

Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedures for the Collection of Periphyton Samples for TMDL studies.

Version 1.1

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EAP085

APPROVED:

Signatures on File

Please note that the Washington State Department of Ecology's Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical and administrative experts. Their primary purpose is for internal Ecology use, although sampling and administrative SOPs may have a wider utility. Our SOPs do not supplant official published methods. Distribution of these SOPs does not constitute an endorsement of a particular procedure or method.

Any reference to specific equipment, manufacturer, or supplies is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the author or by the Department of Ecology.

Although Ecology follows the SOP in most instances, there may be instances in which Ecology uses an alternative methodology, procedure, or process.

Environmental Assessment Program

Standard Operating Procedures for the Collection of Periphyton Samples for TMDL studies.

1.0 Purpose and Scope

- 1.1 This document is the Environmental Assessment Program (EAP) Standard Operating Procedure (SOP) for field collection of periphyton for use in TMDL studies.
- 1.2 Periphyton are benthic algae that live attached or in close proximity to various substrates associated with the stream bottom. The structure, diversity, and abundance of periphyton are highly dependent on the diversity and availability of substrates in the stream. Periphyton algae often form visible filaments or colonies in the form of mats or biofilms attached to substrate.
- 1.3 Two basic types of periphyton are found in Washington streams: diatoms (Division *Chrysophyta*, Class *Bacillariophyceae*) and soft-bodied algae. Soft-bodied algae are represented by four major divisions: green algae (*Chlorophyta*), blue-green algae (*Cyanophyta*), gold/brown algae (*Chrysophyta*) and occasionally red algae (*Rhodophyta*).
- 1.4 Periphyton are important primary producers and often alter or regulate the water chemistry in stream ecosystems. As such, periphyton can be more sensitive to certain stressors such as nutrients, salts, sediment, and temperature compared to other aquatic organisms. Measures of periphyton structure, diversity, and density are useful in the assessment of biological condition for surface waters. For more information on periphyton and their use in bioassessments, refer to Barbour et al. (1999) and Stevenson et al. (1996).
- 1.5 Periphyton data collected for TMDL studies are primarily used to estimate algal biomass. These biomass estimates are used to confirm biomass predictions made using a numerical water quality model (most commonly QUAL2Kw). The model simulates, amongst other things, the primary productivity of the algae attached to the bottom substrates and the effect of that productivity on the temperature, dissolved oxygen, pH, and nutrient levels of the stream.

2.0 Applicability

- 2.1 This SOP is intended for use in freshwater streams during TMDL studies.
- 2.2 To assess the biological integrity of a stream, or to compare the biological community of a given location to other locations or streams, Ecology's targeted (Collyard, 2013) or ambient (Adams, 2010) biological monitoring protocols must be followed.

3.0 Definitions

- 3.1 Ecology – Washington State Department of Ecology.

- 3.2 EAP – Environmental Assessment Program.
- 3.3 EIM – Environmental Information Management System. A searchable database developed and maintained by the Washington State Department of Ecology.
- 3.4 Field Logbook – A weather resistant logbook containing “Rite in the Rain” ® writing paper used to document any and all field activities, sample data, methods and observations for each and all collection sites.
- 3.5 MQO’s – Measurement Quality Objectives
- 3.6 QA – Quality Assurance

4.0 Personnel Qualifications/Responsibilities

- 4.1 Field operations require training specified in EAP's Field Safety Manual such as First Aid, CPR, and Defensive Driving.
- 4.2 Boat operations require that staff meet specific training requirements as described in EAP’s Field Safety Manual, such as an EAP Boating Course and an approved Boating Safety Course.
- 4.3 Because the procedure requires the use of hazardous materials, training is required as per the Ecology Chemical Hygiene Plan and Hazardous Material Handling Plan (Section 1) (Ecology, 2006), which includes Laboratory Safety Orientation, Job-Specific Orientation and Chemical Safety Procedures. The Standard Operating Procedures in Section 16 of the Chemical Hygiene Plan and Hazardous Material Handling Plan for handling chemicals must also be followed.

5.0 Equipment, Reagents, and Supplies

5.1 Periphyton Sampling Supplies

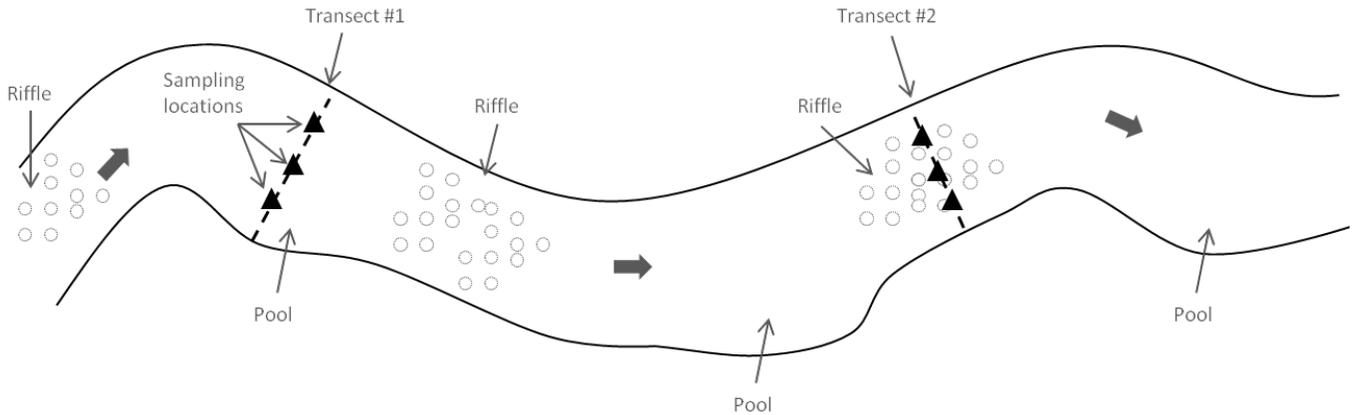
- 5.1.1 Heavy-Duty Aluminum foil
- 5.1.2 Distilled or deionized water
- 5.1.3 Squirt bottle
- 5.1.4 Funnel
- 5.1.5 Hand saw (folding)
- 5.1.6 Labels
- 5.1.7 Pens and permanent markers
- 5.1.8 Plastic petri dishes (47 mm)
- 5.1.9 Plastic sample bottles (1000 mL Nalgene® amber)
- 5.1.10 Plastic trays/tubs (deep enough to be able to scrub rock below the top of the sidewall).
- 5.1.11 Pruning shears
- 5.1.12 Ruler (with metric increments)
- 5.1.13 Scissor
- 5.1.14 One-gallon size sealable plastic bags
- 5.1.15 Spatula (solid with no holes)

- 5.1.16 Toothbrush (soft and firm bristled)
- 5.1.17 Small scrub brush
- 5.1.18 Top-setting or survey rod
- 5.1.19 Flow-meter
- 5.1.20 Lugol's solution reagents: potassium iodide, glacial acetic acid, and crystalline iodine (see Appendix for MSDS sheets).

