Natural England Commissioned Report NECR012

Scientific research into the effects of access on nature conservation: Part 1: access on foot

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NATURAL ENGLAND

Introduction

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

English Nature (now Natural England) and the Countryside Council for Wales commissioned *The Wildlife and Access Advisory Group Guidance 2001* (Penny Anderson Associates, 2001), in response to the Countryside and Rights of Way Act 2000 (CRoW).

The aim was to provide a scientific tool to help identify the potential impacts of access to enable measures to be put in place to secure the reconciliation of both access and nature conservation objectives. The findings were used to undertake appropriate assessments when CRoW open access was being implemented in England and Wales.

The findings are now being published so that they can be used by authorities responsible for implementing new access projects or managing existing access and assessing the likely effects.

The information is intended to contribute to decisions and judgements made as part of an overall assessment process, but may also be used by conservation organisations and land managers who are considering the need to apply for, or remove, statutory exclusions or restrictions.

The information is also relevant to organisations and people managing access on land which is subject to:

- A statutory right of access.
- A right of access under an access agreement.
- Existing de facto access.

The report is a collation of available scientific research into the effects of access on nature conservation, undertaken up to 2001. It should be used in tandem with the supplementary 2008 report. It does not provide prescriptive solutions to perceived problems, but identifies those circumstances where nature conservation interests may trigger consideration of appropriate action.

By identifying and protecting sensitive features from the effects of human interference, people's access to the natural environment can be promoted with the confidence that it is only being limited on nature conservation grounds where this is shown to be necessary. As such it will help Natural England deliver our policy on Inspiring People to Value and Conserve the Natural Environment through access to places where they can enjoy a high quality natural environment.

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Further information
This report can be downloaded from the Natural England website: **www.gov.uk/government/organisations/natural-england**. For information on Natural England publications contact the Natural England Enquiry Service on 0845 600 3078 or e-mail **enquiries@naturalengland.org.uk**.

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SCIENTIFIC RESEARCH INTO THE EFFECTS OF ACCESS ON NATURE CONSERVATION: PART 1: ACCESS ON FOOT

INFORMATION FOR STATUTORY AUTHORITIES INVOLVED IN ASSESSING THE NATURE CONSERVATION IMPLICATIONS OF A STATUTORY RIGHT OF ACCESS IN ENGLAND AND WALES UNDER SECTION 26

This report is a collation of available scientific research into the effects of access on nature conservation, undertaken up to 2001. The purpose of this report is to provide a scientific tool to help identify potential impacts of access and to enable measures to be put in place to secure the reconciliation of both access and nature conservation objectives. It will ensure sensitive features are identified and protected from the effects of human interference, so that people's access to enjoy the natural environment can be promoted with the confidence that it is only being limited on nature conservation grounds where this is shown to be necessary . As such it will help Natural England deliver its policy on Inspiring People to Value and Conserve the Natural Environment through access to places where they can enjoy a high quality natural environment.

The Wildlife and Access Advisory Group Guidance 2001 (Penny Anderson Associates, 2001), was commissioned by English Nature (now Natural England) and the Countryside Council for Wales, with endorsement from the Countryside Agency (now Natural England), RSPB and others in response to the Countryside and Rights of Way Act 2000. It was used successfully to undertake appropriate assessments throughout the implementation of CRoW open access in England and Wales.

This report includes all research relating to the effects of access on foot on habitats and species undertaken up to 2001 and should be used in tandem with the supplementary 2008 report. Together they are a collation of all available scientific research relating to the effects of access on foot on habitats and species up to 2008 as well as all research into the effects of access by bicycle or on horseback.

The research summarised in this report may be used by Relevant Authorities[1] and others in conjunction with knowledge of local circumstances including likely levels of use and a detailed knowledge of local conditions. It is intended to contribute to decisions and judgements which are made on a site by site basis as part of the overall assessment process. This report aims to ensure that any action to control or manage access is based on a scientifically reasoned argument, drawing on available knowledge. It provides a consistent approach when utilised in different areas or counties.

The Guidance may also be used by:

- Conservation Organisations and land managers considering whether there may be a case for statutory exclusions or restrictions under relevant legislation, or for the need for action to circumvent such exclusions or restrictions.
- Any organisation or person considering the need to manage access on land which is subject to:
    - A statutory right of access including those granted under enactments such as the Countryside and Rights of Way Act, the Law of Property Act 1925, the Commons Act 1899, or local or private Acts.
    - A right of access under an access agreement (eg. Pt V of the National Parks and Access to the Countryside Act 1949).
    - Existing de facto access.

The Guidance does not provide prescriptive solutions to perceived problems, but identifies those circumstances where nature conservation interests may trigger consideration of appropriate action on sites. The nature of that action, including whether it will require any statutory exclusion or restriction, can only be determined by analysis at the site level.

[1] Relevant authorities are responsible for administering restrictions on CRoW access land

The scope of this Guidance is on direct nature conservation implications arising from access. There may be indirect effects linked to a statutory right of access, such as risks associated with fire or safety hazards, but these are not covered in detail in this Guidance.

This report was edited by Penny Anderson Associates.

Natural England's viewpoint

This Guidance has a wide application across all access projects in Natural England, but is specifically relevant to the need for appropriate assessments in relation to access on Natura 2000 sites.

ACKNOWLEDGEMENTS

The basis of the different chapters of this guidance have been prepared by different specialists, in English Nature and Countryside Council for Wales. The main contributors are:

Lowland Heathland	*Isabel Alonso* *Alex Turner*
Mountain & Moor	*Barbara Jones* *Mick Rebane*
Lowland Raised Bog and Fen	*Roger Meade* *Peter Jones*
Lowland Grassland	*Richard Jefferson* *David Stevens*
Wooded Common Land	*Keith Kirby* *Jim Latham*
Open Water	*David Fraser* *Tristan Hatton-Ellis*
Coastal Habitats	*Sue Rees* *Peter Rhind* *Gabriel Wyn*
Birds	*Andy Brown* *Rowena Langston* *Sian Whitehead*
Mammals	*Liz Howe* *Tony Mitchell-Jones*
Herptiles	*Jim Foster* *Liz Howe*
Invertebrates	*Adrian Fowles* *David Sheppard*
Higher Plants	*Andy Jones* *Jill Sutcliffe*
Earth Heritage	*Liz Howe* *Jonathan Larwood*

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Comments from the Countryside Agency, English Nature, The Countryside Council for Wales, National Trust, the Royal Society for the Protection of Birds, and the National Park Authorities have been considered and changes incorporated into the text before additional information was provided and editing undertaken by the external consultant.

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1. RATIONALE

The primary function of this Guidance is to assist organisations involved in the implementation of the Countryside and Rights of Way Act 2000. In particular, it will help the Advisory Bodies[1] in the provision of site-based advice to the Relevant Authorities[2] on the need for exclusions, restrictions or other appropriate action necessary to protect nature conservation interests on access land under Section 26 of the Act.

1.1 It will ***inform the decision-making process*** to be followed by the Relevant Authorities under Section 26 of the Act, including the provision of advice (where appropriate) by the Advisory Bodies, and will enable the statutory agencies to assess the necessity for exclusions or restrictions in accordance with this clause. It can also be used as the foundation for consideration of whether non-statutory mechanisms may be applied to manage access in ways which obviate the need for statutory action under Section 26.

Section 26

1.2 ***The Guidance must therefore***:

- Ensure that any action to control or manage access is based on a scientifically reasoned argument, drawing on available knowledge.
- Provide a consistent approach when utilised in different areas or countries.
- Provide clear justification to Relevant Authorities considering the need for action.
- Ensure a transparent case on the circumstances in which action is necessary, which can be appreciated by all parties interested in either promoting or controlling access or conserving wildlife and natural features.

Functions of guidance

1.3 ***The Guidance may also be used by***:

a. Conservation Organisations and land managers considering whether there may be a case for statutory exclusions or restrictions under Section 26 of the Countryside and Rights of Way Act, or for the need for action to circumvent such exclusions or restrictions, and
b. Any organisation or person considering the need to manage access on land which is subject to:

Potential users

[1] English Nature or the Countryside Council for Wales

[2] The Countryside Agency, Countryside Council for Wales, the National Park Authorities or the Forestry Commission in the case of woodlands dedicated for access under Section 16, as appropriate.

- A statutory right of access granted under enactments other than the Countryside and Rights of Way Act (eg. the Law of Property Act 1925, the Commons Act 1899, or local or private Acts).
- A right of access under an access agreement (eg. Pt V of the National Parks and Access to the Countryside Act 1949).
- Existing *de facto* access.

1.4 ***The Guidance does not provide prescriptive solutions*** to perceived problems, but identifies those circumstances where concern about nature conservation interests will ***trigger consideration of appropriate action on*** sites. The nature of that action, including whether it will require any statutory exclusion or restriction, can be determined only by analysis at the site level.

Triggers for action

1.5 ***The Guidance focuses on direct nature conservation implications*** arising from access ie consideration of the need for action under Section 26. There will be many occasions when a statutory right of access can generate other concerns which may in turn impact on nature conservation, eg. difficulties in maintaining grazing management, spraying or felling, or risks associated with fire or safety hazards. These are not covered in the Guidance and will need consideration under the appropriate sections of the Countryside and Rights of Way Act, Sections 22 (28 day exclusion), 24 (exclusion for land management) and 25 (exclusion for avoidance of fire risk).

Direct nature conservation implications, ie. Section 26 only

2. INTRODUCTION

2.1 The Statutory Right of Access conferred under CROW

2.1.1 The Countryside and Rights of Way Act, 2000 (the CROW Act) confers a statutory right of access to certain specified types of land:

- **Open Country, namely mountain, moor, heath and down, and**
- **Registered Common Land.**

Habitats in access

The latter category incorporates a range of further habitats, including wetland and coastal systems. A relevant summary of the provisions in the CROW Act is provided in Appendix 1. A large number of SSSIs will be affected (estimated at 505,000ha in England and Wales, excluding those areas of common land which are not classified as mountain, moor, heath and down). Information on the extent of these habitats within SSSIs is given in Appendices 2 and 3.

CROW summary Appendix 1

2.2 The Need for Guidance

2.2.1 ***Section 26 of the Act makes allowance for restrictions or exclusions*** to be applied ***where necessary*** to protect flora and fauna, geological and physiographic features. It is envisaged that these will only need to be applied in exceptional situations and that, for the most part, concerns will be tackled through appropriate non-statutory mechanisms, such as control on the availability of car parking, and the siting of access points, gates, stiles and paths, and visitor management. The requirement will be to apply non-statutory measures to protect nature conservation against potentially significant effects of access, and it is only where these fail or might be predicted to be insufficient that the statutory provisions can be invoked.

Management measures first choice, statutory exclusions only in exceptional circumstances

2.2.2 Statutory exclusions and restrictions ***will be applied by*** the so called ***Relevant Authorities***, comprising the Countryside Agency, Countryside Council for Wales, the National Park Authorities, and also by the Forestry Commission where woodland is dedicated for access. In determining whether to apply restrictions, the Relevant Authorities must have regard to advice from the Advisory Bodies, comprising English Nature in England and the Countryside Council for Wales (CCW) in the case of land within National Parks in Wales (CCW is the Relevant Authority for the rest of Wales).

