

The First Soil Action Plan for England: 2004-2006



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Useful Links

For information relating to the implementation of the Action Plan, and other developments in soils policy and research, please see the soils part of the Defra website:

<http://www.defra.gov.uk/environment/landliability/soil/index.htm>

For further information about the work of the Environment Agency, and to access a copy of their "State of Soils in England and Wales" report, please see the Environment Agency website:

<http://www.environment-agency.gov.uk>

Cover photography:

Top left: Brown field construction site for housing development. *Defra*

Top right: Farming landscape, wheat field. *Defra photo library*

Bottom left: Agricultural landscape. *Defra*

Bottom right: Bacterial-feeding nematode visualised in a pore within an arable soil. Image width ≈ 180 mm. *Karl Ritz, National Soil Resources Institute & Scottish Crop Research Institute.*

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I am pleased to introduce the First Soil Action Plan for England, which commits the Government and partners to actions which will improve the protection and management of soils within a whole range of land uses. The Action Plan builds on the earlier Draft Soil Strategy published as a consultation paper in 2001. It is complemented by an Environment Agency report on the State of Soils in England and Wales.

Soil is one of the essentials of life, along with air and water. Yet it is so much a part of everyday life that there's a danger of taking it for granted. Covering most of the earth's land surface, it is the essential growing medium for our food, timber and other crops. It supports the buildings that we live and work in and the roads and rails that move us around. It can be a useful source of minerals and it helps to shape our landscape and protects archaeological features. It supports diverse

ecological systems and acts to filter, store or transform many of the chemicals passing through it, preventing them from otherwise ending up in water or air.

There's no right or wrong type of soil. So, for many soil issues it is difficult to set national targets in the way that we often can for air or water. The qualities that make one soil excellent for growing crops might be very different from those which allow another to support a heathland or a third that would be an ideal foundation for a block of flats. Protection and sustainable management of soils needs to recognise and optimise the many different functions that they perform in keeping with the principles of sustainable development and on the basis of sound evidence. Soils take many centuries to develop and can readily be destroyed by misuse or poor husbandry.

The plan sets out an ambitious programme of work for the next three years, to help move towards a clearly stated vision for the nation's soils. The actions are often only the first, important step in the process. The aim for this first plan is to achieve as much as possible by properly embedding soils into ongoing work; to gather the evidence; and to build consensus and partnerships with others in Government and outside to provide the foundation for future action.

I am pleased to add my personal commitment as the Minister responsible for soil policy to drive these actions forward in the heart of Government.

A handwritten signature in black ink, appearing to read 'John Whitty', written in a cursive style.

The Lord Whitty of Camberwell

Summary

This First Soil Action Plan is aimed at policy makers, industry leaders and influencers across the wide spectrum of activities that impinge on soils: from land use planning, construction and minerals extraction to agriculture, forestry and nature, landscape and cultural heritage conservation. It builds on the earlier Draft Soil Strategy for England and sets out the actions which Defra and partners are committed to take to help protect soil functions. The Action Plan is complemented by an Environment Agency report on the State of Soils in England and Wales.

Priorities for Action

The Action Plan contains 52 actions on issues ranging from soil management on farms to soils in the planning system, soils and biodiversity, contamination of soils and the role of soils in conserving cultural heritage and landscape. All of the actions make a step towards more sustainable soil use and protection. The following 9 actions are seen as key to the success of this first Action Plan because they are likely to lead to significant changes on the ground or because they are making first steps to tackle particularly challenging issues:

- Defra will work with stakeholders to develop a programme of education and awareness of soil issues among the general public, those working with soils and the professionals that guide, advise or instruct soil managers. We will aim to develop partnerships and plans by 2005 and review progress in implementing those plans in 2006.
- Defra will implement the CAP cross compliance conditions in a way that enhances management of soils in the farming industry.
- Defra will encourage better management of agricultural soils that goes beyond the requirements of the Single Payment, through the provision of incentives under the Agri-Environment Scheme.
- Defra will build on the output of its Learning Skills and Knowledge review and the pilots of the Whole Farm Appraisals, to develop within the next twelve months a strategy for providing farmers and other land managers with practical information and advice building good soil management into overall farm planning.
- Defra will work during the Spending Review 2004 process to embed soil protection into its forward strategy and, if appropriate, targets on natural resource protection.
- Defra will work with stakeholders to identify the indicators which should be built into a national soil monitoring scheme, in order to develop a scheme which meets both national and European requirements.
- Defra will work with other Government Departments and Agencies (including in the Devolved Administrations), the National Soil Resources Institute at Cranfield University (as co-owners of key data sets) and other soil data users, to develop and provide better access to information on soils.
- Defra will work with the Office of the Deputy Prime Minister (ODPM), representatives of planning authorities and other partners to develop a consensus on the procedures needed to give soils appropriate protection during the planning process. The first milestone will be to examine criteria for designating soils that should be protected from building during the current review of Best and Most Versatile (BMV) land.

- English Nature will prepare and publish, in 2006, a position statement on the role of soil management and protection within statutory nature conservation sites.

Reporting

Defra will report progress on the actions in this plan in 2005. In 2006, we will review the plan, bank achievements to date and work with partners to draw up a Second Action Plan with a longer forward vision.

1 Introduction

1. Soil is a fundamental and irreplaceable natural resource, providing the essential link between the components that make up our environment. The sustainable management of soils is a central pillar in sustainable development. The diversity and versatility of England's soils help shape the landscape and inform the land use planning system. Soils provide the platform for built development and protect and contextualise our cultural heritage. They act as a growing medium for our food, timber and other crops. They store vast quantities of water and carbon and they can buffer and transform chemicals that could otherwise cause water or air pollution and/or contaminate our food. Soils also contain an essential component of our biodiversity and support and/or influence all our ecosystems.



Heavy vehicle damage to wet soil

2. For much of England's soils there is no evidence of unsustainable management, but where difficulties do arise the costs and impacts can be very significant. For example:
 - Estimates suggest that 18% of the soil organic carbon present in arable topsoils in 1980 had been lost by 1995.
 - Researchers have estimated that total long and short-term costs of erosion in the UK are between £23m and £50m per annum.

- Ploughing on archaeological sites accounts for 10% of all destruction of archaeological monuments and 30% of all damage.
- Rapid infilling of lakes with sediment is a major issue in some areas. For example, the National Trust has spent £836k on twelve lake dredging projects.



Plough damage to a mosaic at Dinnington, Somerset

© Somerset County Council

3. The Government published a Draft Soil Strategy for England as a consultation document in 2001 and received over 100 responses. The Draft Strategy was a milestone in Government soil policy in providing the first comprehensive statement on the state of our soils and how threats to the soil were being tackled. The Draft Soil Strategy identified policy objectives in terms of *extent of soil*, *diversity of soil* and *quality of soil*. These three aspects of soil protection still provide a valid guiding framework for soil policy. They are implicit in this plan and the actions within it, even though the plan is structured around the maintenance of soil functions.
4. This First Soil Action Plan takes forward the Government's work on soil protection and management, taking account of comments on the earlier strategy and actions set in train at that time. The Action Plan goes wider than the Draft Strategy in covering soil management issues, as they affect other environmental media. The plan also informs and is informed

by key European initiatives such as the Water Framework Directive and the work towards a European Thematic Strategy for Soil Protection. The EU Soil Thematic Strategy identifies contamination, erosion and organic matter as three priority issues for European soils and is also developing overarching plans for soil monitoring and R&D. The EU strategy will be a key element in soil policy over the coming years, providing a framework in which to develop the Government's policies and actions. While the EU strategy is still developing, this Action Plan, in combination with other work by the Environment Agencies and the Devolved Authorities, should help to highlight UK priorities and demonstrate a commitment to progress through domestic action.

2 Our Vision and Aims for England's Soils

5. The actions proposed in this plan work towards a common vision that recognises the several vital functions that soils perform for society.

Our vision is to ensure that England's soils will be protected and managed to optimise the varied functions that soils perform for society (e.g. supporting agriculture and forestry, protecting cultural heritage,

supporting biodiversity, as a platform for construction), in keeping with the principles of sustainable development and on the basis of sound evidence.

6. In order to achieve this vision, our aims are to ensure:
 - Soil managers will look after their soils with a view both to their own and society's short-term needs and to the interests of future generations;
 - The regulatory, legislative and political framework will provide appropriate protection of soil as an irreplaceable natural resource and empower and encourage people with soil to manage it properly;
 - A better understanding of, and access to, information on the state of our soils and the physical, chemical and biological processes which operate on and within them.

