

Standard Operating Procedure

Field assessments of benthic algae condition in wadeable waters

Commonwealth of Kentucky
Energy and Environment Cabinet
Department for Environmental Protection
Division of Water

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1. TITLE PAGE AND APPROVAL PAGE

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2. REVISION CONTROL PAGE

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3. TABLE OF CONTENTS

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4. PROCEDURES

4a. Scope and Applicability

This SOP describes two rapid field methods for assessing the quality, cover, abundance and general types of benthic algae in wadeable waters (streams and near shore areas of lakes and rivers). These assessment can stand alone or can supplement the information obtained from algae samples. The procedures are typically performed by the Monitoring Section of the Water Quality Branch (WQB), for bioassessment programs and special studies. The methods are intended to be applicable for a wide range of waterbody types to allow broad applicability.

This SOP contains methods in routine use by WQB, and have been partly extracted and modified from the methods manual “Methods for Assessing Biological Integrity of Surface Waters in Kentucky”, Chapter 6¹. Also, general guidelines from the manual “Rapid bioassessment protocols for use in streams and wadeable rivers, Chapter 6”² have been incorporated into these assessment procedures.

This SOP covers the assessment methods and forms. Assessments and any associated activities and samples are logged into the WQB Site Visit and Sample Tracking System following the SOP “EDAS data entry and biological data management”³. These assessments are usually accompanied by algae samples collected using the SOP “Collection methods for of benthic algae in wadeable waters”⁴.

4b. Summary of Method

The specific method used will depend on project objectives. Two assessment methods are described. A summary of each follows.

benthic algae visual assessment

This assessment is used to document in general what taxa or groups of macroalgae are present and their abundances. It can easily be performed in the course of collecting an algae sample. Specific taxa are listed if possible, and then general groups (green filaments, blue-green algal mats, etc.) are given an abundance category from “absent” to “extensive”, based on the cover of suitable substrate.

transect-based rapid periphyton survey (RPS)

This assessment is more time consuming than the benthic algae visual assessment above, but it produces a coarse spatial layout of macroalgal cover, and includes mat thickness categories. Transects are established and then points along each transect are examined visually and by feel to assign cover classes for moss and macroalgae, a thickness class for the periphyton mat, and to identify substrates that are too small to be suitable for macroalgal colonization. The method of establishing transects and the number of points along each transect is determined by project objectives. The use of a template or viewing bucket can be incorporated to define point areas. Other measurements also can be incorporated (e.g., depth and flow categories). The step by step procedure in this SOP assumes that the transects method has been chosen. An example datasheet is presented.

4c. Definitions and Acronyms

Acronyms:

DEP Department for Environmental Protection

DOW Division of Water

MSDS Material Safety Data Sheets

PPE personal protective equipment

RPS rapid periphyton survey

SOP Standard Operating Procedure

WQB Water Quality Branch

4d. Health & Safety

Wading in streams, rivers, and lakes involves physical hazards and hazards associated with unknown pollutants. Do not perform these procedures without fully understanding hazards and appropriate personal protection equipment. Inattention to safety procedures could result in bodily injury, and contact with unknown substances and human pathogens.

All accidents must be reported to the Monitoring Section Supervisor. For life threatening emergencies, call 911 from the cell phone in the field.

Field safety guidelines for DOW personnel are detailed in “Methods for Assessing Biological Integrity of Surface Waters in Kentucky”¹, Section 12: Health and Safety, and in the draft WQB Health and Safety Manual for Field Operations⁵. The manual describes common hazards associated with field sampling in surface waters and personal protective equipment (PPE) appropriate for each hazard. PPE for these tasks described here may include waders, insect repellent, sun block, gloves, and chemical splash goggles (see below). Any hazard encountered during field activities that are not addressed by this SOP or the Field Safety Manual must be reported to the supervisor who will recommend and furnish appropriate PPE where possible or recommend that the activity not be performed.

