

Session 2

Understanding Soil Erosion

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Understanding Soil Erosion

In this session we will:

- Define soil erosion
- Discuss the **main types** of erosion
- Explore the **impacts** of soil erosion
- Introduce the assessment of **erosion hazard**

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What is Erosion?

- The process of **detachment** and **transport** of soil particles by **erosive agents**
- Results in sediment load being transported downslope by runoff

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Eroding Batter



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Eroding Stream Bank



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Erosive Agents

- Major erosive agents in Australia are:
- Water
 - Wind
 - Gravity (mass movement/landslip)
 - Other agents of erosion include snow, ice, plants, animals and human activity

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Deposition

- When transported soil particles come to rest at a new location
- Occurs on land and in water
- Reduces the sediment load
- Adds to soil mass = soil formation

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Why worry about erosion?

... human activity causes **accelerated erosion** and upsets the natural balance

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Accelerated Erosion

- Result of human activities:
 - Land clearing / disturbance
 - Drainage works
 - Earthworks
- Much higher rates of runoff, erosion and soil loss

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Impacts of Accelerated Erosion

- Loss of land and topsoil resources
- Sedimentation and pollution of waterways
- Degradation of ecosystems, habitat destruction
- Nuisance, loss of amenity
- Flooding, damage to infrastructure, blockage of drainage systems

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Direct impact on water bodies

- Loss of amenity, aquatic habitat, siltation of waterways, declining water quality etc.
- Typical comparison of ~400 hectare catchment:
 - 100-600 t/year fine sediment influx to river or lake pre-European Development
 - Current yields estimated at 24,000 t/year (approximately 40x!)

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Blocked Drainage Systems



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Sediment Pollution



- Sediment plume at mouth of Hunter River following extended wet weather


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Measured Erosion Rates

Natural conditions:	(t/ha/yr)
• Forest	0.005 – 0.05
• Grassland	0.1 – 1.0
Human Activity:	
• Grazing land	0.1 – 5.0
• Developed Residential	5 – 10
• Active Construction sites	60 – 100+

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Wind Erosion



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Wind Erosion



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Wind Erosion

- Widespread in central and west NSW
- Upper Murray-Darling has above average Dust Storm Index (DSI)
- Primarily climate driven (drought etc.)
- Land clearing, grazing, feral pests and weed infestation accelerate impacts
- Reduces soil fertility, water holding

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Mass Movement



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Mass Movement



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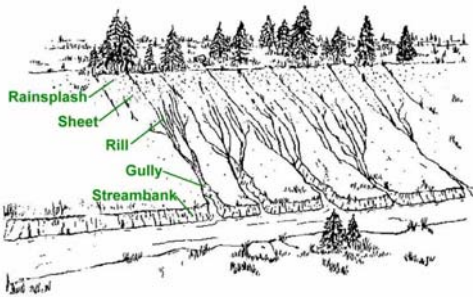
Water Erosion

- Rain-splash
- Sheet
- Rill
- Gully
- Streambank
- Tunnel, Wave etc..

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Water Erosion Diagrammatic



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Rain-splash Erosion

- Raindrops behave as little “bombs”
- Displace soil particles and destroy soil structure
- Exacerbated by poor/thin groundcover
- Runoff water becomes turbid
- Initiates other forms of erosion

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Rain-splash Erosion



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Sheet Erosion

- Removal of a uniform thin layer of soil by raindrop splash or water run-off
- Often occurs gradually
- Often overlooked until the subsoil is exposed
- Should be a major focus of erosion control works

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Rill Erosion

- Often occurs along with sheet erosion
- Water concentrated into deeper, faster-flowing channels (rills) up to 30 cm deep
- “Fluting” common in dispersive soils
- Intermediate stage between sheet and gully erosion

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Rill Erosion

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“Rilling” of constructed wall

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Gully Erosion

- Not just an advanced stage of rill erosion
- Mostly caused by significant changes to site hydrology or the upslope movement of a head-cut feature
- Water concentrated into deeper, broader channels >30 cm deep
- Dispersive/sodic soils extremely prone
- Not typically repairable with standard measures (i.e. ploughing, re-grading)

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Streambank Erosion

- Natural (meander) or accelerated (washout) loss of bank stability or resistance to fluvial energy
- May result from physical mechanisms:
 - Hydrological change (flood freq. or duration)
 - Stream alterations (dredging, filling)
 - Obstacles or constrictions (trees, structures)

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