



MassDEP

**Massachusetts Department of Environmental Protection
Bureau of Water Resources
Division of Watershed Management
Watershed Planning Program**

STANDARD OPERATING PROCEDURE

Percent Cover and Periphyton Collection Determinations

CN 035.1
July 2025 – July 2027
7/23/25

Prepared

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LIST OF REVISIONS

Revision Date	Revision	Pages #s	CN/ (Old CN if applicable)	Initials
May 2, 2012	Original		35.0	JB
May 2025	Edits throughout		35.1	SF
July 2025	updated field sheet	Appendix	35.1	SF

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PERCENT COVER AND PERIPHYTON COLLECTION DETERMINATIONS

1.0 SCOPE AND APPLICATION

The Massachusetts Department of Environmental Protection's Watershed Planning Program (WPP) gathers data on benthic algae in streams to aid in evaluating whether Water Quality Standards for Aesthetics or Aquatic Life criteria for streams and rivers are being exceeded. The assessment described here focuses on the algal part of the periphyton including green algae (both filamentous and micro taxa), diatoms, and cyanobacteria. The methods described here are (1) a field-based rapid survey of periphyton biomass and coarse-level taxonomic composition (e.g., diatoms, filamentous greens, blue-green algae), and (2) a measurement of chlorophyll *a* from the periphyton.

2.0 BACKGROUND

Periphyton is made up of attached green algae, diatoms, cyanobacteria, bacteria, fungi, held to the substrates by polysaccharides and/or fungal hyphae, and mats of twisted filaments of cyanobacteria and algae. This assemblage provides food for fish, macroinvertebrates, and amphibians. The terms periphyton and benthic algae are used interchangeably in the literature and in this SOP.

Benthic algae are considered useful biological indicators of water quality because they are sessile, fast growing, and do not have roots so their entire nutrient and mineral uptake is from the water column. Periphyton are important primary producers in streams and rivers and are critical in oxygen production as well as in carbon dioxide usage. They provide, along with macroinvertebrate, fish, and general habitat assessment, another biological community to help evaluate the condition of aquatic life as well as the impacts from toxicity or nutrient enrichment.

Evaluation of periphyton assemblage should include information on the type of substrate, growth form, percent area within a reach covered with visible periphyton (macroalgae) and microalgae (primarily diatoms), and biomass covering the substrates. Nutrient availability and physical characteristics such as flow, available light, temperature, and scouring affect biomass.

Periphyton samples should be collected during periods of stable stream flow. High flows (approx. > 3 times the median flow) can scour the stream bed, flushing the periphyton downstream. After a high flow event, the periphyton community may need 2-3 weeks to re-grow to its previous biomass. Recolonization of substrates will be faster after less severe floods and in streams with nutrient enrichment.

Biggs (2000) analyzed data from 30 sites to develop a relationship between mean and monthly maximum chlorophyll *a* as a function of soluble nutrient concentrations and found that the variation in stream-water nutrients explained 12-22.6 % of the variation in mean monthly chlorophyll *a* values and 29.5-32.5% of the variation in maximum chlorophyll *a* among sites. If days of accrual are also considered with chlorophyll *a*, then 43.7-48.8% of the variation in mean monthly chlorophyll *a* and 72.1-74.1% of the variation in maximum chlorophyll *a* is explained. Biggs and Close (1989) looked at streams with predominantly gravel substrates and found that the hydrological regime as well as nutrients are critical in development of the periphyton community. Not all studies are in agreement concerning the factors influencing algal biomass in stream. Dodds et al. (1997) examined other factors besides nutrients influencing benthic algal biomass including latitude, temperature, stream gradients, discharge and light,

but they found only TN or TP were useful predictors of stream chlorophyll a-not physical factors found by other researchers or DIN (dissolved inorganic nitrogen) or SRP (soluble reactive phosphorus).

User survey data suggests that filamentous green algae covering greater than 40% substrate or at concentrations $>200 \text{ mg/m}^2$ chlorophyll within a reach would be considered to be a nuisance by fishermen and swimmers (Suplee, 2009) and may be impaired for aesthetics or for recreation.

The time and resources needed to measure periphyton in wadeable streams depends on the objectives of the study. The lowest level of sampling effort is currently performed as part of the EPA's Rapid Bioassessment for wadeable streams and rivers. Identifications are made from natural substrate scrapes. The samples are brought to the laboratory for identification, typically to genus level. The information is used for qualitative comparisons of the community assemblage and abundance to that of the reference station. More labor-intensive surveys include determination of percent cover and chlorophyll a analysis.

Sampling the periphyton is typically done late July-September. This is typically the peak period of growth and accrual for the algae. It also is the time when water levels are low. Ideally, sampling locations should be chosen that have runs/riffles, at least 30 % cobble substrates, and are not too deep or fast flowing to be safely sampled. While sites with at least a partial canopy opening (50 % or greater) provided excellent growth conditions for filamentous green algae, sites that do not meet this criterion may not be automatically eliminated if diatoms are also to be collected since diatoms can grow at lower light levels than green algae.

3.0 SUMMARY

Benthic algal surveys include, at a minimum, visual estimates of percent cover of the algae within the reach, scrapes of the dominant substrate for taxonomic identifications and estimates of density, and scraped for analysis of chlorophyll a. This SOP focuses on hard bottom, riffle/run habitat; alternate methods for periphyton sampling from soft substrates and the use of artificial substrates are described briefly in Appendices C and D. Identifications are done to determine the community assemblage and assess whether the algal taxa indicate nutrient enrichment or other environmental impacts. Identifications are done of the soft-bodied algae green algae.

WPP will be evaluating benthic algal biomass for potential inclusion in Recreational criteria and/or Aquatic Life criteria for Integrated Reports under the Clean Water Act. Sites may be considered impaired if there is either $>40\%$ coverage of visible ($>2 \text{ cm}$ long) filamentous green benthic algae or the mean benthic algae chlorophyll $>200 \text{ mg/m}^2$ during more than one site visit during a prescribed time period.

4.0 SAFETY CONSIDERATIONS

The safety concerns for field collection of samples are discussed in WPP's SOP CN 1.21 "Field Sampling" and CN 00.2 "Field Safety". Care should be taken entering a waterbody if depth and velocity are not known. Periphyton sampling is limited to water depths of 0.6 meters. Stations with depths greater than that should not be included since light penetration can be limited and access to the substrates is also limited to what can be grabbed by the sampler.

Care should also be taken in handling the knife for the algal scrapes. Folding knives should be stored before walking from transect to transect.

Samples collected for chlorophyll a analysis need to be put into acetone. The safety considerations for the acetone are outlined in the Chlorophyll a Standard Operating Procedure: CN 3.44.

