

Path or No Path? A Disturbed-Versus-Undisturbed Plot Survey

Investigation question: Does trampling, a disturbance we can find on our own campus, change the plant and small-animal populations living in the ground, and which nonliving condition changes along with them?

Classroom field investigation

Groups of 4

2 sessions

Setup 10 · Activity 85 · Cleanup 10 min

MS-LS2-4 · assesses

MS-LS2-1 · supports

Name _____

Group _____

Date _____

Your role today

- ☐ **Plot keeper:** Places the string square at the teacher's flags, keeps everyone's feet outside it, and makes sure both plots are treated exactly the same way.
- ☐ **Plant counter:** Runs the 25-point cover count, counts plant kinds and measures the tallest plant. Swaps jobs with the Animal searcher at the second plot.
- ☐ **Animal searcher:** Runs the timed animal search and the litter shake with a hand lens and returns every animal unharmed to where it was found.
- ☐ **Recorder and timekeeper:** Times each search and the soak test, writes every number in the tables as it is called out, and reads it back to the group.

Safety

- Poison oak grows on and near many California campuses. The teacher checks every site first; never touch an unknown plant with bare hands, and wear gloves for the litter shake.
- Bees, wasps and ants: look before you kneel, do not disturb nests or mounds, and do not swat. Students with sting allergies tell the teacher before going out, and the teacher follows the school's emergency plan.
- Do not pick up glass, metal, needles or animal droppings; tell the teacher. Wash hands with soap and water after the survey and before eating.
- Sun and heat: wear a hat, carry water, and rest in shade between measurements.
- Stay inside the marked area and within sight of the teacher; walk, do not run, and watch for traffic, sports equipment and sprinklers.
- Observe small animals and return them exactly where you found them. No collecting and no tasting; nothing goes in your mouth.
- Indoor trays: potting soil can carry bacteria and fungi that cause illness if its dust is breathed in. Keep the soil moist, do not stir up dust, wear gloves, and wash hands afterward. Use untreated seeds, and wipe up spills so no one slips.

Procedure

1. Session 1. Before going out, read the question and write your predictions (q2).
2. At your numbered pair, decide which plot is D (walked on) and which is U (rarely walked on). Record the evidence of disturbance and the sun and slope of each plot in Table 1, answer q1, and sketch a map of the pair.
3. Lay the string square on plot D and hold the corners with stones. Everyone stays outside the square.
4. Plant cover: lay the meter stick across the square 5 cm from one edge. Look straight down at the 5, 15, 25, 35 and 45 cm marks and say 'plant' or 'no plant' for each. Move the stick to 15, 25, 35 and 45 cm and repeat: 25 points in all. Cover (%) = points touching a living plant $\times$ 4.
5. Plant kinds and height: count the kinds of plants that look different from each other (leaf shape, size, flowers) and describe each kind in Table 3; names are not needed, and nothing is pulled up. Measure the tallest plant in centimeters.
6. Animal search: for 3 timed minutes, search the surface and gently part the plants, counting every animal you see and noting its kind. Then, wearing gloves, pick up one handful of loose litter or plant material from the edge of the square, shake it over a white plate for 30 seconds, count the animals, and put everything back.
7. Water soak test: just outside the square, on ground like that inside it, twist the soak ring 1 cm into the soil and press soil against its outside. Pour in 100 mL of water and time how long the standing water takes to disappear. Stop at 300 seconds and record '300+' if water remains.
8. Move to plot U and repeat steps 3 to 7 in the same order, with the same times and the same amount of water. The Plant counter and Animal searcher swap jobs.
9. Indoor tray version: mark a 10 cm square on each tray and read a 25-point grid inside it at 1, 3, 5, 7 and 9 cm in each direction (cover = points $\times$ 4). Count seedlings by kind, measure the tallest seedling, and run the soak test with 50 mL. Skip the animal search unless the trays have outdoor leaf litter.
10. Pick up every flag, stone and cup, wash your hands, and return to class.
11. Session 2. Add your pair's results to the class table and copy the whole table. Compute the class mean for each measurement in the D and U plots, and count how many pairs had lower values in D.
12. Practice the calculation method on the practice dataset (q3 and q4), then graph the class means for plant cover and soak time.
13. Write your argument and answer the analysis questions.

Record your observations

Lab 3 recording sheet: Path or no path?

Pair number: _____. Plot **D** is on ground people walk on. Plot **U** is a few meters away on ground that is rarely walked on. Treat both plots exactly the same way, in the same order.

1. What evidence shows that plot D is disturbed and plot U is not, or is less? Name the disturbance, and say whether it changes a living part of the ecosystem, a nonliving part, or both.