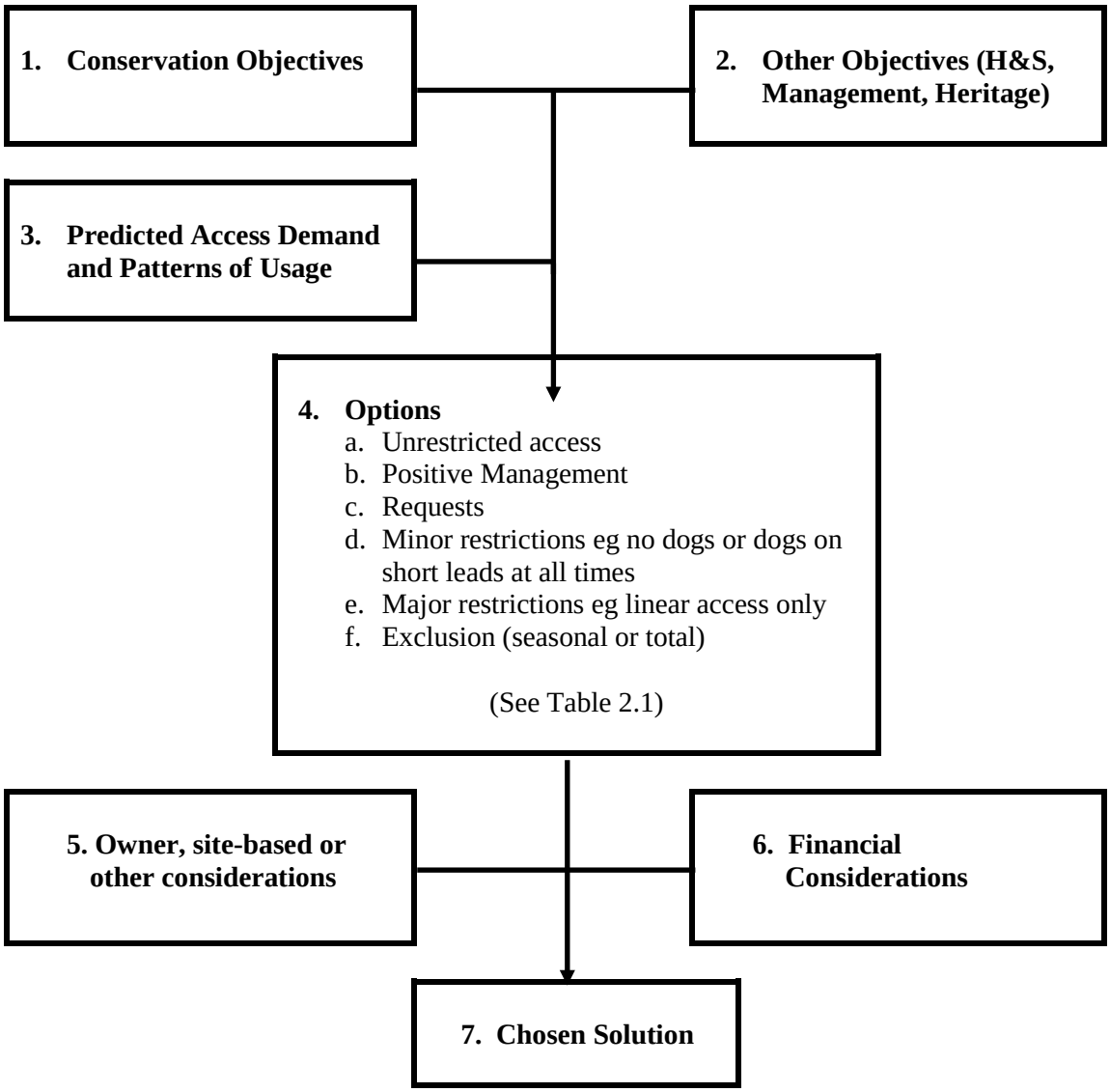
Who are the Relevant Authorities

2.2.3 The authorities are likely to operate a flexible system whereby both ***conservation objectives*** for sites and information on ***likely access usage will be examined*** in conjunction; thereafter a ***range*** of ***statutory and non-statutory options*** will be ***considered*** for addressing any conservation concerns. This process is described in diagrammatic form in Fig. 2.1.

Considering options see Fig. 2.1

FIGURE 2.1. **Provision of Advice Concerning Exclusions, Restrictions and Management of Access**

Process whereby Conservation Objectives are used to generate options on how access may be managed in association with the new statutory right



2.2.4 In practice there will be certain fragile sites that are unlikely to be affected because they will attract few visitors, and some more robust sites that could suffer because of heavy usage. In each case decisions will need to be made on whether imposing statutory restrictions or exclusions will be necessary, or whether management mechanisms would be effective without resort to statutory measures. An illustrative range of statutory and non-statutory mechanisms available is given on Table 2.1.

TABLE 2.1. Mechanisms to Exclude, Restrict or Manage Access in association with a Statutory Right of Access

Formal Statutory Mechanisms available under Section 26 of Countryside and Rights of Way Act:	**Exclusions**	• Permanent • Seasonal • Partial (relating to certain parts of sites only)
	Significant Restrictions	• Confinement to paths • Seasonal confinement to paths
	Minor **Restrictions**	• Dogs on short leads at all times • Dogs banned • Access restricted to certain times of day • Entry/exit statutorily restricted to specified access points
Non Statutory Mechanisms available which obviate the need for statutory exclusions or restrictions under Countryside and Rights of Way Act:	• Appropriate siting or control of car parking, • Siting of gates, stiles • Provision of paths away from sensitive areas • Management of vegetation to enhance natural confinement to paths • Signs • Promotion of least sensitive areas • Site interpretation/education • Path surfacing • Other visitor management measures	

Function of guidance

2.2.5 This document provides guidance to be used by the Advisory Bodies when determining what advice should be provided to the Relevant Authorities on whether action is likely to be required to protect nature conservation interests. Because such advice will be provided at a local and regional level, there is a need to ensure a common approach, and a well-reasoned and defendable position.

Available research and judgements

2.2.6 Currently, there ***is little research available on the implications of a statutory right of access*** to the countryside on nature conservation interests, and the scientific data which do exist often focus on effects at local or individual level, rather than effects which could be significant at a designated site or population level. Accordingly, ***advice*** is likely to be ***based more*** on ***consensual scientific judgements*** than just on hard data, ***using known ecological/behavioural considerations, related species, status and vulnerability***. Furthermore, any advice may be subjected to heavy scrutiny by other public or private bodies, and there is a need to

issue guidance that has a clear rationale, and a transparent and consistent approach.

2.3 The Scope and Application of the Guidance

2.3.1 It is not intended that this report should give hard and fast conclusions on the need for management measures or statutory restrictions which will have universal application. Because action should be based on a combination of both conservation objectives for a site, and the likely access demand, and because a range of options is available for addressing concerns, such issues will need to be agreed and resolved locally. ***Accordingly, this Guidance identifies those circumstances that will trigger consideration of appropriate action on sites, although the nature of that action (ie. whether statutory or non-statutory, and the level necessary) can be determined only by analysis at the site level.***

Trigger action not prescriptive function

2.3.2 The ***determination of any potentially adverse impact*** to a specific site, and the appropriate response to it, will need to be determined in the light of local circumstances, ***habitat sensitivity*** or ***species populations***, and indications of the ***likely scale and pattern of access*** demand on the site in question. However the ***guidance provides***, as a starting point, ***a summary*** of those issues for which there is a ***prima facie cause for concern*** in relation to the introduction of a statutory right of access.

Apply local circumstances

2.4 Arrangement of Habitats, Species and Geological/ Physiological Interests

2.4.1 The report considers the implications of a statutory right of access separately for ***habitats***, ***species*** and ***geological/ physiographical interests***, and the statutory agencies will need to ***consider all appropriate sections*** when determining the need for action. For example, in the case of a heathland site, consideration will need to be given to the effects of access on the habitat generally, and also possibly on birds, reptiles, invertebrates and plants. In addition, Appendix 4 provides some assistance in integrating BAP habitats with those for which access provisions will apply.

Need to consult habitat, species and Earth heritage sections

2.4.2 The ***habitats covered are broader*** than those classified simply as open country in the CROW Act because of the variety that occurs on ***common land***. In addition, it should be noted that the definitions of access land categories do not equate with ecological classifications. It is likely that only a very small proportion of those habitats which occur on commons but that are not included in the definition of open country will be open to access, such as some coastal and water's edge habitats.

Habitats included broader than in CROW to cover commons

2.5 Conservation Issues in relation to Management, Fire, Health and Safety or Other Concerns

2.5.1 This report identifies specific conservation issues which will need consideration in association with the introduction of a statutory right of access. It deals with ***direct issues*** that may arise as the incidental result of the legitimate exercise of the statutory right. These issues include ***erosion, compaction, trampling, pollution, and disturbance to fauna***. These issues have a specific section devoted to them in the Countryside and Rights of Way Act (Section 26). The Guidance also covers the implications of actions which are not authorized by the CROW Act, such as the collection or theft of flora and fauna and geological specimens, but which may be likely to arise. In addition, land management and related issues may have a conservation implication. These are more properly addressed under separate sections of the Act (Sections 24 and 25).

Direct not indirect affects covered

2.5.2 On many sites, a statutory right of access ***may have little direct impact*** on conservation interests, but the ***consequential effects*** of the right may ***generate significant concerns***. For example, certain heathlands may suffer little direct impact; however, access may make essential grazing management unviable, or could lead to risk of fire, both with considerable conservation implications. It is important when providing advice to ***separate direct conservation issues, from other issues*** that also need to be addressed.

2.6 Opportunities and Mitigation

2.6.1 The statutory agencies need to ***consider any positive outcomes*** that may arise in association with the introduction of a statutory right of access, including the provision of ***interpretive material***, and the possibility of ***addressing habitat management issues*** alongside access management. In some cases the effects of access may be relatively minor in comparison to the significant gains that could arise if habitat management issues were addressed. Consideration may also be given to opportunities for habitat creation (joining isolated fragments of habitat qualifying as access land) and restoration. Where potentially harmful effects could arise as a consequence of introducing a statutory right of access it is relevant to consider whether these effects could be mitigated by appropriate management of the habitat or access provisions.

Opportunities for interpretation, management, restoration

2.7 Relationship with the Conservation (Natural Habitats,&c.) Regulations 1994

2.7.1 The decision on whether to manage land or to impose exclusions or restrictions alongside the introduction of a statutory right of access onto a European site ***is a plan or project*** within the meaning of the Habitat Regulations. Where this is likely to have a significant effect, there will ***need*** to be an ***appropriate assessment*** to ascertain that there is no ***adverse effect on integrity***. The guidance given in this report can clearly inform but not over-ride the provisions specified in the Regulations. Legal opinion on the

Applying the Habitats Regulations

application of the Regulations to a statutory right of access has been obtained and is available from English Nature and the Countryside Agency.

2.8 Assessing the Significance of Effects

2.8.1 The ***significance of open access*** effects needs to be judged in terms of the extent to which they might ***compromise both the conservation objectives and the favourable condition*** of the key features of the site. This report is drafted based on the assumption that the ***Sandford Principle*** should be applied to consideration of the statutory right of access. In other words, all reasonable effort should be made to manage access to make it compatible with nature conservation, and in the great majority of situations it is anticipated that the two can be reconciled. In those situations where they are irreconcilable, however, conservation should prevail.

Judging against favourable condition. Application of Sandford and precautionary principles

2.8.2 It will also be appropriate to apply the ***precautionary principle***. This was defined in the Rio declaration as:

"*where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation*".

Precautionary action requires an objective assessment of the costs and benefits (not just the financial ones) of action, and a transparency in decision making (DETR, 1999).

2.8.3 The significance of the effects of visitor pressure will need to be judged against the ***likely demand for access*** to the site. For the most part, it is expected that management measures will be sufficient to reduce the potential impacts to acceptable levels that do not compromise the achievement or maintenance of favourable condition. Best practice guidance on management is available in a number of publications, for example, Bayfield and Aitken (1992), Brooks and Stoneman (1997) and the best practice provided jointly in a web database by the Countryside Agency and English Nature[1]. However, the successful application of management measures, thus obviating the need for statutory restrictions, is totally dependent upon the provision of resources and mechanisms for its implementation. Where statutory controls are needed this could, in exceptional circumstances, entail total site exclusion, but is more likely to require restriction to linear routes and/or further controls on dogs.

Management of access, measures and resources

2.8.4 The nature and stringency of the action required, whether management measure or statutory restriction (including statutory exclusion), can be determined only at the site level. Any measures applied should be the least stringent necessary to protect the nature conservation interest of the site.

