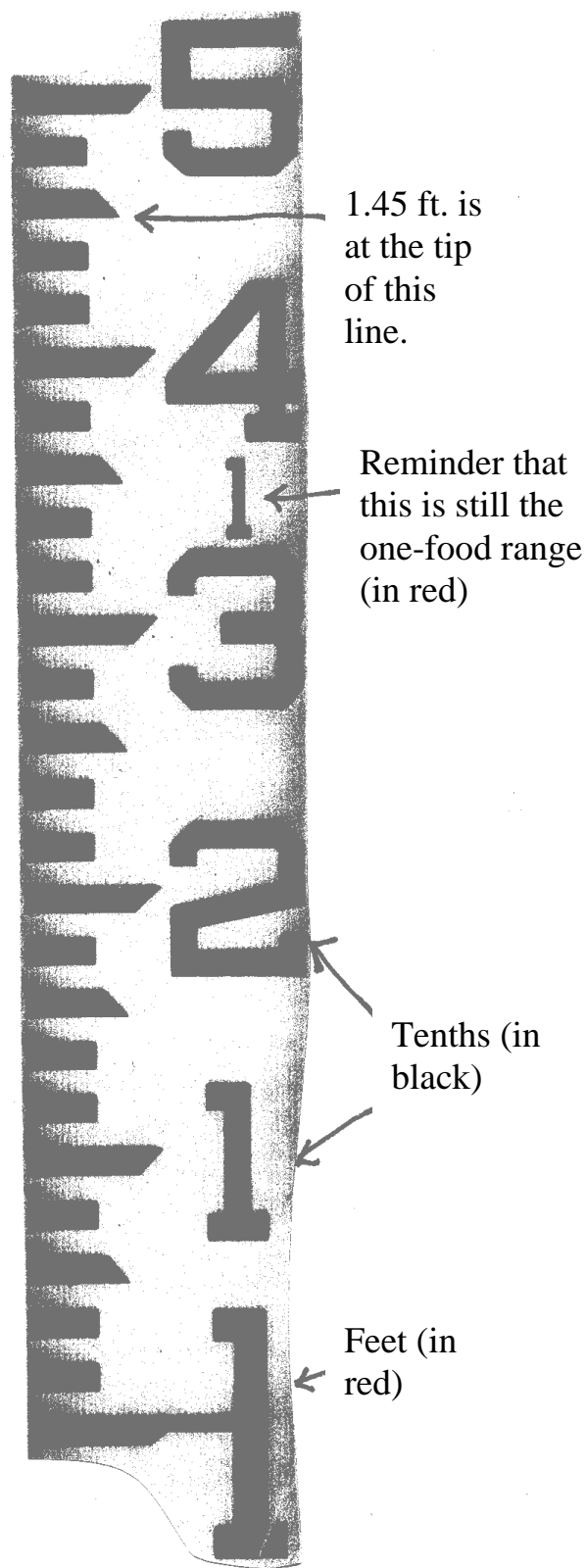


FIELD PROCEDURE: GRADIENT



STADIA ROD

EQUIPMENT NEEDED:

- Sight level ("peashooter"--in leather case)
- 100' tape
- stadia rod
- data sheet, clipboard, pencil

Using this procedure, known as the "peashooter" method, you will measure the downhill slope (gradient) of the water surface. Two people are required: a sighter and a rod-holder. The sighter should ideally be someone with a steady hand and a good eye. A tip: the sight level fogs up in rainy weather, so carry it in your shirt pocket (close to your body) to minimize fogging.

WHERE TO MEASURE: The ideal place:

- is fairly straight and in a single channel, with a good sight line, and with no downstream constrictions that may cause backwater effects during high flows
- is representative of the section of the creek your reach is in
- has 2 identical habitat units (e.g., the tops or bottoms of 2 pools or riffles) for endpoints
- is upstream of your cross-section line (if your reach has one)

Do the best you can to meet these conditions; you may go outside your reach if necessary.

HOW TO MEASURE: Try to have more than one set of samplers perform this procedure (or switch roles) to check on the precision of your measurements; record all samplings on your data sheet, along with comments concerning which sampling you think is most representative and why.

1. The rod-holder extends the stadia rod from the bottom section until the button clicks. The rod should now read above 7'. The sighter gets into sighting posture and looks into the distance through the level, leveling it by getting the bubble in the middle of the 3 lines. The rod-holder puts the stadia rod straight up on level ground next to the end of the sight-level and determines the sighter's pupil-level height, to the nearest tenth of a foot. (The stadia rod markings are unusual: feet are written in red and tenths in black; the halfway point between tenths is the **pointed tip** of the longer line in between. See picture.)

GRADIENT

Enter this “Pupil-height” on the data sheet (see sample data entries below).

2. The sighter takes the sight-level and the tape reel, while the rod-holder takes the rod, the clipboard and pencil, and the end of the tape. (Who stands u/s & who stands d/s is purely a matter of convenience of reading the height on the rod.) The two walk at least 25, but hopefully 50-100 feet apart on a straight stretch of the stream, ideally to two identical habitat units (see above), where the line of sight is good. (**NOTE:** Placement will be different if you are measuring gradient for a stream gage—consult with staff if this is the case.) You may have to do some minor pruning of overhanging branches or walk outside of your reach to get a good sight-line. Run the tape between you.
3. The sighter stands at water level--on a rock, gravel bar, or bank, so that his/her toes just clear the water. If there is no place to stand at water level, stand in the water and measure the water-height with the tape. Enter the “Depth of sighter in water” on your data sheet. (**NOTE:** If the sighter needs to stand above the water level, enter the “depth of sighter in water” as a negative number, and explain on the data sheet.)
4. The rod-holder holds the stadia rod at any convenient point (given the criteria stated above). Make sure it is straight up. Enter the “Depth of rod in water” on your data sheet.
5. The sighter, standing at water level with the same posture as in step 1, sights through the sight level (with the label at the top) toward the stadia rod, and adjusts it so that the bubble is centered on the sight level’s center mark. The sighter then determines where the center mark crosses the stadia rod, either by reading the numbers on the rod her/himself, or by giving signals or verbal directions to the rod-holder to hold the top of a finger where the center line on the level crosses the rod. Record that “Sight height” on the data sheet.
6. Stretch the tape between you, along the contour of the water, and record the “Distance” on the data sheet, to the nearest tenth of a foot.
7. If there is no adequate straight stretch, you may have to take a succession of straight-segment readings as you go around a curve at the deepest point of the water.
8. In the “Sampler’s Initials” box to the right of the data boxes, put all the initials of one sampler taking responsibility for the data. If more than one person worked on this data, put the initials of the person with the most experience or knowledge.
9. The computer in the office will calculate the gradient, which is simply the “rise over the run” (see illustration below).

Pupil height	Depth of sighter in water	Depth of rod in water	Sight height	Distance
5.6	0.3	0	5.1	91.4

Sample gradient data sheet. All measurements to the nearest 0.1 ft.

