Investigation Instruments: Pacing

Determining Your Pace

A pace is equal to walking two steps. Knowing how long your pace is will be helpful throughout your investigation of land cover. Specifically, when you walk diagonals to take measurements at Sample Sites (according to the *Biometry Protocol*), you will need to know how many paces it takes to travel 21.2 meters (the length of half of a diagonal). There are two options given below for determining this number.

Directions for Determining Pace

1. Record the pacing data table (shown below) into your science notebook.
2. Lay out a long measuring tape (minimum 10 meters long) on a flat, open area (a parking lot, field, or hallway is good).
3. Remember that one pace is two steps. Starting with your toe at the 0-meter mark, pace off 10 paces (20 steps), using a normal stride. It is important to use a normal, comfortable stride because of the wide variety of conditions encountered in the field.
4. Count your paces until you reach 10 meters. Keep in mind you may have .5 paces (landing on your non-counted foot) or you may have .25 or .75 paces (landing in between your feet). Have a colleague help estimate your fractional pace at 10 meters (if necessary).
5. Record your number of paces in the pacing data table.
6. Now find your pace per meter by dividing your average paces by 10 meters.

Determining Pace/Meter Table

Trial 1	Trial 2	Trial 3	Average Paces/10 meters (m) *(Trial 1 + Trial 2 + Trial 3/3)*	Pace/Meter *(Average/10m)*	# of paces for 15 m *15 m x (pace/m)*	# of paces for 21.2 m *21.2 m x (pace/m)*	# of paces for 30 m *30 m x (pace/m)*

Determining the Number of Paces to Travel a Given Distance

Once you know your pace per meter and you know the distance you are trying to go (e.g. 30m the length of one side of a standard 30m x 30m sample site) you can calculate how many paces are needed.

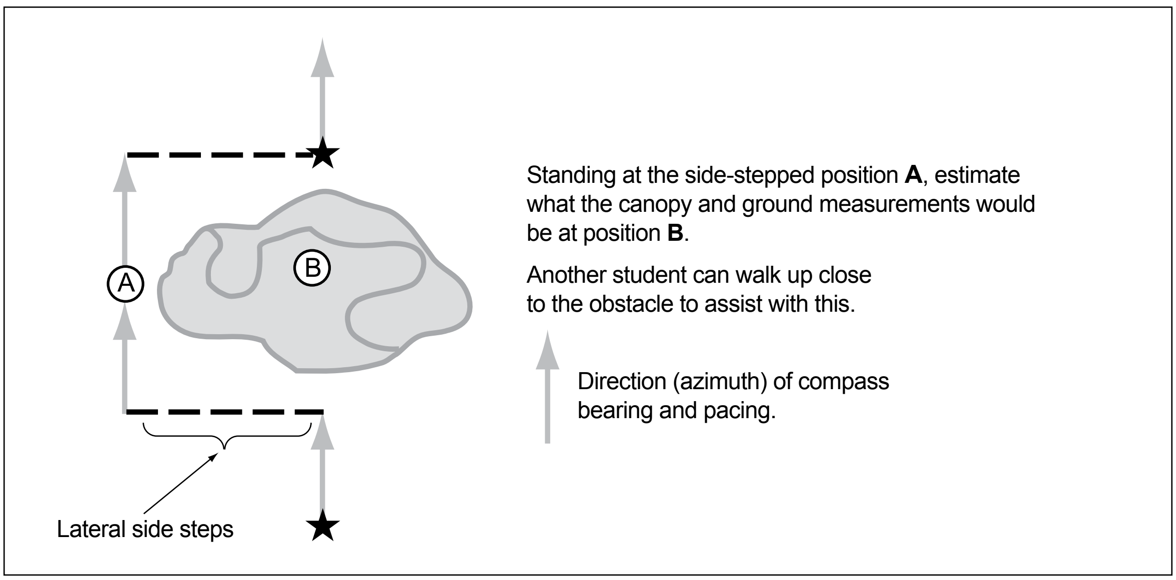
Number of paces needed = desired distance(m) x number of paces/meter

- Possible desired distances:
  - 30 meters (the side length of a sample site)
  - 15 meters (the side length of a Carbon Cycle biomass quadrant within a sample site)
  - 21.2 meters (half the length of the diagonal of a Land Cover Sample Site, measured from center to any corner)