[1] Practical ways of managing access; interactive CD rom and website

2.8.5 In a variety of situations, ***further survey will be needed*** in order to ***understand*** better the ***distribution of populations*** which might be sensitive to access pressures. In addition, where ecological knowledge suggests that certain species may be susceptible to trampling, disturbance of other impacts from open access use, then monitoring will be needed in order to ***assess populations and their condition*** in order to be more informed about the impacts and their significance. This will have resource implications.

Survey and monitoring needs

2.9 Production of the Guidance

2.9.1 The guidance in this report has been commissioned from relevant authors by the Wildlife and Access Advisory Group, on which sit representatives of English Nature, the Countryside Council for Wales, Joint Nature Conservation Committee, Countryside Agency, RSPB, National Trust and the Wildlife Trusts. The draft guidance has been subjected to scrutiny within those bodies before being submitted to the statutory agencies for endorsement. The whole work has been professionally edited and completed.

Authors and consultation

2.10 Format of Guidance

2.10.1 There follows an ***outline of some of the effects*** of recreation, particularly covering issues of compaction, trampling, erosion and pollution, which tend to be generic rather than habitat or species specific. This forms the basis for more specific findings presented in each chapter.

Generic effects of recreation *Chapter 3*

The Guidance concerning habitats is arranged in the following format:

1. ***Introductory statement*** concerning extent, interest, UK/ European context, and designations.
2. Statement (if relevant or known) concerning ***extent of current access*** or attraction to visitors.
3. Statement concerning ***general vulnerability*** of habitat or species group to access pressures under normal circumstances.
4. Statement concerning any ***vegetation or community types particularly vulnerable*** to access pressures.
5. Cross reference to ***other particularly vulnerable and associated interests*** to be considered (as featured elsewhere within the guidance).
6. Conclusions on the ***circumstances in which consideration*** would need to be given ***concerning statutory exclusions, restrictions*** or the implementation of ***management mechanisms***. Mitigation measures if relevant.
7. ***Related concerns*** to be borne in mind if these are crucial issues, eg. dogs worrying livestock, difficulties in getting grazing tenants, fire risks, health and safety.
8. ***Opportunities*** arising from the introduction of a statutory right of access.

Standard format for habitat chapters

The same standard format has been applied to all of the species chapters except birds, and to the Earth heritage chapter.

3. THE POTENTIAL EFFECTS OF ACCESS ON NATURE CONSERVATION

3.1 General Considerations

An outline of the ***generic effects of access*** on habitats is given in the first part of this chapter, which provides the basis for the more habitat or species specific implications examined in each chapter subsequently. This chapter ends with ***an insight into where impacts*** might be ***most relevant***. Disturbance effects are explored in the relevant chapters on different animals, as there are fewer generalisations to be made on this effect.

3.2 Generic Impacts

3.2.1 The CROW Act provides for open-air recreation, basically on foot, which would ***include*** the following activities:-

Activities included

- Walking.
- Climbing.
- Potholing.
- Informal games.
- Scrambling.
- Scree-running.
- Picnicking.
- Ski-ing, toboganning, etc.

Organised games, hang-gliding, paragliding, camping, swimming in non-tidal waters, hunting and fishing are ***specifically excluded***. No animals except dogs are permitted, and these have to be on short leads of less than 2m from 1st March to 31st July and at all times in the vicinity of stock (Schedule 2). The recreational impacts that need to be considered are therefore those derived from trampling and disturbance, with or without dogs.

Activities excluded

3.3 The Effects of Trampling

Key Points

Trampling on soils:

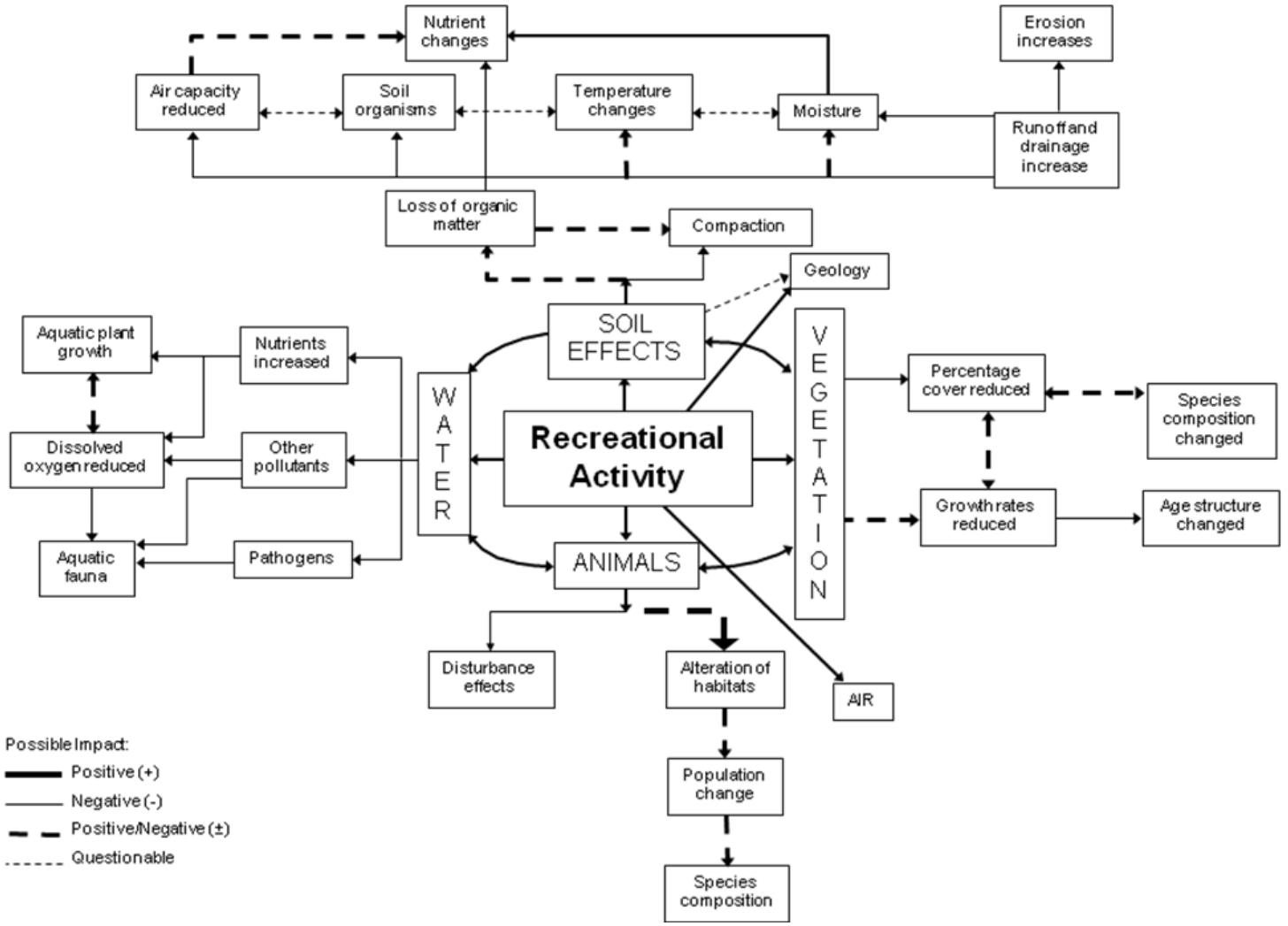
- **Effects are greater on wet soils and steep slopes;**
- **Results in soil compaction, increases in bulk density, reductions in oxygen and infiltration rates;**
- **Can result in significant losses of litter at even very low c.10 tramples/month;**
- **Soil water content greater on dry sandy soils;**
- **Changes soil temperatures on bare ground, hotter by day, colder by night;**
- **Neutralises pH;**
- **Can increase nutrient levels (especially where dog faeces concentrated);**
- **Reduces bacteria, with more ammonium-nitrogen and less nitrate-nitrogen.**

3.3.1 The ***soils and vegetation*** can be ***directly and indirectly*** affected by ***trampling***, with further ***impacts on the invertebrates*** and ***small mammals***. A summary of the interrelationships between the biotic and abiotic elements is given in Fig. 3.1 (modified from Wall and Wright, 1997, taken from Liddle, 1997).

Summary of effects

Fig 3.1

FIGURE 3.1 **Interrelationships between Recreational Impacts (adapted from Wall and Wright, 1977, quoted in Liddle, 1997)**



The mechanical force of trampling

3.3.2 The ***average ground pressure*** exerted by an adult wearing cut-rubber soled boots is 833g/cm^2 (derived from averaging the ratio of males to females and their weights, from Liddle, 1997). The pressure of a flat-bottomed boot is 206g/cm^2 for an average male and 160g/m^2 for an average female (Liddle, 1997). The pressures on the ground increase 5-10 times where horse riding or a vehicle is involved. The general principle is that, for a given load, the ground pressure is inversely related to the area in contact with the ground (hence the reduced impact of All Terrain Vehicles, etc.). The same load spreading applies when walkers tread on tussocks of grass or rush to cross wet areas as their weight is spread out through the plant's stems and root mass (Liddle, 1997). Path surfaces raised to cross soft terrain also act in the same way by spreading the load.

Trampling force

3.3.3 In comparison, the ***trampling pressures*** exerted by ***most grazing stock*** is greater than that for humans (sheep 690-941, cows 980-1467g/cm^2 depending on type and weight).

3.3.4 However, ***higher pressures*** are exerted by humans in the process of ***walking***. Vertical forces up to 12,000g/cm^2 have been recorded for the heel at the time of impact, with increasing shearing and compressive forces as the slope angle increases. The forces on soft ground are reduced as the cleats of a walking boot sink into the mud. The pressures at the surface, however, are transmitted down through the soil profile. Liddle and Greig-Smith (1975b) found the most compacted level at c. 15cm under a trampled zone on a sand dune.

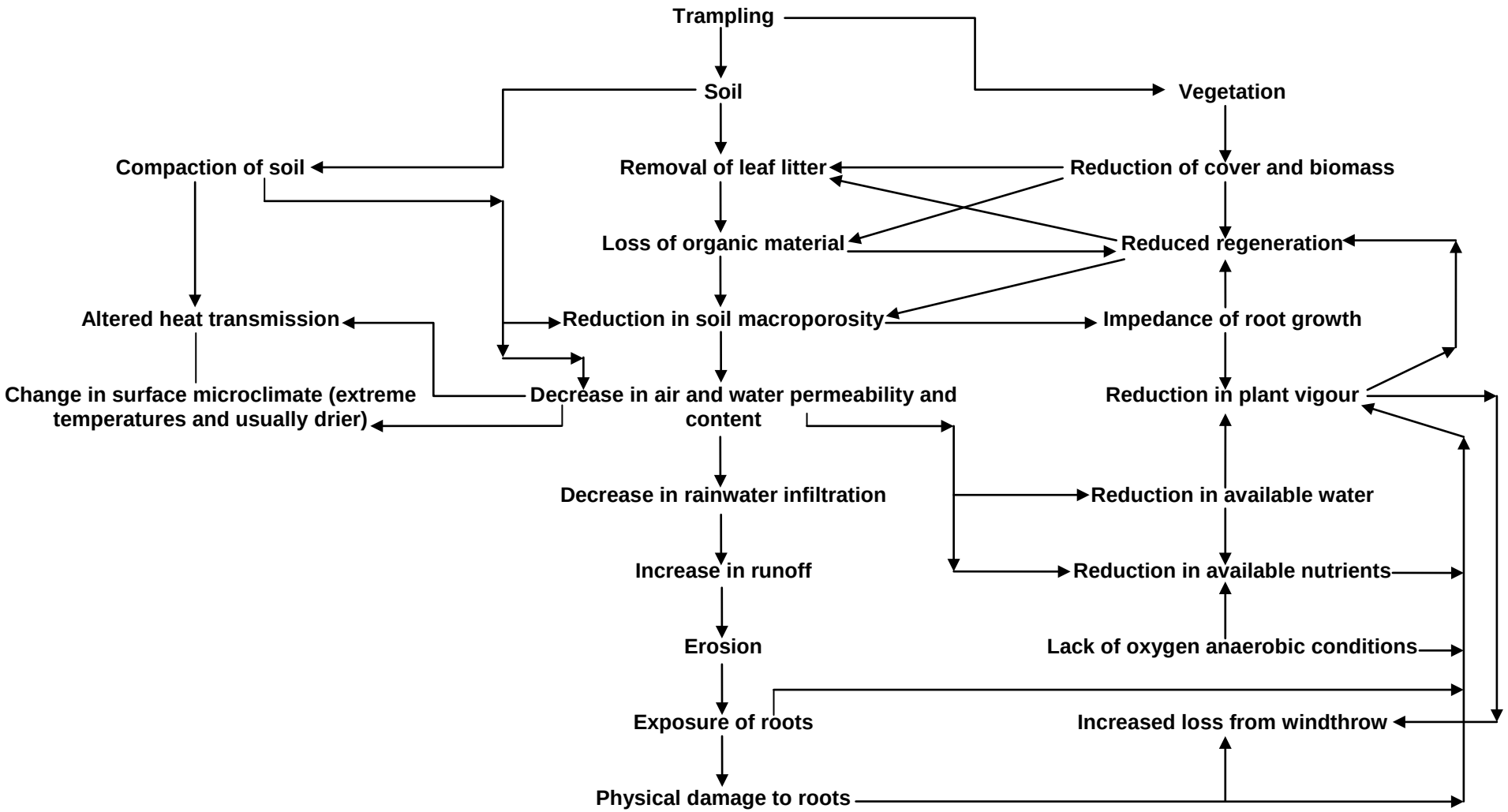
Greater pressures from walking on slopes, down to 15cm in soil profile