5.0 SAMPLE COLLECTION, PRESERVATION AND HANDLING

5.1 Percent Algal Cover Determination

Equipment:

- Field kit (including bug spray and hand sanitizer)
- First aid kit
- chest waders and/or hip boots
- elbow length gloves
- tape measure (30 m)
- marking tape
- field sheets
- clip board
- vials
- cell phone for pictures
- GPS
- viewing bucket(s) - 2
- wash bottle
- rubber straps for algal scrapes
- tools for algal scrapes, including soft tooth brushes
- wide-mouth amber, glass jars for chlorophyll/diatom samples
- small metric ruler
- small plastic bags for algae collection
- cooler with ice
- compass
- Lugol's solution for fixing diatom samples

Sampling Reach and Transect Selection

Select an overall sampling reach, approximately 100 meters long. The recommended substrate/habitat combination is cobble obtained from riffles and runs with current velocities of 10-50 cm/sec (0.3 - 1.5 ft/sec). Within the reach, locate 1-2 riffle/run areas (one is sufficient if the periphyton biomass is low, select two areas if the biomass is high) and two transects within each riffle/run area: one transect at the downstream end of a riffle/run; a second transect at least 5 meters upstream of the first. In general, work from downstream to upstream to avoid disturbing the periphyton.

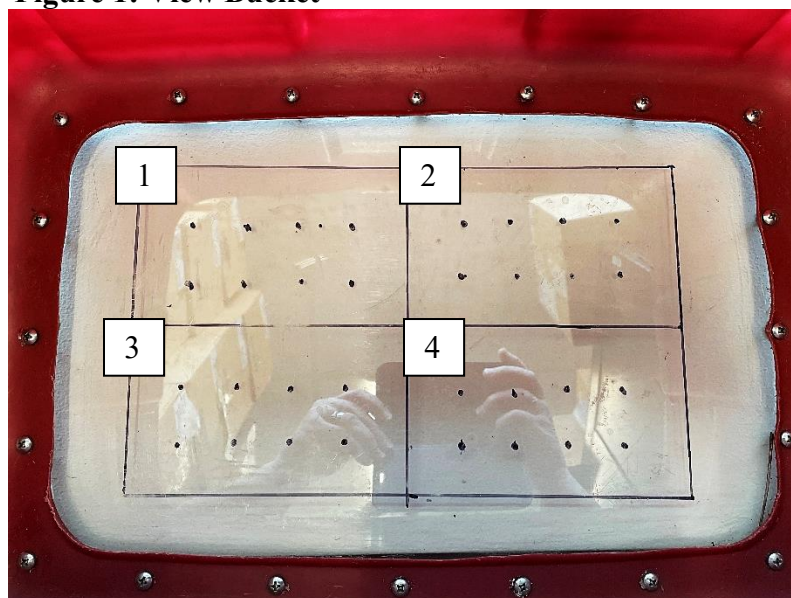
If the reach habitat varies a lot from downstream to upstream and two riffle/run areas are necessary, transects 1 and 2 should be similar and 3 and 4 should be similar. Samples from transects 1 & 2 should be composited, and samples from transects 3 & 4 should be composited.

- Fill out the general information on the Rivers field sheet including relevant information on pages 1 and 2 of the field sheet. Add the station description in the “alternate station description” section and lat/long of the first transect, and sketch map on the back of the sheet.
- Fill out the “Periphyton Percent Cover and Collection” field sheet (Appendix B).
- Estimate the percent open sky using the method described in Appendix A.

Percent Cover Determination at Each Transect

- Measure and record the wetted width of each transect and the depth of the thalweg.
- Before beginning the view bucket procedure, examine a few rocks to become familiar with categories of film or algal cover present.
- Divide the width of the stream into 3 points (near left bank, mid-stream, right bank) beginning near the waters’ edge where flow is discernable. Use the view bucket to determine percent cover of the bottom or to collect suitable substrates for analysis. Have one person make observations and one person record data.
- At each location immerse the viewing bucket in the water. Identify stream bed features at the edges of the viewing frame to help keep the bucket in the same position.

Figure 1: View Bucket



- The grid of 32 dots is divided into 4 boxes outlined with a marker. (Figure 1)
- For each of the 4 boxes, record the number of dots covered by each category.
 - No periphyton (rock, sand, mud)
 - Moss
 - green filamentous ≥ 2 cm
 - Green biofilm-thin layer of algae; visually evident (can be scratched with finger nail)
 - brown biofilm-usually diatoms-thin layer of algae; visually evident (can be scratched with finger nail)
- If filamentous green algae are present measure the longest filament under the view bucket. If you can identify the filamentous algae, record the names of the taxa on the field sheet. Samples of the algae can be brought back to the lab for identification and added to the field sheet later.
- Helpful hints:

- To minimize glare, it is sometimes helpful to put a little water inside the viewing bucket.
- If a category (described below) extends from one box to another, count its dots in the original box and count the dots in the adjacent when you come to it in order.

5.2 Periphyton Sample Collection from Natural Hard Surfaces

Equipment:

- field sheets (Appendix B)
- clip board
- vials
- camera
- GPS unit
- 2 white trays
- knife/razor blades, scalpel type implements
- wash bottles containing tap water
- 500 ml plastic graduated cylinder
- Cooler with ice
- boots
- bug spray
- hand sanitizer
- wash bottle
- rubber straps for algal scrapes
- tools for algal scrapes, including soft tooth brushes
- wide-mouth amber, glass jars for chlorophyll/diatom samples
- small metric ruler
- small plastic bags for algae collection
- cooler with ice
- compass
- Lugol's solution for fixing diatom samples

Laboratory Equipment

- Fisher Scientific PowerGen 35 hand held tissue grinder
- Fisher Scientific Vortex Mixer
- Waring Blender, stainless steel

Sample Collection

- Using the transects selected for periphyton % cover determination (description above), select a cobble at random from along the right shore, mid channel and left shore.

- Put the cobbles into the white enamel pan – ensure that the cobble remains right-side-up. Substrates can be collected from transects one and two or three and four at the same time and then brought to shore for processing.
- Take pictures of the cobbles in white pan.
- Fill out qualitative field sheet (Appendix B) and describe the micro and macro algae on the stone and collect samples for ID's of soft-bodied algae.
- Place the periphyton strap (Figure 2) on the top surface of the substrate.
- Clean the 1-inch opening of periphyton by scraping or cutting long filaments with a knife or scalpel, then scrubbing with toothbrush and spraying with wash bottle.
- Collect the scraped material into the white enamel tray containing ~100 mls of bottled water.
- After the 6 cobbles from two transects are scraped pour the scrapings into a labeled 500-ml amber Nalgene bottle.
- Rinse the tray and equipment to ensure that all algae are collected.
- The subsamples from transects 1 and 2 are composited; subsamples from transects 3 and 4 are composited.
- Record the number of rocks scraped for chlorophyll analysis. Record surface area: 1" circle = 5.067 cm²
- Label bottles with the following information:
 - OWMID
 - Analysis
 - Stream name and town
 - Number of rocks
- Thoroughly clean all equipment, especially brush bristles, in water before leaving the site. Discard brushes if they get too grimy or difficult to clean.
- The samples are brought back to the lab and refrigerated until processed.

Construction of a Chlorophyll-a Sampler for Use on Cobbles and Larger Stone Substrates

The sampler is constructed from a section of bicycle inner tube. Epoxy a neoprene washer with a 1" diameter hole to the outer surface of the tubing. After the glue dries, flip the sampler over and cut away the tubing within the 1" circle. Cutting from the back reduces the strain on the epoxy glue.

