

## Standard Operating Procedure (SOP) 4.9.1.4

### Using and Mounting a Seventeen Point Spherical Convex Densimeter to a Tripod

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#### 1.0 INTRODUCTION

Riparian canopy cover over a stream is important not only in its role in moderating stream temperatures through shading, but also as an indicator of conditions that control bank stability and the potential for inputs of coarse and fine particulate organic material. Organic inputs from riparian vegetation become food for stream organisms and structure to create and maintain complex channel habitat. Determining a stream's integrity is done by assessing the biota and physical habitats. Estimation of canopy cover contributes to this assessment. This method (Ode 2007) uses the Strickler modification (17-point) of a convex spherical densimeter to correct for overestimation of canopy density (thickness and consistency of plant foliage) that occurs with unmodified readings (Strickler 1959). Mounting the densimeter to a tripod helps to ensure that all measurements are made at the same point and distance on a transect and provide greater data quality assurance.

#### 2.0 EQUIPMENT

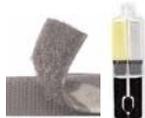
- 17-point modified convex spherical densimeter (Strickler 1959). The Clean Water Team has prepared modification instructions; "Modification of a Standard Spherical Convex Densimeter to a 17-Point Spherical Convex Densimeter".



- Camera/Video tripod, extra mounting plate



- Epoxy cement or self-sticking hook and loop closure (Velcro®)



- Tools: Small diagonal cutters, small slotted screwdriver or a fine pick



- Small round (1/8 inch) stickers

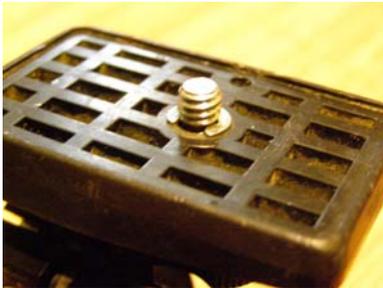


Optional: A one-foot ruler and tape can also be attached.

### 3.0 PROCEDURE

#### Mounting a Densimeter to a Tripod

If using a tripod or a tripod with a removable mounting plate, first remove the tripod to camera screw. This usually requires that you remove a retaining clip (Fig. 1 and 2). The screw should then be easily removed (Fig. 3)



**Fig. 1 Tripod head**

**Fig. 2 Remove locking ring**

**Fig. 3 Remove screw**

When using a modified 17 point densimeter be sure to check the “center”. The densimeter’s center needs to be mounted directly over the middle of the tripods point of pivot. This can be checked by placing a small round sticker on the center of the densimeter and then rotating the tripod head while looking directly down at it. The dot should simply look like it is spinning with out any perceived “wobble”. If it does look like it is “wobbling”, re-center the densimeter and check center again. Do this until you have found the correct placement for mounting the densimeter.



**Fig. 3 Placement of centering dot**

The densimeter can be attached to the tripod head or mounting plate with either epoxy or with self-sticking hook and loop fasteners.



### Fig. 4 Densimeter Mounted on a Tripod

NOTE: If you are using a regular unmodified densimeter, there is little need to perfectly center the densimeter because when taking measurements the operator does not need to rotate the densimeter between measurements at the same point.

#### Using a Tripod Mounted Densimeter

Densimeter measurements are taken at 0.3 m (1 ft) above the water surface, rather than at waist level, to avoid errors because people differ in height; avoid errors from standing in water of varying depths; and to include low overhanging vegetation more consistently in the estimates of cover.

Keep the densimeter level by raising or lowering the tripods legs or center post (Figs 5 and 6). To ensure that the densimeter is level, check the round bubble level indicator found in the densimeter's lower right-hand corner.



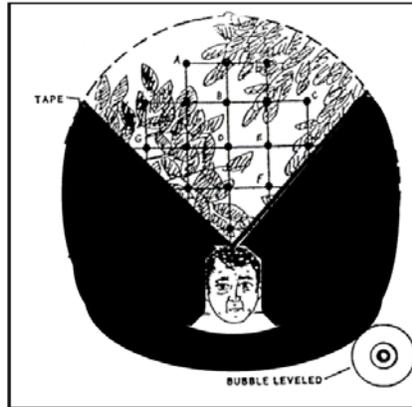
**Figure 5 Tripod/Densimeter shallow water**



**Figure 6 Tripod/Densimeter deeper water**

Keep the densimeter far enough away from your body so that your head is just outside the grid (12-18" away) and 0.3 m (1 foot) above the water surface with your face just

below the apex of the “V” as if it was being reflected within the densiometer’s mirrored surface, see Figure 7. Concentrate on the 17 points of grid intersection on the densiometer that lie within the “V” area not covered with tape.



**Figure 7 Schematic of modified convex spherical canopy densiometer (modified from Mulvey et al., 1992).**

In the example shown in Figure 7, 10 of the 17 intersections show canopy cover, giving a densiometer reading of 10. Note proper positioning with the bubble leveled and face below the apex of the “V.”

Each point represents an area of canopy opening (sky...) or canopy cover (vegetation...). Count the number of canopy covered points. Take and record four 17-point readings. These are all taken from the center of each transect (transect = wetted width): a) facing upstream, b) facing downstream, c) facing the left bank, d) facing the right bank. Being careful not to move the tripod, gently rotate the tripod head a quarter turn between each measurement.

If the reflection of a tree or high branch or leaf overlies any of the 17 intersection points, that particular intersection is counted as having cover. For each of the four measurement points, record the number of intersection points (maximum=17) that have vegetation covering them.

NOTE: If required sand bags can be used to stabilize the tripod. Using reusable self-closing lunch sacks allows the operator to carry the bag and then fill it when onsite.



**Fig. 8 Filling a sandbag**



**Fig. 9 Sandbag on crossbar**



**Fig. 10 Sandbag on leg**

#### 4.0 REFERENCE

C.D.P.R. 2004 SOP Number: FSOT.002.01, STANDARD OPERATING PROCEDURE Instructions for the Calibration and Use of a Spherical Densimeter. California Department of Pesticide Regulation, Environmental Monitoring Branch. 4pp

Ode, Pete 2007 Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California. State Water Resources Control Board, Surface Water Ambient Monitoring Program. 48pp.

Mulvey, M., L. Caton, and R. Hafele. 1992. Oregon Nonpoint Source Monitoring Protocols Stream Bioassessment Field Manual for Macroinvertebrates and Habitat Assessment. Oregon Department of Environmental Quality, Laboratory Biomonitoring Section. 40 pp.

Strickler, Gerald S., 1959. Use of the densimeter to estimate density of forest canopy on permanent sample plots. USDA Forest Service, Pacific Northwest Forest and Range Exp. Sta. Research Note 180, Portland, Oregon, 5 pp.