Project:
Reach ID:

Minnesota Stream Quantification Tool
Parameter Selection Checklist

	Function-Based Parameter	Metric(s)	Datasheets for Field-based Metrics
☐	Reach Runoff*	☐ Land Use Coefficient (D) **AND** Concentrated Flow Points (F)	Project Reach Form Section II(B)** **AND** Reach Runoff Form**
		or	
		☐ BMP MIDS Rv Coefficient (D)	
☐	Floodplain Connectivity*	☐ Bank Height Ratio* **AND** Entrenchment Ratio* (F)	Rapid Survey Form** **OR** Cross Section **AND** Longitudinal Survey Forms
☐	Large Woody Debris (LWD)	☐ LWD Index (F)	LWDI Form
		or	
		☐ No. of LWD Pieces/ 100 meters (F)	Project Reach Form Section VI**
☐	Lateral Migration*	☐ Dominant BEHI/NBS* **AND** Percent Streambank Erosion* (F)	Lateral Migration Form**
		or	
		☐ ***Optional:*** Percent Armoring (F)	Project Reach Form Section II(C)**
☐	Bed Material Characterization	☐ ***Optional:*** Size Class Pebble Count Analyzer (F)	Pebble Count Form
☐	Bed Form Diversity*	☐ Pool Spacing Ratio* **AND** Pool Depth Ratio* **AND** Percent Riffle* (F)	Longitudinal Survey **OR** Rapid Survey Form**
		☐ ***Optional:*** Aggradation Ratio (F)	Cross Section Form **OR** Rapid Survey Form**
☐	Riparian Vegetation*	☐ Effective Vegetated Riparian Area* (D/F) **AND** Canopy Cover* (F) **AND** Herbaceous Vegetation Cover* (F) **AND** Woody Stem Basal Area[1] (F)	Effective Vegetated Riparian Area Documentation Form **AND** Riparian Width, Area, and Vegetation Forms**
☐	Temperature	☐ ***Optional:*** Summer Average (F)	Temperature Logger SOP Form
☐	Dissolved Oxygen	☐ ***Optional:*** Dissolved Oxygen Concentration (F)	Sensor Log
☐	Total Suspended Solids	☐ ***Optional:*** Total Suspended Solids Concentration (F)	Sensor Log
☐	Macroinvertebrates	☐ ***Optional:*** Macroinvertebrate IBI (F)	Macroinvertebrate Sample Sorting Bench Sheet **AND** Stream Invertebrate Visit Form
☐	Fish	☐ ***Optional:*** Fish IBI (F)	Fish Survey Record Form **AND** Visit Summary Form

* Include in all assessments. If % armoring is >75%, other lateral migration measurements are not recommended and the parameter score is a
** Field/Desktop values can be entered directly from field forms into MNSQT; all other metrics require additional post-processing or analysis to calculate values.
(D) indicates metrics are calculated using desktop methods
(F) indicates metrics are calculated or verified using field methods
[1] Include Woody Stem Basal Area only if woody vegetation is determined to be a signification natural component of the riparian zone.

Date:
Investigators:

Minnesota Stream Quantification Tool
Project Reach Form

I. Site Information

Project Name:	
Reach ID:	
Drainage Area (sq. mi.):	
Use Class:	
River Nutrient Region:	
Valley Type:	
Stream Reach length (ft):	
Latitude:	
Longitude:	

Shading Key
Desktop Value
Field Value
Calculation

II. Reach Walk

A.

Difference between bankfull (BKF) stage and water surface (WS) (ft)								
Difference between BKF stage and WS (ft) *Average or consensus value from reach walk.*								

B.

Number Concentrated Flow Points	
Concentrated Flow Points/ 1,000 L.F.	

C.

Length of Armoring on banks (ft)							
Total (ft)							
Percent Armoring (%)							

Note: If %armoring is >75%, it is recommended to not measure other lateral migration metrics.

D.

Valley length (ft)	
Stream Length (ft)	
Sinuosity	

III. Identification of Representative Sub-Reach

Representative Sub-Reach Length At least 20 x the Bankfull Width		20*Bankfull Width	
Latitude of downstream extent:			
Longitude of downstream extent:			

Sub-Reach Survey Method

□ Longitudinal Profile & Cross Section
□ Rapid Survey

Date:
Investigators:

Minnesota Stream Quantification Tool
Project Reach Form

IV. Bankfull Verification and Representative Riffle Cross Section

Is Cross Section located within Representative Sub-Reach? □ Yes □ No

If no, explain why:

A.	Bankfull Width (ft)	
B.	Bankfull Mean Depth (ft) = Average of cross-section depths	
C.	Bankfull Area (sq. ft.) Width * Mean Depth	
D.	Regional Curve Bankfull Width (ft)	
E.	Regional Curve Bankfull Mean Depth (ft)	
F.	Regional Curve Bankfull Area (sq. ft.)	
G.	Curve Used	

NOTE: Space is provided here to survey a cross section using rapid survey methods. A cross section form is also available for cross section surveys.

Cross Section Measurements Depth measured from bankfull			
Station	Depth	Station	Depth

V. Stream Classification

A.	Width Depth Ratio (ft/ft) Bankfull Width / Bankfull Mean Depth	
B.	Bankfull Max Riffle Depth	
C.	Floodprone Area Width (ft)	
D.	Entrenchment Ratio (ft/ft) Floodprone Area Width /Bankfull Width	
E.	Slope Estimate (%)	
F.	Channel Material Estimate	
G.	Stream Type	

Average slope from the representative sub-reach will be measured and calculated. Pebble count forms are available to aid in this determination.

VI. Large Woody Debris (100m (328 ft) assessment length within Sub-Reach)

A.	Number of Pieces	

NOTE: Complete this section only if the LWDI is not being used. Otherwise complete the LWDI Field Form.

Date:
Investigators:

Minnesota Stream Quantification Tool
Project Reach Form

VII. Representative Sub-Reach Sketch

VIII. Notes

Date:
Investigators:

Minnesota Stream Quantification Tool
Reach Runoff Form

Project Name:

See Table 9 of the User Manual for Land Use Descriptions and Land Use Coefficients

Land Use Description	(A) Land Use Coefficient	(B) Drainage Area (acres)	(A) * (B)
			0
			0
			0
			0
			0
	Sum:	0	0
		Weighted Land Use:	

Shading Key
Desktop Value
Calculation

Date:
Investigators:

Minnesota Stream Quantification Tool
Rapid Survey Form

Reach ID:

I. Riffle Data (Floodplain Connectivity & Bed Form Diversity)

A.	Representative Sub-Reach Length			20*Bankfull Width	

B. Bank Height & Riffle Data: Record for each riffle in the Sub-Reach

	R1	R2	R3	R4	R5	R6	R7	R8
Begin Station								
End Station								
Low Bank Height (ft)								
BKF Max Depth (ft)								
BKF Mean Depth (ft)								
BKF Width (ft)								
Flood Prone Width (ft)								
Riffle Length (ft) *Including Run*								
Bank Height Ratio (BHR) Low Bank H / BKF Max D								
BHR * Riffle Length (ft)								
Entrenchment Ratio (ER)								
ER * Riffle Length (ft)								
WDR BKF Width/BKF Mean Depth								