Figure 2: Periphyton Strap



Chlorophyll a Analysis

- The following morning (within 24 hours) the samples are taken from the refrigerator, the contents of the first sample emptied into the 1-liter plastic graduated cylinder and the volume

brought up to 300 mls with DI water. (Note: 300 mls is the suggested volume, but any known volume can work.) Record the total volume of the sample.

- Pour the sample into a beaker. Remove any pieces of moss present. If macroalgae long filaments are present then use either a stainless-steel Waring blender or a Fisher Scientific PowerGen 35 hand held tissue grinder to cut up these fragments. Blend for about 30 seconds or until the mixture is free of obvious clumps of material. If the sample contains much filamentous algae, break the strands up by repeated cutting with a pair of sharp scissors. The entire sample is blended/ground. If the sample does not contain filaments, the sample can be shaken to mix well.
- Immediately after the sample is cut up / mixed, remove a 5-ml aliquot using a disposable pipette which has been modified by clipping the tip to allow larger particles to be taken up as part of the sample.
- Filter the 5-ml aliquot onto a glass fiber filter (following the filtration procedure described in CN 03.43 Chlorophyll Analysis), put into a plastic petri dish, labeled, covered with aluminum foil and frozen. If the aliquots are taking a very long time to filter for each sub-sample, you probably need to dilute your sample or take a smaller volume aliquot (e.g., 2 ml). Record the volume of sample filtered.
- Grind and analyze the sample within 28 days of collection following CN03.43 from the “Day Two – Grinding” step onwards. For reading the sample on the Trilogy fluorimeter, enter 1 for the sample volume and enter 1 for the volume of solvent used. Dilute the sample if necessary for reading.
- Calculate the final chlorophyll a in mg/m² from the Trilogy reading:

$$\text{Chl-a (mg/m}^2\text{)} = (C * S * \text{MF}) / (A * 1000)$$

Where:

C is Total Chl-a reading (ug/L) = Chlorophyll reading * dilution factor (if used)

S = volume of solvent used in extraction (L) (typically 0.01 L)

A is Total area scraped per sample (m²) = # of 1” circles * 0.000507

MF = total sample volume (L) / volume filtered (L)

Based in part on:

Barbour, M. T., Gerritsen, J., Snyder, B. D. and J. B. Stribling. 1999. *Rapid Biological Assessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish*. 2nd edition. USEPA, Office of Water, Washington, D. C.

Biggs, B.J.F. and C. Kilroy. 2000. *Stream Periphyton Monitoring Manual*. New Zealand Ministry for the Environment. NIWA, Christchurch, NZ

Danielson, T. (2006) *Protocols for Sampling Algae in Wadeable Rivers, Streams, and Freshwater Wetlands*. Maine-DEP- Bureau of Land and Water Quality, Division of Environmental Assessment, Biomonitoring Program. 18 p.

Fritz, K. M., Johnson, B. R. and D. M. Walters. 2006. *Field Operations Manual for Assessing the Hydrologic Permanence and Ecological Condition of Headwater Streams*. EPA/600/R-06/126. U.S. Environmental Protection Agency, Office of Research and Development, Washington DC.

Wehr, J.D. and R.G. Sheath. 2003. *Freshwater Algae of North America: Ecology and Classification*. Academic Press. New York.

Appendix A - Field Sheets

Crew Lead (initial):

MassDEP/DWM/Watershed Planning Program
Periphyton Field Sheet (2025)

STATION INFORMATION (fill out prior to departure)		
Field Sheet Login #:	Unique ID:	Registered Lat/Long:
Project:	Site Name (STAID):	
Waterbody Name:		Town:
GENERAL SITE INFORMATION		
Alternate Station Description (Does site match description?) <input type="checkbox"/> YES <input type="checkbox"/> NO If not, describe below:		
Field Lat/Long first transect / Lat/Long Method <input type="checkbox"/> GETAC F110 Tablet <input type="checkbox"/> Handheld GPS <input type="checkbox"/> Other		
Survey Crew Lead:		Other Crew:
Date:	Time: <input type="checkbox"/> EST <input type="checkbox"/> EDT	
Weather Conditions <input type="checkbox"/> Clear <input type="checkbox"/> Mostly sun <input type="checkbox"/> Mostly cloud <input type="checkbox"/> Overcast <input type="checkbox"/> Fog <input type="checkbox"/> Drizzle <input type="checkbox"/> Rain <input type="checkbox"/> Sleet <input type="checkbox"/> Snow		
Air Temperature <input type="checkbox"/> < 20 °F <input type="checkbox"/> 21-30 °F <input type="checkbox"/> 31-40 °F <input type="checkbox"/> 41-50 °F <input type="checkbox"/> 51-60 °F <input type="checkbox"/> 61-70 °F <input type="checkbox"/> 71-80 °F <input type="checkbox"/> 81-90 °F <input type="checkbox"/> 91-100 °F		
Water Odor <input type="checkbox"/> None <input type="checkbox"/> Musty <input type="checkbox"/> Petrol <input type="checkbox"/> Sewage <input type="checkbox"/> Effluent <input type="checkbox"/> Sulfide <input type="checkbox"/> Fishy <input type="checkbox"/> Chlorine <input type="checkbox"/> Rotten Veg. <input type="checkbox"/> Other <input type="checkbox"/> Unobservable		
Turbidity <input type="checkbox"/> None <input type="checkbox"/> Slightly Turbid <input type="checkbox"/> Highly Turbid <input type="checkbox"/> Unobservable		
Water Color <input type="checkbox"/> None <input type="checkbox"/> Brownish <input type="checkbox"/> Blackish <input type="checkbox"/> Greenish <input type="checkbox"/> Greyish <input type="checkbox"/> Reddish <input type="checkbox"/> Yellowish <input type="checkbox"/> Other <input type="checkbox"/> Unobservable		
Floating Scum <input type="checkbox"/> None <input type="checkbox"/> Algal mat <input type="checkbox"/> Foam <input type="checkbox"/> Oily sheens <input type="checkbox"/> Pollen blankets <input type="checkbox"/> Sewage <input type="checkbox"/> Other <input type="checkbox"/> Unobservable Description:		
General Notes:		
OBSERVATIONS (RIVER ONLY)		
Flow Condition <input type="checkbox"/> Flowing <input type="checkbox"/> No Water <input type="checkbox"/> Stagnant <input type="checkbox"/> Ice Covered <input type="checkbox"/> No Access		
Est. Flow Velocity <input type="checkbox"/> ~0 fps <input type="checkbox"/> < 1 fps <input type="checkbox"/> 1-3 fps <input type="checkbox"/> 3-5 fps <input type="checkbox"/> > 5 fps		
Tidal Condition <input type="checkbox"/> Not Applicable <input type="checkbox"/> Ebb (outgoing tide) <input type="checkbox"/> Flood (incoming tide) <input type="checkbox"/> Slack <input type="checkbox"/> Indeterminate		
% Open Sky: _____ % (e.g., total shade=0%, total sun = 100%)		
Dominant Substrates <input type="checkbox"/> Bedrock <input type="checkbox"/> Boulder <input type="checkbox"/> Cobble <input type="checkbox"/> Coarse gravel <input type="checkbox"/> Sand <input type="checkbox"/> Silt/Mud/Clay <input type="checkbox"/> Unobservable		
Staff Gage Reading (in feet to the 1/100 th): _____ ft		
Discharge (Reference) <input type="checkbox"/> Upstream of a discharge <input type="checkbox"/> Adjacent to a discharge <input type="checkbox"/> Downstream of a discharge <input type="checkbox"/> Unknown		
OBSERVATIONS (RIVER AND LAKE)		
Objectionable Deposits <input type="checkbox"/> None <input type="checkbox"/> Trash <input type="checkbox"/> Flocculent mass <input type="checkbox"/> Other <input type="checkbox"/> Unobservable Description:		
Active Shoreline Erosion <input type="checkbox"/> None <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Severe <input type="checkbox"/> Unobservable Description:		
Wildlife <input type="checkbox"/> None <input type="checkbox"/> Fish <input type="checkbox"/> Mammals <input type="checkbox"/> Birds <input type="checkbox"/> Amphibians <input type="checkbox"/> Other Description:		
Beneficial Uses <input type="checkbox"/> None <input type="checkbox"/> Swimming <input type="checkbox"/> Boating <input type="checkbox"/> Water intake <input type="checkbox"/> Fishing <input type="checkbox"/> Other Description:		
Pollution Sources <input type="checkbox"/> None <input type="checkbox"/> Outfalls <input type="checkbox"/> Garbage <input type="checkbox"/> Road runoff <input type="checkbox"/> Waterfowl <input type="checkbox"/> Land clearing <input type="checkbox"/> Lawns		
Aesthetics Impaired? <input type="checkbox"/> YES <input type="checkbox"/> NO Based on water odor, clarity, unnatural color, growths, scum and/or deposits, is the site impaired?		
Water Level <input type="checkbox"/> Low <input type="checkbox"/> Normal <input type="checkbox"/> High Water level, ft above/below _____ ft		

