Appendix B
How to Make and Use a Clinometer

Definition: Clinometer: clin— (slope or slant), —meter (measure)= instrument to measure slope

Materials: Soda straw, protractor, string, weight (rock or metal washer), masking tape, tacks, graph paper, pencil, 100' metal tape measure

Method: Construct a clinometer by taping a straw to the straight edge of a protractor. Attach string to the straw adjacent to the 0-degree measure on the protractor. Attach a weight to the other end of the string.

Working with a partner, practice sighting on an object of known height, such as the top of a door, clock, or other high object. Sight through the straw to the object. Your partner should read the number where the string lies against the protractor while you hold the straw steady. Subtract this number from 90 degrees to obtain the angle of elevation. Then have your partner measure the horizontal distance between the object sighted and the place you are standing. Finally, your partner should measure your eye level at a vertical distance from the floor.

Plot these measurements on graph paper in this way: Keeping the horizontal and vertical scales consistent, plot the angle of elevation at your eye level. Draw a line along this angle until it intersects with a vertical line from a known horizontal distance. Determine the height of the sighted object by counting the vertical feet on the graph paper. Once you get the hang of this, then you can estimate the height of trees.

The most reliable way to measure tree height is with standard measuring tools such as an Abney hand level, hypsometer, clinometer, transit, or high tech rangefinder. However, you can also estimate height using a triangulation method with a straight stick and a 100-foot tape measure. Hold the stick at its base vertically, making certain that the length of the stick above your hand equals the distance from your hand to your eye.

Staying on level ground (or on the same contour as the base of the tree), move away from the tree while sighting the trunk base over your hand. Stop when the top of the stick is level with the top of the tree. You should be looking over your hand at the base of the tree and, moving only your eye, looking over the top of the stick at the top of the tree. Measure how far you are from the tree and that measurement-in feet- is the tree's height.

Trees that lean or are on un-level ground must be considered in determining tree height. For leaning trees, measure the height from the tip of the tree straight down to the ground. Then make an adjustment for any difference in elevation between that point and the base of the tree.

Credit: Adapted from San Francisco Friends of the Urban Forest, San Francisco, CA 1993.