Impacts on soils

3.3.5 A summary of the impacts on soils is provided in Fig. 3.2. The forces of trampling result in ***soil compaction*** which ***increases bulk density***. ***Soil pore spaces*** decline and, along with them, the ***amount of air*** and the ***infiltration rate for water***. Larger soil aggregates can be destroyed, and ***clays change their form*** from a well structured, flocculated state when the particles are in a random arrangement, to a situation where the particles lie parallel, and have the highest bulk density.

Trampling results in soil compaction and increased bulk densities

FIGURE 3.2 The Effects of Trampling on Soils (from Liddle, 1997)



3.3.6 The severity of these changes relate to soil type, with ***coarse soils*** with large particles ***tolerating more trampling than fine, clay-rich soils***. ***Wetter soils*** are also ***more liable to compaction*** than dry soils. Thus, the aeration and infiltration rates can also vary. In one study, a 378cm/hour rate declined to 12cm/hour after trampling (Liddle, 1997). Significant reductions have been found on sandy as well as sandy loams soils.

Compaction

3.3.7 The ***loss of air space*** is accentuated in the upper surface of the soil. Chappell *et al.* (1971) found a loss of 14% in the upper 2.5cm of a trampled chalk soil, but only a 2% loss in the 2.5-5cm layer. This pattern was also found in sandy and sandy loam soils by Lutz (1945) and in woodland soils in Germany (Burger, 1932). Table 3.1 shows the relative susceptibility of different soil characteristics (taken from Cole, 1987). ***Air porosities of 19% or more provide good conditions*** for plant growth, but levels recorded are frequently ***below this in heavily trampled soils***. This can lead to ***deficiencies*** in ***oxygen*** and build-up of carbon dioxide.

Reduced air space

Reduced O_2
Increased CO_2

Table 3.1 Relationships Between Soil Characteristics and Susceptibility to Impact (from Cole, 1987)

Soil Property	Level of Susceptibility		
	Low	**Moderate**	**High**
Texture	Medium	Coarse	Homogeneous; fine
Organic context	Moderate	Low	High
Soil moisture	Moderate	Low	High
Fertility	Moderate	High	Low
Soil depth	None	Deep	Shallow

3.3.8 The impact of ***trampling on litter*** can be, often initially, to increase the quantity as a result of damage to plants, but litter can also decline under even very light trampling (Duffey, 1975). The volume reduced in Duffey's experiments by 81% with 10 tramples/month and the % air space in it reduced to 38% compared with 63% in the controls. On wet soils, mud gets mixed with the litter too (as Duffey, 1975 found) and changes its nature as a habitat. In a different habitat, Bayfield and Brookes (1979) found increases in litter from 20% to 70% of the total biomass under heather heavily used for teaching purposes near Kindrogan Field Study Centre (Scotland) as the vegetation was damaged but a reduction to 40% under severe use. This probably reflects the great brittleness of the shrubby vegetation compared with grassland.

Litter changes

3.3.9 The effect of trampling on ***soil water content*** and its availability depends on the balance between rainfall and soil type. With smaller pore spaces, there is an increased potential to retain water by capillary forces, although this may not be available to plants if the suction pressure is too great on clay soils. This additional water is usually available on sandy soils (Hill and Sumner, 1967; Warkentin, 1971). Soils may become wetter due to compaction and

Soil water content changes

reduction of drainage, indeed, ***waterlogged ground is much more susceptible to puddling and poaching*** than coarse-grained soils (Liddle, 1997).

3.3.10 The changes in air and water content, increases in bulk density, and loss of vegetation, also change the ***soil temperatures***. ***Path surfaces*** can be ***warmer by day*** and ***colder by night***. Liddle (1997) records a 9°C increase and 1°C decrease respectively, with the air above them also affected (6°C cooler than over adjacent vegetation by day and 2°C warmer at night). The extent of these differences will depend on the water content of the soil. Such differences can have a significant effect on some invertebrates (see *Chapter 15, Section 15.3*).

Soil temperature changes

3.3.11 Acidic soils also tend to become alkaline on heavily used paths by about 0.3units under trampling pressure, whereas on more alkaline soils, pH tends to drop, sometimes by more than a unit on a calcareous soil. Liddle (1997) reviewed the findings and noted that ***soils tend to drift towards a pH of 5.5***, but that there was no satisfactory mechanism that could be used to explain this.

pH changes

3.3.12 ***Nutrient levels*** in soil can be altered by trampling through the changes in compaction and drainage, but different studies have shown opposing trends, possibly depending on soil type and micro-organism activity levels. Chappell *et al.* (1971) found no significant differences in soil nutrient levels in non- and trampled areas on chalk grasslands, a response found also by Cole (1982). Leney (1974) did find higher levels of nitrogen and potassium on untrodden and trampled vegetation on sand dunes and dune pasture in Scotland compared with a bare pathway. Liddle (1997) quotes a similar finding of reduced nitrate concentrations by Rutherford and Scott (1979), possibly as a result of reduced microbial activity under poorly aerated conditions.

Nutrient changes

3.3.13 Liddle and Chitty (1981) recorded enhanced levels of nitrogen and phosphorus on a horse-trampled track on southern heathland, possibly as a product of dunging, however, where dogs frequently accompanied visitors, nutrient levels (especially phosphorus but also potassium) can be much elevated beside paths, as noted by Milwain (1984) on sand dunes in Jersey. Both she and Streeter (1971) found that species like wild thyme[1] benefited from the enrichment, producing more luxuriant forms and flowering more profusely. At higher levels of trampling, however, Milwain noted the characteristic zone of perennial rye-grass. Streeter (1971) on Box Hill chalk grassland also noted ***enhanced total nitrogen and phosphorus*** levels in heavily trampled areas compared with areas of lower use, but very low levels in the bare paths where erosion was occurring.

3.3.14 Studies of the impact of trampling on ***bacteria*** in clay soils show reduced numbers in the soil by factors varying from 7.4 to 8.9. However, as might be expected, the numbers of ***nitrifying bacteria*** was ***reduced*** by a factor of 10, whilst the numbers of ***denitrifying***

Bacteria reductions in soils

[1] The scientific names of species used in the text are given in Appendix 5.

bacteria increased by the same proportion (quoted by Liddle, 1997). The nitrogen present as nitrate was reduced in another study by 50-98%,and ammonium-nitrogen increased by factors of 18.7 and 1.2 (Whisler *et al*., 1965, quoted by Liddle, 1997). These changes are probably due to the reduction in oxygen, and increased soil wetness.

Impacts on vegetation

Key Points

Trampling on vegetation results in:

- **Greater effects on low than high productive swards;**
- **Low levels increasing biomass;**
- **Higher levels decreasing biomass, height, cover and flowering;**
- **Bare width increases 2-4 times for every 10 fold increase in use;**
- **Erosion, which once it begins continues even if trampling is reduced;**
- **Damage which is most severe at high altitudes, on steep slopes and wet peat;**
- **Only small numbers of passages (48-1445 – Table 3.2) giving a 50% loss of cover or biomass;**
- **Low recovery rates in low productivity swards;**
- **Reduced food reserves and root growth.**

Less tolerant species:

- **Tall herbaceous stems, soft, hollow or brittle stems;**
- **Thin leaves, rigid and long petioles;**
- **Low growing woody species.**

There are no general threshold levels for site carrying capacity, but see Table 3.2 for guidance.

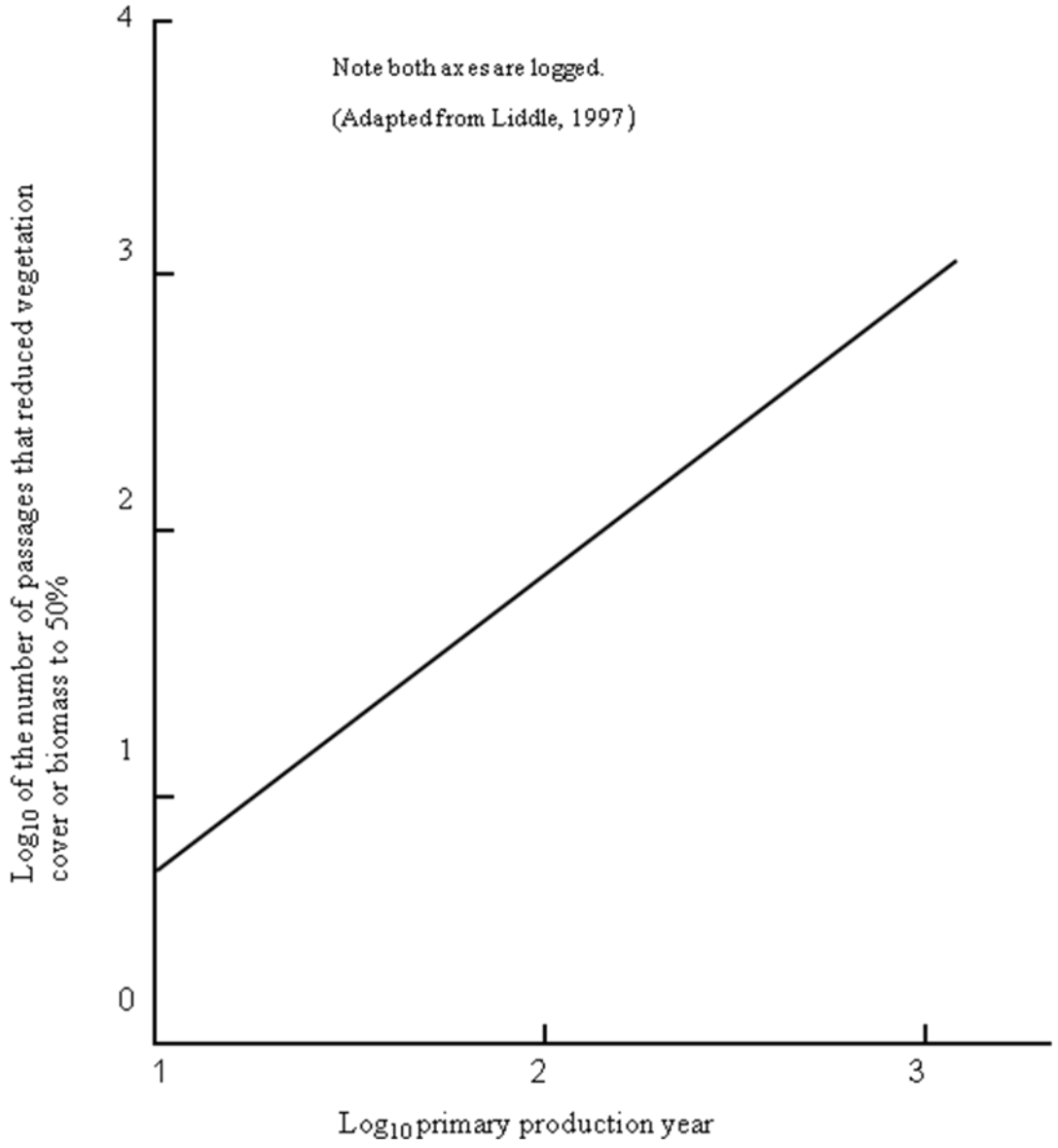
3.3.15 Although information on different vegetation types is presented in the following chapters, there are some generalisations which can act as predictors of trampling impact. Streeter (1971) first hinted at this when he found that species like perennial rye-grass and crested dog's-tail replaced chalk grassland species under heavy trampling pressure. These are potentially high productivity species, perennial rye-grass in particular, being more characteristic of fertile situations.