Crew Lead (initial):

Periphyton Field Sheet (2025)

STATION SPECIFIC PLANT DENSITY							None 0%	Sparse 1-25%	Moderate 25-50%	Dense 50-75%	Very Dense 75-100%	Unobservable
Overall Aquatic Plants		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U					
Floating Aquatic Plants		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U	<u>Species:</u>				
Emergent Aquatic Plants		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U	<u>Species:</u>				
Submerged Aquatic Plants		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U	<u>Species:</u>				
Duckweed		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U					
Free-floating algae		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U					
ALGAL BLOOM												
Algal Bloom Present <input type="checkbox"/> YES <input type="checkbox"/> NO												
Bloom Type		<input type="checkbox"/> Cyanobacteria <input type="checkbox"/> Green Algae <input type="checkbox"/> Other <input type="checkbox"/> Unknown										
Evidence of Bloom (check all that apply)		<input type="checkbox"/> Scum <input type="checkbox"/> Color <input type="checkbox"/> Turbidity <input type="checkbox"/> Odor <input type="checkbox"/> Other										
Lakeward Width (in meters)		<input type="checkbox"/> <1 m <input type="checkbox"/> 1-5 m <input type="checkbox"/> 5-10 m <input type="checkbox"/> 10-15 m <input type="checkbox"/> >15 m										
Shoreline Length (in meters)		<input type="checkbox"/> <1 m <input type="checkbox"/> 1-5 m <input type="checkbox"/> 5-10 m <input type="checkbox"/> 10-15 m <input type="checkbox"/> >15 m										
Bloom specific notes:												
SITE SPECIFIC PERIPHYTON <u>None: 0%</u> <u>Sparse: 1-25%</u> <u>Moderate: 25-50%</u> <u>Dense: 50-75%</u> <u>Very Dense: 75-100%</u> <u>Unobservable</u>												
Filamentous		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	Color: <input type="checkbox"/> Black <input type="checkbox"/> Brown <input type="checkbox"/> Green <input type="checkbox"/> Grey <input type="checkbox"/> Other							
		<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U	Location: <input type="checkbox"/> On plants <input type="checkbox"/> On rocks <input type="checkbox"/> On bottom Location Type: <input type="checkbox"/> Riffle <input type="checkbox"/> Run <input type="checkbox"/> Pool							
Film		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	Color: <input type="checkbox"/> Black <input type="checkbox"/> Brown <input type="checkbox"/> Green <input type="checkbox"/> Grey <input type="checkbox"/> Other							
		<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U	Location: <input type="checkbox"/> On plants <input type="checkbox"/> On rocks <input type="checkbox"/> On bottom Location Type: <input type="checkbox"/> Riffle <input type="checkbox"/> Run <input type="checkbox"/> Pool							
Loose Floc		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	Color: <input type="checkbox"/> Black <input type="checkbox"/> Brown <input type="checkbox"/> Green <input type="checkbox"/> Grey <input type="checkbox"/> Orange <input type="checkbox"/> White <input type="checkbox"/> Other							
		<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U	Location: <input type="checkbox"/> On plants <input type="checkbox"/> On rocks <input type="checkbox"/> On bottom Location Type: <input type="checkbox"/> Riffle <input type="checkbox"/> Run <input type="checkbox"/> Pool							
Moss <i>(enter in Rivers section)</i>		<input type="checkbox"/> N	<input type="checkbox"/> S	<input type="checkbox"/> M	Color: <input type="checkbox"/> Black <input type="checkbox"/> Brown <input type="checkbox"/> Green <input type="checkbox"/> Grey <input type="checkbox"/> Other							
		<input type="checkbox"/> D	<input type="checkbox"/> VD	<input type="checkbox"/> U	Location: <input type="checkbox"/> On plants <input type="checkbox"/> On rocks <input type="checkbox"/> On bottom Location Type: <input type="checkbox"/> Riffle <input type="checkbox"/> Run <input type="checkbox"/> Pool							

SAMPLE - GENERAL

Samples taken from ☐ From shore/left bank ☐ From shore/center stream ☐ From shore/right bank

☐ Wade in/left bank ☐ Wade in/center stream ☐ Wade in/right bank

☐ Bridge upstream ☐ Bridge downstream

☐ Boat ☐ Shore (Lake) ☐ Wading (Lake) ☐ Dock

☐ Pipe

☐ Other (describe): _____

Samples taken from description:

MassDEP/DWM/Watershed Planning Program
Periphyton Field Sheet (2025)

Crew Lead (initial):