4e. Cautions

none

4f. Interferences

none

4g. Personnel Qualifications / Responsibilities

Procedures should be performed by an Environmental Biologist in the WQB, or personnel with a similar level of general aquatic biology background and experience. DOW personnel performing these procedures must be trained in this SOP by a WQB algae specialist under field conditions. For this assessment, it is important that the assessor is familiar with major macroalgal groups and can recognize them under field conditions.

DOW personnel performing this method will be trained in field safety in accordance with “Methods for Assessing Biological Integrity of Surface Waters in Kentucky”¹, Section 12: Health and Safety, and the draft WQB Health and Safety Manual for Field Operations⁵.

Personnel performing these procedures are responsible for fully understanding safety and quality assurance procedures.

4h. Equipment and Supplies

benthic algae visual assessment

benthic algae field form, Appendix A

transect-based rapid periphyton survey

*field form, Appendix B

template or viewing bucket (if required)

* Appendix B gives an example field form. The form can be customized for a project, but must include location and date information, as well as all desired survey elements and the prescribed number of transects/points.

4i. Step by Step Procedure

Before beginning, verify assessment type and specifications, as well as location, with the project plan. Verify that location information entered onto field forms matches the project plan.

4i1. benthic algae visual assessment

- 1) The lower part of the benthic algae field form (Appendix A) contains a box for the benthic algae visual assessment.
- 2) Walk the sampling reach and note algal growths occurring in all major microhabitats. For major algal groups appearing on the field form (green filaments, floating mats or scums, blue-green algal mats, diatom mats, red algae) check the abundance category that best describes the cover of that group on

suitable substrate in the reach. Consider suitable substrate to be the following: rocks greater than 2 cm, stable submerged wood, stable sediments, or macrophyte leaves. Circle the general category describing the density of suspended algae at the bottom of the form.

- 3) Green filaments and red algae taxa should be identified, if possible. If any abundant green filamentous or red algae cannot be identified, collect a small amount into a plastic jar, bag, or vial for later identification, and mark on the form that a sample was taken. Label the container with station ID, stream name and collection date. Place on ice until delivering to the laboratory. Upon identification of the specimen, add the information to the field form.

4i2. transect-based rapid periphyton survey (RPS)

- 1) Establish transects and points according to project specifications. The example form in Appendix B is for a 50-point survey (e.g. 10 transects of 5 points each).
- 2) At each point examine the point area for moss, macroalgal growths, and periphyton mats. If the project plan does not contain specifications for a viewing template, consider the area for examination to be a 15 x 15 cm diameter square.
- 3) Indicate whether the substrate sizes in the area are mainly greater than 2 cm.
- 4) Assign a cover class to moss and macroalgae according to the guide in Table 1. Consider only substrate sizes greater than 2 cm in estimating cover (i.e. cover of the available “suitable” substrate).
- 5) Assign a thickness class to the periphyton biofilm according to guide in Table 1. Scratch with a fingernail to aid in estimating thickness.
- 6) Record any notes in the box provided, including major groups of macroalgae observed (unless the benthic algae visual assessment, 4i1, is also performed).

Table 1. Cover and thickness classes for rapid periphyton surveys.

Coverage Class (Moss and Algae)					
0	1	2	3	4	
0%	<5%	5 to 25%	25 to 50%	>50%	
Biofilm Thickness					
0	1	2	3	4	5
0 mm	<0.5 mm	0.5 to 1 mm	1 to 5 mm	5 to 20 mm	> 20 mm
<i>rough</i>	<i>slimy, not visible</i>	<i>biofilm is visible</i>			

4j. Documentation and Records

There is currently no WQB database for holding results of benthic algae visual assessments or rapid periphyton surveys. Forms (Appendix A and Appendix B) are filed in Monitoring Section files by program /project. Rapid periphyton survey data is entered into spreadsheets for summaries.

5. QUALITY CONTROL AND QUALITY ASSURANCE

The table below summarizes data quality verification steps involved in this procedure. These steps ensure that the assessment is performed correctly and that the site information is clear and correct. Deviations from established methods, or use of a different method than the one prescribed by the study plan must be noted and explained. These notes must be entered into the visit log.

