

# **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 to Vial (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

-MPCA Biological Monitoring Program-  
Macroinvertebrate Identification Lab Bench Sheet

<b>Field Number</b>	<b>Sample Date</b>
<b>Site Name</b>	<b>Taxonomist:</b>
<b>Sample Type</b> QMH* QR HD other _____	<b>Date of Sample ID:</b> ____/____/____

\*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
<b>Ephemeroptera</b>					<b>Odonata</b>				
Baetiscidae	Baetisca				Calopterygidae	Calopteryx			
Caenidae	Bracyrcus					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					Epithea			
	Heptagenia					Somatochlora			
	Stenacron				Gomphidae	Dromogomphus			
	Stenonema					Gomphurus			
Isonychiidae	Isonychia					Gomphus			
Ametropodidae	Ametropus					Hagenius			
Baetidae	Acerpenna					Ophiogomphus			
	Baetis					Phanogomphus			
	Callibaetis					Progomphus			
	Heterocloeon				<i>notes/additional taxa</i>				
<i>notes/additional taxa</i>									
<i>notes/additional taxa</i>									
					<b>Hemiptera</b>				
<b>Plecoptera</b>					Belostomatidae	Belstoma			
Leuctridae						Corixidae			
Taeniopterygidae					Corixidae	Hesperocorixa			
Perlidae	Acroneuria					Sigara			
	Agnetina					Trichocorixa			
	Attaneuria				Nepidae	Ranatra			
	Neoperla				Notonectidae	Buenoa			
	Paragnetina					Notonecta			
	Perlinella				<i>notes/additional taxa</i>				
Perlodidae									
Pteronarcyidae	Pteronarcys								
<i>notes/additional taxa</i>									
					<b>Amphipoda</b>				
					Talitridae	Hyallega	azteca		
					Gammaridae	Gammarus			
<i>notes/additional taxa</i>									
<b>Lepidoptera</b>					<i>notes/additional taxa</i>				
Pyralidae	Paraonyx								
	Petrophila								
<i>notes/additional taxa</i>									
					<b>Decapoda</b>				
					Cambaridae	Cambarus			
						Orconectes			
						Procambarus			
<i>notes/additional taxa</i>									
<b>Megaloptera</b>									
Corydalidae	Chauliodes								
	Corydalus								
	Nigronia								
Sialidae	Sialis								
<i>notes/additional taxa</i>									
					<b>Pelecypoda</b>				
					Sphaeriidae				
					Corbiculidae				
<b>Isopoda</b>					Unionidae				
Asselidae	Asselus				<i>notes/additional taxa</i>				
<i>notes/additional taxa</i>									

entered into DataInverts by \_\_\_\_\_ --- (initials) date \_\_\_\_\_

Order/Family	Genus	Species/Notes	ss	l/r	Order/Family	Genus	Species/Notes	ss	l/r
<b>Trichoptera</b>					<b>Diptera</b>				
Dipseudopsidae	Phylocentropus				Ceratopogonidae	Alluaudomyia			
Hydropsychidae	Ceratopsyche					Atrichopogon			
	Cheumatopsyche					Bezzia			
	Diplectrona					Ceratopogon			
	Hydropsyche					Culicoides			
	Potamyia					Nilobezzia			
Philopotamidae	Chimarra					Palpomyia			
	Dolophilodes					Probezzia			
Polycentropodidae	Cernotina					Sphaeromias			
	Cynellus				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			
Brachycentridae	Brachycentrus				<i>notes/additional taxa</i>				
	Micrasema								
Helicopsychidae	Helicopsyche								
Lepidostomatidae	Lepidostoma								
Leptoceridae	Ceraclea				<b>Coleoptera</b>				
	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			
<i>notes/additional taxa</i>						Helocombus			
						Laccobius			
						Sperchopsis			
						Tropisternus			
<b>Gastropoda</b>									
Ancylidae	Ferrissia								
Planorbidae	Helisoma				<b>Annelida</b>				
	Promentus					Oligochaeta			
	Planorbula					Hirudinea			
	Gyraulus				<i>notes/additional taxa</i>				
Vivaparidae	Campeloma								
Lymnaeidae	Lymnaea								
	Bulimnea								
	Fossaria					Hydracarina (trombidiformes, acarina)			
Hydrobiidae	Amnicola					Nematoda			
Pleuroceridae	Pleurocera				<i>notes/additional taxa</i>				
Physidae	Physa								
<i>notes/additional taxa</i>									

entered into DataInverts by \_\_\_\_\_ --- (initials) date \_\_\_\_\_

*-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 INVERTEBRATE VISIT FORM

<b>Stream Name:</b>		<b>Date:</b>	
<b>Field Number:</b>		<b>County:</b>	
<b>Water Chemistry</b>		<b>Crew:</b>	
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: _____ (cm)	
Water Level: Normal Below _____ (m)		Above _____ (m) Color _____ (pcu)	