2. Predict: for each measurement in Table 2, will plot D be higher, lower or about the same as plot U? Give a reason for your soak-time prediction.

Table 1. Site description

	Plot D (walked on)	Plot U (rarely walked on)
Sun or shade at survey time		
Slope (flat, gentle, steep)		
What covers the surface (bare soil, worn grass, plants, litter)		
Signs of people or other disturbance		

-  Sketch a map of your plot pair from above: both squares, the path or worn area, one landmark (building, tree, fence), the direction of the sun, and where you did each soak test.

Table 2. Measurements

Measurement	Plot D	Plot U	Difference (D – U)
Points touching a living plant (out of 25)			
Plant cover (%) = points × 4			
Number of plant kinds			
Tallest plant (cm)			
Animals seen in the 3-minute search			
Animals in the litter shake			
Kinds of animals seen			
Time for 100 mL to soak in (s)			

Table 3. Plant kinds

Kind	Description (leaf shape, size, flowers)	In D?	In U?
1			
2			
3			
4			
5			
6			

Session 2: the class data

Class data table

Pair	Cover D (%)	Cover U (%)	Kinds D	Kinds U	Animals D	Animals U	Soak D (s)	Soak U (s)
1								
2								
3								
4								
5								
6								
7								

Pair	Cover D (%)	Cover U (%)	Kinds D	Kinds U	Animals D	Animals U	Soak D (s)	Soak U (s)
8								
Class mean								
Pairs where D was lower								

Practice data from another school

Simulated teaching dataset: the numbers are invented to be realistic, not measured.

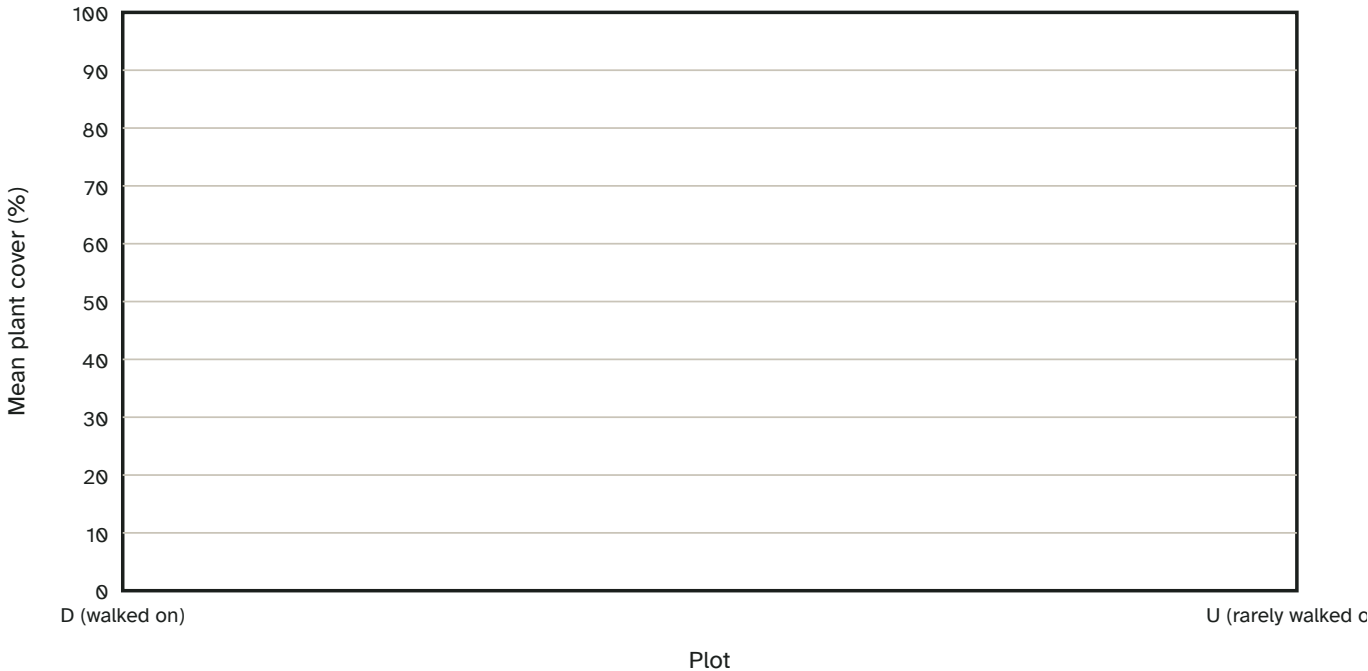
Pair	Plant cover D (%)	Plant cover U (%)	Soak time D (s)	Soak time U (s)
1	28	84	240	45
2	40	76	285	60
3	12	92	210	38
4	52	64	150	70
5	36	84	270	52
6	48	44	135	95

Simulated teaching dataset, invented for practice. Use it to check your calculation method and to compare with your own class's results.