C.	Total Riffle Length (ft) *Excludes Additional Pool Lengths*	
D.	**Weighted BHR** $\frac{\Sigma(Bank\ Height\ Ratio_i \times \text{Riffle Length}_i)}{\Sigma Riffle\ Length}$	
E.	**Weighted ER**	
F.	**Maximum WDR**	
G.	**Percent Riffle (%)**	

Shading Key
Field Value
Calculation

Date:
Investigators:

Minnesota Stream Quantification Tool
Rapid Survey Form

II. Pool Data (Bed Form Diversity)

A. Pool Data: Record for each pool within the Sub-Reach

	P1	P2	P3	P4	P5	P6	P7	P8
Geomorphic Pool?								
Station								
P-P Spacing (ft)								
Pool Spacing Ratio Pool Spacing/BKF Width								
Pool Depth (ft) Measured from BKF								
Pool Depth Ratio Pool Depth/BKF Mean Depth								

B.	**Average Pool Depth Ratio**		C.	**Median Pool Spacing Ratio**	

III. Slope

	Begin	End	Difference	Slope (ft/ft)
Station along tape (ft)				
Stadia Rod Reading (ft)				

IV. Notes

Minnesota Stream Quantification Tool
Cross Section Form

Date:	Rod Team:
Stream Name:	Instrument Team:
Reach I.D.	Notes Team:
Team Number:	

Key Codes:

Head of Riffle	R	Bankfull	BKF	Benchmark	TBM
Head of Run	N	Top of Bank	TOB	Turning Point	TP
Head of Pool	P	Edge of Channel	EC	Backsight	BS
Head of Glide	G	Inner Berm	IB	Foresight	FS
Thalweg	TW			Height of Instrument	HI

Cross Section Field Form

Station	BS (+)	HI	FS (-)	Elevation	Notes

Minnesota Stream Quantification Tool
Longitudinal Profile Form

Date: Rod Team:

Stream Name: Instrument Team:

Reach I.D. Notes Team:

Team Number:

Longitudinal Profile Field Form

Key Codes:

Head of Riffle	R	Bankfull	BKF	Benchmark	TBM
Head of Run	N	Top of Bank	TOB	Turning Point	TP
Head of Pool	P	Edge of Channel	EC	Backsight	BS
Head of Glide	G	Inner Berm	IB	Foresight	FS
Thalweg	TW			Height of Instrument	HI

Survey:			**Thalweg**		**Water Surface**		**Bankfull**		**Top of Low Bank**			
Station	**BS (+)**	**HI**	**FS (-)**	**Elevation**	**FS (-)**	**Elevation**	**FS (-)**	**Elevation**	**FS (-)**	**Elevation**	**FS (-)**	**Elevation**

Minnesota Stream Quantification Tool
Longitudinal Profile Form

Survey:			Thalweg		Water Surface		Bankfull		Top of Low Bank			
Station	BS (+)	HI	FS (-)	Elevation	FS (-)	Elevation	FS (-)	Elevation	FS (-)	Elevation	FS (-)	Elevation

LARGE WOODY DEBRIS FIELD FORM

Date Revised: 10/19/2016

Investigator(s)			State		Forest Type	Deciduous	Evergreen	Mixed	Other
Date			County		Forest Age (yrs)				
Stream Name			Phys. Province		Latitude (dd)				
Reach ID			Drainage Area (mi^2)		Longitude (dd)				
Watershed Name			Dominant Species						
Survey Length (ft)	328	Survey Length = 328 ft/100 m	BKF Width (ft)		Slope (ft/ft)				
Stream Classification	Ephemeral	Intermittent Perennial	BKF Mean Depth (ft)		Bed material				
Stream Condition	Degraded	Restored Reference Managed	Floodprone Width (ft)		Rosgen Type				
Field Notes:									

SCORE

	1		2		3		4		5		
CATEGORY	*** PIECES ***										**TOTAL PIECES**
Length/BKF Width	0 to 0.4		0.4 to 0.6		0.6 to 0.8		0.8 to 1.0		> 1.0		
Diameter (cm)	10 to 20		20 to 30		30 to 40		40 to 50		>50		
Location	**Zone 4** (Above BKF/Extending into Channel)				**Zone 3** (Above BKF/Within Streambanks)		**Zone 2** (Above WS/Below BKF)		**Zone 1** (Below WS)		
Type	Bridge				Ramp		Submersed		Buried		
Structure	Plain		Plain/Int		Intermediate		Int/Sticky		Sticky		
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		
Orientation (deg)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 90		
Total											
CATEGORY	**** DEBRIS DAMS ****										**TOTAL DAMS**
Length (% of BKF Width)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		
Height (% of BKF Depth)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		
Structure	Coarse		Coarse/Int		Intermediate		Int/Fine		Fine		
Location	Partially high flow		In high flow		Partially low flow		Mid low flow		In low flow		
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		
								Total		LWDI	

* Pieces - Non-living wood that has a large end diameter ≥ 10 cm and has a length ≥ 1 m. ** Debris Dams - Three (3) or more pieces touching.

LARGE WOODY DEBRIS FIELD FORM

Revised: 10/18/2016

Investigator(s)			State		Forest Type	
Date			County		Forest Age (yrs)	
Stream Name			Phys. Province		Latitude (dd)	
Reach ID			Drainage Area (mi^2)		Longitude (dd)	
Watershed Name			Dominant Species			
Survey Length (ft)	328	Survey Length = 328 ft/100 m	BKF Width (ft)		Slope (ft/ft)	
Stream Classification			BKF Mean Depth (ft)		Bed material	
Stream Condition			Floodprone Width (ft)		Rosgen Type	
Field Notes:						

SCORE										
	1		2		3		4		5		
CATEGORY	*** PIECES ***										**PIECE SCORES**
Length/BKF Width	0 to 0.4		0.4 to 0.6		0.6 to 0.8		0.8 to 1.0		> 1.0		0
Diameter (cm)	10 to 20		20 to 30		30 to 40		40 to 50		>50		0
Location	**Zone 4** (Above BKF/Hanging into Ch)				**Zone 3** (Above BKF/Within Streambanks)		**Zone 2** (Above WS/Below BKF)		**Zone 1** (Below WS)		0
Type	Bridge				Ramp		Submersed		Buried		0
Structure	Plain		Plain/Int		Intermediate		Int/Sticky		Sticky		0
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		0
Orientation (deg)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 90		0
CATEGORY	**** DEBRIS DAMS ****										**DAM SCORES**
Length (% of BKF Width)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		0
Height (% of BKF Depth)	0 to 20		20 to 40		40 to 60		60 to 80		80 to 100		0
Structure	Coarse		Coarse/Int		Intermediate		Int/Fine		Fine		0
Location	Partially high flow		In high flow		Partially low flow		Mid low flow		In low flow		0
Stability	Moveable		Mov/Int		Intermediate		Int/Sec		Secured		0

Additional Notes:

LWDI Summary

Sheet	No.	Reach ID	Stream Name	Physiographic Province	Stream Condition	Rosgen Type	Drainage Area mi^2	Slope ft/ft	Stream Classification	Latitude	Longitude	No. of Pieces	No. of Dams	Pieces + Dams	Piece Score	Dam Score	Weighted Dam Score	LWDI
_Blank_Data_Entry_	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
	3	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
	4	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
	5	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
	6	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
	7	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
	8	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
	9	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!
	10	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!