3.3.16 Liddle (1975a) drew together the literature of the time, and suggested that as the ***primary productivity of the vegetation increases the vulnerability to trampling*** decreases. Kellomaki and Saastamoinen (1975) correlated fertility and resistance to wear, and high productivity is usually dependent on high fertility, so the two paradigms have parallels. Using a variety of studies, Liddle (1997) graphed the relationship between the primary production and the number of passages needed to reduce the vegetation cover to 50%

Higher productivity vegetation less vulnerable

(Fig. 3.3). Predictions using Liddle's graph need to take into consideration local conditions such as soils, slope, site wetness and the vegetation's morphology.

FIGURE 3.3 The Relationship between the Number of Walking Passages that Reduce Cover or Biomass by 50% and Primary Productivity.



3.3.17 The relationship is further supported by Grime's (1979) triangular model, in which three basic plant strategies are identified as a response to high or low levels of stress or disturbance. Stress-tolerant plants have an inherently low capacity for growth and low competitive ability. They are often evergreen, long-lived, and flower and set seed irregularly. Competitive plants grow rapidly in productive soils in summer, are not evergreen but typically die back seasonally, but are not tolerant of stress or disturbance. Ruderals are the third group that are often short-lived, but which are opportunistic colonisers after disturbance, usually of bare

Low fertility/high sensitivity

ground. Of particular importance to a consideration of the impact of trampling to nature conservation is the fact that ***many vegetation types of high value*** are ***on infertile soils*** where ***productivity is low*** and ***stress-tolerators predominate*** (chalk and acid grasslands, old hay meadows, moor and heaths, for example) whilst the higher productivity communities of value tend to be wet grassland and reed beds.

3.3.18 Light trampling has been shown in several studies to increase plant biomass, but usually of more vigorous species. It is not clear why unless it relates partly, at least, to changes in nutrient availability from faster litter decomposition. However, where ***trampling levels are higher***, the ***biomass, cover and height of plants are reduced***. The ***relationship*** between wear and these parameters is generally ***curvilinear*** in experimental situations, with a rapid decline under lower trampling levels, and a lower rate of reduction as numbers of passages by walkers increase. This probably reflects an initial sharp decline of the more sensitive plants as they are eliminated from the vegetation followed by slower reductions in the more resilient species until bare ground develops.

Biomass increases under light trampling

Reduction in biomass, height and cover with heavier trampling

3.3.19 The ***width of the bare part of a path*** and the ***number of users*** is also represented by a ***curvilinear relationship*** with an initially rapid expansion and subsequent more steady increase in width (Liddle, 1997). Bayfield and Lloyd (1971) found their index of extent on the Pennine Way steadily increased over 11 years. Dale and Weaver (1974) found that a ***doubling of the trail*** width resulted from every ***ten-fold increase*** in the number of walkers in the northern Rocky Mountains, but Satchell and Marren (1976, quoted by Liddle, 1997) found ***chalk grassland path widths increased 4.4 times*** for every ***ten-fold increase in passages***. Lance *et al*. (1989) recorded increases in mean path width on Cairngorm on different paths which varied from 0.2 to 1.3m in width in 1981-2, but increased to 1.7 to 10.2m on the same six paths in 1986, and this was predicted to worsen unless access were reduced during the non-skiing season. Once a path has ***begun to erode***, this is ***likely to continue*** even if the traffic along it reduces (Lance *et al*., 1989). ***Such damage is most severe at high altitudes, on steep slopes and on wet peat***.

Path width increases with use

Erosion continues once it starts

3.3.20 Liddle (1997) drew together a number of studies for which there was adequate data to show the relative susceptibility of different vegetation types. Those relevant to habitats in England and Wales are reproduced in Table 3.2. These figures are relative and cannot be applied to particular habitats without knowledge of the ground conditions on both sites. For example, a 15^{o} slope can increase the loss of plant cover significantly. Weaver and Dale (1978), for example, found only 700 passages rather than the 1000 quoted in Table 3.2, resulted in a 50% loss of plant cover on a 15% slope in the mountain pasture, whilst the 300 on a forest floor was reduced to just 50 on a 15^{o} slope. Bayfield (1973) also found a greater increase in width on steeper slopes up to 20^{o} on Cairngorm.

More rapid vegetation loss on paths on slopes

Table 3.2 **The Sensitivity of Different Vegetation Types to Trampling Expressed as the Number of Passages Needed to Reduce the Cover or Biomass to 50% (adapted from Liddle 1997)**

Habitat	Location	Number of passages to reduce vegetation by 50%
Vaccinium ground flora in spruce wood	Finland	48
Sand dune grassland	Scotland	119
Acid heath	Cairngorm, Scotland	161
Sand dune heath (*Empetrum nigrum*)	Denmark	258
Sand dune-marram grass	Scotland	288
Forest floor	Rocky Mountains	300
Sand dune heather	Scotland	344
Mountain grassland	Rocky Mountains	1000
Sand dune pasture	Wales	1445

50% loss of plant cover or biomass with 48 (wood) to 1445 (dune pasture) passages – ie, very low levels of use

3.3.21 ***These levels are generally very low***, and much lower than most of the more popular footpaths experience – hence the level of bare ground on most of these paths. However, the levels are relevant when considering the impact across open land without footpaths where access is introduced, and also for the zones adjacent to paths, where trampling also occurs in heavily used areas.

3.3.22 This situation is made more complex by the differences in the way we walk up and down slopes. Bayfield (1973) noted that mean pace length increases from 60cm on steep to 72cm on gentler slopes, but that progressing uphill on a 13^{o} slope used a 65cm pace length which reduced to 55cm when descending. In addition, many more walkers left the path (27%) when descending, compared with 6% while ascending a steep path. ***Downhill traversing thus has the potential to increase path width more than uphill walking***.

Path width increases more with downhill passage

3.3.23 Liddle (1997) notes that vegetation is generally more resilient to wear in the growing season and, if given time to recover, this has a greater impact on recovery rate if it too covers the same period. He also notes, however, that low productivity vegetation may take hundreds of years to recover from wear, and that the time for full recovery is often underestimated.

Recovery from trampling poor for low productivity vegetation

3.3.24 Liddle (1975b) gives further details on tolerance:-

Characteristics of tolerant plants

- More tolerant plants have basal apices and meristems.
- When the ground is wet, rather than dry, plant communities are less tolerant.
- Tall grasses at first give way to lower growing, more resilient dicotyledonous plants, but monocots increase again as trampling levels increase before they too are lost.
- Plants with high potential productivity are common on paths.

In general terms, plants which are more tolerant of trampling are grasses or rosette plants where the bud or apex are protected from direct damage, and which can regenerate rapidly after damage. Classic species are daisy, greater plantain, buck's-horn plantain, annual meadow-grass, perennial rye-grass and crested dog's-tail, and strips of these are often found in the trampled zones beside a bare path if the soils are suitable. Annual meadow-grass and greater plantain have even been shown to have developed a diminutive genotype as a response to trampling or tight mowing (Warwick and Briggs 1978 and 1979).

3.3.25 Characteristics of more sensitive species are:-

Characteristics of less tolerant plants

- Low growing plants with woody stems and slow recovery rates.
- Older, taller, woody stems on plants like heather tend to be more susceptible than younger ones.
- Plants with tall herbaceous stems, without basal leaves.
- Soft, hollow, or brittle and solid stems.
- Stem height over 30cm.
- Thin leaves.
- A woody stem base.
- Rigidity of leaves.
- Long leaf petioles.

3.3.26 Trampling reduces leaf area, leaf thickness, width, length and number per plant, although species are differentially affected (Liddle, 1997). Flowering can be inhibited in susceptible species, bulk and other underground storage organ weights can be reduced (eg. bluebell, Blackman and Rutter, 1950) and root rhizome growth in susceptible species significantly reduced (Liddle, 1997). It follows that these effects would also result in a reduction of fruits and seeds. Food reserves in the plants are also reduced and may take some time to replace (Liddle, 1997).

Trampling effects on leaves, flowers & food reserves

3.3.27 ***Most of the damage*** to the vegetation seems to be the result of ***mechanical effects on the above ground biomass***. Although ***impacts on roots can be severe***, compaction levels low enough to prevent root extension completely have not been recorded (Liddle, 1997). However, root growth can be signficantly affected. With a reduced leaf area, carbohydrates are used to regenerate leaf structure rather than being used for root growth, and the plants may become shallow rooted. Under drought conditions, this could be important and susceptibility to windthrow in trees can be

Reduction in root growth

increased. ***Compaction can also reduce water infiltration*** and, hence, the wetted depth – the zone in which most plant roots grow. In ***compacted wet or waterlogged soils, an aerobic, black layer develops*** and ***plants not adapted*** to these conditions ***fail***.

Mechanical damage principal effect

3.3.28 The extent to which compacted soils restrict root growth by reduced oxygen availability is not clear and will vary with species (some can take oxygen efficiently from the atmosphere to the roots, such as in cottongrasses). Similarly, the physiological effects of nutrient availability in compacted soils has not been researched widely. However, as root growth is generally restricted in compacted soils, with or without an adequate nutrient supply, mechanical damage seems to be the principle limiting factor (Liddle, 1997).

3.3.29 A number of relevant studies have also been undertaken elsewhere in Europe and the USA where either the same species or similar effects have been found, the results of which therefore assist in drawing general conclusions. The studies vary from those where effects of visitor use is examined without knowing the numbers involved, to experimental trampling using specific levels. Monitoring of the latter type of project is usual to assess recovery after trampling – a luxury which is unlikely to occur on a well visited site without management of the footpath network. Neither type of study assists in providing quantitative thresholds for individual sites since the ***local impacts are affected by local conditions*** – soils, slopes, climate, plant productivity, etc., but the ***literature can be used to guide the assessment*** of likely impacts on a given site and the vulnerability of species and habitats.

Threshold levels not available - integrating site observations with experimental studies needed

3.3.30 Consequently, the ***research and findings*** from site monitoring ***need some careful interpretation***. Most of the trampling experiments are short-term but demonstrate the relative susceptibility or resilience of different species or vegetation types, often after a period of recovery. Although trampling levels are sometimes selected to match typical use of the site, the latter is likely to persist through the seasons and years. The site monitoring results therefore show not just the current situation, but also the cumulative effect of use of the site over some (often undefined) years. In general terms, the results on the ground under moderate to high levels of regular use over the years are greater than the effects shown from short-term experiments. In addition, with paths already present on many sites, the experimental results are showing over time what may be affected in spatial zones alongside each path.

3.4 The Impacts of Trampling

Key Points

The significance of trampling impact depends on:-

- **The pattern and extent of use of the site.**
- **The numbers off paths (would vary from 5-40% or more depending on terrain and desire lines).**

- **The proliferation of the path network and the total extent of trampled ground as a proportion of the whole site – trampled widths can be up to 100m on popular routes.**
- **Any possible barrier effect to relatively immobile invertebrates and to small mammals and other animals.**

Significance of impacts

3.4.1 Although there has been considerable research on the effects of trampling, it is the ***significance of its impact*** which needs to be assessed in relation to Section 26 of the CROW Act. This will depend on:

Factors affecting significance of impact

- The numbers of visitors.
- The use they make of a site.
- Their familiarity with the site (which influences whether they stay on paths or take short cuts).
- The area of the site.
- The susceptibility of the vegetation to damage (including details of slope and wetness).
- The relative impact of people compared with other activities such as trampling by stock.

