



July 20, 2017

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**Subject:** Revised Appendix G to the Tintina Montana, Inc. - Mine Operating Permit Application  
Black Butte Copper Project, Meagher County, MT, Revision 3

Dear Herb:

On behalf of Tintina Montana, Inc., Black Butte Copper Project, I am enclosing two hard copies, on 3-hole paper, of the May 2017 version of the 2016 Baseline Aquatic Surveys and Assessment of Streams report to replace the version submitted as Appendix G of the Mine Operating Permit Application on July 14, 2017. I apologize for not getting the latest version of Appendix G into the Revision 3 appendix. I provided an electronic copy of the revised Appendix G to Craig Jones via email today, and will forward an electronic copy to you with this transmittal.

If you have any questions, please call me at 406-437-9822.

Sincerely,

A handwritten signature in blue ink that reads 'J. Edward Surbrugg'.

J. Edward Surbrugg, Ph.D.  
BBC Project MEPA Manager

Enclosures

cc: Tintina Montana, Inc. (Jerry Zieg, John Shanahan)  
Geomina Resources, Inc. (Allan Kirk)  
Montana Biological Survey (Dave Stagliano)

# 2016 Baseline Aquatic Surveys and Assessment of Streams in the Tintina Black Butte Copper Project Area of Meagher County, MT

Prepared for:

**Tintina Resources, Inc.**  
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*Sheep Creek AQ3 fall fish survey upstream of Little Sheep Creek*

Prepared by:

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**May 2017**

## TABLE OF CONTENTS

Acknowledgements.....	ii
1.0 INTRODUCTION.....	1
1.1 PROJECT DESCRIPTION .....	1
1.2 STUDY AREA DESCRIPTION.....	1
2.0 METHODS.....	4
2.1 LITERATURE/DATABASE SEARCHES.....	4
2.2 HABITAT / WATER QUALITY ASSESSMENTS.....	4
2.3 FISH COMMUNITY SURVEYS .....	6
2.3.1 Population Estimates.....	6
2.3.2 Pit-tagged Fish .....	7
2.3.3 Fish Tissue Analysis.....	7
2.3.4 Redd Counts.....	7
2.4 FRESHWATER MUSSEL SURVEYS.....	10
2.5 MACROINVERTEBRATE COMMUNITY SURVEYS .....	10
2.6 PERIPHYTON COMMUNITY SURVEYS .....	11
2.7 AMPHIBIAN SURVEYS.....	11
3.0 AQUATIC ASSESSMENT RESULTS.....	12
3.1 AQUATIC SPECIES OF CONCERN .....	12
3.2 HABITAT EVALUATIONS .....	12
3.3 FISH COMMUNITIES.....	13
3.3.1 Pit Tagged Fish .....	19
3.3.2 Fish anomalies .....	20
3.3.3 Fish Tissue Analysis.....	21
3.3.4 Fall Redd Counts.....	22
3.5 FRESHWATER MUSSEL SURVEYS.....	25
3.6 MACROINVERTEBRATE COMMUNITIES.....	25
3.7 PERIPHYTON COMMUNITIES.....	29
3.8 AMPHIBIAN AND REPTILE OBSERVATIONS.....	30
4.0 CONCLUSIONS.....	31
5.0 LITERATURE CITED.....	33

## LIST OF TABLES

Table 1. Stream Flows reported at Aquatic Monitoring Study Reaches.....	2
Table 2. Aquatic Monitoring Study Reach Location Information .....	3
Table 3. Metrics and Classification of Fishes Collected during the Study.....	8
Table 4. Aquatic Sampling Assessment Reach Measurements .....	14
Table 5. Location, Date and Species of Pit-tagged salmonids.....	20
Table 6. Baseline Whole Body Sculpin Tissue Metal Values .....	21
Table 7. Assemblage Tolerance Indices (ATI) for the Aquatic Vertebrates.....	22
Table 8. Macroinvertebrate Sample Characteristics and Metrics.....	27
Table 9. Macroinvertebrate Metric Statistical Results.....	28
Table 10. Periphyton Sample Characteristics.....	29
Table 11. Overall Site Community Integrity Ranks .....	32

## LIST OF MAPS

Map 1. Tintina Black Butte Mine Aquatic Sampling Sites .....	5
Map 2. Sheep Creek Redd Count Locations .....	24

## LIST OF FIGURES

Figure 1. Macroinvertebrate and Fish Sampling Procedures.....	9
Figure 2. Cattle-Damaged Section of Tenderfoot Creek AQ5 reach.....	10
Figure 3. Seasonal Average Fish Abundance for Little Sheep, Sheep and Tenderfoot Creek .....	15
Figure 4. Overall Average Salmonid Abundance for Sheep, Little Sheep and Tenderfoot Creek .....	18
Figure 5. Redd Count Averages for the Sheep Creek Project Area.....	23
Figure 6. Macroinvertebrate MDEQ MMI scores across Tintina Study Sites .....	26
Figure 7. Macroinvertebrate HBI Scores across Tintina Study Sites .....	26

## LIST OF PHOTOS

Photo 1. Typical CT x RBTR hybrid collected in Tenderfoot Creek and Sheep Creek.....	12
Photo 2. Opercula reduction and chromatophore brook trout in Little Sheep Creek AQ7 .....	20
Photo 3. Cyanobacteria covering a rock and the nuisance diatom in Tenderfoot Creek AQ5.....	30
Photo 4. Juvenile Western Toad Observed at Sheep Creek AQ2 during the summer 2016 survey.....	30

## APPENDICES

Appendix A	Site Photographs
Appendix B	Fish Survey Raw Data
Appendix C	Fish Size-Frequency Graphs
Appendix D	Macroinvertebrate Taxa List, Abundance and Metrics
Appendix E	Periphyton Taxa List, Abundance and Metrics
Appendix F	Fish Tissue Analysis
Appendix G	Stream Habitat and Physical Site Conditions

## ACKNOWLEDGEMENTS

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*All photos in the report were taken by MBS personnel, unless otherwise noted*

## Executive Summary

We have completed the second year of seasonal baseline surveys for the assessment of fish, mussel, macroinvertebrates, periphyton and stream habitat at sites in the Tintina Black Butte Copper Project Area of the Sheep Creek drainage basin with Tenderfoot Creek as the reference reach. These 2016 data represent reach-scale stream and aquatic community conditions documented prior to proposed mine activity (i.e. pre-impact). Project goals were: 1) to conduct standardized surveys and collect additional baseline information on the aquatic communities present at stream sites coincident with established water-quality monitoring sites, 2) determine fish populations and seasonal use of Sheep Creek and tributaries near the project area and 3) to assess aquatic community integrity with key indicators comparing these against biotic thresholds of reference condition standards.

Habitat assessments and macroinvertebrate, mussel, periphyton, and fish surveys were performed on similar dates along the same stream reaches of Sheep, Little Sheep and Tenderfoot Creeks in 2016 as in 2014-2015. Two new Sheep Creek monitoring sites, located ~2 and 2.5 miles downstream of the previous lowest site, were added this year at the Fishing Access Site (FAS) and near Indian Creek. The sampling design uses a BACI approach with Before, After, and Control sample sites both upstream and at off-project site locations; and Impact sites located both within and ~4.5 miles downstream of proposed mine activity. Coon Creek (AQ9) upstream from the county road was determined to be fishless in 2015 and was sampled for macroinvertebrates in 2015 and 2016. In total, 10 established monitoring stream reaches were sampled in 2016 with 26 fish survey events; 34 macroinvertebrate and 10 periphyton samples. All stream reaches were visually inspected for amphibians during the surveys. Biological community integrity was calculated for the survey reaches using Fish Integrated Biotic Indices (IBI's) and Observed/Expected Models (O/E), while the macroinvertebrate and periphyton samples were assessed with Montana DEQ's (MDEQ) multi-metric indices (MMI).

**Habitat / Water Quality Evaluations.** It is important to document existing water quality, baseline aquatic communities, and stream habitat conditions in the study area prior to any actual mine development. Water quality sampling has been conducted at four aquatic community (AQ/SW) sites by Hydrometrics, Inc. quarterly over a 5 year period beginning in the spring of 2011. Stream habitat geomorphology is dominated by riffle and runs at all sites; Sheep Creek averaged 85%, Little Sheep 73% and Tenderfoot Creek 75% of the total stream reaches. Of the eleven sampling reaches evaluated in the study area, six were found in Proper Functioning Condition (PFC) with a stable trend, and five were deemed Functional at Risk (FAR). Sites were ranked FAR because they either had riparian habitat altered by cattle (Little Sheep AQ8, Sheep Creek AQ2 and AQ10, Tenderfoot AQ5) or by human stream manipulation (Sheep Creek AQ1 and AQ2). Highest site integrity scores using both the BLM Habitat and Proper Functioning Condition (PFC) Assessment methods were recorded at Sheep Creek upper (AQ3) and lower (AQ4) reaches and Tenderfoot Creek (AQ6). It is important to note that the riparian habitat of the lower reference reach on Tenderfoot Creek (AQ5) is moderately degraded.

**Fish Communities.** Overall, we identified seven fish species and one hybrid (four native / four introduced) from 5,031 individuals collected at 10 sites during 26 stream reach surveys in 2016. Average number of fish species per site across the study area was 4.3 (SE  $\pm$  0.2), while the average number of native species averaged 1.8 (SE  $\pm$  0.4). This is an increase from 3.6 species per site reported for 2014-2015 due to increased detection of mountain whitefish and white suckers at some sites. Rocky mountain sculpin

comprised the highest proportion of total individuals collected (74%) and had 100% site occupancy (n=10). Other native species, mountain whitefish, longnose dace and white sucker had site occupancy rates of 52%, 12% and 12%, respectively. Rainbow trout were the dominant salmonid by numbers at all Sheep Creek sites except AQ4. Rainbow and brook trout were collected at nine of 10 sites in total, achieving highest average estimated densities at site AQ1 (344.1 per mile  $\pm$  136 SE) and AQ7 (847.2 per mile  $\pm$  232 SE), respectively. Brown trout were detected at 7 of 10 sites, achieving highest densities at sites AQ3 and AQ4 averaging  $\sim$ 85 per mile  $\pm$  19 SE. The most diverse fish site in the study area was Sheep Creek (AQ3) with eight species, four native. Coon Creek (AQ9) upstream of the county road near SW3 is fishless, but near its confluence with Sheep Creek, it provides a refuge for young-of-the-year brown and brook trout. No fish species of concern (SOC) were identified during any of the surveys. Although, cutthroat x rainbow trout hybrids were collected rarely in Sheep Creek and were not tested genetically for introgression. In 2016, we documented white suckers and mountain whitefish juveniles using Little Sheep Creek. We also performed whole body metals analysis on sculpins at 2 sites above and below the proposed mine to determine baseline levels. Seasonal salmonid densities at all sites varied significantly with lowest densities reported in the spring. Estimates of total trout abundance at Sheep Creek AQ2 (avg. 108 per mile  $\pm$  36SE) were substantially lower than a 1992 estimate (325 per mile). We scanned all salmonids captured during the 2016 surveys using a Biomark 601 pit-tag reader. No pit-tagged brown or rainbow trout were detected at any sites above the USFS boundary during the seasonal fish surveys in 2016, only tagged mountain whitefish (n=4) were detected in the project area at Sheep Creek sites AQ3 and AQ4. Approximately 2.8 miles of Sheep and Little Sheep Creek were evaluated during fall redd counts (late-October); brown trout redd counts averaged 3.5 and 2.8 per 100m at Sheep Creek AQ3 and AQ4, respectively. Brook trout redds averaged 3.3 per 100m in Little Sheep Creek (AQ7).

**Macroinvertebrate Communities.** Overall, 145 unique macroinvertebrate taxa were reported from the macroinvertebrate assessment samples collected in 2016. No Montana SOC invertebrates were collected. The macroinvertebrate community at Sheep Creek AQ2 reported the highest biological integrity score (MMI=70.1), which has increased since 2014, and resembles the biotic integrity of the Tenderfoot Creek reference (average MMI=70.4). Overall, Sheep Creek MMI scores (n=6) averaged 62.6 which is a point higher than in 2014, but still ranks slightly impaired by MDEQ standards. Sheep Creek AQ2 also reported the highest number of combined mayfly, caddisfly and stonefly taxa (EPT) at 21 species. Average macroinvertebrate richness across all sites was 44.7 taxa, while EPT taxa averaged 15 per site. Mountain streams with less than 20 EPT taxa per site are considered slightly impaired by most measures. Both Little Sheep Creek sites were ranked impaired by the MDEQ MMI with scores <63. Six of the 11 sites showed significant improvements in biotic integrity in both the MMI and HBI since 2014; these are sites AQ1, AQ2, AQ5, AQ6, AQ7 and AQ8. The MDEQ MMI ranked upstream and downstream reaches of the Sheep Creek treatment/control sites similarly and there are no significant differences between control and reference. It is important to note that the Sheep Creek impact sites are again reporting significantly lower macroinvertebrate MMI scores than the Tenderfoot Creek reference sites (Table 9).

**Periphyton Communities.** Overall, 167 unique diatom and algae taxa were reported from the 10 periphyton assessment samples collected in 2016. This has increased the total study's taxa list by 21 taxa over 146 taxa from 2014. No periphyton species are listed as SOC in the state. Diatoms were the dominant taxa at 7 of the 10 study sites. The diatom, *Didymosphenia geminata* (a.k.a rock snot) which can sometimes become invasive, was abundant in the Tenderfoot Creek reference reaches as it was in

2014, but not found in Sheep Creek. The Cyanobacteria, *Phormidium* sp. was the dominant, non-diatom species at 4 of 10 sites in 2016; especially in the Sheep Creek meadow reaches (AQ3, AQ4, AQ7) and at the canyon site (AQ1); it was not the 1<sup>st</sup> or 2<sup>nd</sup> dominant taxa at any site in 2014. Abundant filamentous algae outbreaks were visually observed at the lower Sheep Creek sites (AQ10 and AQ11). This was confirmed with *Cladophora* being the dominant periphyton taxa at both sites. Based on Teply's Diatom Index (TDI), lower meadow site Sheep Creek AQ4 had the highest probability (82%) of impairment followed by Sheep AQ3 at 61%. Based on the TDI, other Sheep and Little Sheep Creek sites had a 40% or less chance of being impaired. The Tenderfoot Creek reference sites were ranked least likely to be impaired (<20%) with the diatom index.

**Amphibian and Reptile Incidentals.** The western toad (*Anaxyrus boreas*), a MT SOC species, had been previously recorded near Sheep Creek AQ2, and one juvenile was observed there during our summer 2016 surveys. The Columbia Spotted Frog (*Rana lutiventris*) was incidentally recorded at Sheep Creek AQ4 and Little Sheep AQ7 during the summer. The terrestrial garter snake (*Thamnophis elegans*) (n=2 adults) was observed along the banks of Tenderfoot Creek (AQ5) during the summer surveys.

**Conclusions.** Aquatic communities surveyed in 2016 at Little Sheep, Sheep Creek (impact and control) and the Tenderfoot Creek (reference) sites were similar to 2014 and 2015 results. Aquatic benthic macroinvertebrate and periphyton communities at virtually all sites are exhibiting some signs of nutrient enrichment (lowered biotic integrity), likely due to livestock use, but these affects were less prevalent in the Tenderfoot Creek sites. The benthic biological integrity trends are improving at many sites since 2014 despite the riparian habitat at five sites (AQ2, AQ5, AQ7, AQ8 and AQ10) having been degraded by cattle use, while Sheep Creek AQ1 and AQ2 are at risk because of the county road effects on the hydrology. Fish species richness and diversity were higher in the Sheep Creek sites than the Tenderfoot reference reaches, and were similar between the upstream control reaches and the downstream impact reaches of the study. Trout densities, catchable size and biomass were lower at Sheep Creek sites with angler access (AQ2, AQ10, AQ11) likely due to harvest or catch mortality. During 2016, we have developed an increased understanding of seasonal fish movement patterns within the Sheep Creek study reaches: brown trout appear to be largely resident and were recaptured within the same reaches throughout the seasons. They may also using these home range sections for spawning based on redd count numbers and lack of tagged fish during the fall surveys. Adult rainbow trout (>8 inches) were virtually absent in the Sheep Creek reaches during the spring surveys, presumably having migrated to tributaries or other Sheep Creek reaches for spawning. No pit-tagged rainbow trout have been detected within the project boundary area during any season. Mountain whitefish were the most abundant salmonid at Sheep Creek AQ4 and were the only pit-tagged fish documented to be migrating into the project area. Juveniles of all fish species used Little Sheep, lower Coon and Spring Creek during all seasons, while adult brown trout used lower Little Sheep Creek as a winter thermal refuge. Overall, salmonid densities were highest in the Tenderfoot Creek reference reach, except for brook trout which had the highest average densities in Little Sheep Creek AQ7.

## **1.0 INTRODUCTION**

### **1.1 PROJECT DESCRIPTION**

The Black Butte / Sheep Creek basin, 15 miles north of White Sulphur Springs, Meagher County, Montana, is currently undergoing exploration and permitting for a proposed underground copper mine. Baseline data on the condition of the aquatic ecosystems that could be potentially affected by the mine (pre-impact) are essential to determine what effects the mine might have on the fish and wildlife in, and downstream of, the affected area (post-impact). Environmental Assessments (EA) often address Threatened and Endangered species (there are no potential aquatic T&E species in the basin, USFWS 2016) and take into account the presence of Montana Species of Concern (SOC), but until these recent on-the-ground surveys were completed, the presence of Montana SOC or other ecologically sensitive native species assemblages may not have been considered. Large gaps in baseline surveys for macroinvertebrates, fish, and mussels exist both temporally and spatially in the Black Butte Copper Project basin. Sheep Creek within and upstream of the proposed mine area had only been sampled at intermittent times for fish between 1979 and 1992 (Montana Fish, Wildlife and Parks [MFWP] 2014). A baseline study or the use of existing data can help estimate the natural variation that is typical of the population(s) to be monitored and to determine whether trends can be reliably detected (Dauwalter et al. 2009). Unfortunately, only two previous fish population estimates from 1973 and 1992 are available for this project area at the upstream control site (MFISH 2014). Recent fish movement studies performed by MFWP) have documented rainbow trout and whitefish from the Smith River using Sheep Creek in their spring spawning migrations (Grisak 2011, 2012, 2013, pers. comm.). These studies did not report any tracked fish moving into the Sheep Creek Black Butte study reach proper. Recent pit-tagged trout in a Montana State University fish movement study were found to spawn ~11 miles upstream from the Smith River or moved into Moose Creek (Lance and Zale 2017). Identifying baseline aquatic communities and conditions in the streams of the project area (i.e., fish, macroinvertebrate, periphyton and mussels) prior to mine development is the objective of this study and is essential to understanding and potentially mitigating impacts to habitats and species during and after mine operation.

### **1.2 STUDY AREA DESCRIPTION**

The entire Tintina Copper Project study area lies within the Middle Rockies Ecoregion (17q) (Woods et al. 2002), specifically the Little Belt Mountains. Sheep Creek is a 36 mile long tributary to the Smith River occurring in Hydrologic Unit 10030103 and having a total watershed area of ~500 km<sup>2</sup> (194 sq. miles). The study area near the proposed mine area is approximately 17 miles upstream from the



confluence (see Hydrometrics Appendix B). The Sheep Creek watershed upstream from the project area drains approximately 202 km<sup>2</sup> and is located approximately 15 miles north of White Sulphur Springs, Montana. Little Sheep Creek is a Sheep Creek tributary within the project area and drains a watershed of approximately 30 km<sup>2</sup>. Pre-impact baseline sampling reaches were established in 2014 in the Sheep and Little Sheep Creek basins upstream and downstream of the proposed mine activity drainage corridor and were sampled in 2014, 2015 and 2016 (Map 1). Tenderfoot Creek, a 40 mile long tributary to the Smith River has a total watershed area of 281 km<sup>2</sup> and was chosen as the off-site control reach; an estimated watershed area of 203 km<sup>2</sup> is drained above the reference reach (Map 1). Watershed areas upstream of the Sheep Creek project area sites and Tenderfoot Creek reference reaches are nearly identical. These aquatic sites represent the range of Middle Rockies stream types in the Black Butte project area: Mountain Streams, Small Mountain Streams and Headwater Foothills Rivers (Stagliano 2006). Eight main-stem reaches in Sheep and Tenderfoot Creeks, and three tributary reaches in Little Sheep Creek (2 reaches) and Coon Creek (1 reach) were visited seasonally (Map 1, Table 1). During the spring visit of 2016 (April 29<sup>th</sup>), fish sampling at the Tenderfoot Creek site was unable to be accomplished due to impassable forest road conditions (USFS, White Sulphur Springs office, pers. comm.). There are no USGS streamflow gauges located on any streams in the area, and we can only report the stream's flow regime data collected by Hydrometrics, Inc. Flows recorded at Sheep, Little Sheep and Coon Creeks during the dates closest to the seasonal sampling are presented in Table 1 (see Hydrometrics Appendix B). Flows recorded in Sheep Creek during the assigned spring sampling period of 2015 (May 4<sup>th</sup>) were bankfull at 90-105 cfs, likewise with Tenderfoot Creek, which we estimated to be 150-180cfs based on a stream gauge relationship from USGS gauges on the Smith River with a Tenderfoot Creek gauge installed by Montana State University (Dave Ritter, pers. comm. 2015). Fortunately, we planned spring 2016 sampling even a week earlier than in 2015 and had flows 30-40 cfs less for the sampling period. The last 2 years spring run-off has been occurring 10-14 days earlier than the 30 year historical flow average; these run-off conditions persist until mid-June, well past a "spring survey period" (see Hydrometrics Appendix B, stream flows).

**Table 1.** Stream Discharge (CFS-cubic feet per second) reported at four surface water quality stations (SW) and associated Aquatic Monitoring Reaches (AQ) closest to the sampling dates from 2014-2016.

Site	Stream	Summer	Fall	Spring	Summer	Spring	Summer	Fall	Fall
		8/21/14	9/3/14	4/29/15	6/25/15	4/29/16	7/14/16	9/20/16	10/22/16
AQ1/SW1	Sheep Creek Canyon	25	22	103	47	79	15.1	18.8	19.6
AQ2/SW2	Sheep Creek Control	19.3	17	82.2	36	68	5	17	18.5
AQ8/SW8	Little Sheep Impact	0.54	0.71	1.72	0.71	0.67	0.67	0.22	0.22
AQ9/SW3	Coon Creek Impact	0.08	0.07	0.22	0.07	0.14	0.07	0.07	0.08

**Table 2.** Aquatic Monitoring Study Reach GPS locations at the downstream (D/S) and upstream (U/S) ends of the assessment reach.

Site Code	Site Name	Type	AES code	Latitude	Longitude	Elev. (m)	Comment
UM_SHEEPAQ1	Sheep Creek (D/S)	Impact	C003	46.795122	-110.910367	1697	Downstream Canyon Reach on USFS land.
	Sheep Creek (U/S)			46.793362	-110.910938		
UM_SHEEPAQ2	Sheep Creek (D/S)	Control	C003	46.772124	-110.855661	1743	Upstream of Castle Mtn Ranch off US 89
	Sheep Creek (U/S)			46.771973	-110.853445		
UM_SHEEPAQ3	Sheep Creek (D/S)	Control	C003	46.777247	-110.898818	1718	Upper Hansen meadow Reach U/S of Little Sheep Creek
	Sheep Creek (U/S)			46.777667	-110.898003		
UM_SHEEPAQ4	Sheep Creek (D/S)	Impact	C003	46.785116	-110.908826	1707	Lower Reach on the USFS boundary
	Sheep Creek (U/S)			46.784465	-110.906504		
UM_SHEEPAQ10	Sheep Creek (D/S)	Impact	C003	46.81131	-110.92432	1652	Fishing Access Site 1.9 miles D/S of AQ1
	Sheep Creek (U/S)			46.81100	-110.92567		
UM_SHEEPAQ11	Sheep Creek (D/S)	Impact	C003	46.82257	-110.95389	1631	Lowest Reach 0.6 miles below FAS
	Sheep Creek (U/S)			46.81987	-110.94929		
UM_TENDAQ5	Tenderfoot Creek (D/S)	Reference	C003	46.95049	-111.14739	1435	Lower Reach at South Fork Tenderfoot confluence
	Tenderfoot Creek (U/S)			46.95077	-111.14447		
UM_TENDAQ6	Tenderfoot Creek (D/S)	Reference	C003	46.95018	-111.14362	1438	Upper Reach U/S of USFS boundary
	Tenderfoot Creek (U/S)			46.95032	-111.14365		
UM_LSHEEP7	Little Sheep Creek (D/S)	Impact	D001	46.775038	-110.89779	1718	Mass wasting of some of the stream banks
	Little Sheep Creek (U/S)			46.775897	-110.89849		
UM_LSHEEP8	Little Sheep Creek (D/S)	Control	D001	46.768352	-110.874397	1738	Above Haul Road Mass wasting of stream banks
	Little Sheep Creek (U/S)			46.769087	-110.874899		
UM_COONAQ9	Coon Creek (D/S)	Impact	D001	46.77871	-110.90834	1708	Above County Road at SW3 site
	Coon Creek (U/S)			46.77842	-110.90921		

*Aquatic Ecological System (AES) code defined in text following Stagliano (2005).*

## **2.0 METHODS**

Habitat assessments and macroinvertebrate, periphyton, and fish surveys were performed on similar dates along the same designated reaches of Sheep, Little Sheep and Tenderfoot Creeks in 2014, 2015 and 2016. Locations of baseline aquatic survey sampling sites are presented in Map 1 for the Sheep Creek and Tenderfoot drainages. These surveys used a Before, After, Control {upstream and off-site reference} and Impact {within and downstream} (BACI) sampling design downstream of proposed mine activity. Coon Creek, another potential Impact site, was sampled for macroinvertebrates in 2016. In total, we performed 26 fish surveys and collected 34 macroinvertebrate and 10 periphyton samples during the visits. Biological community integrity was calculated for 26 fish surveys using Observed/Expected Models (O/E), while the macroinvertebrate and periphyton samples were assessed with Montana DEQ (MDEQ) multimetric indices (MMI) (Teply and Bahls 2006, MDEQ 2012). Summer macroinvertebrate and periphyton samples were collected within the MDEQ recommended range for MDEQ sampling time frame (June 1<sup>st</sup>-September 30<sup>th</sup>) (MDEQ 2006). All stream reaches were visually surveyed for amphibians or reptiles during all visits.

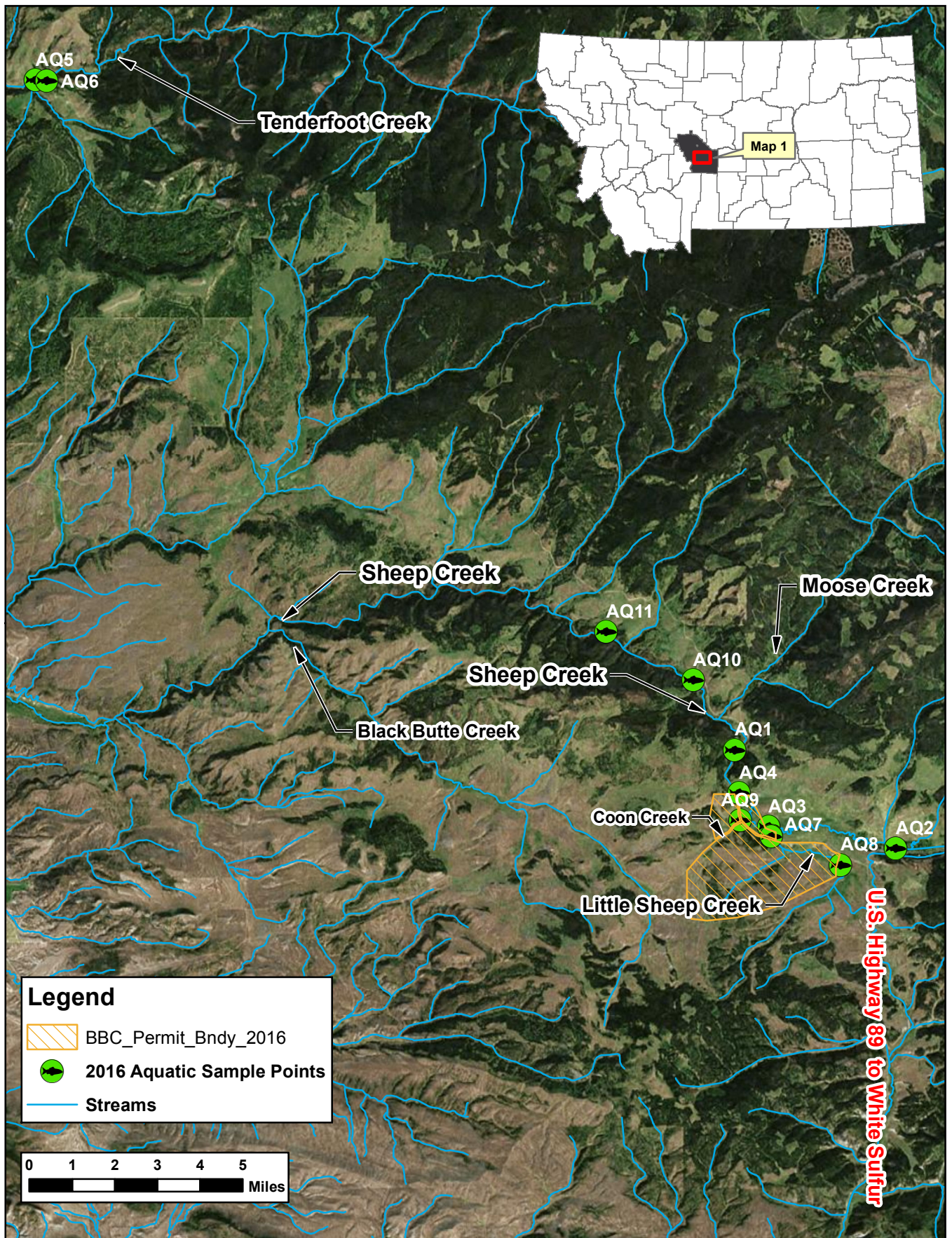
### **2.1 LITERATURE/DATABASE SEARCHES**

Information pertaining to aquatic animal species of concern that may potentially occur in the project corridor was downloaded from the Montana Natural Heritage Program (MNHP) database (MNHP 2016). Information pertaining to federally-listed threatened and endangered (T&E) aquatic species was obtained from U.S. Fish and Wildlife Service (USFWS) county list (USFWS 2016). Information pertaining to prior fisheries investigations in the area was obtained from the MFWP Fisheries Information System Database (MFISH 2014). Prior macroinvertebrate studies conducted in the area of the project were obtained from the MDEQ ecological data application database (Jessup 2006, EDAS 2014).

### **2.2 HABITAT / WATER QUALITY ASSESSMENTS**

It is important to document existing water quality, baseline aquatic community surveys and stream habitat conditions in the study area prior to any actual mine development. Long-term water quality sampling has been conducted at four of the aquatic community sampling sites (AQ1, AQ2, AQ8, AQ9) by Hydrometrics quarterly since spring of 2011 (Hydrometrics 2016). The stream assessment reach was divided into 10 equally spaced transects according to the Bureau of Land Management (BLM) and Environmental Monitoring and Assessment Protocol (EMAP) protocols (BLM 2008b; Lazorchak et al. 1998). The downstream transect (A, T10) was marked (GPS, flagging and photo point) as the bottom of the reach and all ecological assessment protocols started from this point and continued upstream for





	DRAWN BY: <u>DS</u> CHK'D BY: <u>AK</u> APPR. BY: <u>AK</u> DATE: <u>April 2016</u>	<b>Tintina Resources</b> Black Butte Copper Mine Project Meagher County MT	PROJECT NO. T01.2016
	<b>Aquatic Sampling Sites Overview</b>		FIGURE NUMBER <b>MAP 1</b>

20 times average bankfull width (BkFW) (n=4) or a minimum of 150 meters (designated the assessment area or "AA") to the marked top of the reach (K, T1). Stream gradients were estimated using the difference in the upper and lower GPS elevations of individual reaches and dividing by the reach length. Parameters recorded at each transect were: wetted-width (ww), three channel depth measurements ( $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$  ww), % large woody debris, substrate and riparian shading. A stream map of the reach was sketched to scale, so that habitat features (riffle, run, pool) can be quantified. On-site habitat assessments were conducted using the rapid assessment protocol developed for the BLM by the National Aquatic Assessment Team (scores 0-24) (BLM 2008). The process for determining Proper Functioning Condition followed Pritchard et al. (1993). Basic water quality parameters (temperature, TDS, pH, conductivity) were recorded prior to biological sampling using a Horiba H-10 water testing meter, calibrated for the lower conductivity range. The goal of these evaluations was to characterize local reach geomorphology, riparian and in-stream habitat, and characteristics that influence aquatic community integrity. Sites ranking higher using these protocols were determined to have higher quality habitat at the local reach-scale.

## **2.3 FISH AND AMPHIBIAN COMMUNITY SURVEYS**

### **2.3.1 Population Estimates**

A quantitative fisheries population assessment was performed to determine seasonal fish community structure and population densities using two-pass or multiple pass depletion estimates (Zippin 1958, Carle and Strub 1978). We backpack electrofished (Smith Root Models LR-24 and LR-20B) six reaches of Sheep Creek and two reaches on Little Sheep Creek, representing upstream control, downstream and impact sites, as well as Tenderfoot Creek (2 reaches) following MFWP electrofishing protocols (MFWP 2002) (Table 1, Figure 1). In order to establish site variance, each reach was divided into two 200 or 300 feet (60 or 90 meter) sections separated by shallow riffles and block seines. Fish collected during the first-pass were held in buckets or live-cars until the second pass was completed (Figure 1). If salmonid numbers collected during the 2<sup>nd</sup> pass were more than 25% of the 1<sup>st</sup> pass, then a 3<sup>rd</sup> pass was performed. Fish population estimates are reported as numbers per unit distance (per section or per stream mile) based on Two Pass depletion estimates averaged between the two sampled section units per reach. If the two pass depletion captured <75% of the population, then a 3<sup>rd</sup> pass was completed, and a multiple-pass depletion estimate is calculated (MICROFISH Software 1988). All fish collected were identified to species (Holton and Johnson 2003), measured for total length (TL) (mm) and weighed (grams) on mass balance scales to determine densities and biomass per reach using standard fisheries techniques (Dunham et al. 2009) (Table 3, Figure 1). Fish anomalies (e.g. deformities, eroded



fins, lesions, and tumors), and condition were also recorded during the handling procedures (Dunham et al. 2009). Random trout in the study were fin-clipped on the upper caudal fin to establish a section recapture percentage (i.e. reach fidelity), but this was not used in determining population estimates. Fish were processed and released within the same section of capture. Young-of-the-year fish less than 30 mm (TL) were noted on the field sheet, if species could be determined, and immediately released to prevent mortality.

### **2.3.2 Pit-tagged Fish**

We scanned all salmonids captured during the 2016 surveys with a Biomark 601 pit-tag reader (Figure 1). If a pit-tag was detected, the tag number was recorded on the data sheet and reported on the MFWP collection permit report.

### **2.3.3 Fish Tissue Analysis**

We collected rocky mountain sculpin, *Cottus bondi* (n=5) for baseline tissue metal analysis from 2 sites below the proposed mine area and 2 sites upstream of the project mine area. Five individual adult sculpin of various sizes (60-100 mm) were collected and humanely anesthetized in an overdose solution of MS-222, rinsed, placed in zip-loc freezer bags and immediately placed in a cooler on ice. Frozen fish samples were delivered to Energy Laboratories in Helena within 48 hours. Homogenized whole-fish tissue samples were analyzed to determine cadmium, copper, iron, lead, manganese, mercury, selenium, and zinc concentrations (reported as mg/kg).

### **2.3.4 Redd Counts**

Redd count surveys were completed for fall-spawning brown trout and brook trout for all Sheep and Little Sheep Creek reaches at the end of October using methods outlined in Hubert et al (2012). We identified the different salmonid species' redds based on size, visibly identifying fish on redds, or habitat selection preferences between brown and brook trout (Witzel and Maccrimmon 1983), although a small percentage of overlap may be occurring.

**Table 3.** Metrics and classification of native (N) and introduced (I) fishes captured during the Tintina Black Butte Study. Tolerance: T=Tolerant, INT=Intermediate, S=Sensitive. Trophic: OM = Omnivore, IN = Invertivore, C =Carnivore.

Species	Scientific Name	Trophic *	Feeding Habit †	Repro Guild ‡	General Tolerance	Origin	Total Length 3 years
<b>Catostomidae</b>							
White sucker	<i>Catostomus commersoni</i>	OM	BE	LO	TOL	N	180
<b>Cottidae</b>							
Rocky Mountain Sculpin	<i>Cottus bondii</i>	IN	BE	LO	INT	N	86
<b>Cyprinidae</b>							
Longnose Dace	<i>Rhinichthys cataractae</i>	IN	BE	LO	INT	N	71
<b>Salmonidae</b>							
Brook Trout	<i>Salvelinus fontinalis</i>	IN	GE	LO	S	I	240
Brown Trout	<i>Salmo trutta</i>	IN/C	GE	LO	TOL	I	269
Rainbow Trout	<i>Oncorhynchus mykiss</i>	IN	GE	LO	S	I	260
Rainbow Trout x Westslope Cutthroat Hybrid	<i>Oncorhynchus mykiss x clarkia lewisi</i>	IN	GE	LO	S	I	266
Mountain Whitefish	<i>Prosopium williamsoni</i>	IN	BE	LO	INT	N	190

† - BE=Benthic, GE=Generalist, ‡ - Reproductive Guild=Lithophilic Obligate (LO)

**Figure 1. Macroinvertebrate and fish sampling procedures. Clockwise: 1) Backpack electrofishing Sheep Creek (AQ3), 2) Checking fish for pit-tags 3) Brown trout redd count Sheep Creek AQ4 and 4) Macroinvertebrate collection with a Hess sampler (AQ10).**





## 2.4 FRESHWATER MUSSEL SURVEYS

The western pearlshell mussel (WEPE), a Montana SOC and USFS sensitive species, was surveyed for at all 8 original monitoring sites in 2014, and no evidence of current or historical presence was observed (Stagliano 2015). During the summer visit of 2016, we devoted approximately one man-hour of search for the WEPE at the 2 newly added Sheep Creek reaches (AQ10 and AQ11) using the same longitudinal transect survey technique (Young et al. 2001) as performed in 2014.