Sample-Lab	<Place OWMID Label here>				<Place OWMID Label here>				<Place OWMID Label here>			
Sample Type	<input type="checkbox"/> FQC_BLANK (Blank)				<input type="checkbox"/> FQC_BLANK (Blank)				<input type="checkbox"/> FQC_BLANK (Blank)			
	<input type="checkbox"/> FQC_BLANKRINS (Equipment Blank)				<input type="checkbox"/> FQC_BLANKRINS (Equipment Blank)				<input type="checkbox"/> FQC_BLANKRINS (Equipment Blank)			
	<input type="checkbox"/> FQC_REP (Field Duplicate)				<input type="checkbox"/> FQC_REP (Field Duplicate)				<input type="checkbox"/> FQC_REP (Field Duplicate)			
	<input type="checkbox"/> FS_IVP (Integrated Vertical Profile)				<input type="checkbox"/> FS_IVP (Integrated Vertical Profile)				<input type="checkbox"/> FS_IVP (Integrated Vertical Profile)			
	<input type="checkbox"/> FS_ROUTINE (Routine Sample)				<input type="checkbox"/> FS_ROUTINE (Routine Sample)				<input type="checkbox"/> FS_ROUTINE (Routine Sample)			
	<input type="checkbox"/> Other:				<input type="checkbox"/> Other:				<input type="checkbox"/> Other:			
OWMID Parent												
Medium	<input type="checkbox"/> Water <input type="checkbox"/> Sediment <input type="checkbox"/> Other				<input type="checkbox"/> Water <input type="checkbox"/> Sediment <input type="checkbox"/> Other				<input type="checkbox"/> Water <input type="checkbox"/> Sediment <input type="checkbox"/> Other			
Medium (Subdivision)	<input type="checkbox"/> SW (Surface Water)				<input type="checkbox"/> SW (Surface Water)				<input type="checkbox"/> SW (Surface Water)			
	<input type="checkbox"/> MunSewEff (Muni. Sewage Effluent)				<input type="checkbox"/> MunSewEff (Muni. Sewage Effluent)				<input type="checkbox"/> MunSewEff (Muni. Sewage Effluent)			
	<input type="checkbox"/> StmW (Stormwater)				<input type="checkbox"/> StmW (Stormwater)				<input type="checkbox"/> StmW (Stormwater)			
	<input type="checkbox"/> Unknown				<input type="checkbox"/> Unknown				<input type="checkbox"/> Unknown			
Relative Depth	<input type="checkbox"/> Surface <input type="checkbox"/> Mid-Water <input type="checkbox"/> Near Bottom				<input type="checkbox"/> Surface <input type="checkbox"/> Mid-Water <input type="checkbox"/> Near Bottom				<input type="checkbox"/> Surface <input type="checkbox"/> Mid-Water <input type="checkbox"/> Near Bottom			
Start/End Depth	/				/				/			
Start Date/Time	<div><input type="checkbox"/> EDT <input type="checkbox"/> EST</div>				<div><input type="checkbox"/> EDT <input type="checkbox"/> EST</div>				<div><input type="checkbox"/> EDT <input type="checkbox"/> EST</div>			
End Date/Time	<div><input type="checkbox"/> EDT <input type="checkbox"/> EST</div>				<div><input type="checkbox"/> EDT <input type="checkbox"/> EST</div>				<div><input type="checkbox"/> EDT <input type="checkbox"/> EST</div>			
Gear Type	<input type="checkbox"/> Water Bottle		<input type="checkbox"/> Tygon Tube		<input type="checkbox"/> Water Bottle		<input type="checkbox"/> Tygon Tube		<input type="checkbox"/> Water Bottle		<input type="checkbox"/> Tygon Tube	
	<input type="checkbox"/> Sampling Pole		<input type="checkbox"/> Auto Sampler		<input type="checkbox"/> Sampling Pole		<input type="checkbox"/> Auto Sampler		<input type="checkbox"/> Sampling Pole		<input type="checkbox"/> Auto Sampler	
	<input type="checkbox"/> Van Dorn		<input type="checkbox"/> Other		<input type="checkbox"/> Van Dorn		<input type="checkbox"/> Other		<input type="checkbox"/> Van Dorn		<input type="checkbox"/> Other	
	<input type="checkbox"/> Basket		<input type="checkbox"/> N/A		<input type="checkbox"/> Basket		<input type="checkbox"/> N/A		<input type="checkbox"/> Basket		<input type="checkbox"/> N/A	
Gear Serial #												
Composite (Type)	<input type="checkbox"/> No				<input type="checkbox"/> No				<input type="checkbox"/> No			
	<input type="checkbox"/> Yes <input type="checkbox"/> Flow <input type="checkbox"/> Time <input type="checkbox"/> Depth				<input type="checkbox"/> Yes <input type="checkbox"/> Flow <input type="checkbox"/> Time <input type="checkbox"/> Depth				<input type="checkbox"/> Yes <input type="checkbox"/> Flow <input type="checkbox"/> Time <input type="checkbox"/> Depth			
Field Lat/Long	/				/				/			
Field Lat/Long Method	<input type="checkbox"/> GETAC F110 Tablet <input type="checkbox"/> Other: <input type="checkbox"/> Handheld GPS				<input type="checkbox"/> GETAC F110 Tablet <input type="checkbox"/> Other: <input type="checkbox"/> Handheld GPS				<input type="checkbox"/> GETAC F110 Tablet <input type="checkbox"/> Other: <input type="checkbox"/> Handheld GPS			
Sample Notes												
Bottle Group	Planned	Collected	Preserved In Field	Filtered In Field	Planned	Collected	Preserved In Field	Filtered In Field	Planned	Collected	Preserved In Field	Filtered In Field
Bacteria (B)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Na ₂ S ₂ O ₃	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Na ₂ S ₂ O ₃	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Na ₂ S ₂ O ₃	<input type="checkbox"/> Y <input type="checkbox"/> N
Nutrient (N)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> H ₂ SO ₄	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> H ₂ SO ₄	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> H ₂ SO ₄	<input type="checkbox"/> Y <input type="checkbox"/> N
Nutrient (N2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> H ₂ SO ₄	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> H ₂ SO ₄	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> H ₂ SO ₄	<input type="checkbox"/> Y <input type="checkbox"/> N
Metals (M)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> HNO ₃	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> HNO ₃	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> HNO ₃	<input type="checkbox"/> Y <input type="checkbox"/> N
Chloride (CL)	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N
Chl a (I)	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N
Color/Turb (R)	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> Y <input type="checkbox"/> N

Crew Lead (initial):

