

APPENDIX B

FIELD STANDARD OPERATING PROCEDURES for Field Equipment & Physical Habitat Assessments

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B-1A: Densimeter SOP



1.0 INTRODUCTION

The spherical densimeter is used to measure the estimated amount of surface that is covered by shade from streamside vegetation. The estimation of canopy cover contributes to the physical habitat assessment of the PSBP.

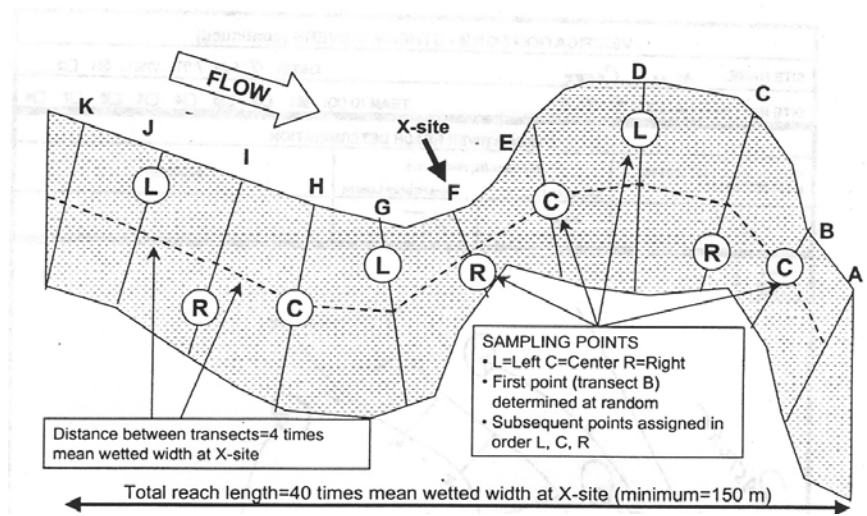
2.0 PURPOSE

The Standard Operating Procedure (SOP) describes the Method to quantify percentage of canopy cover using a Spherical Densimeter (Model A - convex).

3.0 METHOD

This method is similar to USEPA EMAP protocols (EPA/620/R-94/004F). Six canopy cover measurements are taken at each of the 11 transects over the length of the stream reach, for a total of 66 measurements. The stream reach is 40 times channel width, with a 150 meter minimum reach length. The “X-site” is located at the riffle sampling transect site, the mid point of the sample reach. Five evenly spaced transects above and five below the X-site is determined by measuring the distance between each transect: the wetted width of the X-site. Left and right bank is determined by facing downstream.

EMAP-SW-Streams Field Operations Manual, Section 4 (Initial Site Procedures), Rev. No. 4, September 1998 Page 8 of 12



4.0 PROCEDURE

The following procedure follows EMAP protocols (EPA/620/R-94/004F, pgs 105-108).

- 4.1 Follow the PSBP's to determine the sampling point at which to take densiometer measurements at each transect.
- 4.2 Level the instrument using the "level bubble" located in the lower right hand corner before taking measurements (Figures 4-5, and 7).
- 4.3 Hold instrument six inches above the water surface, and far enough away from your body, so that your head is just below the apex of the taped "V" on the bottom of the densiometer (Figure 4-5). This minimizes errors of those with different heights, and includes contribution of low overhanging vegetation.
- 4.4 Measurements are taken by counting the number of grid points that are covered by vegetation cover. There are a total number of 17 grid points. Values will be between 0 (no canopy cover) and 17 for complete canopy cover (Figures 4-5, 7).
- 4.5 Six measurements are taken at **each transect**.
 - 4.5.1 Stand on the "wetted perimeter" of the left bank. Facing the left bank, take a densiometer reading by following steps 4.2 to 4.5 (Figure 4-6).
 - 4.5.2 Stand on the "wetted perimeter" of the right bank. Facing the right bank, take a densiometer reading by following steps 4.2 to 4.5.
 - 4.7.3 Stand at the mid point of the transect. Take four densiometer readings : one is facing the left bank, one facing the right bank, one facing downstream, and one facing upstream by following steps 4.2 to 4.5.
 - 4.7.4 Record the measurements on the canopy cover form (Figure 14-7). See Appendix B-2B for canopy cover SOP.

5.0 CANOPY COVER MEASUREMENTS

The mid-channel measurements are used to estimate canopy cover over the channel. The two bank measurements compliment your visual estimates of vegetation cover structure within the riparian zone itself, and are particularly important in wide streams, where riparian canopy may not be detected by the mid-stream densiometer readings. There is a total number of 17 possible points at each sample location. There are 6 sample locations at each transect, 102 (6x17) possible points at transect, for a total number of 1122 possible points for all 11 transects (102 x 11 = 1122).

Percentage canopy cover is calculated as: **%CC = NP/TN x 100**, where

%CC = percent canopy cover

NP = number of points covered by vegetation

TN = total number of points (1122 = Total number of possible points)

6.0 QUALITY OBJECTIVES/ CRITERIA

It is important to consider the seasonal flow and riparian vegetation conditions when measuring canopy cover using this method, since stream widths and deciduous vegetation cover measurements vary seasonally. Ideally, measurements would be taken during seasonal low flow periods each time to minimize the effects of varying wetted widths. Avoid errors by standing in waters of varying depth. Low flow conditions are usually a time of critical temperature stress to aquatic biota. Stream shade is important, reducing sunlight and lowering water temperatures. Therefore, measurements should

be taken during the season when deciduous vegetation has leaves. Bars are considered part of the wetted channel. Densimeter readings are taken over bars and boulders, just as if they were part of the wetted channel.

7.0 STORAGE

The spherical densimeter is designed for rugged field use. To store, close the lid and securely fasten the clasp.