## 2.5 MACROINVERTEBRATE COMMUNITY SURVEYS

In 2016, we added quantitative macroinvertebrate Hess samples (n=3) at one riffle reach from all monitoring sites and processed these according to MDEQ's protocols (MDEQ 2012) (Figure 1, Addendum A). Macroinvertebrate communities were also sampled semi-quantitatively from each of the 10 transects within the 300m assessment reach using the EMAP Reach-Wide protocol (BLM 2008, Lazorchak et al. 1998). We started sampling at the downstream transect (A) or T10 in the BLM protocol, and proceeded upstream alternating sampling with the 500-micron D-frame net to the right, left or center of the stream channel, so a random sampling of all habitats is achieved. The ten multi-habitat kicks (~1 square meter) were composited into a 20 liter bucket. All organisms and organic matter in the bucket were elutriated from the inorganic portion and washed onto a 500-micron sieve (Figure 1). The inorganic portion was washed and examined until no further organics or organisms were present and discarded. The organic portion on the sieve was transferred to one or two 1-liter Nalgene bottles (unless field sub-sampling was needed), labeled and preserved in 95% ethanol, and brought to the MBS lab in Helena for processing (sorting, identification and data analysis) following protocols MDEQ (2012). Macroinvertebrates were identified to the lowest taxonomic level (MDEQ 2012), counted, imported into EDAS (Jessup 2006), and biological metrics were calculated from the data using MDEQ's MMI protocols (Jessup et al. 2005, Feldman 2006, MDEQ 2012). Metric results were scored using the MDEQ bioassessment criteria and each sample categorized as non-impaired or impaired according to threshold values. If the index score is below the impairment threshold, the individual metrics can be used to provide insight as to why the communities are different from the reference condition (Barbour et. al 1999, Jessup et. al. 2005). The Hilsenhoff Biotic Index (HBI) (modified for Montana {Jessup et al. 2005}) is an informative stand-alone metric, which measures the tolerance of a macroinvertebrate community to organic enrichment (Hilsenhoff 1987). Tolerance values are based on a 0-10 scale, where zero-ranked taxa are most sensitive and 10-ranked taxa are most tolerant to pollutants. HBI values of 0-3.0 in mountain streams indicate no organic pollution (excellent conditions), and 3.0-4.0 slight organic pollution (very good). The impairment threshold set by MDEQ is 63 for the Mountain Stream Index, thus any scores above this threshold are considered unimpaired (MDEQ 2012).

## 2.6 PERIPHYTON COMMUNITY SURVEYS

Periphyton communities were sampled semi-quantitatively from each of the ten transects within the assessment reach using the EMAP Reach-Wide protocol (Lazorchak et al. 1998), a.k.a. Modified Periphyton Field Protocols (MDEQ 2011). Sampling started at the downstream transect (A) or T10 in the protocol, and proceeded upstream alternating with the macroinvertebrate sampling to the left, right and center channel. Sampling periphyton for this study followed the standard methodology, preservation and quality assurance protocols specified in the MDEQ Periphyton Sampling and Analysis Plan (MDEQ 2011). Rhithron Associates, Inc. (Missoula, MT) is the MDEQ approved contract lab that processed and identified the periphyton samples. Periphyton biointegrity metrics were generated and interpreted according to Teply and Bahls (2006).

## 2.7 AMPHIBIAN SURVEYS.

Adult amphibians or reptiles encountered while shocking, seining or walking the designated stream reach were identified to species, counted and recorded, even if they were not captured.

**Figure 2.** Cattle crossing/unstable banks on the lower Tenderfoot Creek AQ5 reach



### 3.0 AQUATIC ASSESSMENT RESULTS

We evaluated eleven stream reaches in the study area: eight mainstem Sheep (6) and Tenderfoot Creek (2) sites that were classified as Mountain Streams (C003), and three tributary reaches, Little Sheep (2) and Coon Creeks that are Headwater Stream systems (D001) (Stagliano 2006) (Table 2).

#### 3.1 AQUATIC SPECIES OF CONCERN

A search of the Montana Natural Heritage Program (MNHP) database (MNHP 2015) indicated the occurrence of the western toad (*Anaxyrus boreas*), a Montana SOC amphibian species, within 1.6 km of the Sheep Creek AQ2 site, and we observed one juvenile toad during our 2016 summer surveys at this site (Photo 1). The western pearlshell mussel (WEPE), *Margaritifera falcata*, a Montana SOC and USFS sensitive species, has not been observed during the 2014 or 2016 surveys that were performed in the project area. The Montana SOC, westslope cutthroat trout (WCT) (*Oncorhynchus clarkia lewisi*) is reported to occur in the project corridor of Sheep Creek, but there are no documented occurrences, only professional opinion (MFWP 2014, MNHP 2015). Pure WCT have been documented in upstream tributaries to Sheep Creek (Daniels Creek 90-99%, Jumping Creek 100%) (MFWP 2014), so it is possible WCT could be in the study area at low densities. WCT (>90% pure) are documented to occur about 7 miles upstream of the Tenderfoot Creek reference reach (AQ6) and in the South Fork Tenderfoot Creek which enters the Tenderfoot near reach AQ5 (MFWP 2014), but we have only collected Rainbow/Cutthroat Hybrids (CT x RBTR) at this site during both years (Photo 1). No genetics testing has been done to determine if any of the CT x RBTR hybrids are >=90% pure; though, it is our professional opinion that they are not. No other aquatic SOC were documented to occur within the project area, and we did not find evidence of any aquatic SOC during our seasonal, on-site surveys.

**Photo 1. Typical CT x RBTR hybrid collected in Tenderfoot Creek and rarely in Sheep Creek.**



#### 3.2 HABITAT EVALUATIONS

Of the eleven sampling reaches evaluated in the study area, we found five in Proper Functioning Condition (PFC) with a stable trend and six were Functional at Risk (FAR) (Appendix G). Sites ranked FAR because they had riparian habitat altered recently or historically by cattle {Little Sheep AQ7 and AQ8, Sheep Creek AQ2 and AQ10, Tenderfoot Creek AQ5} (Figure 2), or because of human stream encroachment or

manipulation (Sheep Creek AQ1 and AQ2) (Appendix G). Highest site integrity scores using both the BLM Habitat and PFC Assessment methods were recorded at the Sheep Creek upper (AQ3) and lower (AQ4) meadow reaches, AQ11, and the Tenderfoot Creek AQ6 site (Appendix G). Sites reporting lower habitat scores were structurally degraded by cattle and had high associated livestock use indices (Little Sheep AQ8, Sheep Creek AQ2, and Tenderfoot AQ5) (Appendix E, See site photos, Appendix A). It is important to note that the riparian habitat of the lower reference reach on Tenderfoot Creek (AQ5) is moderately degraded (Figure 2), as well as the upstream Sheep Creek “control” reach AQ2 (Appendix E).

We mapped stream reach habitat features during the initial site set-up in 2014 following EMAP protocol (Appendix G). Stream gradient averaged 1.4% (0.6 - 2.2%) across all sites with the Sheep Creek AQ1 reach reporting the steepest drop and Coon Creek AQ9 the most gentle gradient. Based on reach gradient, stream geomorphology and bottom substrate characteristics, Sheep Creek and Tenderfoot can be classified broadly as Rosgen C3, while Little Sheep Creek has characteristics of E4-F4 classes, being moderately entrenched at the upper AQ8 and some sections of AQ7 (Rosgen 1996). Coon Creek has morphologic characters of an F4 stream (Rosgen 1996). Stream habitat morphology is dominated by riffle and runs at all sites; Sheep Creek averaged 85% riffle/run, Coon Creek 100%, Little Sheep 73% and Tenderfoot Creek 75% of the total stream reaches (Table 4). Tenderfoot Creek sites had slightly more pool area than the Sheep Creek sites overall and are closest in geomorphology to AQ2/AQ3. The Sheep Creek site AQ11 added in 2016 had similar stream geomorphology to the canyon reach (AQ1) with steeper riffle/run sections and large cobbles, while Sheep Creek AQ10 shared characteristics of the meadow reaches (AQ4) with lower gradient riffles and longer, deeper pools (Table 4).

### **3.3 FISH COMMUNITIES**

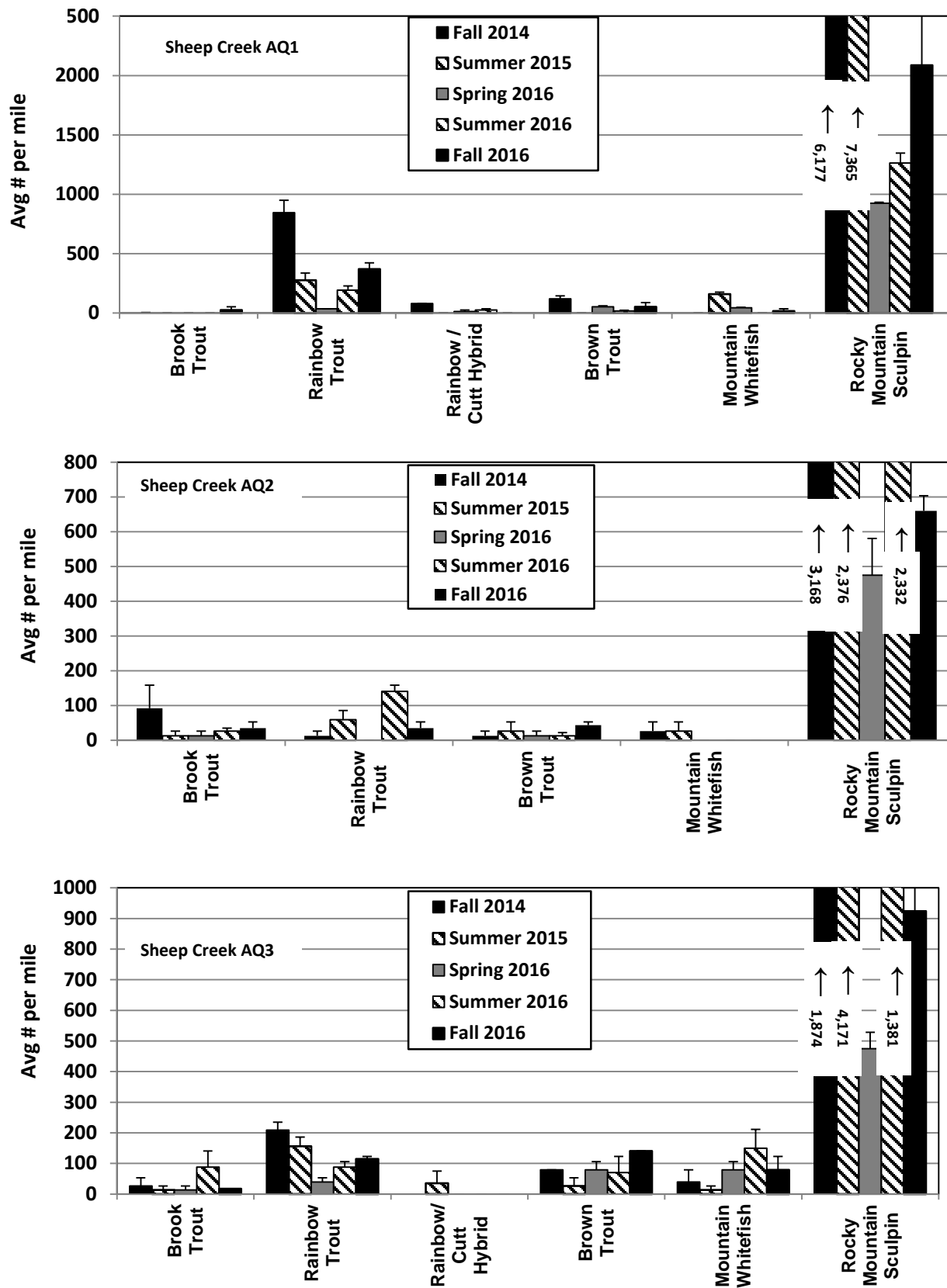
Overall, we identified seven fish species and one hybrid (four native/four introduced) from 5,031 individuals collected during 26 stream reach surveys in 2016 (Table 2). Average number of fish species per site across the project area was 4.3 (standard error of  $\pm 0.2$ ), while native species averaged 1.8 (SE  $\pm 0.4$ ). We collected fish during all surveys at all sites, except at Coon Creek AQ9 which was documented to be fishless in 2014 upstream of the county road, but downstream near its confluence with Sheep Creek, we collected juvenile brown (n=4) and brook trout (n=1). The rocky mountain sculpin comprised the highest proportion of total individuals collected (74%) and had 100% site occupancy (n=10 sites), Tenderfoot Creek had the highest percentage of sculpin comprising the catch (80%). The other native species, mountain whitefish, longnose dace, and white sucker had site occupancy rates of 52%, 12%, and 12%, respectively (Appendix B). This is a net increase in site occupancy, despite adding 2 sites, because in 2016 we documented white sucker and mountain whitefish juveniles using Little Sheep Creek for the first time (Appendix B).

**Table 4.** Aquatic Sampling Assessment Reach Measurements and average stream habitat percentages

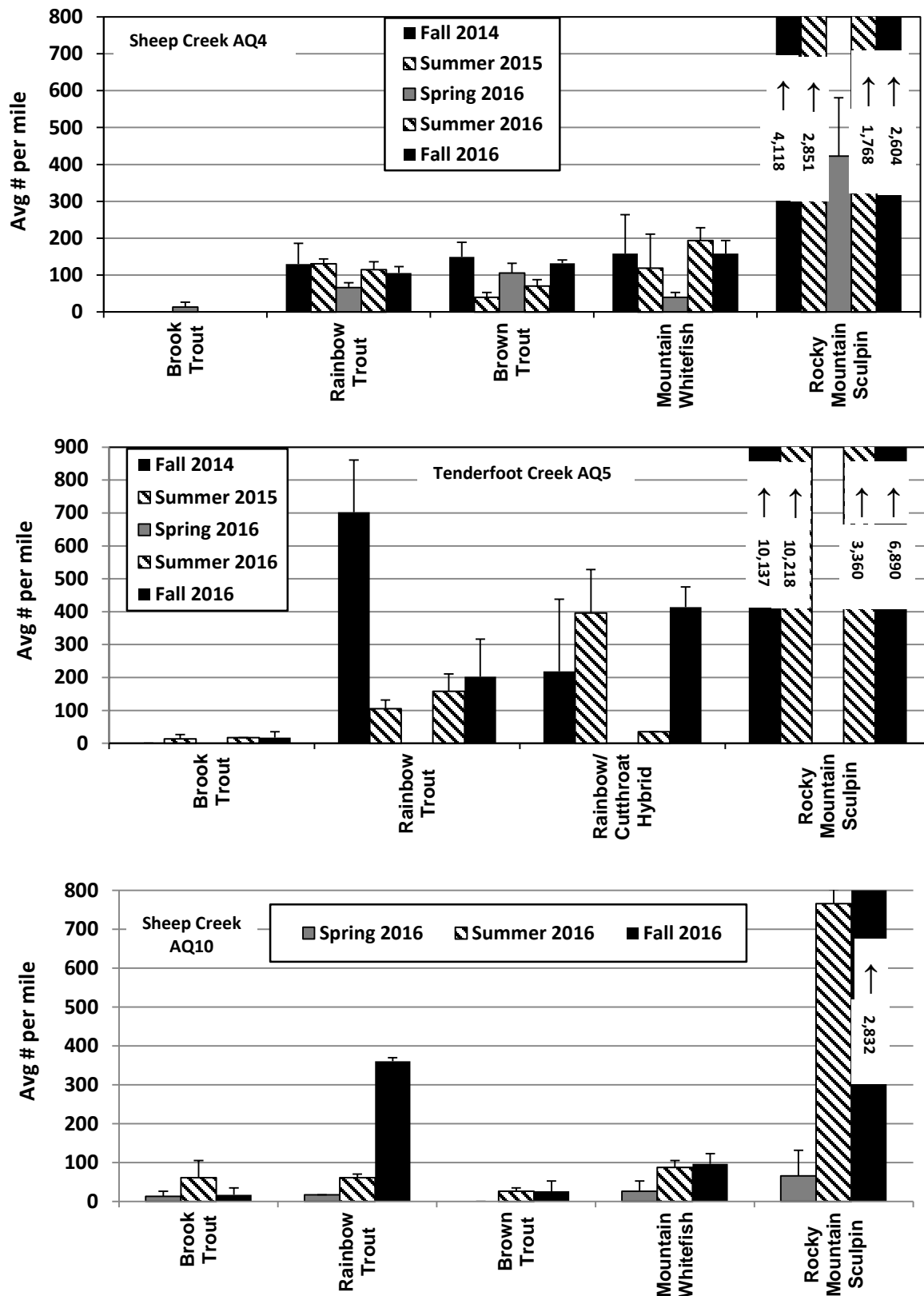
Site Code	Stream	Calculated EMAP Reach Length (m)	Actual Reach Length (m)	% Riffle	% Run	% Pool
AQ1	Sheep Creek	326	300	40	53	7
AQ2	Sheep Creek	158	200	60	20	20
AQ3	Sheep Creek	262	300	40	40	20
AQ4	Sheep Creek	273	300	50	37	13
AQ10	Sheep Creek	340	300	45	40	15
AQ11	Sheep Creek	285	300	50	38	12
			<b>avg.</b>	<b>47.5</b>	<b>38</b>	<b>14.5</b>
AQ5	Tenderfoot Creek	306	300	47	33	20
AQ6	Tenderfoot Creek	302	300	50	20	30
			<b>avg.</b>	<b>48.5</b>	<b>26.5</b>	<b>25</b>
AQ7	Little Sheep Creek	52	150	40	40	20
AQ8	Little Sheep Creek	34	150	40	25	35
			<b>avg.</b>	<b>40</b>	<b>32.5</b>	<b>27.5</b>
AQ9	Coon Creek	24	50	75	25	0

The most diverse fish site in the study area was Sheep Creek AQ3 reporting all eight species, and the highest number of native species (n=4) (Appendix B). No fish SOC were documented during any of the site surveys between 2014 and 2016. Rainbow trout were collected at nine of 10 sites in total, achieving highest average densities at Tenderfoot sites AQ5/AQ6 (385 per mile ± 230 SE) which is not significantly different from the Sheep Creek AQ1 site abundance (344.1 per mile ± 136 SE) (Figure 4). Average rainbow trout densities in the Sheep Creek downstream impact sites (n=4) is higher (168 per mile ± 60 SE) than the control sites (n=2) (85 per mile ± 35 SE), but this is not significant (F-test, p=0.15). Brook trout were collected at nine of 10 sites in total, achieving highest average densities at Little Sheep Creek AQ7 (847 per mile ± 232 SE) (Figure 4). Brook trout densities at both Little Sheep Creek sites (AQ7 and AQ8) are on a significant upward trend since 2014 (Figure 3). Brown trout were detected at 7 of 10 sites, achieving highest densities at Sheep Creek sites AQ3 and AQ4 averaging ~85 per mile (Figure 4). Mountain whitefish were most abundant and the dominant salmonid species at Sheep Creek AQ4 site (134 per mile ± 26 SE) (Figure 4), but were not reported at Sheep Creek AQ2 in 2016 after collecting them there in 2014-2015 (Figure 3). Brown trout and mountain whitefish were never collected in the Tenderfoot Creek reaches which are above a natural barrier, and coincidentally sculpin densities and smaller size classes of rainbow trout were highest in this reach (Figure 3, Appendix C). Lowest trout densities and those of catchable size (>200mm) were reported from Sheep Creek AQ2 and AQ11 (Figure 3, Appendix C) where easily accessible fishing access may account for lower fish numbers.

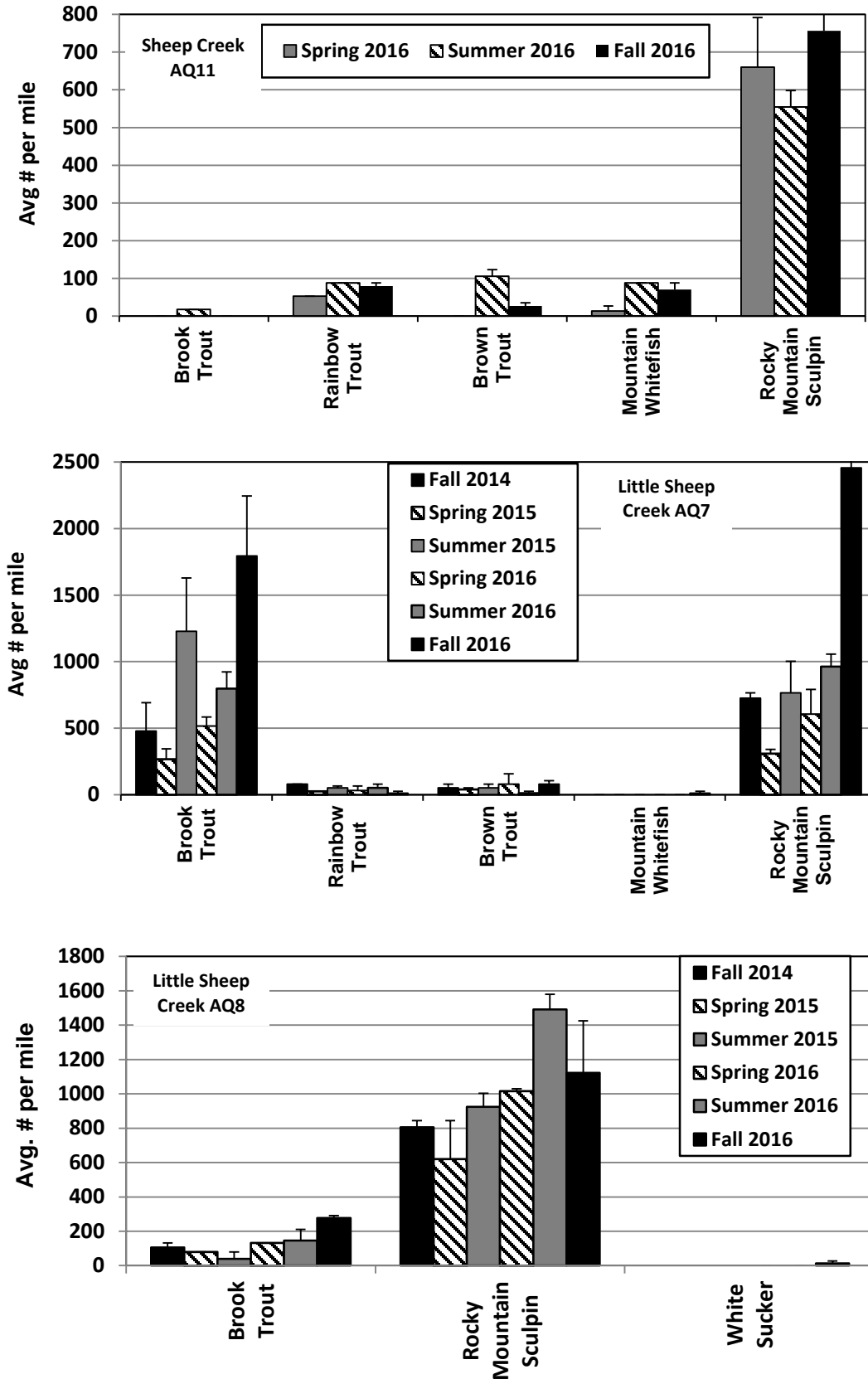
**Figure 3.** Seasonal average fish abundance per mile (+SE) for Sheep Creek AQ1 (top), AQ 2 (middle) and AQ3 (bottom) for the Tintina Black Butte survey sites. Note scale differences on y-axis.



**Figure 3 (cont.).** Seasonal average fish abundance per mile (+SE) for Sheep Creek AQ4 (top) and Tenderfoot Creek AQ5 (middle) and Sheep Creek AQ10 (bottom). Note scale differences on y-axis.

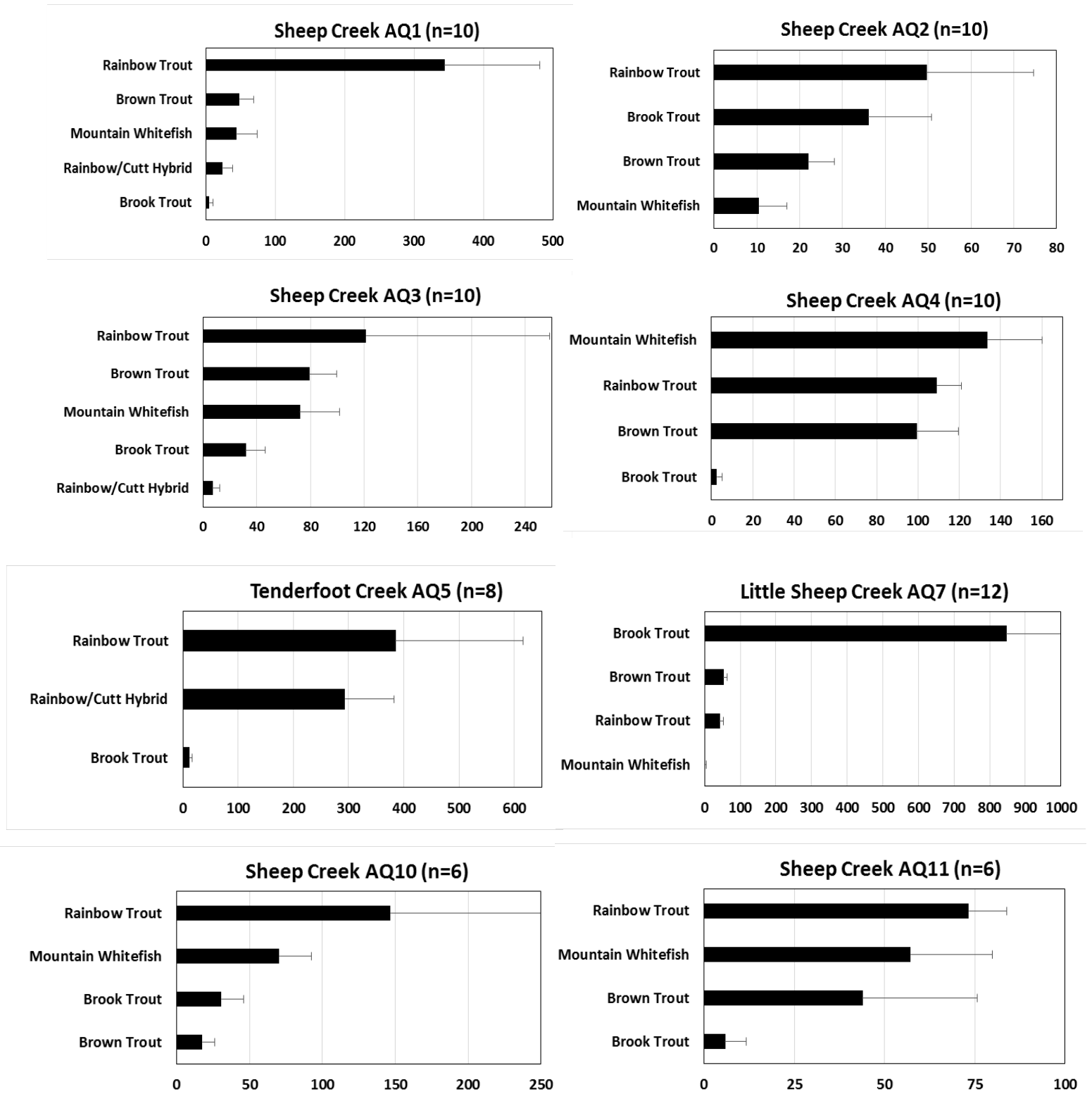


**Figure 3 (cont.).** Seasonal average fish abundance per mile (+SE) for Sheep Creek AQ11 (top), Little Sheep Creek AQ7 (middle) and Little Sheep Creek AQ8 (bottom). Note scale differences on y-axis.





**Figure 4.** Overall average salmonid abundance per mile (+SE) for Sheep, Little Sheep and Tenderfoot Creek sites across all section surveys 2014-2016 (n). Note scale differences on x-axis.



Seasonally, fall 2014 density estimates of rainbow trout reported at Sheep Creek AQ1 (avg. 844 per mile) were most similar to the reference reach, Tenderfoot Creek (avg. 702 per mile), but these high estimates showed significant decreases at both sites by the summer 2015 sampling event and into 2016 (Figure 3). Total trout abundance estimates at Sheep Creek AQ2 (avg. 108 per mile  $\pm$  36 SE) for the past 2 years (Figure 4) were substantially lower than a 1992 estimate (325 per mile) (MFISH 2014).

The downstream Sheep Creek sites AQ10 and AQ11, added in 2016, had similar overall fish densities to AQ4 and AQ2, respectively (Figure 4), but with fewer brown trout. These sites, which qualitatively have similar pool habitat, also reported fewer catchable-sized fish (>200mm) than we found in the Sheep Creek meadow reaches AQ3 and AQ4 (Appendix C). We observed similar patterns at the upper Sheep Creek site AQ2 which has roadside fishing access and likely higher fishing pressure. Rainbow trout size-frequency numbers indicate the presence of four dominant size-classes (age classes) in most Sheep Creek reaches, except those with abundant large brown trout where the 1st and 2nd year classes (<100mm) are missing (Appendix C) likely due to predation. The most evenly distributed RBTR size-classes was observed during summer and fall at the Tenderfoot Creek AQ5 and Sheep Creek AQ3 sites (Appendix C). Brown trout size classes are eschewed towards larger fish across most Sheep Creek sites, especially at AQ10, the fishing access site (Appendix C). The most evenly distributed brown trout size-class populations were observed during the summer and fall at the Sheep Creek AQ3 and AQ4 sites (Appendix C). This may be indicating that a recruitment of younger age-class brown trout into those reach populations from nearby refuge areas (e.g. Little Sheep Creek, Spring Creek). The most evenly distributed brook trout size-class populations were observed during spring surveys at Little Sheep Creek AQ8 and during the fall at the Little Sheep Creek AQ7 site (Appendix C). Large numbers of juvenile brook trout (<100mm) were observed at Little Sheep Creek AQ7 in the summer of 2016 indicating the successful recruitment of this size-class from the previous year's spawn (Appendix C). Mountain Whitefish juveniles were observed across most Sheep Creek sites, except AQ2 and Little Sheep AQ7 in the spring and summer surveys (Appendix C).

### **3.3.1 Pit Tagged Fish**

We captured and released 11 pit-tagged fish (2 recaptures) from the Montana State University study during the 2016 summer and fall surveys, none were reported in the spring (Table 5). The mountain whitefish captured at AQ3 was the furthest upstream detection of any tagged fish into the Tintina Project Area. Tagged-fish captured in the summer at AQ1 were recently tagged at that location and showed signs of handling stress (i.e. missing scales, poor condition). The recaptured mountain whitefish (AQ4) and rainbow trout (AQ10) in the fall survey presumably spent the previous couple months in that reach or nearby.

**Table 5. Location, date and species of pit-tagged salmonids within the Sheep Creek monitoring reaches. RBTR= rainbow trout, LOLE=brown trout and MOWH= mountain whitefish**

Site ID	Date	Species	Length (mm)	Weight (g)	Pit-Tag ID
AQ1	7/13/2016	RBTR	220	110	982 05538116
AQ1	7/13/2016	RBTR	280	220	2280 00148400
AQ1	7/13/2016	RBTR	270	229	2280 00177193
AQ1	7/13/2016	LOLE	270	208	982 05538112
AQ1	7/13/2016	RBTR	265	218	982 05538076
AQ3	7/12/2016	MOWH	265	185	2280 0011739
AQ4	7/13/2016	MOWH	290	250	982 05538110
AQ4	7/13/2016	MOWH	305	285	2280 00177495
AQ4	7/13/2016	MOWH	305	225	982 05538165
AQ4	9/20/2016	MOWH	307	266	982 05538165
AQ10	7/14/2016	MOWH	305	347	2280 00177470
AQ10	7/14/2016	RBTR	270	192	2280 0011667
AQ10	9/20/2016	RBTR	275	210	2280 0011667

**3.3.2 Fish anomalies**

We documented opercula erosion in a small percentage (~10%) of the brook trout and rainbow trout of Little Sheep Creek again in 2016 (Photo 2). This condition can be caused by bacterial gill disease (BGD), so that when gills swell, the gill cover quickly erodes away; typically, only one of the two gill covers is eroded ~20-40%. In the wild, when organic loading into the stream is occurring, the numbers of bacteria can be very high and can cause similar symptoms on the gills (swelling, mucus etc). High loads of *E. coli* bacteria in Sheep Creek and tributaries (MDEQ 2017) may also be contributing factors. Based on macroinvertebrate and periphyton metrics, nutrient loading is still occurring in Little Sheep Creek, but

**Photo 2. Opercula reduction in a juvenile brook trout (left, red circle) and a chromatophore pigmented brook trout (right) collected in Little Sheep Creek AQ7.**



may be improving. Chromatophore brook trout were also sporadically collected in the Little Sheep Creek sites; only 2 have been collected since the start of the study (Photo 2).

### 3.3.3 Fish Tissue Analysis

No significant differences were reported between baseline tissue metal analysis performed on rocky mountain sculpin (n=5) from sites upstream and downstream of the Tintina Project Area (Table 6). Mercury was not reported at any site at detectable levels (Appendix F). Iron (FE) values appear initially higher in the Little Sheep Creek sculpin tissues, but the reported values for all metals are below the impairment threshold for Aquatic Life Standards (MDEQ 2012a).

**Table 6. Baseline tissue metal values (mg/kg) (Cadmium, Copper, Iron, Lead, Manganese, Nickel, Selenium, Zinc) from sculpin downstream (D/S) and upstream (U/S) of the Tintina Project Area. ND= non-detectable at reporting limits**

Stream Site	CD	CU	FE	PB	MN	NI	SE	ZN
Sheep Creek AQ1 (D/S)	ND	2	204	ND	8	ND	1	25
Sheep Creek AQ4 (D/S)	ND	1	177	ND	4	ND	3	18
<b>average</b>		<b>1.5</b>	<b>190.5</b>		<b>6.0</b>		<b>2.0</b>	<b>21.5</b>
Sheep Creek AQ2 (U/S)	ND	1	171	ND	7	ND	2	22
Little Sheep AQ7 (U/S)	ND	1	275	ND	8	ND	2	24
<b>average</b>		<b>1.0</b>	<b>223.0</b>		<b>7.5</b>		<b>2.0</b>	<b>23.0</b>
<b>F-test, p-value</b>		<b>0.21</b>	<b>0.32</b>		<b>0.27</b>		<b>0.50</b>	<b>0.36</b>

**Table 7.** Assemblage Tolerance Indices (ATI) for the fish collected.

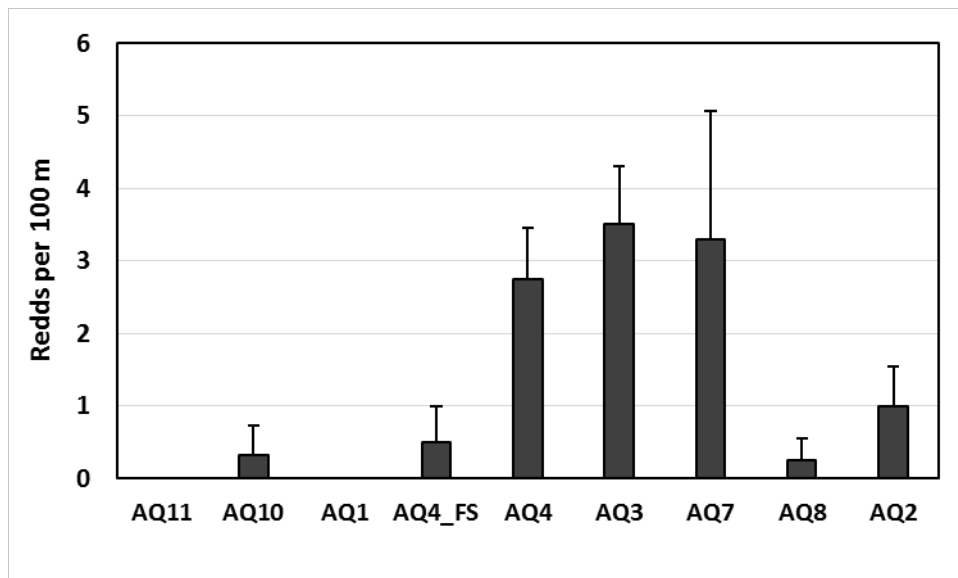
		% Tolerant	% Sensitive	% Intermediate
Sheep Creek AQ1	2014/2015	1.0	14.0	85.0
	2016	1.0	9.0	90.0
	avg.	<b>1.0</b>	<b>11.5</b>	<b>87.5</b>
Sheep Creek AQ2	2014/2015	1.0	<b>3.0</b>	<b>96.0</b>
	2016	1.0	4.0	95.0
	avg.	<b>1.0</b>	<b>3.5</b>	<b>95.5</b>
Sheep Creek AQ3	2014/2015	3.0	7.0	90.0
	2016	11.5	9.0	88.5
	avg.	<b>7.25</b>	<b>8</b>	<b>84.75</b>
Sheep Creek AQ4	2014/2015	3.0	3.0	94.0
	2016	7.9	7.1	85.0
	avg.	<b>5.45</b>	<b>5.05</b>	<b>89.5</b>
Sheep Creek AQ10	2016	<b>1.0</b>	<b>16.0</b>	<b>83.0</b>
Sheep Creek AQ11	2016	<b>5.0</b>	<b>9.0</b>	<b>86.0</b>
Tenderfoot Creek AQ5	2014/2015	0.0	8.0	92.0
	2016	0.0	9.4	90.6
	avg.	<b>0</b>	<b>8.7</b>	<b>91.3</b>
Little Sheep Creek AQ7	2014/2015	4.0	42.0	54.0
	2016	3.0	44.0	53.0
	avg.	<b>3.5</b>	<b>43.0</b>	<b>53.5</b>
Little Sheep Creek AQ8	2014/2015	0.0	12.0	88.0
	2016	3.0	13.0	84.0
	avg.	<b>1.5</b>	<b>12.5</b>	<b>86.0</b>

*\*Underlined values were the highest average site score for the tolerance metric*

### 3.3.4 Fall Redd Counts

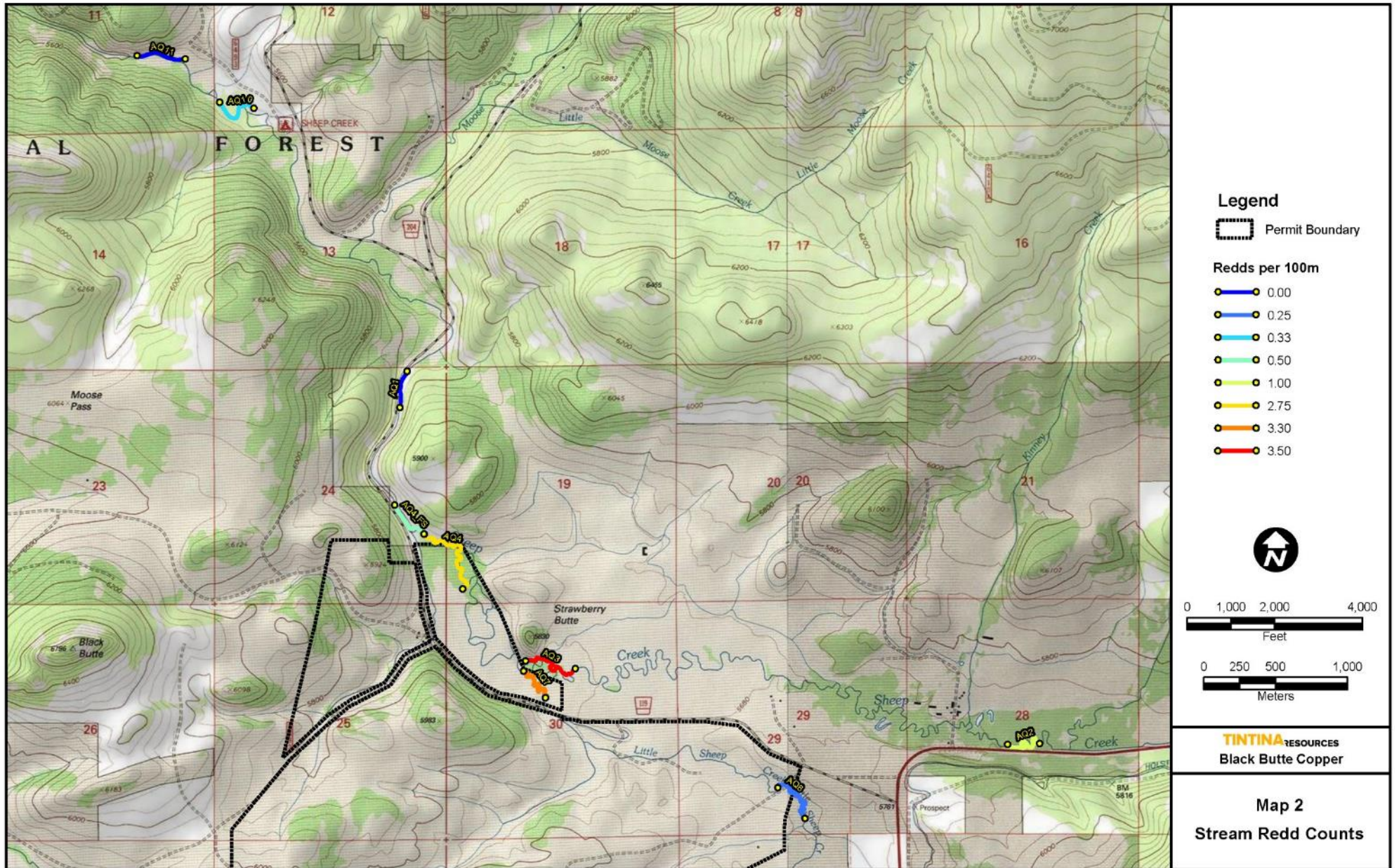
Overall, we evaluated approximately 2.8 miles (4,500m) of stream channel encompassing all Sheep Creek and Little Sheep Creek monitoring sections for the presence of spawning redds in late-October. The highest number of brown trout redds averaged 3.5 and 2.8 per 100 meters at Sheep Creek AQ3 and AQ4, respectively (Figure 5, Map 2). Very few brown trout redds (3 total) were observed downstream of the lower Sheep Creek meadow reach (AQ4) with only one of these occurring in the 3 designated monitoring reaches (AQ1, AQ10, AQ11) (Map 2). Brook trout redds were identified in lower stream velocity areas with smaller substrate size classes and averaged 3.3 and 0.25 per 100m in Little Sheep Creek AQ7 and AQ8, respectively (Figure 5).