3 The Structure and Aims of this Plan

7. The purpose of the Action Plan is to list the actions that Government and others have agreed to take to further protect and better manage England's soils. A Soil Strategy is in preparation in Wales and the issues are under consideration in Scotland and Northern Ireland. The Action Plan is complemented by a report from the Environment Agency on the State of Soils in England and Wales, which outlines the current situation and identifies pressures on soils. The report provides the evidence that underpins both the actions in this plan and the Environment Agency's own Soil Strategy, which will set out its role in taking soil protection forward.



Defra

Functions of soils

8. For the purposes of this plan soil is defined as the upper layer of the earth's crust composed of mineral particles, organic matter, water, air and organisms in which soil-forming processes have transformed the parent material.



NSRI, Cranfield University at Silsoe

Crewe series clay soil looking over the Shropshire Plain towards the Long Mynd

9. The Action Plan sets out the actions which Defra and partners are committed to take now. Although some actions have a longer lifespan, the core of this plan is devoted to things we can achieve in the short-term and to building a consensus view of what is necessary beyond this and a coalition of partners to drive it forward. Our intention is that we should be ready in three years' time (2006) to review progress, bank achievements to date, and adopt a revised Action Plan with a longer forward vision. The EU context for soil protection will be better established by then, and the UK Government will be in a good position to respond favourably on the basis of this Action Plan for England.
10. The Action Plan is aimed at policy makers, industry leaders and influencers across the wide spectrum of activities that impinge on soils: from land use planning, construction and minerals extraction to agriculture, forestry and nature, landscape and cultural heritage conservation. The plan was drawn up in collaboration with stakeholders. A list of organisations which were represented on the steering group and those providing additional input is attached at Annex A.
11. We have identified thirteen "**Core Actions**" (section 4) which tackle issues at the heart of our three aims for soils, and where we aim to make demonstrable progress during the life of this document. The issues and actions which follow have been categorised under six headings, reflecting the six functions of soil;
- **Overarching soil protection issues;**
 - **Soils for agriculture and forestry;**
 - **Interactions between soil, water and air;**
 - **Soils and biodiversity;**
 - **Soils and the landscape and cultural heritage and;**
 - **Soils in mineral extraction, construction and the built environment.**
12. The headings relate broadly to recognised soil functions. Some soil functions can work together so that benefits arising from a particular soil protection measure may extend beyond the original aim, for example, conservation of peatlands for their biodiversity interest will also protect their value to the historic environment and vice versa. However, it should also be recognised that often the different soil functions are not mutually compatible. Measures to maintain soil's capacity to produce food and fibre may compromise the conservation of biodiversity or cultural heritage and vice versa.
13. There are some issues which could potentially affect or apply to all soil functions. To avoid repetition, these issues – the planning system, soil contamination, and the impacts of climate change on soils – are covered separately in an initial overarching section. All of the actions are summarised in Annex B.

4 Core Actions to Achieve our Aims

- 14.** Many of the actions needed are specific to the particular demands which society and individual owners and managers place on their soils. These are examined in more detail in the sections that follow. They need to be underpinned by a series of core actions which work across the board to start delivering the three aims outlined in paragraph six, and so improve public understanding and perceptions of soils.

Sustainable soil management

Background

- 15.** 80% of England's land – and so a broadly proportionate percentage of its soil – is managed primarily for biomass production by farmers and foresters. Economic pressures and rewards for farmers over the past few decades have not encouraged the management of soils to maintain their long-term sustainability or optimise their role in maintaining clean air and water. This is now changing, most particularly with the inclusion of measures on soil erosion, soil organic matter content and soil structure among the cross-compliance conditions attached to the single payment under the reformed Common Agricultural Policy. Within the forestry sector, forest soil condition is a national indicator of sustainable forest management; this requirement is expanded in guidelines on soil conservation, water and archaeology, and is reflected in the conditions that must be met for both grant aid and certification.
- 16.** Outside of agriculture and forestry, Government needs to engage other important soil users such as the construction and minerals industries to ensure fuller consideration of soil issues in their plans and operations.



There are a number of organisations involved in providing advice on the sustainable management of soils. These range from Government Departments and Agencies to Universities and non-Government organisations. Advice is provided in a variety of formats from published codes of practice and advice guides, to internet based case studies and frequently asked questions, to workshops and site visits.

Actions

- 17.** The following actions have been identified:
- Defra will implement the CAP cross compliance conditions in such a way as to enhance the management of soils in the farming industry. Maintaining good agricultural and environmental conditions, focussed on soil quality, is a condition of receiving the Single Payment. This is a long-term aim. The first milestone is the need to implement cross-compliance measures

during 2005. The second will be the review of progress made and the formulation of detailed forward plans during the Action Plan review in 2006. **(Action 1)**

- Defra will encourage better management of agricultural soils that goes beyond the requirements of the Single Payment, through the provision of incentives under the Agri-Environment Scheme. The first milestone will be inclusion in the entry-level scheme. The second milestone will be consideration, during the current review, of whether incentives to change soil management and/or land use to mitigate losses of soil, nutrients and/or other potential pollutants should be included in

the proposed higher tier scheme. The third will be the review of progress made during the Action Plan review in 2006, leading to a decision on which changes (if any) to pursue during the (by then imminent) renegotiation of the rural development regulation. **(Action 2)**

- Defra will build on the output of its Learning Skills and Knowledge review and the pilots of the Whole Farm Appraisals, to develop within the next twelve months, a strategy for providing farmers and other land managers with practical information and advice for building good soil management into overall farm planning. The strategy will itself include further

Sustainable Soil Management

Soil Management Initiative

The UK Soil Management Initiative Ltd (SMI) is an independent organisation created to promote the adoption, by UK farmers and advisors, of sustainable management systems designed to protect and enhance soil quality. Agronomic and economic benefits may then be accrued while also improving the environment through reduced soil erosion and water pollution. SMI's key successes have been increasing farmer awareness of the problems that inappropriate soil management causes, and providing the opportunity to see or discuss economic and pragmatic solutions to real problems.

One such example was SMI advising a lettuce grower, whose field had experienced severe erosion including the development of a deep gully. His subsequent field operations were impacted by the presence of the gully, and sediment and water routinely ran onto an adjacent road. The grower's approach was to remove the soil from the road, store it until after harvest, and then return it to the field. The grower's normal cultivation practice was to power harrow and drill the sandy seed bed

which had resulted in a soil with a granular structure and little stability. SMI visited the grower and identified that drainage water from a compacted playing field adjacent to the site was flowing onto the field. The SMI advisor suggested that the erosion problem could be resolved by: the installation of an intercepting drainage system; leaving the field in stubble until the lettuce is drilled; the use of a cover crop in winter; chopping and incorporating straw to improve soil structure; and changing to a cultivator drill.



Farmers examining a soil pit during an SMI field workshop

milestones. This is part of a wider programme to assist farmers to adapt to the cross-compliance requirements which will lead to the introduction of a Farm Advisory System in 2007. **(Action 3)**

- Defra will engage with the Department of Trade and Industry, and other professional bodies, to raise standards of sustainable construction practices in respect of soil stripping and avoidance of compaction, and disseminate knowledge throughout the development and construction sectors. We will review progress in 2006. **(Action 4)**
- Defra will engage with key stakeholders across Government Departments and Agencies to seek to deliver improved Training/Career Path Development programmes for Defra-funded conservation and environmental advisors that incorporate soil function and protection techniques. We will review progress in 2006. **(Action 5)**

Soil-friendly policy frameworks

Background

18. Government activities at all levels – national, regional and local – have an enormous impact on the factors that are taken into account in a myriad of decisions. Government bodies have not focused on soil protection as a priority issue in the past. We need to reverse this position. The actions below pursue two broad themes. First, Defra needs to engage other Government departments and bodies to build consideration of soils into their procedures; and secondly Defra needs to work with others to use the levers that currently exist in the interest of soils.