Date:
Investigators:

Minnesota Stream Quantification Tool
Lateral Migration Form

Reach ID:
Valley Type:
Bed Material:

			Bank Erosion Hazard Index								
Station ID	**Bank Length (Ft)**	**Study Bank Height (ft)**	**BKF Height (ft)**	**Root Depth (ft)**	**Root Density (%)**	**Bank Angle (degrees)**	**Surface Protection (%)**	**Bank Material Adjustment**	**Stratification Adjustment**	**BEHI Total/ Category**	**NBS Ranking**

Date:
Investigators:

Minnesota Stream Quantification Tool
Lateral Migration Form

Summary Table

BEHI/NBS Ranking	Enter Bank Length from all rows on p.1 with same ranking									Length (Feet)	Percent of Total
Ex/Ex											
Ex/VH											
Ex/H											
Ex/M											
Ex/L											
Ex/VL											
VH/Ex											
Vh/VH											
VH/H											
VH/M											
VH/L											
VH/VL											
H/Ex											
H/VH											
H/H											
H/M											
H/L											
H/VL											
M/Ex											
M/VH											
M/H											
M/M											
M/L											
M/VL											
L/Ex											
L/VH											
L/H											
L/M											
L/L											
L/VL											
VL/Ex											
VL/VH											
VL/H											
VL/M											
VL/L											
VL/VL											
									Total Bank Length:		
									Total Eroding Bank Length:		
									Percent Bank Erosion (%):		

Shading Key
Field Value
Calculation

PEBBLE COUNT DATA SHEET

SITE OR PROJECT:
REACH/LOCATION:
DATE COLLECTED:
FIELD COLLECTION BY:
DATA ENTERED BY:

			PARTICLE CLASS			Reach Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Riffle**	**Pool**	**Total**	Class %	% Cum
	Silt / Clay	< .063					
	Very Fine	.063 - .125					
	Fine	.125 - .25					
	Medium	.25 - .50					
	Coarse	.50 - 1.0					
	Very Coarse	1.0 - 2.0					
	Very Fine	2.0 - 2.8					
	Very Fine	2.8 - 4.0					
	Fine	4.0 - 5.6					
	Fine	5.6 - 8.0					
	Medium	8.0 - 11.0					
	Medium	11.0 - 16.0					
	Coarse	16 - 22.6					
	Coarse	22.6 - 32					
	Very Coarse	32 - 45					
	Very Coarse	45 - 64					
	Small	64 - 90					
	Small	90 - 128					
	Large	128 - 180					
	Large	180 - 256					
	Small	256 - 362					
	Small	362 - 512					
	Medium	512 - 1024					
	Large-Very Large	1024 - 2048					
	Bedrock	> 2048					

Totals

Effective Vegetated Riparian Area Documentation Form

Reach Name:
Bankfull Width:
Valley Type:
Effective Riparian Area Width Calculation (ft): 0
*Wbankfull _____ (ft) * MWR _____ + 2 * Wadditional _____ (ft)*

Insert Image/Map with aerial photo base and topographic contour elevations showing application of effective riparian width to stream channel per Steps 1 through 5 in Appendix A. Show channel center points and associated riparian width lines.

Insert Image/Map with aerial photo base and topographic contour elevations showing Effective Riparian Area Polygon (Step 6 in Appendix A):

Size of Effective Riparian Area Polygon: _____ (square meters).

Insert Image/Map with aerial photo base showing areas determined to be non-vegetated per Step 7 in User Manual (2.7.E):

Total size of area within Effective Riparian Area that is **Non-Vegetated** (square meters):

Percent of Effective Riparian Area that is **Vegetated**:

Date:

Investigators:

Minnesota Stream Quantification Tool

Riparian Width Form

Reach Name: ______________________

Reach Length: ______________________

Shading Key
Desktop Value
Field Value
Calculation

Plot ID: ________________ **Reach STA:** ________________

Effective Vegetated Riparian Width [1] (ft)			
Artificial Veg. Widths [2]	Width (ft)	Width (ft)	Width (ft)
Type of Artificial Vegetation [3]			
Actual Vegetated Area Width (ft) [4]	0		

Plot ID: ________________ **Reach STA:** ________________

Effective Vegetated Riparian Width [1] (ft)			
Artificial Veg. Widths [2]	Width (ft)	Width (ft)	Width (ft)
Type of Artificial Vegetation [3]			
Actual Vegetated Area Width [4] (ft)	0		

Plot ID: ________________ **Reach STA:** ________________

Effective Vegetated Riparian Width [1] (ft)			
Artificial Veg. Widths [2]	Width (ft)	Width (ft)	Width (ft)
Type of Artificial Vegetation [3]			
Actual Vegetated Area Width [4] (ft)	0		

Plot ID: ________________ **Reach STA:** ________________

Effective Vegetated Riparian Width [1] (ft)			
Artificial Veg. Widths [2]	Width (ft)	Width (ft)	Width (ft)
Type of Artificial Vegetation [3]			
Actual Vegetated Area Width [4] (ft)	0		

Plot ID: ________________ **Reach STA:** ________________

Effective Vegetated Riparian Width [1] (ft)			
Artificial Veg. Widths [2]	Width (ft)	Width (ft)	Width (ft)
Type of Artificial Vegetation [3]			
Actual Vegetated Area Width [4] (ft)	0		

[1] Calculated value using equation from in Riparian Vegetation section of Field manual.

[2] If artificial vegetation is identified, measure widths and enter into cells to the right.

[3] Examples of artificial vegetation: lawns, ag. crops, roads, paths, buildings, utility easements, etc.)

[4] Is the Expected Vegetated Area Width minus the sum of all artificial vegetation widths for this plot id/reach sta.

Date:
Investigators:

Minnesota Stream Quantification Tool
Riparian Area Form

Reach Name: _____
Reach Length: _____

Shading Key
Desktop Value
Field Value
Calculation

Riparian Width & Area

Desktop Review Values

Effective Vegetated Riparian Area Width [1] (ft)	
Total Reach Length (ft)	
Estimate of Effective Vegetated Riparian Area (ft^2)	0

Metric Area Conversion

Estimate of Effective Vegetated Riparian Area (m^2)	0

Sampling Plots

Riparian Vegetation Plot Area Needed for 2% Coverage (m^2)	0

Total 5m x 5m plots needed	Total 10m x 10m plots needed
8	4

Field Verification

Average of Actual Vegetated Riparian Widths [2] (ft)	
Total Reach Length (ft)	0

Actual Vegetated Riparian Area (ft^2)	0
Actual Vegetated Riparian Area (m^2)	0

% of Riparian Area that is Vegetated

[1] Calculated value using equation from in Riparian Vegetation section of Field manual.

[2] Value determined from field measurements (exclusion of artificial/non-vegetated areas).

