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Landscape approaches to vegetation restoration in drylands

Janet Hooke

University of Liverpool, UK

UNIVERSITY OF LIVERPOOL

Department of Geography & Planning
School of Environmental Sciences

Background

- **Erosion rates or sediment yields**, often based on small-scale plot studies and on whole catchments respectively, are **widely used to assess land degradation.**
- **Plot studies rarely include major erosional features** such as gullies and can thus underestimate erosion rates. **Catchment studies** frequently use remote sensing and map evidence of land use/ cover and **take black-box approaches** of sediment yield or erosion rate relations to area characteristics.
- Much restoration involves assessment of suitable conditions and plant species but **often that planting is not spatially targeted**. Conventional approaches tend to use blanket afforestation across large areas.
- In **soil erosion control** many individual techniques are recommended, some spatially targeted e.g. buffer strips and grassed thalwegs, but **rarely are they implemented in an integrated way for whole catchments** or large areas. It is now increasingly realised that a **landscape approach is needed for effective restoration** and that spatial strategies related to landscape need to be developed.

Landscape Approach

- A **landscape approach** takes into account the varying characteristics within an area and their **spatial relations**. It recognises that areas are interconnected and need to be managed in an integrated way. It involves identifying where erosion is occurring and different types of restoration need to be applied.
- Application of the connectivity concept to soil erosion and sediment flux involves recognition of **erosion hotspots**, that much of the erosion and transfer is in **pathways**, not over whole hillslopes, and that much storage takes place along pathways such that sediment yields do not necessarily reflect erosion rates.
- **Presence of structures, including tracks, has a large effect on patterns.**

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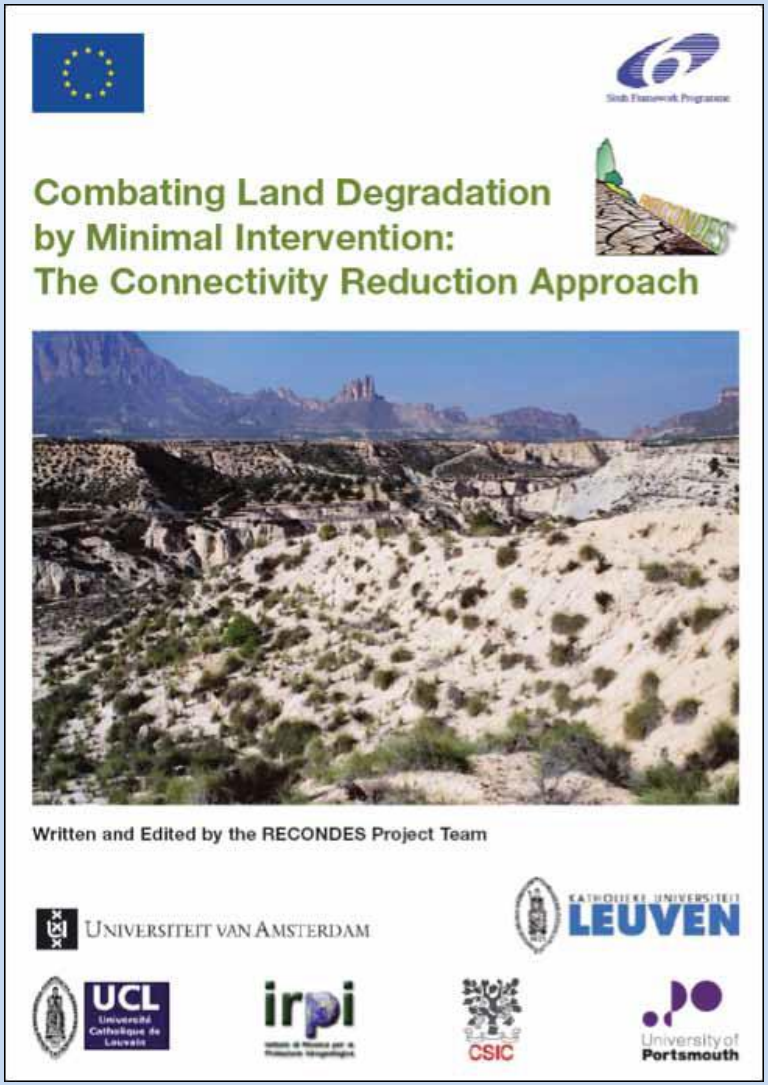
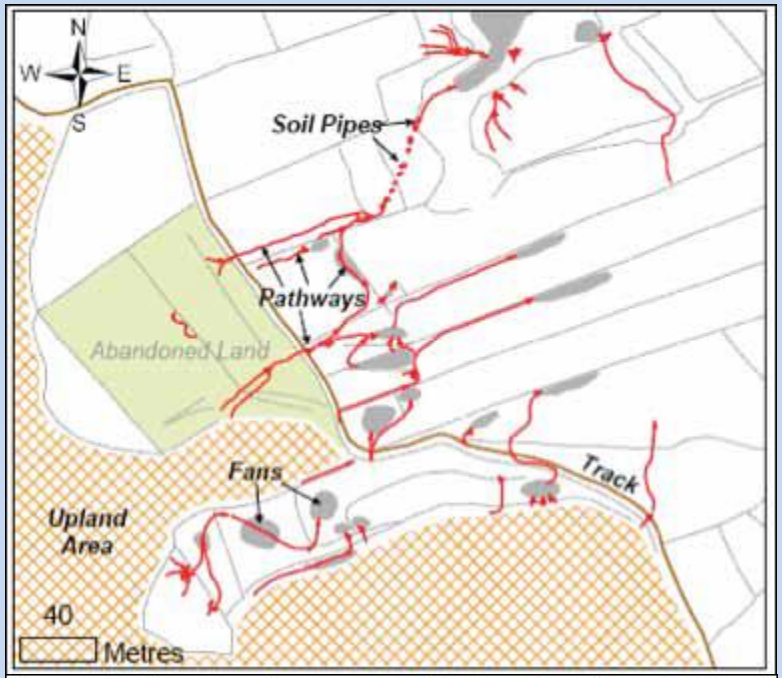
Recent developments

