USE OF CONTINUOUS WATER QUALITY SENSORS TO EXAMINE HEADWATER RESPONSE TO SNOWMELT: JEMEZ RIVER, JEMEZ MOUNTAINS, NM

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Introduction

Many hydrological factors contribute to changes in stream water quality. The study includes two years (2018-2019) of water quality time-series data from streams located in the Valles Caldera National Preserve, Jemez mountains, New Mexico (Figs.1 and 2). Investigation highlights significant differences in snowpack. SNOTEL data show that 2018 was well below, and 2019 similar to, the 1981-2010 median snow water equivalent.

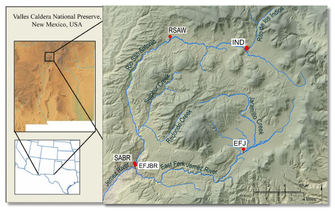

Fig 1. Location of Valles Caldera and sonde sites.

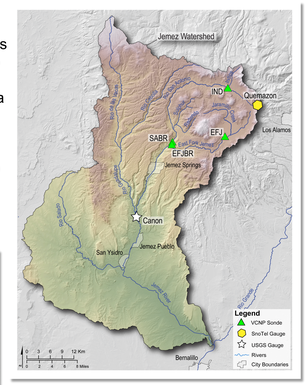

Fig 2. Jemez watershed with study infrastructure (SNOTEL site and USGS gage at Cañon).

Results

- Snowpack in the Jemez Mountains shows high variability (Fig. 5). Jemez River discharge is much higher in 2019 then 2018 (Fig 6.).

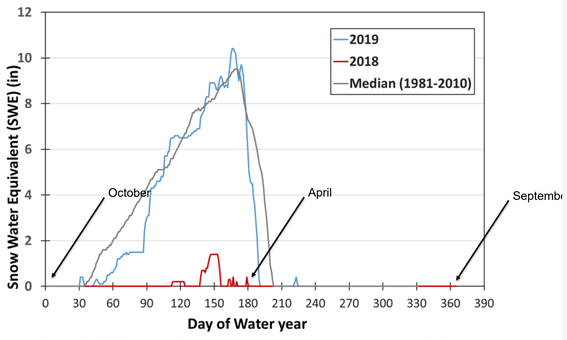

Fig 5. SNOTEL site at Quemazon, daily snow water equivalent (SWE).

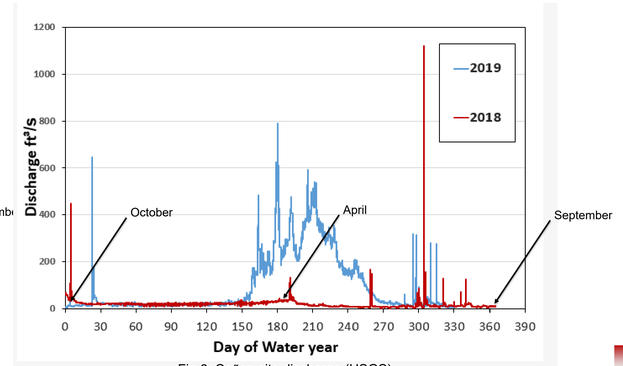

Fig 6. Cañon site discharge (USGS).

- Specific conductance shows a significant change between the two years (Fig 7.) site locations (Fig 1.). All parameters for one site (Fig 8.), site location (Fig 9) EFJBR.

Materials and Methods

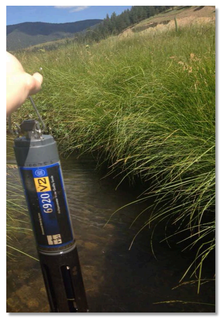

Fig 3. Yellow Springs Instrument (sonde).

Fig 4. Bottom view, wipers that periodically clear the sensors.

- Measurements of temperature, dissolved oxygen (DO), pH, and turbidity were taken using Yellow Springs Instruments continuous monitoring sensors (Figs 3 & 4).
- We report on two consecutive years at 15 minute intervals between May and October in 2018 and 2019.
- Autonomous sensors are calibrated and maintained every three weeks.
- Analysis performed using the AQUARIOUS (Aquatic Informatics), Excel, and MATLAB data platform.

