

# Flathead-Stillwater & Fisher TMDL Planning Areas Sampling Project - 2013: Nutrients Sampling and Analysis Plan

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## ACRONYM LIST

<b>Acronym</b>	<b>Definition</b>
AFDW	Ash Free Dry Weight
ARM	Administrative Rules of Montana
AUID	Waterbody Assessment Unit Identification Number
DEQ	Department of Environmental Quality (Montana)
DO	Dissolved Oxygen
EPA	Environmental Protection Agency (U.S.)
ETOH	Ethanol
GIS	Geographic Information System
GPS	Global Positioning System
HDPE	High-Density Polyethylene
HUC	Hydrologic Unit Code
NAD	North American Datum
PCB	PolyChlorinated Biphenyls
PIBO	PACFISH/INFISH Biological Opinion
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TPA	TMDL Planning Area
TPN	Total Persulfate Nitrogen
TSS	Total Suspended Solids
WQ	Water Quality
WQPB	Water Quality Planning Bureau (DEQ)

## 1.0 INTRODUCTION AND BACKGROUND INFORMATION

The 2013 phase of the Flathead-Stillwater project is a continuation of the 2012 project, for the purposes of obtaining more nutrient data for Sheppard Creek and Fish Creek. The Creston Fish Hatchery site will be sampled to obtain nutrient data for the Flathead Lake nutrient project, conducted by the EPA. The Fisher TMDL Planning Area component of the project is designed to obtain additional data that will be sufficient to assess Raven Creek for nutrients.

This project is to support TMDL development in the Flathead and Stillwater, and the Fisher TMDL Planning Areas (TPAs) and 303(d) list assessments. The focus will be on nutrients only. This Sampling and Analysis Plan (SAP) is designed to meet requirements for the completion of source assessments and loading estimates for nutrients for the project streams, and to have enough data to assess the streams based on the proposed nutrient criteria (Suplee and Sada de Suplee, 2011).

The Flathead and Stillwater TPAs are mostly within Flathead County, Montana. Site 3E of Sheppard Creek is in Lincoln County. These streams are in the Northern Rockies Level 3 Ecoregion. The total extent of the Flathead and Stillwater TPAs is 948,436 acres, or approximately 1482 square miles, and comprise part of the Flathead Lake watershed. Waterbodies in these TPAs flow through both publicly-owned (United States Forest Service, State of Montana and Bureau of Land Management) and privately-owned land. The streams in the Flathead-Stillwater TPAs are within the 4th code HUC 17010210 (Sheppard Creek), and HUC 17010208 (Fish Creek). Fish Creek and Sheppard Creek have been assigned a B-1 beneficial use classification (ARM 17.30.623). Raven Creek, in the Fisher TPA, is in Lincoln County. Raven Creek is on Plum Creek Timberlands LP land and on US Forest Service land. This stream is in the Northern Rockies Level 3 Ecoregion, in HUC 17010102, and has been assigned a B-1 beneficial use classification.

The Water Quality Planning Bureau (WQPB) of the Montana Department of Environmental Quality (DEQ) has identified twenty-five impaired (Category 5) streams within the Flathead-Stillwater TPAs, and three impaired waterbodies in the Fisher TPA; however only the three streams identified in **Table 1-1**, and the Creston Fish Hatchery discharge pipe will be sampled in 2013. **Table 1-1** shows the waterbody segments and the fish hatchery location to be sampled, with the pollutants of concern (nutrients).

**Table 1.1 - Waterbody segments within the Flathead-Stillwater and the Fisher TMDL planning areas to be sampled in 2013, and the 303(d) nutrient listings.**

<b>Waterbody Segment Name</b>	<b>AUID</b>	<b>TMDL Planning Area</b>	<b>Nutrients</b>
<b>Fish Creek</b>	MT76O002_050	Flathead-Stillwater	Phosphorus (Total)
<b>Sheppard Creek</b>	MT76P001_050	Flathead-Stillwater	Phosphorus (Total), Nitrate/Nitrite (Nitrite + Nitrate as N)
<b>Creston Fish Hatchery Discharge Pipe</b>	None	Flathead-Stillwater	No Listings-Permitted Facility
<b>Raven Creek</b>	MT76OC001_030	Fisher	Phosphorus (Total), Nitrate/Nitrite (Nitrite + Nitrate as N), Nitrogen (Total)

## 2.0 OBJECTIVES AND DESIGN

### 2.1 PROJECT OBJECTIVES

The main objective of this phase of the project is to provide monitoring and assessment support for the TMDL Program's schedule for development of nutrient TMDLs in the Flathead-Stillwater TPAs.

