LOWER BLACKFOOT RIVER TRIBUTARIES SAMPLING PROJECT — 2012

Sampling and Analysis Plan

Prepared for:

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Water Quality Monitoring and Assessment and Water Quality Management Sections,
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1.0 Introduction and Background Information

This project is to support nutrient TMDL development in the Lower Blackfoot TMDL Planning Area (TPA) and 303(d) list assessment; the focus will be on nutrients only.

The Lower Blackfoot TPA is located in Missoula, Powell, and Granite counties and encompasses 377 square miles of mixed federal, state, and private land ownership. It includes the Blackfoot River watershed downstream of the Clearwater River confluence. The streams drain from conifer forested mountain slopes into broad, alluvial grassland and shrubland valleys. The mainstem of the Blackfoot River and the lower reaches of Elk, Camas, and Union creeks flow through agricultural valleys where most land uses are related to livestock production (Byron 2009). The streams in the Lower Blackfoot TPA have been assigned a B-1 beneficial use classification (ARM 17.30.623).

The Water Quality Planning Bureau (WQPB) of the Montana Department of Environmental Quality (MDEQ) has identified six Category 5 streams that are impaired for nutrients within the Lower Blackfoot, each of which was sampled for nutrients and related assessment parameters in 2011. All will be sampled for these parameters in 2012 except Union Creek for which sufficient data exists to complete the nutrient assessment (Suplee & Sada de Suplee 2011, Suplee *et al*. 2008). Day Gulch, a tributary of Elk Creek and a Category 3 stream without current nutrient listings, was also sampled in 2011 and will be sampled again in 2012. These assessment unit segments are located in the Columbia Basin (4th code HUC 17070203) and are contained within the Middle Rockies Level III ecoregion.

Table 1.1 shows the current 303(d) listings of waterbody segments to be sampled in 2012.

Table 1.1 – Current 303(d) nutrient listings on tributaries in the Lower Blackfoot TPA

Waterbody	AUID	2012 303(d) nutrient listings
West Fork Ashby Creek	MT76F006_020	Phosphorus (Total)
East Fork Ashby Creek	MT76F006_050	Phosphorus (Total), Nitrate/Nitrite (Nitrite + Nitrate as N)
Camas Creek	MT76F006_060	Phosphorus (Total)
Elk Creek	MT76F006_031	Nitrogen, Nitrate
Washoe Creek	MT76F006_091	Phosphorus (Total), Total Nitrogen (TN), Nitrate/Nitrite (NO_2 + NO_3-N), Chlorophyll *a*
Day Gulch	MT76F006_80	None

2.0 Objectives and Design of the Investigation

2.1 Project Objectives

The goals for this project are as follows:

1. Collect nutrients (total phosphorus (TP), total nitrogen (TN), and nitrate + nitrite (NO_{2+3})) and total suspended solids (TSS) samples on all waterbody segments,
2. Collect one chlorophyll *a*/ash-free dry weight sample on each West Fork Ashby Creek, Elk Creek, and Day Gulch,

3. Measure physical parameters (temperature, dissolved oxygen, pH, and conductivity) *in situ* and monitor flow throughout the sampling timeframe on all waterbody segments,
4. Collect one macroinvertebrate sample on Elk Creek.

2.2 Sampling Timeframe

All sampling events for nutrients, TSS, chlorophyll *a*/ash-free dry weight, and macroinvertebrates will occur during the "growing season" for the Middle Rockies Level III Ecoregion (July 1 – September 30). At least 30 days will pass between sampling events at each site (Suplee & Sada de Suplee, 2011).