Actions

- 19.** The following actions have been identified:
- Defra will agree a framework with other departments to help ensure that Government's wider policies take proper account of their impact on soils and

recognise soil as strategic national resource. The first milestone is to secure a public commitment to specific action from key bodies within one year. The second will be to develop a wide coalition of parties committed to action in the next version of this Action Plan in 2006. **(Action 6)**

- Defra will work during the Spending Review 2004 process to embed soil protection into its forward strategy and, if appropriate, targets on natural resource protection. The milestones will be those set up to manage the Spending Review 2004 process. **(Action 7)**
- Defra will ensure that during the process of modernising the Government's rural delivery landscape in response to the Haskins report, work on the new integrated agency will have regard to the proper management of soil alongside other requirements. The milestones will match those being elaborated in response to the Haskins report. **(Action 8)**
- Defra will work with the European Commission, UK stakeholders and other member states to try and ensure that the legislative and other outcomes of the EU Soil Thematic Strategy are appropriate to UK soils and the pressures on them. We will review progress in 2005. **(Action 9)**

Better understanding and information on soils

Background

20. We know a considerable amount about soils, the processes which influence them, and the ways that they influence other facets of the environment. England is fortunate in the amount of information that has been collected and analysed on its land and soils, e.g. in the National Soils Inventory, National Land Use Database, Land Cover Maps etc. However, there are still some large gaps in our scientific

knowledge which we need to fill if we are to understand soils better and give managers the best advice, especially in areas where different considerations suggest incompatible requirements. We also need to ensure that what is known is widely available at appropriate scales and can be easily interrogated and interpreted to address local issues.



© Cranfield University at Silsoe

Erosion risk map based on slope, soil texture and carbon levels (LandIS database), where 1 (pale green) = no risk of erosion; 5 (dark red) = high risk of erosion

21. An audit of UK soil research was identified as one of the five key strategic actions of the Draft Soil Strategy for England. This was undertaken in 2002/03 on behalf of Defra and the Scotland and Northern Ireland Forum for Environmental Research. The aim of the audit was to review UK soil research from 1995 to present, to recommend future directions for soil research and identify improvements in the management of soil research so that funders, providers and end users could maximise the value of the research. The audit reports a relatively constant level of funding for soil research (in real terms) of £25-28 m per annum, with the funding balance between soil functions varying over time. Recommendations are made in nine key areas covering the thematic balance of soil research, maintaining the UK research capability, the role of the BBSRC/NERC Soil

Science Advisory Committee and the responsibility for knowledge transfer. Information relating to the audit can be found on the soils research part of the Defra website (as outlined in the useful links section on the inside front cover).

22. Even where good information exists on soils, there is a widespread low level of awareness and understanding of the issues. Policy makers at regional and local level, as well as in central Government often take less account of impacts of policies and actions on soils than they do for air and water. Farmers and other land managers often don't appreciate their role as soil managers and the impacts that their action can have on long-term soil functioning. And the quality and management of soils do not generate the same level of public understanding and debate as other environmental media. A programme of education and awareness is needed so that policies and actions command the support of the general public and are understood and acted on by decision makers both in the Government and on the ground.

Actions

- 23.** The following actions have been identified:
- Defra will work with stakeholders to develop a programme of education and awareness of soil issues among the general public, those working with soils and the professionals that guide, advise or instruct soil managers. We will aim to develop partnerships and plans in 2005 and review progress in implementing those plans in 2006. **(Action 10)**
 - Defra will work with stakeholders to identify the indicators which should be built into a national soil monitoring scheme, in order to develop a scheme which meets both national and European requirements. We will also work with colleagues in Scotland, Wales and Northern Ireland to ensure effective collaboration on

these issues, where appropriate. The first step will be to develop a soil health indicator based on organic matter content as part of the Sustainable Food and Farming Strategy. We will aim to pilot a soil monitoring scheme, in order to test what is practicable, in 2005, and have an agreed initial range of indicators identified by the end of 2006. **(Action 11)**

- Defra will review its soil research programme in the light of the recently completed UK Soils Research Audit and issues identified in this plan to ensure that resources are focused on the most urgent questions. Research results will be published as soon as they are ready. The first milestone is successful completion of the research review by June 2004. **(Action 12)**
- Defra will work with other Government Departments and Agencies (including the Devolved Administrations), the National Soil Resources Institute at Cranfield University (as co-owners of key data sets) and other soil data users, to develop and provide better access to information on soils. The first milestone is to review current arrangements by June 2004. **(Action 13)**

5 Overarching Soil Protection Issues

Protecting Soils in the Planning System and Strategic Environmental Assessment Directive

Background

24. Using land for buildings and transport generally damages soils irreversibly, giving rise to conflicting pressures which are at their most acute in and around towns. The planning system sets a framework for consistent and balanced decision-making that takes account of these pressures, to facilitate sustainable development. Currently, national planning

policies are set out in a series of Planning Policy Guidance notes (PPGs).



Construction of new housing on brown field site

Defra

- 25.** PPG7 (The Countryside) offers a degree of protection to soils that form the Best and Most Versatile (BMV) agricultural land under the Agricultural Land Classification. PPG7 advises planning authorities that where development of agricultural land is unavoidable, they should seek to use areas of poorer quality land in preference to that of a higher quality, except where sustainability considerations suggest otherwise. These considerations might include the importance of the land for biodiversity, landscape and amenity value, heritage interest, accessibility to infrastructure, workforce and markets, and the protection of natural resources including soil quality. While each case is considered on its merits, PPG7 policies might suggest that, in any particular case, the most sustainable outcome may be to build on high-quality agricultural land if (say) it lies close to existing transport links and other infrastructure, or takes development pressure away from important landscapes or habitat.
- 26.** In the context of a wider review of PPG7 and the preparation of a new Planning Policy Statement (PPS) 7 (Sustainable Development in Rural Areas), which should replace PPG7 in summer 2004, Defra is reviewing the BMV land policy. Broadly, the issues are that some BMV

land is being lost to development when there are arguments that this is a valuable resource that should be conserved for future generations. On the other hand, agriculturally valuable soils are afforded protection through the policy, yet there are no Public Service Agreement or other targets for home-grown temperate crops. Soils which underpin natural ecosystems or valued landscapes or cultural features are given rather less protection by the present BMV policy unless they have a statutory designation such as a National Park or Site of Special Scientific Interest. At the same time the issues of dealing with contaminated land are becoming more acute and need to be addressed within the same planning framework.

27. The Government is also undertaking major reform of the planning system through the Planning and Compulsory Purchase Bill. The Bill proposes that statutory Regional Spatial Strategies (RSSs) with at least a 15-20 year timeframe should replace regional planning guidance. The Bill also provides for Local Development Documents (LDDs), including Development Plan Documents, which will replace Local Plans and Unitary Development Plans.



Government Office for the South East and the South East Regional Assembly
Photo: Quarry Products Association

The provision of regional planning guidance

28. RSSs and LDDs will be subject to mandatory Sustainability Appraisal, which will incorporate the requirements of the European Directive on Strategic Environmental Assessment (2001/42/EC). The RSSs, and more particularly the LDDs, will need to ensure that they take account of the Government's objectives and measures for soil protection. Where appropriate these plans can contain policies for the sustainable use of soils. County based minerals and waste development documents provide opportunities to achieve positive policy statements about the sustainable use of soils, especially in case where land is to be returned to agriculture or forestry after minerals extraction.

Actions

29. The following actions have been identified:
- Defra will consider with ODPM and Local Government organisations how to increase understanding of soil issues throughout the Regional and Local Government structure. We will review progress in 2006. **(Action 14)**
 - Defra will work with ODPM to clarify the use of existing mechanisms, including the Building Regulations, to ensure proper consideration of soil implications during the planning and development process. The first milestone will be to examine criteria for designating soils that should be protected from building during the current review of BMV Land policy. Subject to the agreement of other partners, a second milestone will be the issue of revised guidance during 2005. **(Action 15)**
 - Defra will work with ODPM to ensure that soil issues are taken into account, where appropriate, in the creation and implementation of plans at both the regional and local level under the proposed new planning system. The European Directive on Strategic Environmental Assessment, which will apply to these plans, requires consideration of the

potential effects on soil of their proposals. ODPM has issued guidance to planning authorities on the Directive which covers soil issues. We will review progress in 2006. **(Action 16)**

Minimising Contamination of Soils

Background

- 30.** Soil contaminants include metals, hydrocarbons and other organic pollutants, pathogens and substances that acidify and/or enrich soils with nutrients. They can arrive in soils by deposition from the atmosphere, the application of organic manures and sludges, fertilisers and pesticides, and from the application, spillage, leakage or illegal dumping of other chemicals and wastes. Measures to protect and maintain clean air and water can increase the burden on soils, as soils are often the final recipient of contaminants removed from these other media. Once contaminated, soil functions may be impaired, and human health and food quality may also be prejudiced.
- 31.** Part IIA of the Environmental Protection Act 1990 sets a regulatory framework for the identification and remediation of contaminated land; and this is complemented by regulations, for example implementing the Integrated Pollution Prevention and Control Directive, the National Emissions Ceilings Directive, the Waste Framework Directive and the Sewage Sludge Directive, which control pollution from a wide range of sources.
- 32.** The deposition of some atmospheric pollutants such as sulphur dioxide has fallen over the past few decades, but acidification and eutrophication of soils is likely to remain a problem in some areas, and we do not know enough about the quantities and impacts of many soil pollutants to judge their likely long term effects.

