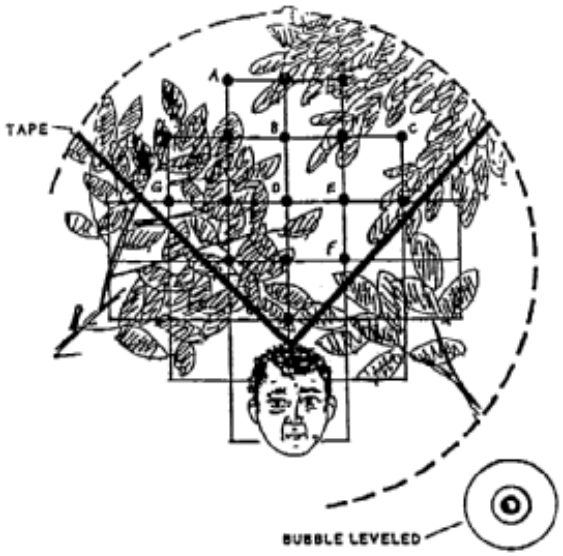
CANOPY COVER AND GRADIENT/SLOPE ESTIMATION

Instructions - The information provided needs to be placed in Section B2 of the Quality Assurance Project Plan (QAPP). In the event that the QAPP should be amended, it may be necessary to update this section.

SAMPLING METHODS

HABITAT MEASUREMENTS

Sample Reach Length : Recognizing the advantages of standardized reach lengths that are long enough to incorporate local habitat-scale variation, large-scale monitoring and assessment in the U.S. sample reach length that increase in proportion to stream size, typically measured as multiples of wetted or bankfull width. Based on fish assemblages and habitat sampling requirements, the sampling reaches for estimating habitat will be 40 times the low flow wetted width. Field crews will measure upstream and downstream distances of 20 times the wetted channel width from the predetermined midpoints to center each 40 channel-width field sampling reach. A minimum reach length is set at 150 meters.



CANOPY COVER (DENSIOMETER)

Raparain canopy cover over a stream is important not only in its role in moderating stream temperatures through shading, but also as a indicator of conditions that control bank stability and the potential for inputs of coarse and fine particulate organic matter. Organic inputs from riparian vegetation become food for stream organisms and structure to create and maintain complex channel habitat. In this project, the estimated canopy percent cover will be used in the assessment of whether the waterbody of concern is nutrient - threatened using the decision criteria as outlined in Table 1

Vegetative cover over the stream will be measured at each of the 11 stations. This measurement uses the Convex Spherical Densiometer, Model B. This instrument is available from only one vendor Forestry Supply. The densiometer must be taped exactly as shown in Figure 1 to limit the number of square grid intersections to 17. To take a canopy density measurement, the observer looks down on the densiometer held just above waist level, concentrating on these 17 points of intersection. If the reflection of a tree or high branch or leaf overlies any of the intersection points, that particular intersection is counted as having cover. The measure to be recorded is the count (from 0 to 17) of all the intersections that have vegetation covering them. Therefore, a greater number indicates increasing canopy extent and density. It is important that while recording the measurement the densiometer be leveled using the bubble level.

For each of the 11 stations, densiometer measures are taken separately in four directions standing at the center of the stream. These measurements will be used to estimate canopy cover over the channel. These multiple canopy densiometer measurements are then reduced to whole-reach canopy density characterizations by calculating the means and standard deviations. Because the data are systematically spaced, these averages and percentiles are spatially representative estimates of canopy density on and along the stream. The mean and standard deviations for the 44 instream measurements are calculated. These metrics are converted to **percent canopy density** by dividing the mean and standard deviation of densiometer reading values by **17**, the highest possible canopy densiometer value, and multiplying the result by **100**.

GRADIENT/SLOPE ESTIMATION

The general method to determine slope is to measure the length of the stream segment for which slope is to be calculated, determine the elevation at the upstream and downstream ends of that length, and divide the elevation difference

by the stream length ("rise over run"). Slope can be expressed in any of several standard notations, such as feet per mile, meters per kilometer, or a percentage. Use of GIS technology for measurements and use of electronic spreadsheet software for calculations are recommended to minimize human error in measuring, transcription, and calculation. Using GIS software,

1. Plot the monitoring sites, streams, and National Elevation Data set (NED). Using the NED, create 10-foot contours for the areas of interest. For each site
2. Determine the value of the contour line closest upstream and downstream to the site and enter the two values into a spreadsheet. Set up an equation in the spreadsheet to determine the difference in elevation between the upstream and downstream contours.
3. Determine the distance between the two contour lines along the stream using the GIS software measuring tool, and enter that value into the spreadsheet.
4. Set up an equation in the spreadsheet to divide the difference in elevation by the distance between the two contour lines to get the estimated slope.
5. If desired, set up an equation to convert the slop to other units of measure.