6.0 Summary of Procedure

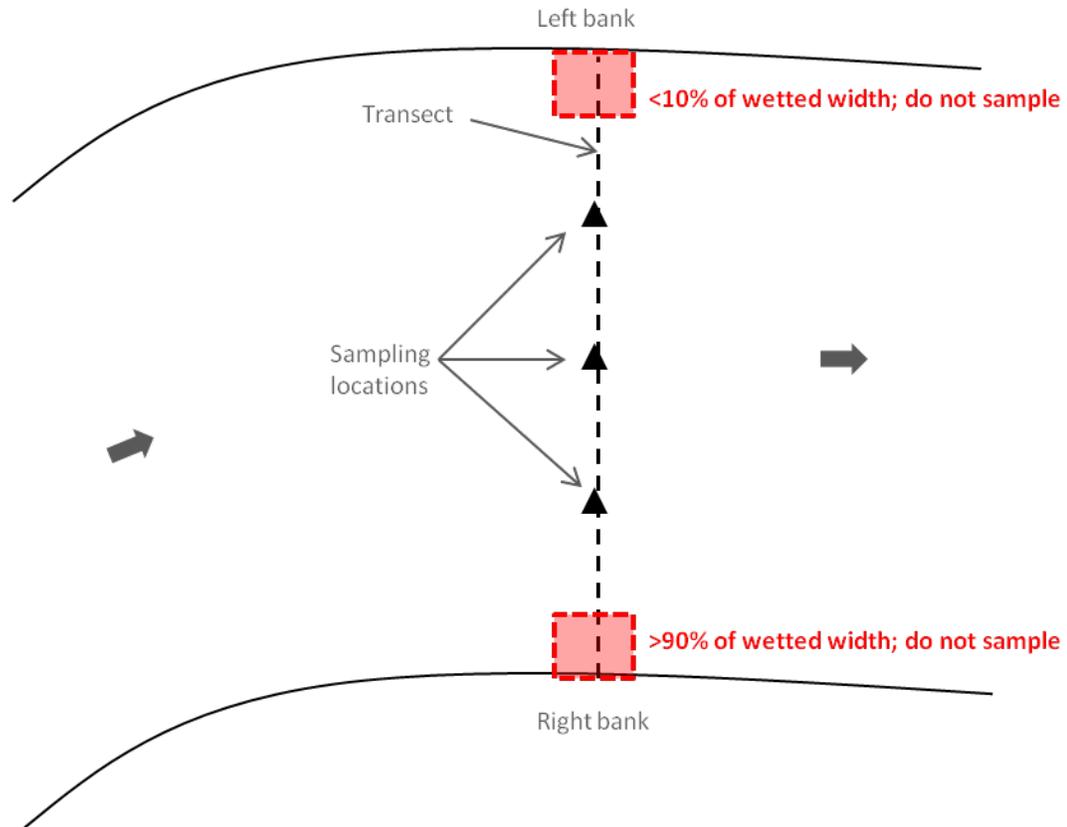
6.1 Choosing transects and sampling stations

- 6.1.1 Determine the location of two transects across the stream's wetted width. Transects should be located in areas that are most representative of the model segment or reach for that site. For example, if most of a segment consists of shallow riffles with steep gradients place transects in two separate riffles of this description. If there are two equally dominant habit types in a segment, place one transect in each.



Example of transects and sampling locations for a stream with equally dominant riffle and pool habitats.

- 6.1.2 For each transect, choose three sampling stations randomly across the width of the stream. Recommended approach: choose one station about halfway between the stream center and the left bank, one station near the stream center, and one station about halfway between the stream center and the right bank. Note, it is not recommended to locate a station near the wetted edges of the stream (i.e. <10% or >90% of the wetted width) as these areas are typically shallow, of low velocity, and not representative of the algal community across the width of the stream.



Ideal sampling location scheme within a periphyton transect.

6.2 Sampling Method for Epilithic (Coarse Substrate) Habitats

- 6.2.1 Carefully remove one rock from each of the six randomly selected sample locations while retaining the rock's orientation as it occurred in the stream to avoid loss of periphyton. Ideally, rocks should be relatively flat and range in size from about 4 cm (coarse gravel) to 10 cm (small cobble) in diameter. *Note, if dominant substrates are relatively large (greater than small cobble; 10cm), sampling only one transect and three rocks is acceptable, provided there is only one dominant habitat type.*
- 6.2.2 Holding the rock above the water surface, gently rinse the bottom of the rock to remove clinging fine sediments and debris. This will minimize the amount of undesirable debris in the plastic tub.
- 6.2.3 Gently place the rocks (as they were oriented in the stream) in a plastic tub; do not stack rocks upon one another. Transport the tub to a convenient sample-processing area. Where possible, process the sample out of direct sunlight to minimize degradation of chlorophyll.
- 6.2.4 After each rock is removed, measure water depth and velocity at each of the six locations using a top-setting rod and velocity meter and record on the datasheet. Assuming the sun is directly overhead, determine the relative degree of riparian shading (e.g. shaded, partial, or full sun) at each randomly selected sample location and record on the datasheet.

