Biological Erosion – Teacher Demonstration

Erosion by Animals

Humans and other animals can create footpaths across vegetated areas. The weight of passing animals compacts the underlying soil causing a depression and making it more difficult for rain to penetrate and feed plants. During subsequent rains plant roots no longer hold the exposed soil together and it is easily eroded. Australian animals are soft footed and do not damage the plants as much as introduced cloven hooved cows and sheep.

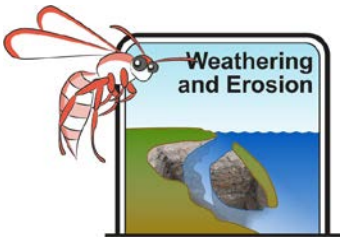
This narrow incised track is the result of over 2,000 years of humans tramping up and down hill to visit a Bronze Age hill fort in southern England.
Generations of feet have killed the grass and created a furrow 15 metres deep. Rains have washed away soil and cut deeply into the soft underlying chalk rock.

Nearby, since the Stone Age, people have cut through the grass turf to expose white chalk and create outlines of horses and giants. These white furrows have also been deepened by rain over time.
Because they are no longer regular walkways however, local people have needed to keep clearing them every three or four years to keep the outlines distinct.
https://en.wikipedia.org/wiki/Uffington_White_Horse

Are there any signs of biological erosion in your school? Yes. Foot and bicycle tracks across grassed areas. Chips and furrows from skateboards. Bare patches before wickets and goals on the sports fields. Tyre tracks where people have parked outside designated parking areas.

Erosion by Humans
The open cut mine sites provides a case where man is the erosive agent. Yellowish red weathered rock at the surface is seen to grade down to greyish green fresh rock that contains the ores.
Weathered rock and soil are scooped up and trucked away, (eroded) to form reserve piles elsewhere. These are held until operations close and are used to return the area to (as close as possible) its original state.
The fresh rock is exposed, drilled and blasted into fragments. These fragments are trucked to crushers. Here large lumps are broken down to smaller sized pieces. Rolling around in a ball mill using the same process that happens in rivers where rocks crash together to become smaller and rounder then finely grinds them. They are then placed on moving tables with fluids that sort them into the denser ore and the less dense mullock (waste material). The ore is then further chemically and heat-treated to release its metals.

What is the name of the largest open cut mine in WA?
The Kalgoorlie Super Pit (or Fimmiston Open Cut) – at time of writing



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Biological (human) Control of Erosion

Although humans are directly and indirectly responsible for causing erosion, we can also help recovery of the landscape.
We can do this by:

1. Saving topsoil and replacing it after excavation.
2. Aerating compacted soil. Many lawn owners and sports field gardeners reinvigorate their turf by punching holes in it to allow better penetration of water to plant roots.
3. Depositing material in benches to stop fast rainwater flow eroding it away.
4. Laying rocks and dead branches on top of the soil to stop it being blown away by the wind until plants start growing again.
5. Replanting the area damaged with local plant species.
6. Planting with a mixture of fast growing and slow growing species so that tall plants will shelter the slower growing smaller plants.

For example, on the coast, regular onshore winds create sand dunes that move slowly landwards. If they are not stopped moving they can cover roads and even houses. Dead branches are laid on their surface to slow wind and decrease its erosive power. These branches also dissuade animals (including humans) from making erosive tracks across the dunes. The dunes are then planted out with salt tolerant long rooted grasses to fix the soil and stop most of the movement.

Holding Back Erosion - Teacher Demonstration

Materials

- Sand (from the sandpit)
- Grass clippings or dead leaves and pieces of twig
- A bucket
- A watering can or sprinkler

Method

1. Using the bucket, make two sandcastles, one castle of sand and the other of sand and plant mix.
2. Sprinkle each with water for ten seconds.
3. Compare which castle was most eroded.

Observation

What did you observe? The pure sand castle eroded much faster than the sand mix

On roadside cuttings soil can be held in place by a damp paper, fertiliser and seed mix which is blown onto the unstable surface. The paper temporarily holds the soil in place until the fertilised seed becomes established. This is an Australian invention which has been exported across the world.