NOTES: Pacing in the woods or over hilly terrain is quite different than pacing a flat distance in a schoolyard or parking area. Remember the following tips:

- When initially measuring your pace, walk using a comfortable stride. Resist the temptation to take exaggerated steps because your pace will naturally become shorter in the woods or over hilly terrain.
- When pacing up or down a hill, you are actually traveling a shorter horizontal distance than it seems, and you may also pace irregularly due to the terrain. Be aware of your paces and compensate by taking slightly shorter or longer steps as necessary.
- When large objects (boulders, large trees, etc.) are in the way, take a few lateral side steps, pace forward, then take the same number of lateral side steps back to your original compass bearing. See Figure BIO-P-1. If an observation is required while sidestepping and pacing around an obstacle, then estimate the reading from the sidestepped position.
- If an object is too large to conveniently side step, stop at the object and determine the direction (or azimuth) you are pacing using your compass. Send a team member out in front of the object (at least 10m) at the desired azimuth and have another team member stand where you are. Once they are both in place, walk around the object until you are directly in-line with your two team members. Estimate the number of paces taken up by the object and then start counting paces again heading toward your team member who is positioned at the correct azimuth.

Figure BIO-P-1: How to Side Step Around Large Obstacles



Students can also determine their average pace (rather than the number of paces per meter) by laying out a 20 or 30 meter measuring tape and walking 10 paces, then mark where their 10th pace lands and divide the distance by 10 to find the length of the average pace.

Example:

Repetition Number	Distance (m) of 10 Paces	Distance (m) of Single Pace
1	17.0 m	1.70 m
2	17.5 m	1.75 m
3	16.8 m	1.68 m
Average Pace = 1.71 meters per pace		

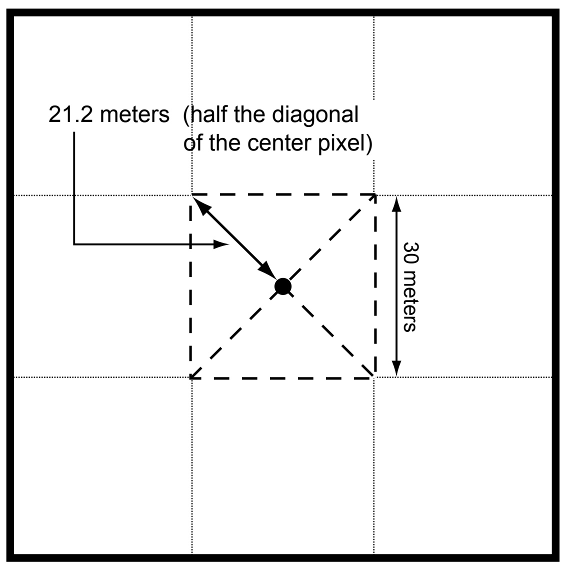
Determining the Number of Paces Required to Travel Half the Diagonal in a 30 m x 30 m Pixel

Note: If your students are able to divide using decimals, use the length of one of their paces to determine the number of paces in half a diagonal using the following formula:

$$\#\text{ paces in half diagonal} = \frac{21.2\text{ meters}}{\text{length of one pace (meters)}}$$

If they cannot divide using decimals, use the procedure below.

Figure BIO-P-2: Pacing Example



1. Measure a distance of 21.2 meters (length of half the diagonal, see Figure BIO-P-2) out on a flat, open area (a parking lot, field, or hallway is good).
2. Remember that one pace is two steps. Starting with your toe at the 0-meter mark, count the number of paces required to travel the entire distance using a normal stride.
3. Repeat this measurement three times and calculate the average to determine an average number of paces.
4. Round the number of paces that you calculate to the nearest half pace. This is the number of paces that it takes you to walk a half diagonal.
5. Record the number of paces required for each individual to walk a half diagonal so it can be referred to when collecting data at a Land Cover Sample Site.

Frequently Asked Questions

1. Why must I pace 21.2 meters?

21.2 meters is the distance of half the diagonal of a 30 m x 30 m area. This is the length that you will pace in each of four directions while taking biometry measurements.