- 6.2.5 Mark or note the embedded line on each rock. The embedded line can be traced with a wax pencil or visually approximated based on discoloration on the rock. If uncertain of the embedded line, assume that only the bottom surface was embedded.
- 6.2.6 Scrub only the upper portion of each rock (the area that was not embedded) with a firm-bristled toothbrush or small scrub brush using a circular motion. Do not brush the bottom (embedded portion) of the rocks. If needed, remove any filamentous algae and mosses by scraping with a knife and place in the plastic tub. Use a knife or scissor to cut algal filaments or moss into roughly 2 to 3 mm segments. Gently brush other larger plant material or macroinvertebrates that may be attached to the rocks but do not collect these plants or bugs.
- 6.2.7 Rinse the sampled rock surface, attached plants, and toothbrush bristles with a rinse bottle containing deionized or distilled water. Use rinse water sparingly, but be thorough. Collect rinsate in the plastic tub containing any filamentous algae or mosses. If the rinsate and plastic tub contain sediment deposited on the rock, try to avoid including this sediment in the sample. Rinse and scrub the sediment thoroughly and decant rinsate through funnel into sample bottle. Repeat process until rinsate is clear, leaving sediment in the bottom of tub.
- 6.2.8 Repeat for the remaining rocks. Once all rocks have been scrubbed rinse your hands, brushes, and insides of the plastic tub into sample container. Again, avoid sediment if present. Keep the total sample volume less than 1000 mL.
- 6.2.9 Tips for conserving DI water: 1) Don't rinse the brush between rocks, wait until all six rocks are scrubbed. 2) Measure capacity of rinse squirt bottle to 'ration' DI use during scrubbing. For example if the squirt bottle holds 500 mL, use ~1/3 of a bottle for each rock. 3) If you are running out of DI water, dip the brush in the periphyton slurry water in the plastic tub and gently wet/rinse. The wet brush can then be used to 'rinse' the rock.
- 6.2.10 After sample processing is complete, measure and record the total rinsate volume (now considered the composite sample volume) on the datasheet and pour the rinsate through a funnel into an amber 1000 mL sample bottle.
- 6.2.11 For each rock processed, cover the surface with a sheet of heavy-duty aluminum foil. Trim the foil with a knife or scissors to match the area sampled. Place the trimmed foil templates into a sealed and labeled plastic bag. Label should include site ID and sample date, at a minimum.
- 6.2.12 Label the sample bottle with Site ID, sample date, sample time, work order, sample number, and desired analyses. Store in a dark cooler on ice.
- 6.3 Sampling Method for Epidendric (Woody Snag) Habitat

- 6.3.1 Collecting quantitative microalgal periphyton samples from epidendric habitats presents a challenge because they generally have an irregular surface and are difficult to remove without loss of periphyton biomass.
- 6.3.2 Select a total of six pieces of woody snag material following procedures outlined in section 6.1. Select pieces greater than 1 cm in diameter that have likely been submerged for most of the year to allow for sufficient periphyton colonization but which are not smothered by bottom sediments.
- 6.3.3 Carefully remove an approximately 10 to 20 cm long section of each woody snag with pruning shears or a hand saw and place in a plastic tub. Transport the tub to a convenient sample-processing area. Where possible, process the sample out of direct sunlight to minimize degradation of chlorophyll.
- 6.3.4 Measure water depth, velocity, and riparian shading following section 6.2.3.
- 6.3.5 Scrub the entire surface of the woody section with a firm-bristled toothbrush following section 6.2.4 (with the exception of scrubbing the *entire* surface, rather than just the top surface).
- 6.3.6 Rinse and collect sample following sections 6.2.5 and 6.2.6.
- 6.3.7 Measure and record the diameter and length of each woody section for later calculation of sampling surface areas. Alternatively, a foil template can be used (see section 6.2.7) for irregularly shaped woody snag sections.
- 6.3.8 Label the sample bottle with Site ID, sample date, sample time, work order, sample number, and desired analyses. Store in a dark cooler on ice.
- 6.4 Sampling Method for Epipsammic (Pea gravel/Sand) and Epipellic (Silt) Habitats
- 6.4.1 Microalgal periphyton samples are collected from the upper 5 to 7 mm layer of epipsammic (pea gravel/sand) and epipellic (silt) habitat in organically-rich depositional areas of the reach.
- 6.4.2 At each sampling location, hold the lid of a plastic Petri dish (47-mm diameter) upside down in the water; gently stir/shake the lid to remove air bubbles without disturbing the substrate.
- 6.4.3 With the lid still submerged, turn the inside of the lid toward the substrate that will be sampled without disturbing the substrate.
- 6.4.4 Carefully and slowly press (in cookie cutter fashion) the lid into the substrate until the substrate fills the lid.
- 6.4.5 Slide the lid onto a spatula to enclose the discrete collection. Holding the Petri dish firm against the spatula, carefully wash extraneous sediment from the spatula and lift out of the water.

- 6.4.6 Transport the Petri dish and spatula to a convenient sample-processing area. Where possible, process the sample out of direct sunlight to minimize degradation of chlorophyll.
- 6.4.7 Invert the lid and remove the spatula. Be careful not to lose any of the discrete sample still adhering to the spatula.
- 6.4.8 Measure water depth, velocity, and riparian shading following section 6.2.3.
- 6.4.9 Rinse the substrate from the lid and spatula into the sampling tub using a rinse bottle containing deionized or distilled water. Rinse and scrub the sediment thoroughly and decant rinsate through funnel into sample bottle. Repeat process until rinsate is clear, leaving sediment in the bottom of tub.
- 6.4.10 Measure and collect sample following sections 6.2.6.
- 6.4.11 The total sample surface area for all six discrete samples collected with a 47-mm Petri dish is approximately 102 cm². Record the sampled surface area on the datasheet.
- 6.4.12 Label the sample bottle with Site ID, sample date, sample time, work order, sample number, and desired analyses. Store in a dark cooler on ice.
- 6.5 Taxonomic Identification of Periphyton Samples
- 6.5.1 The sampling method for taxonomic identification depends on the objective of the study.
- 6.5.2 If the objective is to assess the biological integrity of the stream, or to compare the biological community to other locations or streams, separate periphyton samples must be collected following targeted (Collyard, 2013) or ambient (Adams, 2010) biological monitoring protocols.
- 6.5.3 If there is a different objective, for example to confirm the general dominant algal species, a separate sample can be collected from a single representative location (i.e. rock, snag, etc.) following the above protocols. However, it is strongly recommended to follow the Collyard (2013) or Adams (2010) protocols when collecting samples for taxonomic identification.
- 6.5.4 Prepare Lugol's solution. Use extreme caution when preparing this solution and handling reagents. Solution should be prepared in safe laboratory environment with proper safety equipment nearby (eye shower, fire extinguisher, chemical spill kit, etc.).
- 6.5.4.1 Put on necessary personal protective equipment, including: chemical resistant face shield, goggles, gloves, and apron. Wear long sleeve shirt, pants, and close-toed shoes.

