



Southern Colorado Plateau

INVENTORY & MONITORING NETWORK

Publication Brief - Aquatic Macroinvertebrates

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Title: Long-term Trend in the Aquatic Macroinvertebrate Community of the Mancos River at Mesa Verde National Park -

Aquatic Macroinvertebrate Monitoring 2008–2019

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Report Location: [NPS DataStore 2306058](https://www.nps.gov/datastore/2306058)



Caddisfly larvae/
 Matt Reinbold
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Vital Sign Monitoring Overview: [Long-term aquatic macroinvertebrate monitoring](#) looks at small organisms that are found in freshwater ecosystems, including insect larvae, worms, and snails. They play a key role in the cycling of nutrients in aquatic systems and are a great indicator of river and stream health.

KEY FINDINGS

- Chronic hydrologic and thermal stress have been observed on the Mancos River in MEVE.
- Results from the state of Colorado's multi-metric index support the conclusion that SCPN monitoring sites have been experiencing impairment for multiple years between 2008–2019.
- Sensitive taxa, particularly trichopterans (caddisflies) have shown a decreasing trend attributed to periods of hydrologic and thermal stress.



Adult caddisfly/ Kess Waterlander CC BY-SA

Summary: This report summarized data collected by the [Southern Colorado Plateau Inventory and Monitoring Network](#) (SCPN) from two long-term aquatic macroinvertebrate monitoring sites on the Mancos River in [Mesa Verde National Park](#) (MEVE) for the years between 2008–2019. The goal of this report was to describe trend in key physical habitat and aquatic macroinvertebrate community metrics to provide managers with an assessment of the aquatic community and the physical factors that impact the structuring of that community. Results suggest that the aquatic community at these monitoring sites have experienced periods of thermal and hydrologic stress. These stressors have resulted in periodic impairment of aquatic communities in the Mancos River and have led to a decrease in sensitive taxa.

Multiple reservoirs and diversion ditches along the Mancos River serve as extraction points resulting in reduced streamflow as the river enters MEVE parklands (Fig.1). These reduced flows can prove particularly detrimental to the aquatic community during the warmer, drier months. Stream temperature data collected from the Mancos River indicates that the aquatic community experienced several years of thermal stress where daily maximum stream temperatures exceeded the water quality standard for aquatic life along this stretch

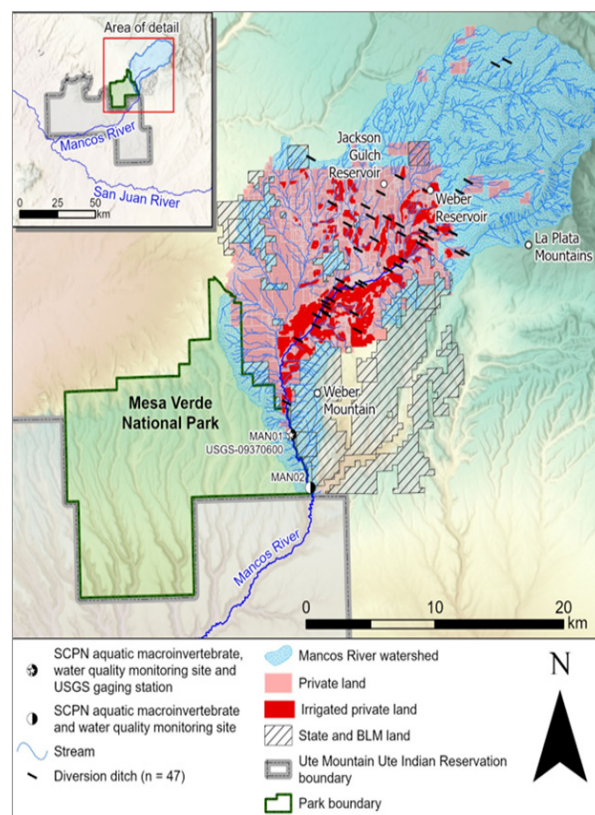


Figure 1. Map of the Mancos River Watershed, Colorado, showing the locations of MAN01 and MAN02 long-term monitoring sites (2008–2019).

of the Mancos River (Fig.2). Timing of these exceedances match closely with some of the lowest discharge values collected by the USGS stream flow gaging station at the upper monitoring site. This suggests that hydrologic stress in the form of extremely low stream discharge may be responsible for an increase in stream temperatures.

Results from the Colorado Multi-Metric Index (MMI) support the finding that monitoring sites on the Mancos River are experiencing chronic stress. This index is designed to describe the ecological integrity of river reaches using biological metrics from community data collected at these monitoring sites. Samples from SCPN monitoring sites demonstrate that approximately 28% of samples from the upstream site and 20% of the samples collected from the downstream site were impaired (orange circles) over the course of this study (Fig. 3). Metrics where impairment was most evident were EPT (Ephemeroptera, Plecoptera, Trichoptera) taxa richness, percentage of intolerant taxa, and clinger taxa richness, which decreased in impaired samples by approximately 35%, 68% and 39%, respectively.

Trichopterans (caddisflies) are a taxonomic group that can be applied to all three of these metrics. Most genera of trichopterans are clingers that reside on the underside of bed substrates in riffles and are extremely sensitive to changes in the aquatic environment, particularly thermal stress. Thermal stress can lead to mortality and egg hatching failures which have been shown to lead to the removal of these organisms from communities where prolonged stream temperature increases occur. Trend analysis results from SCPN's long-term monitoring program show a decreasing trend in trichopteran richness and abundance from the upstream monitoring site from 2008-2019. Stream temperature exceedances match years where lower trichopteran abundances were found at the upstream monitoring site.