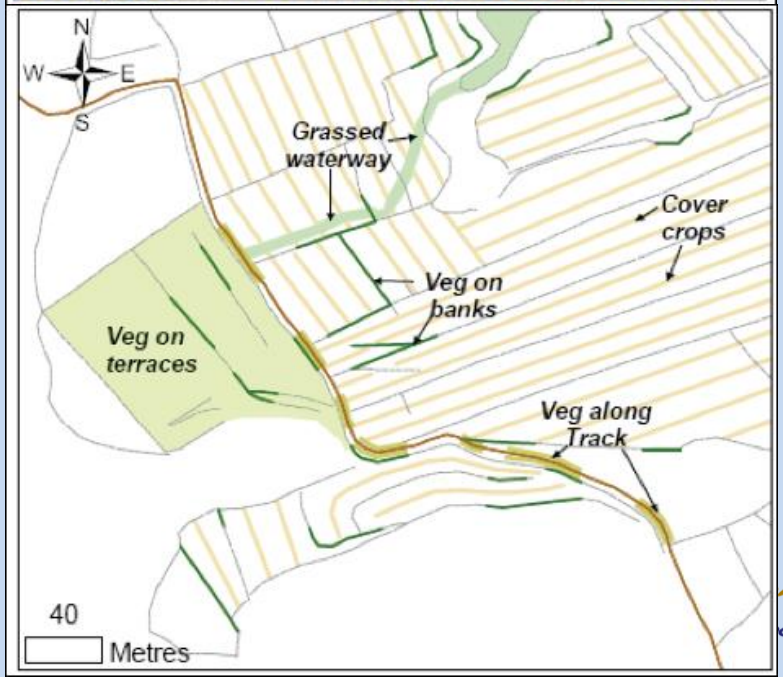
- **Conventional land use practices** in many areas, particularly the Mediterranean, have **long used methods that reduce connectivity** e.g. by agricultural terraces or by construction of check-dams in channels[4]. Many traditional terraced landscapes are **now being destroyed or not maintained**.

- The potential for the connectivity approach to use of vegetation to mitigate and restore degraded drylands was the basis of the **EU RECONDES project[5]**. This combined assessment of erosion hotspots and pathways with types of vegetation that grow in different locations to produce practical guidelines on spatial strategies of vegetation to reduce connectivity and thus soil erosion and degradation in Mediterranean agricultural landscapes[6].

RECONDES







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Guidance on plants

Table 1 Potential plants to form part of vegetation strategies and be applied to land unit hotspots.

Land-unit	Type of plants
Reforested Land	Grasses (*Stipa tenacissima* and *Brachypodium retusum*, *Helictotrichon filifolium*) and shrubs (side bank: *Salsola genistoides*, other hotspots: *Rosmarinus officinalis*, *Anthyllis cytisoides* [first step], *Rhamnus lycioides*, *Pistacia lentiscus* [second step]).
Croplands	Weeds, legumes and grass species.
Abandoned lands	Grasses (*Lygeum spartum*, *Brachypodium retusum* and *Stipa tenacissima*) in combination with more deeper rooted shrubs (*Anthyllis cytisoides*, *Atriplex halimus* or *Salsola genistoides*) on terrace wall.
Hillslopes and gullies	Grasses (*Stipa tenacissima*, *Lygeum spartum*, *Helictotrichon filifolium*) and shrubs (*Salsola genistoides*) on steep slopes. Grass species (*Brachypodium retusum*) and reed species (*Juncus acutus*) to vegetate drainage lines. For stabilizing gully floors a combination of grasses (*Lygeum spartum, Stipa tenacissima, Brachypodium retusum)*, deep rooted shrubs (Salsola genistoides, Anthyllis *cytisoides, Atriplex halimus*) or trees (*Tamarix canariensis*) should be considered.
Channels	Grasses (*Lygeum spartum*) on fans. Grasses (*Stipa tenacissima*, *Lygeum spartum*) and trees (*Tamarix canariensis*) to stabilise valley walls. Larger tributaries/channels, consider either trees/shrubs (Fine substrate - *Tamarix canariensis*, Coarse substrates – *Nerium oleander*) and grasses (*Lygeum spartum*). Where water accumulates plant *Juncus sp*. and *Phragmites australis*.

Note: For Sub-catchments, break up into land-units listed above and then select appropriate plants.

Application

- A landscape approach to erosion management has been developed in various dryland environments. In Australia, understanding of patch scale processes has been implemented in Land Care management strategies at a large scale[7].
- The approach is less readily applicable to areas where wind erosion dominates e.g. in China but the problems of blanket afforestation and the need to adapt to spatial variability have been recognised there[10].
- Also being applied in more humid lands.
- Societal participation and cooperation are key components of any landscape implementation.
- Problem that more schemes implemented than documented in available literature

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