Date: Minnesota Stream Quantification Tool

Investigators: Riparian Vegetation Form

Project/Reach Name: _____

Plot ID#	
Side	

Left or **Right** side of stream (view facing downstream)

Relative Areal Cover[1] by Strata

Strata	Strata Parameters	Cover Midpt.	Range	Midpt.
Herb	all veg < 1.37 m in height [2]		>95-100%	97.5%
Shrub	woody veg 1.37m in height and <7.62cm dbh [3]		>75-95%	85.0%
Tree	woody veg ≥1.37m in height and ≥7.62 cm dbh [3]		>50-75%	62.5%
Canopy	sum of shrub + tree strata cover midpoints		>25-50%	37.50%
Notes:			>5-25%	15%
			>1-5%	3%
			>0-1%	0.50%
			0%	0.00%

[1] Relative Areal Cover is the proportional cover by vegetation as a percentage of the total plot, ranging from 0-100%.

[2] Height is the length of a woody, perennial stem, measured to the terminal bud of longest woody stem (rather than the height above the ground).

[3] Dbh is measured in centimeters at a height of 1.37m above ground.

Woody Stem Basal Area by dbh[A]

Write down the plot dimensions used (e.g. 5m x 5m)

Plot Dimensions	

List the plot size in hectares from table below

Plot Size (ha)	0.0025

DBH Classes (cm)	DBH Midpoint/Actual DBH (cm) [A]	Individual BA/Stem (m^2)	X [B]
0 - 2.5	1.25	0	
2.5 - 5.0	3.75	0	0
5.0 - 7.5	6.75	0	0
7.5 - 12.5	10.00	0	0
12.5 - 20.5	16.50	0	0
20.5 - 30.5	25.50	0	0
>30.5		0	1
		0	1
		0	1
		0	1
		0	1
		0	1
		0	1
		0	1
		0	1
		0	1
		0	1
		0	1
		0	1
	Plot BA Total:	**0.000000**	**m^2**

Plot BA on hectare basis (m^2/ha)
0.0

Plot	Area (ha)	Type
5m x 5m	0.0025	Full
10m x 10m	0.01	Full
2m x 5m	0.001	Sub-Plot [C]
2m x 10m	0.002	Sub-Plot [C]

$BA\ (m^2) = 0.00007854 * (dbh^2)$

$$BA\ (m^2/ha) = \frac{\text{Plot BA Total (m2)}}{\text{Plot Size (ha)}}$$

Shading Key
Field Value
Calculation

[A] Dbh is measured in centimeters at a height of 1.37m above ground.

[B] The user can input the actual stem count by dbh midpoint or individually measured dbh's >30.5 cm.

Example . 12, 1-cm stems. Enter 1 under dbh (cm). Enter 12 in this column and the BA will be calculated correctly.

[C] Subplot is a 1-meter wide strip along the right and left sides of either a 10m x 10m or 5m x 5m plots. Cannot be used for post-project assessment if woody plantings present.

VISIT SUMMARY MPCA

VISIT INFORMATION

==========

=

Field Number: Stream Name:

Visit Result and Reason (check one in appropriate column):

Reportable

☐Reportable: Sufficient and representative sample

☐Reportable: Low sample size (<25 fish)

Replicate

☐Replicate: Sufficient and representative sample

☐Replicate: Low sample size (<25 fish)

Non-reportable

☐Non-reportable: Unsatisfactory taxis

☐Non-reportable: Outside base flow, high

Not sampled

☐Non-sampleable: Insufficient flow

☐Non-sampleable: Beaver dam – too

☐Non-sampleable: No definable channel

☐Non-sampleable: Other (explain in

If **GPS** coordinates taken during site visit:

DS FileName:_____ **X** FileName:_____ **US** FileName:_____

DS Lat:_____ **X** Lat:_____ **US** Lat:_____

DS Lon:_____ **X** Lon:_____ **US** Lon:_____

FIELD WATER CHEMISTRY==========

Time (24 hr clock):_____ Water Temp. (°C):_____ Air Temp. (°C):_____ HACH Meter #:_____ Conductivity (umhos@25°C):_____ pH:_____ Dissolved Oxygen (DO)(mg/l):_____ %DO Saturation:_____ Secchi Tube:_____ /100cm

Water Level: ☐ Normal ☐ Below _____(m) ☐ Above _____(m)

Precipitation (if box(es) checked indicate intensity in comments) ☐ Currently raining ☐ Rain yesterday

LAB WATER CHEMISTRY

==========

Chem. Sample ID (field sample):_____ Chem. Sample ID (field duplicate):_____ Collection Time (field sample):_____ Collection Time (field duplicate):_____

TAPE DOWN DISTANCE MEASUREMENT

==========

CHANNEL CHARACTERISTICS==========

Transect Spacing (m):_____ Station Length (m):_____

Channel Condition (check appropriate box): ☐ Natural Channel ☐ Recent Channelization ☐ Old Channelization

Visual Condition (refer to the ratings and codes on the backside of this form):

Appearance:_____ Recreational Suitability:_____ Stream Condition:_____ / _____ / _____

Does the site appear to be low gradient? ☐ No ☐ Yes (use checkboxes on back to describe observations)

COMMENTS/NOTES:_____

Visual Condition - Ratings and Codes

RATING	APPEARANCE DEFINITION
1A	Clear – crystal, clear transparent water
1B	Tea-colored – transparent water, which has been colored by dissolved organic matter from upstream bogs or wetlands
2	Cloudy – not quite crystal clear; cloudy white, gray or light brown
3	Muddy – cloudy brown due to high sediment levels
4	Green – due to algae growth; indicative of excess nutrients released into stream
5	Muddy AND Green – a combination of cloudy brown from high sediment levels and green from algae growth
RATING	**RECREATIONAL SUITABILITY DEFINITION**
1	Beautiful, could not be better
2	Very minor aesthetic problems: excellent for body-contact recreation
3	Body-contact recreation and aesthetic enjoyment slightly impaired
4	Recreation potential and level of enjoyment of the stream substantially reduced (would not swim but boating/canoeing is okay)
5	Swimming and aesthetic enjoyment of the stream nearly impossible
STREAM CONDITION: **N**=Normal, **L**=Low, **Z**= No Flow, **D**=Dry, **I**=Interstitial, **H**=High **SW**=Swift, **SL**=Slow, **MO**=Moderate **C**=Clear, **M**=Muddy, **O**=Other	
Low Gradient Site Characteristics (check all that apply) (note any comments):	
☐ Flow velocity only slow, or slow and moderate	
☐ Riffles absent or representing very low percentage of reach (typically <5%)	
☐ Dominated (>80%) by fines (silt, sand, detritus), coarse substrate uncommon (<10%)	
☐ Wetland vegetation (cattails, arum, water lily, etc.) in channel or riparian zone	
☐ It looks like a low gradient stream	

PROCEDURE FOR TEMPERATURE LOGGER DEPLOYMENT AT STREAM MONITORING SITES

updated 04/30/2015

I. PURPOSE

To describe the methods used by the Minnesota Pollution Control Agency's (MPCA) Biological Monitoring Program to place, check and retrieve temperature loggers that are placed at stream biological monitoring sites.

II. SCOPE/LIMITATIONS

This procedure applies to all sites where a temperature logger is placed.