3.0 Field Sampling Methods

3.1 Selection of Sites

Table 3.1 lists the potential monitoring sites to be sampled during the 2012 field season and Figure 3.1 depicts the location of each waterbody. Table 3.2 summarizes the sampling needs per site visit to each of these waterbodies. 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 Lower Blackfoot TPA during the 2012 field season

Waterbody	Site Description	Station ID	Latitude	Longitude
EAST FORK ASHBY CREEK	Ashby Creek East Fork	C03ASEFC03	46.8017	-113.5729
	Ashby Creek East Fork 1/8 mi upstream of WF Ashby confluence	C03ASEFC01	46.8234	-113.5969
	Ashby Creek East Fork	C03ASEFC02	46.8094	-113.5878
WEST FORK ASHBY CREEK	Ashby Creek West Fork just upstream East Fork Ashby Creek confluence	C03ASWFC02	46.8243	-113.5980
	Ashby Creek West Fork downstream Mineral Ridge	C03ASWFC03	46.8164	-113.6158
CAMAS CREEK	Camas Creek south of Potomac	C03CMASC01	46.8759	-113.5801
	Camas Creek about 100 yards upstream from mouth (Union Cr)	C03CMASC10	46.8820	-113.5890
ELK CREEK	Elk Creek upstream Stinkwater Creek confluence	C03ELKC02	46.8864	-113.3842
WASHOE CREEK,	Washoe Creek 2/3 mile downstream of BLM Road 0408	C03WASOC01	46.8393	-113.4015
	Washoe Creek 3/4 mile upstream of mouth	C03WASOC02	46.8591	-113.4856
	Washoe Creek at headwaters	C03WASOC03	46.8287	-113.3979
DAY GULCH	Day Gulch at mouth	C03DAYG01	46.8202	-113.2906
	Day Gulch near headwaters	new site	46.8175	-113.3117

Figure 3.1 – Location of waterbodies to be sampled for nutrients in the Lower Blackfoot TPA during the 2012 field season

