
BITTERROOT RIVER TRIBUTARIES SAMPLING PROJECT — 2013

Sampling and Analysis Plan

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Water Quality Monitoring and Assessment and Water Quality Management Sections, Water
Quality Planning Bureau

P.O. Box 200901

Helena, MT 59620-0901

Approvals

Jessica Clarke (WQ Monitoring & Assessment Section)

Date

Darrin Kron (WQ Monitoring & Assessment Section Manager)

Date

Mindy McCarthy (QA Officer)

Date

Dean Yashan (WQ Management Section Manager)

Date

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1.0 Introduction and Background Information

This project is to support TMDL development in the Bitterroot TMDL Planning Area (TPA) and 303(d) list assessment (DEQ 2011a, Suplee *et al.* 2008). The focus will be on collecting metals and macroinvertebrate samples.

The Bitterroot River is located in Missoula and Ravalli counties in southwestern Montana. The river begins where the East and West Forks come together and flows north until it drains into the Clark Fork River at Missoula. The Bitterroot River watershed is an area of over 2,820 square miles and it coincides with the 17010205 fourth-code hydrologic unit code (HUC). The Bitterroot River TPA is located within the Columbia River Basin and also falls within the Middle Rockies and Idaho Batholith ecoregions. All streams within the Bitterroot River TPA have been assigned a B-1 beneficial use classification (ARM 17.30.623).

During the 2012 field season, the Bitterroot River TPA was sampled extensively for metals impairment. There were three waterbodies previously listed as impaired for metals. In addition to sampling these three streams, a risk-based monitoring approach was used in the TPA to determine anthropogenic sources of metals. To do this, a GIS project was created with the Montana Bureau of Mines and Geology (MBMG) Abandoned and Inactive Mines database layer to look at past mining activity on Bitterroot tributaries. Sites were chosen near the mouth of several waterbodies with significant abandoned mining activity, as well as on waterbodies with no apparent mining history.

During this sampling, Lick Creek, a previously unlisted waterbody, showed several metals exceedances. To reach a minimum sample size and to help determine sources of impairment, Lick Creek will continue to be monitored this field season. In addition to Lick Creek, the canal connecting Lost Horse Creek and Lick Creek, and an unnamed tributary to Lick Creek will be sampled. Each site will be sampled once during high flow.

In addition to metals sampling on Lick Creek, sampling efforts in 2013 will also include macroinvertebrate sampling in the Bitterroot River headwaters area. This macroinvertebrate sampling will complete the data set used to determine Bitterroot River TPA sediment impairment. Overwiche Creek and Meadow Creek will each be sampled once, near the mouth, for macroinvertebrates.

The sampling sites chosen for Lick Creek and the headwaters region are listed below in Table 1.1.

Table 1.1 – Waterbodies to be sampled for metals or macroinvertebrates in the Bitterroot TPA in 2013.

Waterbody	Site Description	Station ID	Metals	Macroinvertebrates
Lick Creek	Near mouth	C05LICKC01	X	
Lick Creek	d/s of upper bridge	C05LICKC03	X	
Lost Horse Creek	~halfway between Lost Horse Creek and Lick Creek	N/A	X	
Irrigation Canal				
Unnamed Tributary to Lick Creek	Below mineral lick	N/A	X	
Meadow Creek	On USFS near mouth	N/A		X
Overwiche Creek	On USFS ~1.5 mi u/s	N/A		X

2.0 Objectives and Design of the Investigation

2.1 Project Objectives

The goals for this project are as follows:

1. Collect metals (total recoverable and dissolved Aluminum) and total suspended solids (TSS) on Lick Creek, Lost Horse Creek Irrigation Canal, and Unnamed tributary to Lick Creek during high flow.
2. Assess macroinvertebrate assemblages on Meadow Creek and Overwiche Creek.
3. Measure physical parameters (temperature, dissolved oxygen, pH, and conductivity) *in situ* and monitor flow throughout the sampling timeframe on all waterbody segments.

2.2 Sampling Timeframe

Sampling for metals will occur once per site during high flow (anticipated early June). Sampling events for macroinvertebrates will occur during the "growing season" for the Middle Rockies Level III Ecoregion (July 1 – September 30) (MDEQ 2011a).

3.0 Field Sampling Methods

3.1 Selection of Sites

Table 3.1 lists the potential monitoring sites to be sampled during the 2013 field season and Figure 3.1 and 3.2 depict the location of each waterbody. These sites are proposed locations and changes may be made based on land access or other unforeseen problems.