III. GENERAL INFORMATION

Sites may be selected to have a temperature logger placed for a number of reasons including:

1) Site is a designated coldwater stream
2) Site is a 10x water chemistry site
3) Site is a Long Term Monitoring Reference site
4) Site thought to be coldwater, although not currently designated
5) Site is in coldwater/warmwater transition zone
6) Site is warmwater and chosen for further warmwater or climate change data collection

IV. REQUIREMENTS

A. Qualifications of crew leaders: The crew leader must be a professional aquatic biologist with a minimum of a Bachelor of Science degree in aquatic biology or closely related specialization. Field crew leaders should also possess excellent map reading skills and a demonstrated proficiency in the use of a GPS (Global Positioning System) receiver and orienteering

B. Qualifications of field technicians/student interns: A field technician/student intern must have at least one year of college education and coursework in environmental and/or biological science.

C. General qualifications: All personnel conducting this procedure must have the ability to perform rigorous physical activity. It is often necessary to wade through streams and/or wetlands, canoe, or hike for long distances to reach a sampling site where a temperature logger may be placed.

V. RESPONSIBILITIES

A. Field crew leader: Implement the procedures outlined in the action steps and ensure that the data generated meets the standards and objectives of the Biological Monitoring Program.

B. Technicians/interns: Implement the procedures outlined in the action steps, including maintenance and stocking of equipment, data collection and recording.

VI. QUALITY ASSURANCE AND QUALITY CONTROL

A. Logger QA/QC: Every winter, all data loggers will be deployed and tested in a lab setting. All loggers will also be checked for battery life during data downloading in the fall.

B. Data QA/QC: All data collected by each temp logger each summer will be verified by trained staff to assure temperature logger was logging properly, and remained in the water, out of the sun, and did not become buried in sediment throughout

VII. TRAINING

A. All inexperienced personnel will receive instruction from a trainer designated by the program manager. Major revisions in this protocol require that all personnel be re-trained in the revised protocol by an authorized trainer.

B. The field crew leader will provide instruction in the field and administer a field test to ensure personnel can execute this procedure.

A. Equipment List: Verify that all necessary items are present before commencement of this procedure (Table 1).

B. Method: Sites that require temperature loggers can generally be put in during recon, but if high water persists may be put in at a later date, but no later than May 31st. If suitable deployment locations do not exist within the stream reach, temperature logger can be placed above or below the stream reach.

1) Record the Temperature Logger Serial Number on the Temp Logger form before deploying the logger.

2) Find a suitable location that the temperature logger can be placed.

   a. The logger should remain in the water column during the entire deployment and not exposed to the surface.
   b. The location should be: out of direct sunlight; in flowing water; intermediate depth.
   c. Logger should be placed no closer than 6 inches from the stream bottom to avoid siltation and burial.
   d. Measures should be taken to avoid backwaters, eddies, standing water, point source discharges, lake outlets, springs, groundwater seeps, beaver activity, wetlands and wetlands in stream margins.
   e. Measures should also be taken to choose a location that will protect the logger from future high velocities, substrate movement and debris that may dislodge the logger.
   f. Water should be well mixed. This can be verified by taking numerous temperature measurements near the deployment location. A 10 measurement cross-section can be taken looking at variable stream temperature, dissolved oxygen levels and conductivity. Variability in measurements may indicate sources of thermal variation. If this is true, find a new deployment location.
   g. Extra caution should be taken to place the temperature logger in a discrete location so they are not easily seen unless specifically looking for them. For watershed sites, locating the temperature logger at X, or further away from the road is preferred.

3) Attach the temperature logger to protective radiation shield.

   a. Deployment methodologies.
   i. Rebar – Adhere logger tightly to rebar with wire or heavy duty zip ties. In softer substrates this can be done by hand but in some areas hammers will help secure the rebar into the stream bed. Acceptable method in areas not heavily impacted by fine sediments (sand silt) or streams with unpredictable flows that may dislodge the rebar. Bent rebar can provide extra stability by securely anchoring the rebar into the substrate in two locations as well as allowing for easier deployment and retrieval.
   ii. Dog tie – Adhere logger tightly to end of triangle tie with wire or heavy duty zip tie. Screw tie down into side of stream bank within the channel. Logger should be placed no closer than 6 inches from the stream bank to avoid potential groundwater influence. Acceptable method in streams

iii. Airline Cable – Adhere wire to stable location (rebar on stream bank not prone to collapse, around a tree on stream bank not prone to falling into the stream during a high flow event, a large boulder (in stream laden with bed rock, only if no fine sediment are present), or a bridge pillar or pilon). Wire can be crimped using cable ferrules or wire rope clips. If wire is adhered to object on stream bank measures should be taken to hide evidence of the deployment from would be vandals or curious citizens by hiding exposed wire under vegetation or rocks.

4) Take a GPS waypoint of the temperature logger. Name the waypoint with the prefix "TL" followed by the logger serial number (eg.,TL644619). If the logger is later moved, and a new GPS point collected, label the new waypoint with the prefix "TL", the logger serial number, followed by the letter "M" for "moved" (e.g., TL644619M).

5) If the logger is deployed in a low traffic area, consider documenting the logger's location with a piece of flagging attached to a nearby tree or on the rebar stick.

6) Record the temperature of the water in the exact location of the logger. This should be done with a calibrated high precision electronic thermometer with a lead attached to the probe to get as close to the logger as possible.

7) Photograph the location of the logger by taking a photograph both upstream and downstream at deployment location and perpendicular to the stream towards the stream bank. Photographs will ease relocating the logger at future site visits

C. Temperature Logger Form

This form provides location, fish visit check, and retrieval notes for each temperature logger deployed. The form is completed upon placement of the temperature logger at the site.

C.1. Deployment Information

1) *Field Number* – A seven-digit code that uniquely identifies the station. The first two digits identify the year the station was established, the second two identify the major river basin, and the last three are numerically assigned in sequential order (example 02UM001). Assign the station an appropriate field number. For EMAP sites the last three digits should correspond to the sequential number provided by EPA for each site.

1) *Stream Name* – The name of the stream as shown on the most recent USGS 7.5" topographic map. Include all parts of the name (i.e. "North Branch", "Creek", "River", "Ditch", etc.).

2) *Date* – The date fish sampling is conducted in month/day/year format (MM/DD/YY).

2) *Crew* – The personnel who conducted the temperature logger deployment.

3) *Temp Logger Serial Number* – The unique identifier of the individual temperature logger.

4) *GPS Date* – The date that the final GPS file is taken in month/day/year format (MM/DD/YY).

5) *GPS Time* – The time of day (24-hour clock) that the GPS file is taken.

6) *Latitude* – The angular distance north or south of the equator. Record the latitude of the temperature logger as displayed on the GPS receiver in degrees, minutes, seconds format.

7) *Longitude* – The angular distance east or west of the prime meridian. Record the longitude of the temperature logger as displayed on the GPS receiver in degrees, minutes, seconds format.

8) *Placement Description* – Detailed description of where the temperature logger was placed in relation to all features of the stream (Riffle/Run/Pool) and location within the longitudinal reach (Upstream (US) / Midreach(X) / Downstream (DS) and the lateral reach left bank (LB) / right bank (RB) / mid channel (Mid). Special attention needs to be given so staff members are able to come back and retrieve the logger based on this description.

9) *Comments* – Written explanation of the temperature logger's location and placement. Special attention needs to be given so staff members are able to come back and retrieve the logger based on this description. Example: Temp logger 5 meters upstream from X flag in pool 3 feet off of right bank. Pounded rebar down in gravel until TL was 6" off bottom.

