

BBC Aquatic/Fisheries Monitoring Progress Summary: August 2022 - August 2023

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Since August 2022, MBS has accomplished all annual aquatic biological monitoring objectives on Sheep Creek, the Smith River and selected tributaries using a before-after/control-impact (BACI) design with Tenderfoot and Moose Creeks as off-basin reference streams. We outlined this statistical design approach in the Aquatic Monitoring Plan (AMP 2017) approved by Montana Fish, Wildlife and Parks (MFWP) and adopted by Tintina Montana in December of 2017. We visited and sampled 15 long-term monitoring sites: seven Sheep Creek sites, two Smith River sites and six tributary sites (many have been sampled since 2014) one to multiple times during the year based on the aquatic parameters being sampled, suitable streamflow levels and approved index period.

August 2022. Annual Chlorophyll-*a* and Stream Habitat Sampling occurred during the first week of August 2nd, 2022. We reported that the Chl-*a* results received in 2022 indicated algal biomass across nearly all Sheep Creek sites has been increasing to 'nuisance' levels over the last 5 years since being reported below these levels in 2015 and 2017 (MBS 2022).

October 2022. We received the Chl-*a* biomass data results from our sub-contractor, Energy Laboratories, Inc. from samples collected at 5 sites (n=5 transects per site) in August 2022. All sites except the Sheep FAS site (2 Control and 2 Impact) were significantly above the MDEQ threshold levels of 125 mg/m² (avg. 255 mg/m²).

October-November 2022. Fall redd count surveys were performed over 2 dates in mid-late-October (Oct 20th & 31st) and then, an early snowstorm, anchor ice and snow cover concluded redd counts in early November 2022. These counts are used to estimate the number of brown trout, brook trout, and mountain whitefish using the project area streams to spawn. Brown trout spawn relatively early in Sheep Creek within the project area, and redd numbers counted in mid-October are nearly the same as those in early-November. Redd counts of both brook and brown trout were similar in 2022 to those reported in 2021, which have slightly increased compared to the previous 2 years. We attribute this increase to the natural breaching of a beaver dam on Sheep Creek in

the project area that may have been acting as a barrier to spawning movements. We presented this data in the annual monitoring report delivered to Tintina Montana, MT Department of Environmental Quality and MFWP in May 2023 (MBS 2023).

November 2022. We received the periphyton data results back from our sub-contractor, Rhithron Associates, Inc. from samples collected at 11 sites in late-July 2022 and delivered to their lab in Missoula, MT. Based on Teply's Diatom Index (TDI), only 1 Sheep Creek site (SH18.3) in 2022 had a probability of nutrient impairment; Coon Creek has consistently reported nutrient impairment TDI values for the last 5 years. Tenderfoot Creek sites approached the probability of impairment (50%) for the first time since 2014.

December 2022. We delivered the raw fisheries data collected during the June to July 2022 sampling of the Tintina Monitoring Sites to MFWP in the form of a scientific collection permit report for SCP-33-2022 (Stagliano 2022).

January-March 30th, 2023. We processed, identified, entered data, and provided multi-metric data analysis for the 48 benthic macroinvertebrate samples following MDEQ protocols (MDEQ 2012); these were collected in July from 15 sites outlined in the AMP 2017.

April 2023. On April 6th, we delivered the Scientific Collection Permit (SCP) application to MT FWP for the current fish sampling year 2023. This is the 10th year of this project and the 6th year sampling under the Aquatic Monitoring Plan (AMP).

May 2023. On May 28th, we delivered the summary and analysis report of all the Aquatic and Fisheries Monitoring data collected during the prior sampling year April-October 2022 for the Tintina Project Monitoring Sites (MBS 2023) to Tintina Montana and Jason Mullan, MFWP Fisheries Biologist in Great Falls.

April-May 2023. We were unable to conduct spring redd count surveys for spring-spawning rainbow trout on the six Sheep Creek reaches, Moose Creek and Little Sheep Creek during a visit in late-April to early-

May 2023 due to turbidity because a pulse of spring snowmelt had occurred early and continued throughout May. A beaver dam constructed on lower Moose Creek in the Fall 2020 was blown out by the record high flows in early-May. Redd counts from previous years indicate that rainbow trout are absent from Little Sheep, while minimally using Sheep Creek and lower Moose Creek for spawning. They are likely ascending Moose Creek for many miles upstream to find suitable habitat.