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

<b>Coordinates</b>	<b>LATITUDE</b>	<b>LONGITUTDE</b>	<b>Time:</b>
<b>Field GPS:</b>	_____	_____	<b>Name:</b>

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 C	C		Floating or submerged aquatic vegetation	Ext / Mod / Sparse / NA
	Riffle (with flow) present outside of reach C (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			
C	Stream displays a typical riffle-run pool morphology C adequate flow to maintain riffle organisms C inadequate flow to maintain riffle organisms				
C	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)				
C	Stream has adquate flow to maintain riffle dwelling organism, woody debris has replaced rocks as primary coarse substrate				
C	Stream is low gradient, stream bed is predominately fine substrate, inadequate flow to maintain riffle organisms				

Invertebrate Sample Information

Additional Biological Information

<b>Qualitative Multi-Habitat Sample (QMH)</b>				Presence of freshwater sponge ----- yes / no	
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.				Presence of exotic species ----- yes / no	
				Name of exotic(s) if present:	
				(voucher a specimen if not present in sample)	
				Presence of mussels -----yes / no	
				Description of mussel density and/or mussel bed location:	
<b>a</b>	<b>Habitat</b>		<b>#Samples</b>	<b>Notes</b>	
C	rock riffle/run	Flow adequate to carry insects into net			
C	rock substrate	Artificial flow needed to carry insect into net			
C	aquatic macrophyte				
C	undercut bank, overhanging veg				
C	snag, woody debris, root wad				
C	leaf pack				
<b>Number of multihabitat containers:</b> _____					

**Stream Sample External Label:**

<p><b>MPCA Bioassessment – Invertebrate Sample</b> 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 _____</p>
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**Stream Sample Internal Label:**

<p><b>Invertebrate Sample</b> – sample type _____ Site Name: _____ Field Number _____ Date: ____/____/____ Bottle No. ____ of ____ Collected by: _____ _____</p>
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# 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	Voucher Number	Voucher Pics
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
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27.						
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**-pop-eye; **S**-emaciated; **W**-swirled scales; **T**-tumors; **Z**-other.  
(Heavy [**H**] or Light [**L**] code may be combined with above codes).



(Cont.)

Species (common name)	Length Range (mm)	Weight (g)	Number	Anomalies or YOY	Voucher Number	Voucher Pics
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	Voucher Number	Voucher Pics
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
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26.						
27.						
28.						
29.						
30.						
31.						
32.						

(Revised May 2015)

**VISIT INFORMATION** =====

Field Number: \_\_\_\_\_ Stream Name: \_\_\_\_\_

Date (mm/dd/yy): \_\_\_\_\_ Crew: \_\_\_\_\_

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

**Reportable**

- Reportable: Sufficient and representative sample
- Reportable: Low sample size (<25 fish)

**Non-reportable**

- Non-reportable: Unsatisfactory taxis
- Non-reportable: Outside base flow, high

**Replicate**

- Replicate: Sufficient and representative sample
- Replicate: Low sample size (<25 fish)

**Not sampled**

- Non-sampleable: Insufficient flow
- Non-sampleable: Beaver dam – too deep/wide
- Non-sampleable: No definable channel
- Non-sampleable: Other (explain in comments)

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**=====

Tape Down Length (100ths of ft): \_\_\_\_\_

Location/Description of Reference Mark (if made): \_\_\_\_\_

**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 compass.
- 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 the summer

## 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.

## VIII. ACTION STEPS

- 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 dominated by fine sediments, not suitable for streams with unstable stream banks that may collapse during deployment.

- 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 pylon). 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 and upon retrieval.

### 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) / 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.

- 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. If TL was moved...

- 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.

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

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*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? <input type="checkbox"/>	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	