Actions

- 33.** The following actions have been identified:
- Defra and the Environment Agency will commission a study in 2004 to look in detail at the different routes of new contamination by heavy metals and persistent organic compounds to all soils, building on existing surveys and reports, including the current EU Concerted Action (AROMIS), to examine the feasibility and wider sustainable development implications of new criteria to protect the long term functioning of soils. **(Action 17)**
 - Defra will work with partners to examine the results from the inventory of metal inputs to soils to consider the importance of mineral fertilisers and the appropriateness of proposed EU legislation on cadmium, to ensure that the necessary controls are in place so as not to impair the long term functioning of soils. We will review progress in 2006. **(Action 18)**



Spreading green waste compost

Henry Doubleday Research Association

- The Environment Agency, Defra, and partners will continue to develop soil guideline values for the protection of human health from contaminants in soil. We will review progress in 2006. **(Action 19)**
- Defra will seek to negotiate the proposed revisions to the Sewage Sludge Directive to ensure that the controls on application of sludge to land recognise the potential benefits of this practice while ensuring that it is carried out in ways which do not impair the long term functioning of soils. In fitting with the European Commission's timetable, we will aim to complete negotiations during 2005. **(Action 20)**
- Defra will seek, during negotiations on the proposed Bio-Waste Directive, to agree arrangements which encourage the return of organic material to soil, but in ways which respect the natural diversity of soils and do not impair their long term functioning. Subject to the European Commission's timetable, we will aim to complete negotiations during 2005. **(Action 21)**
- Defra, the Environment Agency and partners will work together to deliver changes to the Waste Management Licensing Regulations to ensure the application of licensed and exempt wastes does not impair the long term functioning of soils. The changes are expected to be introduced in 2004. **(Action 22)**
- Defra will work with partners to seek to ensure the effective enforcement of recent changes to regulations on permissible concentrations of metals in animal feeds. We will review progress in 2006. **(Action 23)**



Defra photo library

- Defra will consider whether controls on the use of metal containing veterinary medicines are appropriate to balance environmental and livestock interests and how they are enforced. A report will be prepared by 2006. **(Action 24)**
- Defra and the Environment Agency will review and evaluate the impacts of contaminants mobilised and transported by floodwaters to gain a better understanding of the issue of diffuse pollution of soils from this source. We will aim to complete the review by 2006. **(Action 25)**
- Defra will ensure that appropriate measures are in place or in train to achieve the requirements for 2010 as set out in the National Emissions Ceilings Directive and Gothenburg Protocol, and will continue to assess the case for further action beyond these targets to protect soils. International review of the Directive is expected in 2005, to review the measures and targets. **(Action 26)**

- Defra and the Environment Agency will seek to explore with industry the need for technical material to assist in considering the impact on and benefits to soil functional capacity from remediation. We will report progress in 2006. **(Action 27)**
- Defra will work with partners to examine by 2006 all the current data sources and inventories of the burden on soil resource from diffuse sources and assess the implications of the results for policy and research. **(Action 28)**
- Defra will work with the veterinary medicines industry and other partners to gain a better understanding of the potential impacts of the active ingredients of veterinary products and their metabolites on soil biodiversity. We will review progress in 2006. **(Action 29)**

Predicting and Adapting to the Impacts of Climate Change on Soils

Background

34. There is concern over the impact of climate change on the ability of soils to maintain their functional capacity. Climate change is likely to modify the key soil processes that underpin the capability of soil to perform its many functions. This could have significant implications for agriculture, forestry, the environment, civil engineering and the preservation of cultural heritage.
35. Soil processes are influenced directly by temperature, rainfall and changes in atmospheric carbon dioxide, particularly as these affect soil ecology and organic matter. This in turn affects soil structure, water regimes and plant growth. In addition, rainfall intensity, duration and amount could alter soil erosion rates.
36. Research is required to better understand the impact of climate change on the ability of soil to perform its many functions.

Actions

37. The following actions have been identified:
 - The UK Climate Change Impacts Programme (UKCIP) and Defra should establish in 2004 a scoping study of the impacts of climate change on English soils. This should cover non-agricultural, as well as agricultural soils and identify vulnerable soil types. **(Action 30)**
 - Following on from the scoping study, Defra and partners will undertake further research including the development of tools to manage the risks to soils from climate change. We will review progress in 2006. **(Action 31)**

6 Soils for Agriculture and Forestry

Background

38. Sustainable rural development is a key pillar of Government policy that envisages a competitive agricultural sector responsive to the market place. It also requires that the environmental impact of agriculture and forestry will be taken into consideration and biodiversity indicators such as populations of farmland birds will improve. An overall increase in tree cover is foreseen as a contributor to timber production

and environmental enhancement. Organic farming is an alternative agriculture, which has been proposed as a solution to problems associated with inputs of chemical fertiliser and pesticide. Organic farming systems rely on the management of soil organic matter to enhance the biological and physical properties of soil, in order to optimise crop production. Soil management is used to control the supply of nutrients to crops, and subsequently livestock, and to suppress weeds, pests and diseases. Organic systems utilise longer-term management strategies such as crop rotations designed for nutrient cycling and conservation.

Working with farmers to improve soil management

Norfolk Arable Land Management Initiative

The Norfolk Arable Land Management Initiative (NALMI) is working with farmers and others in mid Norfolk, to develop ways of improving the economic, environmental and social fabrics of this area through sustainable land management. One of the first research projects carried out through NALMI was an assessment of the soils in the area. The report stressed the lack of structural robustness of soils and warned against inappropriate cultivation timing, with an increased need for balance between growing profitable crops and preventing further damage to soil structure.

Soil problems can be in competition with a wide range of other issues influencing farm management decisions. However, farmers in the NALMI area recognise soil as a key resource; and they have been keen to become involved in NALMI to learn more about soil science and soil health. Soil advisors visited

farmers in the NALMI area, to assess their soils and suggest ways of adapting their management practices to best suit the soil type. A number of components relating to soil management were discussed with farmers, from soil structure, drainage and erosion, through to organic matter and climate change. For example, when examining soil structure, farmers were provided guidelines concerning the dangers of cultivating under inappropriate conditions – this generated high interest, as farmers were willing to produce a good crop while protecting their soil resource.



Norfolk Arable Land Management Initiative

- 39.** These objectives require soil to be in a suitable condition for plant growth and also to be in a physical state that will resist run-off and erosion. In the long term erosion can reduce the productive capacity of soils but in the short term it can also have serious detrimental effects off-site where material is deposited in watercourses and on roads.
- 40.** Inappropriate soil management by land managers can lead to a loss in soil organic matter, and/or degradation of soil structure. These changes in turn can give rise to loss of productive capacity through loss of water holding capacity, loss of machinery days and loss of nutrients. There can also be significant off-site impacts due to increases in water run-off, through lowered infiltration rates, and increased soil erosion leading to losses of sediment, nutrients and pesticide to water (see Chapter 7). There is particular concern over levels of organic matter in some soils under tillage, because of the links between organic matter and soil structure and erosion. Erosion is also a concern on upland peat soils, often associated with high stocking densities and potentially exacerbated by burning practices in some cases.



Severe gully erosion, Bedfordshire

- 41.** Forestry is sometimes beneficial to soils and could be viewed as a strategic means of protecting soils, but it can have a negative impact if good practice is not adhered to,

for example during cultivation and timber harvesting. Good practice is particularly important at ancient woodland sites where landforms and archaeological remains, which have been lost from the farmed countryside, frequently survive.