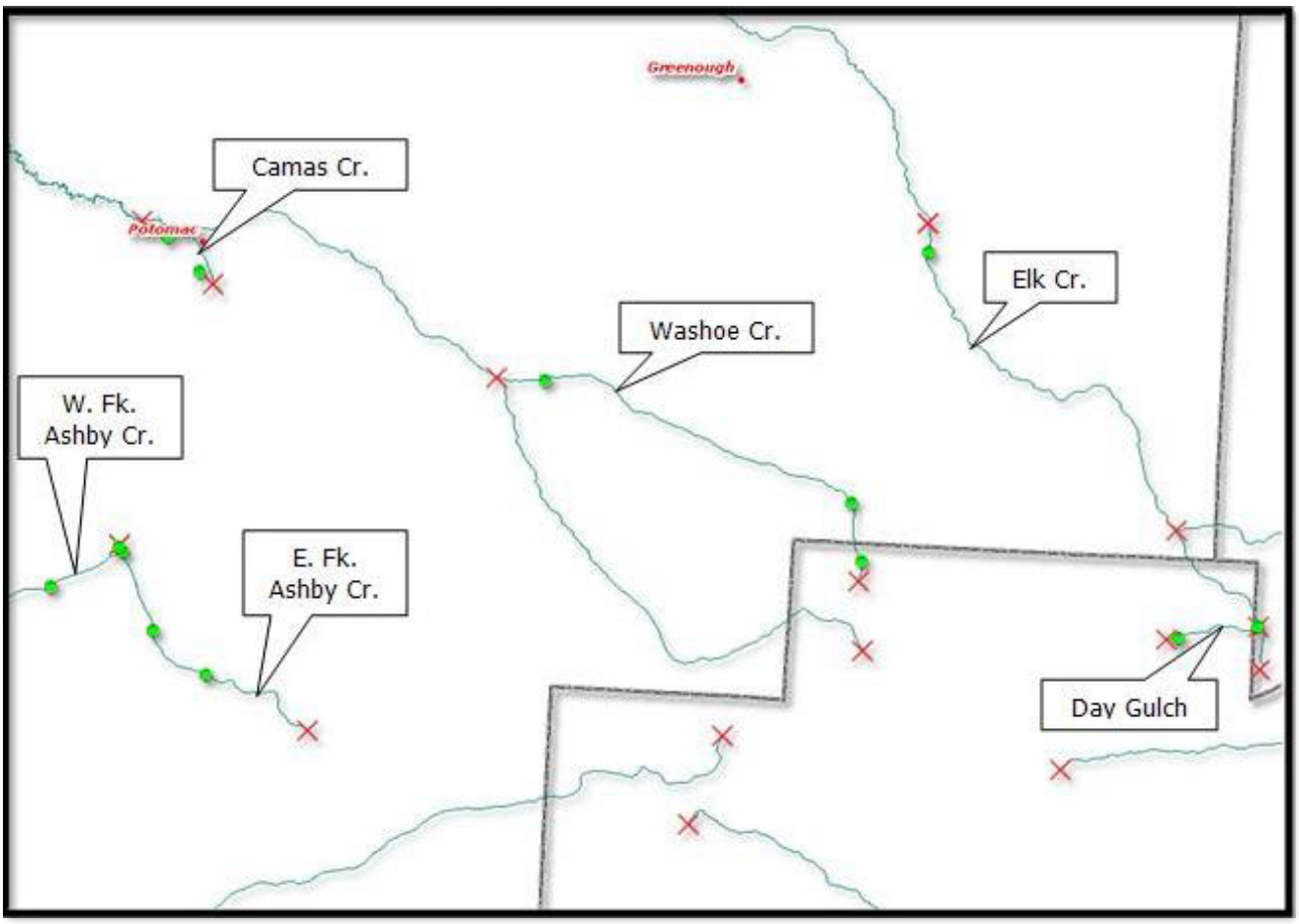

Table 3.2 - Number of samples to be collected per parameter per waterbody in 2012

Site Visit #	Parameter Group	Waterbody Name (# of potential sites)					
		East Fork Ashby Creek (3)	West Fork Ashby Creek (2)	Camas Creek (2)	Day Gulch (2)	Elk Creek (1)	Washoe Creek (3)
1	Nutrients (TN, TP, NO_{2+3})	3	2	2	2	0	3
	Chlorophyll *a* & Ash-Free Dry Weight	0	0	0	0	0	0
	Macroinvertebrates	0	0	0	0	0	0
	TSS, *in situ* measurements & flow	3	2	2	2	0	3

Site Visit #	Parameter Group	Waterbody Name (# of potential sites)					
		East Fork Ashby Creek (3)	West Fork Ashby Creek (2)	Camas Creek (2)	Day Gulch (2)	Elk Creek (1)	Washoe Creek (3)
2	Nutrients (TN, TP, NO_{2+3})	0	2	2	2	1	3
	Chlorophyll *a* & Ash-Free Dry Weight	0	1	0	1	1	0
	Macroinvertebrates	0	0	0	0	1	0
	TSS, *in situ* measurements & flow	0	2	2	2	1	3
3	Nutrients (TN, TP, NO_{2+3})	0	2	2	2	0	3
	Chlorophyll *a* & Ash-Free Dry Weight	0	0	0	0	0	0
	Macroinvertebrates	0	0	0	0	0	0
	TSS, *in situ* measurements & flow	0	2	2	2	0	3

3.2 Physical parameters

3.2.1 *In Situ* Measurements

During each sampling event at each sampling site, 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 2012).

3.3 Nutrient & 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 Nutrient and Other Water Chemistry Sample Collection

Table 3.3 summarizes sampling volumes, containers, preservation and holding time requirements for all water chemistry samples collected from these three water bodies. **Note the short holding time for TSS samples.**

Nutrients and TSS: For total nitrogen (TN), total phosphorus (TP), nitrate + nitrite (NO_{2+3}) and total suspended solids (TSS), grab samples will be collected in 250 ml HDPE bottles and kept on ice (not frozen)

until analyzed. For each sample, the bottles will be triple-rinsed with a small amount of ambient stream water prior to grabbing the final sample. TN will be collected in a single 250ml HDPE bottle and kept on ice (not frozen) until analyzed. TP and NO_{2+3} will be collected in a single 250ml HDPE bottle, will be preserved with sulfuric acid and kept on ice (not frozen) until analyzed. TSS will be collected in a single bottle and kept on ice (not frozen) until analyzed (Table 3.3).

