

Soil Biodiversity Conservation and Restoration

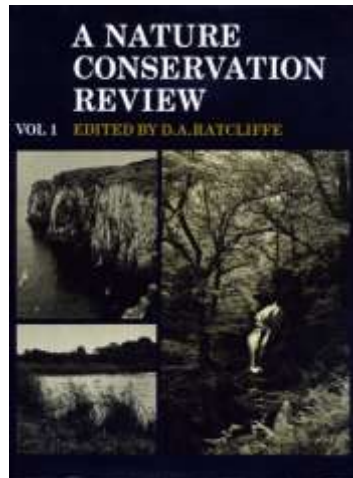
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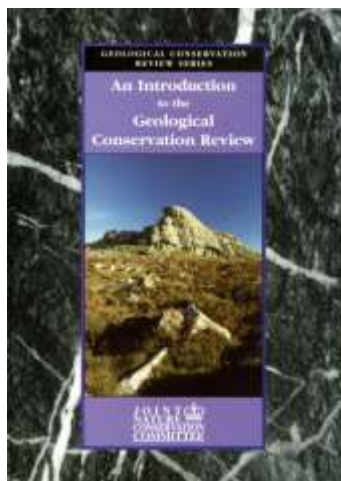
“Not so long ago, soil was described as the Cinderella of environmental policy with most attention focussing on water, air and biodiversity quality objectives. It is now widely acknowledged that the sustainable use and management of our nation’s soils is key to the provision of a wide range of economical, social and environmental benefits”

Bruneau, 2008

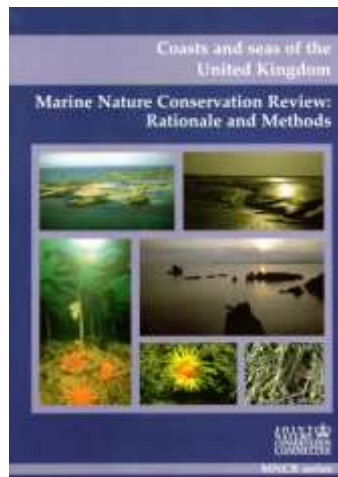
1977 – The 'NCR' sets a trend – it establishes criteria for the recognition of sites important for nature conservation



1996 – the Introduction to and rationale for the 'GCR' was published. It was actually pre-dated by volume 2 in the series, which was published in 1989 (*Quaternary of Wales*), and a few of the subsequent volumes. The series now has 33 published volumes, and more are expected imminently.



1996 – the marine environment was not far behind! The 'MNCR' series has published the volume below, as well as reports on 15 sectors, 17 regions of the *Coasts and Seas of the United Kingdom*, 7 volumes of an *Inventory of the United Kingdom's Estuaries*, as well as accounts of sand dunes and vegetated shingle structures



The Millennium Ecosystem Assessment

- Carried out between 2001 and 2005
- To assess the consequences of ecosystem change for human well-being
- To establish the scientific basis for actions needed to enhance the conservation and sustainable use of ecosystems and their contributions to human well-being
- The focus is therefore on 'Ecosystem Services'
- Full range of ecosystems, from those that are relatively undisturbed (e.g. natural forests) to those that are intensively managed and hence modified (e.g. agricultural land, urban areas)

The Millennium Ecosystem Assessment

- **Provisioning Services**

Food, fresh water, wood and fibre, fuel, ...

- **Regulating Services**

Climate regulation, flood regulation, water purification, disease regulation, ...

- **Cultural Services**

Recreational, educational, spiritual, aesthetic, ...

- **Supporting services**

nutrient cycling, soil formation, primary production, ...

The Natural Environment Research Council's **Soil Biodiversity Research programme**

“A central question in ecology is whether there is a necessary link between biological diversity and ecosystem function. Biogeochemical cycles are among the most fundamental functions performed in ecosystems, and many critical processes in these cycles (e.g. decomposition, nitrogen transformations, trace gas generation) occur in soil and are mediated by soil organisms. The role of these organisms in biophysical processes (e.g. Hydrological cycling, energy balances) is unclear, but almost certainly profound”.

Extract from the first Newsletter of the programme in July 1998



The Natural Environment Research Council's **Soil Biodiversity Research programme:**
The final newsletter – March 2004

“Now that the Programme is drawing to an end, what have we learned? ...

“The Programme was, we believe, unique in bringing together over 120 researchers to study the soil biota at a single location ...

“New ways to study diversity ...

“Coping with stress ...

“Tracing carbon ...

“Model development ...

“Theoretical advances ...

But have we really used what we have learned?

The Natural Environment Research Council's **Soil Biodiversity Research programme:**
New ways to study diversity



The Natural Environment Research Council's **Soil Biodiversity Research programme:**
Coping with stress



The Natural Environment Research Council's **Soil Biodiversity Research programme:**
Tracing carbon



The Natural Environment Research Council's **Soil Biodiversity Research programme:**
Model development



The Natural Environment Research Council's **Soil Biodiversity Research programme**

- We have learned a tremendous amount about the soil on 1ha of an upland grassland site
- There is a large amount of scientific literature relating to this soil
- It has spawned interest in similar studies in the USA, Australia and more widely in Europe
- ... but how widely has this knowledge been applied either in conservation or restoration?

Question 1

Why has the biodiversity within soil been so forgotten by conservationists?

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Why has the biodiversity within soil been so forgotten by conservationists?

- There are no (or virtually no) charismatic species living within the soil – the exceptions might be the mole cricket and the waxcap fungi
- There is insufficient knowledge about the huge diversity of species to know if any are in particular need of conservation action
- There is even less knowledge about the communities of soil biota that might need particular conservation action
- What occurs in the soil is 'out of sight and out of mind'

Question 2

Why has the biodiversity in soil been so neglected in restoration work?

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Why has the biodiversity in soil been so neglected in restoration work?

- A spread of topsoil appears to work
- A green veneer can be achieved (but is it the right shade of green?)
- Wildflower seed mixtures seem to be successful in achieving an aesthetically pleasing landscape
- The soil animals might well arrive anyway
- .. So why look into the 'black box'?

Developing international policy

“The below-ground biodiversity ranges from the ‘invisible’ bacteria, fungi, microbes, microscopic invertebrates to larger invertebrates such as ants, earthworms and termites ...”

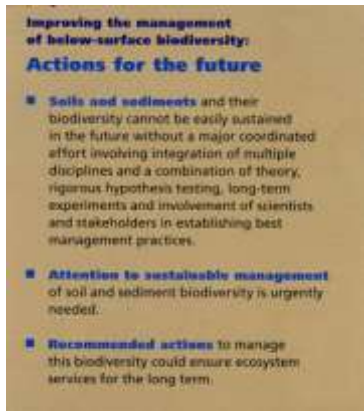


Developing international policy

Soils can

- sequester carbon (organic matter formation, hence some are major carbon sinks)
- detoxify water (N retention in biomass, pollutant metabolism)
- maintain soil fertility (decomposition, nutrient cycling, organic matter formation)
- facilitate waste management (detoxifying pollutants, decomposition)

Developing international policy



Basically this is all about the sustainability of the 'ecosystem services' that were such a feature of the MEA

Will a meeting such as this lead to a greater understanding of the role of the soil's biodiversity in the effective functioning of the soil?

But how is all of this going to be affected by environmental (climate) change?

