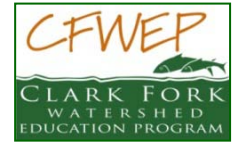


School: \_\_\_\_\_ Date: \_\_\_\_\_

Name(s): \_\_\_\_\_



	Site 1	Site 2
<b>Site Names</b>		

<b>Geography</b>	Site 1	Site 2
Latitude (GLX)		
Longitude (GLX)		
Stream Name		
Watershed		
What is upstream?		
What is downstream?		

<b>General Notes</b>	Site 1	Site 2
What is the land use at the site?		
What is the land use outside the site?		
<b>List Impacts</b> (Could be positive or negative)		
Evidence of Wildlife Use		
Other		

**Which site do you think might be healthier? Why?**




**Riparian Vegetation Assessment**

Name(s): \_\_\_\_\_

Station (Point) No.	Meter position	Site 1			Site 2		
		Ground Cover (<0.5 m)	Under-story (0.5-3 m)	Over-story (>3 m)	Ground Cover (<0.5 m)	Under-story (0.5-3 m)	Over-story (>3 m)
1	3 m						
2	6 m						
3	9 m						
4	12 m						
5	15 m						
6	18 m						
7	21 m						
8	24 m						
9	27 m						
10	30 m						

**Check (✓) General Location:**

Near stream:

5 m from stream:

Other (describe): \_\_\_\_\_

**CODES**

**Ground Cover Layer**

<b>SR</b>	Sedges and rushes
<b>G</b>	Grasses and forbs (good)
<b>P</b>	Pollution tolerant (tufted hairgrass & saltgrass)
<b>B</b>	Bare/disturbed ground
<b>T</b>	Tailings
<b>R</b>	Rock

**Understory & Overstory Layers**

<b>C</b>	Coniferous
<b>D</b>	Deciduous
<b>M</b>	Mixed (coniferous and deciduous)
<b>(-)</b>	Understory or overstory is absent

When **hummocking** is observed, denote ground cover type followed by: " / H " (e.g., G/H is grassy area with hummocks).

When the station lands at the **base of a shrub or tree**, place a slash (/) on the field form.

**Riparian Vegetation - Structural Diversity and Biodiversity**

**What is the biodiversity of your Ground Cover layer?**

**How to calculate Ground Cover biodiversity:**

Add the number of stations (points) that had each type of cover. E.g., if tailings were found at 3 points, put '3' next to 'T'. (Note: this means 30% of ground cover is tailings since there are 10 stations).

**Ground Cover**

Type	Site 1	Site 2
SR		
G		
P		
B		
T		
R		
/		

**What is the structural diversity of your site?**

**Calculate the percent of stations with plants for each layer.**

If all 10 m positions had understory, Understory=100% (10/10); if 3 m positions had overstory, Overstory=30% (3/10); for ground cover **do not include** B's, T's or R's.

Layer	Site 1	Site 2
Ground Cover	%	%
Understory	%	%
Overstory	%	%

**Directions**

For each macro identified, place a check mark (√) under the '√' column. If you have more than one of the same kind, count how many you have and put that number under the 'count' column.

**Macroinvertebrates in Sample**

Group 1 Taxa	Site 1		Site 2	
	√	count	√	count
Alderfly larva				
Stonefly larva				
Snipefly larva				
<b>(# of √ 's) x 4 = Group Score</b>				

Group 2 Taxa	Site 1		Site 2	
	√	count	√	count
Caddisfly larva				
Clam/Mussel				
Crane fly larva				
Crayfish				
Dragonfly larva				
Gilled snail ( <i>right-handed</i> )				
Mayfly larva				
Riffle beetle larva				
<b>(# of √ 's) x 3 = Group Score</b>				

Group 3 Taxa	Site 1		Site 2	
	√	count	√	count
Black fly larva				
Midge larva ( <i>not blood midge</i> )				
Sowbug				
<b>(# of √ 's) x 2 = Group Score</b>				

Group 4 Taxa	Site 1		Site 2	
	√	count	√	count
Leech				
Blood midge larva				
Pouch snail ( <i>left-handed</i> )				
Scud				
Worm				
<b>(# of √ 's) x 1 = Group Score</b>				

<b>TOTAL SCORE =</b> (Add Groups 1 through 4)	Site 1	Site 2

**How to Calculate Pollution Tolerance Index (PTI):**

- Count the number of check marks (√) for each group.
- Multiply total √ count by: **4** for *Group 1 Taxa*; **3** for *Group 2 Taxa*; **2** for *Group 3 Taxa*; **1** for *Group 4 Taxa*.
- Add all your *Group Scores*. This is your **Pollution Tolerance Index (PTI)**