8.0 CLEANING THE DENSIOMETER

Clean the face of the densimeter by dusting with a clean soft cloth.

6.0 REFERENCES

USEPA EMAP Program, 1998. Surface Waters: Field Operations and Methods for Measuring the Ecological Conditions of Wadeable Streams; EPA/ 620/R-94/004F; US Environmental Protection Agency, Office of Research and Development, Washington D.C.

Mulvey, M., L. Caton, R. Hafle, 1992. Oregon Nonpoint Source Monitoring Protocols Stream Bioassessment Field Manual for Macroinvertebrates and Habitat Assessment; Oregon Dept. of Environmental Quality, Laboratory Biomonitoring Section; 1712 S.W. 11th Ave; Portland, OR 97201, 40 pp.

Peck, D.V., Lazorchak, J.M., Klemm, D.; USEPA EMAP Program, April 2003. Western Pilot Study: Field Operations Manual for Wadeable Streams; DRAFT; US Environmental Protection Agency, Office of Research and Development, Washington D.C.

EPA EMAP Figures 4-5, 4-6, 14-7 (1998), and 7 (2003)

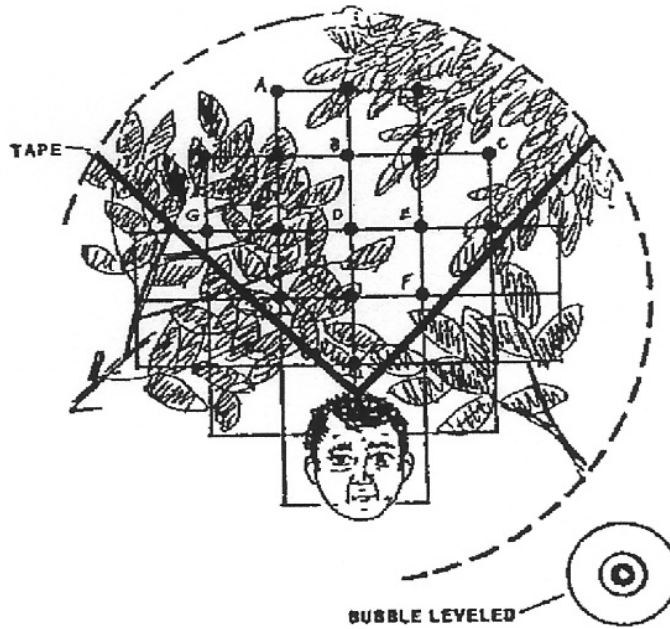


Figure 4-5. Schematic of modified convex spherical canopy densiometer. In this example, 10 of the 17 intersections show canopy cover, giving a densiometer reading of 10. Note proper positioning with the bubble leveled and the head reflected at the apex of the “V.” (Mulvey et al. 1992).

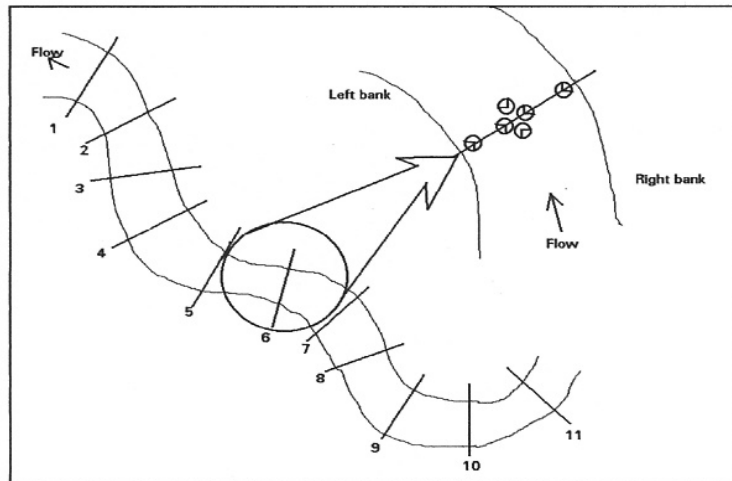


Figure 4-6. Study reach with 11 sample transects and example of 6 densiometer measurements taken at each transect.

Site Name:							Date:
Reach Length:				Transect Interval:			Initials:
Transect	Left Bank	Center-Up stream	Center - Right	Center - downstream	Center - Left	Right bank	Comments:
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							

Figure 14-7. Canopy Cover Form.