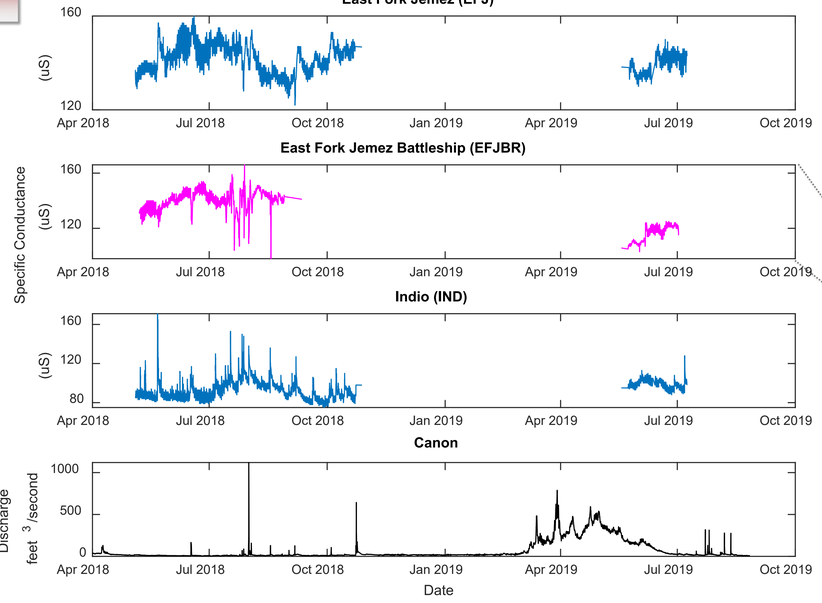

Fig 7. Specific Conductance from selected sites. Cañon discharge at bottom.

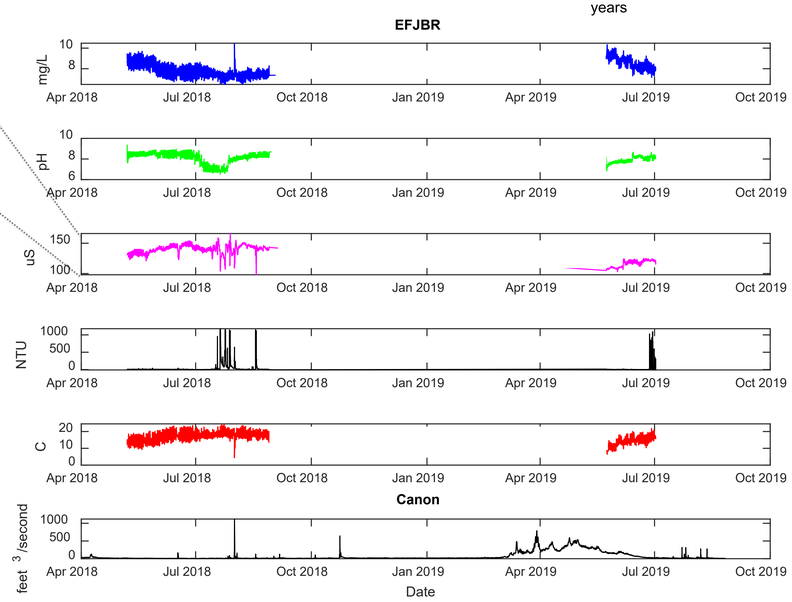

Fig 8. Five parameter data from East Fork Jemez, Battleship Rock.
Top to bottom: Dissolved oxygen, pH, specific conductance, turbidity, and temperature. Cañon discharge at bottom.

Conclusions

The strong snowmelt-runoff in spring 2019 resulted in high turbidity, reflecting runoff contribution of soil and post-fire materials in addition to bank erosion.

Relatively low and constant dissolved oxygen, and attenuated diurnal pH variations relative to conditions in 2018, indicate reduced photosynthetic activity (also strong diurnal variations are noted).

Further observations will allow comparisons of discrete flow events following the snowmelt pulse (monsoon-derived see Fig. 6 and Liu et al., 2008).

Future Work

- Import future data to complete 2019 and correct/ remove noise from data
- Use statistical analysis (quality assurance) to gain more qualitative insight
- Maintain calibration and maintenance of sensors for future years

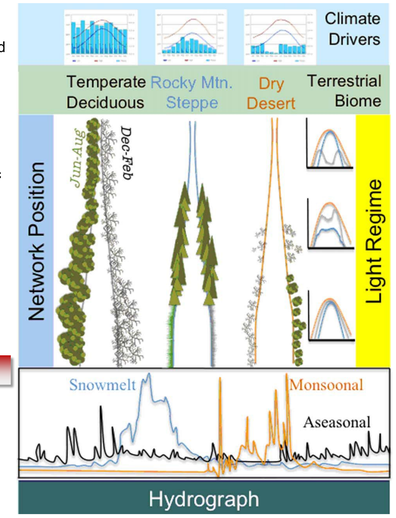

Fig 9. Model with differences in how climate, light and hydrologic regimes vary along the river (Bernhardt, E.S).

Fig 10. East Fork Jemez Battleship Rock (EFJBR)

Acknowledgements

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Fig 11. Valles Caldera National Preserve

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