**Pollution Tolerance Index (PTI)**

<b>Site 1</b>	
<b>Site 2</b>	

**Pollution Tolerance Index**

If your PTI is:	Your water quality is likely:
23 and above	Excellent
17 to 22	Good
11 to 16	Fair
10 or less	Poor

**Three Highest Counts of Macroinvertebrates**

<b>Site 1</b>	1	
	2	
	3	
<b>Site 2</b>	1	
	2	
	3	

**Other macroinvertebrates not on list:**

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**Names:** \_\_\_\_\_

**Date:** \_\_\_\_\_

	<b>Site 1:</b> _____	<b>Site 2:</b> _____
<b>Structure</b>		
<b>Color</b> <i>(circle one)</i>	White    Yellow    Yellow-brown Brown    Red    Black	White    Yellow    Yellow-brown Brown    Red    Black
<b>Texture</b>		
<b>pH</b>	Value: _____ Acid/Base: _____	Value: _____ Acid/Base: _____

**What does your soils data tell you about Site 1?**

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**What does your soils data tell you about Site 2?**

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**Riparian Vegetation Assessment**

Name(s): \_\_\_\_\_

Station (Point) No.	Meter position	Site 1			Site 2		
		Ground Cover (<0.5 m)	Under-story (0.5-3 m)	Over-story (>3 m)	Ground Cover (<0.5 m)	Under-story (0.5-3 m)	Over-story (>3 m)
1	3 m	G	C	C	/	D	D
2	6 m	G	D	D	B	-	-
3	9 m	SR	D	-	P	-	-
4	12 m	G	-	-	T	-	-
5	15 m	G	D	-	B	D	-
6	18 m	SR	D	-	P	D	-
7	21 m	R	-	-	P	D	-
8	24 m	G	C	C	P	D	-
9	27 m	B	-	-	P	-	-
10	30 m	G	D	M	T	-	-

Check (✓) General Location:

Near stream:

5 m from stream:

Other (describe): \_\_\_\_\_

**CODES**

Ground Cover Layer	
SR	Sedges and rushes
G	Grasses and forbs (good)
P	Pollution tolerant (tufted hairgrass & saltgrass)
B	Bare/disturbed ground
T	Tailings
R	Rock

Understory & Overstory Layers	
C	Coniferous
D	Deciduous
M	Mixed (coniferous and deciduous)
(-)	Understory or overstory is absent

When **hummocking** is observed, denote ground cover type followed by: " / H " (e.g., G/H is grassy area with hummocks).

When the station lands at the **base of a shrub or tree**, place a slash (/) on the field form.

**Riparian Vegetation - Structural Diversity and Biodiversity**

What is the biodiversity of your Ground Cover layer?

**How to calculate Ground Cover biodiversity:**

Add the number of stations (points) that had each type of cover. E.g., if tailings were found at 3 points, put '3' next to 'T'. (Note: this means 30% of ground cover is tailings since there are 10 stations).

**Ground Cover**

Type	Site 1	Site 2
SR	2 (or 20%)	0
G	6	0
P	0	5
B	1	2
T	0	2
R	1	0
/	0	1

What is the structural diversity of your site?

**Calculate the percent of stations with plants for each layer.**

If all 10 m positions had understory, Understory=100% (10/10); if 3 m positions had overstory, Overstory=30% (3/10); for ground cover **do not include** B's, T's or R's.

Layer	Site 1	Site 2
Ground Cover	(8 stations so) 80%	50%
Understory	70%	50%
Overstory	40%	10%

**Directions**

For each macro identified, place a check mark (✓) under the '✓' column. If you have more than one of the same kind, count how many you have and put that number under the 'count' column.

**Macroinvertebrates in Sample**

Group 1 Taxa	Site 1		Site 2	
	✓	count	✓	count
Alderfly larva	✓	2		
Stonefly larva	✓	10		
Snipefly larva				
<b>(# of ✓'s) x 4 = Group Score</b>		8		0

Group 2 Taxa	Site 1		Site 2	
	✓	count	✓	count
Caddisfly larva	✓	8		
Clam/Mussel				
Crane fly larva	✓	4		
Crayfish				
Dragonfly larva	✓	1		
Gilled snail (right-handed)				
Mayfly larva				
Riffle beetle larva				
<b>(# of ✓'s) x 3 = Group Score</b>		9		0

Group 3 Taxa	Site 1		Site 2	
	✓	count	✓	count
Black fly larva	✓	5	✓	10
Midge larva (not blood midge)	✓	7	✓	5
Sowbug				
<b>(# of ✓'s) x 2 = Group Score</b>		4		4

Group 4 Taxa	Site 1		Site 2	
	✓	count	✓	count
Leech			✓	50
Blood midge larva	✓	5	✓	40
Pouch snail (left-handed)				
Scud			✓	2
Worm	✓	2	✓	8
<b>(# of ✓'s) x 1 = Group Score</b>		2		4

<b>TOTAL SCORE =</b> (Add Groups 1 through 4)	Site 1		Site 2	
			23	

**How to Calculate Pollution Tolerance Index (PTI):**

- Count the number of check marks (✓) for each group.
- Multiply total ✓ count by: 4 for Group 1 Taxa; 3 for Group 2 Taxa; 2 for Group 3 Taxa; 1 for Group 4 Taxa.
- Add all your Group Scores. This is your **Pollution Tolerance Index (PTI)**.

