Dust bowl
Investigating wind erosion

Ask pupils if they have ever had sand blown in their faces in a strong wind.
Set up a pile of dry sediment of mixed sizes to create a 'mini-desert' on the table. Check that no pupil suffers from asthma or a dust allergy.
Show the pupils a drinking straw, (or the barrel of a cheap pen with the ink tube removed)

A pile of mixed dry sediment being blown gently with a straw (*Photo: P. Kennett*)

Ask the pupils:

- What will happen if we aim at the pile of sediment with the tube and produce a 'wind' by blowing down it?
- Which of the materials is most likely to move first?
- What would we need to do to get the remaining materials to move?
- How far do you think the materials will travel? Which will go the furthest?

Get small groups of pupils to set up their own piles of sediment and to blow steadily through the tube.
Encourage them to test their answers to the questions above.
Ask them to describe any results which were not as they had expected and to try to explain them.
Ask them how they think this activity relates to the real world, e.g. in their own locality; in a dry ploughed field; in a dusty school playground; on a beach; in a desert.

A dust cloud formed of blown topsoil, engulfing a farm in Stratford, Texas in the 1930s.
(*NASA 01_theb1365 NOAA Photo Library, Historic NWS Collection)*

Topsoil, eroded by the wind and deposited in a roadside ditch, Iowa, USA (*AGI hkeamf © NRCS)*

Sand dunes formed by the deposition of wind-blown sand, California, USA (*AGI ha469y © Marli Miller, University of Oregon)*

The back up

Title: Dust bowl

Subtitle: Investigating wind erosion

Topic: Investigating the effects of different wind strengths and particle sizes on the erosion, transportation and deposition of sediment by wind.

Age range of pupils: 8 -14 years

Time needed to complete activity: 20 minutes

Pupil learning outcomes: Pupils can:

- describe how wind picks up and moves particles of sediment;
- show that wind can transport sediment away from its original location;
- explain why stronger winds can move greater quantities and larger particles;
- explain why wind erosion could be a big problem to a farming economy.

Context: The activity could form part of a lesson looking at the mechanism of sediment movement. It could also lead to an understanding of the effects of wind erosion in flat, exposed areas and dry climates. Wind erosion and subsequent

deposition of the load is an important source of fertile soils in the area of deposition.

- What will happen if we aim at the pile of sediment with the tube and produce a 'wind' by blowing down it? *Some of the particles will begin to move 'downwind'. Some will move along the table, but others will be lifted up into the space above the table.*
- Which of the materials is most likely to move first? *The smallest particles are usually the first to move and are also more likely to lift off the table into suspension in the 'wind'.*
- What would we need to do to get the remaining materials to move? *The wind strength could be increased by blowing harder down the tube, or the tube could be directed more closely towards them. Fine particles could be dislodged from behind larger ones by moving the tube over them.*
- How far do you think the materials will travel? Which will go the furthest? *Pupils will have their own ideas about the actual distance, which can be tested. Finer particles travel further than large ones, although once a large particle has begun to move, its momentum can make it travel further than expected.*

Following up the activity:

- Spray the sediment lightly with water and carry out the investigation again, to see the importance of water as a binding agent, reducing the erosive effects of the wind.
- Sow some fast-growing seeds onto the dampened sediment pile. Once they have germinated, test the effects of vegetation as a binding agent.
- Try other Earthlearningidea activities dealing with related themes, e.g. Why does soil get washed away?; Mighty river in a small gutter.
- Carry out a web search on the 'Dustbowl' of the American mid-west in the 1930s, or look for an example which is local to the school.

Underlying principles:

- Moving air can pick up small particles and carry them in suspension.
- Moving air can move larger particles as 'bed-load' by dragging or rolling them or by causing them to jump into the air for a short time, and displacing other particles as they land.
- Large particles can protect areas of smaller ones, creating 'sand shadows'.
- Friction against the land surface eventually reduces the wind velocity to the point where it will deposit its load of sediment.
- Wind erosion can have devastating effects on a region's soil, if measures are not taken to protect it.

Thinking skill development:

Investigating the movement of sediment is a constructive activity. Cognitive conflict arises when trying to predict how the particles will move, especially smaller ones in the shadow of larger ones. Applying the principles to a real flat-lying or arid environment involves bridging.

Resource list:

Per small group:

- sand
- pebbles (various sizes)
- talcum powder, or a similar fine, harmless powder
- drinking straws, or the barrels of pens with the ink tubes removed
- smooth surface, e.g. table top or the bottom of a large box with the two ends removed but the sides left in place.

Assess and minimise the risk to asthma sufferers, to pupils' eyes, and of the spread of airborne infections.

Useful links:

www.oznet.ksu.edu/fieldday/kids/wind/erosion

Source: "Science Through the Window" - Investigating the Science of Atmosphere, Soil, Weathering, Erosion and Landscape. Earth Science Education Unit, for the National Curriculum of Scotland, 2004