- 6.5.4.2 Slowly add 20 mL glacial acetic acid to 200mL of distilled water. **Never** add water to acid!
- 6.5.4.3 Carefully dissolve 20 grams potassium iodide (KI) and 10 grams iodine crystals in water-acid solution.
- 6.5.4.4 Store Lugol's solution in an opaque plastic bottle.
- 6.5.4.5 **Caution!** Potassium iodide may cause eye, skin, and respiratory tract irritation. May cause reproductive and fetal effects.
- 6.5.4.6 **Danger!** Glacial Acetic Acid causes severe eye and skin burns. Causes severe digestive and respiratory tract burns. **Flammable liquid and vapor.** May be harmful if absorbed through the skin. Glacial acetic acid solidifies below 62°F (17°C). Corrosive to metal.
- 6.5.4.7 **Danger!** Crystalline Iodine may cause allergic skin reaction. Harmful if swallowed, inhaled, or absorbed through skin. Causes burns by all exposure routes. Extreme inhalation exposure causes build-up of fluid in the lungs and can be fatal in extreme cases.
- 6.5.5 Preserve the ID sample with 5 to 10 percent Lugol's solution. Five percent should be sufficient for most samples, although up to 10 percent can be used for samples rich in organic matter. Record the preservative volume on the datasheet. For example, for a 500 mL ID sample, add 25-50 mL of Lugol's solution.
- 6.5.6 Label the sample bottle with site name, sample ID, collection date (mm-dd-yyyy), collection time (24 hr.), and total ID sample volume (mL) [ID sample + preservative volumes]. Store sample in a dark location.
- 6.6 Calculating periphyton sample area
- 6.6.1 Calculating sampling area of rocks/foil (epilithic method)
- 6.6.1.1 Scanning the foil:
1. Place foil SHINY SIDE DOWN on scanner (this seems to enhance the contrast).
 2. Place a calibration square of foil, with a known area (10 cm x 10 cm works well), next to the foil without touching or overlapping it.
 3. Place a dark (preferably black) sheet of paper on top of the foil as the background for the scanned image.
 4. Set the scanner settings to either grayscale or color – do not use any of the black and white options since this turns your image into a bitmap which makes it difficult when processing the image.

5. Set resolution to about 300dpi.
6. Set image density or other contrast options to the darkest possible setting to enhance contrast between the foil and the background.
7. If necessary, set the page size (the scanner may not be able to automatically detect the size of your scanned image).
8. Save the scanned images as .tif or .jpg files, whichever option is available.

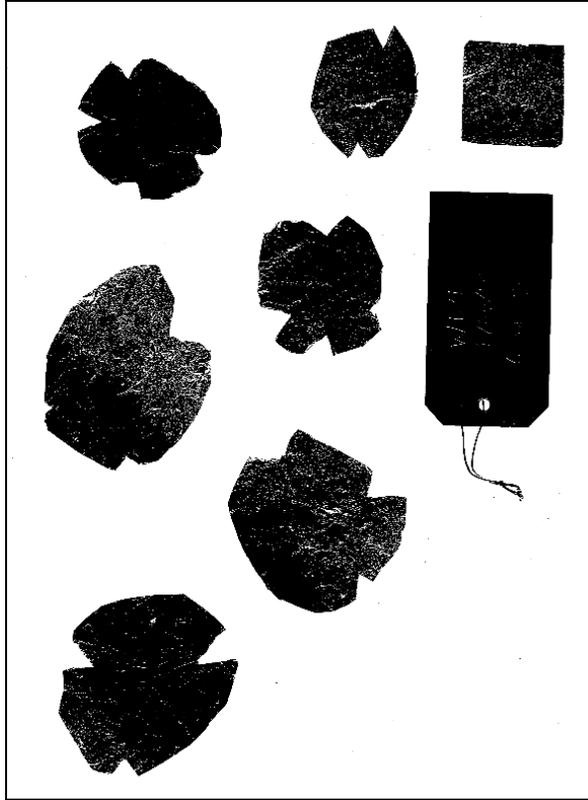
6.6.1.2 Using Photoshop or ImageJ software to process the scanned images.

Using Photoshop:

1. Open your scanned images in Photoshop
2. Use the *magic wand* to select the black area outside the foil pieces you have scanned in.
3. Select *Inverse* under the *Select* menu on the toolbar – this will inverse your selection and select everything but your background (i.e. your foil pieces).
4. Once foil shapes have been selected, click on the *brush* tool and use this to color-in the shapes of the foil in white.
5. The brush tool will only color within the selected areas.
6. Save your image as a .tif or .jpg file.

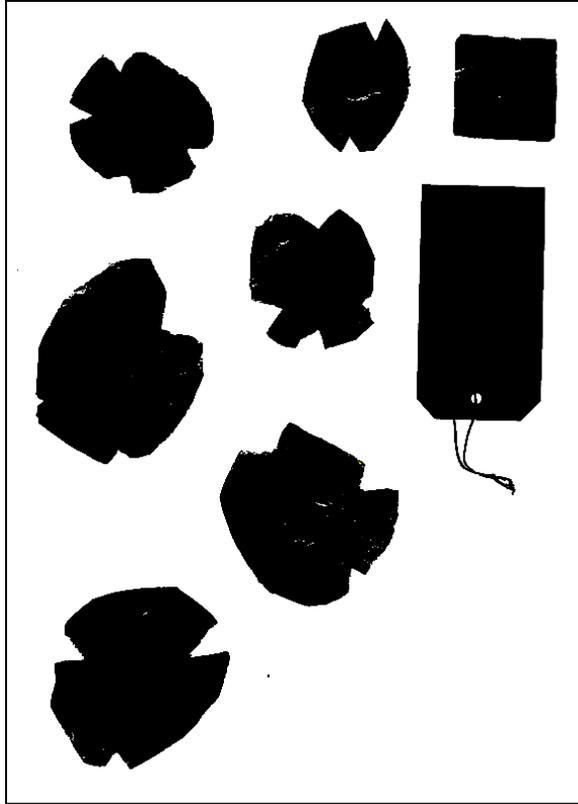
Using Image J (PC users) or NIH Image (Mac users):

1. Download the necessary software for free from one of the following links:
ImageJ software for PC's: <http://rsb.info.nih.gov/ij/>
NIH Image for Mac's: <http://rsb.info.nih.gov/nih-image/Default.html>
2. Both sites have links that have FAQ's and other documentation (the following instructions are only if you're using ImageJ software, though NIH Image may be similar).
3. Open your scanned image in ImageJ.
4. From the menu, select 'Process' then 'Binary' then 'Make Binary'. Note, depending on contrast of image sometimes the foil pieces will be black and background white, sometimes the opposite.