**Figure 5. Average number of redds per 100 m at sites within the Sheep Creek project area arranged from the furthest downstream to upstream.**





Map 2. Fall 2016 redd count locations in relation to the monitoring sites and Tintina project area.



### 3.5 FRESHWATER MUSSEL SURVEYS

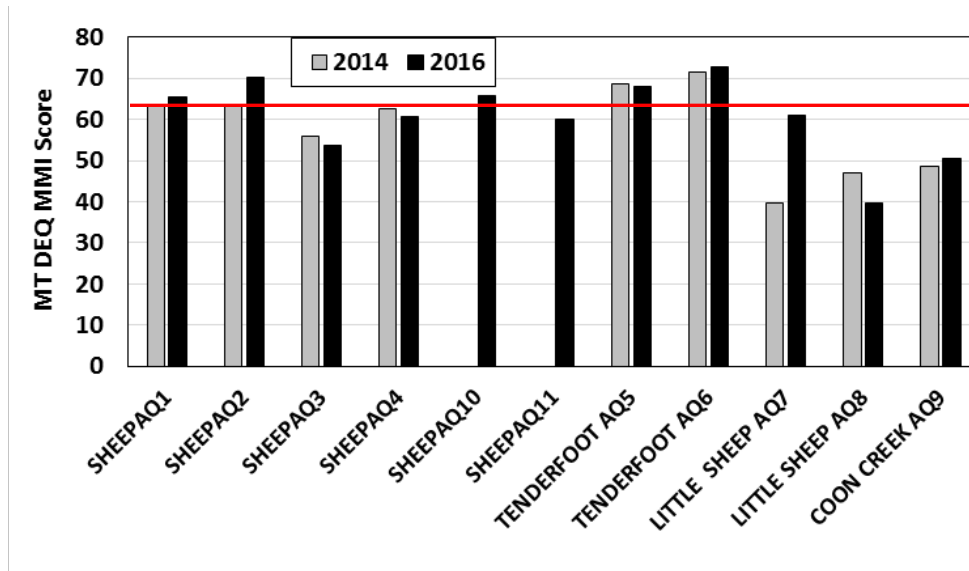
No evidence of the western pearlshell mussel (live, dead, or as shell fragments indicative of a previous historical population) was reported during the 2014 and 2016 surveys of Sheep, Little Sheep or Tenderfoot Creek reaches.

### 3.6 MACROINVERTEBRATE COMMUNITIES

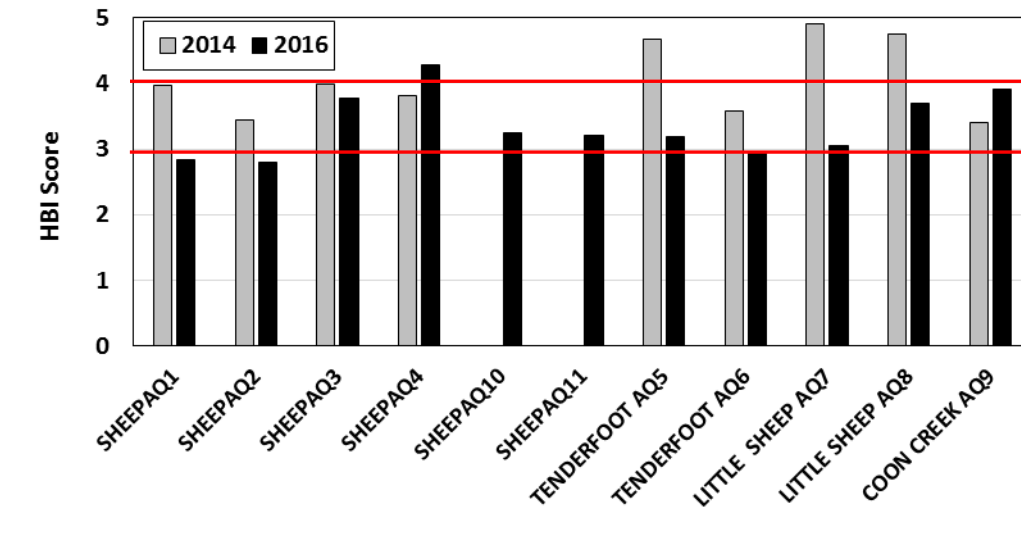
Overall, 145 unique macroinvertebrate taxa were reported from the assessment samples collected from the Tintina Project streams from 2014 to 2016 (Appendix D). Macroinvertebrate samples collected in 2016 added 33 new taxa to the previous taxa list due to two new Sheep Creek sites and a 2-week earlier sample date in 2016. No Montana invertebrate SOCs were collected. The macroinvertebrate community at Sheep Creek AQ2 had very high benthic densities, high MDEQ MMI scores and resembled taxa of the reference condition mountain stream (Tenderfoot Creek) (Table 8, Figure 6). Sheep Creek AQ4 reported the highest taxa richness (60 spp.), while AQ2 had the highest number of combined mayfly, caddisfly and stonefly taxa (EPT) (21 species) (Table 8). Tenderfoot Creek reported the highest integrity scores ranked by the MDEQ MMI (avg. 70), while Sheep Creek sites averaged 62.6, which is ranked slightly impaired by MDEQ thresholds. These 2016 MMI differences are not significantly lower (ANOVA,  $p=0.22$ ) as they were in 2014 (Table 9). Control Sheep Creek sites (AQ2 and AQ3) had lower macroinvertebrate integrity than the treatment reaches (AQ1, AQ4), but this was not significantly different (ANOVA  $p=0.22$ ). Initial 2014 macroinvertebrate densities were highest in Tenderfoot Creek and were significantly higher than Sheep or Little Sheep Creek (one-way ANOVA,  $p=0.03$  and  $0.028$ , respectively); this was not significant in 2016 (Table 9). Average macroinvertebrate richness across all sites was 45 taxa, while EPT taxa averaged 15 per site (Table 8). EPT taxa and % EPT were not different between Sheep and Tenderfoot Creeks in 2016, but Little Sheep and Coon Creek had significantly lower values than both other sites (Table 9). Both Little Sheep Creek sites, Sheep Creek AQ3 and AQ11 and Coon Creek were ranked impaired by the MDEQ MMI with scores  $<63$  (Table 8, Figure 6), but ranked unimpaired with the Low Valley MMI. Hilsenhoff Biotic Index (HBI) scores averaged 3.4 across all 2016 sites; this is slightly impaired for mountain streams ( $>3$ ), indicating probable nutrient or other organic impairment to all sites. But, significant improvements have been seen in decreases to the HBI from 2014 to 2016 at 6 sites, including AQ1, AQ2, AQ5, AQ6, AQ7 and AQ8 (Figure 7). Little Sheep Creek sites, particularly AQ8, have significantly lower EPT taxa than Sheep or Tenderfoot Creek samples again in 2016 (Table 9); this is one of the few differences noted in 2016, as large improvements in AQ7 macroinvertebrate communities has evened these differences out. It is important to note that the Sheep Creek impact sites are again reporting significantly different (lower) macroinvertebrate MMI scores than the Tenderfoot Creek reference sites (Table 9).



**Figure 6. Macroinvertebrate MDEQ MMI scores across Tintina Study Sites by year. Red line represents the impairment threshold (63), below this indicates impairment.**



**Figure 7. Macroinvertebrate HBI scores across Tintina Study Sites by year. Red lines bracket the slight organic impairment range (3.0-4.0), below 3.0 indicates minimal impairment.**



**Table 8.** Macroinvertebrate sample characteristics and various metrics used for the MDEQ MMI.  
 Bolded, underlined values are below the impairment threshold.

StationID	Coll Date	Ind m <sup>-2</sup>	Mtn MMI Index	Total Taxa	EPT Taxa	% EPT	% CrusMol	% NonIns	HBI
UM_SHEEPAQ1	7/14/2016	4335	65.5	58	20.7	65.2	1.8	2.3	2.8
UM_SHEEPAQ2	7/12/2016	5632	70.1	59	21.1	63.6	0.3	0.6	2.8
UM_SHEEPAQ3	7/12/2016	3940	<u>53.7</u>	35	14.4	36.8	0.0	1.3	3.8
UM_SHEEPAQ4	7/11/2016	1840	<b>60.8</b>	64	17.5	25.5	0.8	4.1	4.3
UM_SHEEPAQ10	7/12/2016	2044	65.8	55	19.5	53.9	0.6	0.9	3.2
UM_SHEEPAQ11	7/12/2016	2760	<b>60.1</b>	45	14.2	51.6	2.9	4.8	3.2
	<b>avg.</b>	<b>3425.2</b>	<b>62.6</b>	<b>52.7</b>	<b>17.9</b>	<b>49.5</b>	<b>1.1</b>	<b>2.3</b>	<b>3.4</b>
UM_TENDAQ5	7/12/2016	2224	68.12	47	18.3	67.7	0.0	0.2	3.2
UM_TENDAQ6	7/12/2016	2515	72.76	42	19.9	62.6	0.0	0.0	3.0
	<b>avg.</b>	<b>2369.5</b>	<b>70.4</b>	<b>44.5</b>	<b>19.1</b>	<b>65.2</b>	<b>0.0</b>	<b>0.1</b>	<b>3.1</b>
UM_LSHEEP7	7/11/2016	2612	<b>61.1</b>	45	20.0	52.7	3.5	5.2	3.1
UM_LSHEEP8	7/12/2016	1136	<u>39.7</u>	29	8.0	9.9	7.8	9.9	3.7
	<b>avg.</b>	<b>1874.0</b>	<u><b>50.4</b></u>	<b>37.0</b>	<b>14.0</b>	<b>31.3</b>	<b>5.6</b>	<b>7.5</b>	<b>3.4</b>
UM_COONAQ9	7/12/2016	2520.0	<u>47.5</u>	35.0	11.0	15.5	1.8	3.8	3.9
	<b>Overall Avg.</b>	<b>4114.8</b>	<b>60.5</b>	<b>44.8</b>	<b>15.3</b>	<b>37.7</b>	<b>2.1</b>	<b>3.7</b>	<b>3.4</b>

**Table 9.** Macroinvertebrate Metric ANOVA statistical results by stream and treatment from 2014 (top) and 2016 (bottom). Underlined and bolded values were significant at  $p < 0.05$ .

	Ind m <sup>-2</sup>	Mtn MMI Index	Total Taxa	EPT Taxa	% EPT	HBI
Tenderfoot x Sheep	<u>0.03</u>	<u>0.02</u>	0.47	0.191	0.35	0.23
Sheep x L. Sheep	0.110	<u>0.004</u>	0.082	<u>0.009</u>	<u>0.034</u>	<u>0.004</u>
Tenderfoot x L. Sheep	<u>0.03</u>	<u>0.01</u>	<u>0.07</u>	<u>0.004</u>	<u>0.07</u>	0.16
Treatment X Control	0.248	0.219	0.210	0.064	0.407	0.294
Treatment X Reference	0.141	<u>0.022</u>	0.356	0.464	0.227	0.360
Control X Reference	<u>0.017</u>	0.060	0.258	0.060	0.455	0.285

2016	Ind m <sup>-2</sup>	Mtn MMI Index	Total Taxa	EPT Taxa	% EPT	HBI
Tenderfoot x Sheep	0.19	0.06	0.18	0.19	0.31	0.27
Sheep x L. Sheep	0.11	0.06	0.06	<u>0.01</u>	0.16	0.49
Tenderfoot x L. Sheep	0.29	0.10	0.23	<u>0.004</u>	0.25	0.24
Treatment X Control	0.37	0.45	0.10	0.28	0.35	0.31
Treatment X Reference	0.34	<u>0.02</u>	0.07	0.32	0.14	0.27
Control X Reference	<u>0.05</u>	0.21	0.43	0.37	0.19	0.36

### 3.7 PERIPHYTON COMMUNITIES

Overall, 167 unique diatom and algae taxa were reported from the 10 periphyton assessment samples collected in 2016 (Appendix F). This has increased the total study's taxa list by 21 taxa over 146 taxa collected in 2014. No periphyton species are listed as SOC in the state. Diatoms were the dominant taxa at 7 of the 10 study sites (Table 10). The diatom, *Didymosphenia geminata* (a.k.a. rock snot) which can sometimes become invasive, was abundant in the Tenderfoot Creek reference reaches, as it was in 2014, but not in Sheep Creek. The Cyanobacteria, *Phormidium* sp. was the dominant, non-diatom species at 4 of 10 sites in 2016; especially in Sheep Creek meadow reaches (AQ3, AQ4, AQ7) and at the canyon site (AQ1). This toxic, algae-like taxa can form thick, brown-black slimy mats on rocks and displace important mayfly, stonefly and caddisfly taxa (Photo 3); it was not the 1<sup>st</sup> or 2<sup>nd</sup> dominant taxa at any site in 2014. Abundant filamentous algae outbreaks observed at the lower Sheep Creek sites (AQ10 and AQ11) was confirmed with the periphyton samples; *Cladophora* is the dominant taxa at both sites (Table 10). Sheep Creek AQ3 reported the highest periphyton taxa richness (86 spp.), while Sheep Creek AQ2 reported the lowest (44 spp.). The average periphyton richness per site was 68.6 taxa, which is ~10 taxa higher than in 2014. Tenderfoot Creek periphyton taxa richness was not significantly different than Sheep or Little Sheep Creeks (T-test, p=0.2 and p=0.33, respectively), as it was significantly lower in 2014. Tenderfoot Creek had more sensitive taxa and was least likely to be impaired of all sites in the 2016 assessment (Table 10).

**Table 10.** Periphyton sample characteristics: total taxa in the sample, % relative abundance and the % probability of impairment ranked by TDI with the dominant taxa. Impaired values are underlined

Site ID	Station ID	Total Taxa	% Relative Abund.	% Probability Impairment	Dominant Taxa 1	Dominant Taxa 2
AQ1	Sheep Creek #1	57	12.8	41.4%	Diatoms	<i>Phormidium</i>
AQ2	Sheep Creek #2	44	8.4	28.8%	<i>Tolypothrix</i>	Diatoms
AQ3	Sheep Creek #3	86	19.6	<u>62.1%</u>	Diatoms	<i>Phormidium</i>
AQ4	Sheep Creek #4	82	27.5	<u>82.2%</u>	Diatoms	<i>Phormidium</i>
AQ5	Tenderfoot Creek #5	61	3.4	17.7%	Diatoms	<i>Nostoc</i>
AQ6	Tenderfoot Creek #6	60	4.3	19.8%	Diatoms	<i>Nostoc</i>
AQ7	Little Sheep Creek #7	56	11.7	37.9%	Diatoms	<i>Phormidium</i>
AQ8	Little Sheep Creek #8	74	5.9	22.9%	Diatoms	<i>Cladophora</i>
AQ10	Sheep Creek #10	82	12.7	41.3%	<i>Cladophora</i>	Diatoms
AQ11	Sheep Creek #11	84	12.1	40.0%	<i>Cladophora</i>	Diatoms

Based on Teply's Diatom Index (TDI), the lower meadow site, Sheep Creek AQ4 had the highest probability of impairment (82.2%) followed by Sheep Creek AQ3 at 62.1% (Table 10). Other Sheep and Little Sheep Creek sites had less than a 42% chance of being impaired based on the TDI (Table 10). Both of the Tenderfoot Creek reference sites were least likely to be impaired (<20%), but with *Nostoc* representing the 2<sup>nd</sup> dominant periphyton taxa, there is likely some nutrient loading from cattle use in the adjacent watershed (Table 10).

**Photo 3. Cyanobacteria, *Phormidium sp.* covering a rock (left) and the nuisance diatom, *Didymosphenia geminata* in the Tenderfoot Creek AQ 5 reach (right).**



### 3.8 AMPHIBIAN AND REPTILE OBSERVATIONS

Two amphibian species, the Columbia Spotted Frog (*Rana luteiventris*) and the western toad (*Anaxyrus boreas*), Montana SOC, were incidentally recorded during 2016 summer surveys at Sheep Creek AQ4 and AQ2, respectively. The western toad had been previously recorded within 1.6 km of Sheep Creek site AQ2 (MNHP 2015), but had not been observed during our 2014 or 2015 surveys until summer 2016 (Photo 4).

Two terrestrial garter snakes (*Thamnophis elegans*) were observed during the summer survey along the Tenderfoot Creek AQ5 reach. These were the only herpetofauna occurrences reported in conjunction with the seasonal aquatic survey visits.

**Photo 4. Juvenile western toad observed at Sheep Creek AQ2 during the summer 2016 survey.**



## 4.0 CONCLUSIONS

Despite reports of westslope cutthroat trout occurring in the Sheep Creek study area (MFWP 2014, MNHP 2015), only cutthroat x rainbow hybrids (overall phenotypic traits appear to be <90% pure) were rarely collected during 38 seasonal site surveys; therefore, it is my professional opinion that no fish SOC are present in the project area. We did incidentally observe the Montana SOC western toad (1 juvenile) during the summer fisheries survey in 2016 at Sheep Creek AQ2. Fish species richness and diversity were higher in the Sheep Creek sites than the Tenderfoot reference reaches, and were similar between the Sheep Creek upstream control reaches and the downstream “impact” reaches of the study area. Overall fish densities were highest in the Tenderfoot Creek reference reach (avg. 7,900 per mile) due to high sculpin densities and the highest combined rainbow/cutthroat hybrid numbers (averaging 678 per mile) of all sites. Brook trout reported highest average densities in Little Sheep Creek AQ7, and brown trout attained highest densities and biomass in the meadow reaches of Sheep Creek AQ3 and AQ4. ATIs were dominated by large percentages of intermediate tolerant species, because of the abundant and ubiquitous rocky mountain sculpin populations.

Fisheries population conclusions can be summed up as follows:

- 1) Rainbow trout adults were virtually absent from the Sheep Creek project area in the spring, and no pit-tagged rainbows were reported upstream of Sheep Creek AQ1 at any time in 2016.
- 2) Brown trout adults in the project area are using lower Little Sheep Creek as a thermal refuge in the winter, and are largely resident based on the recapture rate of previously marked individuals and no newly detected pit-tagged individuals during any season.
- 3) Fall redd counts indicate the highest number of brown trout redds (avg. 3.1 per 100m or ~50 per mile) are located within the Sheep Creek meadow reaches AQ3 and AQ4. Brook trout redds are concentrated in lower Little Sheep Creek (AQ7)
- 4) Mountain whitefish are moving into the Sheep Creek project reach from downstream, especially in the summer, as indicated by 4 pit-tagged individuals being collected at AQ3 and AQ4. Other pit-tagged salmonids detected in 2016 are largely being recaptured at their original tagging sites, AQ1 and AQ10.

Aquatic benthic communities at all sites are exhibiting signs of nutrient or organic enrichment based on the HBI index, likely due to cattle ranching, but this was less prevalent in the Tenderfoot Creek site AQ6. Riparian habitat at five sites (AQ2, AQ5, AQ7, AQ8 and AQ10) ranked Degraded because of cattle use, while Sheep Creek AQ1 and AQ2 are Functional, but at risk because of adjacent road effects on the hydrology. In contrast, initial baseline biotic integrity of macroinvertebrate and periphyton communities was significantly higher in the Tenderfoot Creek reaches despite riparian degradation at AQ5. Diverse aquatic communities with high biological integrity are usually correlated with intact riparian conditions and diverse habitat quality (Allen et al. 1997), but the

streams of this study have a mixed relationship (Table 11). Tenderfoot Creek AQ6 and Sheep Creek AQ4 both report high aquatic diversity and habitat quality, while Tenderfoot AQ5 and Sheep Creek AQ2 have high biotic integrity, but lower habitat quality. During these initial 2 years of the study, macroinvertebrate and periphyton communities indicate that many sites in Sheep and Little Sheep Creeks are slightly to moderately impaired, likely from nutrients. Even the sites with high quality riparian and in-stream habitat condition show slight to moderate impairment. This is corroborated by the HBI scores being moderately elevated across all sites indicating probable nutrient or other organic impairment. The common cause of organic enrichment across all sub-basins of the study is cattle grazing, and the macroinvertebrate and periphyton communities are exhibiting the deleterious effects. Community results from the habitat, fish, periphyton and macroinvertebrate surveys combined to rank the Tenderfoot Creek AQ6 reference site with the highest ecological integrity, Tenderfoot Creek AQ5 second, and three Sheep Creek sites, 2 control and one impact (AQ2, AQ3, AQ4), tied for third highest overall integrity (Table 11).

**Table 11.** Site Community integrity ranks within their aquatic ecological classification and treatment code.  
 1 = highest integrity -- 5= lowest.

Site ID	Type	AES code	Fish	Macros	Algae	Habitat	Overall Rank	Integrity Comment
<b>Mountain Stream Reaches</b>								
SHEEP CREEK AQ1	Impact	C003	5	3	4	5	5	Stream manipulation from roadside stabilization
SHEEP CREEK AQ2	Control	C003	3	2	3	5	3	Stream manipulation from road and cattle trampling
SHEEP CREEK AQ3	Control	C003	1	5	5	3	3	Upper reach affected by a partial beaver dam
SHEEP CREEK AQ4	Impact	C003	2	5	5	2	3	Lower Reach with some loss of riparian vegetation
SHEEP CREEK AQ10	Impact	C003	3	3	4	5	4	Mass trampling of some stream banks by cattle
SHEEP CREEK AQ11	Impact	C003	5	5	4	5	5	Lower Reach with some streambank impairment
TENDERFOOT AQ5	Reference	C003	3	2	2	4	2	Mass trampling of some stream banks by cattle
TENDERFOOT AQ6	Reference	C003	3	1	1	1	1	Upper Reach with no streambank impairment
<b>Headwater Stream Reaches</b>								
LITTLE SHEEP AQ7	Impact	D001	1	1	2	2	1	Mass wasting of some of the stream banks
LITTLE SHEEP AQ8	Control	D001	2	3	1	3	3	Mass wasting of some of the stream banks
COON CREEK AQ9	Impact	D001	na	2	na	1	2	Fenced, not grazed

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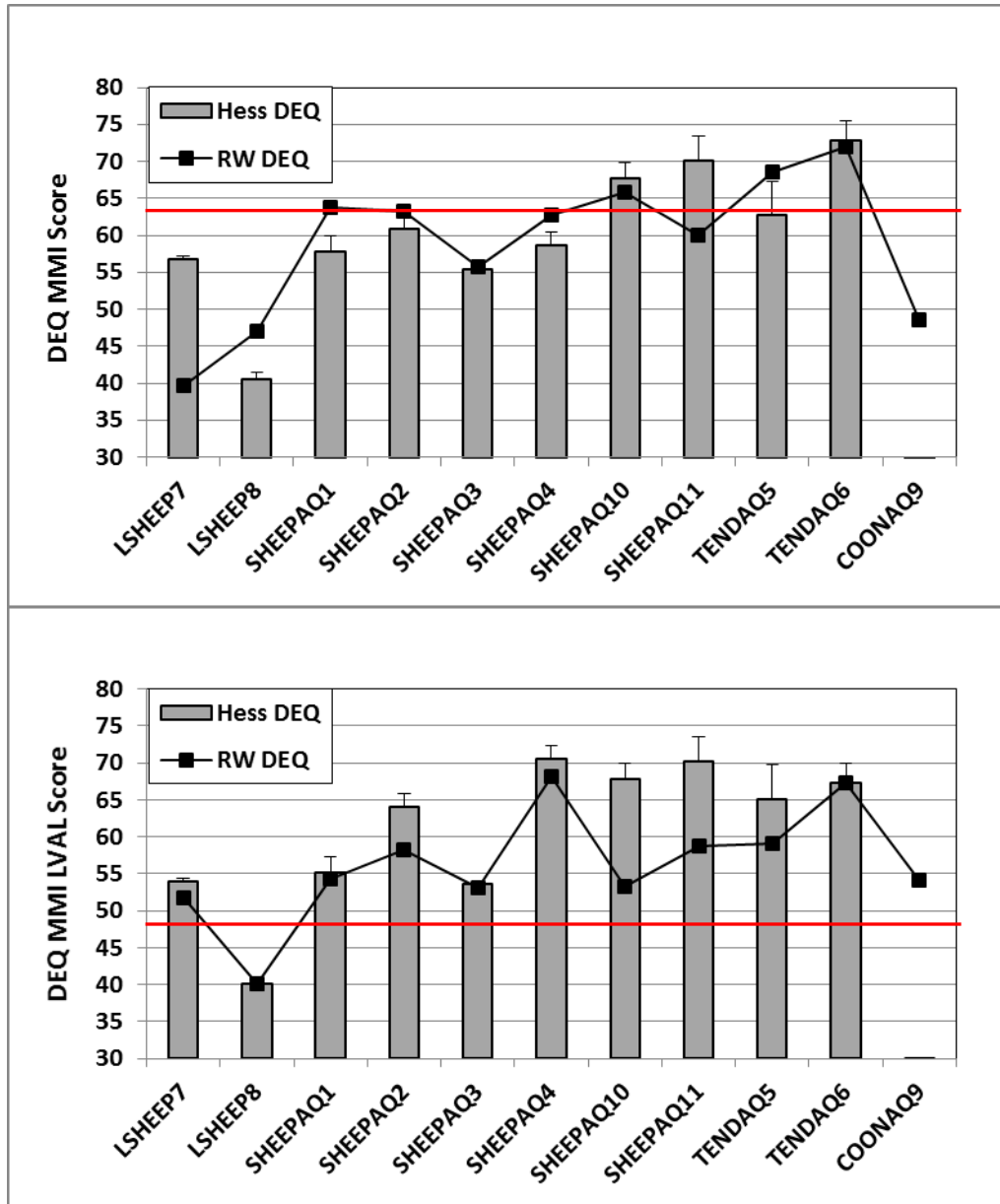
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**Addendum A**  
**Hess Macroinvertebrate Results**

## Addendum A to Macroinvertebrate Results

Macroinvertebrate Hess MDEQ MMI scores from 2016 followed a similar pattern of biological integrity displayed by the reach-wide macroinvertebrate samples (Figure 1), except at Little Sheep AQ7 and Sheep Creek AQ11 where the Hess samples scored substantially higher than the reach-wide samples. Likewise for the DEQ Low Valley MMI at Sheep Creek AQ10 and AQ11. Hess samples collected at Sheep Creek AQ1, AQ2 and AQ4 scored lower than the reach-wide samples and below the impairment threshold (Figure 1).

**Figure 1.** MDEQ Mountain (top) and Low Valley (bottom) MMI scores calculated for the Reach-Wide (RW) vs. Hess samples (n=3) from 2016. Red line in the impairment threshold.



**Appendix A**  
**Site Photographs**





Photo 1. Sheep Creek Site AQ1, Fall upper reach.



Photo 2. Sheep Creek AQ1, lower reach block seine.



Photo 3. Sheep Creek Site AQ2, spring lower reach.



Photo 4. Sheep Creek AQ2 fall lower reach.



Photo 5. Sheep Creek Site AQ3, lower reach block seine



Photo 6. Sheep Creek Site AQ3, backpack shocking crew, lower reach





Photo 7. Sheep Creek AQ4, Fall fish lower block seine.

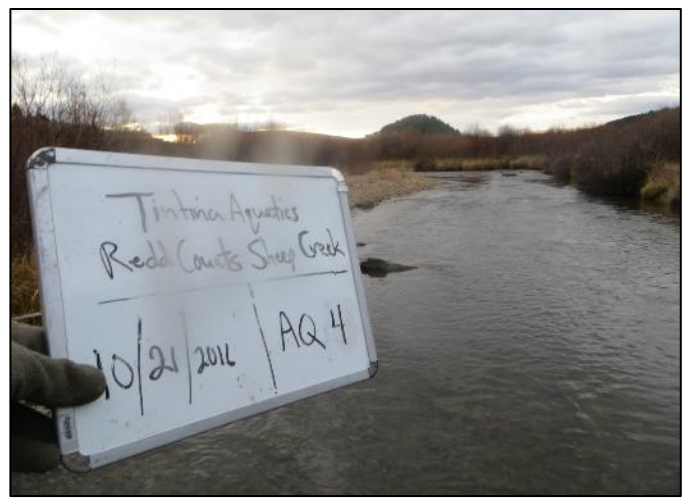


Photo 8. Sheep Creek AQ4, fall redd counts lower reach.



Photo 9. Tenderfoot Creek AQ5, summer Hess Sampling.



Photo 10. Tenderfoot Creek Site AQ6, lower reach.



Photo 11. Little Sheep Creek AQ7 spring, 25 inch brown trout.



Photo 12. Little Sheep Creek AQ7 spring, juvenile mountain whitefish





Photo 13. Backpack electrofishing Sheep Creek (AQ10)



Photo 14. Sheep Creek AQ10 summer algae bloom.



Photo 15. Little Sheep Creek (AQ8) fall brook trout.



Photo 16. Sheep Creek AQ11, fall redd counts lower reach



Photo 17. Adjacent brown trout redds at Sheep Creek AQ3.



Photo 18. Pit-tagged Mountain whitefish from Sheep Creek AQ4).



## **Appendix B**

### **Seasonal Fish Average Abundance and Biomass**

**Appendix B.** Average seasonal fish population characteristics by site and species. Standard errors (SE) are presented.

Spring 2016	Species	Avg # per section	Avg biomass (g) per section	Avg # per 1000 ft	Avg biomass (g) per section	Avg # per mile	Avg biomass (kg) per mile	SE	SE	SE	SE	SE	SE
Sheep Creek AQ1 Canyon Reach	Rainbow Trout	2.0	185.0	6.7	616.1	<b>35.2</b>	<b>3.3</b>	0.0	17.5	0.0	58.3	<b>0.0</b>	<b>0.3</b>
	Rainbow/Cutthroat Hybrid	0.5	56.0	2.5	280.0	<b>13.2</b>	<b>1.5</b>	0.5	56.0	2.5	280.0	<b>13.2</b>	<b>1.5</b>
	Brown Trout	3.0	653.0	10.0	2174.5	<b>52.8</b>	<b>11.5</b>	0.5	168.5	1.7	561.1	<b>8.8</b>	<b>3.0</b>
	Mountain Whitefish	2.0	440.0	8.3	1809.2	<b>44.0</b>	<b>9.6</b>	0.0	14.0	0.8	125.4	<b>4.4</b>	<b>0.7</b>
	Rocky Mountain Sculpin	35.0	416.6	175.0	2083.2	<b>924.0</b>	<b>11.0</b>	0.5	17.5	2.5	58.3	<b>8.8</b>	<b>0.5</b>
Sheep Creek AQ2 Castle Mtn Upper	Brook Trout	0.5	75.0	2.5	375.0	<b>13.2</b>	<b>2.0</b>	0.5	75.0	2.5	375.0	<b>13.2</b>	<b>2.0</b>
	Rainbow Trout	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>
	Brown Trout	0.5	399.0	2.5	1995.0	<b>13.2</b>	<b>10.5</b>	0.5	399.0	2.5	1995.0	<b>13.2</b>	<b>10.5</b>
	Mountain Whitefish	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>
	Rocky Mountain Sculpin	18.0	125.7	90.0	628.6	<b>475.2</b>	<b>3.3</b>	4.0	38.9	20.0	194.6	<b>105.6</b>	<b>1.0</b>
Sheep Creek AQ3 Meadow	Brook Trout	0.5	8.0	2.5	40.0	<b>13.2</b>	<b>0.2</b>	0.5	8.0	2.5	40.0	<b>13.2</b>	<b>0.2</b>
	Rainbow Trout	1.5	130.0	7.5	650.0	<b>39.6</b>	<b>3.4</b>	0.5	122.0	2.5	610.0	<b>13.2</b>	<b>3.2</b>
	Brown Trout	3.0	1561.5	15.0	7807.5	<b>79.2</b>	<b>41.2</b>	1.0	951.5	5.0	4757.5	<b>26.4</b>	<b>25.1</b>
	Mountain Whitefish	3.0	589.0	15.0	2945.0	<b>79.2</b>	<b>15.5</b>	1.0	575.0	5.0	2875.0	<b>26.4</b>	<b>15.2</b>
	Rocky Mountain Sculpin	18.0	183.9	90.0	919.5	<b>475.2</b>	<b>4.9</b>	2.0	41.9	10.0	209.5	<b>52.8</b>	<b>1.1</b>
	Longnose Dace	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>
	White Sucker	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>
Sheep Creek AQ4 Lower Meadow	Rainbow Trout	2.5	172.0	12.5	860.0	<b>66.0</b>	<b>4.5</b>	0.5	20.0	2.5	100.0	<b>13.2</b>	<b>0.5</b>
	Brook Trout	0.5	54.5	2.5	272.5	<b>13.2</b>	<b>1.4</b>	0.5	54.5	2.5	272.5	<b>13.2</b>	<b>1.4</b>
	Brown Trout	4.0	1877.5	20.0	9387.5	<b>105.6</b>	<b>49.6</b>	1.0	864.5	5.0	4322.5	<b>26.4</b>	<b>22.8</b>
	Mountain Whitefish	1.5	227.0	7.5	1135.0	<b>39.6</b>	<b>6.0</b>	0.5	15.0	2.5	75.0	<b>13.2</b>	<b>0.4</b>
	Rocky Mountain Sculpin	16.0	190.6	80.0	953.0	<b>422.4</b>	<b>5.0</b>	6.0	88.4	30.0	442.2	<b>158.4</b>	<b>2.3</b>
Sheep Creek AQ10 FAS	Rainbow Trout	1.0	81.0	3.3	267.3	<b>17.6</b>	<b>1.4</b>	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>
	Brook Trout	0.5	54.5	2.5	272.5	<b>13.2</b>	<b>1.4</b>	0.5	12.5	2.5	62.5	<b>13.2</b>	<b>0.3</b>
	Brown Trout	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>
	Mountain Whitefish	1.0	247.5	5.0	1237.5	<b>26.4</b>	<b>6.5</b>	1.0	247.5	5.0	1237.5	<b>26.4</b>	<b>6.5</b>
	Rocky Mountain Sculpin	6.5	72.1	32.5	244.3	<b>66.1</b>	<b>7.3</b>	1.5	8.7	7.5	72.7	<b>65.9</b>	<b>5.7</b>
Sheep Creek AQ11	Rainbow Trout	2.0	84.5	10.0	342.5	<b>52.8</b>	<b>1.8</b>	0.0	7.5	0.0	117.5	<b>0.0</b>	<b>0.6</b>
	Brook Trout	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>
	Brown Trout	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>
	Mountain Whitefish	0.5	126.0	2.5	630.0	<b>13.2</b>	<b>3.3</b>	0.5	126.0	2.5	630.0	<b>13.2</b>	<b>3.3</b>
	Rocky Mountain Sculpin	25.0	325.9	125.0	1629.4	<b>660.0</b>	<b>8.6</b>	5.0	88.6	25.0	442.9	<b>132.0</b>	<b>2.3</b>
Little Sheep Creek AQ7	Brook Trout	19.6	539.0	98.0	2695.2	<b>517.4</b>	<b>14.2</b>	2.5	4.9	12.5	24.3	<b>66.0</b>	<b>0.1</b>
	Rainbow Trout	1.3	74.3	6.3	371.3	<b>33.0</b>	<b>2.0</b>	1.3	74.3	6.3	371.3	<b>33.0</b>	<b>2.0</b>
	Brown Trout	3.0	3930.0	15.0	19650.0	<b>79.2</b>	<b>103.8</b>	3.0	3930.0	15.0	19650.0	<b>79.2</b>	<b>103.8</b>
	Rocky Mountain Sculpin	23.0	309.2	115.0	1545.9	<b>607.2</b>	<b>8.2</b>	7.0	34.9	35.0	174.7	<b>184.8</b>	<b>0.9</b>
Little Sheep Creek AQ8	Brook Trout	5.0	735.5	25.0	3677.5	<b>132.0</b>	<b>19.4</b>	0.0	234.5	0.0	1172.5	<b>0.0</b>	<b>6.2</b>
	Rocky Mountain Sculpin	38.5	116.6	192.5	583.0	<b>1016.4</b>	<b>3.1</b>	0.5	15.7	2.5	78.5	<b>13.2</b>	<b>0.4</b>

**Appendix B (cont.).** Average seasonal fish population characteristics by site and species. Standard errors (SE) are presented.