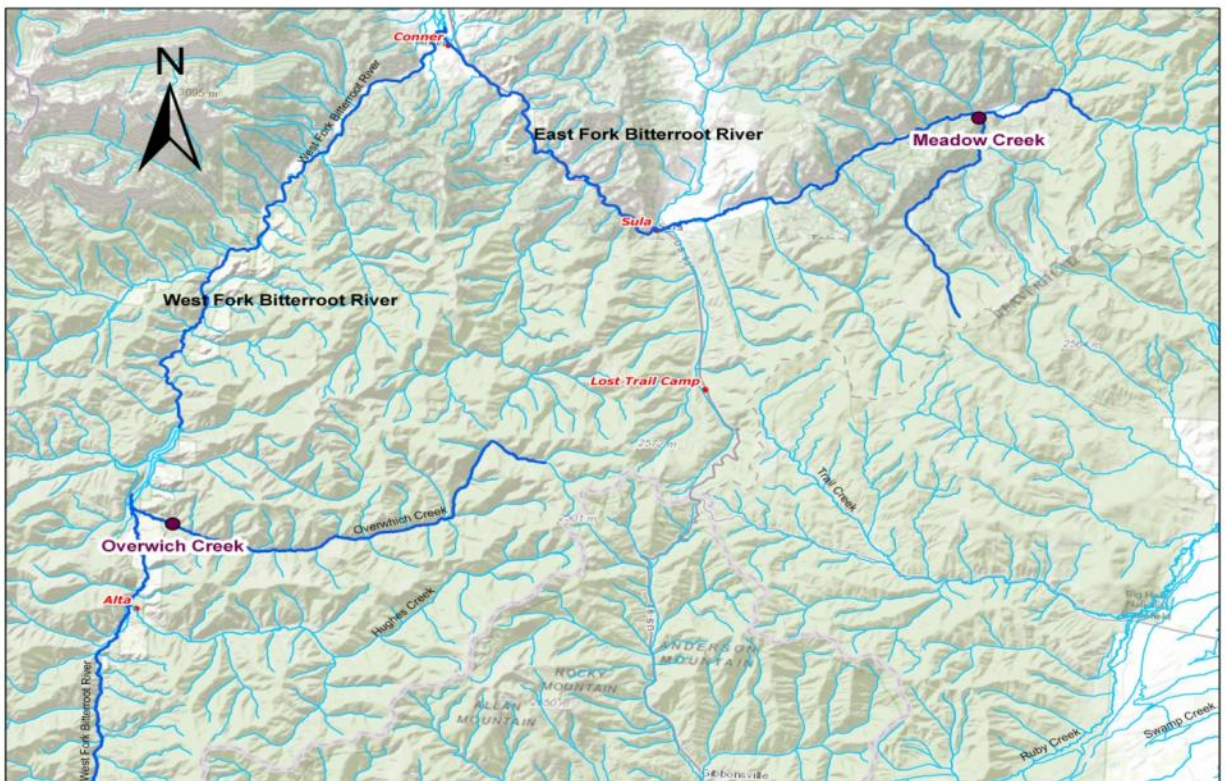
Table 3.1 – Monitoring site names and locations to be sampled in the Bitterroot TPA during the 2013 field season.

Waterbody	Station ID	Latitude	Longitude
Lick Creek	C05LICKC01	46.09424	-114.18955
Lick Creek	C05LICKC03	46.07679	-114.25791
Lost Horse Creek Irrigation Canal	N/A	46.094	-114.216
Unnamed Tributary to Lick Creek	N/A	46.077	-114.245
Meadow Creek	N/A	45.90527	-113.778
Overwiche Creek	N/A	45.66546	-114.28

Figure 3.1 – Location of waterbodies to be sampled for metals in the Bitterroot TPA in 2013.



Figure 3.1 – Location of waterbodies to be sampled for macroinvertebrates in the Bitterroot TPA in 2013.



3.2 Physical parameters

3.2.1 *In Situ* Measurements

During each sampling event, a YSI 85 field meter will be used to collect *in situ* measurements of temperature, dissolved oxygen, and specific conductance, and a portable pH meter will be used to measure pH. These measurements will be collected prior to the collection of water samples or other physical disturbances to the water column or substrate. See details about calibration in Section 6.0.

3.2.2. Flow Measurement

Flow will be measured at each site during each sampling event using the quantitative flow meter method, although the semi-quantitative float method will be used, as necessary, when high flows prevent wading (DEQ 2011b).

3.3 Metals & Other Water Chemistry Sample Collection

Water (grab) samples will be collected at each site after completing the *in situ* YSI 85 measurements. All water samples from the stream will be collected in new acid-washed high-density polyethylene (HDPE) bottles. Sample replicates will be randomly taken on at least 10% of the total samples for each parameter. Field blanks will be made prior to departure from the field at the end of each sampling run ("trip").

3.3.1 Metals and Other Water Chemistry Sample Collection

Table 3.2 summarizes sampling volumes, containers, preservation and holding time requirements for all water chemistry samples collected from these three water bodies.