Example of initial binary image

5. If foil pieces in binary image are black, choose 'Dilate' from 'Process>Binary'. Repeat until most of the white areas have been removed from the foil pieces and the area of each piece can be selected with the *wand (tracing) tool*.



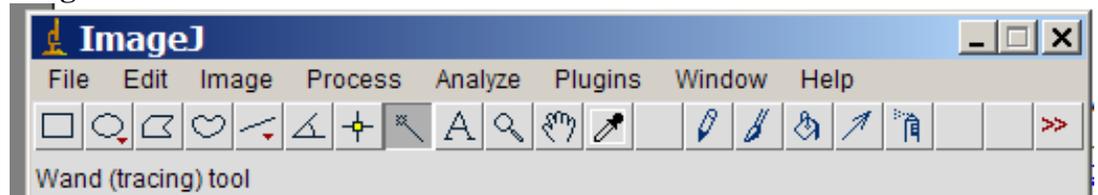
Example of adequately 'dilated' image.

6. If foil pieces in binary image are white, choose 'Erode' from 'Process>Binary'. Repeat until most of the black areas have been removed from the foil pieces and the area of each piece can be selected with the *wand (tracing) tool*.

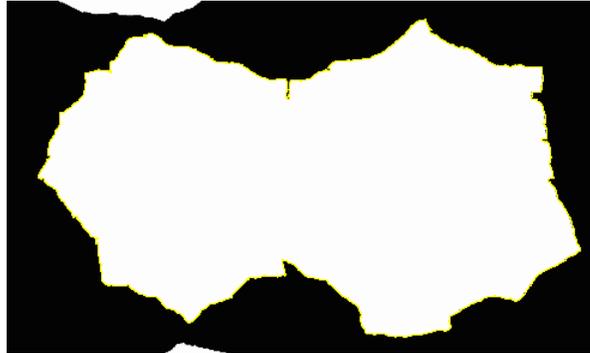
6.6.1.3 Using ImageJ software to calculate area of foil pieces.

1. Download the necessary software for free from one of the following links:
ImageJ software for PC's: <http://rsb.info.nih.gov/ij/>
NIH Image for Mac's: <http://rsb.info.nih.gov/nih-image/Default.html>
2. Both sites have links that have FAQ's and other documentation (the following instructions are only if you're using ImageJ software, though NIH Image may be similar).
3. Open your scanned image in ImageJ.
4. Select the *wand (tracing) tool* on the vertical toolbar and select inside the foil area – a yellow line appears around the shape of your foil.

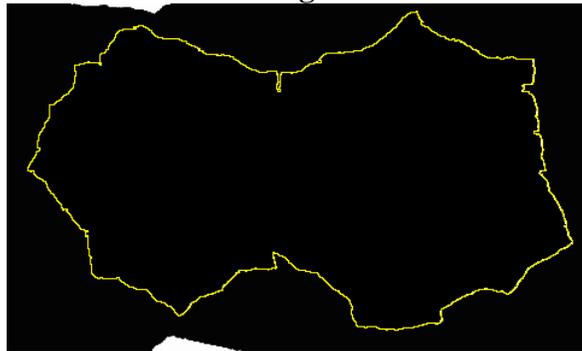
ImageJ Toolbar and Wand tool



- Alternatively, you can have the software define the edges of your foil by clicking on *Find Edges* under the *Process* menu and then select this edge using the wand tool to highlight the shape in yellow (this might highlight areas outside of the foil, so be careful).



Selected foil area using *Wand Tool*



Selected foil area using *Find Edges*

- Once a foil piece has been selected, select *Measure* under the *Analyze* menu on the tool bar.
- A *Results* window appears which gives you the total area of the selected areas in your image – as you use the measure tool again, this table will continue to be populated in chronological order as shown below.

Measure Results table

	Area	Mean	Min	Max
1	8.151	253	253	253

- The area measured is in a pixels unit. Use the measurement for the calibration pieces to find the conversion factor to cm^2 . Use this to convert the pixels area for all foil pieces processed.

9. Keep note of the order in which you made measurements and which result in the table corresponds to which foil image and which foil image is from which sampling site.
10. Once you have measured all your foil pieces, you can export the results table into excel by going to *Save As* under the *File* menu of the *Results* window. Alternately you can copy and paste records into an open excel worksheet as you go.

6.6.2 Calculating sampling area of woody snag sections (epidendric method)

Total Sampling Area (cm²): $\sum_{i=1}^n (\pi)(di)(li)$

where,

n = number of discrete collections,

di = diameter of each woody snag section, in centimeters, and

li = length of each woody snag section, in centimeters.

6.6.3 Calculating sampling area for Epipsammic (Pea gravel/Sand) and Epipellic (Silt) Habitats method:

For a typical site, the total sample surface area for all six discrete samples collected with a 47-mm Petri dish is 102 cm². Adjust calculations accordingly based on the surface area of Petri dish and number of samples collected.

7.0 Records Management

7.1 All hardcopy documentation of the data, such as completed Field Logbook and Field Data Report Forms are kept and maintained by the project lead. These documents are organized in binders or in expanding files. After about six years, hardcopies are boxed and moved to EAP archives.

7.2 Data collected will be reviewed, verified, and stored based on the Quality Assurance Project Plan (QAPP) for the project.

8.0 Quality Control and Quality Assurance

8.1 The TMDL data QA program for field sampling consists of two parts: (1) adherence to the SOP procedures for sample/data collection and periodic evaluation of sampling personnel and (2) the collection of a field quality control (QC) sample for ten percent of the samples collected for a given study.

8.1.1 The field QC sample is collected as a duplicate field sample. This consists of the collection of an additional set of samples the initial sample.