When	Inputs	Element Verified	Verification Records
before beginning (4i)	project plan; field form	assessment type and specifications; location	deviations noted on field form
before leaving site	field form	completeness	deviations noted field form

6. REFERENCES

1. Kentucky Division of Water, 2008. Methods for Assessing Biological Integrity of Surface Waters in Kentucky, Revision 3.0. Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. Frankfort, KY.
2. Barbour, M.T., J. Gerritsen, B.D. Snyder, and J. B. Stribling. 1999. Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates, and fish, second edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water, Washington, D.C.
3. Kentucky Division of Water, 2009. EDAS data entry and biological data management, Revision 1.0. Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. Frankfort, KY.
4. Kentucky Division of Water, 2009. Collection methods for of benthic algae in wadeable waters, Revision 1.0. Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. Frankfort, KY.
5. Kentucky Division of Water, 2007. WQB Health and Safety Manual, in draft. Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. Frankfort, KY.

7. ATTACHMENTS/CHECKLISTS AND APPENDICES

Appendix A: field form: benthic algae field sheet, with benthic algae visual assessment

Appendix B: field form: transect-based rapid periphyton survey example

APPENDIX A: FIELD FORM: VISUAL ASSESSMENT OF BENTHIC ALGAE
CONDITION (next page)

BENTHIC ALGAE FIELD DATA SHEET

DOW Station ID Number:	Stream Name:	Location:
Collection Date:	Time:	County:
River Basin:	DOW Program:	Name of Investigator(s):
Sampling visit associated information (circle): Habitat form Multiprobe Water Sample Fish Macroinvertebrates		
Sample type(s) Number of samples _____	QualMHC (all habitats) QualMHC-S: low gradient high gradient QualTH: riffle rocks sediments other (_____) QuantTH (habitat _____; total area _____ cm ² ; total sample vol _____ mL) Other: _____	
Macrohabitats Sampled:	Riffles Runs Pools Margins/Backwaters	
Microhabitats Sampled (composite samples):	Silt Sand Rock Wood Roots Moss Plants Leaves Animal Shells Artificial substrate	
Microalgae Thickness (sampled substrate):	Thickness: 0 absent 1 “slimy” 2 “visible” 3 1-5 mm 4 5-20 mm 5 >20 mm	

Benthic Algae Visual Assessment	Macroalgae taxa present: _____					
	Macroalgae sampled for ID? Yes No					
	Macroalgae cover: approximate % of suitable substrate covered					
		absent	sparse < 5%	Common 5 to 25%	Abundant 25-50%	Extensive >50%
	Green Filaments					
	Floating Mats or Scums					
	Blue-green Mats					
Diatom Mats						
Red Algae						
Suspended algae: not evident low to moderate water column appears green						

Notes:

APPENDIX B: FIELD FORM: TRANSECT-BASED RAPID PERIPHYTON SURVEY
EXAMPLE (next page)

Rapid Periphyton Survey Data Sheet

Stream Name
Location

Station ID
Date

Transect Number	Point	Moss Cover	Algae Cover	Biofilm Thick	Substrate >2cm (Y/N)
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				

Transect Number	Point	Moss Cover	Macro Cover	Biofilm Thick	Substrate >2cm (Y/N)
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				
	36				
	37				
	38				
	39				
	40				
	41				
	42				
	43				
	44				
	45				
	46				
	47				
	48				
	49				
	50				

Notes:

Coverage Class (Moss and Algae)					
0	1	2	3	4	
0%	<5%	5 to 25%	25 to 50%	>50%	

Biofilm Thickness					
0	1	2	3	4	5
0 mm	<0.5 mm	0.5 to 1 mm	1 to 5 mm	5 to 20 mm	> 20 mm
<i>rough</i>	<i>slimy, not visible</i>	<i>biofilm is visible</i>			

Substrate Size
 Record "Y" in column if predominant substrate is greater than 2 cm in size.
 Record "N" if not greater than 2 cm.