June-July 2023. Fish population estimates and community sampling using electrofishing methods occurred in early-July (July 3 & 6) for the smaller monitoring streams (Little Sheep {n=2}, Coon {lower} and Moose Creeks) to mid-July for the larger Sheep Creek sites and the Tenderfoot Creek reference reach. We followed AMP (2017) fish collection protocols using 2-pass electrofishing depletion methods for the smaller-width stream reaches and mark-recapture techniques on the mainstem Sheep Creek sites. Stream flows in the project area were higher in 2023 with continued rain events into late-June than during similar sampling dates in July 2022. We delayed the Tenderfoot Creek sampling until July 18th, in hopes of achieving summer baseflow regime.

We collected and humanly euthanized five Rocky Mountain Sculpin (+5 juvenile Brook Trout from Little Sheep + 5 Rainbows <150mm) from each of 6 sites for tissue metals analysis during this fish sampling period. Brook trout and Rainbow trout juveniles typically exhibit lower metal concentrations than sculpin from the same site.

July 2023. Benthic macroinvertebrate sampling occurred in mid-July 2023 in accordance with the mountain ecoregional index period outlined in MDEQ protocols (June 21st to October 1st; MDEQ 2012) and coincided with Hydrometrics water chemistry collections (± 5 days). We collected both replicated,

quantitative Hess samples (n=3) and/or a semi-quantitative EMAP reach-wide samples across all 15 sites outlined in the AMP 2017. We will process and identify these samples over the fall and winter at the MBS laboratory in Helena, MT.

Late-July 2023. Benthic periphyton and Chlorophyll-*a* sampling occurred during the third week of July 2023 in accordance with the mountain ecoregional index period outlined in MDEQ protocols (July 1st to Sept 30th; MDEQ 2011) and coincided with Hydrometrics water chemistry collections (within ± 5 days). We hand-delivered these samples to our sub-contractor, Rhithron Associates, Inc in Missoula on August 2nd, and to Energy Laboratories in Helena on July 27th where they are currently being analyzed.

August 2023. Chlorophyll-*a* and Fish Tissue Metals Analysis results were received. Chl-*a* samples collected in late-July 2023 reported slightly less biomass than in 2022 (i.e., not all at nuisance levels) despite looking very green at most sites in early-mid-July observed during the fish sampling.

Fish Tissue Metals Analysis samples were analyzed at Energy Labs in Helena, MT and results were delivered in late-July and early-August. Most metals were at non-detectable levels (AS, CD, CU, PB, NI) across all years, except Selenium (SE) which has increased to detectable levels across more sites in 2023. Zinc concentrations also appear to be on the rise this year in both sculpin and trout samples. We will evaluate these results more fully in the Aquatics Summary Report.

All biological samples, habitat and survey data collected for the AMP from April 2023 to November 2023 will be compiled, analyzed and summarized in a report delivered to Tintina by March 31st, 2024.

LITERATURE CITED

AMP 2017. *Aquatic Biological Monitoring Plan for the Black Butte Copper Project in the Sheep Creek Basin in Meagher County, MT* prepared by Montana Biological Survey for Tintina Montana, White Sulphur Springs, MT. December 2017. 18 pages.

MDEQ 2012. *Sample Collection, Sorting, and Taxonomic Identification of Benthic Macroinvertebrates Standard Operating Procedure*. Helena, MT: Montana Department of Environmental Quality. WQPBWQM-012. <http://deg.mt.gov/wqinfo/SOPs/WQPBWQM>

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Montana Biological Survey (MBS) 2023. *Aquatic Monitoring Plan and Assessment Summary 2022 for Streams in the Tintina Black Butte Copper Project Area of Meagher County, MT*. Report prepared for Tintina Montana, Black Butte Copper Project, White Sulphur Springs, MT 66 pp. + appendices

Stagliano, D.M. 2022. Scientific Collection Report to MT Fish, Wildlife and Parks. Report of fish collection activities and data delivered to MFWP Region 4 Fisheries Biologist in Great Falls and Research Coordinator in Missoula, MT for SCP-33-2022. Delivered December 28st, 2022.