Measuring Distance and Grade on the Trail

USDA Forest Service, 2025

Selected pages from Trail Maintenance and Construction Notebook.

Use your pace, marked tool handles and a clinometer to estimate distances and calculate trail grade.

Compiled for The Survival University PDF collection

Measuring

Tips for measuring

- Mark off commonly used measurements on your tool handles.
- Know the length of your feet, arms, fingers, and other rulers that are handy on the trail.
- Know the length of your pace so you can easily estimate longer distances.

Clinometer. A clinometer (fig. 7–13), called a "clino" by trail workers, is a simple instrument for measuring grades. Digital clinometer apps are available. Verify their accuracy before depending on them. Most clinometers have two scales, one with percent of slope, the other with degrees. Don't confuse the readings (it is easy to do). Percent slope is the most-used measure, and the values are on the right side of the scale on most standard clinometers. Percent slope is derived from the relationship of rise or drop in grade over a horizontal distance. You can derive your own slope value with this equation:

$$\text{Percent of slope} = \frac{\text{Amount of rise}}{\text{Amount of run (horizontal distance)}} \times 100$$

For example, a section of trail 100 ft (30 m) long with 10 ft (3 m) of difference in elevation would be a 10 percent grade ([10/100]x100=10). A 100 percent grade is equal to 45 degrees.



Figure 7–13. Standard clinometer. USDA photo by Kerry Wood.

Global Positioning System (GPS) unit. Most trail managers use GPS units to receive a signal from GPS satellites for accurate trail location, inventory, and contract preparation. Accuracy depends on a clear view of the sky. The reading can be off under a heavy canopy.

Tape measures. Standard tape measures are handy for measuring lumber and logs. A forestry tape (also called diameter tape) is better for measuring longer distances. One side of the tape also has marks to measure the diameter at breast height (DBH) of a tree. (DBH is measured about 4.5 ft [1.4 m] above the ground).