

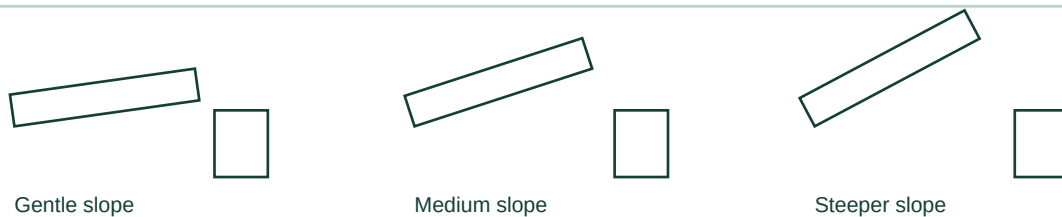
Research ideas 01-02

01 Slope and soil erosion

Question: How does slope angle affect the mass of soil lost in runoff from model trays?

Data plan: Use identical trays at several safe angles, with equal soil mass, moisture and simulated rainfall. Dry and weigh the sediment collected; repeat each treatment. Select a practical range of angles in a pilot. Apply equal water volumes over equal times, collect sediment using the same filtration method and dry it to constant mass. Plot sediment mass against angle and compare the variation among independent runs.

Watch for: A model simplifies real hillslopes. Keep rainfall rate constant and contain all runoff.



Equal simulated rainfall -> collect, dry and weigh sediment

Method sketch only; choose ranges and replication through your own pilot.

02 Biodiversity near a pond

Question: How does distance from the edge of [pond] relate to terrestrial plant species richness?

Data plan: Place quadrats at fixed distances along several transects. Count plant species using a consistent identification method and record shade and soil moisture. Use a consistent rule for locating transects rather than choosing the richest patches. Record each quadrat separately and sample within the same season. Plot richness against distance and assess whether the pattern is consistent across transects.

Watch for: Distance may covary with shade or disturbance; an association does not establish causation.



Record plant species in each quadrat; repeat across sites

Method sketch only; choose ranges and replication through your own pilot.

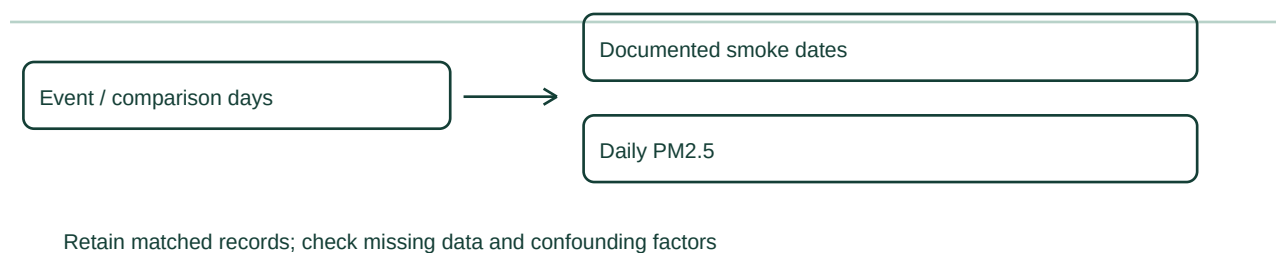
Research ideas 15-16

15 Wildfire smoke and PM2.5

Question: How did daily PM2.5 concentrations at [station] differ during a documented smoke event and matched comparison days?

Data plan: Combine public air-quality records with documented smoke dates. Use a defined event window and justify comparable reference days. Define smoke-event days using an independent source rather than choosing days with high pollution. Summarise PM2.5 and weather for event and comparison periods. Plot a time series and compare distributions while considering season, traffic and missing data.

Watch for: Other sources and weather can affect PM2.5; a before-after pattern alone does not prove the fire caused it.



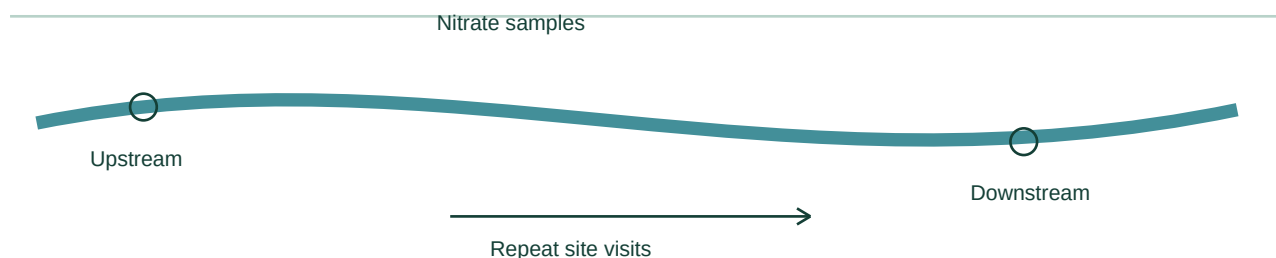
Method sketch only; choose ranges and replication through your own pilot.

16 Farming and river nutrients

Question: How does nitrate concentration vary among safely accessible river sites upstream and downstream of [agricultural area]?

Data plan: Use a validated nitrate test and replicate samples on several dates. Record recent rainfall, site conditions and distance; standardise sampling. Check the test range and detection limit with a pilot and use clean containers. Sample sites at comparable times and keep independent dates separate in the results. Plot concentrations by site and date; interpret any downstream pattern alongside rainfall and other land uses.

Watch for: Nitrate is an adaptation of the original nitrite idea. Avoid entering water; do not assume the farm is the only source.



Method sketch only; choose ranges and replication through your own pilot.