Summer 2016	Species	Avg # per section	Avg biomass (g) per section	Avg # per 1000 ft	Avg biomass (g) per section	Avg # per mile	Avg biomass (kg) per mile	SE	SE	SE	SE	SE	SE
Sheep Creek AQ1 Canyon Reach	Rainbow Trout	11.0	1351.0	36.3	4458.3	<b>193.6</b>	<b>23.8</b>	2.0	419.0	6.6	1382.7	35.2	7.4
	Rainbow/Cutthroat Hybrid	1.0	234.0	5.0	1170.0	<b>26.4</b>	<b>6.2</b>	0.5	108.0	1.7	356.4	8.8	1.9
	Brown Trout	1.0	124.0	3.3	409.2	<b>17.6</b>	<b>2.2</b>	0.5	67.0	1.5	137.0	5.2	0.7
	Rocky Mountain Sculpin	59.0	998.4	238.1	4122.5	<b>1262.8</b>	<b>21.9</b>	8.0	24.6	17.0	746.5	83.6	3.9
Sheep Creek AQ2 Castle Mtn Upper	Brook Trout	1.5	170.0	5.0	561.0	<b>26.4</b>	<b>3.0</b>	0.5	108.0	1.7	356.4	8.8	1.9
	Rainbow Trout	8.0	85.5	26.4	282.2	<b>140.8</b>	<b>1.5</b>	1.0	6.5	3.3	21.5	17.6	0.1
	Brown Trout	0.5	399.0	2.5	1995.0	<b>13.2</b>	<b>10.5</b>	0.5	82.5	1.7	272.3	8.8	1.5
	Mountain Whitefish	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	0.0	0.0
Sheep Creek AQ3 Meadow	Rocky Mountain Sculpin	132.5	299.9	437.3	989.7	<b>2332.0</b>	<b>5.3</b>	10.5	85.3	156.2	608.8	814.0	3.2
	Brook Trout	5.0	662.5	16.5	2186.3	<b>88.0</b>	<b>11.7</b>	3.0	376.5	9.9	1242.5	52.8	6.6
	Rainbow Trout	5.0	1033.0	16.5	3408.9	<b>88.0</b>	<b>18.2</b>	1.0	118.0	3.3	389.4	17.6	2.1
	Brown Trout	4.0	1565.0	13.2	5164.5	<b>70.4</b>	<b>27.5</b>	3.0	835.0	9.9	2755.5	52.8	14.7
	Mountain Whitefish	8.5	2468.0	28.1	8144.4	<b>149.6</b>	<b>43.4</b>	3.5	830.0	11.6	2739.0	61.6	14.6
	Rocky Mountain Sculpin	78.5	497.0	259.1	1640.0	<b>1381.6</b>	<b>8.7</b>	13.5	33.1	44.6	109.1	237.6	0.6
	Longnose Dace	0.5	8.0	1.7	26.4	<b>8.8</b>	<b>0.1</b>	0.5	8.0	1.7	26.4	8.8	0.1
White Sucker	1.0	743.5	3.3	2453.6	<b>17.6</b>	<b>13.1</b>	0.5	255.0	2.5	1275.0	8.0	6.7	
Sheep Creek AQ4 Lower Meadow	Rainbow Trout	6.5	973.5	21.5	3212.6	<b>114.4</b>	<b>17.1</b>	1.3	127.3	4.1	419.9	22.0	2.2
	Brook Trout	0.0	0.0	0.0	0.0	<b>0.0</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	0.0	0.0
	Brown Trout	4.0	965.0	13.2	3184.5	<b>70.4</b>	<b>17.0</b>	1.0	559.0	3.3	1844.7	17.6	9.8
	Mountain Whitefish	11.0	3468.0	36.3	11444.4	<b>193.6</b>	<b>61.0</b>	2.0	746.0	6.6	2461.8	35.2	13.1
	Rocky Mountain Sculpin	100.5	1064.3	331.7	3512.2	<b>1768.8</b>	<b>18.7</b>	20.5	454.4	67.6	1499.4	360.8	8.0
Tenderfoot Creek AQ5	Rainbow Trout	9.0	1022.0	29.7	3372.6	<b>158.4</b>	<b>18.0</b>	3.0	108.0	9.9	356.4	52.8	1.9
	Rainbow/Cutthroat Hybrid	2.0	277.0	6.6	914.1	<b>35.2</b>	<b>4.9</b>	0.0	215.0	0.0	709.5	0.0	3.8
	Brook Trout	1.0	25.5	3.3	84.2	<b>17.6</b>	<b>0.4</b>	0.0	0.5	0.0	1.7	0.0	0.0
	Rocky Mountain Sculpin	95.5	1263.7	315.2	4170.2	<b>1680.8</b>	<b>22.2</b>	11.5	162.8	37.9	537.2	202.4	2.9
Sheep Creek AQ10 FAS	Rainbow Trout	3.5	354.5	11.6	1169.9	<b>61.6</b>	<b>6.2</b>	0.5	82.5	1.7	272.3	8.8	1.5
	Brook Trout	3.5	212.5	11.6	701.3	<b>61.6</b>	<b>3.7</b>	2.5	92.5	8.3	305.3	44.0	1.6
	Brown Trout	1.5	949.5	5.0	3133.4	<b>26.4</b>	<b>16.7</b>	0.5	364.5	1.7	1202.9	8.8	6.4
	Mountain Whitefish	5.0	1584.5	16.5	5228.9	<b>88.0</b>	<b>27.9</b>	1.0	782.5	3.3	2582.3	17.6	13.8
	Rocky Mountain Sculpin	43.5	601.0	143.6	1983.1	<b>765.6</b>	<b>10.6</b>	2.1	29.3	7.0	96.7	37.3	0.5
Sheep Creek AQ11 Lowest	Rainbow Trout	5.0	529.5	16.5	1747.4	<b>88.0</b>	<b>9.3</b>	0.0	100.5	0.0	331.7	0.0	1.8
	Brook Trout	1.0	35.0	3.3	115.5	<b>17.6</b>	<b>0.6</b>	0.0	5.0	0.0	16.5	0.0	0.1
	Brown Trout	4.0	1877.5	20.0	9387.5	<b>105.6</b>	<b>49.6</b>	1.0	566.0	3.3	2222.0	17.6	13.8
	Mountain Whitefish	5.0	1415.5	16.5	4671.2	<b>88.0</b>	<b>24.9</b>	0.0	5.0	0.0	16.5	0.0	0.1
	Rocky Mountain Sculpin	31.5	341.3	104.0	1126.3	<b>554.4</b>	<b>6.0</b>	2.5	9.3	8.3	30.7	44.0	0.2
Little Sheep Creek AQ7	Brook Trout	30.2	671.9	151.0	3359.5	<b>797.3</b>	<b>17.7</b>	4.8	203.6	24.0	1018.1	126.7	5.4
	Rainbow Trout	2.0	236.5	10.0	1182.5	<b>52.8</b>	<b>6.2</b>	1.0	88.5	5.0	442.5	26.4	2.3
	Brown Trout	0.5	255.0	2.5	1275.0	<b>13.2</b>	<b>6.7</b>	0.5	255.0	2.5	1275.0	13.2	6.7
	Rocky Mountain Sculpin	36.5	383.1	182.5	1915.3	<b>963.6</b>	<b>10.1</b>	3.5	60.8	17.5	304.0	92.4	1.6
Little Sheep Creek AQ8	Brook Trout	5.5	178.0	27.5	889.8	<b>145.2</b>	<b>4.7</b>	2.5	86.0	12.5	429.8	66.0	2.3
	Rocky Mountain Sculpin	56.5	250.6	282.5	1252.9	<b>1491.6</b>	<b>6.6</b>	0.5	33.0	1.7	108.9	88.0	1.1

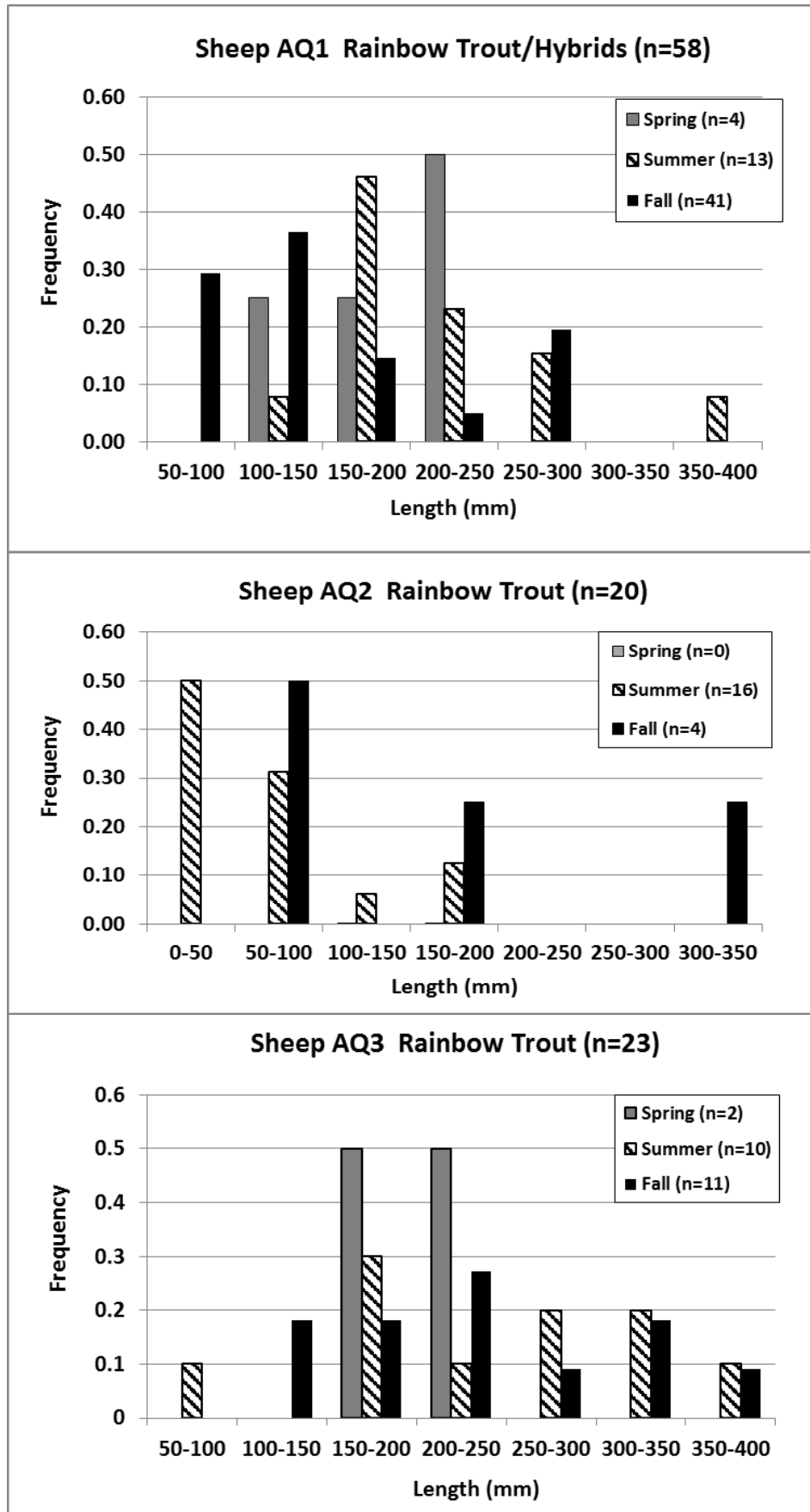


**Appendix B (cont.).** Average seasonal fish population characteristics by site and species. Standard errors (SE) are presented.

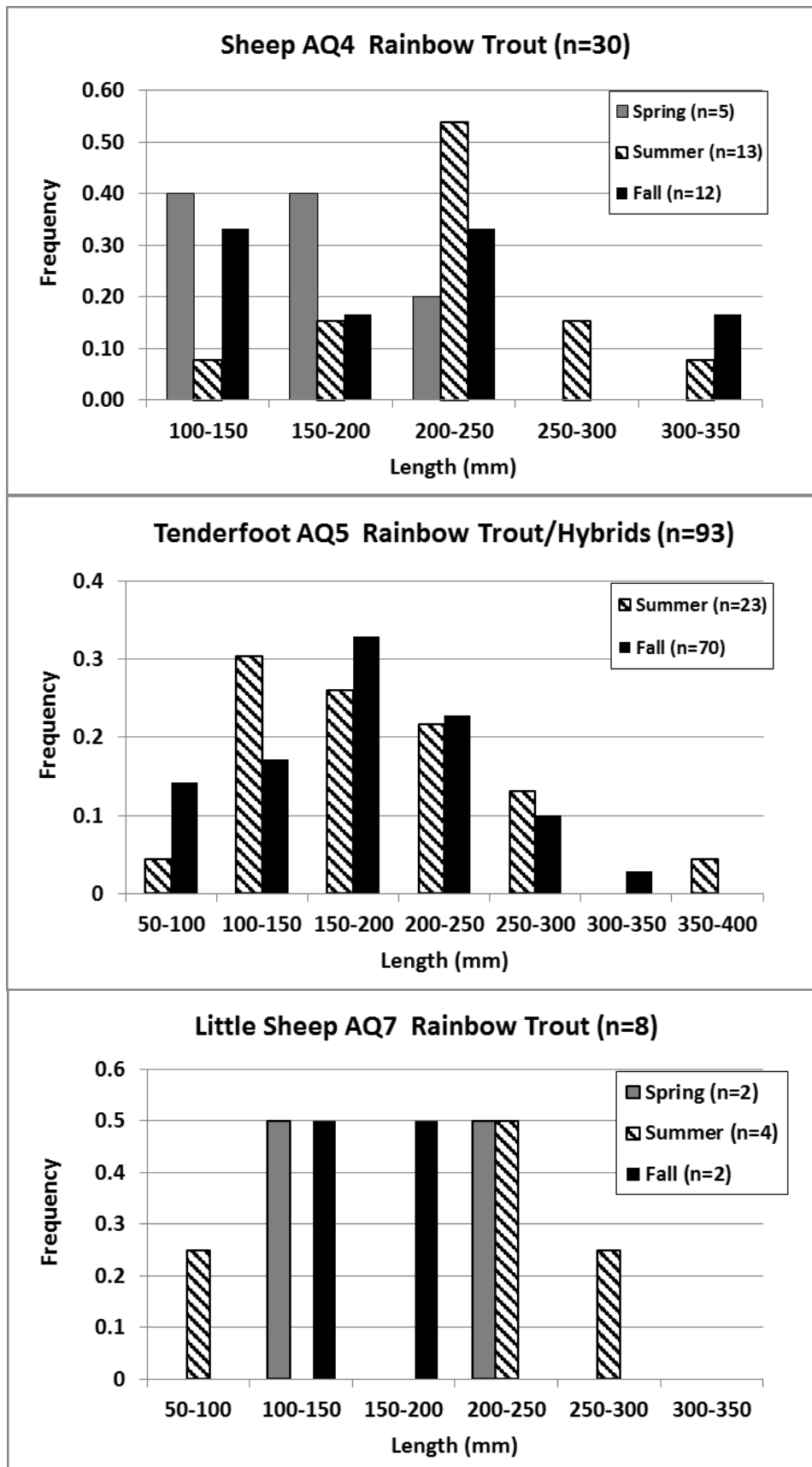
Fall 2016	Species	Avg # per section	Avg biomass (g) per section	Avg # per 1000 ft	Avg biomass (g) per section	Avg # per mile	Avg biomass (kg) per mile	SE	SE	SE	SE	SE	SE
Sheep Creek AQ1 Canyon Reach	Brook Trout	1.5	38.0	5.0	125.4	26.4	0.7	1.5	38.0	5.0	125.4	26.4	0.7
	Rainbow Trout	21.0	906.5	69.3	2991.5	369.6	16.0	3.0	139.5	9.9	460.4	52.8	2.5
	Rainbow/Cutthroat Hybrid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Brown Trout	3.0	155.5	9.9	513.2	52.8	2.7	2.0	102.5	6.6	338.3	35.2	1.8
	Mountain Whitefish	1.0	110.0	3.3	363.0	17.6	1.9	1.0	110.0	3.3	363.0	17.6	1.9
Sheep Creek AQ2 Castle Mtn Upper	Rocky Mountain Sculpin	118.6	1243.7	391.4	4104.3	2087.4	21.9	45.6	483.1	150.5	1594.3	802.6	8.5
	Brook Trout	2.0	218.0	6.6	719.4	35.2	3.8	1.0	62.0	3.3	204.6	17.6	1.1
	Rainbow Trout	2.0	255.5	6.6	843.2	35.2	4.5	1.0	251.5	3.3	830.0	17.6	4.4
	Brown Trout	2.5	977.0	8.3	3224.1	44.0	17.2	0.5	175.0	1.6	577.5	8.8	3.1
Sheep Creek AQ3 Meadow	Rocky Mountain Sculpin	37.5	443.9	123.8	1464.9	660.0	7.8	2.5	108.7	8.3	358.7	44.0	1.9
	Brook Trout	1.0	99.0	3.3	326.7	17.6	1.7	0.0	77.0	0.0	254.1	0.0	1.4
	Rainbow Trout	5.5	826.5	21.6	3411.7	114.4	18.1	1.5	21.5	1.6	613.3	8.8	3.2
	Brown Trout	8.0	3620.0	26.4	11946.0	140.8	63.7	0.0	217.0	0.0	716.1	0.0	3.8
	Mountain Whitefish	4.5	742.0	14.9	2448.6	79.2	13.1	2.5	397.0	8.3	1310.1	44.0	7.0
	Rocky Mountain Sculpin	52.5	516.8	173.3	1705.5	924.0	9.1	17.5	212.8	57.8	702.3	308.0	3.7
	Longnose Dace	1.5	12.0	5.0	39.6	26.4	0.2	0.5	2.0	1.5	8.0	10.0	0.0
Sheep Creek (AQ4) Lower Meadow	White Sucker	3.0	2238.5	15.0	11192.5	79.2	59.1	1.5	12.0	5.0	39.6	26.4	0.2
	Rainbow Trout	6.0	787.0	19.8	2597.1	105.6	13.9	1.0	4.0	3.3	13.2	17.6	0.1
	Brook Trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Brown Trout	7.5	1494.0	24.8	4930.2	132.0	26.3	0.5	760.0	1.7	2508.0	8.8	13.4
	Mountain Whitefish	9.0	2978.0	29.7	9827.4	158.4	52.4	2.0	497.0	6.6	1640.1	35.2	8.7
	Longnose Dace	1.0	3.0	3.3	9.9	17.6	0.1	1.0	3.0	3.3	9.9	17.6	0.1
Tenderfoot Creek AQ6	Rocky Mountain Sculpin	148.0	1514.0	488.4	4996.2	2604.8	26.6	12.0	491.4	39.6	1621.8	211.2	8.6
	Rainbow Trout	11.5	681.0	38.0	2247.3	202.4	12.0	6.5	495.0	21.5	1633.5	114.4	8.7
	Rainbow/Cutthroat Hybrid	23.5	1933.0	77.6	6378.9	413.6	34.0	3.5	99.0	11.6	326.7	61.6	1.7
	Brook Trout	1.0	53.0	3.3	174.9	17.6	0.9	1.0	53.0	3.3	174.9	17.6	0.9
Sheep Creek AQ10 FAS	Rocky Mountain Sculpin	391.5	5170.3	1292.0	17061.9	6890.4	91.0	61.5	766.7	203.0	2530.3	1082.4	13.5
	Rainbow Trout	20.5	1545.5	67.7	5100.2	360.8	27.2	0.5	465.5	1.7	1536.2	8.8	8.2
	Brook Trout	1.0	8.0	3.3	26.4	17.6	0.1	1.0	8.0	3.3	26.4	17.6	0.1
	Brown Trout	1.5	1144.0	5.0	3775.2	26.4	20.1	1.5	1144.0	5.0	3775.2	26.4	20.1
	Mountain Whitefish	5.5	961.0	18.2	3171.3	96.8	16.9	1.5	554.0	5.0	1828.2	26.4	9.8
Sheep Creek AQ11 Lowest	Rocky Mountain Sculpin	160.9	1664.3	531.1	5492.3	2832.3	29.3	19.2	238.2	63.3	786.0	337.5	4.2
	Rainbow Trout	4.5	616.5	14.9	2034.5	79.2	10.9	0.5	56.5	1.7	186.5	8.8	1.0
	Brook Trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Brown Trout	1.5	410.0	5.0	1353.0	26.4	7.2	0.5	60.0	1.7	198.0	8.8	1.1
	Mountain Whitefish	4.0	1173.0	13.2	3870.9	70.4	20.6	1.0	358.0	3.3	1181.4	17.6	6.3
Little Sheep Creek AQ7	Rocky Mountain Sculpin	43.0	478.8	141.9	1580.0	756.8	8.4	3.0	36.6	9.9	120.8	52.8	0.6
	Brook Trout	68.0	3812.6	340.0	19062.8	1795.2	100.7	17.0	1139.4	85.0	5697.2	448.8	30.1
	Rainbow Trout	0.5	9.5	2.5	47.5	13.2	0.3	0.5	9.5	2.5	47.5	13.2	0.3
	Brown Trout	3.0	298.5	15.0	1492.5	79.2	7.9	1.0	45.5	5.0	227.5	26.4	1.2
	Mountain Whitefish	0.5	5.0	2.5	25.0	13.2	0.1	0.5	5.0	2.5	25.0	13.2	0.1
Little Sheep Creek AQ8	Rocky Mountain Sculpin	93.0	1185.1	465.0	5925.6	2455.2	31.3	8.0	119.7	40.0	598.5	211.2	3.2
	Brook Trout	10.5	498.5	52.5	2492.5	277.2	13.2	0.5	41.5	2.5	207.5	13.2	1.1
	White Sucker	0.5	27.0	2.5	135.0	13.2	0.7	0.5	27.0	2.5	135.0	13.2	0.7
	Rocky Mountain Sculpin	42.5	199.0	212.5	995.0	1122.0	5.3	11.5	92.9	57.5	464.7	303.6	2.5

**Appendix C**  
**Seasonal Fish Size-Frequency Data**

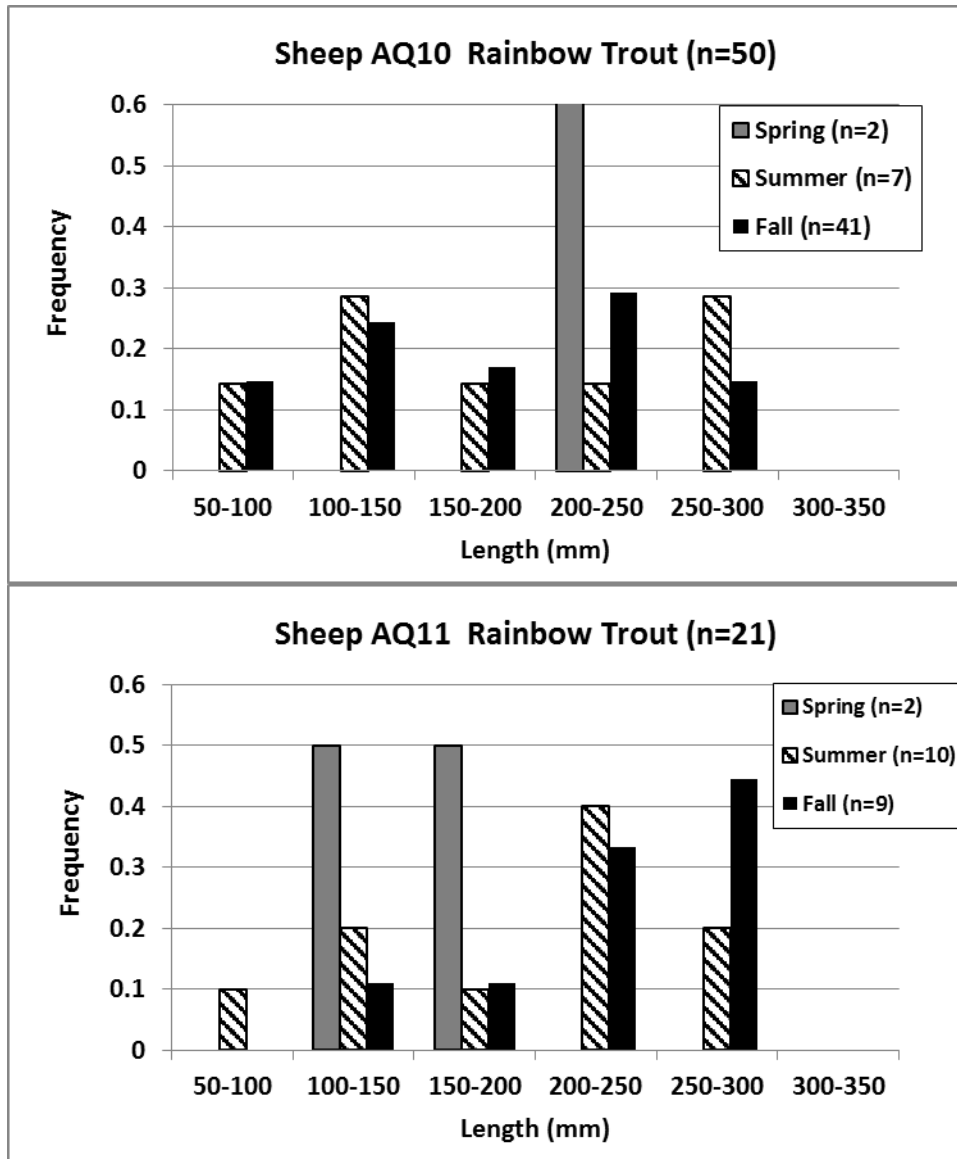
**Appendix C.** Sheep Creek seasonal Rainbow trout (RBTR) size-frequency graphs for 2016.  
 Catchable size is considered >200mm (8 inches).



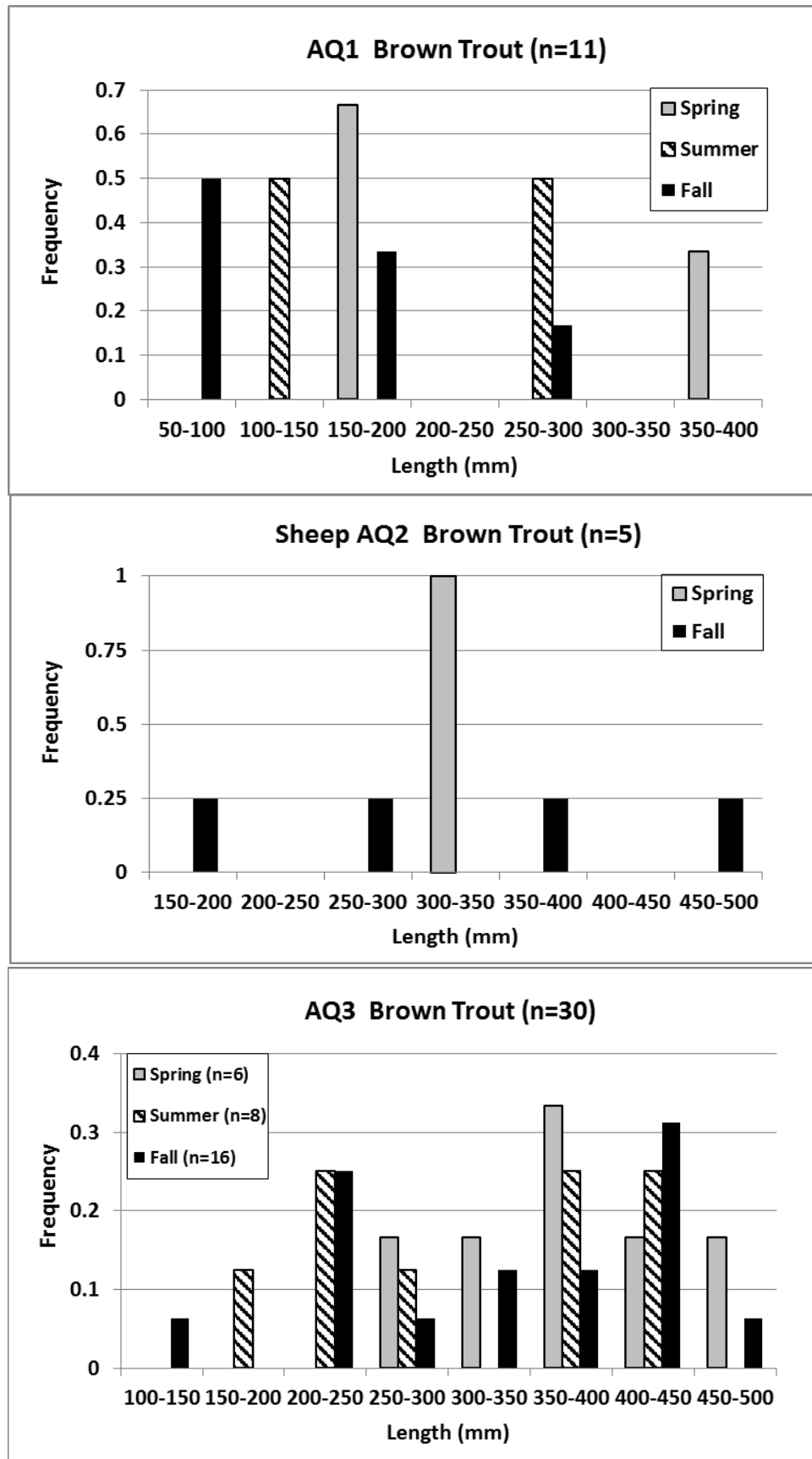
**Appendix C.** Sheep Creek seasonal rainbow trout (RBTR) size-frequency graphs for 2016.  
 Catchable size is considered >200mm (8 inches).



**Appendix C.** Sheep Creek seasonal rainbow trout (RBTR) size-frequency graphs for 2016.  
Catchable size is considered >200mm (8 inches).

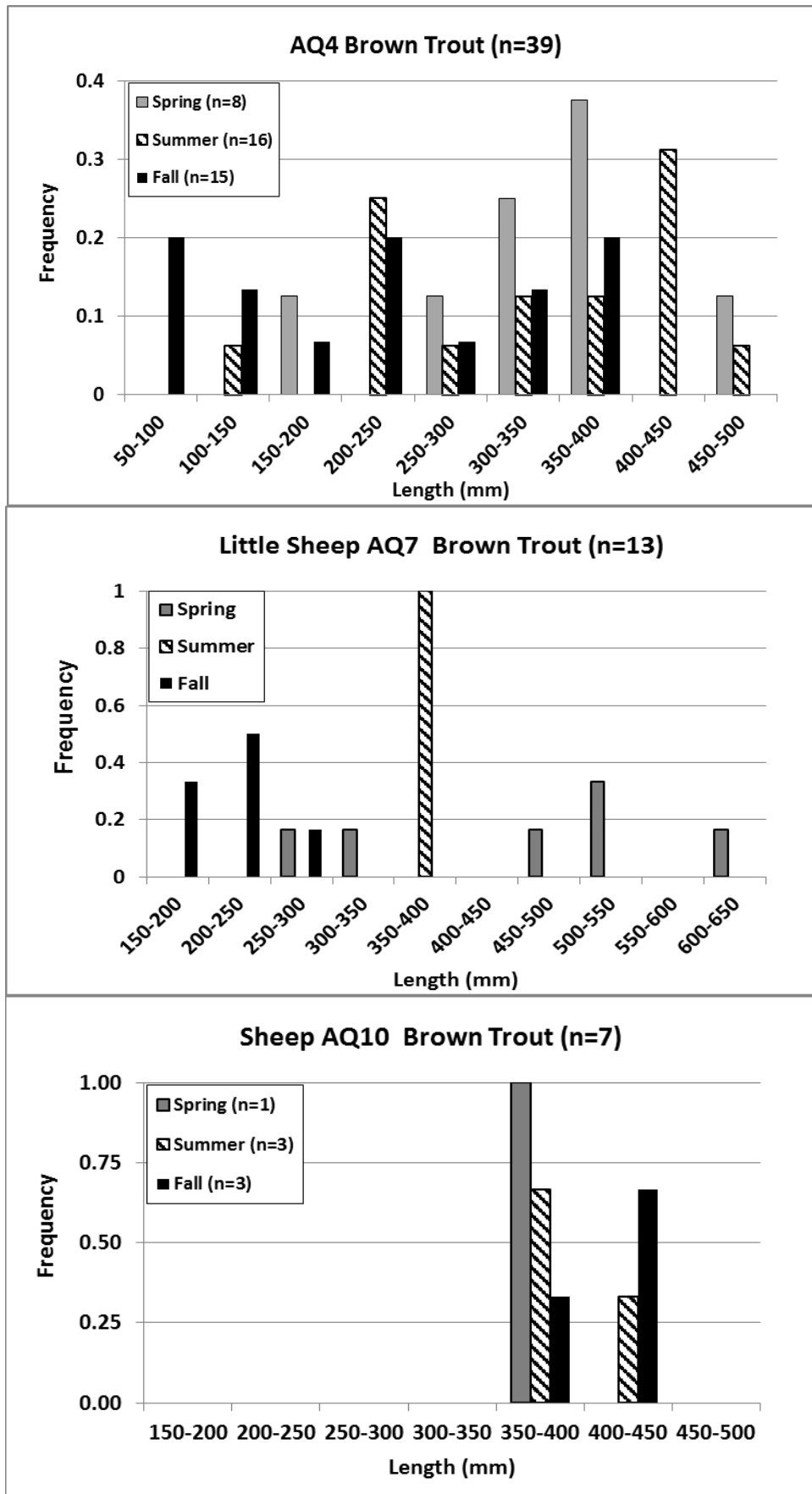


**Appendix C.** Sheep Creek seasonal Brown trout (LOLE) size-frequency graphs for 2016.  
 Catchable size is considered >200mm (8 inches).