Dissolved Aluminum: A 60 cm³ syringe and a 0.45 um filter disposable filter are used. 50 ml of the filtrate will be placed in a 250 ml HDPE bottle, preserved with nitric acid, and kept on ice until analyzed (Table 3.3). Filtration will be accomplished with a large syringe connected to a disposal filter capsule. A small amount of the sample will be wasted through the filter before the filtered sample is collected. Sample bottles and lids will be pre-rinsed with a small amount of the filtered sample before collecting the final filtered sample. Detailed methodology can be found in MDEQ (2011).

TSS and Metals: Summary information is shown in Table 3.2. Total recoverable metals will be collected in a 250 ml HDPE bottle, preserved with nitric acid, and held on ice. Hardness will be calculated from the TR metals bottle. TSS will be collected in a 500 ml HPDE bottle, no preservative, and held on ice. NOTE THE SHORT HOLDING TIME FOR TSS. Detailed methodology can be found in MDEQ (2011).

Table 3.2 - Sampling Volumes, Containers, Preservation, and Holding Times

Analyte	Bottle Size	Container	Preservation	Storage	Holding time
Total Suspended Solids	500 ml	HDPE bottle	None	Cool to <6 °C (on ice)	7 days
Total Recoverable Metals	250 ml	HDPE bottle	Nitric acid	Cool to <6 °C (on ice)	180 days
Dissolved Aluminum	250 ml	HDPE bottle	0.45 um field filtered, nitric acid	Cool to <6 °C (on ice)	180 days
Macroinvertebrates (species presence)	1000 ml	HPDE bottle	Ethanol	No ice	NA

3.4 Macroinvertebrates

Macroinvertebrate sampling will take place on Meadow Creek and Overwiche Creek using the EMAP reach-wide procedure (Peck *et al.* 2006). Macroinvertebrate samples will be stored in 1L HDPE bottles topped off with ethanol (MDEQ 2011b).

3.5 Digital Photographs

Digital photographs will be taken (at a minimum) at transect F of each site.

4.0 Sample Handling Procedures

This project follows the WQPB "internal process". Appropriate storage times for water quality samples are discussed in Section 3.3 and shown in Table 3.2. Water chemistry samples will be delivered to Energy Labs and macroinvertebrate samples will be delivered to Rhithron, Inc. for analysis.

5.0 Laboratory Analytical Measurements

Table 5.1 summarizes, per analyte, the analytical methods and detection/reporting limits to be used for this project during field season 2013.

Table 5.1 - Analytical Methods and Required Reporting Limits

Analyte	Method	Required Reporting Limit (mg/L)
Water Sample – Common Ions		
Total Suspended Solids (TSS)	A 2540 D	4
Water Sample – Dissolved Metals		
Aluminum	EPA 200.7	30
Water Sample – Total Recoverable Metals		
Arsenic	EPA 200.8	3
Cadmium	EPA 200.8	0.08
Chromium	EPA 200.8	1
Copper	EPA 200.8	1
Iron	EPA 200.7	50
Lead	EPA 200.8	0.5
Selenium	EPA 200.8	1
Silver	EPA 200.8	0.2
Zinc	EPA 200.7	10

6.0 Quality Assurance and Quality Control Requirements

All QA/QC requirements followed by MT DEQ “internal process” will be instituted for this project. The QA/QC requirements are described in DEQ (2005).

YSI 85 meter calibration: Pre-calibration of the YSI 85 meter will be undertaken in the laboratory. The YSI meter will also be calibrated in the field just prior to measuring dissolved oxygen for site-specific altitude at each site following the instructions in the YSI 85 operations manual.

Hand-held pH meter calibration: The pH meter will be pre-calibrated in the laboratory using the two-point method (pH 4.0 and 7.0 standards), and checked against a 4.0 and 7.0 standard each day of sampling in the field, according to the instrument’s operations manual.

7.0 Data Analysis, Record Keeping, and Reporting Requirements

This project will follow the WQPB “internal process”. Site Visit/Chain of Custody forms, field forms, digital photos, and laboratory results will be processed by WQPB staff following QA/QC procedures as indicated in section 6.0

8.0 Schedule

The Water Quality Monitoring and Assessment staff will sample these waterbodies as indicated in Table 3.2. High flow metals sampling will take place in June 2013. Site visits for macroinvertebrate sampling will occur within July 1 – September 30, 2013, during the growing season for the Middle Rockies Level III ecoregion (DEQ 2011a).

9.0 Project Team and Responsibilities

The Water Quality Monitoring and Assessment Section will conduct this project. Darrin Kron will oversee the overall monitoring & assessment component, Jessica Clarke will lead the monitoring and assessment project.

10.0 References

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