Defra

- 42.** Information and advice to farmers and foresters on soil management is dispersed among many schemes and organisations. Currently for farmers these include initiatives co-ordinated by Defra (Whole Farm Planning), Environment Agency (Environmental Management System for Farms), farm assurance schemes such as those operating under the British Farm Standard's 'Little Red Tractor' logo, and the organic farming organisations.
- 43.** Poor soil management under farming and forestry needs to be defined, discouraged and, where appropriate, penalised. Conversely farmers and foresters should be rewarded, as appropriate, for delivering public goods through good soil management that goes beyond sound economic practice and legal minima. Soil management guidelines, which already exist for forestry, need to be agreed and information and advice provided in ways which better assist and encourage good decision-making.
- 44.** Research is needed to better define the relationships between farm soil management

John Quinton, Lancaster University

practice, physical characteristics, functions of soils and the impacts e.g. on diffuse water pollution and flooding.

45. The condition of soils under agriculture should be monitored and appropriate targets for improvement developed in the light of further research.

Actions

46. Many of the actions arising in this section are seen as "Core Actions". In addition the following specific actions have been identified:

- Defra will review the Code of Good Agricultural Practice for the Protection of Soil and amend or replace, as required, by 2005. **(Action 32)**
- Defra will work with the farming industry to examine current and/or novel means of encouraging voluntary change in soil management. We will review progress in 2006. **(Action 33)**
- Defra will work with partners to fund further research on the relationships between farm soil management practice, physical characteristics, functions of soils and the impacts e.g. on diffuse water pollution, and flooding. We will review progress in 2006. **(Action 34)**
- With the Forestry Commission, Defra will examine the scope for inclusion of soil issues in the England Woodland Grant Scheme, as work progresses during 2004. **(Action 35)**

7 Interactions between Soils, Air and Water

Background

47. Soil provides the essential links between the components that make up our environment. These components include the atmosphere,

surface and ground waters, above-ground habitats and human activities. Managing and protecting soil is therefore an essential part of protecting the environment as a whole.

48. Soil forms these links through the exchange of gases, such as carbon dioxide, with the atmosphere; through its role in regulating the flow of water and rainfall in the water cycle; through its role in the degradation and storage of organic matter; and through the storing, degradation and transformation of solid materials, such as nutrients and contaminants that are applied through animal and human activities or deposited by flood waters and aerial deposition. Protecting the capacity of soils to store, transform and regulate these processes is critical to environmental sustainability. Loss of this capacity can also have an economic impact through increased run-off with its potential to increase local flood risk, water pollution and climate change.
49. The ways that soils are managed can have significant impacts on water quality and on the speed and pathways that water flows in a catchment. Surface waters and groundwater are closely integrated in the water cycle and it is important that soil is managed in a way which protects both sources.



Water channel with high sediment load

The Upper Avon Landcare Partnership Project

Environment Agency

'Landcare' is a partnership project that has been led by the South Wessex Area of the Environment Agency since 1994. The Environment Agency and English Nature have jointly funded the project, which involves a large number of local and national partners. Landcare's aim has been to work with farmers and agronomists to determine practical solutions to deal with excessive runoff from agricultural land into the River Avon, upstream of Salisbury.

Salmon numbers have fallen sharply in the catchment in recent years, and surveys have revealed that egg survival is poor because there is too much soil sediment in river gravels. There is widespread poor soil structure in the upper Avon catchment. In particular, the surface of sandy soils often develops a hard cap, which can cause excessive runoff, leading to local flooding and mud on roads and causing pollution.

To raise awareness about soils and problems associated with runoff in the Avon catchment, a number of demonstration farms were

established. Field plots on these farms showed that improved management can substantially reduce runoff through maintaining a good soil structure that readily absorbs rainfall. Farmers and advisers are now taking steps to improve the management of soils at high risk. For example, cereal crops are to be established in early autumn so that crop cover is sufficient to protect the soil over the winter; and the surfaces of seedbeds are being left coarse, to prevent capping. These measures aim to improve soil husbandry across the area.



Environment Agency

Salmon and sensitive river life require clear water with low input of soil sediment

50. Increased sediment in watercourses can damage the spawning grounds of trout and salmon and the phosphorus and pesticides that can attach to fine sediments give rise to algal blooms and other water quality problems. The Habitats Directive requires that measures must be taken to ensure that the habitats and species for which sites (Special Protection Areas (SPAs) and Special Areas of Conservation (SACs)) have been designated are maintained in a favourable state or that action is taken, where necessary, to restore them. The Water Framework Directive takes a catchment-based approach to improving the ecological and water quality status of controlled waters. It requires a programme of measures to be implemented to

tackle issues that are contributing to the failure to meet these aims. It is clear that measures to protect soil and ensure good management in order to reduce diffuse pollution from land will be a major contributor to delivering the objectives of these pieces of legislation.



David Scholefield, IGER

The use of fencing to keep animals away from the river bank, reducing erosion of soil into the river.

- 51.** Groundwater is an extremely important source of clean water and has a key role in the supply of drinking water and in maintaining the flow and quality of rivers. It is highly vulnerable to leaching of excess nutrients, pesticides or other chemicals from the soil and, once polluted, is difficult, if not impossible, to remediate. Its slow rate of flow and low microbiological activity mean that self-purification often takes decades. Depending on their texture and structure, soils can play an important role in attenuating leaching of substances to groundwater and good management of soil needs to take this important role into account. Water infiltration is reduced in soils that are compacted or capped and this can give rise to increased overland water flow, which increases the risk of flooding and the export of sediment to surface water and reduces the soil's capacity to hold water and attenuate pollutants.
- 52.** Poor soil management that could increase flood risks or lead to decreased air and water quality needs to be defined, discouraged and, where appropriate, penalised. Conversely, soil managers should be rewarded, where appropriate, for delivering public goods through good soil management that goes beyond sound economic practice and legal minima. Soil management guidelines need

to be agreed and information and advice provided in ways which better assist and encourage good decision-making.

- 53.** Research is needed to better define the relationships between soil management practice and physical characteristics, functions of soils and, ultimately on the impacts e.g. on diffuse water pollution, and flooding.

Actions

- 54.** Many of the actions arising from this section appear as "Core Actions". The following additional actions have been identified:
- Defra will work with partners to re-examine, by 2005, current advice on soil management and revise it, as appropriate, to take account of the potential impacts of inappropriate management on flooding, aquifer recharge and water and air quality. **(Action 36)**
 - Defra will complete research already underway to provide further understanding of the role that land and soil management might play in flood management at water catchment level and take account of the results as they become available. We will review progress in 2006. **(Action 37)**
 - Defra will research the capacity of different soils to attenuate substances in relation to the protection of groundwater. We will review progress in 2006. **(Action 38)**
 - Defra will work with the Environment Agency and other partners to continue to examine during 2004 a range of policy options for the control of sediment and soil-bound nutrient losses to water. The Government will ensure that soil management is reflected in the Programme of Measures to be introduced under the Water Framework Directive and that these measures are tailored to the soils present within catchments. **(Action 39)**

8 Soils and Biodiversity

Background

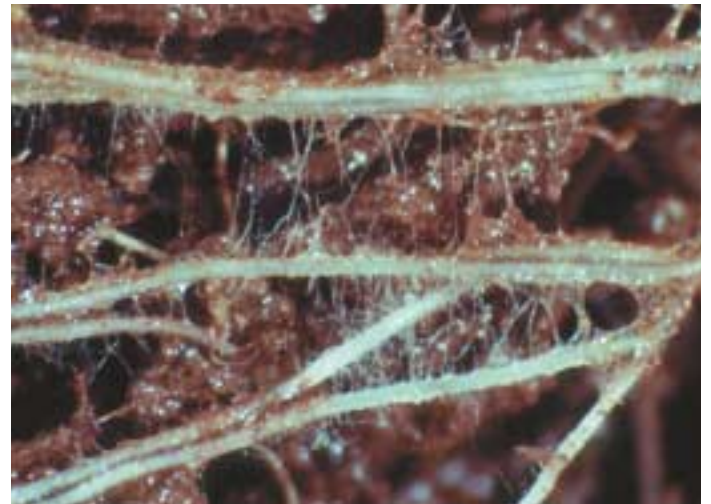
- 55.** Soils contain a very diverse biota. We are beginning to describe and quantify the extent of this diversity in detail but still do not have a complete inventory of the diversity of a single site or soil type worldwide. In addition to the organisms which spend their full life cycle in soils, there are many for which a soil based phase is a crucial part of their life cycle.
- 56.** Soil biodiversity is vitally important in maintaining soil functions and sustainable systems as many of the key process underpinning these functions are mediated by the soil biota. Fungi, bacteria and larger organisms, particularly earthworms, play a crucial role in the generation and stabilisation of soil structure which influences rooting, aeration and drainage.



