pH is a numeric scale for measuring acidity. The pH of water affects the amount of nutrients and other chemicals that can be dissolved and utilized by organisms in the ecosystem. A neutral pH range of 6.5-8.5 is considered supportive of aquatic life. No results were below 6.5.

GREEN indicates that all monthly measurements were within the neutral pH range.

YELLOW indicates that one monthly measurement exceeded 8.5.

RED indicates that two or more monthly measurements were above a pH of 8.5.

**Water temperature (Temp)** can affect many aspects of stream ecology. Warmer temperatures accelerate photosynthesis by algae and aquatic plants, which can lead to overgrowth in streams with adequate nutrients. Because cold water can hold more oxygen than warm water, trout become stressed when water is too warm for too long. MT Fish, Wildlife & Parks often temporarily suspends fishing on streams where the daily maximum temperature reaches 22.8°C (73°F) for three or more consecutive days. The highest temperature recorded is shown. For sites with a continuous hourly temperature record, GREEN indicates that the daily max. never exceeded 22.8°C. YELLOW indicates that the daily max. exceeded 22.8°C, but never for more than two consecutive days. RED indicates that the 22.8°C threshold was exceeded for three or more consecutive days.

**pH**

**Temp**
Dissolved Oxygen (DO) allows fish and aquatic insects to breathe under water. Increased water temperature and salinity (dissolved salts) can both decrease the amount of DO water is capable of holding. The MT Department of Environmental Quality (DEQ) has set a standard of 8.0 mg/l as the minimum level of DO required by all fish life stages. GREEN indicates that all monthly measurements met or exceeded the standard. YELLOW indicates that one monthly measurement was below the standard. RED indicates that two or more monthly measurements were below the standard.

Nutrients - specifically nitrogen and phosphorus - are essential to aquatic plant and algae growth. Nutrients normally occur at low concentrations relative to demands, but when waterways become over-fertilized, excessive growth can degrade the aesthetic value of the water. The die-off of overgrowth can decrease dissolved oxygen to below the levels needed to support aquatic life. DEQ has set stream-specific numeric nutrient standards for Total Nitrogen (TN) and Total Phosphorus (TP) in Montana's streams based on levels that correlate with excessive algal growth and detriment to aquatic life. GREEN indicates that all monthly measurements were at or below the standard. YELLOW indicates that one monthly measurement exceeded the standard. RED indicates that two or more monthly measurements exceeded the standard.

E. coli bacteria are a reliable indicator of sewage or animal waste contamination in a stream. Most strains of E. coli don’t cause disease, but their presence indicate potential contamination by pathogens that are impractical to monitor directly. E. coli concentrations are the best predictor of the risk of contracting swimming-associated illnesses like diarrhea, eye and skin infections, and respiratory illness. DEQ has set E. coli standards based on statistical risk assessment using multiple samples collected during a 30-day period. While GLWQD does not collect samples with enough frequency to apply DEQ’s assessment methods, we use their single-sample threshold as a guideline for this summary. GREEN indicates that all monthly measurements were at or below the standard. YELLOW indicates that one monthly measurement exceeded the standard. RED indicates that two or more monthly measurements exceeded the standard.

Total Suspended Solids (TSS) in the water column in high concentrations can have negative impacts on fish and macroinvertebrates by clogging their gills, or by settling out and filling in the tiny spaces between rocks, reducing suitable habitat. The state standard for TSS is a descriptive narrative that prohibits increases above “naturally occurring levels”. Several studies indicate that fish habitat conditions are being protected if concentrations remain below 25 mg/L, and are considered compromised at concentrations above 80 mg/L. GREEN indicates that all monthly measurements were below 25 mg/L. YELLOW indicates that all monthly measurements were below 80 mg/L. RED indicates that one or more monthly measurements exceeded 80 mg/L.

Aquatic Macroinvertebrates drive the flow of energy in stream ecosystems by feeding on algae, other insects, (and even small fish!) before becoming the major food source for trout. They are also indicators of water quality and aquatic ecosystem health, as the abundance and diversity of species present responds to water pollution and degradation of habitat. The Hilsenhoff Biotic Index (HBI) is one of many metrics that can be used to assess stream health from a macroinvertebrate sample. It assigns a score from 0 (very intolerant to degradation) to 10 (very tolerant to degradation) to each species present in the sample, and uses these scores to calculate HBI, with a lower HBI indicating better water quality and aquatic habitat conditions. GREEN indicates good to excellent water quality/aquatic habitat. YELLOW indicates fair water quality/aquatic habitat. RED indicates poor water quality/aquatic habitat.

These materials summarize data collected during the 2018 & 2019 field seasons. For more information on monitoring methods and sampling schedule, please see the SWMN Project Plan at: https://glwqd.org/surface-water-monitoring-program/