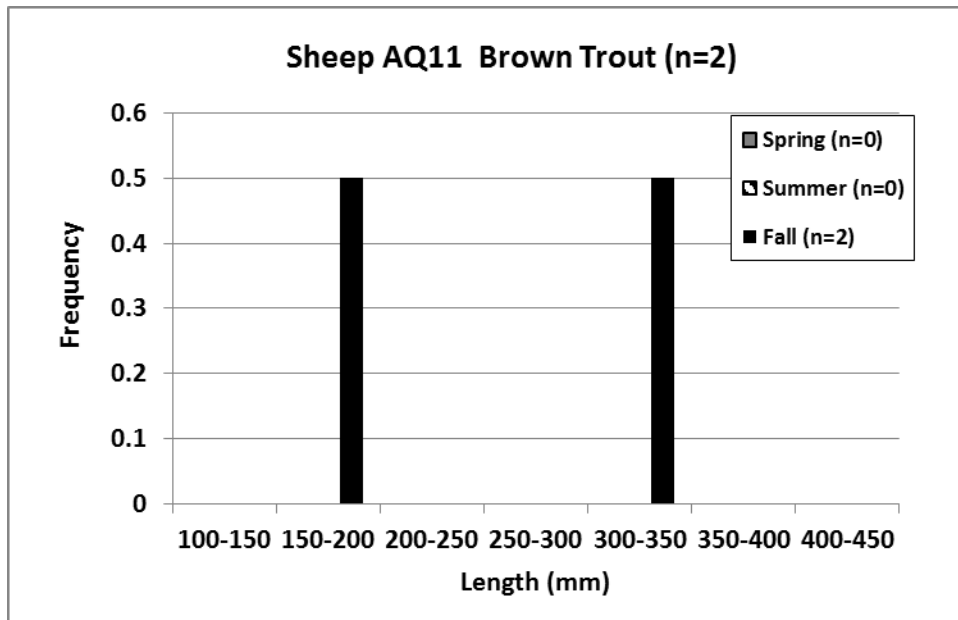




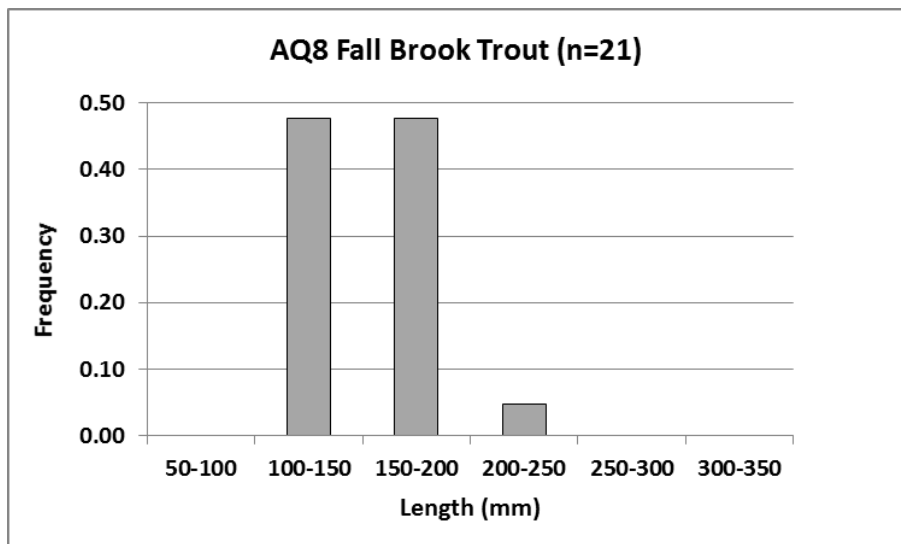
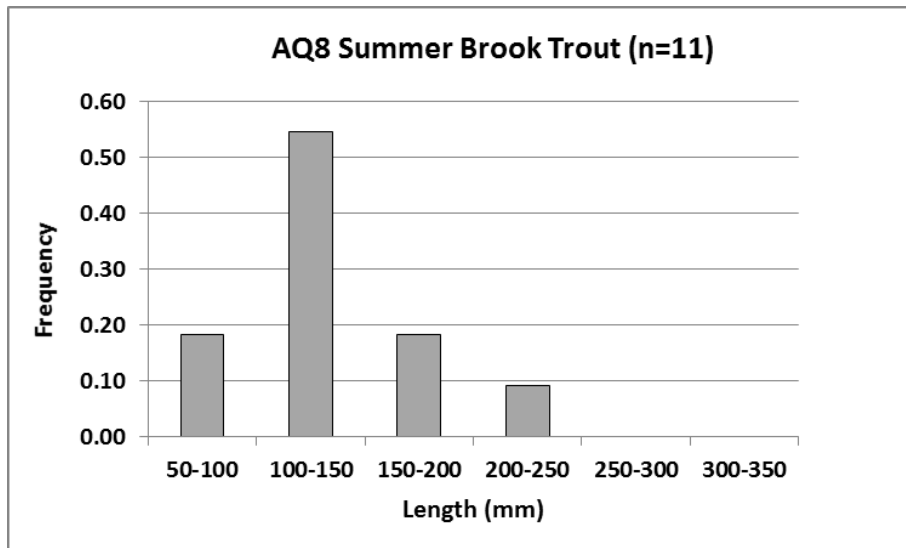
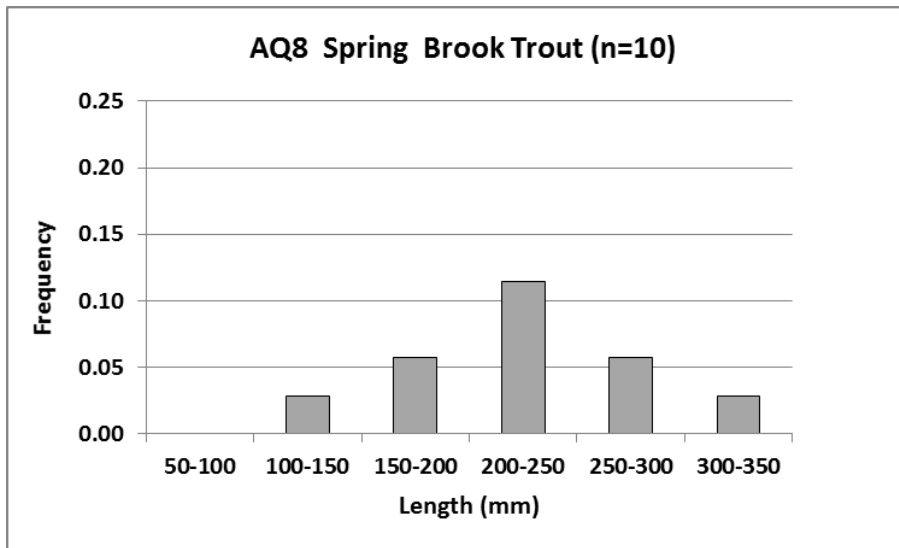
**Appendix C.** Sheep Creek seasonal Brown trout (LOLE) size-frequency graphs for 2016.  
 Catchable size is considered >200mm (8 inches)



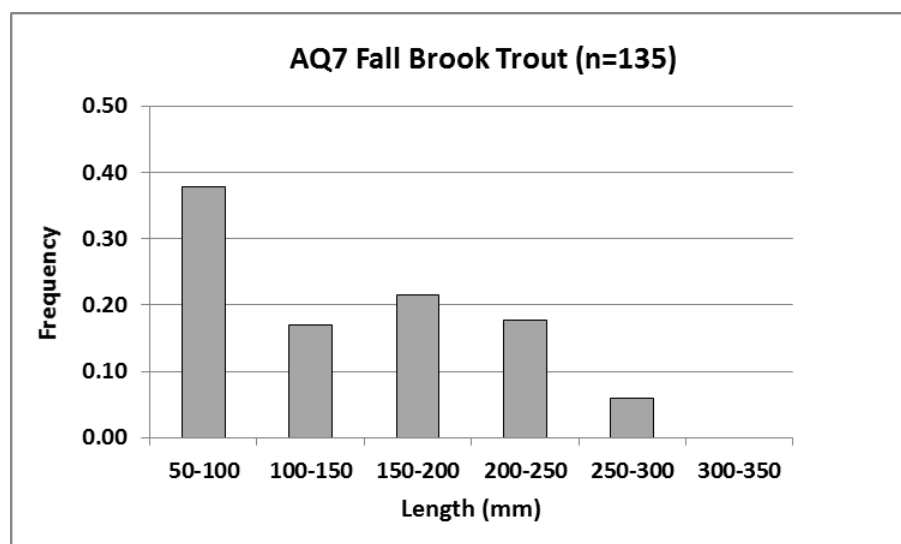
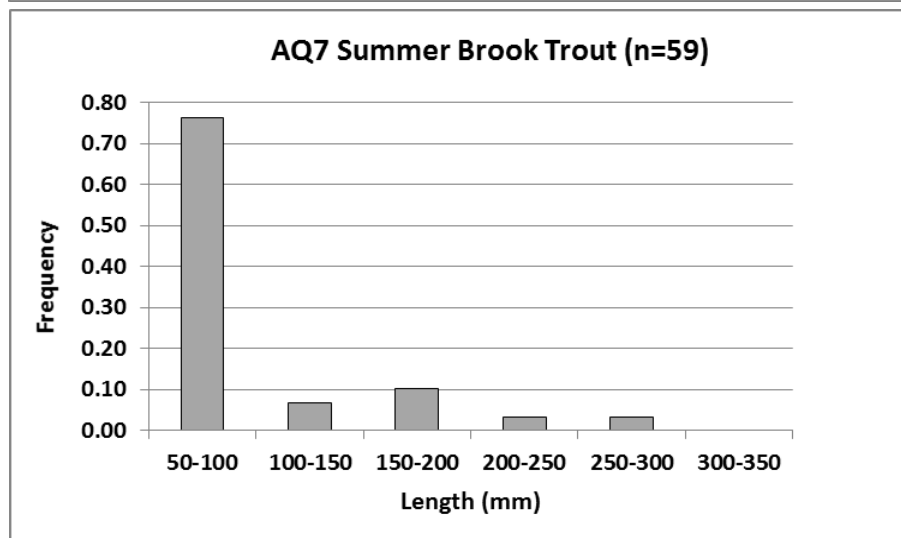
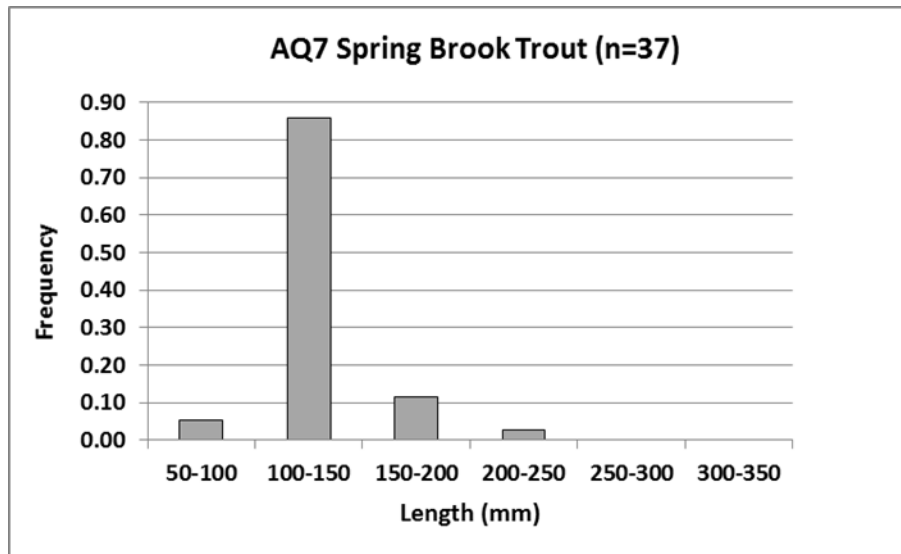
**Appendix C.** Sheep Creek seasonal Brown trout (LOLE) size-frequency graphs for 2016.  
Catchable size is considered >200mm (8 inches)



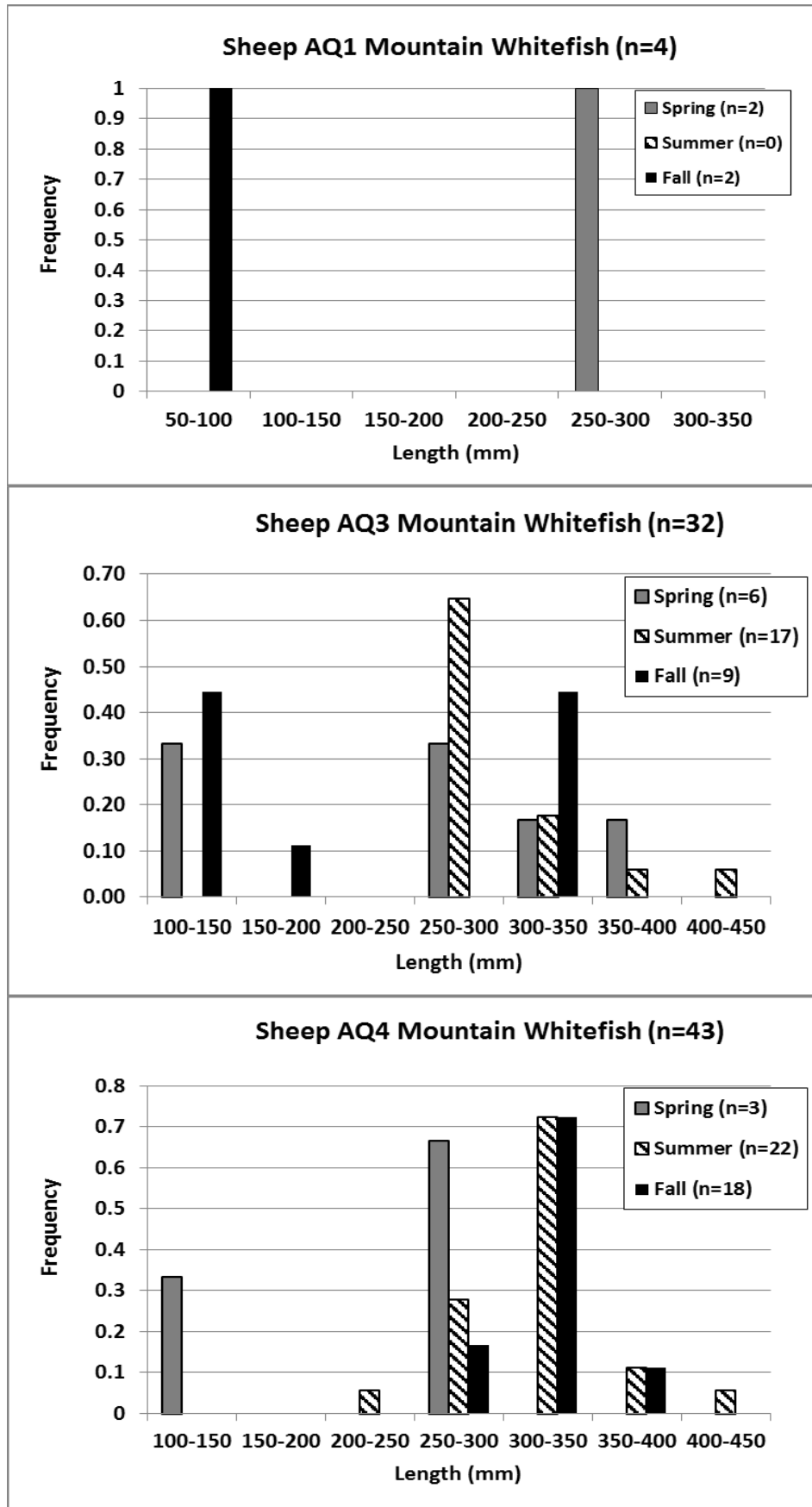
Appendix C. Little Sheep Creek seasonal Brook trout (EBT) size-frequency graphs for 2016



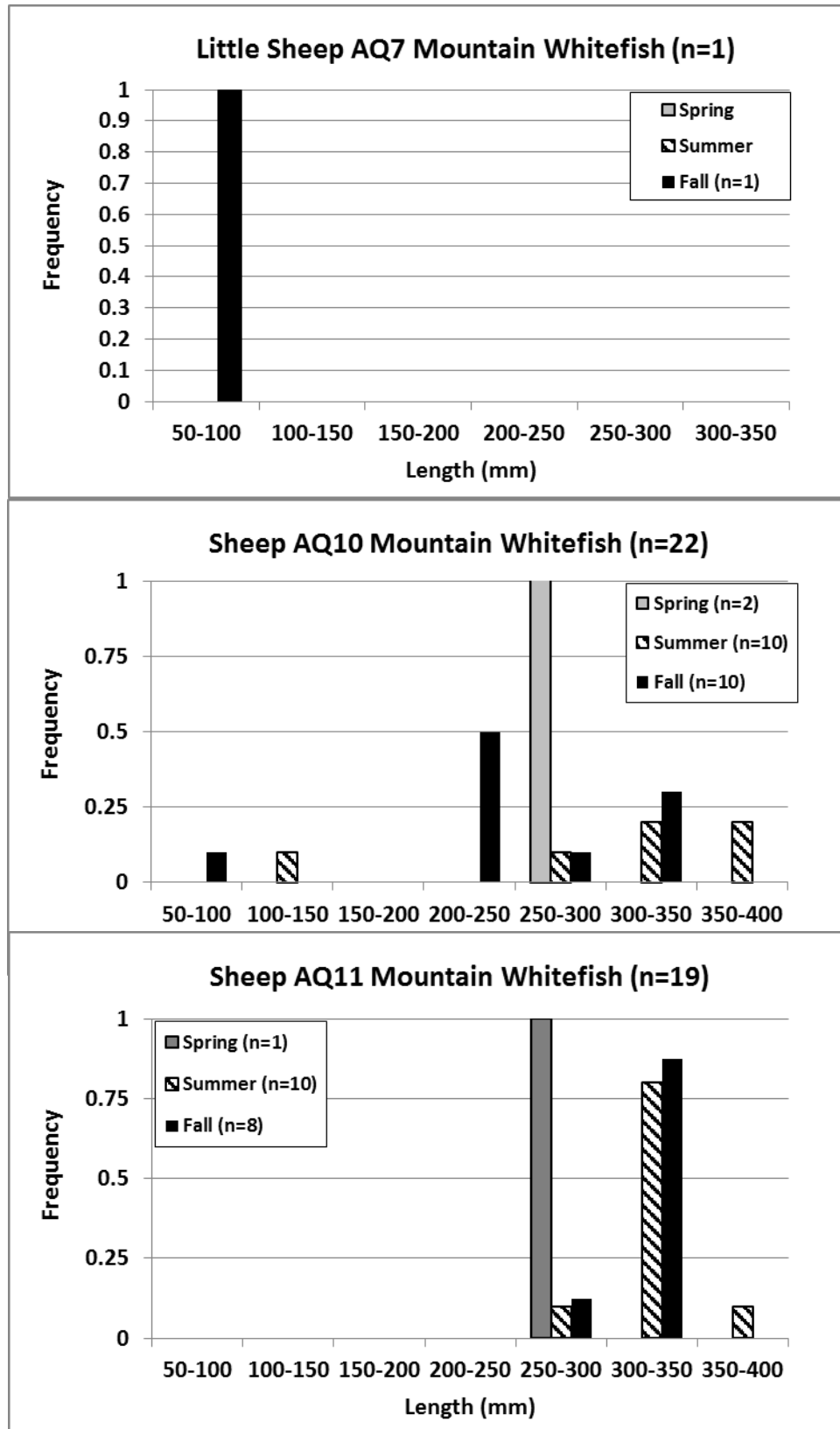
Appendix C. Little Sheep Creek seasonal Brook trout (EBT) size-frequency graphs for 2016



**Appendix C.** Sheep Creek seasonal Mountain Whitefish (MOWH) size-frequency graphs for 2016. Catchable size is considered >200mm (8 inches).



**Appendix C.** Sheep Creek seasonal Mountain Whitefish (MOWH) size-frequency graphs for 2016. Catchable size is considered >200mm (8 inches)





## **Appendix D**

### **Macroinvertebrate Taxa List, Abundance and Metrics**

# Montana Bioassessment Report

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<b>Waterbody Name:</b> Coon Creek AQ9	<b>Benthic Sample ID:</b> 18233
<b>Station ID:</b> UM_CoonAQ9	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T09-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/12/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 498

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<b>Metric:</b>	<b>Value</b>	<b>Score</b>
<b>Mountain MMI:</b> <input style="border: 1px solid black; padding: 2px 10px;" type="text" value="47.5"/>	<b>Ephemeroptera Taxa:</b>	4	36.8
	<b>Plecoptera Taxa:</b>	3	38.4
	<b>EPT Percent:</b>	15.5	17.2
	<b>Non-Insect Percent:</b>	3.8	86.4
	<b>Predator Percent:</b>	7.6	19.6
	<b>Burrower Taxa %:</b>	30.2	74.3
	<b>HBI:</b>	3.90	60.0

---

### **Predictive Model Results**

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Little Sheep Creek AQ7	<b>Benthic Sample ID:</b> 18234
<b>Station ID:</b> UM_LSHPAQ7	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T07-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/11/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 653

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
<i>Mountain MMI:</i> <input type="text" value="61.1"/>	Ephemeroptera Taxa:	7	68.6
	Plecoptera Taxa:	3	42.1
	EPT Percent:	52.7	58.5
	Non-Insect Percent:	5.2	81.4
	Predator Percent:	6.7	17.3
	Burrower Taxa %:	22.2	85.6
	HBI:	3.05	74.1

---

### *Predictive Model Results*

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Little Sheep Creek AQ8	<b>Benthic Sample ID:</b> 18237
<b>Station ID:</b> UM_LSHPAQ8	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T08-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/12/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 284

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
<i>Mountain MMI:</i> <input style="border: 1px solid black; width: 60px; text-align: center;" type="text" value="39.7"/>	Ephemeroptera Taxa:	5	50.0
	Plecoptera Taxa:		0.0
	EPT Percent:	9.9	11.0
	Non-Insect Percent:	9.9	64.8
	Predator Percent:	10.9	28.0
	Burrower Taxa %:	40.0	60.6
	HBI:	3.69	63.5

---

### *Predictive Model Results*

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Sheep Creek AQ1	<b>Benthic Sample ID:</b> 18238
<b>Station ID:</b> UM_SHPAQ1	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T01-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/14/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 816

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
<i>Mountain MMI:</i> <input style="border: 1px solid black; padding: 2px 10px;" type="text" value="65.5"/>	Ephemeroptera Taxa:	7	69.1
	Plecoptera Taxa:	3	46.1
	EPT Percent:	65.2	72.4
	Non-Insect Percent:	2.3	91.7
	Predator Percent:	8.7	22.3
	Burrower Taxa %:	27.0	78.9
	HBI:	2.83	77.8

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### *Predictive Model Results*

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Sheep Creek AQ10	<b>Benthic Sample ID:</b> 18239
<b>Station ID:</b> UM_SHPAQ10	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T10-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/12/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 545

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
<i>Mountain MMI:</i>	Ephemeroptera Taxa:	7	74.4
	Plecoptera Taxa:	4	54.4
	EPT Percent:	53.9	59.9
	Non-Insect Percent:	0.9	96.7
	Predator Percent:	8.8	22.6
	Burrower Taxa %:	25.3	81.3
	HBI:	3.24	71.0

65.8

---

### *Predictive Model Results*

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Sheep Creek AQ11	<b>Benthic Sample ID:</b> 18240
<b>Station ID:</b> UM_SHPAQ11	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T11-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/11/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 2

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
	<b>Ephemeroptera Taxa:</b>	1	10.0
	<b>Plecoptera Taxa:</b>		0.0
	<b>EPT Percent:</b>	100.0	100.0
	<b>Non-Insect Percent:</b>		100.0
	<b>Predator Percent:</b>		0.0
	<b>Burrower Taxa %:</b>		100.0
	<b>HBI:</b>	0.00	100.0

**Mountain MMI:**

58.6
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Small sample size !  
MMI values may be distorted.

**Predictive Model Results**

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Sheep Creek AQ11	<b>Benthic Sample ID:</b> 18241
<b>Station ID:</b> UM_SHPAQ11	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T11-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/12/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 688

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
	Ephemeroptera Taxa:	4	35.5
	Plecoptera Taxa:	3	49.9
	EPT Percent:	51.6	57.3
	Non-Insect Percent:	4.8	82.9
	Predator Percent:	17.2	44.0
	Burrower Taxa %:	26.7	79.3
	HBI:	3.21	71.5

---

### *Predictive Model Results*

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Sheep Creek AQ2	<b>Benthic Sample ID:</b> 18242
<b>Station ID:</b> UM_SHPAQ2	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T02-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/12/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 704

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
<i>Mountain MMI:</i> <input style="width: 80px; height: 20px; border: 1px solid black;" type="text" value="70.1"/>	Ephemeroptera Taxa:	7	69.5
	Plecoptera Taxa:	5	67.1
	EPT Percent:	63.6	70.7
	Non-Insect Percent:	0.6	98.0
	Predator Percent:	10.7	27.3
	Burrower Taxa %:	26.5	79.5
	HBI:	2.80	78.4

---

### *Predictive Model Results*

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Sheep Creek AQ3	<b>Benthic Sample ID:</b> 18243
<b>Station ID:</b> UM_SHPAQ3	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T03-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/12/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 481

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
<i>Mountain MMI:</i> <div style="border: 1px solid black; padding: 2px; display: inline-block;">53.6</div>	Ephemeroptera Taxa:	4	44.3
	Plecoptera Taxa:	2	35.4
	EPT Percent:	36.8	40.9
	Non-Insect Percent:	1.2	95.5
	Predator Percent:	9.4	24.0
	Burrower Taxa %:	30.9	73.4
	HBI:	3.78	62.0

---

### *Predictive Model Results*

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Sheep Creek AQ4	<b>Benthic Sample ID:</b> 18244
<b>Station ID:</b> UM_SHPAQ4	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T04-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/11/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 736

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
	Ephemeroptera Taxa:	7	73.3
	Plecoptera Taxa:	3	46.9
	EPT Percent:	25.5	28.4
	Non-Insect Percent:	4.1	85.4
	Predator Percent:	23.9	61.3
	Burrower Taxa %:	28.6	76.6
	HBI:	4.27	53.8

*Mountain MMI:*

60.8

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### *Predictive Model Results*

*O/E\_p>0.5:*

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Tenderfoot Creek AQ5	<b>Benthic Sample ID:</b> 18235
<b>Station ID:</b> UM_TENDAQ5	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T05-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/12/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 595

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i>Metric:</i>	<i>Value</i>	<i>Score</i>
<i>Mountain MMI:</i> <div style="border: 1px solid black; padding: 2px; display: inline-block;">68.1</div>	Ephemeroptera Taxa:	6	64.2
	Plecoptera Taxa:	4	56.5
	EPT Percent:	67.7	75.3
	Non-Insect Percent:	0.2	99.4
	Predator Percent:	11.4	29.3
	Burrower Taxa %:	26.0	80.2
	HBI:	3.19	71.9

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### *Predictive Model Results*

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

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<b>Waterbody Name:</b> Tenderfoot Creek AQ6	<b>Benthic Sample ID:</b> 18236
<b>Station ID:</b> UM_TENDAQ6	<b>Rep. Num</b> 0
<b>Reference Status:</b>	<b>STORET Activity ID:</b> T06-R500-M
<b>Site Classification:</b>	<b>Collect. Date:</b> 07/12/2016
<b>Four Code HUC:</b>	<b>Collect Method:</b> MAC-R-500
<b>TMDL Plan. Area:</b>	<b>Total Indiv. in Sample:</b> 503

<b>Latitude:</b>	GIS_LAT	<b>Longitude:</b>	GIS_LONG:
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	<i><b>Metric:</b></i>	<i><b>Value</b></i>	<i><b>Score</b></i>
<i><b>Mountain MMI:</b></i>	<b>Ephemeroptera Taxa:</b>	7	67.0
	<b>Plecoptera Taxa:</b>	5	68.4
	<b>EPT Percent:</b>	62.6	69.6
	<b>Non-Insect Percent:</b>		100.0
	<b>Predator Percent:</b>	17.9	45.9
	<b>Burrower Taxa %:</b>	24.2	82.8
	<b>HBI:</b>	2.96	75.7

72.8

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### ***Predictive Model Results***

**O/E\_p>0.5:**

Model Test:

Total Individuals

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# Montana Bioassessment Report

**Waterbody Name:** Coon Creek AQ9 **Benthic Sample ID:** 18233  
**Station ID:** UM\_CoonAQ9 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T09-R500-M  
**Site Classification:** **Collection Date:** 07/12/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 498

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Hydrobeanus	52			
.	Turbellaria	Polycelis coronata	2	4	CG/PR	SP
Basommatop	Lymnaeidae	Pseudosuccinea columella	1	8	CG	CN
Coleoptera	Agabus	Agabus	10	5	PR	"CM(la), DI,SW(ad)"
Coleoptera	Helophorus	Helophorus	2	5	SH	CM
Coleoptera	Heterlimnius	Heterlimnius corpulentus	12	3	SC/CG	"CN/50%, BU/50%"
Diptera	Chironominae	Micropsectra	8	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Polypedilum	6	7	CG/CF/PR	BU/CN/SP
Diptera	Diamesinae	Pagastia	186	4	CG	sp
Diptera	Diamesinae	Pseudodiamesa	76	4	CG	sp
Diptera	Muscidae	Limnophora	4	9	PR	SP/BU
Diptera	Orthoclaadiinae	Cricotopus	4		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella pseudomontana	4		CG/SC	SP/BU
Diptera	Orthoclaadiinae	HETEROTRISOCLADIUS M	4		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Parametricnemus	4		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia vitracies	8		CG/SC	SP/BU
Diptera	Simuliidae	Simulium	18	6	CF	CN
Diptera	Tanypodinae	Paramerina	2		PR	SP/BU
Diptera	Tipula	Tipula	2	4	SH	BU
Ephemeropte	Baetis	Baetis tricaudatus	10	5	CG	"SW/10%, CN/90%"
Ephemeropte	Cinygmula	Cinygmula	2	0	SC	CN
Ephemeropte	Drunella coloraden	Drunella coloradensis	8	1	SC	"CN/75%, SP/25%"
Ephemeropte	Serratella	Serratella tibialis	2	2	CG	CN
Haplotaxida	Oligochaeta	Lumbricina	4	8	CG	BU
Haplotaxida	Oligochaeta	Tubificidae	4	8	CG	BU
Non-Insect ta	Ostracoda	Ostracoda	6		unk	SW
Plecoptera	Amphinemura	Amphinemura	11	2	SH	CN
Plecoptera	Chloroperlidae	Sweltsa	2	1	PR	CN
Plecoptera	Zapada	Zapada cinctipes	2	2	SH	CN
Trichoptera	Amphicosmoecus	Amphicosmoecus canax	2		SH	SP
Trichoptera	Dicosmoecus	Dicosmoecus atripes	2	2	SC	SP
Trichoptera	Neothremma	Neothremma alicia	22	1	SC	CN
Trichoptera	Psychoglypha	Psychoglypha	10	0	CG	SP
Trichoptera	Rhyacophila brunn	Rhyacophila Brunnea Gr.	4	0	PR	CN
Veneroida	Pisidiidae	Pisidium	2	8	CF	BU

# Montana Bioassessment Report

**Waterbody Name:** Little Sheep Creek AQ7 **Benthic Sample ID:** 18234  
**Station ID:** UM\_LSHPAQ7 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T07-R500-M  
**Site Classification:** **Collection Date:** 07/11/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 653

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Baetis brunneicolor	27			
		Thienimannimyia gr.	6			
Amphipoda	Gammarus	Gammarus lacustris	2	4	CG	"SW/50%, SP/50%"
Basommatop	Physa_Physella	Physella gyrina	12	8	CG	CN
Basommatop	Planorbidae	Gyraulus parvus	2	6	CG	CN
Coleoptera	Optioservus	Optioservus quadrimaculatus	77	5	SC	"CN/50%, BU/50%"
Coleoptera	Zaitzevia	Zaitzevia parvula	24	5	SC/CG	"CN/50%, BU/50%"
Diptera	Antocha	Antocha	4	3	CG	CN
Diptera	Chironominae	Rheotanytarsus	8	7	CG/CF/PR	BU/CN/SP
Diptera	Diamesinae	Pagastia	22	4	CG	sp
Diptera	Dicranota	Dicranota	6	0	PR	SP
Diptera	Limnophila	Limnophila	3	3	PR	BU
Diptera	Orthoclaadiinae	Cardiocladius	12		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Cricotopus bicinctus	22		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella gracei	7		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Orthocladus	23		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Parametriocnemus	5		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Rheocricotopus	15		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia vitracies	4		CG/SC	SP/BU
Diptera	Simuliidae	Simulium	8	6	CF	CN
Diptera	Tipula	Tipula	2	4	SH	BU
Ephemeropte	Baetis	Baetis tricaudatus	44	5	CG	"SW/10%, CN/90%"
Ephemeropte	Dipheter	Dipheter hageni	21	5	CG	"SW/10%, CN/90%"
Ephemeropte	Drunella coloraden	Drunella coloradensis	5	1	SC	"CN/75%, SP/25%"
Ephemeropte	Ephemerella	Ephemerella excrucians	4	2	CG	CN/SW
Ephemeropte	Leucrocuta	Leucrocuta	9	1	SC	CN
Ephemeropte	Paraleptophlebia	Paraleptophlebia	8	1	CG	SW/CN/SP
Ephemeropte	Serratella	Serratella tibialis	12	2	CG	CN
Haplotaxida	Oligochaeta	Lumbricina	11	8	CG	BU
Plecoptera	Chloroperlidae	Suwallia	2	1	PR	CN
Plecoptera	Chloroperlidae	Sweltsa	6	1	PR	CN
Plecoptera	Isoperla	Isoperla	5	2	PR	CN
Plecoptera	Megarcys	Megarcys	10	1	PR	CN
Trichoptera	Agapetus	Agapetus montanus	14	0	SC	CN
Trichoptera	Arctopsyche	Arctopsyche grandis	7	2	CF	CN

# Montana Bioassessment Report

**Waterbody Name:** Little Sheep Creek AQ7

**Benthic Sample ID:** 18234

**Station ID:** UM\_LSHPAQ7

**Rep. Num** 0

**Reference Status:**

**STORET Activity ID:** T07-R500-M

**Site Classification:**

**Collection Date:** 07/11/2016

**Latitude:**

**Collection Method:** MAC-R-500

**Longitude:**

**Total Number of Individuals in Sample:** 653

Trichoptera	Brachycentrus	Brachycentrus americanus	133	1	CF	CN
Trichoptera	Dicosmoecus	Dicosmoecus gilvipes	2	2	SC	SP
Trichoptera	Glossosoma	Glossosoma	12	0	SC	CN
Trichoptera	Lepidostoma	Lepidostoma	27	1	SH	CM/SP
Trichoptera	Micrasema	Micrasema bactro	5	1	SH	CN
Trichoptera	Neophylax	Neophylax rickeri	6	3	SC	CN
Trichoptera	Ochrotrichia	Ochrotrichia	6	4	CG	CN
Trichoptera	Onocosmoecus	Onocosmoecus unicolor	2	3	SH	"SP/75%, CG/25%"
Trichoptera	Rhyacophila brunn	Rhyacophila Brunnea Gr.	4	0	PR	CN
Veneroida	Pisidiidae	Pisidium	7	8	CF	BU

# Montana Bioassessment Report

**Waterbody Name:** Tenderfoot Creek AQ5 **Benthic Sample ID:** 18235  
**Station ID:** UM\_TENDAQ5 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T05-R500-M  
**Site Classification:** **Collection Date:** 07/12/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 595

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Antocha monitcola	4			
		Nostococladus	1			
		Thienimannimyia gr.	26			
Coleoptera	Narpus	Narpus concolor	5	2	CG	"CN/50%, BU/50%"
Coleoptera	Optioservus	Optioservus quadrimaculatus	10	5	SC	"CN/50%, BU/50%"
Coleoptera	Ordobrevia	Ordobrevia nubifera	25	5	SC/CG	"CN/50%, BU/50%"
Coleoptera	Zaitzevia	Zaitzevia parvula	31	5	SC/CG	"CN/50%, BU/50%"
Diptera	Chironominae	Polypedilum	27	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Rheotanytarsus	5	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Stempellina	4	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Tanytarsus	18	7	CG/CF/PR	BU/CN/SP
Diptera	Diamesinae	Pagastia	13	4	CG	sp
Diptera	Diamesinae	Potthastia	1	4	CG	sp
Diptera	Hemerodromia	Hemerodromia	2	6	PR	SP
Diptera	Hexatoma	Hexatoma	2	2	PR	BU
Diptera	Orthoclaadiinae	Brillia	5		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Cricotopus bicinctus	7		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella gracei	1		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Parakiefferiella	2		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia bavarica	1		CG/SC	SP/BU
Diptera	Pelecorhynchidae	Glutops	1	1	PR	SP
Ephemeropte	Baetis	Baetis flavistriga	10	5	CG	"SW/10%, CN/90%"
Ephemeropte	Baetis	Baetis tricaudatus	26	5	CG	"SW/10%, CN/90%"
Ephemeropte	Dipheter	Dipheter hageni	65	5	CG	"SW/10%, CN/90%"
Ephemeropte	Drunella coloraden	Drunella coloradensis	2	1	SC	"CN/75%, SP/25%"
Ephemeropte	Epeorus	Epeorus deceptivus	4	2	CG	CN
Ephemeropte	Ephemerella	Ephemerella excrucians	2	2	CG	CN/SW
Ephemeropte	Paraleptophlebia	Paraleptophlebia	5	1	CG	SW/CN/SP
Ephemeropte	Serratella	Serratella tibialis	21	2	CG	CN
Haplotaxida	Oligochaeta	Tubificidae	1	8	CG	BU
Plecoptera	Chloroperlidae	Suwallia	1	1	PR	CN
Plecoptera	Hesperoperla	Hesperoperla pacifica	4	1	PR	CN
Plecoptera	Isoperla	Isoperla	1	2	PR	CN
Plecoptera	Paraperla	Paraperla	21	1	unk	unk
Plecoptera	Visoka	Visoka cataractae	1	0	SH	CN

# Montana Bioassessment Report

**Waterbody Name:** Tenderfoot Creek AQ5

**Benthic Sample ID:** 18235

**Station ID:** UM\_TENDAQ5

**Rep. Num** 0

**Reference Status:**

**STORET Activity ID:** T05-R500-M

**Site Classification:**

**Collection Date:** 07/12/2016

**Latitude:**

**Collection Method:** MAC-R-500

**Longitude:**

**Total Number of Individuals in Sample:** 595

Plecoptera	Zapada	Zapada cinctipes	1	2	SH	CN
Trichoptera	Brachycentrus	Brachycentrus americanus	17	1	CF	CN
Trichoptera	Dicosmoecus	Dicosmoecus gilvipes	1	2	SC	SP
Trichoptera	Ecclisomyia	Ecclisomyia	3	4	CG	CN/SP/CM
Trichoptera	Hydropsyche_Cera	Hydropsyche occidentalis	21	5	CF	CN
Trichoptera	Lepidostoma	Lepidostoma	187	1	SH	CM/SP
Trichoptera	Micrasema	Micrasema bacro	3	1	SH	CN
Trichoptera	Neophylax	Neophylax rickeri	3	3	SC	CN
Trichoptera	Oecetis	Oecetis	2	8	PR	CN/SP
Trichoptera	Rhyacophila brunn	Rhyacophila Brunnea Gr.	1	0	PR	CN
Trichoptera	Wormaldia	Wormaldia	1	0	CF	CN

# Montana Bioassessment Report

**Waterbody Name:** Tenderfoot Creek AQ6 **Benthic Sample ID:** 18236  
**Station ID:** UM\_TENDAQ6 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T06-R500-M  
**Site Classification:** **Collection Date:** 07/12/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 503

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Antocha monitcola	12			
		Thienimannimyia gr.	6			
Coleoptera	Microcylloepus	Microcylloepus pusillus	1	5	CG	"CN/50%, BU/50%"
Coleoptera	Narpus	Narpus concolor	1	2	CG	"CN/50%, BU/50%"
Coleoptera	Optioservus	Optioservus quadrimaculatus	30	5	SC	"CN/50%, BU/50%"
Coleoptera	Oreodytes	Oreodytes	1	5	PR	"CM (la), DI, SW (ad)"
Coleoptera	Zaitzevia	Zaitzevia parvula	4	5	SC/CG	"CN/50%, BU/50%"
Diptera	Chironominae	Rheotanytarsus	17	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Tanytarsus	15	7	CG/CF/PR	BU/CN/SP
Diptera	Diamesinae	Pagastia	28	4	CG	sp
Diptera	Diamesinae	Potthastia	5	4	CG	sp
Diptera	Hexatoma	Hexatoma	5	2	PR	BU
Diptera	Orthoclaadiinae	Cricotopus bicinctus	16		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella gracei	4		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Orthocladius	12		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Parakiefferiella	4		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Rheocricotopus	5		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia bavarica	12		CG/SC	SP/BU
Diptera	Pelecorhynchidae	Glutops	2	1	PR	SP
Diptera	Pericoma/Telmatos	Pericoma	8	4	CG	BU
Ephemeropte	Ameletus	Ameletus	3	0	SC	"SW/10%, CN/90%"
Ephemeropte	Attenella	Attenella margarita	11	3	CG	CN
Ephemeropte	Baetis	Baetis tricaudatus	48	5	CG	"SW/10%, CN/90%"
Ephemeropte	Drunella grandis	Drunella grandis	6	2	PR	"CN/75%, SP/25%"
Ephemeropte	Leucrocuta	Leucrocuta	2	1	SC	CN
Ephemeropte	Paraleptophlebia	Paraleptophlebia	3	1	CG	SW/CN/SP
Ephemeropte	Serratella	Serratella tibialis	33	2	CG	CN
Plecoptera	Chloroperlidae	Suwallia	2	1	PR	CN
Plecoptera	Chloroperlidae	Sweltsa	26	1	PR	CN
Plecoptera	Hesperoperla	Hesperoperla pacifica	4	1	PR	CN
Plecoptera	Isoperla	Isoperla	2	2	PR	CN
Plecoptera	Skwala	Skwala	4	3	PR	CN
Plecoptera	Zapada	Zapada cinctipes	10	2	SH	CN
Trichoptera	Arctopsyche	Arctopsyche grandis	8	2	CF	CN
Trichoptera	Brachycentrus	Brachycentrus americanus	68	1	CF	CN

# Montana Bioassessment Report

**Waterbody Name:** Tenderfoot Creek AQ6

**Benthic Sample ID:** 18236

**Station ID:** UM\_TENDAQ6

**Rep. Num** 0

**Reference Status:**

**STORET Activity ID:** T06-R500-M

**Site Classification:**

**Collection Date:** 07/12/2016

**Latitude:**

**Collection Method:** MAC-R-500

**Longitude:**

**Total Number of Individuals in Sample:** 503

Trichoptera	Ecclisomyia	Ecclisomyia	3	4	CG	CN/SP/CM
Trichoptera	Hydropsyche_Cera	Hydropsyche occidentalis	23	5	CF	CN
Trichoptera	Lepidostoma	Lepidostoma	45	1	SH	CM/SP
Trichoptera	Micrasema	Micrasema bactro	4	1	SH	CN
Trichoptera	Ochrotrichia	Ochrotrichia	3	4	CG	CN
Trichoptera	Psychoglypha	Psychoglypha	1	0	CG	SP
Trichoptera	Rhyacophila brunn	Rhyacophila Brunnea Gr.	6	0	PR	CN



