

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



WATER QUALITY

State of Utah
Department of Environmental Quality
Division of Water Quality

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Foreword

Utah Division of Water Quality (DWQ) Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical experts. This document is intended primarily 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 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.

The methodology detailed below is the protocol followed by DWQ's monitoring staff and verified by DWQ's Quality Assurance officer.

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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
3/1/21	2	Updated to all wetland types.	All	Put into a new standardized format, began document control/revision tracking.

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1.0 SCOPE AND APPLICABILITY

This document presents the Standard Operating Procedure (SOP) for the collection of macroinvertebrate samples in wetlands. This SOP applies to all DWQ field staff, DWQ cooperators, and volunteer monitors trained on this SOP.

Macroinvertebrates are a primary component of wetland food webs, providing food to birds and other wildlife (e.g., amphibians) in the wetlands. 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).

2.0 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.

3.0 DEFINITIONS

IW: impounded wetland

FR: fringe wetland

m: meter(s)

SAP: Sampling and Analysis Plan

SAV: submerged aquatic vegetation

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

4.0 HEALTH AND SAFETY WARNINGS

Hazardous conditions potentially exist at every waterbody. If unfavorable conditions are present at the time of sampling, it is recommended that the sampling be rescheduled. If hazardous conditions arise during sampling, such as lightning, high winds, rising water, or flash flood warning, personnel should cease sampling and move to a safe location.

When working in Utah and other warm climates, precautionary steps should be taken to avoid heat induced illnesses such as heat stroke or heat exhaustion.

Use caution when working in waders as drowning hazards exist.

Take appropriate precautions when operating equipment and working on, in, or around water, as well as possibly steep and unconsolidated banks, bridges, or edges of ponds/lagoons. All field crews should follow DWQ health and safety procedures and be equipped with safety equipment

such as proper wading gear, personal flotation devices (PFDs), gloves, first aid kits, cellular phone, etc.

5.0 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.

6.0 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.

7.0 PERSONNEL QUALIFICATIONS/RESPONSIBILITIES

DWQ personnel performing wetland macroinvertebrate sampling must be familiar with sampling techniques, safety procedures, proper handling, and record keeping. Samplers are responsible for attending refresher meetings held each spring/summer to review procedures and techniques. New staff will be trained in the field by DWQ trained personnel.

Cooperators are required to read this SOP annually and acknowledge they have done so via a signature page that will be kept on-file at DWQ along with the official hard copy of this SOP (see Appendix).

8.0 EQUIPMENT AND SUPPLIES

- Copy of this SOP
- Plastic, high-sided utility sled 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 μm mesh such as Wildco D-frame Multifilament 500 μm (EPA) Net (425-D52) from Cole Parmer (cat# YO-05491-32)

- Sieve bucket with 500 μm mesh
- Regular plastic bucket
- Deionized water squeeze bottle
- Polyethylene sample jars with plastic lids, quart and gallon sizes
- 95% ethanol
- Field sheet (see project-specific SAP)
- Tablet with relevant data forms and applications
- Sample labels (for exterior) (**Figure 1**) and printed on “Rite in the Rain”[®] paper (for interior)
- Clear strapping tape
- Electrical tape
- Pencils and Sharpies for labeling

9.0 PROCEDURE

1. Prepare sample labels (**Figure 1**) and jars.
2. Exact sample location will depend on the type of wetland and protocol being implemented (e.g., the impounded wetland plot placement is slightly different than for fringe wetlands.) Sample approximately 5-meters away from where other types of sample collection could have disturbed the location. Refer to the project-specific SAP for details on sampling locations. Often these are the same locations where vegetation is collected. See **Figure 2** for impounded and fringe wetland transects.
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. Use the bottom of the net frame to 'tap' the wetland substrate to dislodge and collect organisms. Macroinvertebrates use the top layer of sediment and SAV as habitat. By 'tapping' with the net instead of scooping, a representative sample can be obtained without too much sediment or SAV.
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 3-4 at 4 other sampling locations, so that at the end of the sampling effort there are 5 sweeps, forming one composite, in the bucket.
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 into the polyethylene sample jar(s).

9. Field data for macroinvertebrates is recorded in the vegetation field sheet. If vegetation sampling is not occurring, ensure the time, date, sampling method and latitude and longitude locations are recorded on a field sheet. (See DWQ SOP for Sampling Vegetation in Wetlands).

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 samples 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 sample jar.
4. Fill each jar with 95% denatured alcohol (leaving little to no headspace) and replace the 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 place that is protected from direct sunlight exposure.
8. Before using the net and sieve bucket at the next site, rinse them thoroughly to avoid any potential cross contamination of samples and wetland systems.
9. After returning from the field store the samples on a shelf or in a box at room temperature for storage until delivery (samples may be delivered to the laboratory in batches).

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).

9.1 Laboratory 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:

USU/BLM National Aquatic Monitoring Center (BugLab)
Department of Watershed Sciences
Utah State University
5210 Old Main Hill
Logan, UT 84322-5210

10.0 DATA AND RECORDS MANAGEMENT

Before leaving the field site, be sure that all required samples have been collected, labeled, and that all appropriate field sheets, field notes, and sample tracking forms have been filled out completely and accurately. The data from the field forms is sent to the wetlands coordinator at the same time as the other field data collected for that day (ideally within 2 weeks from the date of the site visit).