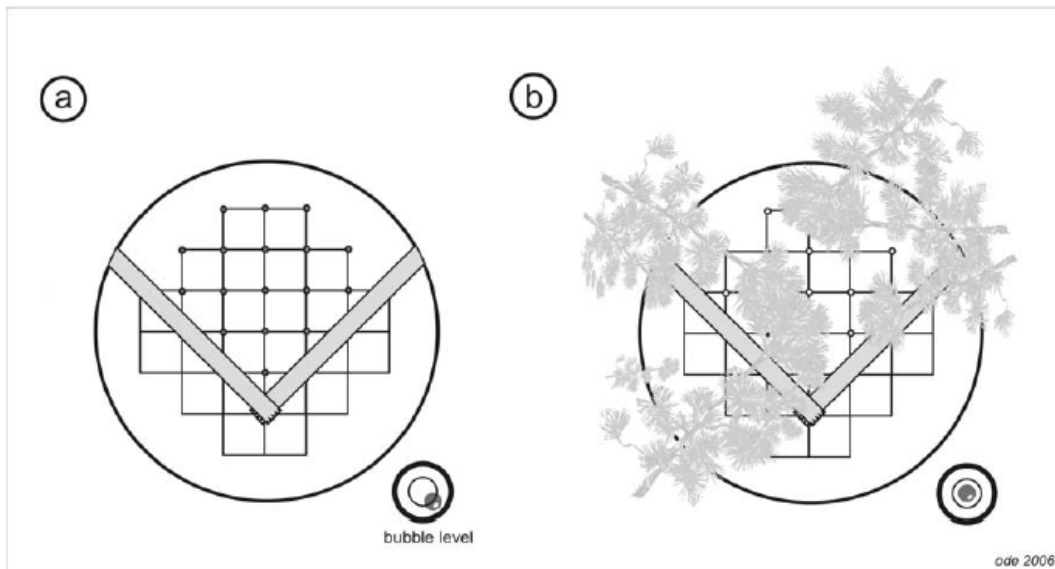
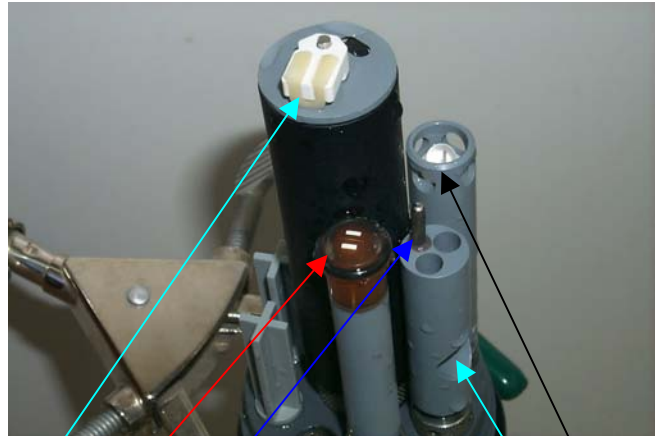


Figure 7. Representation of the mirrored surface of a spherical densiometer showing the position for taping the mirror and the intersection points used for the densiometer reading. The score for the hypothetical condition in (b) is 10 covered intersection points out of 17 possible. Note the position of the bubble level in (b) when the densiometer is leveled.

B-1B: YSI Sonde (Model 6920) SOP



Sensors: Turbidity, D.O., Temperature, Conductivity port, pH

1.0 INTRODUCTION

The YSI 6920 sonde is a multi-parameter device used to measure and record WQ measurements in surface waters for the following: temperature (C°), dissolved oxygen (mg/L), pH, turbidity (NTU), specific conductivity (mhos/cm), Salinity (ppt), and Total Dissolved Solids (grams/ liter).

2.0 PURPOSE

The Standard Operating Procedure (SOP) describes the method to use the 6920 sonde in the field.

3.0 METHOD

See the YSI “Environmental Monitoring Systems Operations Manual” for complete instructions for maintenance, care, and use of the 6920 sonde and sensors.

4.0 MATERIALS NEEDED FOR 6920 SONDE CALIBRATION.

- 4.1.1 Stand with clamp to hold sonde during calibration
- 4.1.2 Conductivity 6.668 calibration standard (made in lab)
- 4.1.3 PH 7.0 & 10.0 calibration standards (purchased commercially)
- 4.1.4 Turbidity 0.0 & 123.0 calibration standards (purchased commercially)
- 4.1.5 Sonde cap protector for sensors (during field use)
- 4.1.6 YSI 6920 Sonde and Calibration cup (on bottom)
- 4.1.7 MDS 650 display and cable connecting to sonde



5.0 PROCEDURE: PRE-FIELD SONDE CALIBRATIONS

5.1 Dissolved Oxygen (D.O.) Calibration.

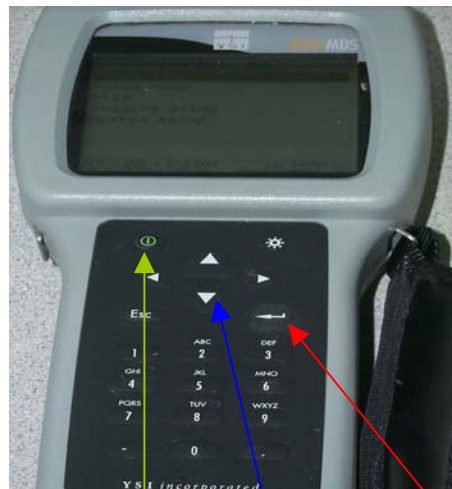
- 5.1.1 Place approximately 3mm (1/8 inch) of tap water in the calibration cup. The calibration cup twists on/ off the bottom of the 6920 sonde.
- 5.1.2 Place the probe end of the sonde into the cup, making sure that the D.O. and temperature probes are **not** immersed in the water.
- 5.1.3 Engage only 1 or 2 threads of the calibration cup to insure that the probe is vented to the atmosphere. Place sonde in an upside down position on a stand, Figure 5.1.3.

Figure 5.1.3. 6920 Sonde



Calibration Cup secured by clamp

Figure 5.1.6 650 MDS



Touch pad: Power, Cursor, and 'Enter' keys.

- 5.1.4 Wait approximately 10 minutes for the air in the calibration cup to become water saturated and the temperature to equilibrate.
- 5.1.5 While waiting, call the Reno weather station at (775) 673-8107, and ask for the "corrected" barometric pressure for the Nixon, Nevada area. Write the number in your lab notebook.
- 5.1.6 Power the sonde by pressing the green power button, on the upper left hand corner of the 650 MDS display unit (connected to the sonde by a cable), figure 5.1.6.
- 5.1.7 Using the 'down arrow' cursor key, select "**Sonde menu**" from the 650 MDS display menu, then press the enter key.
- 5.1.8 Using the cursor key, select "**Calibrate**" from the main menu, then press 'enter.'
- 5.1.9 Using the cursor key, select "**Dissolved Oxy**" from the menu, then press 'enter.'
- 5.1.10 Select "**DO %**" from the DO calibration menu, then press the enter key.
- 5.1.11 Multiply the "corrected" barometric pressure by 25.4, then subtract 98.5 (for elevation correction). Record this equation in your lab notebook. Enter the value into the 650 MDS using the numbers on the touch pad.
- 5.1.12 Press the 'enter' key. The sonde will self calibrate as all enabled sensors become stabilized. Usually takes one to two minutes.
- 5.1.13 Press the 'enter' key to continue calibration.
- 5.1.14 Press the 'escape' key on the touch pad to get back to the 'calibrate' menu.