# Montana Bioassessment Report

**Waterbody Name:** Little Sheep Creek AQ8 **Benthic Sample ID:** 18237  
**Station ID:** UM\_LSHPAQ8 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T08-R500-M  
**Site Classification:** **Collection Date:** 07/12/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 284

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Centropilum	1			
		Dactylabis	1			
		Nostococladus	1			
		Thienimannimyia gr.	6			
.	Turbellaria	Polycelis coronata	1	4	CG/PR	SP
Basommatop	Lymnaeidae	Pseudosuccinea columella	1	8	CG	CN
Basommatop	Physa_Physella	Physella acuta	10	8	CG	CN
Basommatop	Planorbidae	Gyraulus parvus	2	6	CG	CN
Coleoptera	Cleptelmis	Cleptelmis addenda	1	4	CG	"CN/50%, BU/50%"
Coleoptera	Haliplus	Haliplus	1	8	PH	N,CM (la), SW,CM (ac
Coleoptera	Heterlimnius	Heterlimnius corpulentus	151	3	SC/CG	"CN/50%, BU/50%"
Coleoptera	Optioservus	Optioservus quadrimaculatus	22	5	SC	"CN/50%, BU/50%"
Diptera	Chironominae	Micropsectra	6	7	CG/CF/PR	BU/CN/SP
Diptera	Diamesinae	Pagastia	1	4	CG	sp
Diptera	Limnophila	Limnophila	9	3	PR	BU
Diptera	Orthoclaadiinae	Cricotopus	5		CG/SC	SP/BU
Diptera	Simuliidae	Simulium	3	6	CF	CN
Diptera	Tanypodinae	Radotanypus	15		PR	SP/BU
Diptera	Tipula	Tipula	5	4	SH	BU
Ephemeropte	Baetis	Baetis tricaudatus	2	5	CG	"SW/10%, CN/90%"
Ephemeropte	Dipheter	Dipheter hageni	2	5	CG	"SW/10%, CN/90%"
Ephemeropte	Ephemerella	Ephemerella excrucians	1	2	CG	CN/SW
Ephemeropte	Pseudocloeon	Pseudocloeon	2	4	CG	"SW/10%, CN/90%"
Ephemeropte	Serratella	Serratella tibialis	1	2	CG	CN
Haplotaxida	Oligochaeta	Tubificidae	5	8	CG	BU
Trichoptera	Brachycentrus	Brachycentrus americanus	4	1	CF	CN
Trichoptera	Onocosmoecus	Onocosmoecus unicolor	1	3	SH	"SP/75%, CG/25%"
Trichoptera	Psychoglypha	Psychoglypha	15	0	CG	SP
Veneroida	Pisidiidae	Pisidium casertanum	9	8	CF	BU

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ1 **Benthic Sample ID:** 18238  
**Station ID:** UM\_SHPAQ1 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T01-R500-M  
**Site Classification:** **Collection Date:** 07/14/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 816

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Microcylloepus pusillis	1			
		Nostococladius	12			
		Thienimannimyia gr.	8			
Coleoptera	Cleptelmis	Cleptelmis addenda	2	4	CG	"CN/50%, BU/50%"
Coleoptera	Narpus	Narpus concolor	2	2	CG	"CN/50%, BU/50%"
Coleoptera	Optioservus	Optioservus quadrimaculatus	137	5	SC	"CN/50%, BU/50%"
Coleoptera	Oreodytes	Oreodytes	3	5	PR	"CM (la), DI, SW (ad)"
Coleoptera	Zaitzevia	Zaitzevia parvula	30	5	SC/CG	"CN/50%, BU/50%"
Diptera	Antocha	Antocha monticola	4	3	CG	CN
Diptera	Atherix	Atherix	4	5	PR	SP/BU
Diptera	Ceratopogoninae	Probezzia	2	6	PR/CG	SP/BU/SW
Diptera	Chironominae	Polypedilum	10	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Rheotanytarsus	13	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Stempellina	3	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Tanytarsus	6	7	CG/CF/PR	BU/CN/SP
Diptera	Diamesinae	Pagastia	12	4	CG	sp
Diptera	Diamesinae	Potthastia	1	4	CG	sp
Diptera	Diamesinae	Pseudodiamesa	2	4	CG	sp
Diptera	Hemerodromia	Hemerodromia	2	6	PR	SP
Diptera	Hexatoma	Hexatoma	1	2	PR	BU
Diptera	Orthoclaadiinae	Brillia	1		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Cricotopus	3		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella gracei	2		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Rheocricotopus	1		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia vitracies	3		CG/SC	SP/BU
Ephemeropte	Ameletus	Ameletus validus	1	0	SC	"SW/10%, CN/90%"
Ephemeropte	Attenella	Attenella margarita	16	3	CG	CN
Ephemeropte	Baetis	Baetis flavistriga	11	5	CG	"SW/10%, CN/90%"
Ephemeropte	Baetis	Baetis tricaudatus	14	5	CG	"SW/10%, CN/90%"
Ephemeropte	Cinygmula	Cinygmula	1	0	SC	CN
Ephemeropte	Dipheter	Dipheter hageni	11	5	CG	"SW/10%, CN/90%"
Ephemeropte	Drunella coloraden	Drunella coloradensis	4	1	SC	"CN/75%, SP/25%"
Ephemeropte	Epeorus	Epeorus albertae	3	2	CG	CN
Ephemeropte	Paraleptophlebia	Paraleptophlebia	2	1	CG	SW/CN/SP
Ephemeropte	Serratella	Serratella tibialis	10	2	CG	CN

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ1

**Benthic Sample ID:** 18238

**Station ID:** UM\_SHPAQ1

**Rep. Num** 0

**Reference Status:**

**STORET Activity ID:** T01-R500-M

**Site Classification:**

**Collection Date:** 07/14/2016

**Latitude:**

**Collection Method:** MAC-R-500

**Longitude:**

**Total Number of Individuals in Sample:** 816

Haplotaxida	Oligochaeta	Lumbricina	2	8	CG	BU
Haplotaxida	Oligochaeta	Tubificidae	2	8	CG	BU
Plecoptera	Chloroperlidae	Suwallia	3	1	PR	CN
Plecoptera	Chloroperlidae	Sweltsa	17	1	PR	CN
Plecoptera	Hesperoperla	Hesperoperla pacifica	5	1	PR	CN
Plecoptera	Pteronarcys	Pteronarcys dorsata	7	2	SH	CN
Plecoptera	Skwala	Skwala	1	3	PR	CN
Trichoptera	Arctopsyche	Arctopsyche grandis	9	2	CF	CN
Trichoptera	Brachycentrus	Brachycentrus americanus	121	1	CF	CN
Trichoptera	Dicosmoecus	Dicosmoecus gilvipes	1	2	SC	SP
Trichoptera	Glossosoma	Glossosoma	1	0	SC	CN
Trichoptera	Helicopsyche	Helicopsyche borealis	17	3	SC	CN
Trichoptera	Hydropsyche_Cera	Hydropsyche occidentalis	21	5	CF	CN
Trichoptera	Lepidostoma	Lepidostoma	223	1	SH	CM/SP
Trichoptera	Micrasema	Micrasema bactro	9	1	SH	CN
Trichoptera	Neophylax	Neophylax rickeri	10	3	SC	CN
Trichoptera	Neothremma	Neothremma alicia	1	1	SC	CN
Trichoptera	Ochrotrichia	Ochrotrichia	1	4	CG	CN
Trichoptera	Parapsyche	Parapsyche elsis	7	0	CF	CN
Trichoptera	Rhyacophila brunn	Rhyacophila Brunnea Gr.	1	0	PR	CN
Trichoptera	Wormaldia	Wormaldia	4	0	CF	CN
Veneroida	Pisidiidae	Pisidium	15	8	CF	BU

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ10 **Benthic Sample ID:** 18239  
**Station ID:** UM\_SHPAQ10 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T10-R500-M  
**Site Classification:** **Collection Date:** 07/12/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 545

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Amiocentrus asplis	1			
		Ecdyonurus simplicioides	1			
		Nostococladus	4			
		Thienimannimyia gr.	7			
Coleoptera	Cleptelmis	Cleptelmis addenda	1	4	CG	"CN/50%, BU/50%"
Coleoptera	Narpus	Narpus concolor	1	2	CG	"CN/50%, BU/50%"
Coleoptera	Optioservus	Optioservus quadrimaculatus	125	5	SC	"CN/50%, BU/50%"
Coleoptera	Oreodytes	Oreodytes	1	5	PR	"CM (la), DI, SW (ad)"
Coleoptera	Zaitzevia	Zaitzevia parvula	28	5	SC/CG	"CN/50%, BU/50%"
Diptera	Antocha	Antocha monticola	6	3	CG	CN
Diptera	Chironominae	Phaenopsectra	1	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Polypedilum	15	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Rheotanytarsus	1	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Stempellina	2	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Tanytarsus	5	7	CG/CF/PR	BU/CN/SP
Diptera	Diamasinae	Pagastia	10	4	CG	sp
Diptera	Hemerodromia	Hemerodromia	1	6	PR	SP
Diptera	Hexatoma	Hexatoma	2	2	PR	BU
Diptera	Orthoclaadiinae	Cricotopus	9		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella gracei	8		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Parametriocnemus	3		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia	1		CG/SC	SP/BU
Diptera	Pelecorhynchidae	Glutops	1	1	PR	SP
Diptera	Simuliidae	Simulium	11	6	CF	CN
Diptera	Tanypodinae	Nilotanypus	1		PR	SP/BU
Ephemeropte	Ameletus	Ameletus	1	0	SC	"SW/10%, CN/90%"
Ephemeropte	Attenella	Attenella margarita	12	3	CG	CN
Ephemeropte	Baetis	Baetis flavistriga	5	5	CG	"SW/10%, CN/90%"
Ephemeropte	Baetis	Baetis tricaudatus	18	5	CG	"SW/10%, CN/90%"
Ephemeropte	Dipheter	Dipheter hageni	19	5	CG	"SW/10%, CN/90%"
Ephemeropte	Drunella coloraden	Drunella coloradensis	7	1	SC	"CN/75%, SP/25%"
Ephemeropte	Epeorus	Epeorus albertae	1	2	CG	CN
Ephemeropte	Epeorus	Epeorus deceptivus	1	2	CG	CN
Ephemeropte	Ephemerella	Ephemerella excrucians	1	2	CG	CN/SW
Ephemeropte	Rhithrogena	Rhithrogena	1	0	CG	CN

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ10

**Benthic Sample ID:** 18239

**Station ID:** UM\_SHPAQ10

**Rep. Num** 0

**Reference Status:**

**STORET Activity ID:** T10-R500-M

**Site Classification:**

**Collection Date:** 07/12/2016

**Latitude:**

**Collection Method:** MAC-R-500

**Longitude:**

**Total Number of Individuals in Sample:** 545

Ephemeropte	Serratella	Serratella tibialis	7	2	CG	CN
Haplotaxida	Oligochaeta	Tubificidae	2	8	CG	BU
Plecoptera	Chloroperlidae	Suwallia	2	1	PR	CN
Plecoptera	Chloroperlidae	Sweltsa	11	1	PR	CN
Plecoptera	Hesperoperla	Hesperoperla pacifica	3	1	PR	CN
Plecoptera	Paraperla	Paraperla	1	1	unk	unk
Plecoptera	Pteronarcys	Pteronarcys dorsata	1	2	SH	CN
Plecoptera	Zapada	Zapada cinctipes	2	2	SH	CN
Trichoptera	Arctopsyche	Arctopsyche grandis	1	2	CF	CN
Trichoptera	Brachycentrus	Brachycentrus americanus	109	1	CF	CN
Trichoptera	Dicosmoecus	Dicosmoecus gilvipes	5	2	SC	SP
Trichoptera	Hydropsyche_Cera	Hydropsyche morosa gr.	1	5	CF	CN
Trichoptera	Hydropsyche_Cera	Hydropsyche occidentalis	5	5	CF	CN
Trichoptera	Lepidostoma	Lepidostoma	70	1	SH	CM/SP
Trichoptera	Micrasema	Micrasema bacro	3	1	SH	CN
Trichoptera	Neophylax	Neophylax rickeri	3	3	SC	CN
Trichoptera	Ochrotrichia	Ochrotrichia	1	4	CG	CN
Trichoptera	Rhyacophila brunn	Rhyacophila Brunnea Gr.	2	0	PR	CN
Trichoptera	Wormaldia	Wormaldia	1	0	CF	CN
Veneroida	Pisidiidae	Pisidium	3	8	CF	BU

# Montana Bioassessment Report

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Waterbody Name: Sheep Creek AQ11

Benthic Sample ID: 18240

Station ID: UM\_SHPAQ11

Rep. Num 0

Reference Status:

STORET Activity ID: T11-R500-M

Site Classification:

Collection Date: 07/11/2016

Latitude:

Collection Method: MAC-R-500

Longitude:

Total Number of Individuals in Sample: 2

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## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
Ephemeropte	Ameletus	Ameletus	2	0	SC	"SW/10%, CN/90%"

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ11 **Benthic Sample ID:** 18241  
**Station ID:** UM\_SHPAQ11 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T11-R500-M  
**Site Classification:** **Collection Date:** 07/12/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 688

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Anagepetus	3			
		Ecdyonurus simplicioides	2			
		Nostococladius	77			
		Thienimannimyia gr.	3			
Basommatop	Lymnaeidae	Stagnicola elodes	6	8	CG	CN
Basommatop	Physa_Physella	Physella acuta	2	8	CG	CN
Coleoptera	Optioservus	Optioservus quadrimaculatus	41	5	SC	"CN/50%, BU/50%"
Coleoptera	Zaitzevia	Zaitzevia parvula	11	5	SC/CG	"CN/50%, BU/50%"
Diptera	Antocha	Antocha monticola	35	3	CG	CN
Diptera	Chelifera_Metachel	Chelifera	1	5	unk	SP
Diptera	Chironominae	Phaenopsectra	11	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Polypedilum	1	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Rheotanytarsus	71	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Stempellina	2	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Tanytarsus	1	7	CG/CF/PR	BU/CN/SP
Diptera	Orthoclaadiinae	Eukiefferiella gracei	3		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia	1		CG/SC	SP/BU
Diptera	Pelecorhynchidae	Glutops	9	1	PR	SP
Diptera	Pericoma/Telmatos	Pericoma	26	4	CG	BU
Diptera	Simuliidae	Simulium	2	6	CF	CN
Ephemeropte	Attenella	Attenella margarita	1	3	CG	CN
Ephemeropte	Baetis	Baetis tricaudatus	20	5	CG	"SW/10%, CN/90%"
Ephemeropte	Caudatella	Caudatella hystrix	1	0	CG	CN
Ephemeropte	Drunella grandis	Drunella grandis	2	2	PR	"CN/75%, SP/25%"
Ephemeropte	Ephemerella	Ephemerella exrucians	93	2	CG	CN/SW
Haplotaxida	Oligochaeta	Lumbricina	1	8	CG	BU
Haplotaxida	Oligochaeta	Tubificidae	12	8	CG	BU
Plecoptera	Chloroperlidae	Suwallia	2	1	PR	CN
Plecoptera	Chloroperlidae	Sweltsa	1	1	PR	CN
Plecoptera	Hesperoperla	Hesperoperla pacifica	2	1	PR	CN
Plecoptera	Isogenoides	Isogenoides elongatus	1	3	PR	CN
Plecoptera	Pteronarcys	Pteronarcys dorsata	1	2	SH	CN
Plecoptera	Skwala	Skwala	1	3	PR	CN
Plecoptera	Zapada	Zapada cinctipes	2	2	SH	CN
Trichoptera	Arctopsyche	Arctopsyche grandis	1	2	CF	CN

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ11

**Benthic Sample ID:** 18241

**Station ID:** UM\_SHPAQ11

**Rep. Num** 0

**Reference Status:**

**STORET Activity ID:** T11-R500-M

**Site Classification:**

**Collection Date:** 07/12/2016

**Latitude:**

**Collection Method:** MAC-R-500

**Longitude:**

**Total Number of Individuals in Sample:** 688

Trichoptera	Brachycentrus	Brachycentrus americanus	45	1	CF	CN
Trichoptera	Helicopsyche	Helicopsyche borealis	5	3	SC	CN
Trichoptera	Hydropsyche_Cera	Hydropsyche morosa gr.	1	5	CF	CN
Trichoptera	Hydropsyche_Cera	Hydropsyche occidentalis	2	5	CF	CN
Trichoptera	Lepidostoma	Lepidostoma	145	1	SH	CM/SP
Trichoptera	Micrasema	Micrasema bactro	10	1	SH	CN
Trichoptera	Ochrotrichia	Ochrotrichia	5	4	CG	CN
Trichoptera	Rhyacophila brunn	Rhyacophila Brunnea Gr.	14	0	PR	CN
Veneroida	Pisidiidae	Pisidium	12	8	CF	BU



# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ2 **Benthic Sample ID:** 18242  
**Station ID:** UM\_SHPAQ2 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T02-R500-M  
**Site Classification:** **Collection Date:** 07/12/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 704

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Microcylloepus pusillis	1			
		Neophylax splendans	3			
		Nostococladius	15			
		Thienimannimyia gr.	17			
Coleoptera	Cleptelmis	Cleptelmis addenda	7	4	CG	"CN/50%, BU/50%"
Coleoptera	Narpus	Narpus concolor	5	2	CG	"CN/50%, BU/50%"
Coleoptera	Optioservus	Optioservus quadrimaculatus	96	5	SC	"CN/50%, BU/50%"
Coleoptera	Oreodytes	Oreodytes	1	5	PR	"CM (la), DI, SW (ad)"
Coleoptera	Zaitzevia	Zaitzevia parvula	24	5	SC/CG	"CN/50%, BU/50%"
Diptera	Antocha	Antocha monticola	2	3	CG	CN
Diptera	Atherix	Atherix	3	5	PR	SP/BU
Diptera	Ceratopogoninae	Probezzia	2	6	PR/CG	SP/BU/SW
Diptera	Chelifera_Metachel	Chelifera	3	5	unk	SP
Diptera	Chironominae	Polypedilum	17	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Rheotanytarsus	10	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Stempellina	2	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Tanytarsus	13	7	CG/CF/PR	BU/CN/SP
Diptera	Diametinae	Pagastia	15	4	CG	sp
Diptera	Diametinae	Potthastia	1	4	CG	sp
Diptera	Diametinae	Pseudodiametina	2	4	CG	sp
Diptera	Hemerodromia	Hemerodromia	2	6	PR	SP
Diptera	Hexatoma	Hexatoma	1	2	PR	BU
Diptera	Orthoclaadiinae	Cricotopus	3		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella graciei	2		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Rheocricotopus	1		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia vitracies	2		CG/SC	SP/BU
Diptera	Simuliidae	Simulium	2	6	CF	CN
Ephemeropte	Ameletus	Ameletus validus	4	0	SC	"SW/10%, CN/90%"
Ephemeropte	Attenella	Attenella margarita	2	3	CG	CN
Ephemeropte	Baetis	Baetis flavistriga	6	5	CG	"SW/10%, CN/90%"
Ephemeropte	Baetis	Baetis tricaudatus	10	5	CG	"SW/10%, CN/90%"
Ephemeropte	Cinygmula	Cinygmula	1	0	SC	CN
Ephemeropte	Dipheter	Dipheter hageni	3	5	CG	"SW/10%, CN/90%"
Ephemeropte	Drunella coloraden	Drunella coloradensis	2	1	SC	"CN/75%, SP/25%"
Ephemeropte	Epeorus	Epeorus albertae	3	2	CG	CN

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ2

**Benthic Sample ID:** 18242

**Station ID:** UM\_SHPAQ2

**Rep. Num** 0

**Reference Status:**

**STORET Activity ID:** T02-R500-M

**Site Classification:**

**Collection Date:** 07/12/2016

**Latitude:**

**Collection Method:** MAC-R-500

**Longitude:**

**Total Number of Individuals in Sample:** 704

Ephemeropte	Paraleptophlebia	Paraleptophlebia	2	1	CG	SW/CN/SP
Ephemeropte	Serratella	Serratella tibialis	66	2	CG	CN
Haplotaxida	Oligochaeta	Lumbricina	2	8	CG	BU
Plecoptera	Chloroperlidae	Suwallia	4	1	PR	CN
Plecoptera	Chloroperlidae	Sweltsa	10	1	PR	CN
Plecoptera	Hesperoperla	Hesperoperla pacifica	5	1	PR	CN
Plecoptera	Kogotus	Kogotus	3	1	PR	CN
Plecoptera	Paraperla	Paraperla	1	1	unk	unk
Plecoptera	Pteronarcys	Pteronarcys dorsata	1	2	SH	CN
Plecoptera	Skwala	Skwala	1	3	PR	CN
Plecoptera	Zapada	Zapada cinctipes	2	2	SH	CN
Trichoptera	Arctopsyche	Arctopsyche grandis	9	2	CF	CN
Trichoptera	Brachycentrus	Brachycentrus americanus	122	1	CF	CN
Trichoptera	Dicosmoecus	Dicosmoecus gilvipes	1	2	SC	SP
Trichoptera	Glossosoma	Glossosoma	1	0	SC	CN
Trichoptera	Helicopsyche	Helicopsyche borealis	17	3	SC	CN
Trichoptera	Hydropsyche_Cera	Hydropsyche occidentalis	21	5	CF	CN
Trichoptera	Lepidostoma	Lepidostoma	135	1	SH	CM/SP
Trichoptera	Micrasema	Micrasema bacro	5	1	SH	CN
Trichoptera	Neophylax	Neophylax rickeri	5	3	SC	CN
Trichoptera	Ochrotrichia	Ochrotrichia	1	4	CG	CN
Trichoptera	Rhyacophila brunn	Rhyacophila Brunnea Gr.	1	0	PR	CN
Trichoptera	Wormaldia	Wormaldia	4	0	CF	CN
Veneroida	Pisidiidae	Pisidium	2	8	CF	BU

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ3 **Benthic Sample ID:** 18243  
**Station ID:** UM\_SHPAQ3 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T03-R500-M  
**Site Classification:** **Collection Date:** 07/12/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 481

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Antocha monitcola	4			
		Thienimannimyia gr.	12			
Coleoptera	Lara	Lara avara	2	1	SH	"CN/50%, BU/50%"
Coleoptera	Optioservus	Optioservus quadrimaculatus	189	5	SC	"CN/50%, BU/50%"
Coleoptera	Oreodytes	Oreodytes	5	5	PR	"CM (la), DI, SW (ad)"
Coleoptera	Zaitzevia	Zaitzevia parvula	7	5	SC/CG	"CN/50%, BU/50%"
Diptera	Chironominae	Polypedilum	11	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Rheotanytarsus	12	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Tanytarsus	2	7	CG/CF/PR	BU/CN/SP
Diptera	Diamesinae	Pagastia	22	4	CG	sp
Diptera	Hexatoma	Hexatoma	6	2	PR	BU
Diptera	Orthoclaadiinae	Eukiefferiella devonica	5		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella gracei	2		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella pseudomontana	12		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Parakiefferiella	1		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Rheocricotopus	1		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia vitracies	1		CG/SC	SP/BU
Diptera	Simuliidae	Simulium	4	6	CF	CN
Ephemeropte	Baetis	Baetis tricaudatus	15	5	CG	"SW/10%, CN/90%"
Ephemeropte	Drunella coloraden	Drunella coloradensis	2	1	SC	"CN/75%, SP/25%"
Ephemeropte	Ephemera	Ephemera simulans	1	2	CG	BU
Ephemeropte	Paraleptophlebia	Paraleptophlebia	3	1	CG	SW/CN/SP
Ephemeropte	Serratella	Serratella tibialis	22	2	CG	CN
Haplotaxida	Oligochaeta	Tubificidae	6	8	CG	BU
Plecoptera	Chloroperlidae	Sweltsa	1	1	PR	CN
Plecoptera	Hesperoperla	Hesperoperla pacifica	6	1	PR	CN
Plecoptera	Megarcys	Megarcys	2	1	PR	CN
Trichoptera	Agapetus	Agapetus montanus	5	0	SC	CN
Trichoptera	Arctopsyche	Arctopsyche grandis	5	2	CF	CN
Trichoptera	Brachycentrus	Brachycentrus americanus	66	1	CF	CN
Trichoptera	Hydropsyche_Cera	Hydropsyche occidentalis	13	5	CF	CN
Trichoptera	Hydroptila	Hydroptila	1	6	PH	CN
Trichoptera	Lepidostoma	Lepidostoma	21	1	SH	CM/SP
Trichoptera	Micrasema	Micrasema bactro	12	1	SH	CN
Trichoptera	Neophylax	Neophylax rickeri	2	3	SC	CN

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ4 **Benthic Sample ID:** 18244  
**Station ID:** UM\_SHPAQ4 **Rep. Num** 0  
**Reference Status:** **STORET Activity ID:** T04-R500-M  
**Site Classification:** **Collection Date:** 07/11/2016  
**Latitude:** **Collection Method:** MAC-R-500  
**Longitude:** **Total Number of Individuals in Sample:** 736

## Sample Taxa List

<i>Order:</i>	<i>OTU name:</i>	<i>FinalID:</i>	<i>Individuals</i>	<i>Tol Val:</i>	<i>FFG:</i>	<i>Habit:</i>
		Neophylax splendans	2			
		Nostococladius	2			
		Thienimannimyia gr.	30			
Basommatop	Lymnaeidae	Fossaria humilis	2	8	CG	CN
Basommatop	Lymnaeidae	Stagnicola elodes	2	8	CG	CN
Basommatop	Physa_Physella	Physella acuta	2	8	CG	CN
Coleoptera	Cleptelmis	Cleptelmis addenda	2	4	CG	"CN/50%, BU/50%"
Coleoptera	Lara	Lara avara	4	1	SH	"CN/50%, BU/50%"
Coleoptera	Optioservus	Optioservus quadrimaculatus	164	5	SC	"CN/50%, BU/50%"
Coleoptera	Oreodytes	Oreodytes	2	5	PR	"CM (la), DI, SW (ad)"
Coleoptera	Zaitzevia	Zaitzevia parvula	34	5	SC/CG	"CN/50%, BU/50%"
Diptera	Antocha	Antocha monticola	2	3	CG	CN
Diptera	Atherix	Atherix	2	5	PR	SP/BU
Diptera	Chironominae	Cryptochironomus	6	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Microtendipes	4	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Phaenopsectra	2	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Rheotanytarsus	62	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Stempellina	10	7	CG/CF/PR	BU/CN/SP
Diptera	Chironominae	Tanytarsus	30	7	CG/CF/PR	BU/CN/SP
Diptera	Diamesinae	Pagastia	36	4	CG	sp
Diptera	Diamesinae	Potthastia	4	4	CG	sp
Diptera	Dicranota	Dicranota	2	0	PR	SP
Diptera	Hemerodromia	Hemerodromia	4	6	PR	SP
Diptera	Hexatoma	Hexatoma	14	2	PR	BU
Diptera	Orthoclaadiinae	Cricotopus	22		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella devonica	2		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella gracei	4		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Eukiefferiella pseudomontana	6		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Orthocladius	26		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Parakiefferiella	16		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Rheocricotopus	2		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Synorthocladius	2		CG/SC	SP/BU
Diptera	Orthoclaadiinae	Tvetenia vitracies	10		CG/SC	SP/BU
Diptera	Pelecchynchidae	Glutops	2	1	PR	SP
Diptera	Prodiamesinae	Odontomesa	2	5	CG	BU/SP

# Montana Bioassessment Report

**Waterbody Name:** Sheep Creek AQ4

**Benthic Sample ID:** 18244

**Station ID:** UM\_SHPAQ4

**Rep. Num** 0

**Reference Status:**

**STORET Activity ID:** T04-R500-M

**Site Classification:**

**Collection Date:** 07/11/2016

**Latitude:**

**Collection Method:** MAC-R-500

**Longitude:**

**Total Number of Individuals in Sample:** 736

Diptera	Tanypodinae	Nilotanypus	6		PR	SP/BU
Ephemeropte	Ameletus	Ameletus	2	0	SC	"SW/10%, CN/90%"
Ephemeropte	Attenella	Attenella margarita	22	3	CG	CN
Ephemeropte	Baetis	Baetis tricaudatus	10	5	CG	"SW/10%, CN/90%"
Ephemeropte	Cinygmula	Cinygmula	2	0	SC	CN
Ephemeropte	Dipheter	Dipheter hageni	4	5	CG	"SW/10%, CN/90%"
Ephemeropte	Drunella grandis	Drunella grandis	2	2	PR	"CN/75%, SP/25%"
Ephemeropte	Ephemerella	Ephemerella excrucians	2	2	CG	CN/SW
Ephemeropte	Paraleptophlebia	Paraleptophlebia	4	1	CG	SW/CN/SP
Ephemeropte	Serratella	Serratella tibialis	8	2	CG	CN
Haplotaxida	Oligochaeta	Lumbricina	2	8	CG	BU
Haplotaxida	Oligochaeta	Tubificidae	14	8	CG	BU
Lumbriculida	Oligochaeta	Lumbriculidae	2	8	CG	BU
Plecoptera	Chloroperlidae	Suwallia	10	1	PR	CN
Plecoptera	Chloroperlidae	Sweltsa	2	1	PR	CN
Plecoptera	Hesperoperla	Hesperoperla pacifica	8	1	PR	CN
Plecoptera	Megarcys	Megarcys	2	1	PR	CN
Plecoptera	Pteronarcys	Pteronarcys dorsata	2	2	SH	CN
Trichoptera	Brachycentrus	Brachycentrus americanus	52	1	CF	CN
Trichoptera	Dicosmoecus	Dicosmoecus gilvipes	6	2	SC	SP
Trichoptera	Glossosoma	Glossosoma	14	0	SC	CN
Trichoptera	Helicopsyche	Helicopsyche borealis	2	3	SC	CN
Trichoptera	Hydropsyche_Cera	Hydropsyche morosa gr.	2	5	CF	CN
Trichoptera	Hydropsyche_Cera	Hydropsyche occidentalis	4	5	CF	CN
Trichoptera	Lepidostoma	Lepidostoma	24	1	SH	CM/SP
Trichoptera	Micrasema	Micrasema bacro	2	1	SH	CN
Trichoptera	Neothremma	Neothremma alicia	2	1	SC	CN
Trombidiform	Acarina	Hydrodroma	2	5	PR	"SW/10%, CN/90%"
Trombidiform	Acarina	Hygrobatas	4	5	PR	"SW/10%, CN/90%"

## **Appendix E**

### **Periphyton Taxa List, Abundance and Metrics**

**Analysis of biological samples:  
Technical summary of methods and procedures  
Prepared for Montana Biological Survey  
David Stagliano, Project Manager  
October 19, 2016**



by  
W. Bollman, Chief Biologist  
Rhithron Associates, Inc.  
Missoula, Montana

## **METHODS**

Ten periphyton samples collected for the Black Butte Mine project were delivered to Rhithron's laboratory facility in Missoula, Montana on July 18, 2016. An inventory spreadsheet was provided by the Montana Biological Survey Project Manager. Upon arrival, samples were unpacked and examined, and checked against the inventory. All samples arrived in good condition. The inventory spreadsheet was updated with project code and internal laboratory identification numbers and was uploaded to the Rhithron database prior to sample processing.

Samples were thoroughly mixed by shaking. Permanent diatom slides were prepared: subsamples were taken and treated with 70% Nitric acid (HNO<sub>3</sub>) and digested using a closed-vessel microwave digestion system (Milestone Ethos EZ), following the method developed by the Academy of Natural Sciences, Philadelphia (ANSP 2002). Samples were neutralized by rinses with distilled water, and subsample volumes were adjusted to obtain adequate densities. Small amounts of each sample were dried onto 22-mm square coverslips. Coverslips were mounted on slides using Naphrax diatom mount. To ensure a high quality mount for identification and to make replicates available for archives, 3 slide mounts were made from each sample. One of the replicates was selected from each sample batch for identification. A diamond scribe mark was made to define a transect line on the cover slip, and a minimum of 800 diatom valves were identified along the transect mark. A Leica DM 2500 compound microscope, Nomarski contrast, and 1000x magnification were used for identifications. Diatoms were identified to the lowest possible taxonomic level, generally species, following standard taxonomic references.

For soft-bodied (non-diatom) algae samples, the raw periphyton sample was manually homogenized and emptied into a porcelain evaporating dish. A small, random sub-sample of algal material was pipetted onto a standard glass microscope slide using a disposable pasture pipette. Visible (macroscopic) algae were also sub-sampled, in proportion to their estimated importance relative to the total volume of algal material in the sample, and added to the liquid fraction on the slide. The wet mount was then covered with a 22X30 mm cover slip.

Soft-bodied (non-diatom) algae were identified to genus using a Leica DM 2500 compound microscope under 200X and 400X. The relative abundance of each algal genus (and of all diatom genera collectively) was estimated for comparative purposes, according to the following system:

- rare (R): fewer than 1 cell per field of view at 200X, on the average;
- common (C): at least 1 but fewer than 5 cells per field of view;
- very common (VC): between 5 and 25 cells per field of view;
- abundant (A): more than 25 cells per field of view, but countable;
- very abundant (VA): number of cells per field of view too numerous to count.

Soft-bodied genera (and the diatom component) were also ranked according to their estimated contribution to the total algal biovolume present in the sample. The genus with the most biomass ranked number 1; the genus with the next most biomass ranked number 2, and so on.

### *Data analysis*

Diatom data, including species names and counts, and non-diatom algae data, including generic names, relative abundances and biovolume rankings, were entered into Rhithron's customized laboratory information management system. A formatted data file for upload to the MT-eWQX database was generated for the diatom samples. Metric calculations, consistent with Montana Department of Environmental Quality (MDEQ 2011) data requirements, were performed for diatom samples. An Excel file including taxon names, relative abundances and biovolume rankings was created for the non-diatom algae samples.

## **RESULTS**

### *Data analysis*

Electronic spreadsheets were provided to the Montana Biological Survey Project Manager via e-mail. Taxa lists are provided in an Appendix to this report.

## **REFERENCES**

ANSP. 2002. Protocols for the analysis of algal samples collected as part of the U.S. Geological Survey National Water-Quality Assessment Program. The Academy of Natural Sciences Patrick Center for Environmental Research: Report No. 02-06. May 2002.

MDEQ. 2011. Periphyton Standard Operating Procedure. Montana Department of Environmental Quality. Water Quality Planning Bureau. Standard Operating Procedure. WQPBWQM-010. Helena, Montana.