Send samples to the lab at the National Aquatic Monitoring Center within one year of collection. Note the date, time, location, sampler(s), and sampling method on the field sheet and upload to the Bug Lab submission tool: <https://submission.namc.usu.edu/>.

Reach out to the specific lab if you need to store samples for longer. General information suggests sample storage within 1 year is ok. Degradation can occur between years one and five. Procedures for handling sample results can be found in the appropriate project-specific Sampling and Analysis Plan (SAP).

11.0 QUALITY ASSURANCE AND QUALITY CONTROL

Macroinvertebrate samples should be analyzed by an approved laboratory with documented QA/QC and analytical procedures provided to DWQ. Frequency and type of quality control samples, particularly field replicates, will be described in project-specific SAP.

12.0 REFERENCES

NAMC Sample Processing: Subsampling, Sorting and Identification of Macroinvertebrate Samples. October, 2011.

<https://www.usu.edu/buglab/SampleProcessing/LaboratoryProcedures/?item=23>

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>.

Related DWQ SOPs:

Standard Operating Procedure for the Collection of Sediment in Wetlands

Standard Operating Procedure for the Collection of Vegetation in Wetlands

Standard Operating Procedure for the Collection of Water Chemistry in Streams and Wetlands

Standard Operating Procedure for the Collection of Zooplankton Samples Using a Horizontal Tow

13.0 FIGURES

BENTHOS COMPOSITE SAMPLE
SITE ID _____
SITE NAME _____

COLLECTION DATE _____
SAMPLER TYPE _____
COLLECTOR(s) _____
OF STATIONS _____
JAR _____ OF _____

Figure 1. Sample label for macroinvertebrate samples

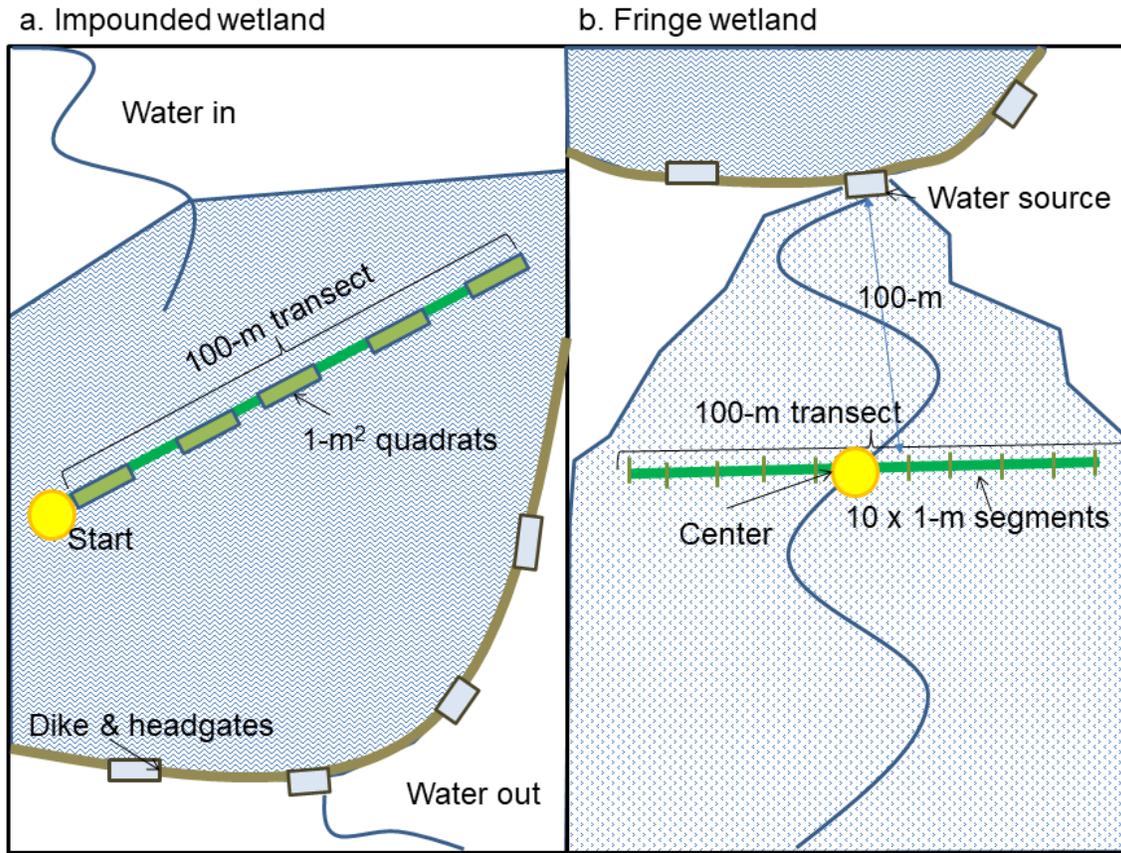


Figure 2. Transect location for sampling in impounded and fringe wetlands.