5.2 Specific Conductivity Calibration.

- 5.2.1 From the calibration menu, use 'up arrow' cursor key to select "**Conductivity**", then press the enter key.
- 5.2.2 Select "**Sp Cond**" from the "Cond calibration" menu, then press the enter key.
- 5.2.3 Fill the calibration cup with 2.5 cm (1 inch) of the 6.668 mS/cm conductivity standard.
- 5.2.4 Replace the calibration cup on the sonde, shake 4 seconds to rinse the probes, and then discard the conductivity solution.
- 5.2.5 Fill the calibration cup with **200 ml** of the 6.668 mS/cm conductivity standard, covering all sensors. Replace the calibration cup gently moving the sonde up and down to remove any bubbles from the conductivity cell. The probe must be completely immersed past its vent hole. Place the sonde in a upside down position on a stand (figure 5.1.3).
- 5.2.6 Enter the standard calibration mS/cm value of "**6.668**" into the 650 MDS using the numbers on the touch pad. Then press the enter key.
- 5.2.7 Wait one minute for the sonde to calibrate. The current values of all enabled sensors will appear on the screen and will change in time as they stabilize.
- 5.2.8 Observe the readings under '**mS/cm.**' When they show no significant change for approximately 30 seconds, press the 'enter' key to calibrate.
- 5.2.9 The 6920 sonde is now calibrated at 25 °C for Specific conductivity to be read in the 0 –100 mS/cm range.
- 5.2.10 Discard conductivity solution, and rinse probes twice with tap water.
- 5.2.11 Press the 'enter' key, then the 'escape' key' on the touch pad to get back to the 'calibrate' menu.

5.3 PH Calibration.

- 5.3.1 From the calibration menu, use 'up arrow' cursor key to select "**ISE1 pH**", then press the enter key.
- 5.3.2 Select "**2 point**" from the "pH calibration" menu, then press the enter key.
- 5.3.3 Fill the calibration cup with 2.5 cm (1 inch) of the 7.0 pH standard. These standards are purchased commercially).
- 5.3.4 Replace the calibration cup on the sonde, shake to rinse the probes, and then discard the pH solution.
- 5.3.5 Fill the calibration cup with 100 ml of the 7.0 pH standard, enough to cover all sensors. Replace calibration cup. Place the sonde in a upside down position on a stand (figure 5.1.3).
- 5.3.6 Enter the standard calibration pH value of "**7.00**" into the 650 MDS using the numbers on the touch pad. Then press the enter key. Wait one minute for the sensors to stabilize.
- 5.3.7 Observe the readings under "**pH**", and when they show no significant change for approximately 30 seconds, press the 'enter' key to calibrate.
- 5.3.8 The 6920 sonde is now calibrated for 7.0 pH.
- 5.3.9 Press the 'escape' key on the touch pad to get back to the 'pH calibration menu.'
- 5.3.10 Discard ph calibration solution, and rinse probes once with tap water.
- 5.3.11 Repeat steps 5.3.3 to 4.5.10 using the pH 10.0 standard.
- 5.3.12 The 6920 sonde is now calibrated for pH in the 7.0 to 10.0 range.
- 5.3.13 Press 'enter' and then 'escape' to get back to the calibration menu.

5.4 Turbidity Calibration.

- 5.4.1 From the calibration menu, use the 'down' cursor key to select "**Optic T Turbidity-6136**", then press the enter key.

- 5.4.2 Select “**2 point**” from the “Turbidity calibration” menu, then press the enter key.
- 5.4.3 Fill the calibration cup with 2.5 cm (1 inch) of the **0.00 mS/cm** Turbidity standard (clear deionized water).
- 5.4.4 Replace the calibration cup on the sonde, gently rinse the probes to avoid air pockets, and then discard the deionized water.
- 5.4.5 Fill the calibration cup with 100ml of the 0 mS/cm Turbidity standard (clear deionized water), enough to cover all sensors. Replace calibration cup. Place the sonde in a upside down position on a stand (figure 5.1.3).
- 5.4.6 Enter the Turbidity standard mS/cm value of “**0.00**” into the 650 MDS using the numbers on the touch pad. Then press the enter key. Wait one minute for the sensors to stabilize.
- 5.4.7 Observe the readings under “**NTU.**” When they show no significant change for approximately 30 seconds, press the ‘enter’ key to calibrate.
- 5.4.8 The 6920 sonde is now calibrated for 0 mS/cm.
- 5.4.9 Press the ‘escape’ key on the touch pad to get back to the ‘calibrate menu.’
- 5.4.10 Discard calibration solution, and rinse probes once with tap water.
- 5.4.11 Repeat steps 5.4.3 to 5.4.10 using the **10.0 mS/cm** Turbidity standard.
- 5.4.12 The YSI conductivity system is very linear over its entire 0 to 100 mS/cm range. Therefore, it is usually not necessary to use calibration solutions other than the 0.00 and 10.0 mS/cm standard recommended by YSI’s 6920 System Operations Manual.

Note: All Turbidity standards are purchased through YSI Inc. except for the **0 mS/cm** Turbidity standard, which is newly made distilled water.

5.5 Salinity Calibration.

Salinity is determined automatically from the sonde conductivity and temperature readings. See YSI’s “Environmental Monitoring Systems Operations Manual” Section 5.2 for a detailed explanation.