**APPENDIX**

**Diatom Taxa Lists  
Non-diatom Algae Results**

**Black Butte Mine 2016**

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM001

RAI No.: MM16BBM001

Sta. Name: Sheep Creek #1

Client ID: AQ1

Date Coll.: 7/14/2016

No Jars: 1

STORET ID:

Sample Notes: 5667 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
<i>Diatoms</i>				
Bacillariophyta				
<i>Achnantheidium minutissimum</i>	83	10.38%		
<i>Adlafia minuscula</i>	6	0.75%		
<i>Amphipleura pellucida</i>	5	0.63%		
<i>Amphora pediculus</i>	28	3.50%		
<i>Cocconeis placentula sensu lato</i>	14	1.75%		
<i>Cymbella affinis</i>	11	1.38%		
<i>Diatoma moniliformis</i>	39	4.88%		
<i>Diploneis oblongella</i>	3	0.38%		
<i>Encyonema minutum</i>	13	1.63%		
<i>Encyonema silesiacum</i>	11	1.38%		
<i>Encyonopsis subminuta</i>	6	0.75%		
<i>Frustulia rhomboides</i>	3	0.38%		
<i>Gomphoneis olivaceum</i>	11	1.38%		
<i>Gomphonema sp.</i>	13	1.63%		girds
<i>Gomphonema minutum</i>	3	0.38%		
<i>Gomphonema parvulum</i>	5	0.63%		
<i>Gyrosigma attenuatum</i>	2	0.25%		
<i>Humidophila contenta</i>	2	0.25%		
<i>Mayamaea atomus</i>	9	1.13%		
<i>Meridion circulare</i>	6	0.75%		
<i>Navicula sp.</i>	2	0.25%		
<i>Navicula antonii</i>	2	0.25%		
<i>Navicula capitatoradiata</i>	14	1.75%		
<i>Navicula caterva</i>	46	5.75%		
<i>Navicula cryptotenella</i>	9	1.13%		
<i>Navicula reichardtiana</i>	16	2.00%		
<i>Navicula tripunctata</i>	36	4.50%		
<i>Navicula viridula</i>	2	0.25%		
<i>Nitzschia sp.</i>	13	1.63%		
<i>Nitzschia acicularis</i>	17	2.13%		
<i>Nitzschia archibaldii</i>	33	4.13%		
<i>Nitzschia dissipata</i>	16	2.00%		
<i>Nitzschia dissipata v. media</i>	3	0.38%		
<i>Nitzschia fonticola</i>	8	1.00%		
<i>Nitzschia frustulum</i>	3	0.38%		
<i>Nitzschia graciliformis</i>	6	0.75%		
<i>Nitzschia inconspicua</i>	9	1.13%		
<i>Nitzschia linearis</i>	3	0.38%		
<i>Nitzschia paleacea</i>	30	3.75%		
<i>Nitzschia pura</i>	30	3.75%		
<i>Nitzschia radícula</i>	8	1.00%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM001

RAI No.: MM16BBM001

Sta. Name: Sheep Creek #1

Client ID: AQ1

Date Coll.: 7/14/2016

No Jars: 1

STORET ID:

Sample Notes: 5667 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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<i>Nitzschia recta</i>	2	0.25%		
<i>Nitzschia sociabilis</i>	9	1.13%		
<i>Nitzschia sublinearis</i>	5	0.63%		
<i>Planothidium dubium</i>	5	0.63%		
<i>Planothidium frequentissimum</i>	28	3.50%		
<i>Planothidium lanceolatum</i>	6	0.75%		
<i>Reimeria sinuata</i>	3	0.38%		
<i>Rhoicosphenia abbreviata</i>	9	1.13%		
<i>Sellaphora nigri</i>	16	2.00%		
<i>Stauroneis reichardtii</i>	2	0.25%		
<i>Stausira construens</i>	14	1.75%		
<i>Stausira construens v. venter</i>	36	4.50%		
<i>Stausirella leptostauron</i>	21	2.63%		
<i>Stausirella pinnata</i>	49	6.13%		
<i>Surirella brebissonii v. kuetzingii</i>	8	1.00%		
<i>Ulnaria ulna</i>	8	1.00%		

Sample Count 800

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM002

RAI No.: MM16BBM002

Sta. Name: Sheep Creek #2

Client ID: AQ2

Date Coll.: 7/12/2016

No Jars: 1

STORET ID:

Sample Notes: 5821 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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## Diatoms

### Bacillariophyta

<i>Achnantheidium gracillimum</i>	6	0.75%		
<i>Achnantheidium minutissimum</i>	215	26.88%		
<i>Amphora pediculus</i>	23	2.88%		
<i>Cocconeis pediculus</i>	3	0.38%		
<i>Cocconeis placentula sensu lato</i>	13	1.63%		
<i>Cymbella affinis</i>	3	0.38%		
<i>Diatoma moniliformis</i>	42	5.25%		
<i>Encyonema minutum</i>	10	1.25%		
<i>Encyonema silesiacum</i>	29	3.63%		
<i>Encyonopsis subminuta</i>	42	5.25%		
<i>Gomphonema sp.</i>	19	2.38%		
<i>Mayamaea atomus</i>	3	0.38%		
<i>Navicula sp.</i>	13	1.63%		
<i>Navicula capitatoradiata</i>	10	1.25%		
<i>Navicula caterva</i>	13	1.63%		
<i>Navicula cryptotenella</i>	48	6.00%		
<i>Navicula cryptotenelloides</i>	10	1.25%		
<i>Navicula menisculus</i>	6	0.75%		
<i>Navicula reichardtiana</i>	26	3.25%		
<i>Navicula tripunctata</i>	48	6.00%		
<i>Nitzschia sp.</i>	13	1.63%		
<i>Nitzschia acicularis</i>	19	2.38%		
<i>Nitzschia acidoclinata</i>	6	0.75%		
<i>Nitzschia agnita</i>	6	0.75%		
<i>Nitzschia archibaldii</i>	10	1.25%		
<i>Nitzschia dissipata</i>	10	1.25%		
<i>Nitzschia fonticola</i>	16	2.00%		
<i>Nitzschia lacuum</i>	13	1.63%		
<i>Nitzschia linearis</i>	3	0.38%		
<i>Nitzschia microcephala</i>	6	0.75%		
<i>Nitzschia palea</i>	6	0.75%		
<i>Nitzschia paleacea</i>	23	2.88%		
<i>Nitzschia pura</i>	6	0.75%		
<i>Planothidium dubium</i>	6	0.75%		
<i>Planothidium frequentissimum</i>	13	1.63%		
<i>Pseudostaurosira parasitica</i>	3	0.38%		
<i>Rhoicosphenia abbreviata</i>	6	0.75%		
<i>Rhopalodia gibba</i>	6	0.75%		
<i>Sellaphora nigri</i>	6	0.75%		
<i>Sellaphora pupula</i>	3	0.38%		
<i>Stauroneis separanda</i>	3	0.38%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM002

RAI No.: MM16BBM002

Sta. Name: Sheep Creek #2

Client ID: AQ2

Date Coll.: 7/12/2016

No Jars: 1

STORET ID:

Sample Notes: 5821 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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<i>Staurosira construens</i>	19	2.38%		
<i>Staurosira construens v. venter</i>	13	1.63%		
<i>Ulnaria ulna</i>	3	0.38%		

Sample Count 800

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM003

RAI No.: MM16BBM003

Sta. Name: Sheep Creek #3

Client ID: AQ3

Date Coll.: 7/14/2016

No Jars: 1

STORET ID:

Sample Notes: 5739 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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## Diatoms

### Bacillariophyta

<i>Achnanthes</i> sp.	1	0.12%		
<i>Achnantheidium deflexum</i>	2	0.25%		
<i>Achnantheidium gracillimum</i>	2	0.25%		
<i>Achnantheidium minutissimum</i>	83	10.36%		
<i>Adlafia bryophila</i>	1	0.12%		
<i>Adlafia minuscula</i>	5	0.62%		
<i>Amphipleura pellucida</i>	5	0.62%		
<i>Amphora inariensis</i>	2	0.25%		
<i>Amphora pediculus</i>	30	3.75%		
<i>Caloneis bacillum</i>	8	1.00%		
<i>Caloneis lewisii</i>	2	0.25%		
<i>Cocconeis pediculus</i>	1	0.12%		
<i>Cocconeis placentula sensu lato</i>	27	3.37%		
<i>Cyclotella meneghiniana</i>	6	0.75%		
<i>Cymbella affinis</i>	36	4.49%		
<i>Cymbella compacta</i>	3	0.37%		
<i>Diatoma moniliformis</i>	14	1.75%		
<i>Diploneis oblongella</i>	1	0.12%		
<i>Encyonema</i> sp.	1	0.12%		
<i>Encyonema leibleinii</i>	1	0.12%		
<i>Encyonema minutum</i>	3	0.37%		
<i>Encyonema reichardtii</i>	2	0.25%		
<i>Encyonema silesiacum</i>	16	2.00%		
<i>Encyonopsis subminuta</i>	15	1.87%		
<i>Epithemia adnata</i>	2	0.25%		
<i>Fallacia lenzii</i>	2	0.25%		
<i>Fallacia monoculata</i>	1	0.12%		
<i>Fistulifera saprophila</i>	1	0.12%		
<i>Fragilaria capucina</i>	3	0.37%		
<i>Fragilaria capucina v. gracilis</i>	1	0.12%		
<i>Fragilaria vaucheriae</i>	1	0.12%		
<i>Gomphoneis olivaceum</i>	2	0.25%		
<i>Gomphonema</i> sp.	4	0.50%		
<i>Gomphonema angustatum</i>	2	0.25%		
<i>Gomphonema minutum</i>	16	2.00%		
<i>Gomphonema pumilum v. elegans</i>	2	0.25%		
<i>Mayamaea atomus</i>	4	0.50%		
<i>Meridion circulare</i>	2	0.25%		
<i>Navicula antonii</i>	7	0.87%		
<i>Navicula capitatoradiata</i>	18	2.25%		
<i>Navicula caterva</i>	28	3.50%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM003

RAI No.: MM16BBM003

Sta. Name: Sheep Creek #3

Client ID: AQ3

Date Coll.: 7/14/2016

No Jars: 1

STORET ID:

Sample Notes: 5739 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
<i>Navicula cryptocephala</i>	5	0.62%		
<i>Navicula cryptotenella</i>	24	3.00%		
<i>Navicula cryptotenelloides</i>	1	0.12%		
<i>Navicula densilineolata</i>	3	0.37%		
<i>Navicula disjuncta</i>	1	0.12%		
<i>Navicula menisculus</i>	4	0.50%		
<i>Navicula radiosa</i>	1	0.12%		
<i>Navicula reichardtiana</i>	12	1.50%		
<i>Navicula tripunctata</i>	44	5.49%		
<i>Nitzschia</i> sp.	4	0.50%		
<i>Nitzschia acicularis</i>	1	0.12%		
<i>Nitzschia acidoclinata</i>	1	0.12%		
<i>Nitzschia agnita</i>	8	1.00%		
<i>Nitzschia archibaldii</i>	18	2.25%		
<i>Nitzschia dissipata</i>	17	2.12%		
<i>Nitzschia dissipata v. media</i>	1	0.12%		
<i>Nitzschia fonticola</i>	4	0.50%		
<i>Nitzschia frustulum</i>	3	0.37%		
<i>Nitzschia graciliformis</i>	1	0.12%		
<i>Nitzschia inconspicua</i>	2	0.25%		
<i>Nitzschia lacuum</i>	25	3.12%		
<i>Nitzschia linearis</i>	3	0.37%		
<i>Nitzschia palea</i>	4	0.50%		
<i>Nitzschia paleacea</i>	4	0.50%		
<i>Nitzschia perminuta</i>	1	0.12%		
<i>Nitzschia pura</i>	9	1.12%		
<i>Nitzschia recta</i>	1	0.12%		
<i>Nitzschia sociabilis</i>	5	0.62%		
<i>Nitzschia subacicularis</i>	4	0.50%		
<i>Planothidium dubium</i>	14	1.75%		
<i>Planothidium frequentissimum</i>	27	3.37%		
<i>Planothidium lanceolatum</i>	8	1.00%		
<i>Pseudostaurosira brevistriata</i>	1	0.12%		
<i>Pseudostaurosira parasitica</i>	2	0.25%		
<i>Reimeria sinuata</i>	6	0.75%		
<i>Rhopalodia gibba</i>	2	0.25%		
<i>Sellaphora nigri</i>	25	3.12%		
<i>Sellaphora pupula</i>	2	0.25%		
<i>Simonsenia delognei</i>	1	0.12%		
<i>Stauroneis</i> sp.	1	0.12%		
<i>Stauroneis separanda</i>	1	0.12%		
<i>Staurosira construens v. venter</i>	65	8.11%		
<i>Staurosirella leptostauron</i>	64	7.99%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM003

RAI No.: MM16BBM003

Sta. Name: Sheep Creek #3

Client ID: AQ3

Date Coll.: 7/14/2016

No Jars: 1

STORET ID:

Sample Notes: 5739 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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*Staurosirella pinnata*

7

0.87%

*Surirella angusta*

1

0.12%

Sample Count 801



# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM004

RAI No.: MM16BBM004

Sta. Name: Sheep Creek #4

Client ID: AQ4

Date Coll.: 7/14/2016

No Jars: 1

STORET ID:

Sample Notes: 5703 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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## Diatoms

### Bacillariophyta

<i>Achnanthes subhudsonis</i> v. <i>kraeuselii</i>	1	0.13%		
<i>Achnantheidium affine</i>	1	0.13%		
<i>Achnantheidium deflexum</i>	1	0.13%		
<i>Achnantheidium gracillimum</i>	1	0.13%		
<i>Achnantheidium minutissimum</i>	53	6.63%		
<i>Achnantheidium rivulare</i>	3	0.38%		
<i>Adlafia minuscula</i>	5	0.63%		
<i>Amphipleura pellucida</i>	11	1.38%		
<i>Amphora pediculus</i>	17	2.13%		
<i>Caloneis bacillum</i>	4	0.50%		
<i>Chamaepinnularia bremensis</i>	1	0.13%		
<i>Cocconeis placentula</i> sensu lato	17	2.13%		
<i>Cocconeis pseudolineata</i>	1	0.13%		
<i>Cyclotella meneghiniana</i>	4	0.50%		
<i>Cymbella affinis</i>	32	4.00%		
<i>Diatoma mesodon</i>	3	0.38%		
<i>Diatoma moniliformis</i>	25	3.13%		
<i>Diploneis oblongella</i>	3	0.38%		
<i>Encyonema reichardtii</i>	5	0.63%		
<i>Encyonema silesiacum</i>	12	1.50%		
<i>Encyonopsis microcephala</i>	1	0.13%		
<i>Encyonopsis subminuta</i>	1	0.13%		
<i>Fistulifera saprophila</i>	1	0.13%		
<i>Fragilaria capucina</i>	1	0.13%		
<i>Fragilaria vaucheriae</i>	11	1.38%		
<i>Fragilariforma nitzschioides</i>	4	0.50%		
<i>Geissleria acceptata</i>	5	0.63%		
<i>Gomphoneis erienne</i>	3	0.38%		
<i>Gomphoneis olivaceum</i>	7	0.88%		
<i>Gomphonema</i> sp.	5	0.63%		
<i>Gomphonema acuminatum</i> v. <i>pusilla</i>	1	0.13%		
<i>Gomphonema angustatum</i>	7	0.88%		
<i>Gomphonema minutum</i>	8	1.00%		
<i>Gomphonema parvulum</i>	4	0.50%		
<i>Gomphonema pumilum</i> v. <i>elegans</i>	5	0.63%		
<i>Gyrosigma attenuatum</i>	1	0.13%		
<i>Mayamaea atomus</i>	1	0.13%		
<i>Meridion circulare</i>	12	1.50%		
<i>Meridion circulare</i> v. <i>constrictum</i>	3	0.38%		
<i>Navicula antonii</i>	1	0.13%		
<i>Navicula capitatoradiata</i>	24	3.00%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM004

RAI No.: MM16BBM004

Sta. Name: Sheep Creek #4

Client ID: AQ4

Date Coll.: 7/14/2016

No Jars: 1

STORET ID:

Sample Notes: 5703 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
<i>Navicula caterva</i>	17	2.13%		
<i>Navicula cryptotenella</i>	27	3.38%		
<i>Navicula cryptotenelloides</i>	7	0.88%		
<i>Navicula menisculus</i>	1	0.13%		
<i>Navicula reichardtiana</i>	4	0.50%		
<i>Navicula tripunctata</i>	77	9.63%		
<i>Nitzschia</i> sp.	5	0.63%		
<i>Nitzschia acicularis</i>	3	0.38%		
<i>Nitzschia acidoclinata</i>	3	0.38%		
<i>Nitzschia agnita</i>	3	0.38%		
<i>Nitzschia archibaldii</i>	13	1.63%		
<i>Nitzschia dissipata</i>	11	1.38%		
<i>Nitzschia fonticola</i>	8	1.00%		
<i>Nitzschia heufleriana</i>	1	0.13%		
<i>Nitzschia inconspicua</i>	8	1.00%		
<i>Nitzschia lacuum</i>	1	0.13%		
<i>Nitzschia lanceolata</i>	1	0.13%		
<i>Nitzschia linearis</i>	5	0.63%		
<i>Nitzschia paleacea</i>	9	1.13%		
<i>Nitzschia perminuta</i>	1	0.13%		
<i>Nitzschia pura</i>	8	1.00%		
<i>Nitzschia recta</i>	3	0.38%		
<i>Nitzschia subtilis</i>	1	0.13%		
<i>Opephora olsenii</i>	8	1.00%		
<i>Pinnularia borealis</i>	1	0.13%		
<i>Planothidium</i> sp.	1	0.13%		
<i>Planothidium dubium</i>	9	1.13%		
<i>Planothidium frequentissimum</i>	34	4.25%		
<i>Planothidium lanceolatum</i>	27	3.38%		
<i>Pseudostaurosira brevistriata</i>	5	0.63%		
<i>Pseudostaurosira parasitica</i>	4	0.50%		
<i>Reimeria sinuata</i>	11	1.38%		
<i>Rhoicosphenia abbreviata</i>	3	0.38%		
<i>Sellaphora nigri</i>	16	2.00%		
<i>Simonsenia delognei</i>	1	0.13%		
<i>Stauroneis smithii</i>	1	0.13%		
<i>Staurosira construens v. venter</i>	41	5.13%		
<i>Staurosirella leptostauron</i>	51	6.38%		
<i>Staurosirella pinnata</i>	62	7.75%		
<i>Surirella angusta</i>	1	0.13%		
<i>Ulnaria ulna</i>	1	0.13%		

Sample Count 800

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM005

RAI No.: MM16BBM005

Sta. Name: Tenderfoot Creek #5

Client ID: AQ5

Date Coll.: 7/13/2016

No Jars: 1

STORET ID:

Sample Notes: 4793 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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## Diatoms

### Bacillariophyta

<i>Achnantheidium exiguum</i>	1	0.12%		
<i>Achnantheidium minutissimum</i>	41	5.10%		
<i>Adlafia minuscula</i>	3	0.37%		
<i>Amphipleura pellucida</i>	5	0.62%		
<i>Amphora pediculus</i>	7	0.87%		
<i>Aulacoseira alpigena</i>	2	0.25%		
<i>Caloneis bacillum</i>	1	0.12%		
<i>Cocconeis pediculus</i>	2	0.25%		
<i>Cocconeis placentula sensu lato</i>	16	1.99%		
<i>Diatoma mesodon</i>	4	0.50%		
<i>Diatoma moniliformis</i>	66	8.21%		
<i>Didymosphenia geminata</i>	4	0.50%		
<i>Encyonema sp.</i>	2	0.25%		
<i>Encyonema caespitosum</i>	4	0.50%		
<i>Encyonema minutum</i>	252	31.34%		
<i>Encyonema silesiacum</i>	47	5.85%		
<i>Epithemia sorex</i>	15	1.87%		
<i>Epithemia turgida</i>	10	1.24%		
<i>Fragilaria vaucheriae</i>	12	1.49%		
<i>Fragilariforma nitzschioides</i>	2	0.25%		
<i>Gomphoneis erienne</i>	2	0.25%		
<i>Gomphoneis minuta</i>	4	0.50%		
<i>Gomphoneis olivaceum</i>	1	0.12%		
<i>Gomphonema sp.</i>	7	0.87%		
<i>Gomphonema micropus</i>	1	0.12%		
<i>Gomphonema minutum</i>	1	0.12%		
<i>Hannaea arcus</i>	2	0.25%		
<i>Karayevia laterostrata</i>	1	0.12%		
<i>Melosira varians</i>	1	0.12%		
<i>Meridion circulare</i>	1	0.12%		
<i>Navicula capitatoradiata</i>	8	1.00%		
<i>Navicula caterva</i>	21	2.61%		
<i>Navicula cryptocephala</i>	1	0.12%		
<i>Navicula cryptotenella</i>	3	0.37%		
<i>Navicula cryptotenelloides</i>	1	0.12%		
<i>Navicula reichardtiana</i>	7	0.87%		
<i>Navicula schmassmannii</i>	1	0.12%		
<i>Navicula seibigiana</i>	1	0.12%		
<i>Navicula tripunctata</i>	1	0.12%		
<i>Nitzschia sp.</i>	2	0.25%		
<i>Nitzschia angustata</i>	1	0.12%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM005

RAI No.: MM16BBM005

Sta. Name: Tenderfoot Creek #5

Client ID: AQ5

Date Coll.: 7/13/2016

No Jars: 1

STORET ID:

Sample Notes: 4793 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
<i>Nitzschia archibaldii</i>	58	7.21%		
<i>Nitzschia dissipata</i>	10	1.24%		
<i>Nitzschia fonticola</i>	39	4.85%		
<i>Nitzschia frustulum</i>	8	1.00%		
<i>Nitzschia inconspicua</i>	10	1.24%		
<i>Nitzschia linearis</i>	1	0.12%		
<i>Nitzschia paleacea</i>	29	3.61%		
<i>Nitzschia pura</i>	1	0.12%		
<i>Planothidium dubium</i>	7	0.87%		
<i>Planothidium frequentissimum</i>	7	0.87%		
<i>Planothidium granum</i>	2	0.25%		
<i>Planothidium lanceolatum</i>	5	0.62%		
<i>Rhoicosphenia abbreviata</i>	8	1.00%		
<i>Sellaphora nigri</i>	14	1.74%		
<i>Stausosira construens v. binodis</i>	1	0.12%		
<i>Stausosira construens v. venter</i>	24	2.99%		
<i>Stausosirella leptostauron</i>	11	1.37%		
<i>Surirella brebissonii v. kuetzingii</i>	1	0.12%		
<i>Synedra mazamaensis</i>	3	0.37%		
<i>Ulnaria contracta</i>	1	0.12%		
Sample Count	804			

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM006

RAI No.: MM16BBM006

Sta. Name: Tenderfoot Creek #6

Client ID: AQ6

Date Coll.: 7/13/2016

No Jars: 1

STORET ID:

Sample Notes: 4803 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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## Diatoms

### Bacillariophyta

<i>Achnantheidium minutissimum</i>	71	8.88%		
<i>Adlafia minuscula</i>	2	0.25%		
<i>Caloneis bacillum</i>	2	0.25%		
<i>Cocconeis placentula sensu lato</i>	14	1.75%		
<i>Craticula molestiformis</i>	2	0.25%		
<i>Cymbella affinis</i>	4	0.50%		
<i>Diatoma mesodon</i>	3	0.38%		
<i>Diatoma moniliformis</i>	62	7.75%		
<i>Diatoma tenuis</i>	2	0.25%		
<i>Didymosphenia geminata</i>	2	0.25%		
<i>Encyonema leibleinii</i>	1	0.13%		
<i>Encyonema minutum</i>	237	29.63%		
<i>Encyonema muelleri</i>	3	0.38%		
<i>Encyonema obscurum</i>	1	0.13%		
<i>Encyonema silesiacum</i>	47	5.88%		
<i>Encyonopsis subminuta</i>	1	0.13%		
<i>Epithemia sorex</i>	6	0.75%		
<i>Epithemia turgida</i>	1	0.13%		
<i>Fistulifera saprophila</i>	1	0.13%		
<i>Fragilaria capucina v. gracilis</i>	4	0.50%		
<i>Fragilaria vaucheriae</i>	17	2.13%		
<i>Gomphoneis erienne</i>	3	0.38%		
<i>Gomphoneis minuta</i>	1	0.13%		
<i>Gomphoneis olivaceum</i>	2	0.25%		
<i>Gomphonema sp.</i>	1	0.13%		
<i>Gomphonema kobayasii</i>	5	0.63%		
<i>Gomphonema olivaceoides</i>	2	0.25%		
<i>Gomphonema pumilum v. elegans</i>	1	0.13%		
<i>Hannaea arcus</i>	3	0.38%		
<i>Mayamaea atomus</i>	3	0.38%		
<i>Navicula capitatoradiata</i>	8	1.00%		
<i>Navicula caterva</i>	19	2.38%		
<i>Navicula cryptotenella</i>	12	1.50%		
<i>Navicula cryptotenelloides</i>	3	0.38%		
<i>Navicula menisculus</i>	2	0.25%		
<i>Navicula reichardtiana</i>	8	1.00%		
<i>Navicula tripunctata</i>	1	0.13%		
<i>Nitzschia sp.</i>	3	0.38%		
<i>Nitzschia archibaldii</i>	32	4.00%		
<i>Nitzschia dissipata</i>	12	1.50%		
<i>Nitzschia fonticola</i>	37	4.63%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM006

RAI No.: MM16BBM006

Sta. Name: Tenderfoot Creek #6

Client ID: AQ6

Date Coll.: 7/13/2016

No Jars: 1

STORET ID:

Sample Notes: 4803 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
<i>Nitzschia frustulum</i>	6	0.75%		
<i>Nitzschia inconspicua</i>	11	1.38%		
<i>Nitzschia linearis</i>	3	0.38%		
<i>Nitzschia paleacea</i>	32	4.00%		
<i>Nitzschia perminuta</i>	8	1.00%		
<i>Planothidium</i> sp.	1	0.13%		
<i>Planothidium dubium</i>	3	0.38%		
<i>Planothidium frequentissimum</i>	22	2.75%		
<i>Planothidium lanceolatum</i>	4	0.50%		
<i>Pseudostaurosira brevistriata</i>	3	0.38%		
<i>Reimeria sinuata</i>	1	0.13%		
<i>Rhoicosphenia abbreviata</i>	3	0.38%		
<i>Sellaphora nigri</i>	13	1.63%		
<i>Staurosira construens</i> v. <i>venter</i>	27	3.38%		
<i>Staurosirella leptostauron</i>	6	0.75%		
<i>Staurosirella pinnata</i>	2	0.25%		
<i>Synedra mazamaensis</i>	9	1.13%		
<i>Ulnaria contracta</i>	1	0.13%		
<i>Ulnaria ulna</i>	4	0.50%		
Sample Count	800			

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM007

RAI No.: MM16BBM007

Sta. Name: Little Sheep Creek #7

Client ID: AQ7

Date Coll.: 7/14/2016

No Jars: 1

STORET ID:

Sample Notes: 5738 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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## Diatoms

### Bacillariophyta

<i>Achnantheidium affine</i>	1	0.12%		
<i>Achnantheidium deflexum</i>	6	0.75%		
<i>Achnantheidium gracillimum</i>	5	0.62%		
<i>Achnantheidium minutissimum</i>	155	19.33%		
<i>Amphora copulata</i>	1	0.12%		
<i>Amphora pediculus</i>	4	0.50%		
<i>Caloneis tenuis</i>	1	0.12%		
<i>Cocconeis placentula sensu lato</i>	22	2.74%		
<i>Craticula accomoda</i>	1	0.12%		
<i>Craticula molestiformis</i>	2	0.25%		
<i>Cymbella affinis</i>	31	3.87%		
<i>Denticula kuetzingii</i>	1	0.12%		
<i>Diatoma moniliformis</i>	28	3.49%		
<i>Encyonema caespitosum</i>	2	0.25%		
<i>Encyonema minutum</i>	2	0.25%		
<i>Encyonema reichardtii</i>	1	0.12%		
<i>Encyonema silesiacum</i>	24	2.99%		
<i>Encyonopsis subminuta</i>	1	0.12%		
<i>Fragilaria capucina</i>	14	1.75%		
<i>Fragilaria capucina v. gracilis</i>	6	0.75%		
<i>Fragilaria lapponica</i>	4	0.50%		
<i>Fragilaria vaucheriae</i>	5	0.62%		
<i>Geissleria punctifera</i>	2	0.25%		
<i>Gomphoneis minuta</i>	1	0.12%		
<i>Gomphonema angustatum</i>	5	0.62%		
<i>Gomphonema kobayasii</i>	1	0.12%		
<i>Gomphonema micropus</i>	1	0.12%		
<i>Gomphonema minusculum</i>	1	0.12%		
<i>Gomphonema minutum</i>	1	0.12%		
<i>Gomphonema parvulum</i>	4	0.50%		
<i>Meridion circulare</i>	2	0.25%		
<i>Meridion circulare v. constrictum</i>	1	0.12%		
<i>Navicula capitatoradiata</i>	5	0.62%		
<i>Navicula caterva</i>	12	1.50%		
<i>Navicula cryptocephala</i>	1	0.12%		
<i>Navicula cryptotenella</i>	1	0.12%		
<i>Navicula reichardtiana</i>	5	0.62%		
<i>Navicula tripunctata</i>	5	0.62%		
<i>Nitzschia archibaldii</i>	2	0.25%		
<i>Nitzschia dissipata</i>	5	0.62%		
<i>Nitzschia fonticola</i>	9	1.12%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM007

RAI No.: MM16BBM007

Sta. Name: Little Sheep Creek #7

Client ID: AQ7

Date Coll.: 7/14/2016

No Jars: 1

STORET ID:

Sample Notes: 5738 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
<i>Nitzschia paleacea</i>	12	1.50%		
<i>Nitzschia perminuta</i>	1	0.12%		
<i>Nitzschia pura</i>	23	2.87%		
<i>Nitzschia subtilis</i>	1	0.12%		
<i>Opephora olsenii</i>	1	0.12%		
<i>Planothidium dubium</i>	3	0.37%		
<i>Planothidium frequentissimum</i>	8	1.00%		
<i>Reimeria sinuata</i>	3	0.37%		
<i>Sellaphora nigri</i>	9	1.12%		
<i>Stauroneis separanda</i>	1	0.12%		
<i>Stausira construens v. venter</i>	141	17.58%		
<i>Stausirella leptostauron</i>	76	9.48%		
<i>Stausirella pinnata</i>	139	17.33%		
<i>Surirella brebissonii v. kuetzingii</i>	2	0.25%		
<i>Ulnaria ulna</i>	1	0.12%		

Sample Count 802



# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM008

RAI No.: MM16BBM008

Sta. Name: Little Sheep Creek #8

Client ID: AQ8

Date Coll.: 7/12/2016

No Jars: 1

STORET ID:

Sample Notes: 5806 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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## Diatoms

### Bacillariophyta

<i>Achnantheidium gracillimum</i>	4	0.50%		
<i>Achnantheidium minutissimum</i>	34	4.25%		
<i>Adlafia minuscula</i>	12	1.50%		
<i>Amphipleura pellucida</i>	2	0.25%		
<i>Amphora pediculus</i>	9	1.13%		
<i>Caloneis bacillum</i>	8	1.00%		
<i>Cocconeis pediculus</i>	2	0.25%		
<i>Cocconeis placentula sensu lato</i>	65	8.13%		
<i>Craticula acidoclinata</i>	1	0.13%		
<i>Cymbella affinis</i>	9	1.13%		
<i>Diploneis oblongella</i>	2	0.25%		
<i>Encyonema minutum</i>	11	1.38%		
<i>Encyonema obscurum</i>	2	0.25%		
<i>Encyonema silesiacum</i>	10	1.25%		
<i>Epithemia adnata</i>	2	0.25%		
<i>Fistulifera saprophila</i>	3	0.38%		
<i>Fragilaria capucina</i>	3	0.38%		
<i>Fragilariforma</i> sp.	2	0.25%		
<i>Frustulia vulgaris</i>	1	0.13%		
<i>Gomphoneis olivaceum</i>	1	0.13%		
<i>Gomphonema</i> sp.	10	1.25%		
<i>Gomphonema micropus</i>	4	0.50%		
<i>Gomphonema minutum</i>	8	1.00%		
<i>Gomphonema olivaceoides</i>	6	0.75%		
<i>Gomphonema parvulum</i>	8	1.00%		
<i>Mayamaea atomus</i>	9	1.13%		
<i>Meridion circulare</i>	1	0.13%		
<i>Navicula</i> sp.	6	0.75%		
<i>Navicula aitchelbee</i>	2	0.25%		
<i>Navicula antonii</i>	1	0.13%		
<i>Navicula capitatoradiata</i>	20	2.50%		
<i>Navicula caterva</i>	20	2.50%		
<i>Navicula cryptocephala</i>	8	1.00%		
<i>Navicula erifuga</i>	2	0.25%		
<i>Navicula hustedtii</i>	4	0.50%		
<i>Navicula recens</i>	2	0.25%		
<i>Navicula reichardtiana</i>	19	2.38%		
<i>Navicula tripunctata</i>	10	1.25%		
<i>Navicula trivialis</i>	1	0.13%		
<i>Nitzschia</i> sp.	8	1.00%		
<i>Nitzschia acicularis</i>	61	7.63%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM008

RAI No.: MM16BBM008

Sta. Name: Little Sheep Creek #8

Client ID: AQ8

Date Coll.: 7/12/2016

No Jars: 1

STORET ID:

Sample Notes: 5806 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
<i>Nitzschia archibaldii</i>	72	9.00%		
<i>Nitzschia communis</i>	4	0.50%		
<i>Nitzschia dissipata</i>	52	6.50%		
<i>Nitzschia dissipata v. media</i>	8	1.00%		
<i>Nitzschia draveillensis</i>	29	3.63%		
<i>Nitzschia fonticola</i>	2	0.25%		
<i>Nitzschia linearis</i>	8	1.00%		
<i>Nitzschia palea</i>	24	3.00%		
<i>Nitzschia paleacea</i>	31	3.88%		
<i>Nitzschia perminuta</i>	2	0.25%		
<i>Nitzschia pusilla</i>	2	0.25%		
<i>Nitzschia recta</i>	3	0.38%		
<i>Nitzschia sociabilis</i>	1	0.13%		
<i>Nitzschia subtilis</i>	10	1.25%		
<i>Pinnularia sp.</i>	2	0.25%		
<i>Planothidium dubium</i>	2	0.25%		
<i>Planothidium frequentissimum</i>	22	2.75%		
<i>Platessa conspicua</i>	2	0.25%		
<i>Reimeria sinuata</i>	9	1.13%		
<i>Reimeria uniseriata</i>	1	0.13%		
<i>Rhoicosphenia abbreviata</i>	2	0.25%		
<i>Rhopalodia gibba</i>	4	0.50%		
<i>Sellaphora nigri</i>	31	3.88%		
<i>Stauroneis smithii</i>	2	0.25%		
<i>Stausosira construens v. venter</i>	24	3.00%		
<i>Stausosirella pinnata</i>	3	0.38%		
<i>Surirella sp.</i>	2	0.25%		
<i>Surirella angusta</i>	4	0.50%		
<i>Surirella brebissonii v. kuetzingii</i>	4	0.50%		
<i>Synedra famelica</i>	2	0.25%		
<i>Ulnaria acus</i>	1	0.13%		
<i>Ulnaria contracta</i>	2	0.25%		
<i>Ulnaria ulna</i>	40	5.00%		

Sample Count 800

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM009

RAI No.: MM16BBM009

Sta. Name: Sheep Creek #10

Client ID: AQ10

Date Coll.: 7/13/2016

No Jars: 1

STORET ID:

Sample Notes: 5420 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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## Diatoms

### Bacillariophyta

<i>Achnantheidium exiguum</i>	1	0.12%		
<i>Achnantheidium gracillimum</i>	2	0.25%		
<i>Achnantheidium minutissimum</i>	83	10.34%		
<i>Adlafia minuscula</i>	2	0.25%		
<i>Amphipleura pellucida</i>	5	0.62%		
<i>Amphora pediculus</i>	30	3.74%		
<i>Caloneis bacillum</i>	1	0.12%		
<i>Cocconeis pediculus</i>	25	3.11%		
<i>Cocconeis placentula sensu lato</i>	19	2.37%		
<i>Cocconeis pseudolineata</i>	1	0.12%		
<i>Cyclotella meneghiniana</i>	1	0.12%		
<i>Cymbella affinis</i>	4	0.50%		
<i>Diatoma mesodon</i>	2	0.25%		
<i>Diatoma moniliformis</i>	112	13.95%		
<i>Encyonema minutum</i>	21	2.62%		
<i>Encyonema reichardtii</i>	4	0.50%		
<i>Encyonema silesiacum</i>	13	1.62%		
<i>Encyonema yellowstonianum</i>	1	0.12%		
<i>Encyonopsis subminuta</i>	11	1.37%		
<i>Epithemia sorex</i>	22	2.74%		
<i>Epithemia turgida</i>	2	0.25%		
<i>Fallacia lenzii</i>	1	0.12%		
<i>Fragilaria sp.</i>	1	0.12%		
<i>Fragilaria capucina</i>	2	0.25%		
<i>Fragilaria vaucheriae</i>	6	0.75%		
<i>Frustulia amphipleuroides</i>	1	0.12%		
<i>Geissleria acceptata</i>	1	0.12%		
<i>Gomphoneis erienne</i>	3	0.37%		
<i>Gomphoneis minuta</i>	1	0.12%		
<i>Gomphoneis olivaceum</i>	15	1.87%		
<i>Gomphonema sp.</i>	2	0.25%		
<i>Gomphonema angustatum</i>	1	0.12%		
<i>Gomphonema kobayasii</i>	6	0.75%		
<i>Gomphonema minutum</i>	6	0.75%		
<i>Gomphonema parvulum</i>	1	0.12%		
<i>Karayevia clevei</i>	1	0.12%		
<i>Luticola mutica</i>	1	0.12%		
<i>Mayamaea atomus</i>	3	0.37%		
<i>Meridion circulare</i>	6	0.75%		
<i>Navicula sp.</i>	1	0.12%		
<i>Navicula capitatoradiata</i>	22	2.74%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM009

RAI No.: MM16BBM009

Sta. Name: Sheep Creek #10

Client ID: AQ10

Date Coll.: 7/13/2016

No Jars: 1

STORET ID:

Sample Notes: 5420 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
<i>Navicula caterva</i>	9	1.12%		
<i>Navicula cryptotenella</i>	35	4.36%		
<i>Navicula cryptotenelloides</i>	2	0.25%		
<i>Navicula densilineolata</i>	2	0.25%		
<i>Navicula menisculus</i>	2	0.25%		
<i>Navicula reichardtiana</i>	8	1.00%		
<i>Navicula tripunctata</i>	33	4.11%		
<i>Nitzschia</i> sp.	4	0.50%		
<i>Nitzschia acicularis</i>	5	0.62%		
<i>Nitzschia archibaldii</i>	31	3.86%		
<i>Nitzschia dissipata</i>	6	0.75%		
<i>Nitzschia dissipata v. media</i>	3	0.37%		
<i>Nitzschia fonticola</i>	24	2.99%		
<i>Nitzschia gracilis</i>	1	0.12%		
<i>Nitzschia inconspicua</i>	2	0.25%		
<i>Nitzschia lacuum</i>	12	1.49%		
<i>Nitzschia linearis</i>	2	0.25%		
<i>Nitzschia palea</i>	4	0.50%		
<i>Nitzschia paleacea</i>	12	1.49%		
<i>Nitzschia perminuta</i>	4	0.50%		
<i>Nitzschia pura</i>	6	0.75%		
<i>Nitzschia pusilla</i>	2	0.25%		
<i>Nitzschia sublinearis</i>	3	0.37%		
<i>Placoneis constans v. symmetrica</i>	2	0.25%		
<i>Planothidium dubium</i>	2	0.25%		
<i>Planothidium frequentissimum</i>	19	2.37%		
<i>Planothidium lanceolatum</i>	7	0.87%		
<i>Platessa conspicua</i>	2	0.25%		
<i>Pseudostaurosira parasitica</i>	3	0.37%		
<i>Reimeria sinuata</i>	3	0.37%		
<i>Reimeria uniseriata</i>	1	0.12%		
<i>Rhoicosphenia abbreviata</i>	2	0.25%		
<i>Sellaphora nigri</i>	39	4.86%		
<i>Staurosira construens v. venter</i>	26	3.24%		
<i>Staurosirella leptostauron</i>	8	1.00%		
<i>Staurosirella pinnata</i>	20	2.49%		
<i>Surirella</i> sp.	1	0.12%		
<i>Surirella brebissonii v. kuetzingii</i>	1	0.12%		
<i>Synedra mazamaensis</i>	4	0.50%		
<i>Synedra rumpens</i>	1	0.12%		
<i>Ulnaria ulna</i>	7	0.87%		

Sample Count 803

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM010

RAI No.: MM16BBM010

Sta. Name: Sheep Creek #11

Client ID: AQ11

Date Coll.: 7/13/2016

No Jars: 1

STORET ID:

Sample Notes: 5350 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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## Diatoms

### Bacillariophyta

<i>Achnantheidium affine</i>	1	0.13%		
<i>Achnantheidium deflexum</i>	1	0.13%		
<i>Achnantheidium gracillimum</i>	3	0.38%		
<i>Achnantheidium minutissimum</i>	98	12.25%		
<i>Adlafia minuscula</i>	3	0.38%		
<i>Amphipleura pellucida</i>	1	0.13%		
<i>Amphora copulata</i>	5	0.63%		
<i>Amphora inariensis</i>	4	0.50%		
<i>Amphora ovalis</i>	3	0.38%		
<i>Amphora pediculus</i>	19	2.38%		
<i>Caloneis bacillum</i>	3	0.38%		
<i>Chamaepinnularia bremensis</i>	3	0.38%		
<i>Cocconeis pediculus</i>	27	3.38%		
<i>Cocconeis placentula sensu lato</i>	24	3.00%		
<i>Cyclotella meneghiniana</i>	1	0.13%		
<i>Cymbella affinis</i>	5	0.63%		
<i>Diatoma moniliformis</i>	100	12.50%		
<i>Encyonema caespitosum</i>	3	0.38%		
<i>Encyonema leibleinii</i>	1	0.13%		
<i>Encyonema minutum</i>	11	1.38%		
<i>Encyonema reichardtii</i>	4	0.50%		
<i>Encyonema silesiacum</i>	40	5.00%		
<i>Encyonopsis subminuta</i>	20	2.50%		
<i>Epithemia adnata</i>	3	0.38%		
<i>Epithemia sorex</i>	7	0.88%		
<i>Epithemia turgida</i>	3	0.38%		
<i>Eunotia muscicola</i>	1	0.13%		
<i>Fistulifera saprophila</i>	1	0.13%		
<i>Fragilaria alpestris</i>	1	0.13%		
<i>Fragilaria capucina</i>	5	0.63%		
<i>Fragilaria vaucheriae</i>	4	0.50%		
<i>Fragilariforma nitzschoides</i>	3	0.38%		
<i>Gomphoneis eriose</i>	3	0.38%		
<i>Gomphoneis minuta</i>	3	0.38%		
<i>Gomphoneis olivaceum</i>	9	1.13%		
<i>Gomphonema angustatum</i>	3	0.38%		
<i>Gomphonema kobayasii</i>	1	0.13%		
<i>Gomphonema minutum</i>	9	1.13%		
<i>Gyrosigma attenuatum</i>	3	0.38%		
<i>Mayamaea atomus</i>	3	0.38%		
<i>Meridion circulare</i>	5	0.63%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM010

