

Exploring water in soils: Erosion modelling and fertiliser



· EXPLORE ·
SOILS

Summary:

Soils form part of the hydrological cycle, their properties determining whether water runs off the surface and/or soaks through the surface of soils moving down or along the profile. This alters the rate at which waters are stored and move in our landscapes.

The pace and force of the water in these rainfall events have the potential to change and manipulate soils. The impact of raindrops can dislodge soil particles, flinging them into the air. Surface runoff can carry soil particles away in vast amounts into the nearest water store at the base of a slope.

This activity looks at the impact of rainfall events on sample blocks of soil and examines what happens in the top 10cm of our soil profile in rainfall events, and allows us to compare between different management techniques of soils.

Learning Objectives:

- Knowledge of raindrop dislocation on soil surface particles
- Knowledge of surface runoff sediment carry
- Likelihood and uptake of soluble mineral fertilisers

Equipment:

- 3x tetra-packs with screw tops
- 3 blocks of soil cut to fit within tetra-packs (preferably; 1 with grass cover, one with leaf litter/crop residue and 1 bare soil)
- Watering can with rose
- Water
- 6x bowls
- Soluble plant feed containing nitrate
- Measuring cylinder
- Kitchen scales
- Stop watch
- Box
- Piece of wood (as long as the width of all 3 tetra-packs)
- Note pad and pen
- Nitrate test strips

Preparation:

- Estimated time ~40 minutes.
- Cut the tetra-packs to shape (see image)
- Select, remove and cut soil blocks to shape

Time Required:

Introduction- 5 mins

Set soil blocks into tetra-packs- 5 mins

Set tetra-packs up on slant, degree of angle is a free choice- 2 mins

Mix fertiliser solution- 5 mins

Apply water- 2 mins

Measure surface runoff from all 3 and note quantity- 7 mins

Take measure of nitrate from all 3 run-throughs - 5 mins

Measure run-through quantity and note - 7 mins

Compare and note nitrate load - 3 mins

Total timing ~40 minutes

Background Learning Needs:

- Understanding of hydrological cycle
- Understanding of solubility of minerals

Risk Assessment:

| Hazard | Likelihood | Severity | Mitigation |
|--------------------------------------------|------------|----------|-----------------------------------------------------------------------------------------------------------|
| Injury illness from soil ingestion | Low | Medium | Use gloves when handling the soil |
| Injury due to fertiliser contact with eyes | Low | Medium | Wear goggles if required |
| Site/local specific risks | Unknown | Unknown | Anyone running this activity is advised to conduct a risk assessment for the specific site and conditions |

Description of Activities:

1. Place a raised surface securely on the ground (see diagram), place wood at forward edge and prop up the back with baton or other tool. Place the 3 tetra-packs next to each other, butting them up against each.
2. Ensure lids are off the tetra-packs.
3. Place bowls under both tip of the surface each if the runoff spouts and screw-lid openings.
4. Mix plant feed/fertiliser (3g) with water 1.5 litres(2:1 grams of feed:litre of water) and place in watering can.
Water the tetra-packs with fertiliser solution for 2 minutes, using the stopwatch as a guide.
5. Examine the amount of sediment produced in the runoff from each tetra-pack of soil and note observations.
6. Measure the quantity of water from the surface runoff for all 3 and note.
7. Place a Nitrate test strip in of the bowls that caught the opening run off, place somewhere safe to develop.
8. Measure the quantity of water from the opening runoff for all 3 and note.
9. Examine the runoff spout to see the level of material that has been dislocated

from the soil surface.

10. Check the nitrate tests and record.

11. Examine the notes made for each tetra-pack of soil- it will give some indication about how these soils cope during heavy rain events. Have a look at the soil block inside the tetra-pack does is it very wet or remains partly dry? How much washed away? And would this soil be prone to erosion?