8.1.2 QA/QC procedures will be addressed more thoroughly on a project-by-project basis in the QAPP for the project.

9.0 Safety

- 9.1 Safety is the primary concern when collecting periphyton samples. Review Ecology's Safety Program Manual (Ecology, 2010) periodically to assist with these safety determinations.
- 9.2 A proper safety assessment of the sampling reach of the stream is extremely important when collecting periphyton samples, given that the stream must be waded in order to collect the samples.
- 9.2.1 Assess whether or not the velocity and depth of the stream are low enough to safely wade across it. As a rule-of-thumb: **Do NOT wade in flowing water when the product of depth (in feet) and velocity (in feet per second) equals 10 or greater.** For example, if the stream is estimated to be 3 feet deep and have a velocity of 4 ft/s, do **NOT** wade across the stream. These streams likely have little periphyton on the substrates anyways, so you would be needlessly risking your life. This is only a general rule, take extra precautions where the substrate is unstable (slippery or moving), water visibility is impaired (high turbidity or glare), or other challenges are present.
- 9.2.2 Never wade across a stream where: a) potentially fatal entrapments/obstacles are located downstream (such as strainers, dams, large boulders, frowning (upstream V) rapids, etc); or b) medium to large debris pieces are floating down the stream.
- 9.2.3 For a more complete list of river hazards see:
http://www.ccadc.org/instruction/ACA_RKTLA_Class/TLHazard/RiverHazards.html
- 9.3 ALWAYS a) wear a PFD while wading in the stream, b) wear a tight wading belt with waders, c) wear wading specific boots with good traction, d) work with a partner, and e) have the non-wading partner carry a throw-bag (and make sure they know how to use it).
- 9.4 **Use extreme caution when preparing Lugol's solution and handling reagents (see appendix for MSDS):**
Caution! Potassium iodide may cause eye, skin, and respiratory tract irritation. May cause reproductive and fetal effects.
Danger! Glacial Acetic Acid causes severe eye and skin burns. Causes severe digestive and respiratory tract burns. **Flammable liquid and vapor.** May be harmful if absorbed through the skin. Glacial acetic acid solidifies below 62°F (17°C). Corrosive to metal.
Danger! Crystalline Iodine may cause allergic skin reaction. Harmful if swallowed, inhaled, or absorbed through skin. Causes burns by all exposure routes. Extreme inhalation exposure causes build-up of fluid in the lungs and can be fatal in extreme cases.

10.0 References

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Material Safety Data Sheet

Acetic acid, >96%

ACC# 00120

Section 1 - Chemical Product and Company Identification

MSDS Name: Acetic acid, >96%

Catalog Numbers: AC124040000, AC124040010, AC124040025, AC124040050, AC124040250, AC148930000, AC148930010, AC222140000, AC222140010, AC222140025, AC222140051, AC222140200, AC222142500, AC295320000, AC295320010, AC295320025, AC295320100, AC423220000, 14893-0025, 42322-0025, 42322-5000, A35-500, A35-500LC, A38-212, A38-450LB, A38-500, A38-500LC, A38212LC, A38C-212, A38C212LC, A38J500, A38P-20, A38P500, A38S-212, A38S-500, A38SI-212, A465-1, A465-250, A465-500, A490-212, A491-20, A491-212, A491-212LC, A491-4, A507-212, A507-4, A507-500, A507SK-212, AC38C212EA, BP1185-500, BP1185500LC, BP2400-500, BP2401-212, BP2401-500, BP2401C-212, BP2401P-20, BP2401S-212, BP2401S-500, BP2401SI-212, NC9011470, NC9758600, S70048-1SC, S70048-2MF, S700481MF

Synonyms: Ethanoic acid; Ethylic acid; Methanecarboxylic acid; Vinegar acid; Glacial acetic acid.

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
64-19-7	Acetic acid	>96	200-580-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 39 deg C.

Danger! Causes severe eye and skin burns. Causes severe digestive and respiratory tract burns. **Flammable liquid and vapor.** May be harmful if absorbed through the skin. Glacial acetic acid solidifies below 62°F (17°C). Corrosive to metal.

Target Organs: Teeth, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Causes severe eye irritation. Contact with liquid or vapor causes severe burns and possible irreversible eye damage.

Skin: Causes skin burns. May be harmful if absorbed through the skin. Contact with the skin may cause blackening and hyperkeratosis of the skin of the hands.

Ingestion: May cause severe and permanent damage to the digestive tract. Causes severe pain, nausea, vomiting, diarrhea, and shock. May cause polyuria, oliguria (excretion of a diminished amount of urine in relation to the fluid intake) and anuria (complete suppression of urination). Rapidly absorbed from the gastrointestinal tract.

Inhalation: Effects may be delayed. Causes chemical burns to the respiratory tract. Exposure may lead to bronchitis, pharyngitis, and dental erosion. May be absorbed through the lungs.

Chronic: Chronic exposure to acetic acid may cause erosion of dental enamel, bronchitis, eye irritation, darkening of the skin, and chronic inflammation of the respiratory tract. Acetic acid can cause occupational asthma. One case of a delayed asthmatic response to glacial acetic acid has been reported in a person with bronchial asthma. Skin sensitization to acetic acid is rare, but has occurred.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Persons with pre-existing skin disorders or impaired respiratory or pulmonary function may be at increased risk to the effects of this substance. Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Reacts with most metals to form highly flammable hydrogen gas which can form explosive mixtures with air. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: Use water spray, dry chemical, "alcohol resistant" foam, or carbon dioxide.

Flash Point: 39 deg C (102.20 deg F)

Autoignition Temperature: 426 deg C (798.80 deg F)

Explosion Limits, Lower: 4.0 vol %

Upper: 19.9 vol %

NFPA Rating: (estimated) Health: 3; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wash area with soap and water. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures. Control runoff and isolate discharged material for proper disposal. Spill may be carefully neutralized with soda ash (sodium carbonate).

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Discard contaminated shoes. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Do not breathe vapor or mist. Use corrosion-resistant transfer equipment when dispensing.