Table 3.3 - Sampling Volumes, Containers, Preservation, and Holding Times

Analyte	Bottle Size	Container	Preservation & Storage	Holding time
TN	250 ml	Acid-washed high density polyethylene (HDPE) bottle	Cool to <6 °C (on ice)	28 days
TP, NO_{2+3}	250 ml		Cool to <6 °C (on ice); sulfuric acid (H_2SO_4)	28 days
Total Suspended Solids (TSS)	500 ml		Cool to <6 °C (on ice)	7 days
Chlorophyll *a* & Ash-Free Dry Weight	n/a	Ziplock bag (hoop), Petri dish (template), or centrifuge tube (core)	Freeze	45 days
Macroinvertebrates	1000 ml	Acid-washed high density polyethylene (HDPE) bottle	Ethanol	n/a

3.4 Chlorophyll *a* and Ash-Free Dry Weight

Chlorophyll *a* sampling will take place on each waterbody for which additional samples are needed (Table 3.2) following the EMAP reach-wide procedure (Peck *et al.* 2006; DEQ 2011). Hoop chlorophyll-a samples will be stored in zip-lock bags wrapped in aluminum foil, template samples on filters in centrifuge tubes and wrapped in foil, and cores in centrifuge tubes wrapped in aluminum foil. All samples will be frozen (dry ice) until analyzed. Samples will be composited at the laboratory according to collection method (i.e., hoop, core, template). Ash-free dry weight will be analyzed from the same chlorophyll *a* samples. Weighted averages for chlorophyll *a* and ash-free dry weight will be calculated, with only those transects sampled using the hoop and template methods included in the ash-free dry weight weighted average.

3.5 Macroinvertebrates

Macroinvertebrate sampling will take place on Elk 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 2012).

3.6 Digital Photographs

Digital photographs will be taken (at a minimum) at transect F of each site. At sites where chlorophyll *a* samples are collected, at least one photograph will be taken at each transect (A-K). The objective of these photos is to document visible changes in the stream flora as time passes and, as such, photos will be a combination of close-ups of stream substrate where the sampling took place and stream panoramas. The photo number and pertinent transect information will be recorded for each photo.

3.7 Aquatic Plant Tracking Form and Aquatic Plant Visual Assessment Form

Both forms will be completed when chlorophyll *a* samples are collected according to DEQ protocol (DEQ 2011, 2012).

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 3.3. Water chemistry and chlorophyll *a* samples will be delivered to Energy Laboratory 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 2012.

Table 5.1 - Analytical Methods and Required Reporting Limits

Analyte	Method	Required Reporting Limit (mg/L)
Total Phosphorus (TP)	EPA 365.1	0.003
Total Nitrogen (TN)	4500-N B or C	0.04
Nitrate + Nitrite-Nitrogen (NO_2+NO_3-N)	EPA 353.2	0.01
Total Suspended Solids (TSS)	A 2540 D	4
Chlorophyll *a*	A 10200 H	n/a
Ash-Free Dry Weight (AFDW)	A 10300 C (5)	n/a

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. All site visits will occur between July 1 – September 30, 2012 during the growing season for the Middle Rockies Level III ecoregions (Suplee & Sada de Suplee, 2011).

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, Katie Makarowski will lead the monitoring and assessment project, and Steven Reistroffer and Jess Clarke will help with data collection in the field. Christian Schmidt will lead the nutrient TMDL component, and Dean Yashan will oversee the overall TMDL component.

10.0 References

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