5.6 Total Dissolved Calibration.

Total Dissolved Calibration (grams/ liter) is determined automatically from the sonde conductivity, multiplied by a default constant of 0.65. See YSI’s “Environmental Monitoring Systems Operations Manual” Section 5.3 for a detailed explanation.

- 5.7 A moist 1.0 inch sponge is kept in the calibration cup when traveling to sampling sites to keep sensors moist.

6.0 PROCEDURE: IN-FIELD

- 6.1 Remove calibration cup, and replace with the sonde sensor ‘protector’ cap.
- 6.2 The entire sonde should be immersed in the water to be sampled. The sensors should be cleaned and free of any debris.
- 6.3 Power on the sonde, then press “Sonde run” to enable the sensors. The MDS 650 will display all active parameters.
- 6.4 Observe the readings under Temperature (°C), Dissolved Oxygen (DO mg/L), Specific Conductivity (mS/cm), and Turbidity (NTU). When they show no significant change (approximately 60 seconds), record the measurements in field notebook using a pencil.
- 6.5 Power off the sonde, and replace the calibration cup.

7.0 POST FIELD CALIBRATIONS

Re-calibrate sensors (steps 5.1 to 5.4), and record in lab book. The difference between PRE and POST calibrations of the 6920 sonde will show the degree of instrument accuracy of measurements taken in the field.

8.0 CALIBRATION STANDARDS

Note: The calibration cup is made to serve as a calibration chamber for all calibrations. See YSI's "Environmental Monitoring Systems Operations Manual" Section 2.6 for detailed explanation for calibrating the 6920 sonde.

8.1 PH 7.0 & 10.0 Standards (buffer solutions) are purchased commercially through Fisher Scientific: Cat. No. SB107-4 and Cat. No. SB115-4, for ph 7.00 & 10.00 respectfully.

8.2 Turbidity 0.00 Standard is distilled water, made in a distiller located in the PLPT's WQ laboratory. Turbidity 1000 NTU is purchased commercially through YSI, Inc. Cat. No. YSI 6074 for the #6136 Turbidity probe. The **Turbidity 10.0 Standard** is made by taking 10 ml of the 1000 NTU Standard, then diluting it to one liter with deionized water.

8.3 Conductivity 6.668 mS/cm Standard is made in the PLPT's WQ laboratory: **XXX grams** of Potassium Chloride (KCL) is dissolve in 700 ml of deionized water, then diluted to one liter with deionized water. This produces a 111.9 mS/cm solution. The conductivity 6.668 mS/cm standard is made by taking 50 ml of the 111.9 mS/cm solution, and diluting to one liter with deionized water.

9.0 STORAGE

9.1 After field use: rinse the sensors with tap water, making sure there is no debris in the sensors. Place 0.5 inch of tap water inside the calibration cup before placing on the sonde. No sensor should be immersed in water. **The calibration cup should be sealed to prevent evaporation.** The storage chamber should remain at 100% humidity. Store upside down (figure 5.1.3), and close to room temperature the day prior to calibration.

For long-term storage (over 45 days), store the pH sensor in ORP solution (provided with instrument) to prevent the probe from drying out. After removing this sensor from sonde, replace it with a plug (provided with the sonde). All other sensors can remain on the sonde.

Note: See YSI's "Environmental Monitoring Systems Operations Manual" Section 2.0 for detailed explanation of the care, maintenance and storage of the 6920 sonde/ sensors.

9.2 Winter (off season) Storage.

Storage Tips

The point of proper winter storage is to have your instruments in top condition and ready for use in the spring. The old adage, "an ounce of prevention is worth a pound of cure," is well worth noting. Make some time over the next few weeks and be ready for the spring!

Winter Storage Tips:

- Remove batteries from logging instruments.
- Power down instruments by turning them off and removing batteries.

- Fill your storage cup full of tap water and make sure all sensors are submerged.
- Clean, clean, clean! Remove all organic materials from your instruments to prevent a caked-on, asphalt-like substance next spring.
- If your multiprobe has exposed pins, remove cables and attach dummy plugs. Order new dummy plugs if necessary.
- Get yourself a tote or five gallon bucket. Put everything together – cal cups, sensor guards, membranes, cables, instruction manuals, tools, etcetera so they don't wander off.
- Re-order maintenance supplies as necessary. Make sure you have fresh calibration solutions, DO membranes, DO electrolyte, and pH reference solution.

10.0 REFERENCES

Environmental Monitoring Systems Operations Manual; January 2002, Revision B, Item #069300; YSI Inc.; 1700/ 1725 Brannum Lane; Yellow Springs, Ohio 45387

[http://www.ysi.com/extranet/EPGKL.nsf/447554deba0f52f2852569f500696b21/90a0378150c2d2dd85256a1f0073f295/\\$FILE/069300B.pdf](http://www.ysi.com/extranet/EPGKL.nsf/447554deba0f52f2852569f500696b21/90a0378150c2d2dd85256a1f0073f295/$FILE/069300B.pdf)

B-1C: GARMIN GPSMAP (Model 76S) SOP

1.0 Introduction

The GARMIN, model “GPSMAP 76S” is a 12 channel (satellite) hand-held GPS receiver with a built-in Quad Helix antenna, used to display and/ or record latitude, longitude, elevations. The GPSMAP 76S is a full function GPS, with a built-in electronic compass, barometer, and a variety of mapping software and tools..

2.0 Purpose

The Standard Operating Procedure (SOP) describes the basic steps to use the GPSMAP Model 76S in the field, and to obtain the latitude, longitude, elevation needed for any given sampling site or reach.