Percent Algal Coverage – View Bucket Survey

Stream Name / Station Name										Unique ID													
Survey Date										Survey Lead													
Wetted Width (first transect) m										Thalweg Depth (first transect) m													
Macroalga Max Length cm										Water Temp °C													
Macroalga ID										% Open Sky													
% Cover Observations (# dots covered / quadrant)																							
		Green Filamentous >2cm				Moss				Green Biofilm				Brown Biofilm > 0.5cm				No Periphyton					
Transect #	Observation Location	Top L	Top R	Bot L	Bot R	Top L	Top R	Bot L	Bot R	Top L	Top R	Bot L	Bot R	Top L	Top R	Bot L	Bot R	Top L	Top R	Bot L	Bot R		
1	Left																						
1	Center																						
1	Right																						
Total Transect 1																							
Total % T1 (out of 32 dots)																							
2	Left																						
2	Center																						
2	Right																						
Total Transect 2																							
Total % T2 (out of 32 dots)																							
3	Left																						
3	Center																						
3	Right																						
Total Transect 3																							
Total % T3 (out of 32 dots)																							
4	Left																						
4	Center																						
4	Right																						
Total Transect 4																							
Total % T4 (out of 32 dots)																							
Periphyton Chlorophyll a Sampling – single substrate																							
Method: <input type="checkbox"/> 1" area scraped <input type="checkbox"/> other:																							
Transect 1										Transect 2													
Observation Location	# Scrapes	Biofilm	Filamentous	Color		Observation Location	# Scrapes	Biofilm	Filamentous	Color		Observation Location	# Scrapes	Biofilm	Filamentous	Color		Observation Location	# Scrapes	Biofilm	Filamentous	Color	
Left		<input type="checkbox"/>	<input type="checkbox"/>			Left		<input type="checkbox"/>	<input type="checkbox"/>			Left		<input type="checkbox"/>	<input type="checkbox"/>			Left		<input type="checkbox"/>	<input type="checkbox"/>		
Center		<input type="checkbox"/>	<input type="checkbox"/>			Center		<input type="checkbox"/>	<input type="checkbox"/>			Center		<input type="checkbox"/>	<input type="checkbox"/>			Center		<input type="checkbox"/>	<input type="checkbox"/>		
Right		<input type="checkbox"/>	<input type="checkbox"/>			Right		<input type="checkbox"/>	<input type="checkbox"/>			Right		<input type="checkbox"/>	<input type="checkbox"/>			Right		<input type="checkbox"/>	<input type="checkbox"/>		
Transect 3										Transect 4													
Left		<input type="checkbox"/>	<input type="checkbox"/>			Left		<input type="checkbox"/>	<input type="checkbox"/>			Left		<input type="checkbox"/>	<input type="checkbox"/>			Left		<input type="checkbox"/>	<input type="checkbox"/>		
Center		<input type="checkbox"/>	<input type="checkbox"/>			Center		<input type="checkbox"/>	<input type="checkbox"/>			Center		<input type="checkbox"/>	<input type="checkbox"/>			Center		<input type="checkbox"/>	<input type="checkbox"/>		
Right		<input type="checkbox"/>	<input type="checkbox"/>			Right		<input type="checkbox"/>	<input type="checkbox"/>			Right		<input type="checkbox"/>	<input type="checkbox"/>			Right		<input type="checkbox"/>	<input type="checkbox"/>		
Comments																							

Crew Lead (initial):

Sketch Map of the Site and Transects

Appendix B - % Open Sky Determination (based on description provided by Mark Mattson, PhD, MassDEP)

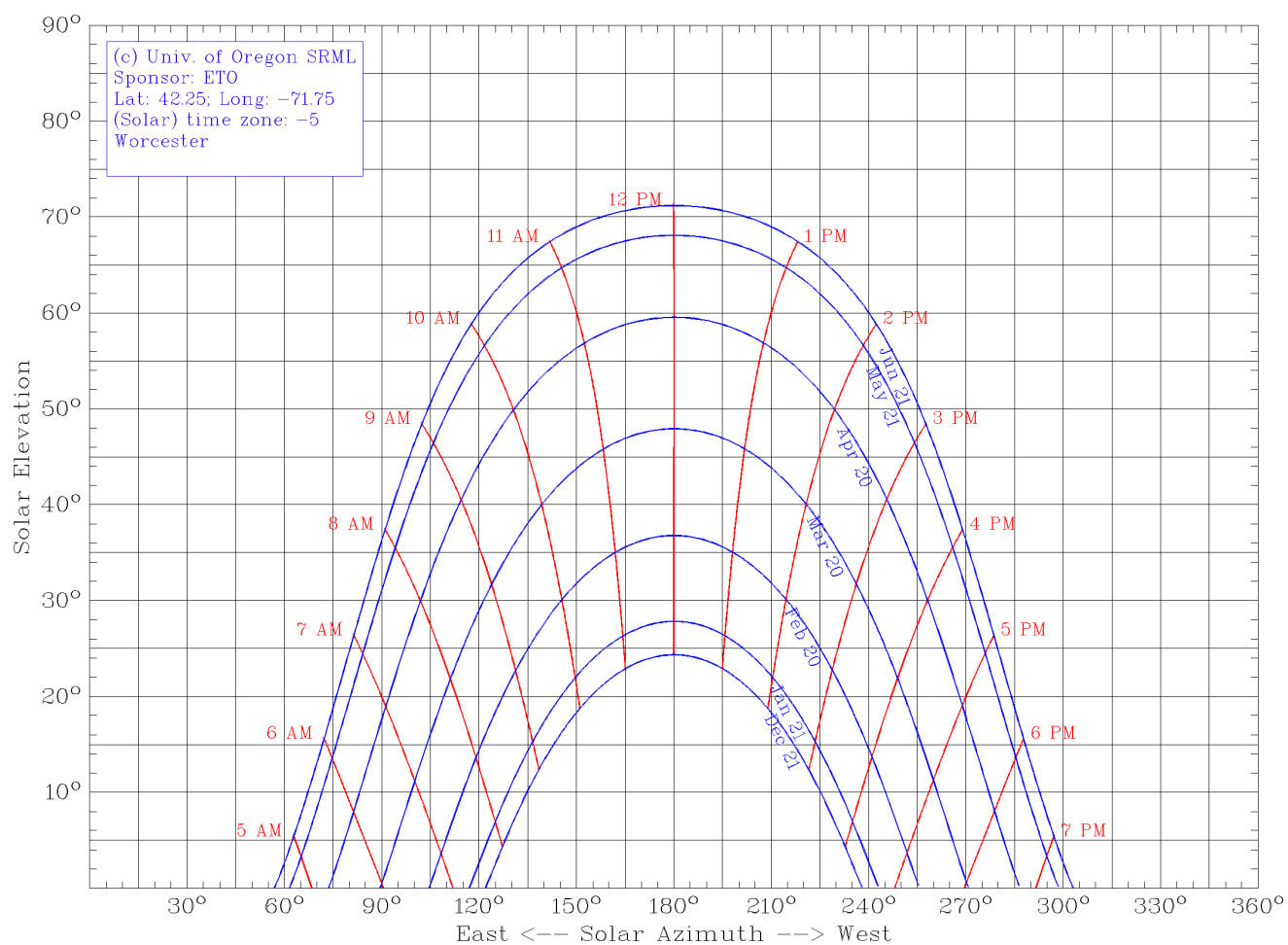
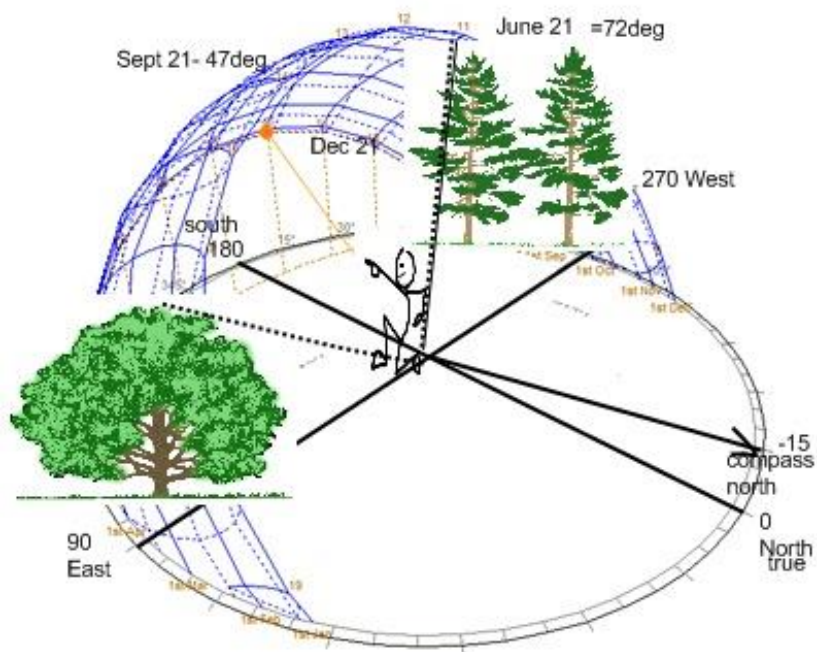
The objective is to determine how much of the available sunlight hits the stream at your feet. The preferred method is to track the imaginary path of the sun across the sky and to estimate the percent of the time you could see the sun. For precise measurements it is recommended to use a Solar Pathfinder TM with a digital camera.