10) *Photographs of reach segments (frame #)* - In the first photograph, identify the site by writing the field number on a piece of paper held within the picture frame. Take two pictures (one facing upstream and one facing downstream) at the exact deployment location and a straight shot perpendicular to (or facing) the stream bank. Record the order the photos were taken or the frame numbers of each photograph to assist in identifying the pictures for each site after developing or downloading.

11) *Protective case* – Indicate type of radiation shield (case) utilized during deployment PVC or Metal.

12) *Precision thermometer #* - Identify meter utilized to take temperature during temperature logger deployment.

13) *Temperature (C)* – Temperature recorded during temperature logger launch. Temperature is tested with a calibrated thermometer.

14) *Time* : Indicate the time of day (24-hour clock) that the temperature is taken at deployment.

C.2. Fish Visit Information:

1) Site Visit 1
   a. *Date* – The date the temperature logger check was completed.
   b. *Crew* – The personnel who conducted the temperature logger check.
   c. *Was temp logger checked?* – A Yes/No option indicating whether or not the temperature logger was checked.
   d. *TL in good location?* – A Yes/No option indicating whether or not the temperature logger was in an appropriate location.
   e. *Comments* – Any additional comment about the condition the temp logger was found in.
   f. *Precision thermometer #* - Identify meter utilized to take temperature during temperature logger during site visit.
   g. *Temperature (C)* – Temperature recorded during site visit. Temperature is tested with a calibrated thermometer.
   h. *Time* : Indicate the time of day (24-hour clock) that the temperature is taken.

2) Site Visit 2
   a. *Date* – If there was a second visit, the date the temperature logger check was completed.
   b. *Crew* – If there was a second visit, the personnel who conducted the temperature logger check.
   c. *Was temp logger checked?* – If there was a second visit, a Yes/No option indicating whether or not the temperature logger was checked.
   d. *TL in good location?* – If there was a second visit, a Yes/No option indicating whether or not the temperature logger was in an appropriate location.

e. *Comments* – If there was a second visit, any additional comment about the condition the temp logger was found in.

f. *Precision thermometer #* - If there was a second visit, identify meter utilized to take temperature during site visit.

g. *Temperature (C)* – If there was a second visit, temperature recorded during site visit. Temperature is tested with a calibrated thermometer.

h. *Time:* If there was a second visit, indicate the time of day (24-hour clock) that the temperature is taken.

3) Site Visit 3

a. *Date* – If there was a third visit, the date the temperature logger check was completed.

b. *Crew* – If there was a third visit, the personnel who conducted the temperature logger check.

c. *Was temp logger checked?* – If there was a third visit, a Yes/No option indicating whether or not the temperature logger was checked.

d. *TL in good location?* – If there was a third visit, a Yes/No option indicating whether or not the temperature logger was in an appropriate location.

e. *Comments* – If there was a third visit, any additional comment about the condition the temp logger was found in.

f. *Precision thermometer #* - If there was a third visit, identify meter utilized to take temperature during site visit.

g. *Temperature (C)* – If there was a third visit, temperature recorded during site visit. Temperature is tested with a calibrated thermometer.

h. *Time* : If there was a third visit, indicate the time of day (24-hour clock) that the temperature is taken.

C.4. <u>If TL was moved…</u>

1) *Temp Logger Serial Number* – The unique identifier of the individual temperature logger.

2) *GPS Date* – The date that the final GPS file is taken in month/day/year format (MM/DD/YY).

3) *GPS Time* – The time of day (24-hour clock) that the GPS file is taken.

4) *Latitude* – The angular distance north or south of the equator. Record the latitude of the temperature logger as displayed on the GPS receiver in degrees, minutes, seconds format.

5) *Longitude* – The angular distance east or west of the prime meridian. Record the longitude of the temperature logger as displayed on the GPS receiver in degrees, minutes, seconds format.

6) *Placement Description* – Detailed description of where the temperature logger was placed in relation to all features of the stream (Riffle/Run/Pool) and location within the longitudinal reach (Upstream (US) / Mid reach (X) / Downstream (DS) and the lateral reach left bank (LB) / right bank (RB) / mid channel (Mid). Special attention needs to be given so staff members are able to come back and retrieve the logger based on this description.

C.5. Retrieval Notes:

i. *TL Retrieved* – Check box, indicates whether or not the temperature logger was collected.

j. *Date Attempted* – If an unsuccessful attempt to collect temperature logger was made, indicate date here.

k. *Crew* – The personnel who conducted the unsuccessful temperature logger check.

l. *Date Retrieved* – The date the temperature logger retrieval was completed.

m. *Retrieval Crew* - The personnel who conducted the successful temperature logger retrieval.

n. *Comments* – Any additional comments about where the temperature logger was found, especially noting if there were any issues with its location. If the temperature logger retrieval was unsuccessful indicate information about the search and whether or not additional attempts are warranted.

o. *Precision thermometer #* - Identify meter utilized to take temperature at temperature logger retrieval.

p. *Temperature (C)* – Temperature recorded during logger retrieval. Temperature is tested with a calibrated thermometer.

q. *Time:* Indicate the time of day (24-hour clock) that the temperature is taken at retrieval.

Table 1. Equipment List – This table identifies all equipment needed in order to deploy a temperature logger at a stream biological monitoring site.

Stream information sheet – for location of site

1:24,000 USGS topographical maps – for navigation to and from the sampling site

County Platte maps – for determining land ownership

Aerial photographs – for navigation to and from the sampling site

DeLorme atlas – for vehicular navigation to and from the sampling site

GPS receiver – to locate and document temperature logger location

Flagging – to mark the temperature logger location if needed

Pencil – for filling out forms

Permanent marker – to label flagging

Clipboard – to store forms/maps and record data

Waders – because it is necessary to enter the stream to place temperature logger

Cellular telephone – to contact landowners, to communicate between field crews, and for safety

Rebar – for anchoring temperature logger into the stream bed

Cable – for anchoring temperature logger to stable object

Dog ties – for anchoring temperature logger to side of stream bank

Cable Ferrules – for securing temperature logger to cable

Wire Cutter and Crimper – for cutting wire and securing cable ferrules to cable

Heavy duty Zip ties – for securing logger to rebar and dog ties

Hammer – to assist in getting rebar into the stream bed

Temperature Logger – to record temperature data

Wire – to attach temperature logger to rebar or dog tie

Temperature Logger Cases – radiation shields to protect temperature logger during deployment and (metal) enable deployment in streams with hard substrates (bedrock, cobble, boulder)

Water Chemistry Meter – to take DO and Conductivity measurements during deployment to insure water at deployment location is well mixed.