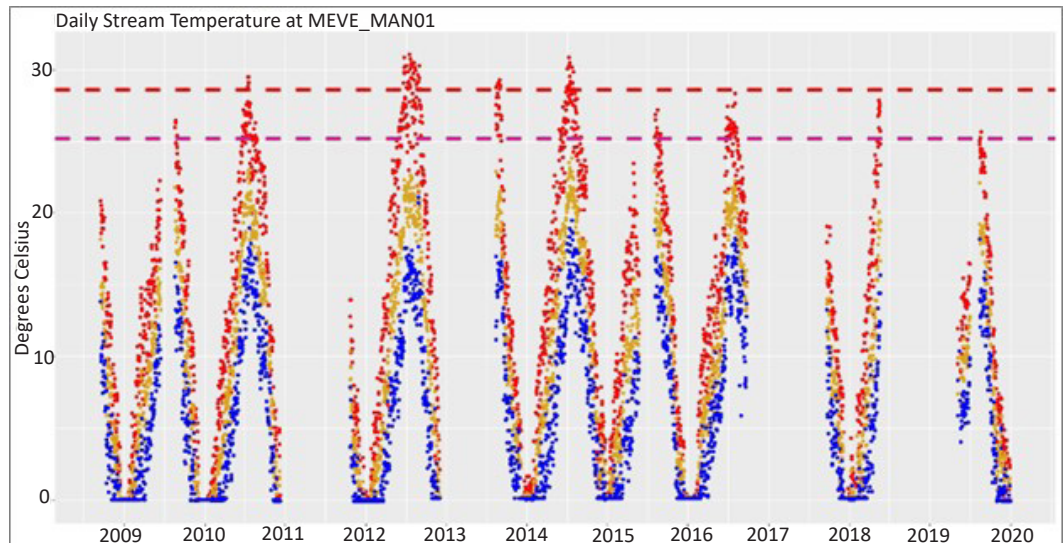


Figure 2. Daily stream temperature values, derived from continuous temperature monitoring, for the MAN01 monitoring site (2008-2019). Daily mean stream temperatures are represented in orange. Daily maximum and minimums are represented in red and blue, respectively. Red dashed line at 28.6 degrees represents the daily maximum water quality standard for March-November. The daily maximum standard for December-February is denoted by the pink dashed line at 25.2 degrees.

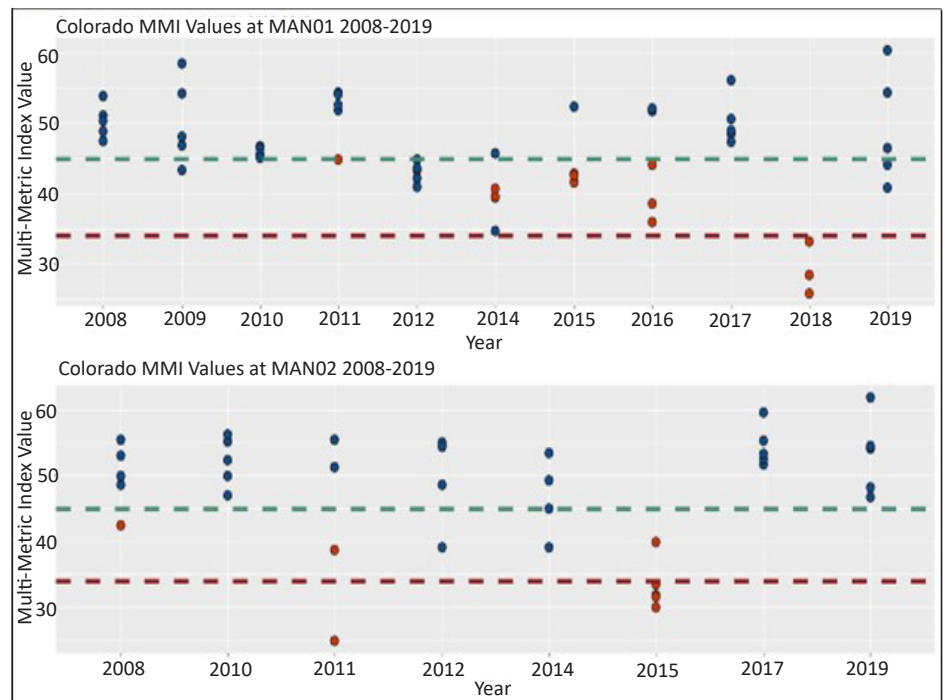


Figure 3. State of Colorado multi-metric index results for samples collected at MAN01 (top) & MAN02 (bottom) (2008-2019). Figure shows individual index scores for each sample by year. Blue circles represent years when site met aquatic use standard. Orange circles indicates years where site did not meet standard and is considered in an impaired state. Blue-green dashed line indicates index attainment threshold. All samples above line represent reference conditions. Red dashed line indicates impairment threshold. All samples below line represent impaired conditions.

Management Implications:

- Continuous monitoring of stream discharge and temperature will be vital to understanding the impacts of a warming climate on the aquatic community of the Mancos River in MEVE. Restoration efforts that promote shading of stream corridor and slowing water through the system will help buffer stream temperatures against warming air temperatures.
- Sensitivity of trichopteran taxa to chronic thermal and hydrologic stress likely resulted in the decreasing trend found in their abundance and richness.



Mancos River
Mesa Verde
National Park/NPS