

**STANDARD OPERATING PROCEDURE
FOR THE COLLECTION OF
MACROINVERTEBRATES IN WETLANDS**

**WILLARD SPUR
2011 MONITORING ACTIVITIES**

State of Utah
Department of Environmental Quality
Division of Water Quality

Revision 1
Effective 9/9/2011

Utah Division of Water Quality (DWQ) Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical experts. The primary purpose of this document is for internal DWQ use. This SOP should not replace any official published methods.

Any reference within this document to specific equipment, manufacturers, or supplies is only for descriptive purposes and does not constitute an endorsement of a particular product or service by the author or by DWQ. Additionally, any distribution of this SOP does not constitute an endorsement of a particular procedure or method.

Although DWQ will follow this SOP in most instances, there may be instances in which DWQ will use an alternative methodology, procedure, or process.

REVISION PAGE

Date	Revision #	Summary of Changes	Sections	Other Comments
9/9/2011	1	not applicable	not applicable	Adapted from GSL wetlands field manual and put into new standardized format, began document control/revision tracking

TABLE OF CONTENTS

1.0 Scope and Applicability 5
2.0 Summary of Method 5
3.0 Definitions..... 5
4.0 Health and Safety Warnings..... 5
5.0 Cautions 6
6.0 Interferences..... 6
7.0 Personnel Qualifications/Responsibilities 6
8.0 Equipment and Supplies..... 6
9.0 Procedure 7
10.0 Laboratory Analytical Methods 9
11.0 Data and Records Management..... 9
12.0 Quality Assurance and Quality Control..... 9
13.0 References 10
14.0 Appendices..... 10

1) SCOPE AND APPLICABILITY

This document presents the Standard Operating Procedure (SOP) for the collection of macroinvertebrate samples in the wetland areas of Willard Spur, and applies to any Utah Division of Water Quality (DWQ) monitor or non-DWQ cooperator performing wetlands sampling.

Macroinvertebrates are a primary component of wetland food webs, providing food to birds and other wildlife (e.g., amphibians) in the wetlands of Willard Spur. In addition, different taxonomic groups of macroinvertebrates are sensitive to different pollutants and can act as key indicators of disturbance caused by stressor gradients (e.g., nutrient gradients) in wetland ecosystems. Macroinvertebrate data is therefore used by the DWQ as a key component in a multi-metric index (MMI) tool used to assess wetland condition (Utah DWQ, 2009).

2) SUMMARY OF METHOD

Macroinvertebrate samples are collected at 5 (five) randomly selected locations along a 100 meter transect in the open water of the target wetland area. Samples are collected using a standard dip net and preserved with alcohol for taxonomic identification.

3) DEFINITIONS

m - meter(s)

SAV - submerged aquatic vegetation

µm - micrometer(s), also called micron(s)

4) HEALTH AND SAFETY WARNINGS

Field personnel should take appropriate precautions when operating watercraft and working on, in, or around water. All boats should be equipped with safety equipment such as personal flotation devices (PFD's), oars, air horn, etc. Utah's Boating Laws and Rules shall be followed by all field personnel.

Field personnel should be aware that hazardous conditions potentially exist at every waterbody. If unfavorable conditions are present at the time of sampling, the sample visit is recommended to be rescheduled. If hazardous weather conditions arise during sampling, such as lightning or high winds, personnel should cease sampling and move to a safe location.

5) CAUTIONS

Care should be taken to sample the water column and sediment-water interface without including excessive sediment in the sample. Areas with duckweed or surface mat algae should be avoided.

Rinse nets thoroughly with water between sites to avoid any potential cross contamination of samples and wetland systems.

Samples should be preserved in the field.

6) INTERFERENCES

Anything that makes the sample more difficult to visualize in the laboratory can cause interference with results. Try to minimize duckweed, algae, sediment, etc. in the sample.

High turbidity or dense SAV may also interfere with sample collection (net clogging or dragging).

Samples should not be exposed to freezing temperatures, extreme hot temperatures, or direct sunlight during storage.

Samples should be submitted to the lab in a timely manner (4-6 months suggested maximum holding time) to avoid degradation of benthic organisms and to aid identification.

7) PERSONNEL QUALIFICATIONS/RESPONSIBILITIES

Monitors collecting wetland macroinvertebrate samples must read this SOP annually and acknowledge they have done so via a signature page (see **Appendix 1**). New field personnel must also demonstrate successful performance of the method. The signature page will be signed by both trainee and trainer to confirm that training was successfully completed and that the new monitor is competent in carrying out this SOP. The signature page will be kept on-file at DWQ along with the official hard copy of this SOP.