Soil fungus under Scanning Electron Microscope

- 57.** Soils are the major terrestrial store of carbon and the sequestration or release of carbon in soils is the result of the balance between inputs of plant litter to soil and the breakdown of that litter by the soil biota.
- 58.** The provision of full inventories of soil biodiversity is still not practical, despite the recent advances in molecular techniques, and is not the key consideration in terms of soil

functions and sustainable systems. In this latter context, the relevant consideration is the functional diversity of the soil biota – the key interacting groups, or species, of biota required to ensure the continuing delivery of various soil functions; the maintenance and functioning of specific ecosystems or habitats, to optimise flexibility for future land uses; and to provide resilience to environmental stresses.



Roots of plantain (*plantago lanceolata*) and fungal hyphae in grassland soil. Image width \approx 20 mm

- 59.** Evidence exists to show that both acid and nitrogen deposition has resulted in a change in the biodiversity of soils and that these soil changes lead to changes in above ground diversity. Similarly, soil biodiversity can be reduced in soils contaminated with heavy metals and/or persistent organic compounds, while, populations of some soil biota can show dramatic increases. It is also known that changes in land use or management can lead to marked changes in the soil biota and overall biodiversity which can impact on biologically mediated processes and soil functions. Despite this important body of work, much remains to be done to quantify the roles of soil biodiversity in soil function and the impacts of human activity on those roles.
- 60.** The long-term aim is to maintain soil conditions conducive to diverse soil biota and functional soil systems. Initially, the need is to gather the

Colin Campbell, Macaulay Institute

Karl Ritz, National Soil Resources Institute

evidence to enable the development of robust indicators and soil management guidelines to monitor and maintain functional biodiversity in soils.

Actions

- 61.** In addition to the core actions, the following have been identified:
- Defra and partners will review and synthesise by 2005 the published material on links between biodiversity, pollution, climate change, contamination and land management with the aim of identifying an initial list of biological and biochemical indicators of functional diversity. **(Action 40)**
 - Defra will consider with English Nature and other partners the benefits which might arise from the establishment of a national series of benchmark sites for soil biodiversity, which could also include a cross reference with the Regionally Important Geological and Geomorphological Sites (RIGS) register. We will review progress in 2006. **(Action 41)**
 - English Nature will prepare and publish, in 2005, a position statement on the role of soil management and protection within statutory nature conservation sites. **(Action 42)**
 - English Nature will publish guidance in 2005 on the use of soil information in the restoration of wildlife and wildlife habitats. **(Action 43)**

National assessment of soil biodiversity

Centre for Ecology and Hydrology, Lancaster

As part of Countryside Survey 2000 the MASQ (monitoring and assessing soil quality) initiative carried out the first nationwide assessment of soil biodiversity, to address the remarkable lack of information regarding the distribution and occurrence of different soil organisms in the British countryside.



Fauna from grassland soil

Soil invertebrates and microbes were identified and counted in soil samples taken from over 1200 locations using relatively simple and cost-effective techniques. From this information, patterns have been discerned in the occurrence and diversity of these soil organisms within the countryside, reflecting differences in habitat, soil type or other properties of soils e.g. pollutants, carbon content, pH or texture. This knowledge is elementary to a better understanding of the relationships between the biological, chemical and physical components of soils and thus a more holistic view of soil quality. In the process, species of soil mites have been unearthed that are new to science or new

records for Britain – highlighting the significance, but poor knowledge, of the soil as a reservoir of terrestrial species. The MASQ data are currently being deployed in a wide range of projects ranging from characterising the diversity of soils under different habitats to developing biological indicators of soil quality. Ultimately, MASQ proved the feasibility of incorporating biological assessments into large-scale soil monitoring programmes.

This project was carried out by the Centre for Ecology and Hydrology on behalf of Defra, the Environment Agency, Scottish and Northern Ireland Forum for Environmental Research and the Natural Environment Research Council.

9 Soils, the Landscape and Cultural Heritage

Background

62. Soils are a vital part of the landscape and our cultural heritage. They must be considered as part of the totality of the landscape and the broader historic environment. The historic landscape results from a long history of different and continually changing patterns of land use, including the mosaic of settlements and fields, buildings, walls, hedges, copses and woods, streams and marshes, with their native plant communities and animals. These components, together with individual buildings and monuments, create local identity and character that is valued by visitors and by communities. Importantly, landscape is about the relationship between people and place. This value – social as well as economic – is often under-estimated. It can be seen not only in the obvious economic importance of tourism, but also in higher property values.

Protecting buried heritage

Centre for Archaeology, English Heritage

The continued survival of buried archaeological remains under arable farming is a long-running concern. Areas where cultivation depth has increased are of particular concern, caused for example by the introduction of new machinery or crops, or where existing cultivation practice is reaching greater depths because of soil erosion or compaction.

English Heritage has been piloting a new technique to monitor ploughing depth by burying layers of recycled coloured glass chips in test squares across threatened sites; the glass is chosen because it is non-toxic, long lasting, highly visible and unmistakably different from materials used in the past. Disturbance to a specific depth is detected by the appearance of glass chips on the surface of the field; different

colours of glass buried at different depths can be used to detect variations in the depth of cultivation disturbance across a field.



Glass depth disturbance indicators in the plough soil



© Cornwall County Council

A pre-historic agricultural landscape at West Penwith

- 63.** Soils may cover the remains of buildings, burials and other archaeological features and include a variety of artefacts and other materials resulting from human activity. This can include features from dumps of re-distributed natural soils to layers built up through human activity and deposition of refuse. Threats to soil and soil quality endanger the sustainability and protection of the historic landscape, and damage archaeological evidence preserved within the soil irreversibly.
- 64.** Landscape is dynamic – stopping the clock is not an option. Policies to conserve soils and the culture and landscape they underpin must be aware of the process of change and adapt to a definition of acceptable change. Our cultural heritage is fragile: recent research estimates that 65% of monuments in arable areas are at medium or high risk of damage, 9020 monuments in England have been damaged by drainage and 2180 by conversion of pasture to arable. Tourism can have both positive and negative impacts.
- 65.** Currently, there is poor awareness of the importance of soils and their heterogeneity in heritage and landscape, partly because of the concealed nature of the archaeological resource, and partly because of a lack of relevant soil quality indicators.

Countryside Stewardship

Whitcliff Deer Park in South Gloucestershire is part of the Berkeley Estate. Ten years of Countryside Stewardship has helped to preserve the park's medieval landscape and archaeological remains, and a new ten-year agreement has recently been signed.

The agreements cover 126 hectares and have specific arrangements for: conserving and encouraging native plants and animals; conserving and enhancing the landscape; conserving the historical interest; and increasing public enjoyment of the area. The agreement sets out management principles that relate directly to soil quality and conservation including: prohibition on use of inorganic or organic fertiliser, animal manure, slurry, lime, slag, herbicides or other pesticides; and no ploughing or other cultivation activities. This regime has supported the introduction of native British grasses such as Common Bent and Small-leaved Timothy on a 3.7 hectares area. In addition, grazing must be regulated to ensure the year's grass growth is removed without damaging the sward, anthills, or archaeological remains. Measures to protect archaeology include a ban on the use of metal detectors on sites of archaeological interest, without the written consent of Defra/English Heritage.



Defra

Medieval landscape at Whitcliff Deer Park

66. In the short-term the objective is to improve understanding of the threats and impacts to soils supporting heritage and landscape; and to define and accommodate acceptable and necessary change within the framework of sustainability.

Actions

67. In addition to the "Core Actions", the following actions have been identified:
- English Heritage will monitor the state of the landscape and historic environment (e.g. through the State of the Historic Environment Reviews and surveys such as the Monuments at Risk Survey) and, where needed, develop new indicators. We will review progress in 2006. **(Action 44)**
 - English Heritage will research into the threats and mechanisms of loss and degradation of soils supporting historic landscapes, as appropriate, including the impacts of drainage/abstraction/dewatering; ploughing and erosion; agricultural change; and coastal erosion and realignment. We will review progress in 2006. **(Action 45)**
 - English Heritage will improve understanding of soils and the historic landscape through research on the importance of landscape and the historic environment to the economy (through tourism) and to quality of life. We will review progress in 2006. **(Action 46)**

10 Soils in Minerals Extraction, Construction and the Built Environment

Background

68. Within the built environment soils perform a number of vital functions. They are an essential component in many waste treatment systems for built land uses – sewage (septic

tanks/package plants and their associated 'soakaways'), highway run off, industrial effluent and site run off, farm effluent and site run off, etc. Many of these soil soakaway uses are in rural/semi-rural areas, and though designed to cure point source pollution, can lead to problematic diffuse source pollution if not properly sited and managed.