The following will assist in assessing the significance of a trampling impact.

3.4.2 If a site currently has no access, then new access will result in new paths if there are sufficient visitors. Where these will develop will depend on:-

Potential new access patterns

- Access points and availability of parking.
- Desire lines.
- Nature of the vegetation.
- Features people wish to visit (hill tops, views, monuments, etc.).
- Linkages or desire lines to adjacent sites or features.
- Existing paths created by stock or by management activities.

Depending on the level of use, paths with varying widths and extents of bare ground can develop. The trampled widths summed across a site can be used to indicate the extent of habitat loss.

On and off path use

3.4.3 The ***use of paths*** will vary with the site and many of the factors listed in 3.4.2 ***More people stay on paths where the adjacent vegetation provides a more uncomfortable surface*** than that on the path (Huxley, 1970). Thus, Picozzi (1971) is much quoted as showing that 95% of visitors stay on paths. However, this was through tall, dense heather that only the most determined would elect to traverse.

Path use greater when adjacent ground difficult to traverse

3.4.4 In contrast, Anderson (1990) found on average ***23.4% of walkers off the path across a range of moorland habitats*** in a widespread study on the Peak District moorlands mostly in areas already with open, or *de facto* access. This average varied widely depending on the habitat, the nature of the path, where people wished to go and the weather conditions. In some areas without access agreements, only 5% strayed from paths, whilst in access areas across blanket mire, over 40% on average across a summer season were off-path walkers.

Off path use greater where adjacent ground easy to traverse

3.4.5 Where a ***modern well-built new path surface*** had been placed along the Pennine Way, many ***more people stayed on it*** (92% - Pearce-Higgins and Yalden, 1997), whilst where deep, bare peat was exposed and trampled, many more stayed off it (32%), (Yalden and Yalden, 1988). Where recreational use was concentrated near a small river, off-path use was regularly over 40%, (Anderson, 1990).

Good path surface used more than adjacent difficult terrain

3.4.6 Picozzi (1971) also refers to a 15% off-path usage on open mountain tops in Cairngorm, while Young and Pendlebury (1969) found 16-17% of visitors off paths in Dovedale in the Peak District which is a narrow Dale containing a stream. Barrow (1972) found 15.7% of people off the paths in open moorland in Gairloch (Scotland), Bayfield and Moyes (1972) recorded 13% making their own way to the summit on Stac Polly (Easter Ross), while Bayfield (1973) found an even higher 30% off the path on some Scottish routes. Few of these studies defined off-path usage and this could vary from routes parallel to a path, to cross country movements. The extent of both would need to be assessed.

Off path usage could be 15-30% of visitors

3.4.7 The same pattern is evident in any site where visitors come to engage in dispersed activities, and water's edge is particularly targeted for spread out, off-path use. ***The amount of off-path usage will therefore depend on:***

- The nature of the adjacent vegetation and the ease with which it can be traversed.
- The degree of comfort the path offers in terms of the extent of mud, wet peat, stones, or roughness.
- The desire lines which do not coincide with paths.
- The attractiveness of the adjacent environment eg. water's edge, woodland edge, sheltered hollow on a sand dune etc.

Proliferation of a path network

3.4.8 Another consequence of open access on a site may be a ***proliferation of the footpath network***. Anderson (1990) found a significant expansion of paths on a moorland site in the Peak District over 18 years, whilst Liddle and Greig-Smith (1975a) recorded an increase from 2.2km to 16.5km in 10 years on Abberffraw sand dune system. Watson (1988) noted a more substantial increase on Cairngorm from 1.3km to 17.1km in 21 years. The implications of open access on a site need to be gauged in relation to the number of likely access points from which new

Path networks can proliferate

footpaths could develop. Substantial works may be needed to direct and manage access round very open sites.

Barrier effect to some animals

3.4.9 One potential consequence of increased tracks and paths is the ***barrier they create for some species***. Those which will not cross an open, possibly dry, environment, may become isolated in the habitats left enclosed by paths and tracks. Mader (1984) and Mader *et* al. (1990) first raised this issue, and showed that several carabids and two species of small mammal found different width tracks and roads subject to very little to high levels of vehicular traffic in various situations in Germany, a barrier to cross movements. Lindsay (in a presentation at the winter British Ecological Society Conference 2001) seemed to find a similar reluctance of carabid beetles in a mark-recapture experiment to move between heathland patches separated by grassy golf fairways. Baur and Baur (1990), in a study of the land snail *Arianta arbustorum*, found that it did not cross a 3m wide track (although individuals moved far enough to have done so), but freely crossed an 0.3m overgrown path.

Paths as barriers to animals

3.4.10 ***The implications for less mobile species of path networks is not clear***. How many individuals needing to cross paths to maintain genetic biodiversity is unknown, and will vary between species. The maximum path width that different species will cross is largely unresearched, and the long-term implications for species sustainability cannot be predicted. Nevertheless, the possibilities of deleterious effects need to be borne in mind when assessing individual situations.

Value of bare ground

3.4.11 This also needs to be balanced against the ***value of bare ground*** (provided it is not continually disturbed) ***to some species***, ***especially aculeate hymenoptera,*** on moorland paths (M. Waterhouse pers. comm.), ***orthoptera*** and sand lizards (K. Corbett, pers. comm.). Kirby (1992) highlights the value first of bare ground, and secondly of paths on heathland which provided useful niches for invertebrates (see *Chapter 15, Section 15.3*). Firmly packed or loose sand, but not that which is heavily churned up by trampling, provides the best habitat conditions.

Value of bare ground

Erosion

3.4.12 One final effect of bare ground and compaction derived from trampling is ***erosion***. Although that induced by visitor use is small-scale compared with natural forces, recreation-induced erosion can still be significant in sensitive areas. Erosion can be through overland flow, rill or gully erosion, sub-surface flow or wind (Morgan, 1979). The amount of soil carried by erosion will be related to the velocity of the flow, and therefore the slope and severity of the rainfall event, and the particle size of the soil. Large particles require more energy to move them. Soils with high silt contents are the most erodable.

Erosion impacts

3.4.13 Soil compaction and reduced plant cover, litter and rain infiltration all contribute to enhanced erosion rates, accentuated on slopes, and where paths pass straight up a hill (a common feature of human, compared with animal, paths). ***Significant erosion can be expected where the plant cover falls below 70%*** (Liddle, 1997), but erosion can commence before this level is reached (Kuss and Morgan, 1984).

3.4.14 Paths can develop into multiple tracks, each eroded into channels. Lance *et al*. (1989), for example, found that the small-scale erosion recorded on paths on Cairngorm by Watson (1985) had developed up to seven eroded tracks.

3.4.15 The extent of erosion will be related to the vulnerability of the soils to damage. In a study of the Pennine Way, Bayfield and Lloyd (1971) showed that the widest bare width and most erosion were associated with organic soils (mostly peat). If a path cuts through the soil to a solid bedrock, erosion rates may be much reduced, but where the parent material is, for example, unconsolidated glacial or alluvial sediments (consisting of fine sands, silts or clays) then damage can be significant (Root and Knapik, 1972, quoted by Liddle, 1997).

3.4.16 Based on a model developed by Morgan (1985), Liddle (1997) estimates the potential rate of soil loss as 17 years for the total removal of the soil layer, with topsoil lost after 9 years following an annual predicted loss of 0.219kg/m^2/yr as a result of hikers using some American trails. Although needing field testing and the results will depend on the soils and local climate, these results, based on actual figures, give an indication of possible time-scales which are worth noting.

3.4.17 The full extent of the effects of, and therefore, the impact of trampling will need to be gauged with these factors in mind.

3.5 The Effects of Disturbance

Key Points

Disturbance to animals results in:-

- **Detection and possible changes in behaviour (see chapters on different animals).**
- **Loss of or change to habitats (see habitat chapters).**
- **Death (eg. fishing, hunting, not generally covered in this Guidance).**

Disturbance types

3.5.1 ***Disturbance*** has been separated by Liddle (1997) and others into three categories. Type 1 disturbance occurs when an animal is

aware of the presence of the visitor, through sight, sound or smell, but there is no contact. This may or may not alter the animal's behaviour.

3.5.2 Type 2 disturbance occurs when the animal's habitat is altered, for example, by trampling or the presence of waste food, whilst Type 3 disturbance is more extreme, resulting in direct and damaging effects. This is usually the result of hunting or fishing, which are not part of this guidance, but could also result from unintentional treading on an animal (for example, young birds or invertebrates). The result can be death. It is mostly Type 1 disturbance which is discussed in the sections devoted to different animal groups . Type 2 disturbance, ie. loss of habitat, is covered in the separate chapters on different habitats.

3.6 Pollution and Waste

Key Points

- **Pollution probably not a CROW associated issue.**
- **Waste materials (plastic, bottles) not a significant threat unless affecting a rare species.**
- **Waste food can attract crows which can then predate nesting birds.**
- **Significance of discarded glass for starting fires is unknown.**

Impact of waste materials

3.6.1 There will ***probably be little pollution*** resulting from additional access permitted by the CROW Act. The main sources of pollution related to recreational activities are from motorised boats or from facilities such as campsites, sewage provisions etc. Car park run-off could have implications if it passed untreated into important watercourses or ditches. None of these are associated with the access provided directly by the Act, nor are they, in general, likely to be permitted on high value sites for nature conservation, although there could be pressure because of access to provide some, such as car parks and toilets.

3.6.2 ***Discarded waste materials*** could be a greater problem. Litter, including plastic bags, which can be eaten by mammals, bottles that can trap small mammals and other animals, and waste food, could be significant in well-used areas. However undesirable eating or being trapped and dying in waste materials is, the levels of loss are unlikely to result in a nature conservation issue unless the animals concerned are very rare, and with small, vulnerable populations.

3.6.3 The issue of waste food could be more significant as it attracts opportunistic feeders such as crows. Watson (1988) found this in the arctic-alpine environment in Scotland where crows had been a rare sight before visitor numbers increased in the 1940s. Watson (1981) recounts how crows then robbed nests of ptarmigan and other native birds and were thought to pose a new threat to the hill

birds. The conclusion was drawn that the number of crows was preventing red grouse and ptarmigan from maintaining sustainable populations on both quiet and disturbed areas on Cairngorm, although the impact of reduced predator control on the big Estates at this time would also need to be taken into account.

3.6.4 One last issue is the discarding of glass litter that could start fires in very dry and sunny circumstances. The significance of this is unknown. Research into the wildfires in the Peak District by Anderson (1986) showed that the majority were the result of careless discarding of cigarettes or of arson and vandalism. There was no evidence of bottles starting fires. On the other hand, such evidence would be very hard to gather.

Glass and fire

3.7 Assessing the Significance of Impacts

3.7.1 The available research provides detailed findings for particular sites from which some generalisations have been drawn (for example, on the features of plants which make them more-or-less tolerant of being trodden on repeatedly, or on the fact that many invertebrate groups are reduced by trampling). In addition, much of the research directed at trampling has examined the effects of paths and trampled zones, existing ones or experimentally created ones. ***Translating the information available to assist making site specific decisions*** is the next stage which will ***need to be undertaken at the local level***.

Translating information to local situation

3.7.2 ***Factors which will need to be taken into consideration will be:***

- ***The presence of extra-sensitive species, assemblages and communities, their location, extent and current condition.***
- ***The predicted patterns and levels of access use either additional to current linear (ie. footpath use), or as a new activity.***
- ***The availability of resources to plan for and manage access effectively.***

Factors to consider

3.7.3 It will be important to consider the ecological and environmental situations in the local context. Species differ in their sensitivities to climate, soils, wetness and other environmental factors within the different geographic zones of the country. It is possible that species towards the edges of their range may react differently to further factors such as trampling. The species which would benefit from some trampling (for example, invertebrates favouring bare ground) will vary between habitats and regions.

