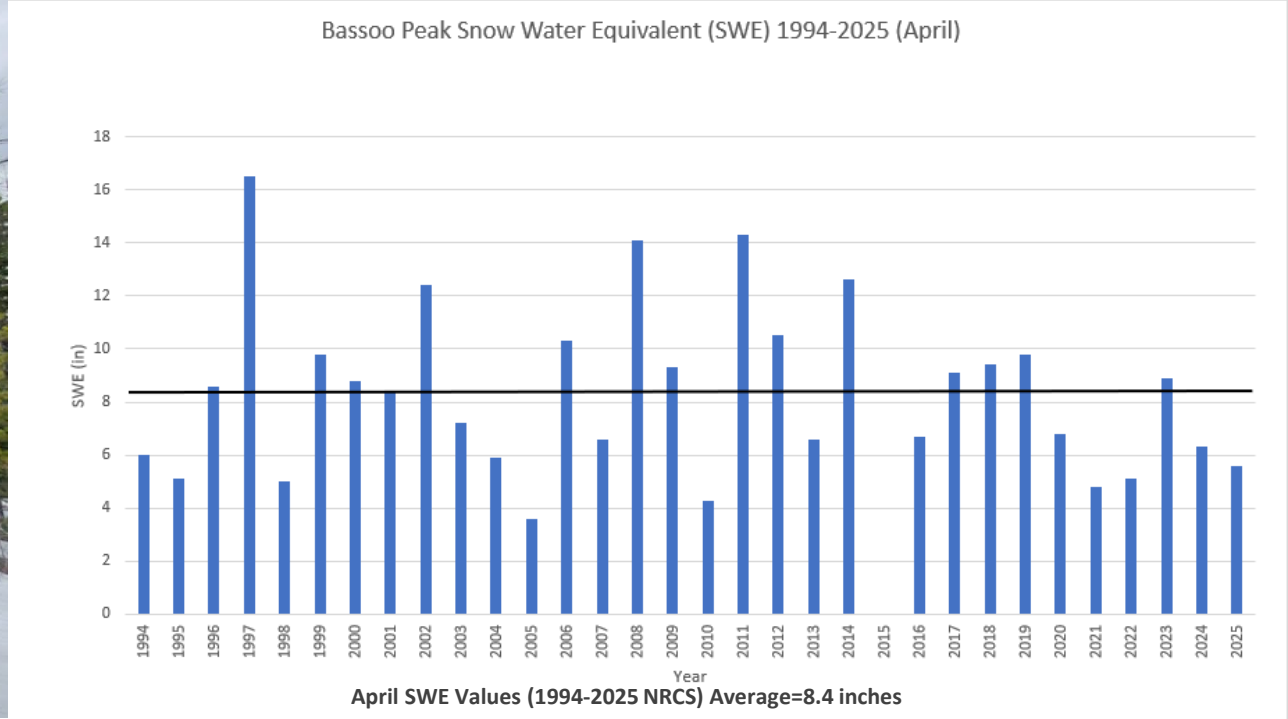
-3.65in

Data from Western Regional Climate Center RAWS

Snow Pack Data

Bassoo Peak SNOTEL, black line indicating 2024-2025 season and earlier melt out, April 21 vs average of April 30. (NRCS)





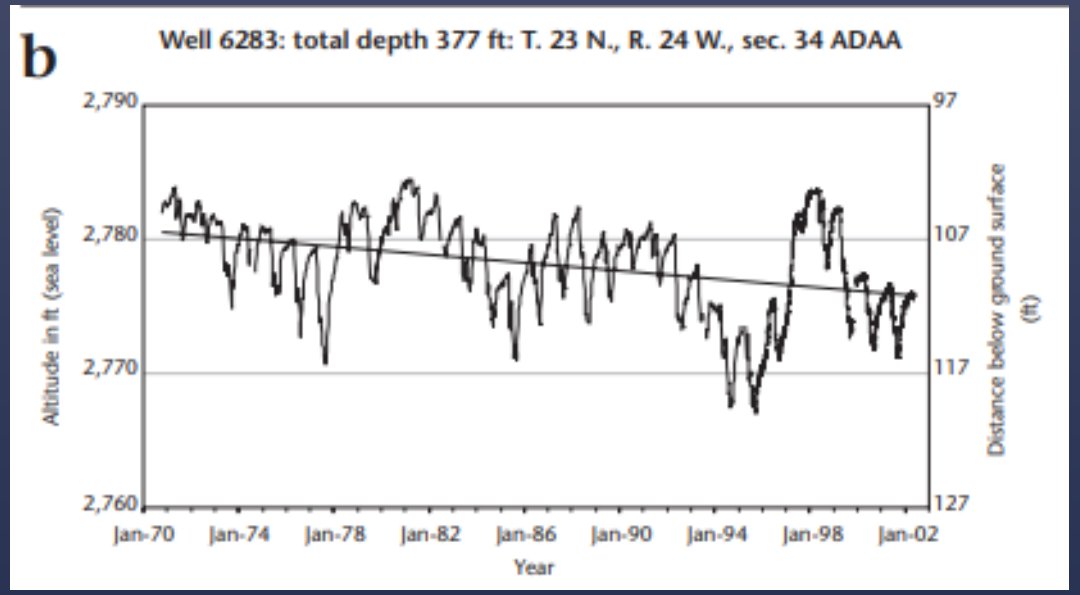
April SWE Values (1994-2025 NRCS) Average=8.4 inches

Groundwater

A 2004 study on groundwater resources by MT Bureau of Mines and Geology states that

"…the long-term water-level trend is downward, indicating that artesian pressure in the aquifer is being lost."

-Ground-Water Assessment Atlas 2



Implications

The combination of post fire conditions, increased temperatures, and decreased precipitation in the Mill Creek watershed has made water availability hard to predict.

Next steps?

- Address/adjust how water is managed upstream and downstream
- Look for options for additional storage
- Increase water use efficiency

Questions
Discussion