The goals for this project are as follows:

- Measure physical parameters (temperature, DO, pH, and conductivity) in situ.
- Collect nutrients, chlorophyll-*a* /Ash Free Dry Weight (AFDW), and periphyton samples.
- Measure stream flow during each sampling event, when practical, to assist in TMDL nutrients and metals load allocations.

### 2.2 SAMPLING TIMEFRAME

All sampling events for nutrients, TSS, chlorophyll-*a*/AFDW, and periphyton will occur during the "growing season" for the Northern Rockies Level III Ecoregion (July 1 – September 30) (Suplee and Sada de Suplee, 2011). Samples collected at the same site will be taken at least 30 days apart (Suplee and Sada de Suplee, 2011).

## 3.0 FIELD SAMPLING METHODS

### 3.1 SELECTION OF SITES

Specific site locations within the streams are identified using GIS and topographic maps. The selected sites follow the guidelines and definitions found in Suplee and Sada (2011) unless a specific location is to be sampled because a pollutant source was identified. The sites are established locations, and are identified in **Appendix A**. Changes might be made based on land access or other unforeseen problems.

### 3.2 PHYSICAL PARAMETERS

#### 3.2.1 In-Situ Measurements

During low flow sampling events (July – September), a YSI 85 meter will be used to measure temperature, dissolved oxygen, and specific conductance at each sampling site. These measurements will be collected prior to the collection of water samples or other physical disturbances to the water column or substrate. A portable pH meter will be used to measure pH at each site. See details about calibration in **Section 6.0**.

#### 3.2.2. Flow Measurement

Flow will be measured at each sampling site during each sampling event. During high flow sampling events (June), flow will be measured using either the quantitative flow meter method or using the semi-quantitative float method when streams are not wadeable (Montana Department of Environmental Quality, 2011b).

### 3.3 WATER SAMPLE COLLECTION

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

#### 3.3.1 Chemistry Samples

Nutrients and TSS: Summary information is shown in **Table 3-1**. TP and NO<sub>2+3</sub> will be collected in a 250 ml HDPE bottle. The sample bottles will be triple-rinsed with stream water before the water samples are collected. This sample will be preserved with sulfuric acid, and held on ice. TN will be collected in another 250 ml HDPE bottle, no preservative, and held on ice. TSS will be collected in a 500 ml HDPE bottle, no preservative, and held on ice. NOTE THE SHORT HOLDING TIME FOR TSS. Detailed methodology can be found in DEQ (Montana Department of Environmental Quality, 2011b).

### 3.4 BENTHIC CHLOROPHYLL-A AND ASH-FREE-DRY WEIGHT

Benthic chlorophyll-*a* will be collected at 11 transects only at some sites (**Appendix A**). Samples will be collected either using the template, hoop, or core methods, depending on the dominant substrate and/or algae type present. These samples will be composited in the lab according to the collection method (i.e., hoops, cores, templates). Hoop chlorophyll-*a* samples will be stored in zip-lock bags wrapped in aluminum foil, template samples on filters in Petri dishes and wrapped in foil, and cores in centrifuge tubes wrapped in aluminum foil. All samples will be frozen (Montana Department of Environmental Quality, 2011b) (see **Table 3-1**). Ash-free dry weight (AFDW) will be calculated from the same samples of chlorophyll-*a* (Montana Department of Environmental Quality, 2011b).

### 3.5 PERIPHYTON SAMPLES

Periphyton will be collected at some nutrient monitoring sites (**Appendix A**). The samples will be placed in a 50 ml centrifuge tube and preserved with formalin (see **Table 3-1**). Detailed methodology can be found in DEQ (Montana Department of Environmental Quality, 2011b).

**Table 3-1. Sampling Volumes, Containers, Preservation, and Holding Times**

Analyte	Bottle Size	Container	Preservation	Storage	Holding time
TN	250 ml	HDPE bottle	None	Cool to <6 °C (on ice)	28 Days
TP, NO <sub>2</sub> +NO <sub>3</sub>	250 ml	HDPE bottle	Sulfuric acid	Cool to <6 °C (on ice)	28 days
Total Suspended Solids	500 ml	HDPE bottle	None	Cool to <6 °C (on ice)	7 days
Chlorophyll- <i>a</i>	N/A	Ziplock bag (hoop), centrifuge tube (template), or centrifuge tube (core)	None	Dry ice	45 days
Periphyton	50 ml	Centrifuge tube	Formaline	No Ice	NA

### **3.6 DIGITAL PHOTOGRAPHS**

Digital photographs will be taken at transect F of each site (metal sites). On the nutrient sites (chlorophyll-*a* sampling), photographs will be taken at each transect (A-K). The objective of the photos is to document visible changes in the stream flora as time passes, and as such photos may be a mix of close-ups and stream panoramas. The photo number will be recorded along with the transect identification.