Soil as a platform for construction

69. The performance and safety of all our domestic and commercial electricity systems depends on soil conductivity potential for earthing.
70. Some soil functions within built areas, such as aquifer recharge and control of flash runoff from built areas and hard surfaces – as exemplified in the Sustainable Urban Drainage Systems issue – will be considered as part of the planning system processes. However, there is also a wide range of urban and urban-fringe land uses for which soil function and soil condition is a very important issue – for gardens, parks, public open space, allotments, and 'ancillary' or marginal land.
71. Problems can also arise where soil stability is not fully investigated in construction proposals and works. The pollution of water resources by soil degradation/erosion caused by construction activities can be a serious issue for water companies – with the associated increased costs

of treatment – as well as for the Environment Agency which has responsibilities for protecting watercourses.

72. The impact on soils of minerals extraction can be minimised by ensuring observance of good practice guidance on soil handling issues published by MAFF in April 2000. Defra has been promoting this guidance to minerals planning authorities and to operators. Minerals Planning Guidance note 7 provides guidance on soils for restoration and work is also well advanced on further good practice guidance intended to help raise the standard of restoration and after-use at minerals sites. In those cases where land is not to be returned to agricultural or forestry after use, soils surplus to requirements for site restoration including any necessary landscaping work, should be re-used as effectively as possible. Concerns are emerging that good quality soils may be lost where sites are to be flooded for amenity use, or where a particular habitat creation could be achieved without using such soils.
73. Impacts of mineral extraction on soils can also be reduced by maximising working on existing sites, consistent with good practice and economic limits, thus reducing demands for new sites to be brought into operation until really needed.
74. Minerals Planning Guidance (note 13) on peat extraction seeks to conserve peatland habitats and prevent the destruction of archaeological remains while continuing to supply the horticultural industry and encouraging the development and use of alternatives.
75. The objective for this part of the Soils Action Plan is to reduce the impact of the construction and development sectors on the long-term functioning of soils. Additionally, there is a continuing sustainable development objective to minimise the wider impacts of minerals extraction. Successful outcomes depend on integration of economic, environmental, and social considerations. The conservation of soils as a natural resource is part of the overriding

Choosing underground pipes appropriate to soil types

National Soil Resources Institute, Cranfield University at Silsoe

A number of environmental risks are associated with pipeline installation. To minimise these, and assist in the safe management of underground assets, information and understanding on a range of ground conditions, including the spatial distribution of soil properties into which pipes are to be laid, should be sought. Such understanding can indicate safe land working periods at the planning stage so that soil structural degradation can be minimised. Potential risks to the water environment from soil erosion, turbid water and increased nutrient content can also be addressed and limited.

Pipeline integrity is compromised if the effects of naturally corrosive soils or areas susceptible

to clay shrinkage are not identified and minimised. Adopting simple measures, such as finishing pipes with chemically resistant coatings or using effective sand bedding in areas with a perceived risk, can greatly extend the natural life of pipelines installed in challenging environments.



Pipe materials appropriate for local soil conditions

objective, while continuing to supply the raw material and infrastructure needs of the nation.

Actions

76. In addition to "Core Actions", the following have been identified:

- Defra will promote with industry better understanding of the potential benefits to sustainable construction through specific tests and British Standards for soil use – e.g. soakaway function and infiltration tests; construction specifications; electrical earthing tests and specifications; good practice guide in respect of soils and subsidence. We will aim to have developed and implemented specific measures in 2005. **(Action 47)**
- Defra will continue to support the development of recycling and composting to provide alternative growing media and soil conditioners to peat, and to report on progress in 2006. **(Action 48)**
- Defra will examine by 2005 the practicality of introducing and monitoring a programme to integrate minerals and waste policies which will increase the recycling of materials for re-use or for restoration and so reduce the need for "wet" or low standard restorations due to lack of fill material. **(Action 49)**
- Defra will consult the Environment Agency and local planning authorities with the objective of devising a proportionate and targeted programme to improve monitoring of use of soils in relation to built development, compliance with soil protection conditions of planning permissions and for reducing off-site impacts. We will report progress in 2005. **(Action 50)**

- Defra will continue to work closely with ODPM, minerals planning authorities, and the industry, in promoting and developing practical guidance on minerals site restorations and aftercare programmes. We will report progress in 2005. **(Action 51)**

11 Measuring and Reporting Progress

- 77.** The purpose of this plan is to set in train actions that will lead to measurable progress in soil management and protection. Each of the actions has a named organisation that will lead and a date by which progress will be reviewed. The Defra soils team will be responsible for measuring and reporting progress on all fifty-one actions. In 2005 Defra will report progress on the actions in this plan. In 2006, we will review the plan, bank achievements to date and work with partners as before to draw up a Second Action Plan with a longer forward vision. **(Action 52)**

1 Organisations represented on the Soil Action Plan Steering Group

- Biotechnology and Biological Sciences Research Council/Natural Environment Research Council Soil Science Advisory Committee
- British Society of Soil Science
- Campaign to Protect Rural England
- Country Land and Business Association
- Countryside Agency
- English Heritage
- English Nature
- Environment Agency
- Forestry Commission
- Forum for the Future
- Henry Doubleday Research Association
- Linking Environment And Farming
- National Farmers Union
- National Soil Resources Institute
- National Trust
- Office of the Deputy Prime Minister
- Royal Society for the Protection of Birds

2 Organisations that provided additional input to the Soil Action Plan

- Agricultural Industry Confederation
- Anglia Polytechnic University (Applied Geography)
- Biotechnology and Biological Sciences Research Council
- British Association of Landscape Industries

- British Geological Survey
- British Grassland Society
- British Institute of Agricultural Consultants
- British Sugar
- British Waterways
- Centre for Ecology and Hydrology
- Chartered Institute of Water and Environmental Management
- Construction Industry Research and Information Association
- Composting Association
- Council for British Archaeology
- Exeter University (Geography, Archaeology and Earth Resources)
- Growing Media Association
- Hampshire County Council
- Highways Agency
- Home Grown Cereals Authority
- Horticulture Research International
- Institute of Field Archaeologists
- Institute of Grassland and Environmental Research
- Institute of Professional Soil Scientists
- Joint Nature Conservation Committee
- National Association for Areas of Outstanding Natural Beauty
- Reading Agricultural Consultants
- Rothamsted Research
- Royal Agricultural College
- Silsoe Research Institute
- Soil Association
- Soil Management Initiative
- UK Climate Impacts Programme

Summary Table of Actions

| Action Summary | Milestone |
|--|---|
| Core Actions: Sustainable soil management | |
| 1. Defra will implement the CAP cross compliance conditions in such a way as to foster basic good management of soils in the farming industry. | Implementation of cross-compliance measures during 2005. |
| 2. Defra will encourage better management of agricultural soils that goes beyond the requirements of the Single Payment, through the provision of incentives under the Agri-Environment Scheme. | Inclusion in the entry-level scheme. |
| 3. Defra will develop a strategy for providing farmers and other land managers with practical information and advice for building good soil management into overall farm planning. | Strategy developed by end 2004. |
| 4. Defra will engage with DTI and other professional bodies to raise standards of sustainable construction practices, and disseminate knowledge throughout the development and construction sectors. | Review progress in 2006. |
| 5. Defra will engage with key stakeholders across Government Departments and Agencies to seek to deliver improved Training/CPD programmes for Defra-funded conservation and environmental advisors that incorporate soil function and protection techniques. | Review progress in 2006. |
| Core Actions: Soil-friendly policy frameworks | |
| 6. Defra will agree a framework with other departments to help ensure that Government's wider policies take proper account of their impact on soils and recognise soil as strategic national resource. | Secure a public commitment to specific action from key bodies in 2005. |
| 7. Defra will work during the Spending Review 2004 process to embed soil protection into its forward strategies and, if appropriate, targets on natural resource protection. | The milestones will be those set up to manage the SR2004 process. |
| 8. Defra will ensure that, during the process of reconstructing the Government's rural delivery landscape in response to the Haskins report, all new and reconstructed agencies concerned with land management issues have regard to the proper management of soil alongside other requirements. | The milestones will match those being elaborated in response to the Haskins report. |
| 9. Defra will work with the European Commission, UK stakeholders and other member states to try and ensure that outcomes of the EU Soil Thematic Strategy are appropriate to UK soils and the pressures on them. | Review progress in 2005. |
| Core Actions: Better understanding and information on soils | |
| 10. Defra will work with stakeholders to develop a programme of education and awareness of soil issues. | Develop partnerships and plans in 2005. |
| 11. Defra will work with stakeholders to identify indicators which should be built into a national soil monitoring scheme, aiming to develop a scheme meeting national and European requirements. | Aim to pilot a soil monitoring scheme in 2005. |