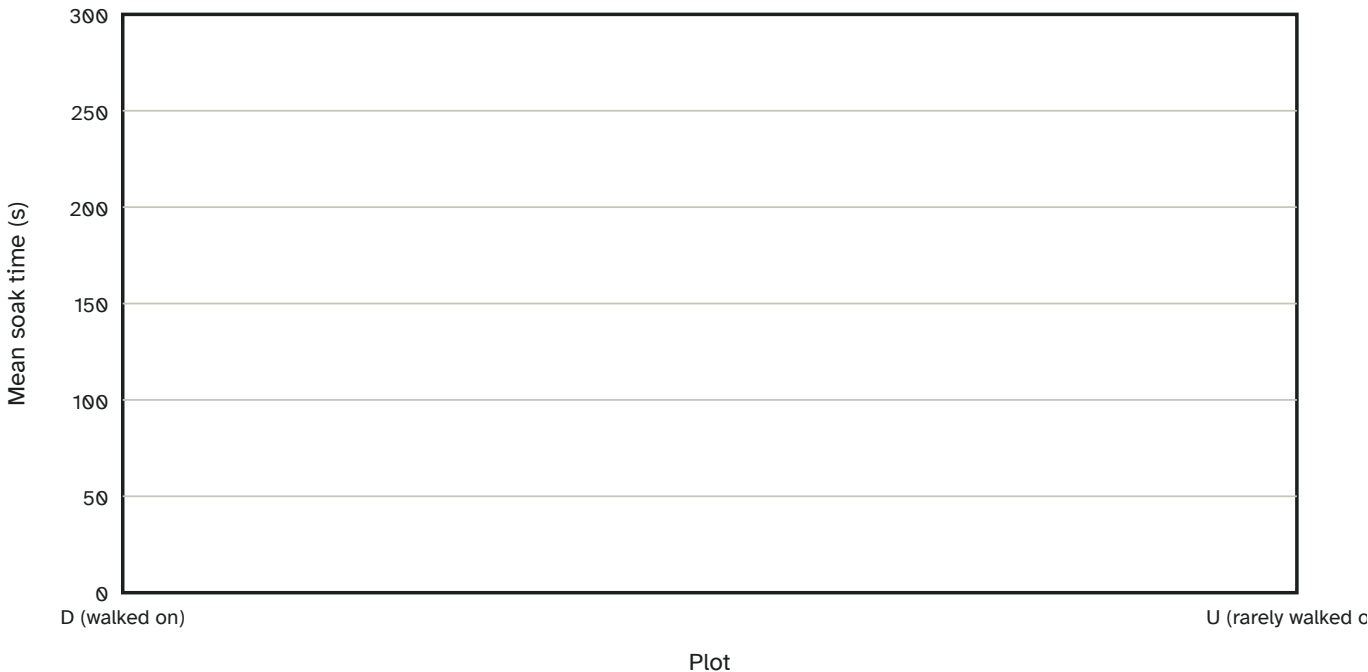
- 3.** Practice data: calculate the mean plant cover for the D plots and for the U plots, and the difference between the means. In how many of the six pairs was cover lower in D? Suggest one reason pair 6 might not fit the pattern.

- 4.** Practice data: calculate the mean soak time for the D plots and for the U plots. About how many times longer did water take to soak in on the walked-on plots?

Class mean plant cover



Class mean soak time for 100 mL



Analysis questions

5. Using your **class** data, write a claim about how trampling affected the plant populations in the plots. Support it with at least two class means and the number of pairs that agree with the pattern.

6. Which nonliving condition did you measure, and how did it differ between D and U plots? Explain a mechanism that connects that difference to your plant results (and to your animal results, if they showed a pattern).

7. Did the animal counts follow the same pattern as the plants? Give one possible reason they did or did not, and one way to collect better animal data.

8. Name one difference between your D and U plots, other than trampling, that could have affected your results. How could you control it in a better study?

9. Suppose the path beside plot D were fenced off for five years. What kind of succession would happen there, primary or secondary? Predict what you would see first and what later, and explain why.

10. A strong argument uses before-and-after data, with-and-without comparisons, a mechanism, and repetition. Which of these did your class's evidence have, which was missing, and how could you add the missing one?