**Pollution Tolerance Index (PTI)**

Site 1	23
Site 2	8

**Pollution Tolerance Index**

If your PTI is:	Your water quality is likely:
23 and above	Excellent
17 to 22	Good
11 to 16	Fair
10 or less	Poor

**Three Highest Counts of Macroinvertebrates**

Site 1	1	Stonefly larva (10)
	2	Caddisfly larva (8)
	3	Midge larva (7)
Site 2	1	Leech (50)
	2	Blood midge larva (40)
	3	Black fly larva (10)

**Other macroinvertebrates not on list:**

Site 1: Water penny (2)

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## WATER QUALITY

Measure	Healthy MT Stream (relatively undisturbed)
<b>H<sub>2</sub>O Temperature</b> (°C)	15 - 19° (60-65° F)
<b>pH</b> (standard units)	7.0 - 9.0
<b>Conductivity</b> (µS/cm)	50 - 500
<b>Turbidity</b> (NTU)	2 - 8 (clear to cloudy)
<b>Copper</b> (µg/L; ppb)	5.2
<b>Iron</b> (mg/L; ppm)	1.0
<b>Aluminum</b> (mg/L; ppm) (pH ≥ 6.5)	0.087
<b>Nitrate/Nitrite</b> (mg/L; ppm) (as NO <sub>3</sub> <sup>-</sup> -N)	≤ 10.0 / ≤ 1.0
<b>Dissolved O<sub>2</sub></b> (mg/L; ppm)	6.0 - 10.0

## Others of Interest

<b>Arsenic</b> (µg/L; ppb)	150.0
<b>Cadmium</b> (µg/L; ppb) (@ 50 mg/L hardness)	0.16
<b>Lead</b> (µg/L; ppb) (@ 100 mg/L hardness)	3.2
<b>Zinc</b> (µg/L; ppb) (@ 50 mg/L hardness)	67.0
<b>Water Hardness</b> (mg/L; ppm) (as CaCO <sub>3</sub> )	150 - 250

## VEGETATION

Measure	Healthy MT Stream (relatively undisturbed)
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<b>Ground Cover Biodiversity</b>	
<b>Sedges &amp; Rushes</b>	10-20%
<b>Grasses &amp; Forbs</b>	30-40%
<b>Pollution Tolerant</b>	< 10%
<b>Bare Ground</b>	near 0%
<b>Tailings</b>	0%
<b>Structural Diversity</b>	
<b>Ground Cover</b>	40%
<b>Understory</b>	40%
<b>Overstory</b>	20%

<b>AQUATIC MACROINVERTEBRA</b>	
<b>Measure</b>	<b>Healthy MT Stream (relatively undisturbed)</b>
<b>Pollution Tolerance Index</b>	
<b>PTI</b>	$\geq 17$
<b>Top 3 Macros</b>	
<b>1</b>	Stonefly
<b>2</b>	Mayfly
<b>3</b>	Caddisfly

**Sources:**  
**Montana Department of Environmental Quality** - Circular WQB-7 (<http://www.deq.state.mt.us/wqinfo/>)  
**Environmental Protection Agency** - Water Quality Standards (<http://www.epa.gov/waterscience/standard>)

**Unhealthy MT stream**  
(heavily impacted)

$\geq 20^\circ$   
( $>68^\circ$  F)

$\leq 6.0$

$> 500$

$\geq 9$   
( $\geq 10$  appears muddy)

$> 20.0$   
(harms fish)

$> 1.0$

$\geq 0.1$

$> 10.0 / > 1.0$

$< 6.0$

$> 150.0$

$> 0.2$

$> 3.2$

$> 67.0$

$> 250$

**Unhealthy MT stream**  
(heavily impacted)

< 10%
< 30%
50-100%
> 20%
> 0%
90-100%
0-10%
0%

<b>NOTES</b>
<b>Unhealthy MT stream</b> (heavily impacted)
≤ 16
Leech
Black fly
Blood or other midge

Circulars/WQB-7.PDF)
s/)