RAI No.: MM16BBM010

Sta. Name: Sheep Creek #11

Client ID: AQ11

Date Coll.: 7/13/2016

No Jars: 1

STORET ID:

Sample Notes: 5350 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
<i>Navicula capitatoradiata</i>	27	3.38%		
<i>Navicula caterva</i>	41	5.13%		
<i>Navicula cryptocephala</i>	1	0.13%		
<i>Navicula cryptotenella</i>	21	2.63%		
<i>Navicula cryptotenelloides</i>	1	0.13%		
<i>Navicula menisculus</i>	5	0.63%		
<i>Navicula radiosa</i>	1	0.13%		
<i>Navicula reichardtiana</i>	8	1.00%		
<i>Navicula tripunctata</i>	19	2.38%		
<i>Nitzschia acicularis</i>	4	0.50%		
<i>Nitzschia archibaldii</i>	27	3.38%		
<i>Nitzschia dissipata</i>	8	1.00%		
<i>Nitzschia dissipata v. media</i>	1	0.13%		
<i>Nitzschia fonticola</i>	5	0.63%		
<i>Nitzschia inconspicua</i>	5	0.63%		
<i>Nitzschia lacuum</i>	8	1.00%		
<i>Nitzschia liebethruthii</i>	4	0.50%		
<i>Nitzschia linearis</i>	1	0.13%		
<i>Nitzschia palea</i>	5	0.63%		
<i>Nitzschia paleacea</i>	15	1.88%		
<i>Nitzschia perminuta</i>	3	0.38%		
<i>Nitzschia pura</i>	13	1.63%		
<i>Nitzschia recta</i>	1	0.13%		
<i>Nitzschia sublinearis</i>	1	0.13%		
<i>Pinnularia borealis</i>	1	0.13%		
<i>Planothidium dubium</i>	8	1.00%		
<i>Planothidium frequentissimum</i>	21	2.63%		
<i>Planothidium lanceolatum</i>	3	0.38%		
<i>Platessa conspicua</i>	4	0.50%		
<i>Pseudostaurosira parasitica</i>	1	0.13%		
<i>Reimeria sinuata</i>	5	0.63%		
<i>Reimeria uniseriata</i>	1	0.13%		
<i>Rhoicosphenia abbreviata</i>	3	0.38%		
<i>Rhopalodia gibba</i>	3	0.38%		
<i>Sellaphora nigri</i>	20	2.50%		
<i>Sellaphora seminulum</i>	3	0.38%		
<i>Simonsenia delognei</i>	1	0.13%		
<i>Staurosira construens v. venter</i>	12	1.50%		
<i>Staurosirella leptostauron</i>	12	1.50%		
<i>Staurosirella pinnata</i>	24	3.00%		
<i>Surirella brebissonii v. kuetzingii</i>	1	0.13%		
<i>Synedra mazamaensis</i>	1	0.13%		
<i>Ulnaria ulna</i>	4	0.50%		

# Taxa Listing

Project ID: MM16BBM

RAI No.: MM16BBM010

RAI No.: MM16BBM010

Sta. Name: Sheep Creek #11

Client ID: AQ11

Date Coll.: 7/13/2016

No Jars: 1

STORET ID:

Sample Notes: 5350 ft

Taxonomic Name	Count	PRA	Cell Count	Comment
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Sample Count	800			
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**Non-diatom algae study: Black Butte Mine September 2016**  
**Non-Diatom Algae Data**

**Determinations by**  
**Rhithron Associates, Inc.**

RAI Sample ID	Client ID	Station Name	Sample Date	Taxon	Division	Relative Abundance	Biovolume Rank
MM16BBM001	AQ1	Sheep Creek #1	7/14/2016	Diatoms	Bacillariophyta	A	1
MM16BBM001	AQ1	Sheep Creek #1	7/14/2016	<i>Phormidium</i>	Cyanophyta	VC	2
MM16BBM001	AQ1	Sheep Creek #1	7/14/2016	<i>Homoeothrix</i>	Cyanophyta	VC	3
MM16BBM001	AQ1	Sheep Creek #1	7/14/2016	<i>Pseudanabaena</i>	Cyanophyta	C	4
MM16BBM001	AQ1	Sheep Creek #1	7/14/2016	<i>Nostoc</i>	Cyanophyta	C	5
MM16BBM001	AQ1	Sheep Creek #1	7/14/2016	<i>Ankistrodesmus</i>	Chlorophyta	C	6
MM16BBM001	AQ1	Sheep Creek #1	7/14/2016	<i>Closterium</i>	Chlorophyta	R	7
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Tolypothrix</i>	Cyanophyta	VC	1
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	Diatoms	Bacillariophyta	A	2
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Phormidium</i>	Cyanophyta	C	3
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Calothrix</i>	Cyanophyta	C	4
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Homoeothrix</i>	Cyanophyta	C	5
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Pseudanabaena</i>	Cyanophyta	C	6
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Heteroleibleinia</i>	Cyanophyta	C	7
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Stigeoclonium</i>	Chlorophyta	R	8
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Mougeotia</i>	Chlorophyta	R	9
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Nostoc</i>	Cyanophyta	R	10
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Closterium</i>	Chlorophyta	R	11
MM16BBM002	AQ2	Sheep Creek #2	7/12/2016	<i>Ankistrodesmus</i>	Chlorophyta	R	12
MM16BBM003	AQ3	Sheep Creek #3	7/14/2016	Diatoms	Bacillariophyta	A	1
MM16BBM003	AQ3	Sheep Creek #3	7/14/2016	<i>Phormidium</i>	Cyanophyta	VC	2
MM16BBM003	AQ3	Sheep Creek #3	7/14/2016	<i>Ulothrix</i>	Chlorophyta	C	3
MM16BBM003	AQ3	Sheep Creek #3	7/14/2016	<i>Nostoc</i>	Cyanophyta	C	4
MM16BBM003	AQ3	Sheep Creek #3	7/14/2016	<i>Cosmarium</i>	Chlorophyta	C	5
MM16BBM003	AQ3	Sheep Creek #3	7/14/2016	<i>Homoeothrix</i>	Cyanophyta	C	6
MM16BBM003	AQ3	Sheep Creek #3	7/14/2016	<i>Stigeoclonium</i>	Chlorophyta	R	7
MM16BBM003	AQ3	Sheep Creek #3	7/14/2016	<i>Closterium</i>	Chlorophyta	R	8
MM16BBM003	AQ3	Sheep Creek #3	7/14/2016	<i>Ankistrodesmus</i>	Chlorophyta	R	9
MM16BBM004	AQ4	Sheep Creek #4	7/14/2016	Diatoms	Bacillariophyta	A	1
MM16BBM004	AQ4	Sheep Creek #4	7/14/2016	<i>Phormidium</i>	Cyanophyta	VC	2
MM16BBM004	AQ4	Sheep Creek #4	7/14/2016	<i>Homoeothrix</i>	Cyanophyta	VC	3
MM16BBM004	AQ4	Sheep Creek #4	7/14/2016	<i>Calothrix</i>	Cyanophyta	R	4
MM16BBM004	AQ4	Sheep Creek #4	7/14/2016	<i>Closterium</i>	Chlorophyta	R	5
MM16BBM004	AQ4	Sheep Creek #4	7/14/2016	<i>Stigeoclonium</i>	Chlorophyta	R	6
MM16BBM005	AQ5	Tenderfoot Creek #5	7/13/2016	Diatoms	Bacillariophyta	VC	1
MM16BBM005	AQ5	Tenderfoot Creek #5	7/13/2016	<i>Nostoc</i>	Cyanophyta	A	2



**Non-diatom algae study: Black Butte Mine September 2016**  
**Non-Diatom Algae Data**

**Determinations by**  
**Rhithron Associates, Inc.**

RAI Sample ID	Client ID	Station Name	Sample Date	Taxon	Division	Relative Abundance	Biovolume Rank
MM16BBM005	AQ5	Tenderfoot Creek #5	7/13/2016	<i>Anabaena</i>	Cyanophyta	C	3
MM16BBM005	AQ5	Tenderfoot Creek #5	7/13/2016	<i>Homoeothrix</i>	Cyanophyta	C	4
MM16BBM005	AQ5	Tenderfoot Creek #5	7/13/2016	<i>Closterium</i>	Chlorophyta	R	5
MM16BBM005	AQ5	Tenderfoot Creek #5	7/13/2016	<i>Pseudanabaena</i>	Cyanophyta	R	6
MM16BBM005	AQ5	Tenderfoot Creek #5	7/13/2016	<i>Stigeoclonium</i>	Chlorophyta	R	7
MM16BBM006	AQ6	Tenderfoot Creek #6	7/13/2016	Diatoms	Bacillariophyta	A	1
MM16BBM006	AQ6	Tenderfoot Creek #6	7/13/2016	<i>Nostoc</i>	Cyanophyta	A	2
MM16BBM006	AQ6	Tenderfoot Creek #6	7/13/2016	<i>Tolypothrix</i>	Cyanophyta	C	3
MM16BBM006	AQ6	Tenderfoot Creek #6	7/13/2016	<i>Anabaena</i>	Cyanophyta	C	4
MM16BBM006	AQ6	Tenderfoot Creek #6	7/13/2016	<i>Homoeothrix</i>	Cyanophyta	VC	5
MM16BBM006	AQ6	Tenderfoot Creek #6	7/13/2016	<i>Closterium</i>	Chlorophyta	C	6
MM16BBM007	AQ7	Little Sheep Creek #7	7/14/2016	Diatoms	Bacillariophyta	A	1
MM16BBM007	AQ7	Little Sheep Creek #7	7/14/2016	<i>Phormidium</i>	Cyanophyta	VC	2
MM16BBM007	AQ7	Little Sheep Creek #7	7/14/2016	<i>Homoeothrix</i>	Cyanophyta	VC	3
MM16BBM007	AQ7	Little Sheep Creek #7	7/14/2016	<i>Ulothrix</i>	Chlorophyta	C	4
MM16BBM007	AQ7	Little Sheep Creek #7	7/14/2016	<i>Stigeoclonium</i>	Chlorophyta	C	5
MM16BBM007	AQ7	Little Sheep Creek #7	7/14/2016	<i>Cladophora</i>	Chlorophyta	R	6
MM16BBM007	AQ7	Little Sheep Creek #7	7/14/2016	<i>Scenedesmus</i>	Chlorophyta	R	7
MM16BBM007	AQ7	Little Sheep Creek #7	7/14/2016	<i>Ankistrodesmus</i>	Chlorophyta	R	8
MM16BBM007	AQ7	Little Sheep Creek #7	7/14/2016	<i>Pseudanabaena</i>	Cyanophyta	R	9
MM16BBM008	AQ8	Little Sheep Creek #8	7/12/2016	Diatoms	Bacillariophyta	A	1
MM16BBM008	AQ8	Little Sheep Creek #8	7/12/2016	<i>Cladophora</i>	Chlorophyta	C	2
MM16BBM008	AQ8	Little Sheep Creek #8	7/12/2016	<i>Ulothrix</i>	Chlorophyta	C	3
MM16BBM008	AQ8	Little Sheep Creek #8	7/12/2016	<i>Oedogonium</i>	Chlorophyta	C	4
MM16BBM008	AQ8	Little Sheep Creek #8	7/12/2016	<i>Chamaesiphon</i>	Cyanophyta	C	5
MM16BBM008	AQ8	Little Sheep Creek #8	7/12/2016	<i>Heteroleibleinia</i>	Cyanophyta	C	6
MM16BBM008	AQ8	Little Sheep Creek #8	7/12/2016	<i>Closterium</i>	Chlorophyta	R	7
MM16BBM008	AQ8	Little Sheep Creek #8	7/12/2016	<i>Cosmarium</i>	Chlorophyta	R	8
MM16BBM008	AQ8	Little Sheep Creek #8	7/12/2016	<i>Tribonema</i>	Chrysophyta	R	9
MM16BBM009	AQ10	Sheep Creek #10	7/13/2016	<i>Cladophora</i>	Chlorophyta	VC	1
MM16BBM009	AQ10	Sheep Creek #10	7/13/2016	Diatoms	Bacillariophyta	A	2
MM16BBM009	AQ10	Sheep Creek #10	7/13/2016	<i>Heteroleibleinia</i>	Cyanophyta	VC	3
MM16BBM009	AQ10	Sheep Creek #10	7/13/2016	<i>Tolypothrix</i>	Cyanophyta	C	4
MM16BBM009	AQ10	Sheep Creek #10	7/13/2016	<i>Phormidium</i>	Cyanophyta	C	5
MM16BBM009	AQ10	Sheep Creek #10	7/13/2016	<i>Chamaesiphon</i>	Cyanophyta	C	6
MM16BBM009	AQ10	Sheep Creek #10	7/13/2016	<i>Homoeothrix</i>	Cyanophyta	C	7

**Non-diatom algae study: Black Butte Mine September 2016**  
**Non-Diatom Algae Data**

**Determinations by  
Rhithron Associates, Inc.**

RAI Sample ID	Client ID	Station Name	Sample Date	Taxon	Division	Relative Abundance	Biovolume Rank
MM16BBM009	AQ10	Sheep Creek #10	7/13/2016	<i>Closterium</i>	Chlorophyta	R	8
MM16BBM009	AQ10	Sheep Creek #10	7/13/2016	<i>Pseudanabaena</i>	Cyanophyta	R	9
MM16BBM010	AQ11	Sheep Creek #11	7/13/2016	<i>Cladophora</i>	Chlorophyta	C	1
MM16BBM010	AQ11	Sheep Creek #11	7/13/2016	Diatoms	Bacillariophyta	A	2
MM16BBM010	AQ11	Sheep Creek #11	7/13/2016	<i>Homoeothrix</i>	Cyanophyta	VC	3
MM16BBM010	AQ11	Sheep Creek #11	7/13/2016	<i>Tolypothrix</i>	Cyanophyta	C	4
MM16BBM010	AQ11	Sheep Creek #11	7/13/2016	<i>Heteroleibleinia</i>	Cyanophyta	VC	5
MM16BBM010	AQ11	Sheep Creek #11	7/13/2016	<i>Phormidium</i>	Cyanophyta	C	6
MM16BBM010	AQ11	Sheep Creek #11	7/13/2016	<i>Nostoc</i>	Cyanophyta	C	7

**Appendix F**  
**Fish Tissue Analysis Report**



# ANALYTICAL SUMMARY REPORT

July 20, 2016

Stag Benthics  
1671 Old Clyde Rd  
Clyde, NC 28721

Work Order: H16070161      Quote ID: H1200 - Fish Tissue  
Project Name: Tintina Resources

Energy Laboratories Inc Helena MT received the following 4 samples for Stag Benthics on 7/12/2016 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H16070161-001	Sheep #1	07/11/16 12:00	07/12/16	Fish	Metals by ICP/ICPMS, Total Mercury in Solid By CVAA Moisture Digestion, Total Metals Digestion, Mercury by CVAA Soil Preparation
H16070161-002	Sheep #4	07/11/16 10:00	07/12/16	Fish	Metals by ICP/ICPMS, Total Mercury in Solid By CVAA Moisture Digestion, Total Metals Digestion, Mercury by CVAA
H16070161-003	L. Sheep #7	07/11/16 11:00	07/12/16	Fish	Same As Above
H16070161-004	Sheep #2	07/11/16 13:00	07/12/16	Fish	Same As Above

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:



### LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

**Client:** Stag Benthics  
**Project:** Tintina Resources  
**Lab ID:** H16070161-001  
**Client Sample ID:** Sheep #1

**Report Date:** 07/20/16  
**Collection Date:** 07/11/16 12:00  
**Date Received:** 07/12/16  
**Matrix:** Fish

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>PHYSICAL CHARACTERISTICS</b>							
Moisture (As Received)	75.7	wt%		0.2		D2974	07/20/16 08:20 / rgk
<b>3050 EXTRACTABLE METALS</b>							
Cadmium	ND	mg/kg		1		SW6020	07/18/16 15:19 / dck
Copper	2	mg/kg		1		SW6020	07/18/16 15:19 / dck
Iron	204	mg/kg		5		SW6010B	07/18/16 15:10 / sld
Lead	ND	mg/kg		1		SW6020	07/18/16 15:19 / dck
Manganese	8	mg/kg		1		SW6020	07/18/16 15:19 / dck
Nickel	ND	mg/kg		1		SW6020	07/18/16 15:19 / dck
Selenium	1	mg/kg		1		SW6020	07/18/16 15:19 / dck
Zinc	25	mg/kg		1		SW6010B	07/18/16 15:10 / sld
<b>METALS, TOTAL</b>							
Mercury	ND	mg/kg		0.50		SW7471B	07/18/16 13:06 / rgk

**Report Definitions:** RL - Analyte reporting limit.  
QCL - Quality control limit.

MCL - Maximum contaminant level.  
ND - Not detected at the reporting limit.



### LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

**Client:** Stag Benthics  
**Project:** Tintina Resources  
**Lab ID:** H16070161-002  
**Client Sample ID:** Sheep #4

**Report Date:** 07/20/16  
**Collection Date:** 07/11/16 10:00  
**Date Received:** 07/12/16  
**Matrix:** Fish

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>PHYSICAL CHARACTERISTICS</b>							
Moisture (As Received)	76.5	wt%		0.2		D2974	07/20/16 08:20 / rgk
<b>3050 EXTRACTABLE METALS</b>							
Cadmium	ND	mg/kg		1		SW6020	07/18/16 15:22 / dck
Copper	1	mg/kg		1		SW6020	07/18/16 15:22 / dck
Iron	177	mg/kg		5		SW6010B	07/18/16 15:14 / sld
Lead	ND	mg/kg		1		SW6020	07/18/16 15:22 / dck
Manganese	4	mg/kg		1		SW6020	07/18/16 15:22 / dck
Nickel	ND	mg/kg		1		SW6020	07/18/16 15:22 / dck
Selenium	3	mg/kg		1		SW6020	07/18/16 15:22 / dck
Zinc	18	mg/kg		1		SW6010B	07/18/16 15:14 / sld
<b>METALS, TOTAL</b>							
Mercury	ND	mg/kg		0.50		SW7471B	07/18/16 13:08 / rgk

**Report Definitions:** RL - Analyte reporting limit.  
QCL - Quality control limit.

MCL - Maximum contaminant level.  
ND - Not detected at the reporting limit.



### LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

**Client:** Stag Benthics  
**Project:** Tintina Resources  
**Lab ID:** H16070161-003  
**Client Sample ID:** L. Sheep #7

**Report Date:** 07/20/16  
**Collection Date:** 07/11/16 11:00  
**Date Received:** 07/12/16  
**Matrix:** Fish

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>PHYSICAL CHARACTERISTICS</b>							
Moisture (As Received)	78.2	wt%		0.2		D2974	07/20/16 08:20 / rgk
<b>3050 EXTRACTABLE METALS</b>							
Cadmium	ND	mg/kg		1		SW6020	07/18/16 15:25 / dck
Copper	1	mg/kg		1		SW6020	07/18/16 15:25 / dck
Iron	275	mg/kg		5		SW6010B	07/18/16 15:18 / sld
Lead	ND	mg/kg		1		SW6020	07/18/16 15:25 / dck
Manganese	8	mg/kg		1		SW6020	07/18/16 15:25 / dck
Nickel	ND	mg/kg		1		SW6020	07/18/16 15:25 / dck
Selenium	2	mg/kg		1		SW6020	07/18/16 15:25 / dck
Zinc	24	mg/kg		1		SW6010B	07/18/16 15:18 / sld
<b>METALS, TOTAL</b>							
Mercury	ND	mg/kg		0.50		SW7471B	07/18/16 13:13 / rgk

**Report Definitions:** RL - Analyte reporting limit.  
QCL - Quality control limit.

MCL - Maximum contaminant level.  
ND - Not detected at the reporting limit.



### LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

**Client:** Stag Benthics  
**Project:** Tintina Resources  
**Lab ID:** H16070161-004  
**Client Sample ID:** Sheep #2

**Report Date:** 07/20/16  
**Collection Date:** 07/11/16 13:00  
**Date Received:** 07/12/16  
**Matrix:** Fish

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>PHYSICAL CHARACTERISTICS</b>							
Moisture (As Received)	77.9	wt%		0.2		D2974	07/20/16 08:20 / rgk
<b>3050 EXTRACTABLE METALS</b>							
Cadmium	ND	mg/kg		1		SW6020	07/18/16 15:38 / dck
Copper	1	mg/kg		1		SW6020	07/18/16 15:38 / dck
Iron	171	mg/kg		5		SW6010B	07/18/16 15:40 / sld
Lead	ND	mg/kg		1		SW6020	07/18/16 15:38 / dck
Manganese	7	mg/kg		1		SW6020	07/18/16 15:38 / dck
Nickel	ND	mg/kg		1		SW6020	07/18/16 15:38 / dck
Selenium	2	mg/kg		1		SW6020	07/18/16 15:38 / dck
Zinc	22	mg/kg		1		SW6010B	07/18/16 15:40 / sld
<b>METALS, TOTAL</b>							
Mercury	ND	mg/kg		0.50		SW7471B	07/18/16 13:15 / rgk

**Report Definitions:** RL - Analyte reporting limit.  
QCL - Quality control limit.

MCL - Maximum contaminant level.  
ND - Not detected at the reporting limit.





# QA/QC Summary Report

Prepared by Helena, MT Branch

**Client:** Stag Benthics  
**Project:** Tintina Resources

**Report Date:** 07/20/16  
**Work Order:** H16070161

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method:</b> D2974										Batch: R116928
<b>Lab ID:</b> H16070161-003ADUP		Sample Duplicate								Run: SOIL DRYING OVEN 2_16072 07/20/16 08:20
Moisture (As Received)		78.1	wt%	0.20				0.2	20	

**Qualifiers:**

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.



# QA/QC Summary Report

Prepared by Helena, MT Branch

**Client:** Stag Benthics  
**Project:** Tintina Resources

**Report Date:** 07/20/16  
**Work Order:** H16070161

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method: SW6010B</b>								Analytical Run: ICP2-HE_160718B		
<b>Lab ID: ICV</b>	2	Initial Calibration Verification Standard								07/18/16 09:44
Iron		4.07	mg/L	0.030	102	90	110			
Zinc		0.798	mg/L	0.010	100	90	110			
<b>Lab ID: ICSA</b>	2	Interference Check Sample A								07/18/16 10:23
Iron		185	mg/L	0.030	92	80	120			
Zinc		0.000420	mg/L	0.010		0	0			
<b>Lab ID: ICSAB</b>	2	Interference Check Sample AB								07/18/16 10:27
Iron		186	mg/L	0.030	93	80	120			
Zinc		0.940	mg/L	0.010	94	80	120			
<b>Method: SW6010B</b>								Batch: 33640		
<b>Lab ID: MB-33640</b>	2	Method Blank								07/18/16 14:56
Iron		2	mg/kg	1						
Zinc		ND	mg/kg	0.3						
<b>Lab ID: LFB-33640</b>	2	Laboratory Fortified Blank								07/18/16 15:00
Iron		250	mg/kg	5.0	102	80	120			
Zinc		48.6	mg/kg	1.0	100	80	120			
<b>Lab ID: LFB-33640 DUP</b>	2	Laboratory Fortified Blank Duplicate								07/18/16 15:03
Iron		245	mg/kg	5.0	100	80	120	2.1	20	
Zinc		46.5	mg/kg	1.0	96	80	120	4.5	20	
<b>Lab ID: LCS-33640</b>	2	Laboratory Control Sample								07/18/16 15:07
Iron		14000	mg/kg	5.0	86	51.7	131.9			
Zinc		214	mg/kg	1.0	93	75.3	111.7			
<b>Lab ID: H16070161-003APDS</b>	2	Post Digestion/Distillation Spike								07/18/16 15:25
Iron		745	mg/kg	5.0	91	75	125			
Zinc		116	mg/kg	1.0	90	75	125			
<b>Lab ID: H16070161-003AMS</b>	2	Sample Matrix Spike								07/18/16 15:36
Iron		396	mg/kg	5.0	51	75	125			S
Zinc		68.7	mg/kg	1.0	94	75	125			

- S= Spike recovery outside of QC advisory limits. The recovery in the Laboratory Control Sample was within QC advisory limits. This suggests that the Matrix Spike recover is due to matrix interference.

**Qualifiers:**

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.



# QA/QC Summary Report

Prepared by Helena, MT Branch

**Client:** Stag Benthics  
**Project:** Tintina Resources

**Report Date:** 07/20/16  
**Work Order:** H16070161

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method: SW6020</b>								Analytical Run: ICPMS204-B_160718A		
<b>Lab ID: ICV STD</b>	6	Initial Calibration Verification Standard								07/18/16 13:13
Cadmium		0.0302	mg/L	0.0010	101	90	110			
Copper		0.0612	mg/L	0.0010	102	90	110			
Lead		0.0588	mg/L	0.0010	98	90	110			
Manganese		0.303	mg/L	0.0010	101	90	110			
Nickel		0.0610	mg/L	0.0010	102	90	110			
Selenium		0.0612	mg/L	0.0010	102	90	110			
<b>Lab ID: ICV STD</b>	6	Initial Calibration Verification Standard								07/18/16 14:21
Cadmium		0.0312	mg/L	0.0010	104	90	110			
Copper		0.0644	mg/L	0.0010	107	90	110			
Lead		0.0597	mg/L	0.0010	100	90	110			
Manganese		0.299	mg/L	0.0010	100	90	110			
Nickel		0.0628	mg/L	0.0010	105	90	110			
Selenium		0.0582	mg/L	0.0010	97	90	110			
<b>Method: SW6020</b>								Batch: 33640		
<b>Lab ID: MB-33640</b>	6	Method Blank						Run: ICPMS204-B_160718A		07/18/16 15:06
Cadmium		ND	mg/kg	0.2						
Copper		ND	mg/kg	0.6						
Lead		ND	mg/kg	0.09						
Manganese		ND	mg/kg	0.2						
Nickel		ND	mg/kg	0.1						
Selenium		ND	mg/kg	0.2						
<b>Lab ID: LCS-33640</b>	6	Laboratory Control Sample						Run: ICPMS204-B_160718A		07/18/16 15:09
Cadmium		102	mg/kg	1.0	103	73.9	106.1			
Copper		140	mg/kg	1.0	102	76.6	108.8			
Lead		104	mg/kg	1.0	99	74.4	108.6			
Manganese		444	mg/kg	1.0	102	81.1	116.6			
Nickel		90.0	mg/kg	1.0	104	72.3	105			
Selenium		183	mg/kg	1.0	89	71.2	110.2			
<b>Lab ID: LFB-33640</b>	6	Laboratory Fortified Blank						Run: ICPMS204-B_160718A		07/18/16 15:13
Cadmium		25.5	mg/kg	1.0	105	80	120			
Copper		54.8	mg/kg	1.0	113	80	120			
Lead		51.0	mg/kg	1.0	105	80	120			
Manganese		255	mg/kg	1.0	105	80	120			
Nickel		54.3	mg/kg	1.0	112	80	120			
Selenium		45.4	mg/kg	1.0	94	80	120			
<b>Lab ID: LFB-33640 DUP</b>	6	Sample Duplicate						Run: ICPMS204-B_160718A		07/18/16 15:16
Cadmium		25.7	mg/kg	1.0						
Copper		53.1	mg/kg	1.0						
Lead		49.7	mg/kg	1.0						
Manganese		249	mg/kg	1.0						

**Qualifiers:**

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.



# QA/QC Summary Report

Prepared by Helena, MT Branch

**Client:** Stag Benthics  
**Project:** Tintina Resources

**Report Date:** 07/20/16  
**Work Order:** H16070161

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method: SW6020</b> <span style="float: right;">Batch: 33640</span>										
<b>Lab ID:</b> LFB-33640 DUP	6	Sample Duplicate								
Nickel		52.4	mg/kg	1.0						
Selenium		45.6	mg/kg	1.0						
<b>Lab ID:</b> H16070161-003APDS	6	Post Digestion/Distillation Spike								
										Run: ICPMS204-B_160718A 07/18/16 15:16
Cadmium		250	mg/kg	1.0	100	75	125			
Copper		514	mg/kg	1.0	103	75	125			
Lead		503	mg/kg	1.0	101	75	125			
Manganese		2480	mg/kg	1.0	99	75	125			
Nickel		512	mg/kg	1.0	102	75	125			
Selenium		449	mg/kg	1.0	90	75	125			
<b>Lab ID:</b> H16070161-003AMS	6	Sample Matrix Spike								
										Run: ICPMS204-B_160718A 07/18/16 15:35
Cadmium		26.2	mg/kg	1.0	108	75	125			
Copper		56.0	mg/kg	1.0	114	75	125			
Lead		50.9	mg/kg	1.0	105	75	125			
Manganese		266	mg/kg	1.0	108	75	125			
Nickel		54.2	mg/kg	1.0	112	75	125			
Selenium		47.1	mg/kg	1.0	95	75	125			

**Qualifiers:**

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.



# QA/QC Summary Report

Prepared by Helena, MT Branch

**Client:** Stag Benthics  
**Project:** Tintina Resources

**Report Date:** 07/20/16  
**Work Order:** H16070161

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method: SW7471B</b>								Analytical Run: HGCV201-H_160718A		
<b>Lab ID: ICV</b>		Initial Calibration Verification Standard								07/18/16 12:41
Mercury		0.00099	mg/kg	0.50	99	90	110			
<b>Lab ID: CCV</b>		Continuing Calibration Verification Standard								07/18/16 12:43
Mercury		0.0024	mg/kg	0.50	97	90	110			
<b>Method: SW7471B</b>								Batch: 33641		
<b>Lab ID: MB-33641</b>		Method Blank								07/18/16 12:48
Mercury		ND	mg/kg	0.001						
<b>Lab ID: LCS-33641</b>		Laboratory Control Sample								07/18/16 12:50
Mercury		6.2	mg/kg	0.50	125	71	126.4			
<b>Lab ID: LFB-33641</b>		Laboratory Fortified Blank								07/18/16 12:52
Mercury		0.20	mg/kg	0.50	100	80	120			
<b>Lab ID: LFB-33641 CT</b>		Laboratory Fortified Blank								07/18/16 12:54
Mercury		0.20	mg/kg	0.50	98	80	120			
<b>Lab ID: H16070017-002AMS</b>		Sample Matrix Spike								07/18/16 13:00
Mercury		0.52	mg/kg-dry	0.50	113	80	120			E
<b>Lab ID: H16070017-002AMSD</b>		Sample Matrix Spike Duplicate								07/18/16 13:02
Mercury		0.52	mg/kg-dry	0.50	108	80	120	0.4	20	
<b>Lab ID: H16070161-002AMS</b>		Sample Matrix Spike								07/18/16 13:12
Mercury		0.13	mg/kg	0.50	59	80	120			S

**Qualifiers:**

RL - Analyte reporting limit.

E - Estimated value. Result exceeds the instrument upper quantitation limit.

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.



# Work Order Receipt Checklist

## Stag Benthics

## H16070161

Login completed by: Tracy L. Lorash

Date Received: 7/12/2016

Reviewed by: BL2000\acarlson

Received by: wjj

Reviewed Date: 7/20/2016

Carrier name: Hand Del

Shipping container/cooler in good condition?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on all shipping container(s)/cooler(s)?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on all sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Not Applicable <input type="checkbox"/>
Container/Temp Blank temperature:	4.5°C No Ice		
Water - VOA vials have zero headspace?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Applicable <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Applicable <input checked="" type="checkbox"/>

---

### Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

---

### Contact and Corrective Action Comments:

No collection time on sample bags. Logged in with time from COC. tl 7/12/16





Quote #: H1200

Project Manager: Amanda B. Carlson

Expires: 1/25/2017

### Analytical Quote

David Stagliano

TAT: 7 days

~~Morrison Maierle Inc~~ *Stacy Banthies*  
~~PO Box 6147~~ *1901 Paosta Ave.*  
Helena, MT 59604 1

QC Level: STD

### Project Name: Fish Tissue

Schedule: Fish Tissue

Matrix: Fish

Comments:

Analyses	Method	Reporting Limit	Analyte Price
<b>Soil Preparation</b>			
Soil Preparation	USDA1		\$10.00
REMARKS: Fish Processing			
<b>3050 Extractable Metals</b>			
Metals by ICP/ICPMS, Total			\$80.00
Cadmium	E6010.20	1 mg/kg	**
Copper	E6010.20	1 mg/kg	**
Iron	E6010.20	5 mg/kg	**
Lead	E6010.20	1 mg/kg	**
Manganese	E6010.20	1 mg/kg	**
Nickel	E6010.20	1 mg/kg	**
Selenium	E6010.20	1 mg/kg	**
Zinc	E6010.20	1 mg/kg	**
** Included in Metals by ICP/ICPMS, Total Price			
<b>Metals, Total</b>			
Mercury in Solid By CVAA	SW7471B	0.5 mg/kg	\$10.00
<b>Prep For Fish Tissue</b>			
Digestion, Mercury by CVAA	SW7471B		\$25.00
Digestion, Total Metals	SW3050 B		\$25.00
Schedule Price/Sample:			\$150.00
Number of Samples:			4
Schedule Total:			\$600.00



Schedule Name	Price / Sample	Number of Samples	Schedule Total
Fish Tissue	\$150.00	4	\$600.00
Quote Sub Total:			\$600.00
Discount:			0.00%
Misc Charges:			\$0.00
Quote Total:			\$600.00

**To assure that the quoted analysis and pricing specifications are provided, please include the Quote ID number referenced above on the Chain of Custody or sample submittal documents.**

**Appendix G**  
**Site Habitat and Physical Conditions**

**Appendix G.** Habitat and Water Quality Parameters measured for the Black Butte Project sites visited. na = not visited or sampled during this visit.  
 Proper Functioning Condition = PFC, Functional-At-Risk=FAR, Non-Functioning=NF.

2016	Sheep Creek AQ1			Sheep Creek AQ2			Sheep Creek AQ3			Sheep Creek AQ4			Tenderfoot AQ5			Tenderfoot AQ6			Little Sheep AQ7		
	April	Jul	Sept	April	Jul	Sept	April	Jul	Sept	April	Jul	Sept	April	Jul	Sept	April	Jul	Sept	April	Jul	Sept
Water Temp °C	6.5	14.2	8.7	1.5	12.9	8.1	3.1	15.5	9.5	3.5	14.1	7.5	na	11.3	8.3	na	11.3	8.3	4.5	12.1	8.7
Conductivity (µs/cm)	120	292	228	112	287	221	106	276	211	116	296	225	na	115	97	na	114	97	234	324	298
TDS (ppm)	76	166	112	65	144	102	55	131	108	60	161	112	na	88	55	na	86	55	131	157	142
pH	8	8.1	8.1	7.9	7.9	8	7.8	7.8	7.9	7.8	7.8	8	na	7.85	7.9	na	7.85	7.9	8	8	8.1
PFC	FAR	FAR	FAR	FAR	FAR	FAR	PFC	PFC	FAR	PFC	PFC	PFC	na	FAR	FAR	na	PFC	PFC	FAR	FAR	FAR
BLM HBI	17	17	17	17	17	17	20	22	18	21	21	19	na	18	17	na	19	19	16	17	15
Avg wetted width (m)	19.5	15.0	14.4	11.9	8.2	7.6	12.0	9.0	8.8	11.1	8.0	7.6	na	10.0	9.9	na	11.2	10.2	2.6	2.1	2.2
Avg Left CHD (cm)	43	35	36	45	28	25	45	37	40	44	44	40	na	35	35	na	38	40	31	28	30
Avg Center CHD (cm)	52	46	44	58	33	32	52	46	45	37	37	35	na	40	40	na	42	45	42	33	37
Avg Right CHD (cm)	40	35	37	65	40	38	65	50	52	48	48	44	na	25	25	na	40	37	29	28	30
% Boulder	40	40	40	5	5	5	3	2	1	5	5	5	na	7	7	na	8	8	1	1	1
% Cobble Reach	40	40	40	45	40	40	47	48	49	42	42	42	na	43	43	na	45	45	8	8	8
% Pebble Reach	10	10	10	25	25	25	30	30	30	23	23	20	na	20	20	na	20	20	27	27	27
% Gravel Reach	5	5	5	20	20	20	15	13	13	20	20	15	na	15	15	na	15	15	40	40	40
% Fines in Reach	0	0	0	5	10	10	5	7	7	10	10	10	na	5	5	na	5	5	10	10	10
Livestock Use (CPI)	0	0	0	0	5	11	0	0	8	0	0	12	na	5	5	na	4	4	14	14	14
Avg. Riparian Shade	10	30	30	20	33	30	10	25	25	10	25	25	na	15	15	na	25	25	20	25	25

2016	Sheep Creek AQ10			Sheep Creek AQ11			Little Sheep AQ8			Coon Creek AQ9		
	April	Jul	Sept	April	Jul	Sept	April	Jul	Sept	April	Jul	Sept
Water Temp °C	1.6	12.7	9.4	3.1	13.2	10.1	1.6	10.1	6.4	na	13.6	na
Conductivity (µs/cm)	75	192	211	75	195	215	202	350	306	na	304	na
TDS (ppm)	39	100	108	40	97	111	110	176	156	na	153	na
pH	7.8	7.8	7.8	7.9	7.9	8	7.9	8	8	na	7.5	na
PFC	FAR	FAR	FAR	PFC	PFC	PFC	FAR	FAR	FAR	na	PFC	na
BLM HBI	17	17	17	18	19	18	16	16	15	na	20	na
Avg wetted width (m)	19.5	16.7	16.1	15.7	14.3	14.0	1.6	1.5	1.4	na	0.5	na
Avg Left CHD (cm)	43	35	33	45	37	35	18	16	15	na	6	na
Avg Center CHD (cm)	65	54	50	52	46	50	20	16	16	na	11	na
Avg Right CHD (cm)	74	62	59	50	44	40	14	12	12	na	5	na
% Boulder	3	1	1	35	30	30	1	1	1	na	0	na
% Cobble Reach	55	57	57	45	40	40	5	5	5	na	20	na
% Pebble Reach	22	22	22	10	15	25	5	5	5	na	50	na
% Gravel Reach	15	12	12	8	10	20	33	33	30	na	33	na
% Fines in Reach	5	8	8	2	10	10	35	35	50	na	100	na
Livestock Use (CPI)	0	8	15	0	5	11	23	23	15	na	36	na
Avg. Riparian Shade	10	25	25	25	30	30	10	10	10	na	30	na