3.0 Procedure

- 3.1 Press and hold the **POWER** key to turn on the unit.
- 3.2 The instrument menu display will ask you to press the **PAGE** key to continue. Press the **PAGE** key.
- 3.3 Press the **PAGE** again to agree with Garmin’s operation agreement policy.
- 3.4 The GPSMAP 76S unit will begin to look and acquire the satellites needed to find the latitude, longitude, and elevations for your location. This requires a 360° view of the sky and fresh batteries. This could take several minutes depending on your location.
- 3.5 Once the satellites are found, the latitude, longitude, and elevations will be displayed. Enter the latitude, longitude, and elevations for your location on your PSBP Field Data Sheet.
- 3.6 Press and hold the **POWER** key to turn off the unit.

4.0 Storage

Place GPSMAP Model 76S unit in its carrying case. Clean by wiping the instrument display panel and unit with a soft cloth.

5.0 References:

The GPSMAP 76S “Owners Manual and Reference Guide”, April 2003.

Appendix B-2 PHYSICAL HABITAT ASSESSMENT SOP's

B-2A: SOP: Laying out the Sampling Reach	B-16
B-2B: Canopy Cover - Field Data Sheet	B-18
B-2C: SOP: Canopy Cover - Field Data Sheet	B-19
B-2D: EPA's RBP's for Physical Habitat Assessment	B-22
Form 1: PLPT Stream Bioassessment Worksheet (found in Appendix A-2A)	
Form 2: Physical Habitat Assessment (High Gradient Streams)	
Form 3: Physical Habitat Assessment (Low Gradient Streams)	

The PLPT will adopt EPA's RBP's for conducting Physical Habitat Assessments and Forms 1, 2, and 3.

found in

**Chapter 5 of EPA's Benthic Macroinvertebrate version of "Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers:
Second Edition (Appendix B-2D)**

B-2A: Laying Out the Sampling Reach

The PLPT has established sampling reaches from which Physical and Bioassessments will be conducted. The standard sampling layout consists of a 150 meter long reach for a stream, and 500 meter long reach for the Truckee River (length measured along the bank) divided into 11 equidistant transects that are arranged perpendicular to the direction of flow. Transects are designated A through K (see figure 1 below).

X –sites have been pre-established by best professional judgment of the Project Manager for both streams and the Lower Truckee River.

Use the following step-by-step procedures for laying out a sampling reach (modified version of the “Draft” EMAP Western Pilot Study, 2003):

1. Once arriving at the X –site (or sample site of the reach to be assessed), use a surveyor’s rod or tape measure to determine the wetted width of the channel. Five measurements are considered to be of “typical” width within 5 channel widths upstream and downstream from the X -site. Average the 5 readings together and round to the nearest 1 m. If the average width is less than 4 m, use 150 m as a minimum sample length reach. Maximum is 500 m. Record this width on the Canopy Cover Form.
2. Check the condition of the stream upstream and downstream of the X -site by having one team member go upstream and one downstream. Each person proceeds until they can see stream to a distance of 20 times the average channel width (equal to one-half the sampling reach length) determined in Step 1 from the X -site.

For example, if the reach length is determined to be 150 m, each person would proceed 75 m from the X -site to lay out the reach boundaries.

3. Determine if the reach needs to be adjusted about the X -site due to confluences with higher order streams (downstream), lower order streams (upstream), or ponds.

If such a confluence is reached, note the distance and flag the confluence as the end point of the reach. Move the other endpoint of the reach an equivalent distance away from the X -site.

NOTE: Do not slide the reach to avoid man-made obstacles such as bridges, culverts, rip-rap, or channelization.

4. Starting back at the X -site (or the new midpoint of the reach if it had to be adjusted as described in Step 3), measure a distance of 20 channel widths down one side of the stream using a tape measure. Be careful not to “cut corners.” Enter the channel to make measurements only when necessary to avoid disturbing the stream channel prior to sampling activities. This endpoint is the downstream end of the reach, and is flagged as transect “A”.
5. Using the tape measure, measure 1/10 (50 meters in the Truckee River, and 15 meters in small streams) of the required stream length upstream from the start point (transect A). Flag this spot as the next cross-section or transect (transect B).

6. Proceed upstream with the tape measure and flag the positions of 9 additional transects (labeled “C” through “J” as you move upstream) at intervals equal to 1/10 of the stream length.
7. Densimeter measurements will be taken at the center of each transect following Canopy Cover protocols (Appendix B2 -B, B2 -C) after water and BMI samples are collected.
8. BMI samples will be collected following protocols in Appendix A-1.
9. Water samples will be collected and parameters (temp, DO, pH, TDS, Spec. Cond.) measured & recorded at a pool or flowing water nearest to the X -site following protocols in Appendix B1 -B, and Appendix D.
10. The physical Habitat assessments will be conducted for the entire reach following protocols in Appendix B-2D.
11. Periphyton samples will not be collected at left, center, and right portions of transects as illustrated below, but may be included as part of the sampling effort in the future.