Storage: Keep away from heat, sparks, and flame. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store near alkaline substances. Acetic acid should be kept above its freezing point of 62°F(17°C) to allow it to be handled as a liquid. It will contract slightly on freezing. Freezing and thawing does not affect product quality.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use a corrosion-resistant ventilation system.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Acetic acid	10 ppm TWA; 15 ppm STEL	10 ppm TWA; 25 mg/m ³ TWA 50 ppm IDLH	10 ppm TWA; 25 mg/m ³ TWA

OSHA Vacated PELs: Acetic acid: 10 ppm TWA; 25 mg/m³ TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles and face shield.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear, colorless

Odor: pungent odor - vinegar odor

pH: <.01

Vapor Pressure: 11.4 mm Hg @ 20 deg C

Vapor Density: 2.10 (Air=1)

Evaporation Rate:0.97 (n-Butyl acetate=1)

Viscosity: 1.22 cP

Boiling Point: 117 - 118 deg C

Freezing/Melting Point:16.6 deg C

Decomposition Temperature:Not available.

Solubility: Soluble.

Specific Gravity/Density:1.05 (Water=1)

Molecular Formula:C₂H₄O₂

Molecular Weight:60.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.

Conditions to Avoid: Ignition sources, excess heat, freezing temperatures, confined spaces, Note: Use great caution in mixing with water due to heat evolution that causes explosive spattering. Always add the acid to water, never the reverse..

Incompatibilities with Other Materials: Metals, strong oxidizing agents, bases, chlorine trifluoride, nitric acid, acetaldehyde, chlorosulfonic acid, oleum, bromine pentafluoride, perchloric acid, potassium tert-butoxide, ethyleneimine, 2-aminoethanol, ethylene diamine, phosphorus trichloride, phosphorus isocyanate, chromic acid.

Hazardous Decomposition Products: Carbon monoxide, carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 64-19-7: AF1225000

LD50/LC50:

CAS# 64-19-7:

Draize test, rabbit, skin: 50 mg/24H Mild;

Inhalation, mouse: LC50 = 5620 ppm/1H;

Oral, rat: LD50 = 3310 mg/kg;

Skin, rabbit: LD50 = 1060 uL/kg;

.

Carcinogenicity:

CAS# 64-19-7: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.

Teratogenicity: No teratogenic effects were observed among the offspring of mice, rats, or rabbits that had been given very large doses of apple cider vinegar (containing acetic acid) during pregnancy. Acetic acid treatment of suckling rats (via maternal administration) was associated with abnormalities of behavioral testing.

Reproductive Effects: Intratesticular, rat: TDLo = 400 mg/kg (male 1 day(s) pre-mating) Fertility - male fertility index (e.g. # males impregnating females per # males exposed to fertile nonpregnant females).

Mutagenicity: Sister Chromatid Exchange: Human, Lymphocyte = 5 mmol/L.; Unscheduled DNA Synthesis: Administration onto the skin, mouse = 79279 ug/kg.; Cytogenetic Analysis: Hamster, Ovary = 10 mmol/L.

Neurotoxicity: No information available.

Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 88 mg/L; 96 Hr; Static bioassay @ 18-22°C Fish: Bluegill/Sunfish: LC50 = 75 mg/L; 96 Hr; Unspecified Fish: Goldfish: LC50 = 423 mg/L; 24 Hr; Unspecified Water flea Daphnia: EC50 = 32-47 mg/L; 24-48 Hr; Unspecified Bacteria: Phytobacterium phosphoreum: EC50 = 8.86-11 mg/L; 5,15,25 min; Microtox test If released to water or soil, acetic acid will biodegrade readily. Evaporation from dry surfaces is likely to occur. When spilled on soil, the liquid will spread on the surface and penetrate into the soil at a rate dependent on the soil type and its water content. Acetic acid shows no potential for biological accumulation or food chain contamination.

Environmental: If released to the atmosphere, it is degraded in the vapor-phase by reaction with photochemically produced hydroxyl radicals (estimated typical half-life of 26.7 days). It occurs in atmospheric particulate matter in acetate form and physical removal from air can occur via wet and dry deposition.

Physical: Natural waters will neutralize dilute solutions to acetate salts.

Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ACETIC ACID, GLACIAL	ACETIC ACID GLACIAL
Hazard Class:	8	8(3)
UN Number:	UN2789	UN2789
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 64-19-7 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 64-19-7: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 64-19-7: immediate, delayed, fire.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 64-19-7 is listed as a Hazardous Substance under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 64-19-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

C

Risk Phrases:

R 10 Flammable.

R 35 Causes severe burns.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 64-19-7: 1

Canada - DSL/NDSL

CAS# 64-19-7 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E, B3.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 64-19-7 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/21/1999