Local ecology and environment

3.7.4 It is because of both this local variation, and the need to apply the research to local situations, that it is impossible to provide quantitative guidance on, at its crudest level, how many people a site can absorb without unacceptable damage. Every situation has to be judged against the key features of a site, the criteria for favourable condition and the limits of acceptable change these must enshrine.

3.7.5 In order to assess the significance of potential access effects, it is therefore essential to have a good grasp of the local ecological balances and opportunities on the sites in question, and to conduct a constraints analysis which examines graphically the location of all the key features overlain by predicted recreational use. The need for, and types of, management measures can then be identified from such an analysis. At the same time, where these are considered to be inadequate to protect the key features in favourable condition, then the need for some form of statutory restriction or exclusion, can be identified. Conducting a constraints analysis, even informally, will provide the reasoned arguments needed to justify management needs or more stringent measures.

Constraints analysis needed

Summary

A constraints analysis for each site is needed to identify:-

- **Sensitive habitats and species which contribute to favourable condition.**
- **Likely patterns and numbers of visitors as a product of access provisions (ie. over and above current usage).**
- **Likely results in terms of extent of trampling zones, bare ground, path network densities, erosion potential.**
- **Disturbance effects on animals.**
- **Extent to which negative effects outweigh positive ones.**
- **Extent to which management measures can reduce any damaging effects to an acceptable level.**
- **Extent to which statutory restrictions or exclusions may be justified.**

4. Lowland Heathland

4.1 Introduction and Context

4.1.1 ***Lowland heathland occurs on acidic, infertile soils*** across the UK. Latest figures indicate that there are about 39,000ha of lowland heathland in England and 12,400ha in Wales. There are 268 and 39 SSSIs respectively containing this habitat type in the two countries, which represent about 15% of the lowland heathland within Europe. A large number of SSSIs also have international designations. However, many of the remaining heathland sites in England and Wales are small fragments of the landscapes which covered big areas across the countries at the end of the 19th century.

Areas and numbers

4.2 Accessibility of Sites with Heathlands

4.2.1 Many of the remaining heathlands are in close vicinity to urban areas or to holiday destinations, and these are often open to access. ***There are extensive areas of lowland heathlands already open to the public***, particularly in Dorset, Hampshire, Devon, Cornwall, Surrey, Sussex, Norfolk, and Suffolk, many in National Trust or institutional ownership. There are still areas with no statutory or customary access, and significant areas are kept closed for military training purposes.

Many have access

4.3 General Vulnerability of Sites with Heathland to Direct Impacts arising from Access

KEY POINTS

The research undertaken on heathlands and related habitats shows that:

- **Dwarf shrubs are reduced to 50% cover or less with 200-400 passages.**
- **Damp or wet heath plants are more sensitive than dry heath species.**
- **Dry heath plants are more vulnerable when older or wet.**
- **Lichen-rich areas and *Sphagna* are much more sensitive *(Chapter 16)*.**
- **Eutrophication from dog fouling can change heath to grassland, eg. *Molinia*.**
- **Bare ground by paths on heathland is particularly important for some invertebrates.**
- **Even light trampling can damage heathland invertebrate communities in the vegetation (*Chapter 15*).**
- **For disturbance effects on birds see *Chapter 12*.**

4.3.1 ***Existing*** sites with open ***access generate direct conservation concerns*** (eg. local cases of trampling, vandalism, erosion, eutrophication, calls to install car parks, facilities and major paths, or where there are highly sensitive species interests). Some negative effects of uncontrolled fires on heathland vegetation

Range of effects

have been documented (Bullock & Webb, 1995; Haskins, 2000; de Molenaar, 1998). Anderson (1986) showed how much more at risk open access dwarf shrub and moorland vegetation is to fires compared with non-access land.

4.3.2 ***It is difficult to give a measure of heathland vulnerability***: this will depend on the type and intensity of pressure, the time when it occurs, facilities for access (eg. car parks), soil type, weather conditions, vegetation characteristics and species affected (Harrison, 1981; Toullec *et al*., 1999; Bayfield, 1979a; Gallet & Roze, 2001). ***Calluna heathland***, for instance, is ***highly sensitive to trampling***, both during summer and in the winter, as also happens with some grass heaths (Harrison, 1981; Haskins, 2000). There are direct and immediate effects; but also deferred responses, usually to winter trampling.

4.3.3 Harrison (1980, 1981) demonstrated the high intolerance of heather to trampling in an experiment where 2,000 tramples at 400/week for five weeks in summer, 100/week for four weeks in winter, or both were applied to pristine heathland on Keston Common (Bromley). After only ***400 passages*** in the first summer of the experiment, ***heather cover had fallen*** to about ***50%***, and by 800 passages it was less than 10%. The vegetation failed to recover in the period following the experimental trampling, after winter only, summer only or all season trampling.

Trampling levels to reduce dwarf shrubs

4.3.4 Gallet and Roze (2001) compared the sensitivity to trampling of dry heathland (bell heather, European gorse and bristle bent), and mesophilous heathland (Dorset heath, European gorse and bristle bent). The differences were dependent on season and weather conditions, with the dry heath more resistant to trampling than the mesophilous one. However, under wet conditions, they were both equally vulnerable, but the dry heathland proved to be significantly more resistant in winter. The treatments involved tramples at 0, 100, 200, 500 and 700 times, all on the same day, but in winter, in dry summer or after rain in summer in different plots. In all cases, though, trampling led to a great decrease in ***vegetation cover, with the vegetation cover varying between 0 and 50% under 750 passages***.

4.3.5 These Breton heathlands fall into Cole and Bayfield's (1993) moderately resistant vegetation types, defined by about 200 passages to reduce vegetation cover to 50% (other resistance levels are discussed in *Chapter 3 para. 3.20* and given in Table 3.2). Bristle bent was the most resistant species, except when trampled in dry, summer conditions in the mesophilous community. European gorse appeared more resistant than heather and the *Ericas*, and bell heather was less damaged than Dorset heath, but more vulnerable in wet conditions. These differences are likely to relate to the different growth habits. Gorse, being much woodier, was more resistant to winter than summer trampling.

4.3.6 Although not on heathland, about ***200 passes is needed to reduce bilberry to 50% cover*** in spruce woodland (Kellomaki, 1973), although Cole (1987) found similar damage after only 40. ***The number of passages required to reduce individual species to less than 50% was less than for the community as a whole.***

Differences between species and communities

4.3.7 As Gallet and Roze (2001) point out, trampling experiments can only indicate the relative sensitivity of species, and are not readily translated into real visitor numbers on sites. The aim of management on high value heathlands must be to retain the community structure and species, not just plant cover, and visitor resistance has to be adjusted accordingly. Gallet and Roze (2001) suggest that to achieve this, some 30% less trampling pressure is needed during or after wet days than in dry days in summer, and total trampling should be 50% lower on mesophilous compared to dry heathlands. In addition, the studies described also allow recovery periods which are not available without a greater management input on heathlands. There is the additional complication that young dwarf shrub plants are generally more resistant to trampling than older plants. More woody material, though, also increases the fire risk in dry conditions.

Nutrient enrichment

4.3.8 ***Dog fouling*** in car parks and surrounding areas may present a risk of habitat change through ***eutrophication*** (Bull, 1998). This increase in the available nutrients in naturally nutrient-poor habitats may result in a conversion of a heathy sward dominated by heather and bell heather to a grassy sward, or conversion of a short sward to tall, less diverse ones (de Molenaar, 1998; Bull, 1998). See *Chapter 3, para. 3.3.12-14* for further information on the effects on soils.

Air pollution

4.3.9 The fact that a significant majority of visitors may use their cars to go to the sites also poses some risk of ***atmospheric deposition*** of pollutants in the vegetation (Angold, 1997; Haskins, 2000; Bull, 1998) which in turn, can cause vegetation changes towards a more mesotrophic vegetation type, for example, of increasing purple moor-grass. However, it would be difficult to separate the contribution of recreational traffic to heathland sites from the general levels of air pollution generated from roads. Most southern heathlands are close enough to roads to experience general impacts from traffic.

4.3.10 These potentially negative effects have been observed at various sites (Harrison, 1981; Haskins, 2000; de Molenaar, 1998; Bull, 1998) but they need to be counterbalanced by possible benefits for plant species needing bare ground to trampled swards (see *Chapter 16, para 16.3.2*).

Other heathland species, Possible benefits to invertebrates

4.3.11 The ***impact of trampling on invertebrates*** needs to be considered. Although there are no studies available directly on heathland, there are indicators from dune heathland (see *Chapter 15, para. 15.3.8*). However, bare ground on heathlands, associated with lightly trampled path edges ***can be important for some species*** (*see para. 15.4.3*). This has to be considered

alongside the possible effects of the tracks and paths acting as a barrier (*Chapter 3, para. 3.4.9 et seq.* and *Chapter 15, Section 15.3*).

4.3.12 Similarly, consideration of sensitivity of herptiles and birds are important on heathlands (for these, see *Chapters 12* and *14*).

4.4 Types of Site with Lowland Heathland with Particular Vulnerability to Access Related Issues

4.4.1 The term "heath" as interpreted within the CROW Act incorporates dry, humid and wet heaths, gorse stands, acid grassland and other habitats on low pH soils without ericaceous shrubs. The research findings suggest that ***the most to the less sensitive communities on heathland are:***

Most to the less sensitive vegetation types

- Lichen-rich heathland.
- *Sphagna*/wet heath.
- Humid heath.
- Dry heath.
- Gorse.

4.4.2 ***Open access*** under the CROW Act on sites ***with current*** or *de facto* open ***access is unlikely to be responsible for significant additional impact*** especially if there is already a footpath network, and this is stable, not expanding.

4.4.3 ***On sites with no current open access, a new path network,*** which ***will rapidly develop bare ground***, is likely if the site attracts more than 200 or so visitors a year. The significance of this network will relate to its extent overall as a proportion of the site, balanced against any benefits of bare ground it provides. The difficulty of walking through tall, rank, dwarf shrub heath will result in more people staying on paths in this vegetation. Shorter swards could attract more off-path use, depending on desire lines and points of attraction.

Sites with new access – new footpath network – how to assess its significance

4.4.4 The significance of this needs to be considered in relation to the size of the site, the relative sensitivity of the vegetation community types, the steepness of slopes and, hence, the erodability of the soils, and the age of the dwarf shrubs. If there is no opportunity to manage the heathland to reduce the fire-risk of old, leggy heather, especially where this lies beside paths, then the potential impact of wildfire must be considered (Anderson, 1986), and action may need to be considered under Section 25 of the Act for exclusion provisions during exceptional weather conditions.

4.4.5 The significance of the potential effects needs to be assessed against the limits of acceptable change of the parameters used to define favourable condition for the whole site.

Assess against parameters for favourable condition for whole site

4.5 Associated Interests

4.5.1 Certain areas of lowland heathland provide a suitable habitat for specialised and scarce species, including:

Birds, Herptiles, Plants, Invertebrates

- Birds, eg. stone curlew, nightjar, Dartford warbler, woodlark.
- Reptiles, eg. sand lizard.
- Amphibians, eg. natterjack toad.
- Invertebrates, eg. silver-studded blue, raft spider.
- Plants, eg. marsh clubmoss, marsh gentian.

In considering access to such areas, consideration should be given to the relevant species sections of this report. The same action may be beneficial to some species and detrimental to others, eg. black bog ant, which is likely to be vulnerable to trampling pressure, and three-lobed crowfoot, which benefits from poaching.

4.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

4.6.1 In general, ***conservation objectives for lowland heathland sites*** are most ***likely to be met using a variety of management and non-statutory mechanisms***, especially taking care in the siting of any new access points and paths, and ensuring that facilities such as car parks and interpretative material are provided in ways that steer people away from sensitive sites and areas. Where necessary, a responsive approach to repairing localised trampling or erosion is acceptable provided that this is necessary in only localised areas.