8) EQUIPMENT AND SUPPLIES

- _____ Copy of this SOP
- _____ Plastic, high-sided utility sled or float tube (fishing type) for toting equipment
- _____ Laser range finder or reel tape and PVC posts to mark ends of transect
- _____ Meter stick made of PVC and marked in centimeters for measuring water depth
- _____ D-net 500 μ m mesh such as Wildco D-frame Multifilment 500 μ m (EPA) Net (425-D52) from Cole Parmer (cat# YO-05491-32)
- _____ Sieve bucket with 500 μ m mesh

- _____ Regular plastic bucket
- _____ Deionized water squeeze bottle
- _____ Polyethylene sample jars with plastic lids, quart and gallon sizes
- _____ 95% ethanol
- _____ Field sheet
- _____ Sample labels (for exterior) (**Figure 1**) and printed on “Rite in the Rain”[®] paper (for interior)
- _____ Chain of Custody (COC) forms
- _____ Printed list of sets of random numbers (from 0 to 100)
- _____ Clear strapping tape
- _____ Electrical tape
- _____ Pencils and Sharpies for labeling

Figure 1. Sample label for macroinvertebrate samples
(U:\WQ\PERMITS\MONITORS\Labels\ BENTHOS JAR TAG (INTERIOR).doc)

<p>BENTHOS COMPOSITE SAMPLE</p> <p>SITE ID _____</p> <p>SITE NAME _____</p> <p>_____</p> <p>COLLECTION DATE _____</p> <p>SAMPLER TYPE _____</p> <p>COLLECTOR(S) _____</p> <p># OF STATIONS _____</p> <p>JAR _____ OF _____</p>

9) PROCEDURE

- 1) Prepare sample labels (Figure 1) and jars.
- 2) Walk out about 5 meters into the wetland (away from the boat) from where other types of samples have already been collected to avoid sampling an area that has been previously disturbed.
- 3) Using a 500 μm D-frame net, sample the target area with a 1-m “sweep”. A “sweep” consists of passing the net back and forth over the same 1-m length three (3) times using a figure eight type motion. Aim for the water column down to the sediment level, careful to keep the net below the surface of the water while tapping the bottom to dislodge and collect organisms in the sediment.

- 4) Once you have made your first “sweep”, pick the net up out of the water immediately to prevent backwash and loss of sample.
- 5) Repeat Steps 2 – 3 at 4 other sampling locations, so that at the end of the sampling effort there are 5 sweeps, forming one composite, in the net.
- 6) Empty all the contents of the net, including vegetation, into the sieve bucket.
- 7) Carefully swirl the sieve bucket in the water to rinse sediment/mud from the sample.
- 8) Place the contents of the sieve bucket in to the polyethylene sample jar(s).

***Note about field sheets:** Typically, aquatic vegetation measurements are performed in conjunction with macroinvertebrate samples in the wetlands and the field sheet accompanying the document “Standard Operating Procedure for determining Percent Cover of Aquatic Vegetation in Wetlands of Willard Spur” is used to record field observations). If vegetation measurements are not performed along with macroinvertebrate sampling, use the field sheet in **Appendix 3** to record field observations of aquatic vegetation during collection of macroinvertebrate samples.

9.1 SAMPLE PROCESSING AND PRESERVATION

- 1) Once the composite sample has been collected, return to the vehicle or staging area with the equipment and sample.
- 2) If the sample jar is greater than 50% full of material, the sample should be split into multiple jars (or the entire sample may be put into a larger jar) so that no one jar is more than 50% full. If the sample is divided into multiple jars, label sample appropriately to indicate the series of jars (e.g. jar 1 of 3, 2 of 3, and 3 of 3).
- 3) Fill out a “Rite in the Rain” label in pencil with the same information on it as the sample labels and place it in the each sample jar.
- 4) Fill each jar with 95% denatured alcohol (leaving little to no headspace) and replace lid.
- 5) Seal each jar with electrical tape around the lid to prevent leakage.
- 6) Fill out sample label(s) appropriately, put it on the exterior of the jar(s) and cover the label(s) with clear tape.
- 7) Place jar(s) in a cooler to protect them from direct sunlight exposure.
- 8) Before using the net and sieve bucket at the next site, rinse them thoroughly with deionized or tap water to avoid any potential cross contamination of samples and wetland systems.

- 9) After returning from the field, fill out a COC form, and store the samples with the form on a shelf or in a box at room temperature for storage until delivery (samples may be delivered to the laboratory in batches).

9.1 PHOTOGRAPHS

Photographs should be taken during macroinvertebrate sampling to gain a better understanding of the submerged aquatic vegetation habitat available for the macroinvertebrate community. First, take a photo of the field station ID on the field sheet before taking any site photos (in lieu of a photo logbook). Then, photograph the contents of the inside of the net, after it is pulled out of the water, for one or more sweeps along the transect (greater heterogeneity of net contents from one sample to another = more photos).