| Action Summary | Milestone |
|--|---|
| Core Actions: Better understanding and information on soils – <i>continued</i> | |
| 12. Defra will review its soil research programme in the light of the recently completed UK Soils Research Audit, and issues identified in this plan, to ensure that resources are focused on the most urgent questions. | Successful completion of the research review by June 2004. |
| 13. Defra will work with other Government Departments and Agencies (including the Devolved Administrations), and other soil data users, to develop and provide better access to information on soils. | Review current arrangements by June 2004. |
| Overarching Soil Protection Issues: Protecting Soils in the Planning System and Strategic Environmental Assessment Directive | |
| 14. Defra will consider with ODPM and Local Government organisations how to increase understanding of soil issues throughout the Regional and Local Government structure. | Review progress in 2006. |
| 15. Defra will work with ODPM to clarify the use of existing mechanisms, including the Building Regulations, to ensure proper consideration of soil implications during the planning and development process. | Examine criteria for protecting soils from development, during the review of “Best and Most Versatile Land” policy. |
| 16. Defra will work with ODPM to ensure that soil issues are taken into account, where appropriate, in the creation and implementation of plans at both the regional and local level under the proposed new planning system. | Review progress in 2006. |
| Overarching Soil Protection Issues: Minimising Contamination of Soils | |
| 17. Defra and the Environment Agency will commission work to assess routes of contamination by heavy metals and persistent organic compounds to soils, and to examine the feasibility of new criteria to protect the long term functioning of soils. | Report to be commissioned in 2004. |
| 18. Defra will work with partners to examine results from the inventory of metal inputs to soils, to ensure that necessary controls are in place to retain the long term soil functioning. | Review progress in 2006. |
| 19. The Environment Agency, Defra and partners will continue to develop soil guideline values for the protection of human health from contaminants in soil. | Review progress in 2006. |
| 20. Defra will seek to negotiate the proposed revisions to the Sewage Sludge Directive to ensure that controls on the application of sludge to land recognise potential benefits, while ensuring that sludge does not impair the long term functioning of soils. | In keeping with the EC timetable we aim to complete negotiations during 2005. |
| 21. Defra will seek, during negotiations on the proposed Bio-Waste Directive, to agree arrangements which encourage the return of organic material to the soil (respecting natural soil diversity and retaining long term functions). | Aim to complete negotiations during 2005 (subject to EC timetable). |
| 22. Defra, the Environment Agency and partners will work to deliver changes to Waste Management Licensing Regulations to ensure that application of licensed and exempt wastes does not impair the long-term soil functions. | Changes expected in 2004. |
| 23. Defra will work with partners to ensure the effective enforcement of regulations on permissible metal concentrations in animal feeds. | Review progress in 2006. |

| Action Summary | Milestone |
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| Overarching Soil Protection Issues: Minimising Contamination of Soils – <i>continued</i> | |
| 24. Defra will consider whether controls on the use of metal-containing veterinary medicines are appropriate to balance environmental and livestock interests and how they are enforced. | Report by 2006. |
| 25. Defra and the Environment Agency will review and evaluate the impacts of contaminants mobilised and transported by floodwaters, on diffuse pollution of soils. | Complete the review by 2006. |
| 26. Defra will ensure that appropriate measures are in place or in train to achieve the requirements for 2010 as set out in the National Emissions Ceilings Directive and Gothenburg Protocol. | International review of the Directive is expected in 2005. |
| 27. Defra, the Environment Agency and partners will seek to establish criteria for the assessment of the impact on and benefits to soil functional capacity from remediation. | Report progress in 2006. |
| 28. Defra will work with partners to examine current data sources of the burden on soil resource from diffuse sources; and assess the implications of the results for policy and research. | Report by 2006. |
| 29. Defra will work with the veterinary medicines industry and other partners to gain better understanding of the potential impacts of veterinary products on soil biodiversity. | Review progress in 2006. |
| Overarching Soil Protection Issues: Predicting and Adapting to the Impacts of Climate Change on Soils. | |
| 30. The UK Climate Change Impacts Programme (UKCIP) and Defra will establish a scoping study of the impacts of climate change on all soil types in England | Study to be established in 2004. |
| 31. Following on from Action 30, Defra and partners will undertake further research, (including development of tools to manage the risks to soils from climate change). | Review progress in 2006. |
| Soils for Agriculture and Forestry | |
| 32. Defra will review the Code of Good Agricultural Practice for the Protection of Soil. | Amend or replace, as required, by 2005. |
| 33. Defra will work with the farming industry to examine current and/or novel means of encouraging voluntary change in soil management. | Review progress in 2006. |
| 34. Defra will work with partners to fund further research on the relationships between farm soil management practice, physical characteristics, functions of soils and subsequent impacts. | Review progress in 2006. |
| 35. With the Forestry Commission, Defra will examine the scope for inclusion of soil issues in the England Woodland Grant Scheme. | During progression of scheme in 2004. |

| Action Summary | Milestone |
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| Interactions between Soils, Air and Water | |
| 36. Defra will work with partners to re-examine current soil management advice, to take account of the potential impacts of inappropriate management on flooding, aquifer recharge and water and air quality. | Examine and revise, where appropriate, by 2005. |
| 37. Defra will complete research, and take account of results, to provide further understanding of the role that land and soil management might play in flood management at water catchment level. | Review progress in 2006. |
| 38. Defra will research the capacity of different soils to attenuate substances in relation to the protection of groundwater. | Review progress in 2006. |
| 39. Defra will work with the Environment Agency and other partners to continue to examine a range of policy options for the control of sediment and soil-bound nutrient losses to water. | Examine policy options during 2004. |
| Soils and Biodiversity | |
| 40. Defra and partners will review and synthesise the published material on links between biodiversity, pollution, contamination and land management, to identify an initial list of biological and biochemical indicators of functional diversity. | Initial list of indicators produced by 2005. |
| 41. Defra will consider with English Nature and other partners the benefits which might arise from the establishment of a national series of benchmark sites for soil biodiversity. | Review progress in 2006. |
| 42. English Nature will prepare a position statement on the role of soil management and protection within statutory nature conservation sites. | Statements published in 2005. |
| 43. English Nature will publish guidance on the use of soil information in the restoration of wildlife and wildlife habitats. | Guidance published in 2005. |
| Soils and the Landscape and Cultural Heritage | |
| 44. English Heritage will monitor the state of the landscape and historic environment and, where needed, develop new indicators. | Review progress in 2006. |
| 45. English Heritage will research into the threats and mechanisms of loss and degradation of soils supporting historic landscapes, as appropriate. | Review progress in 2006. |
| 46. English Heritage will improve understanding of soils and the historic landscape through research on the importance of the landscape and historic environment to the economy (through tourism), and to quality of life. | Review progress in 2006. |
| Soils in Minerals Extraction, Construction and the built environment | |
| 47. Defra will promote with industry better understanding of the potential benefits to sustainable construction through specific tests and British Standards for soil use. | Develop and implement specific measures in 2005. |
| 48. Defra will continue to support the development of recycling and composting to provide alternative growing media and soil conditioners to peat. | Report on progress in 2006. |

| Action Summary | Milestone |
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| Soils in Minerals Extraction, Construction and the built environment – <i>continued</i> | |
| 49. Defra will examine the practicality of introducing and monitoring a programme to integrate minerals and waste policies which will increase the recycling of materials for re-use or for restoration. | Examine by 2005. |
| 50. Defra will consult the Environment Agency and local planning authorities to improve monitoring of use of soils in relation to built development, compliance with soil protection conditions of planning permissions, and for reducing off-site impacts. | Report progress in 2005. |
| 51. Defra will continue to work closely with ODPM, minerals planning authorities, and the industry, to promote and develop practical guidance on minerals site restorations and aftercare. | Report progress in 2005. |
| Measuring and Reporting Progress | |
| 52. The Defra Soils Team will measure and report progress on all fifty-one actions in the Action Plan. | Defra will report progress in 2005. In 2006, we will adopt a revised plan with a longer forward vision. |

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