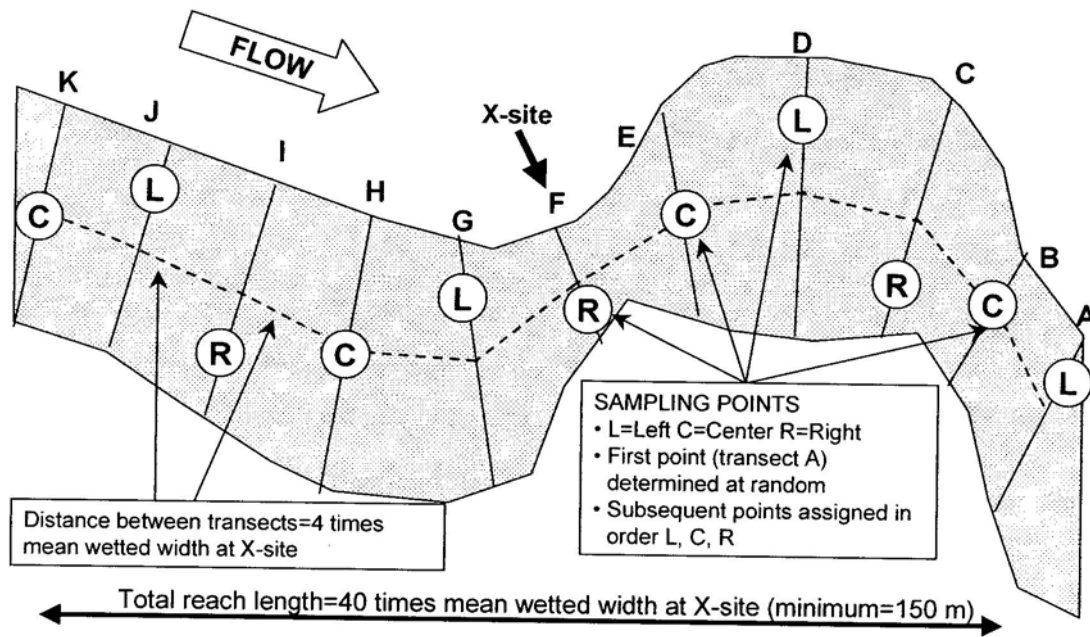


Figure 1. Layout example of a 150 meter (or 500m) reach of a stream. (EMAP Western Pilot Study, 2003 Draft, pages 74)

Canopy Cover - Field Data Sheet

Site Name:						Date:	
Reach Length:			Transect Interval:			Initials:	
Trans	Left Bank	Center- Up	Center- right	Center- down	Center- Left	Right Bank	Comments:
1							
2							
3							
4							
5							
X Site							Transect Sampling site
6							
7							
8							
9							
10							% Canopy Cover =
Totals							/ 1122 =

In- Channel Cover

Visual Riparian Estimates

FISH/ COVER Other (CIRCLE ONE)	0 = Absent { 0%}	RIPARIAN VEGETATION COVER	0 = Absent { 0%}	D = Deciduous
	1 = Sparse { < 10%}		1 = Sparse { < 10%}	W = Whitetop
	2 = Moderate {10 - 40%}		2 = Moderate {10 - 40%}	T = Tamarisk
	3 = Heavy {40 - 75%}		3 = Heavy {40 - 75%}	M = Mixed
	4 = Very Heavy { > 75%}		4 = Very Heavy { > 75%}	N = None
Filamentous Algae	0 1 2 3 4		LEFT BANK RIGHT BANK	
			CANOPY (> 5 m HIGH)	
		Vegetation Type	D W T M N	D W T M N
Macrophytes	0 1 2 3 4	Big Trees (Trunk >0.3 m DBH)	0 1 2 3 4	0 1 2 3 4
		Small Trees (Trunk <0.3 m DBH)	0 1 2 3 4	0 1 2 3 4
		Non - Native vegetation	0 1 2 3 4	0 1 2 3 4
Woody Debris > 0.3 m (SMALL)	0 1 2 3 4		UNDERSTORY (0.5 to 5m HIGH)	
		Vegetation Type	D W T M N	D W T M N
		Woody, Shrubs, & saplings	0 1 2 3 4	0 1 2 3 4
		Non-woody herbs, grasses, forbs	0 1 2 3 4	0 1 2 3 4
		Non - Native vegetation	0 1 2 3 4	0 1 2 3 4
BRUSH Woody Debris < 0.3 m (SMALL)	0 1 2 3 4		GROUND COVER (< 0.5 m HIGH)	
		Woody, Shrubs, & seedlings	0 1 2 3 4	0 1 2 3 4
		Non-woody herbs, grasses, forbs	0 1 2 3 4	0 1 2 3 4
Over-hanging Veg. ≥ 1 m of surface	0 1 2 3 4	Barren, bare dirt, or duff	0 1 2 3 4	0 1 2 3 4
		Non - Native vegetation	0 1 2 3 4	0 1 2 3 4
		HUMAN INFLUENCE	O = NOT PRESENT	P = > 10 m
			C = WITHIN 10 m	B = On Bank
Undercut Banks	0 1 2 3 4	Dam, Diversion Structure	O P C B	O P C B
		Bridge	O P C B	O P C B
		Rip-Rap, Gabions	O P C B	O P C B
		Pasture, Alfalfa Fields	O P C B	O P C B
Boulders	0 1 2 3 4	Non-Point / Point Source	O P C B	O P C B
		Road, Pavement	O P C B	O P C B
		Trailer Park, buildings	O P C B	O P C B
Artificial Structures	0 1 2 3 4	Mining Activity	O P C B	O P C B
		Other:	O P C B	O P C B

Notes

B-2C: Canopy Cover - Field Data Sheet SOP

1.0 Introduction

The “Canopy Cover Field Data Sheet” is used to record various stream vegetation characteristics/ biological measurements during the field assessment. This Field Data Sheet is a modified version from a Field Data Sheet used in EPA’s Environmental Monitoring & Assessment Program (EMAP), to incorporate local vegetation. Densiometer readings follow the SOP in Appendix B-1A.

2.0 Purpose

The Standard Operating Procedure (SOP) describes the method in which to complete this worksheet.