Revision #14 Date: 9/30/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet

Section 1 Identification					
Product Number:	C1906				
Product Name:	Iodine Laboratory Grade, Crystal	Health:	2		
		Flammability	0		
		Reactivity	0		
		Hazard Rating:			
Trade/Chemical Synonyms		Least Slight Moderate High Extreme			
Formula:	I'	0 1 2 3 4			
RTECS:	NN1575000	NA = Not Applicable NE = Not Established			
C.A.S	CAS# 7553-56-2				
Section 2 Component Mixture					
Sara 313	Component	CAS Number	%	Dim	Exposure Limits:
<input type="checkbox"/>	Iodine	CAS# 7553-56-2	100%	w/w	OSHA PEL (C) 0.1 ppm (1 mg/mf)
Section 3 Hazard Identification (Also see section 11)					
Keep away from heat and ignition sources. May be harmful if swallowed. Avoid breathing vapor or dust. Use with adequate ventilation. Avoid contact with eyes, skin, and clothes. Wash thoroughly after handling. Keep container closed.					
Section 4 First Aid Measures					
Keep away from heat and ignition sources. May be harmful if swallowed. Avoid breathing vapor or dust. Use with adequate ventilation. Avoid contact with eyes, skin, and clothes. Wash thoroughly after handling. Keep container closed.					
FIRST AID: SKIN: Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention					
EYES: Wash eyes with plenty of water for at least 15 minutes, lifting lids occasionally. Seek Medical Aid. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen					
INGESTION: Give several glasses of milk or water. Vomiting may occur spontaneously, but DO NOT INDUCE! Never give anything by mouth to an unconscious person.					
Section 5 Fire Fighting Measures					
Fire Extinguisher Type:	Any means suitable for extinguishing surrounding fire				
Fire/Explosion Hazards:	Toxic vapor will be liberated on burning.				
Fire Fighting Procedure:	Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and clothing.				
Section 6 Accidental Release Measures					
Sweep up and place in suitable (fiberboard) containers for reclamation or later disposal.					
Section 7 Handling and Storage					
Store in a cool, well ventilated area away from direct sunlight. Keep tightly closed.					
Section 8 Exposure Controls & Personal Protection					
Respiratory Protection: NIOSH/MSHA-approved respirator					
Mechanical:		Hand Protection: Wear appropriate gloves to prevent skin exposure			
<input type="checkbox"/>					
Ventilation: Local Exhaust:		Eye Protection: Safety goggles			
<input checked="" type="checkbox"/>					
Other Protective Equipment: Wear appropriate clothing to prevent skin exposure					
Section 9 Physical and Chemical Properties					
Melting Point:	113.5°c	Specific Gravity	4.93		
Boiling Point:	184 Deg C	Percent Volatile by Volume:	0		
Vapor Pressure:	1 mm @ 38.7 Deg C	Evaporation Rate:	0		
Vapor Density:	9 @ 25Deg C	Evaporation Standard:			
Solubility in Water:	Soluble	Auto ignition Temperature:	Not applicable		
Appearance and Odor:	Dark purple to black solid with a penetrating color	Lower Flamm. Limit in Air:	Not applicable		
Flash Point:	None	Upper Flamm. Limit in Air:	Not applicable		
Section 10 Stability and Reactivity Information					
Stability: Stable	Conditions to Avoid: Strong reducing agents, ammonia, and acetylene				
Materials to Avoid: Mild steel, or aluminum.					
Hazardous Decomposition Products: Not known to occur					
Hazardous Polymerization: Will Not Occur					
Condition to Avoid: None known					
Section 11 Additional Information					
Harmful if swallowed, or inhaled. Inhalation may be fatal due to irritation, edema, and spasm of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. If comes in contact with eyes open eyelids and flush with water. If comes in contact with skin dilute sodium thiosulfate or bisulfate, then wash with water. If ingested drink milk, egg white, or vegetable oil. If inhaled remove to fresh air. Persons with pre-existing disorders may be more susceptible.					
DOT Classification: Not Regulated					
DOT regulations may change from time to time. Please consult the most recent version of the relevant regulations.					
Revision No: 1 Date Entered: 9/1/2006 Approved by: WPF					

The information contained herein is believed to be accurate and is offered in good faith for the user's consideration and investigation. No warranty is expressed or implied regarding the completeness or accuracy of this information, whether originating from Science Stuff, Inc. or from an alternate source. Users of this material should satisfy themselves by independent investigation of current scientific and medical information that this material may be safely handled.

Material Safety Data Sheet

Potassium iodide

ACC# 19435

Section 1 - Chemical Product and Company Identification

MSDS Name: Potassium iodide

Catalog Numbers: AC193790000, AC193790100, AC193790500, AC196730000, AC196730025, AC196735000, AC206470000, AC206471000, AC206475000, AC373650000, AC373651000, AC373655000, AC418260000, AC418261000, 41826-5000, BP367-500, NC9433542, P410-10, P410-100, P410-3, P410-500, P410J-500, P412-10, P412-3, P412-500

Synonyms: None.

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7681-11-0	Potassium iodide	99.995	231-659-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white crystalline powder.

Caution! May cause eye, skin, and respiratory tract irritation. May cause reproductive and fetal effects.

Target Organs: Thyroid.

Potential Health Effects

Eye: Causes mild eye irritation.

Skin: May cause skin irritation. May be harmful if absorbed through the skin. May cause allergic sensitization in certain individuals.

Ingestion: May cause irritation of the digestive tract. May be harmful if swallowed.

Inhalation: May cause respiratory tract irritation. May be harmful if inhaled. May cause respiratory sensitization.

Chronic: May cause reproductive and fetal effects. May interfere with iodine uptake of the thyroid gland and enlarge it. Some references (e.g. Dreisbach's Handbook) say that iodine and iodine compounds are potent sensitizers and that repeated contact may cause sensitivity dermatitis, laryngeal edema, serum sickness with lymph node enlargement, and joint pain and swelling.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.

Ingestion: Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self-contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products.

Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.

Flash Point: Not applicable.

Autoignition Temperature: Not applicable.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 1; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions.

Section 7 - Handling and Storage

Handling: Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation.

Storage: Store in a cool, dry place. Do not store in direct sunlight. Store in a tightly closed container.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Potassium iodide	none listed	none listed	none listed

OSHA Vacated PELs: Potassium iodide: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Crystalline powder

Appearance: white

Odor: odorless

pH: 7-9 (aq soln)

Vapor Pressure: Not available.

Vapor Density: Not available.

Evaporation Rate: Not available.

Viscosity: Not available.

Boiling Point: 1330 deg C @ 760 mmHg

Freezing/Melting Point: 680 deg C

Decomposition Temperature: Not available.

Solubility: Soluble.

Specific Gravity/Density: 3.13

Molecular Formula: KI

Molecular Weight: 166

Section 10 - Stability and Reactivity

Chemical Stability: Air sensitive. Moisture sensitive. Light sensitive.

Conditions to Avoid: Incompatible materials, light, dust generation, moisture, prolonged exposure to air.

Incompatibilities with Other Materials: Chloral hydrate, calomel, strong reducing agents, oxidizing agents, alkali metals, metals, metal salts, ozone, perchloryl fluoride, charcoal, bromine trifluoride, chlorine trifluoride.

Hazardous Decomposition Products: Hydrogen iodide, oxides of potassium.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 7681-11-0: TT2975000

LD50/LC50:

Not available.

Carcinogenicity:

CAS# 7681-11-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Potassium iodide has been shown to produce fetotoxicity in newborns.

Teratogenicity: Teratogenic effects have occurred in humans.

Reproductive Effects: Adverse reproductive effects have occurred in humans.

Mutagenicity: Mutagenic effects have occurred in experimental animals.

Neurotoxicity: No information found

Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.

Environmental: No information available.

Physical: No information available.

Other: Do not empty into drains.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated.	Not regulated.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7681-11-0 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPO.

SARA Codes

CAS # 7681-11-0: immediate, delayed.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7681-11-0 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:**Safety Phrases:**

S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 7681-11-0: 1

Canada - DSL/NDSL

CAS# 7681-11-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7681-11-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 2/25/1999

Revision #8 Date: 2/15/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.