10.0 LABORATORY ANALYTICAL METHODS

Macroinvertebrate samples will be analyzed according to procedures outlined in “SOPs for analysis of aquatic macroinvertebrate samples collected from the Great Salt Lake freshwater wetlands” (Gray, 2009). Macroinvertebrate samples will be examined for taxa present and community composition. Taxa will be identified to the lowest practical taxon. The methodology and quality assurance and quality control procedures for this analysis and analyzing laboratory can be obtained from:

Dr. Lawrence J. Gray, Senior Ecologist (ESA)
Dept. of Biology, Utah Valley University, 800 W. University Parkway
Orem, UT 84058
(801) 863-8558
FAX: (801) 863-8054
grayla@uvu.edu
<http://research.uvu.edu/Gray/>

11.0 DATA AND RECORDS MANAGEMENT

Note the date, time, sampler(s), and sampling method on the field sheet and COC form as indicated. Monitors should review the field sheet and COC form for completeness and accuracy in the field before leaving the site. Make sure the information on the paperwork is consistent with the information on the sample container label(s).

Upon returning to the office, both the monitor collecting the sample and the field team leader sign/initial that they have reviewed the field sheet. The field sheet is then scanned and the PDF file saved into the shared “Monitors” folder. The original form is placed in the project file. Additionally, a copy of the signed COC form is provided to the database manager.

12.0 QUALITY ASSURANCE AND QUALITY CONTROL

Field replicates should be collected at a minimum rate of 1 replicate for every 10 regular samples, or at a frequency required by a program/project specific quality assurance plan or sampling and analysis plan. To perform the replicate sampling, conduct alternating sweeps along the same transect at ten (10) random sampling points instead of five (5). One set is for the regular composite sample; the other set is for the replicate composite sample. In other words, put the contents of one sweep into one sample jar; then put the contents of the next sweep into the second sample jar. Note on the field sheet or in the field notebook that a replicate was collected. Refer to the program/project specific quality assurance plan or sampling and analysis plan for performance goals for replicate samples.

13.0 REFERENCES

Gray, L.J. 2009. Macroinvertebrates in the wetlands of the Great Salt Lake 2007. Submitted to Utah DWQ. Online at http://www.deq.utah.gov/Issues/gslwetlands/docs/DEQ_GSLwetlands2007ReportLGray.pdf.

Gray, L.J. 2009. SOPs for analysis of aquatic macroinvertebrate samples collected from the Great Salt Lake freshwater wetlands. Submitted to Utah DWQ. Online at <http://www.deq.utah.gov/Issues/gslwetlands/docs/appendixCLJGrayStandardMethodsJuly2009.pdf>.

Utah Department of Environmental Quality, Division of Water Quality (DWQ). 2009. Development of an assessment framework for impounded wetlands of Great Salt Lake. Draft Report. November 2009. Online at <http://www.deq.utah.gov/Issues/gslwetlands/docs/FinalReport122209.pdf>.

Appendix 2 – COC form for macroinvertebrate samples analyzed by Dr. Larry Gray (U:\WQ\PERMITS\MONITORS\Willard Spur\Field Sampling\Chain of Custody Forms\COC_macroinvertebrates wetlands_Gray lab.doc)

UTAH DIVISION OF WATER QUALITY				MACROINVERTEBRATE CHAIN OF CUSTODY RECORD (Gray Lab, Utah Valley University)			
PROJECT: Willard Spur – Macroinvertebrate Sample Collection				Net: D-net 500 µm mesh		Preservation: Denatured Alcohol	
Sample Date Range:				Method: Open water, composite of 5 1-m sweeps		Length of each sweep (m): 1	
Sample Number	Date Collected	Time Collected	STORET	Site Name	Water Depth (m)	Collector Initials	Remarks/Analysis Requested
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Relinquished By:				Date:	Time:	REMARKS:	
Received By:				Date:	Time:		

Page _____ of _____

Appendix 3 – Field sheet to be used if NOT performing aquatic vegetation measurements on the day of macroinvertebrate sampling

(U:\WQ\PERMITS\MONITORS\GSL wetlands\2011 Field Forms\GSL Wetlands Data Sheet.pdf)

**GSL Wetlands Data Sheet:
 Open Water Habitat Characteristics**

Wetlands Area _____

Site				
Date				
Time				
Water depth, m				
Height of SAV, m				
SAV Cover Class				
SAV Condition				
Fil. Algae Cover Class				
Duckweed Cover Class				

Water Depth: measured to the nearest 0.1 meter

SAV Height: nearest 0.1 meter (if extending to the surface, use water depth value)

SAV Cover Class: extent of SAV coverage of pond bottom

SAV Condition: 1 = decomposing 2 = intact, but stressed 3 = healthy

Filamentous Algae: extent of algae on SAV and/or surface of pond

Duckweed: extent of duckweed on surface of pond

Cover Class	1 = <25%	3 = 50-74%
	2 = 25-49%	4 = 75-100%

Note: Record "0" for cover class if attribute is completely absent.

Page _____ of _____