Supplies: Magnetic compass, solar elevation diagram for your latitude, clinometer or drafting compass.

Procedure:

- 1) Refer to Figure 1. Stand mid-stream stream and face true south.
- 2) Use magnetic compass to determine magnetic south. Note the magnetic declination correction for Massachusetts is to subtract 15 degrees from true north, so to correct for this add 15 degrees (i.e. face slightly SSW which is true south).
- 3) Use the solar elevation chart in Figure 2 for central Massachusetts (Worcester) to determine the angular elevation of the sun at solar noon (on June 21 it is about 72 degrees up from southern horizon, while on August 21 it is 60 degrees and Sept. 21 it is 47 degrees). Also note solar elevations for the sun in the East at compass 90 degrees and similar elevation in West.
- 4) Use a clinometer or estimate these solar positions and sweep your hands across them to draw an imaginary half circle of approximately 180 degrees across the sky that traces the sun's path. If the sun is out, your line should pass through the sun.
- 5) Now look east and estimate where the sun would first shine from behind the trees and other obstructions. Subtract the degrees of shade from the 180 degrees of the solar path.
- 6) Repeat the procedure in the west where the sun would disappear behind trees or obstructions and subtract those degrees as well. If the tree canopy is thin, and the sun can partially shine through it, proportionately reduce the estimation of shade.
- 7) Determine the percent open sky as the ratio of unobstructed sun path degrees from the total sun path of 180 degrees multiplied by 100. Example from the sketch diagram in Fig. 1.
- 8) After adjusting for magnetic declination of 15 degrees and facing true south we determine the maximum elevation of the sun to be 60 degrees on August 21 from the solar elevation chart in Figure 1. We also observe from the solar elevation chart in Figure 1 that the sun would be at 20 degrees above the horizon in the east and west.
- 9) A clinometer, drafting compass or visual estimate is used to locate these positions and trace the imaginary path of the sun with our hands.
- 10) Sample calculation: An oak forest in the east blocks out the sun for the first 45 degrees of the half circle, leaving 135 degrees potentially open. We continue to trace the sun's path and observe a thin pine forest in the west that also blocks off another 60 degrees. However the canopy is thin and we estimate 50 percent of the sun would shine thru the canopy. Thus we subtract only half of the 60 degrees or 30 degrees from the 135 to obtain 105 degrees of sunshine. The percent open sky is thus $105/180 \times 100 = 58$ percent. In the field this can be estimated to the nearest 10 percent without a calculator as about 60% open sky.

Figure 1. Diagram of how to estimate percent open sky.



APPENDIX C - ARTIFICIAL SUBSTRATE SAMPLING (Streams only) (from Maine SOP)

- (1) Periphytometers should be deployed for 14 days ! 2 days.
- (2) Maine DEP uses two types of periphytometers
 - (a) Wildco® Periphytometer (Figure 3)
 1. They hold 8 standard microscope slides.
 2. They have two sliding plastic pieces that lock slides in place (Figure 4).
 - (b) Durasampler® Periphytometer (Figure 5).
 1. They hold 20 standard microscope slides.
 2. Only 8 standard microscope slides should be installed in the sampler.
 3. Place slides in the slots marked with red dots (slots 2,4,6,8,10, 11, 13, 15, 17, & 19).
- (3) Microscope slides
 - (a) Use standard, non-frosted microscope slides.
 - (b) Use new slides. If new slides are not available follow protocols in Section J for cleaning slides.
 - (c) Only hold the edges; avoid touching the slide surfaces as it can effect colonization.
- (4) Placement of samplers in the field
 - (a) Sunlight
 1. Maine DEP standardizes sampling by putting samplers in areas with minimal canopy cover.
 2. If possible, samplers should receive sunlight for all or most of the day.
 - (b) Flow
 1. Periphytometers should be placed in areas with at least some visible flow.
 2. Avoid putting periphytometers in backwaters or eddies.
 3. Avoid putting periphytometers in excessively turbulent eddies that might limit algal colonization.
 - (c) Installation
 1. Periphytometers should be secured with lightweight nylon rope to a metal ring or metal part of sampler.
 2. The periphytometers should be secured so that the slides are parallel to stream flow (Figures 5 & 6).
 3. The length of the rope will vary depending on stream flow, but the rope should be long enough to allow the periphytometer to sway slightly in the current, but short enough so the periphytometer does not drift into eddies or slow sections along the bank.
 4. The other end of the rope should be securely tied to a boulder, log, woody vegetation, or piece of rebar that has been hammered into the substrate deep enough to prevent it from coming loose during high flows.
 - (d) Retrieving samplers and processing slides.

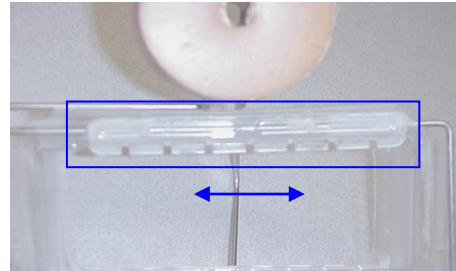


Figure 4: Movable plastic piece that locks slides in place.