Calibrated Precision Thermometer – to record temperature at temperature logger deployment, site visits and temperature logger retrieval

Temperature Logger Form

(Revised 4/2015)

Deployment Information					
Field Number:		Stream Name:			
Date:		Crew:			
Temp Logger Serial Number		GPS Date		GPS Time	
Field GPS		Latitude		Longitude	
Decimal Degrees		____.____		____.____	
Placed in a: Riffle Run Pool	Placed Near: US X DS / LB RB Mid				
Comments:					
Photos of Temp Logger Deployment					
Site number:	Logger looking DS:	Logger Looking US:	Straight on:		
Case used : PVC or Metal		Deployment Method:			
Precision Thermometer		Temperature (C)		Time	

Visit information					
Date:		Crew:			
Was temp logger checked?		TL in a good location (not at surface, or buried)?			
Comments:					
Precision Thermometer #:		Temperature (C)		Time	
Date:		Crew:			
Was temp logger checked?		TL in a good location (not at surface, or buried)?			
Comments:					
Precision Thermometer #:		Temperature (C)		Time	
Date:		Crew:			
Was temp logger checked?		TL in a good location (not at surface, or buried)?			
Comments:					
Precision Thermometer #:		Temperature (C)		Time	
If TL was moved to a new location, please describe and include GPS Coordinates					
Temp Logger Serial Number		GPS Date		GPS Time	
Field GPS		Latitude		Longitude	
Decimal Degrees		____.____		____.____	
Placed in a: Riffle Run Pool	Placed Near: US X DS LB RB Mid				
Comments:					

Retrieval Notes					
TL retrieved? ☐		If no, Date Attempted :		Crew:	
Date retrieved:		Retrieval Crew:			
Comments: (At water surface, out of water, buried, no shade, surrounded by veg, looked good)					
Precision Thermometer #:		Temperature (C)		Time	

Date:
Investigators:

Minnesota Stream Quantification Tool
Sensor Log

Stream Name:
Sub-reach Name:

Dissolved Oxygen Logger Deployed? □ **Yes** □ **No**

Date Deployed:	
Date Retreived:	

Frequency of data: □ Daily □ Other: _____
Timing of data: □ 1-3pm □ Other: _____

Describe sensor location within reach:

Total Suspended Solids Sample Obtained? Sample Type:

Date Obtained:	

Describe location within reach:

Other Sensor Deployed? Sensor Type:

Date Deployed:	
Date Retreived:	

Frequency of data (if applicable): _____

Describe location within reach:

ALSO IDENTIFY ALL SENSOR LOCATIONS ON SUB-REACH SKETCH ON PROJECT REACH FORM

-MPCA Biological Monitoring Program-

Macroinvertebrate Identification Lab Bench Sheet

Field Number	**Sample Date**
Site Name	**Taxonomist:**
Sample Type QMH* QR HD other_____	**Date of Sample ID:** ____/____/____

*A processed QMH sample consists of 2 parts, the subsample(ss) and large/rare (l/r), both parts must be identified

Order/Family	Genus	Species/Notes	ss	l/r	Order/Family	Genus	Species/Notes	ss	l/r
Ephemeroptera					**Odonata**				
Baetiscidae	Baetisca				Calopterygidae	Calopteryx			
Caenidae	Bracycercus					Hetaerina			
	Caenis				Coenagrionidae	Argia			
Ephemerellidae	Attenella					Enallagma			
	Ephemerella					Nehalennia			
	Serratella				Lestidae	Lestes			
Ephemeridae	Ephemera				Aeshnidae	Aeschna			
	Hexagenia					Anax			
Leptohyphidae	Tricorythodes					Basiaeschna			
Leptophlebiidae	Leptophlebia					Boyeria			
	Paraleptophlebia				Cordulegastridae	Cordulegaster			
Polymitarcidae	Ephoron				Corduliidae	Cordulia			
Potamanthidae	Anthopotamus					Dorocordulia			
Heptageniidae	Epeorus					Epitheca			
	Heptagenia					Somatochlora			
	Stenacron				Gomphidae	Dromogomphus			
	Stenonema					Gomphurus			
Isonychiidae	Isonychia					Gomphus			
Ametropodidae	Ametropus					Hagenius			
Baetidae	Acerpenna					Ophiogomphus			
	Baetis					Phanogomphus			
	Callibaetis					Progomphus			
	Heterocloeon				***notes/additional taxa***				
notes/additional taxa									
					Hemiptera				
Plecoptera					Belostomatidae	Belstoma			
Leuctridae						Corixidae			
Taeniopterygidae					Corixidae	Hesperocorixa			
Perlidae	Acroneuria					Sigara			
	Agnetina					Trichocorixa			
	Attaneuria				Nepidae	Ranatra			
	Neoperla				Notonectidae	Buenoa			
	Paragnetina					Notonecta			
	Perlinella				***notes/additional taxa***				
Perlodidae									
Pteronarycyidae	Pteronarcys								
notes/additional taxa									
					Amphipoda				
					Talitridae	Hyallela	azteca		
					Gammaridae	Gammarus			
Lepidoptera					***notes/additional taxa***				
Pyralidae	Paraponyx								
	Petrophila								
notes/additional taxa					**Decapoda**				
					Cambaridae	Cambarus			
Megaloptera						Orconectes			
Corydalidae	Chauliodes					Procambarus			
	Corydalus				***notes/additional taxa***				
	Nigronia								
Sialidae	Sialis								
notes/additional taxa					**Pelecypoda**				
					Sphaeriidae				
					Corbiculidae				
Isopoda					Unionidae				
Asselidae	Asselus				***notes/additional taxa***				
notes/additional taxa									

entered into DataInverts by _____ --- (initials) date _____

Order/Family	Genus	Species/Notes	ss	l/r	Order/Family	Genus	Species/Notes	ss	l/r
Trichoptera					**Diptera**				
Dipseudopsidae	Phylocentropus				Ceratopogonidae	Alluaudomyia			
Hydropsycidae	Ceratopsyche					Atrichopogon			
	Cheumatopsyche					Bezzia			
	Diplectrona					Ceratopogon			
	Hydropsyche					Culicoides			
	Potamyia					Nilobezzia			
Philopotamidae	Chimarra					Palpomyia			
	Dolophilodes					Probezzia			
Polycentropodidae	Cernotina					Sphaeromias			
	Cyrnellus				Chironomidae	G.			
	Neureclipsis				Dixidae	Dixa			
	Paranyctiophylax					Dixella			
	Polycentropus				Simuliidae	Simulium			
Psychomyiidae	Lype				Tipulidae	Antocha			
	Psychomyia					Dicranota			
Glossosomatidae	Agapetus					Hexatoma			
	Glossosoma					Limnophila			
	Protoptila					Limonia			
Hydroptilidae	Hydroptila					Pilaria			
	Leucotrichia					Tipula			
	Mayatrichia				Athericidae	Atherix			
	Oxyethira				Empididae	Hemerodromia			
	Orthotrichia				Tabanidae	Chrysops			
Rhyacophilidae	Rhyacophila					Tabanus			
Brachyecentridae	Brachycentrus				***notes/additional taxa***				
	Micrasema								
Helicopsychidae	Helicopsyche								
Lepidostomatidae	Lepidostoma								
Leptoceridae	Ceraclea				**Coleoptera**				
	Leptocerus				Dytiscidae	Agabus			
	Mystacides					Laccophilus			
	Nectopsyche					Liodessus			
	Oecetis				Gyrinidae	Dineutus			
	Trianodes					Gyrinus			
Limnephilidae	Limnephilus				Elmidae	Ancyronyx			
	Hydatophylax					Dubiraphia			
Molannidae	Molanna					Macronychus			
Phryganeidae	Phryganea					Optioservus			
	Ptilostomis					Stenelmis			
Sericostomatidae	Agarodes				Hydrophilidae	Berosus			
notes/additional taxa						Helocombus			
						Laccobius			
						Sperchopsis			
						Tropisternus			
Gastropoda									
Ancylidae	Ferrissia								
Planorbidae	Helisoma				**Annelida**	Oligochaeta			
	Promentus					Hirudinea			
	Planorbula				***notes/additional taxa***				
	Gyraulus								
Vivaparidae	Campeloma								
Lymnaeidae	Lymnaea								
	Bulimnea								
	Fossaria				Hydracarina (trombidoformes, acarina)				
Hydrobiidae	Amnicola				Nematoda				
Pleuroceridae	Pleurocera				*notes/additional taxa*				
Physidae	Physa								
notes/additional taxa									