3.0 Canopy Cover Field Data Sheet – Front Page

3.1 Site Name – Enter the name of the sampling site (ID#).

3.2 Date – Enter the date of the sampling event.

3.3 Reach Length – Enter the entire length of the sampling “reach” in meters.
(Enter 150 m for streams, and 500 m for the Truckee River)

3.4 Transect Interval – Enter the length of the “transect intervals” in meters (m).
(Enter 15 m for streams, and 50 m for the Truckee River)

3.5 Initials – Enter the initials of all sampling crew members participating in the sampling event.

3.6 Densiometer Readings – Truckee River (See Densiometer SOP for instrument use)

3.6.1 Left Bank – Enter the densiometer reading for each transect.

3.6.2 Center - Up – Enter the densiometer reading for each transect.

3.6.3 Center - Right – Enter the densiometer reading for each transect.

3.6.4 Center - Down – Enter the densiometer reading for each transect.

3.6.5 Center - Left – Enter the densiometer reading for each transect.

3.6.6 Right Bank – Enter the densiometer reading for each transect.

3.6.7 Comments – Enter any comments regarding each transect (e.g. type and height of any non-native vegetation that may provide canopy cover, etc...)

3.6.8 Percent Canopy Cover – Following the Densiometer SOP, enter the total of all readings, divide by 1122, and enter the value. Multiply by 100 for percent canopy cover in the Truckee River ‘sample’ reach.

3.7 Densiometer Readings – Mountain Streams

3.7.1 Left Bank – Take no reading.

3.7.2 Center - Up – Enter the densiometer reading for each transect.

3.7.3 Center - Right – Enter the densiometer reading for each transect.

3.7.4 Center - Down – Enter the densiometer reading for each transect.

3.7.5 Center - Left – Enter the densiometer reading for each transect.

3.7.6 Right Bank – Take no reading.

3.7.7 Comments – Enter any comments regarding each transect (e.g. type and height of any non-native vegetation that may provide canopy cover, etc...)

3.7.8 Percent Canopy Cover – Following the Densiometer SOP, enter the total of all readings, divide by 748, and enter the value. Multiply by 100 for percent canopy cover in the mountain stream ‘sample’ reach.

- 3.8 In-Channel/ Fish Cover** (Use the 1 to 4 scale for the “In-Channel/ Fish Cover” score)
- 3.8.1 Filamentous Algae** – Circle the appropriate score for this transect.
 - 3.8.2 Macrophytes**- Circle the appropriate score for this transect.
 - 3.8.3 Woody Debris >0.3m** – Circle the appropriate score for this transect.
 - 3.8.4 Brush Woody Debris <0.3m** – Circle the appropriate score for this transect.
 - 3.8.5 Overhanging Vegetation >1m** – Circle the appropriate score for this transect.
 - 3.8.6 Undercut Banks** – Circle the appropriate score for this transect.
 - 3.8.7 Boulders** – Circle the appropriate score for this transect.
 - 3.8.8 Artificial Structures** – Circle the appropriate score for this transect.
- 3.9 Visual Riparian Estimates** (Use the “vegetation cover” 1 to 4 scale and the code for “vegetation type” for the appropriate left/ right bank column).
- 3.9.1 Canopy Cover (>5m High)** – Circle the appropriate vegetation score and code for this transect for both left and right banks.
 - 3.9.2 Understory (0.5 to 5m High)** – Circle the appropriate vegetation score and code for this transect for both left and right banks.
 - 3.9.3 Ground Cover (<0.5m High)** – Circle the appropriate vegetation score and code for this transect for both left and right banks.
- 3.10 Human Influence** (Use the key provided for both left/ right banks)
- 3.10.1 Dam, Diversion, Structure** – Circle the appropriate “Human Influence” code for this transect.
 - 3.10.2 Bridge** – Circle the appropriate code for this transect.
 - 3.10.3 Rip-Rap, Gabions** – Circle the appropriate code for this transect.
 - 3.10.4 Pasture, alfalfa field** – Circle the appropriate code for this transect.
 - 3.10.5 Nonpoint, Point Source Pollution** – Circle the appropriate code for this transect.
 - 3.10.6 Road, Pavement** – Circle the appropriate code for this transect.
 - 3.10.7 Trailer Park, buildings** – Circle the appropriate code score for this transect.
 - 3.10.8 Mining Activity** – Circle the appropriate code for this transect.
 - 3.10.9 Other** – Circle the appropriate code for this transect.
- 3.11 Notes** – Record any additional field notes of interest to this sampling site and project.
- 4.0 Map of Sampling Reach – Back Page**
- 4.1 Site Name** – Enter the name of the sampling site (ID#).
 - 4.2 Date** – Enter the date of the sampling event.
 - 4.3 Reach Length** – Enter the entire length of the sampling “reach” in meters.
 - 4.4 Initials** – Enter the initials of all sampling crew members participating in the sampling event.
 - 4.5 Channel Width** – Enter the Channel Width used to define the reach in meters (m). (Enter 15 m for streams, and 50 m for the Truckee River)
 - 4.6 Distance from X Site** – Enter the upstream and downstream lengths from the X Site. (Enter 75 m for streams, and 250 m for the Truckee River)
 - 4.7 Comments** – Record any additional field notes of interest to this map or reach.
 - 4.8 Map** – Draw a map similar to what is illustrated, and note anything of interest.

B-2D: EPA's RBP's for PHYSICAL HABITAT ASSESSMENT

Chapter 5 of EPA's Benthic Macroinvertebrate version of "Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Second Edition

***Form 1: Physical Characterization/ WQ - Field Data Sheets (PSBP Form)**

Form 2: Physical Habitat Assessment (High Gradient Streams)

Form 3: Physical Habitat Assessment (Low Gradient Streams)

(found at> <http://www.epa.gov/owow/wtr1/monitoring/rbp/index.html>)

***The PLPT will adopt EPA's RBP's for conducting Physical Habitat Assessments and Forms 2, and 3. EPA's "Form 1" will be replaced with PSBP's Form in Appendix 2A-9.**