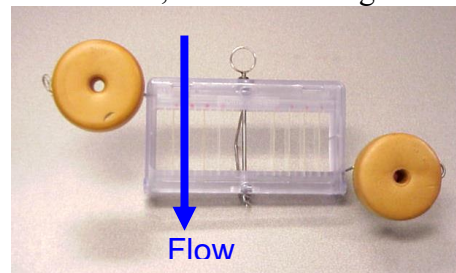


Figure 5: Durasampler® 40-slide Periphytometer

1. Care should be taken to avoid touching the flat sides of the microscope slides. Handle the slides by holding the edges.
2. Pick up periphytometer by holding the edges.
3. Slide the two plastic pieces (Figure 4) so the microscope slides can be removed.
4. Grasp slides along the edges and remove them from the periphytometer. Be careful to avoid disturbing the surfaces of the slides or other slides in the periphytometer.
5. Chl *a* slides
 - i. Place 1 slide (3rd from the left) into a whirl-pak with some bottled water.
 - ii. Using a permanent marker, write down the date, stream name, town, sample location, Chl *a*, and number of slides on the whirl-pak.
 - iii. Place the sealed whirl-pak into a cooler and bring back to the lab for Chl *a* filtering (Section I.1).
 - iv. Record the number of slides collected for Chl *a* on the field sheet.
6. Processing periphytometer slides for taxonomic analysis.
 - i. Carefully pour slides and water into a graduated beaker.
 - ii. Using a razor blade or utility knife, carefully scrape the other 7 microscope slides. Scrape only the flat surface, not the edges.
 - iii. Using a squirt bottle filled with bottled water, squirt the razor blade and slides and collect the sample into the graduated beaker.
 - iv. Add bottled water until there is a multiple of 50ml (*e.g.*, 100ml, 150ml) and record the amount on the field sheets. For example, if the sample is 130ml, then add 20ml of bottled water. Having a multiple of 50ml will make it easier to determine how much preservative to add.
 - v. Pour the sample from the beaker into a brown, wide-mouth, nalgene bottle (typically 125ml or 250ml in size).
 - vi. Record the number of slides scraped for taxonomic analysis
 - vii. Record surface area:
 - 1 slide (both sides) = 17.25cm².
 - 7 slides (both sides of each) = 241.5cm²
 - viii. Label the bottle with the following information:
 - date
 - bottle number
 - stream name
 - town
 - location
 - type of sample (species)
 - type of sample (slides)
 - number of slides (*e.g.*, 7) and sides (*e.g.*, 14)
 - volume of sample
 - ix. Add 1 ml of M3 for each 50ml of sample in the brown bottle (refer to the field sheet to determine the amount).

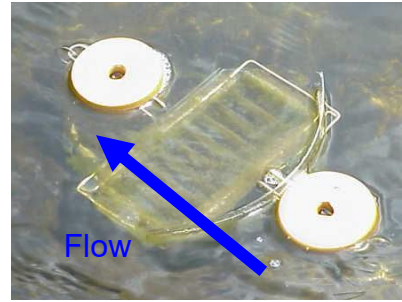


Figure 6: Direction of flow for Wildco® Periphytometer

- x. Carefully clean razor blade/utility knife and beaker.
- (e) Thoroughly clean all equipment, especially brush bristles, in water before leaving stream. Discard brushes if they get too grimy or difficult to clean.
- (f) Add 1 ml of M3 for each 50ml of sample in the brown bottle (refer to the field sheet to determine the amount).

Appendix D - Periphyton Sampling from Soft Substrates

There are several options for sampling soft bottom streams, including the following methods listed in order of preference.

1. Epilithic algae from log scrapings.
2. Epiphytic algae from plant clippings.
3. Epipsammic and Epipellic algae from soft substrate.

Hard substrates (rocks and cobbles) are the preferred substrates for sampling attached algae for chlorophyll analysis. However, log scrapings can be effectively sampled.

Epilithic algae from log scrapings

- Fill in Field Sheets
- Clean large, white sample trays, toothbrushes, and metal scraping tools.
- Find logs or branches within the reach that can be lifted from the water.
- Using the following methods, collect up to 12 log scrapings
 - Pick up a log/branch and hold it over a large, white sample tray.
 - Place rubber sampling device (Figure 7) over the log/branch and hold firmly in place to define surface area to be sampled.
 - Brush the area within the circle vigorously with a toothbrush and wash down brush and log/branch with a squeeze bottle into a collection pan (note, you may need to scrape the area with a metal scraping tool first if the algae is very thick).
- Rinse tools and sample area on log/branch with a squirt bottle filled with bottled water and collect sample in the large, white sample tray.
- Repeat process for other logs/branches or other parts of long logs/branches and composite all scrapings into a graduated beaker. (Rinse the tray and equipment to ensure all algae are in the beaker.)
- Add bottled water until there is a multiple of 50 mL (e.g., 100 mL, 150 mL) and record the amount on the field sheets. For example, if the sample is 130 mL, then add 20 mL of bottled water. Having a multiple of 50 mL will make it easier to determine how much preservative to add.
- Pour the sample from the beaker into a brown, wide-mouth, nalgene bottle (typically 250 mL or 500 mL in size).
- Record the number of logs/branches scraped for taxonomic analysis.
- Record surface area:
 - 1" circle = 5.067 cm²
 - 18 circles = 91.027 cm²
- Label the bottle with the following information:
 - date
 - bottle number
 - stream name
 - town and location
 - type of sample (log/branch)
 - number of logs/branches (e.g., 18)
 - volume of sample
- Thoroughly clean all equipment, especially brush bristles, in water before leaving stream. Discard brushes if they get too grimy or difficult to clean.
- Add 1 mL of M3 for each 50 mL of sample in the brown bottle (refer to the field sheet to determine the amount).

Epiphytic algae from plant clippings

- Fill in ME DEP Stream Algae Data Sheet and/or the ME DEP Epiphytic Algae Data Sheet
- Select 3 locations in runs within the reach that have emergent or floating-leaved vegetation (e.g., pickerel weed, water lilies, rushes, cattails,).
- In wetlands, do not define reach, just select 3 representative areas with emergent and/or floating leaved vegetation.
- At each location, select plants that have at least 10 cm underwater.
- Using clean garden clippers, clip plant stems near their base or at least 10 cm underwater and trim off any parts that are above water.
- Clip 5 stems per location.
- If plants are thick (e.g., >2 cm across), then clip 3 stems per location.
- Place each stems into a whirl-pak and trim stems to approximately 10-15 cm in length.
- When all stems are collected, add a little bottled or tap water, remove most of the air within the bag, and seal the whirl-pak.
- Massage the plant stems to remove epiphytic algae.
- Rinse each stem with bottled or tap water as it is removed from the whirl-pak.
- Pour the whirl-pak contents into a graduated beaker and set aside the cleaned stems for measurement.
- Add bottled or tap water until there is a multiple of 50 mL (e.g., 100 mL, 150 mL) and record the amount on the field sheets. For example, if the sample is 130 mL, then add 20 mL of bottled water. Having a multiple of 50 mL will make it easier to determine how much preservative to add.
- Pour the sample from the beaker into a brown, wide-mouth, Nalgene bottle (typically 250 mL or 500 mL in size).
- Label the bottle with the following information:
 - Date
 - bottle number (if known at this time)
 - stream or wetland name
 - town
 - location
 - station location number
 - volume of sample
- Estimate surface area of each clipped stem, either in the field or back at the office.
- Complete ME DEP Epiphytic Algae Data Sheet
- Make the measurements that are appropriate for the stem shapes and enter the measurements on the field sheet.
- Calculate the surface area for each stem using the formulas provided on the field sheet.
- Add the surface areas together and record on the field data sheet.
- Thoroughly rinse all equipment with water before leaving site.
- Add 1 mL of M3 for each 50 mL of sample in the brown bottle (refer to the field sheet to determine the amount).
- After M3 has been added, place a pre-printed preservative label ("sample preserved with M3") on the sample container