entered into DataInverts by _____ --- (initials) date _____

Macroinvertebrate Sample Sorting Bench Sheet

Field Number	Sample Date	Sample Type *	# Sample Bottles	Sample Sorting Date		# Organisms Picked	# Squares Picked**	L/R (y/n)	Chiro toVial (y/n)
				Begin	End				

* QMH, QR, HD, WTL

** Applies only to samples being subsampled

Macroinvertebrate Sorting QC Form

Sample Field Number	Sampling Date	Sample Type	Initials of QC Sorter	# Organisms found in QC	# Organisms originally found in sample	Sorting Efficiency	Date QC Sort Completed

Minnesota Pollution Control Agency

MPCA Stream Monitoring Program

INVERTEBRATE VISIT FORM

Stream Name:		**Date:**
Field Number:	**County:**	**Crew:**
Water Chemistry	Tape Down: ___._____ (1/100ths ft) Location: _____	

Time: (24 hr) _____:___ Air Temp:_____ (°C) Water Temp:_____ (°C) Conductivity: _____ (umhos@25°C)

DO: _____(mg/L) DO % Saturation:_____ pH:_____ Secchi -Tube: _____

*****If Flagging is not found or if establishing a new site, fill out GPS info*****

Coordinates	**LATITUDE**	**LONGITUTDE**	**Time:**
Field GPS:	_____._____	_____._____	**Name:**

Notes:

Stream Classification Information

Flow	Flow over riffle(s)	High / Med / Low / NA	Channel	Excavated, trapezoidal channel	%
	Flow at reach constriction	High / Med / Low / NA		Shallow excavation, channelized wetland	%
	Flow over run	High / Med / Low / NA		Natural channel	%
	General flow pattern	High / Med / Low / NA	Vegetation	Emergent, aquatic vegetation in channel	Ext / Mod / Sparse / NA
	Intermittent sections	Yes / No		Emergent, aquatic vegetation along bank	Ext / Mod / Sparse / NA
Habitat	Riffle (with flow) present in reach			Floating or submerged aquatic vegetation	Ext / Mod / Sparse / NA
	Riffle (with flow) present outside of reach (riffles do not include riprap associated with bridges or bank stabilization)			Loosely attached filamentous algae	Ext / Mod / Sparse / NA
				Firmly attached algae or submerged veg	Ext / Mod / Sparse / NA
	Dominant invertebrate habitat (circle two) Riffle | Rocky Run-Pool | Aquatic Macrophyte | Bank-Overhanging Veg | Wood | Leaf				
Substrate	Dominant Run Substrate	bedrock / boulder / cobble / gravel / sand / silt			
	Dominant Pool Substrate	bedrock / boulder / cobble / gravel / sand / silt			
	Dominant Substrate receiving flow	bedrock / boulder / cobble / gravel / sand / silt			
	Dominant Substrate in reach	bedrock / boulder / cobble / gravel / sand / silt			

☐ Stream displays a typical riffle-run pool morphology ☐ adequate flow to maintain riffle organisms ☐ inadequate flow to maintain riffle organisms

☐ Stream has adquate flow to maintain riffle organism, but does not have suitable coarse substrate to support these assemblages (riffles, rock substrate in runs or pools)

☐ Stream has adquate flow to maintain riffle dwelling organism, woody debris has replaced rocks as primary coarse substrate

☐ Stream is low gradient, stream bed is predominately fine substrate, inadequate flow to maintain riffle organisms

Invertebrate Sample Information

Qualitative Multi-Habitat Sample (QMH)

Divide 20 samples equally among habitat types present in the reach. If three habitat types are present take 7 samples in each of the three dominant habitats (for a total of 21). If a habitat is present, but not in abundance to sample in equal proportion to other habitats, sample as much as possible and divide the remaining samples between the dominant habitat types.

✓	Habitat		#Samples
☐	rock riffle/run	Flow adequate to carry insects	
	rock substrate	Artificial flow needed to carry insect into net	
☐	aquatic macrophyte		
☐	undercut bank, overhanging veg		
☐	snag, woody debris, root wad		
☐	leaf pack		

Number of multihabitat containers:

Additional Biological Information

Presence of freshwater sponge yes / no

Presence of exotic species yes / no

Presence of mussels yes / no

Description of mussel density and/or mussel bed location:

Notes

Pictures #: __ DD __ DU __ MD __ MU __ UD __ UU

-MPCA Biological Monitoring Program-

Macroinvertebrate Identification QC Form

Field Number	Sample Date	Identifiers' Initials		Discrepancies		Comments	Total # of Conflicts	Total # of Taxa	Precision	
		Original ID	QC ID	Original Identification	QC Identification				Original ID	QC ID

Stream Sample External Label:

MPCA Bioassessment – Invertebrate Sample
Sample Preservative - 100% reagent alcohol / 10% formalin
Sample Type: QMH / RTH
Sample Composition: Riffle / Bank / Wood / Veg
Date ____/____/20___ (mm/dd/yyyy)
Station Name _____ Station ID _____
Site Visit 1 / 2 Sample Jar ___ of ___ Collectors

Stream Sample Internal Label:

Invertebrate Sample – sample type _____
Site Name:_____
Field Number_____
Date:_____/_____/_____ Bottle No. _____of_____
Collected by:
_____

FISH SURVEY RECORD MPCA

Field Number:	Stream Name:	
Date (mm/dd/yyyy):	Crew:	
Gear Type (circle one): Backpack* Stream-electrofisher Boom-electrofisher Mini-Boom *Type of Backpack (circle one): Generator LR-24 Halltech		
Channel Position: Right Bank Mid-Channel Left Bank (circle one if boom-electrofisher site)		
Distance (m):	Time Fished (sec):	Identified By:
Visit Comments:		

Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies or YOY
1.				
2.				
3.				
4.				
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28.				

Anomalies: **A**-anchor worm; **B**-black spot; **C**-leeches; **D**-deformities; **E**-eroded fins; **F**-fungus; **G**-yellow grub; **L**-lesions; **N**-blind; **P**=parasites; **PL**-parasite lesion; **Y**-popeye; **S**-emaciated; **W**-swirled scales; **T**-tumors; **Z**-other.

(Cont.)

Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies or YOY
29.				
30.				
31.				
32.				
33.				
34.				
35.				
36.				
37.				
38.				

INDIVIDUAL OR BATCH MEASUREMENTS

Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies or YOY
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