### **3.7 AQUATIC PLANT VISUAL ASSESSMENT FORM**

Form will be completed when chlorophyll-*a* is collected according to the procedure found in MT DEQ 2012

### **3.8 AQUATIC PLANT TRACKING FORM**

Form will be completed when either chlorophyll-*a* or periphyton is collected, according to the procedure found in MT DEQ 2011.



## 4.0 SAMPLE HANDLING PROCEDURES

This project follows the WQPB “internal process”. Appropriate storage times for water quality samples discussed in **Sections 3.3 to 3.6** are shown in **Table 3-1** above. Water quality samples will be delivered to Energy Laboratory and periphyton samples will be delivered to Rhithron, Inc.

## 5.0 LABORATORY ANALYTICAL MEASUREMENTS

**Table 5-1** summarizes the analytical methods and required laboratory detection and reporting limits to be used for this project.

**Table 5-1. Analytical Methods and Required Reporting Values.**

Water Sample – Nutrients		
Analyte	Method	Req. Report Limit (ug/L)
Total Nitrogen (TN)	A 4500-N-C	40
Total Phosphorus as P	EPA 365.1	3
Nitrate-Nitrite as N	EPA 353.2	10
Water Sample - Suspended Solids		
Analyte	Method	Req. Report Limit (ug/L)
TSS	EPA 2540D	4000
Others		
Parameter	Method	Req. Report Limit
Chlorophyll -a	A 10200H	N/A
Ash Free Dry Weight	A 10300 (C5)	N/A

## 6.0 QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

This project will follow the WQPB “internal process”. All QA/QC requirements followed by MT DEQ will be instituted for this project. The QA/QC requirements are described in MT DEQ (Montana Department of Environmental Quality, 2005).

### 6.1 INSTRUMENT CALIBRATION

#### YSI 85 meter

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

#### Hand-held pH meter

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 prior to each measurement in the field.

## 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 lab will be processed by WQPB staff following QA/QC procedures as indicated in **Section 6.0**. The GPS coordinate system datum used will be NAD 1983 State Plane Montana, in decimal degrees, to at least the third decimal.

## 8.0 SCHEDULE

The Water Quality Monitoring and Assessment staff will sample the two project streams within the Flathead-Stillwater TPA at 7 proposed sites (**Appendix A**). Sampling events will begin in July 2013. Data collection should be completed no later than September 30, 2013 (Suplee and Sada de Suplee, 2011).

## 9.0 PROJECT TEAM AND RESPONSIBILITIES

The Water Quality Monitoring and Assessment Section will lead the monitoring component. Darrin Kron will oversee the overall Monitoring and Assessment component. Alan Nixon will lead the monitoring project with support and assistance from the monitoring and assessment section staff. Dean Yashan will oversee and lead the overall TMDL component.

## 10.0 REFERENCES

- Montana Department of Environmental Quality. 2005. Quality Assurance Project Plan (QAPP): Sampling and Water Quality Assessment of Streams and Rivers in Montana, 2005. Report WQPBQAP-02, Rev. 03.
- , 2011a. Assessment Methodology for Metals Assessments. Helena, MT: Montana Department of Environmental Quality.
- , 2011b. Field Procedures Manual for Water Quality Assessment Monitoring, Draft. Helena, MT: Montana Department of Environmental Quality. Report WQPBWQM-020.v.3.
- Suplee, Michael W. and Rosie Sada de Suplee. 2011. Assessment Methodology for Determining Wadeable Stream Impairment Due to Excess Nitrogen and Phosphorus Levels. Helena, MT: Montana Department of Environmental Quality.

## APPENDIX A

Flathead-Stillwater and Fisher TPAs proposed 2013 Sampling Site locations and the proposed number of samples to be collected per parameter, at each site. Sites are stations established prior to this project, with the exception of the Creston Fish Hatchery site.

Site Number	Water Body Name	Latitude	Longitude	Nutrients	TSS*	Chlorophyll- <i>a</i> /AFDW	Periphyton
5A	Fish Creek	48.1919	-114.6493	2	2	1	1
5B	Fish Creek	48.1941	-114.6680	2	2	1	1
5C	Fish Creek	48.2048	-114.6851	2	2	1	1
3A	Sheppard Creek	48.3728	-114.6823	1	1	1	-
3B	Sheppard Creek	48.3799	-114.7105	1	1	1	-
3C	Sheppard Creek	48.3817	-114.7462	1	1	1	-
3D	Sheppard Creek	48.3706	-114.8178	1	1	1	1
9A	Creston Fish Hatchery	48.1986	-114.1166	2	2	-	-
10A	Raven Creek	48.0439	-115.2871	2	2	-	1
10B	Raven Creek	48.0526	-115.2932	2	2	-	1
* Total Suspended Solids (TSS)							