Most sensitive types of sites

4.6.2 There may be cases where minor restrictions are necessary for example to define access points to enter the land, or to provide additional controls on dogs beyond the CROW Act requirement for all dogs to be on short leads from March to July inclusive.

4.6.3 Significant statutory exclusions and restrictions are likely to be necessary for direct conservation reasons only in exceptional circumstances, as follows:

i. Where access demand and wear is likely to be unusually high due to the proximity of major populations and the lack of alternative sites.
ii. On small sites on urban fringes where erosion could be severe.
iii. Where there are specialised and fragile heathland vegetation categories, especially lichen heath, dune heath and wet heath, and where these are vulnerable to damaging levels of pressure.
iv. Where there are vulnerable species interests (birds, vertebrates, invertebrates and plants) as specified in the other sections of this report.

Even here it is expected that access could continue in most cases along linear routes, and proper visitor management and interpretation should be sufficient to guide people away from the sensitive areas.

4.6.4 Other exceptional circumstances may be referred to the appropriate specialist.

4.7 Related Concerns

4.7.1 Indirect issues of concern may arise in association with the statutory right of access. These especially include:

Grazing management

- ***Interference with grazing regimes*** (through leaving gates open, damage to fences or water supplies).
- ***Opposition to fencing*** to allow adequate grazing regimes for conservation may be important.
- ***Disturbance to livestock*** caused by dogs (thousands of incidents - some resulting in the death of the livestock - are reported each year (Bull, 1998)).

4.7.2 Because lowland heathland is generally considered unproductive and marginal land, issues of this kind ***can make grazing economically unviable***, and threaten the maintenance of conservation management. Without grazing, scrub and trees will invade again and favourable conditions would be threatened. Such issues need to be addressed under the provisions of Section 24 of the CROW Act.

4.7.3 Certain heath sites can be dangerous due to their steepness or the presence of cliffs or scree, or to the presence of unexploded shells or other ordnance.

4.7.4 There is a very high annual number of uncontrolled wildfires in heathlands near urban areas. There is no evidence by whom and why fires are set. Incidental observations point mainly, but not exclusively, to youngsters, setting fire on purpose but also by accident (flipping away burning cigarette tips, campfires out of control, etc). Fires in heathlands have effects which vary with the season and their extent, intensity and frequency. Controlled fire is a not an uncommon heathland management tool to rejuvenate old heather, but is applied in winter. Uncontrolled fires occur in the summer and may result in the killing of the heather, as well as any animals which can not get away in time. Regeneration of the vegetation is slow and may never occur due to expansion of more vigorous species (de Molenaar, 1998) or to the loss of soil and peat layers which lead to permanent changes. Management issues are covered under Section 24 of the Act, and exclusion to reduce fire risk in extreme weather conditions, under Section 25.

Danger of wildfire

4.7.5 The adverse effects on heathland from other forms of recreation, such as off path horse riding, mountain biking and motorcycle scrambling, can lead to erosion and loss of vegetation, particularly on steeper slopes, and to the increase in number and width of tracks. These activities can have effects on wildlife (eg. sand lizards, sand wasps) partly through effects on soil and plant cover (indirectly affecting flora and fauna) and partly through the direct effects of disturbance on wildlife (de Molenaar, 1998). There is also the matter of disregarding by site visitors, often willingly and knowingly, codes of conduct and guidance provided on signs.

Other damaging recreational uses

4.8 Opportunities Associated with a Statutory Right of Access

4.8.1 Heaths form an integral part of attractive and sometimes historic landscapes, with fine, open views and showy wildlife and they lend themselves readily to the provision of ***interpretative material***. Opportunities for promoting interpretative material should be taken wherever this can be achieved without promoting public usage to unsustainable levels. Many heathlands suffer from inadequate management, especially lack of grazing. Where the provision of fences, gates, cattle-grids or other infrastructure is to be provided in association with the management of access, or vegetation management undertaken, consideration needs to be given to opportunities for ***enhancing habitat condition simultaneously***. In addition, there are many heathlands now in a fragmented state due to agricultural improvement and afforestation with consequent deterioration of both their access and wildlife potential. Assessors should consider the potential for ***promoting reversion schemes aimed at re-connecting such sites***. Such new heathlands are likely to be less vulnerable to recreational damage once they are established because they are unlikely to acquire all the specialist heathland species for some time. In addition, they could be valuable in spreading out recreational pressures.

Interpretation, management restoration, creating links

SUMMARY OF POTENTIAL SIGNIFICANCE OF ACCESS IMPACTS ON LOWLAND HEATHLAND

	DIRECT EFFECTS			INDIRECT EFFECTS	
	Trampling	**Eutrophication**	**Disturbance**	**Fire**	**Management**
Dry heath	xx	xx		xxx	xxx
Damp/wet heath	xxx	xx		xx	xx
Dune-heath	xxx	xxx		xx	xx
Mire	xxx	xx		xx	xx
Acid grassland	xx	xx		xx	xx

	DIRECT EFFECTS			INDIRECT EFFECTS	
	Trampling	**Eutrophication**	**Disturbance**	**Fire**	**Management**
Lichen-rich heath/grass	xxx	xxx			
Breeding birds			xx(x)*	xxx	xx
Wintering birds (Raptor roosts)			xx		xx
Herptiles	xx			xxx	x
Invertebrates	xx/++			xxx	x
Special plants	xx/++				xx

Key:

Least ← x xx xxx → most - degree of negative effects
+ ++ +++ - degree of positive impacts

The assessment assumes a moderate to high level of use to have the above impacts. The scale of each impact depends on local site characteristics and size.

* Stone curlew disturbance possibly critical see *Chapter 12, Section 12.6.*

5. *MOUNTAIN AND MOOR*

5.1 Introduction and Context

5.1.1 In the context of this guidance the term moor is used to refer to the unenclosed land of the uplands which supports montane habitats; upland dwarf-shrub heaths (wet and dry); blanket bogs; acid and calcareous grassland; and crags, screes and limestone pavement. These vegetation types frequently occur as an intimate mosaic of habitat types, and within them are also found areas of bracken, shrubs, flushes and occasional trees. As they form such an intricate mosaic they are treated together in this chapter.

Range of habitats

5.1.2 Many SSSIs are notified for a range of interest features, and most contain a mixture of habitats and vegetation types. It is extremely difficult to give precise countrywide data for component habitats within these mosaics but estimates are given in the following accounts. Many of these upland SSSIs are internationally important, and are either proposed or candidate Special Areas of Conservation (SACs) including, for example, the Border Mires, Dartmoor, Exmoor, Lake District High Fells, North Pennines, North York Moors and South Pennines, Y Wyddfa, Migneint and Berwyn.

Montane

5.1.3 ***Montane areas*** are defined here as the ***land found above 600m***, which is generally above the tree-line. The tree-line however is difficult to detect in England as natural vegetation communities have been greatly modified by grazing and burning.

Definition, Areas

5.1.4 Where there is tree growth there may be a zone of tall scrub at the upper limits. The upper limits of this tall scrub is generally taken as the boundary between the sub-montane and montane zones, but this is often blurred. The tall scrub gives way with increasing altitude to medium sized shrubs of species such as juniper and willows, and then to dwarf-shrub heath, moss- and lichen-heaths, dwarf-herb communities, sedge- and rush-heaths, and other grass-dominated communities.

5.1.5 There are 33 SSSIs in England that contain land above 600m and these cover approximately 26,000ha. The total area of ground above 600m in England is 41,300ha**.** In Wales the area of land over 600m is 20,875ha of which 14,495ha are within 21 SSSIs.

Upland heathland

5.1.6 Heathland vegetation occurs widely on mineral soils and thin peats (<0.5m deep) throughout the uplands and moorlands. It is characterised by the presence of dwarf shrubs, especially heather. Blanket bog vegetation may also contain substantial amounts of dwarf shrubs, but is distinguished from heathland by its occurrence on deep peat (>0.5m). In the south and west of England, western

Definition, Areas

gorse occurs together with a range of dwarf shrubs, and in northern areas juniper is occasionally seen above a heath understorey. Wet heath is most commonly found in the wetter north and west and is characterised by an understorey of mosses often including carpets of *Sphagnum* species.

5.1.7 Upland heathland is present on an estimated 270,000ha in England and 69,000ha in Wales. Dwarf-shrub heaths (all types) are recognised as being of international importance, and are largely confined within Europe to the British Isles and the western seaboard of mainland Europe. Around 180,000ha of upland heathland are found within 87 SSSIs in England and 34,000ha on 50 SSSIs in Wales.

Blanket bog

5.1.8 Blanket bog is a globally restricted peatland habitat confined to cool, wet, typically oceanic climates. Peat depth is very variable, with an average of 0.5-3m being fairly typical but depths in excess of 5m is not unusual. In terms of national cover of blanket peat soil, England supports some 215,000ha and Wales has about 54,000ha. Many of the typical blanket mire species such as cross-leaved heath, deergrass, cottongrasses and several of the *Sphagna* species occur throughout much of the range of the habitat.

Definition, Areas

5.1.9 Extensive areas of blanket bog are given legal protection by being designated as SSSI. Current estimates suggest that the 51 SSSIs that include blanket mire as part of the designated interest, extends to around 90,000ha in England and 15,000ha in Wales on 29 SSSIs.

Upland acid grassland

5.1.10 Acid grasslands, where grasses are the dominant species and where dwarf shrubs form less than 25%, are widespread. While naturally part of upland vegetation mosaics, their extent has increased substantially since the 1940s along with the dramatic increase in sheep numbers, and now cover extensive areas of moors. Much of the ground covered by acid grassland is regarded as degraded heath, and tends to be very species-poor, especially so when the grasslands themselves are overgrazed.

Definition, Areas

5.1.11 These communities are found on all upland SSSIs notified for their upland heath or blanket bog interest and can cover substantial areas on many.

Upland calcareous grassland

5.1.12 Upland calcareous grasslands occur on shallow lime-rich soils situated above the limit of agricultural enclosure. As with the other habitats, they typically occur as components of habitat mosaics, which are generally managed as rough grazing land for domestic livestock. This is a relatively rare upland vegetation type that supports a wide range of uncommon species.

Definition, Areas

5.1.13 It is estimated that 10,000ha of upland calcareous grassland occur in England and much of that resource (around 75%) is found within the 33 SSSIs that have this vegetation type. There are only 800ha in Wales, 50% being on 16 SSSIs. Particularly important areas for this habitat include the North Pennines and Cumbria, with smaller amounts on the Brecon Beacons.

Crags, scree and limestone pavement

5.1.14 Rock exposures occur as features such as cliffs or crags, gullies and ravines, boulders and scree, and limestone pavements. Exposures may occur in rocks of sedimentary, volcanic or metamorphic origin. Limestone pavement is a particular type of rock habitat that occurs from sea level to mountain top. Past natural weathering has formed a complex of deep crevices known as grykes interspersed with massive blocks known as clints. The vegetation of rock habitats is characteristically discontinuous and often sparse. Soil cover is thin, skeletal or absent altogether. The vegetation includes two distinct types:

Definition, Areas

- Vegetation that uses the physical structure or form of the rock as a shelter from the extremes of climate or grazing. This includes ledge flora, scree communities, the flora of grykes of limestone pavement and remnant woodland on upland crags.
- Vegetation consisting of species that are poor competitors but can withstand or tolerate the stress caused by thin or absent soil, low nutrient levels, poor shelter and drought. This is true 'chasmophytic' vegetation, and includes the flora of cracks and fissures of rock faces, and the surface of clints of limestone pavement.

5.1.15 There is no precise data on the total extent of rock and scree habitats in England, with the exception of limestone pavement which is found on 29 SSSIs in England covering some 1400ha. The total resource in England is estimated to be around 2,300ha. By contrast, only about 50ha occurs in Wales, mostly in the lowlands of Clwyd and Gwynedd and on the uplands of the Brecon Beacons.

5.2 Accessibility of Sites with Mountain and Moor

5.2.1 People have been drawn to the beauty and isolation of the mountains and moors for many years. Extensive areas of the habitats described above form the backbone of the National Parks in England, and where linear access is already encouraged and open access provided by some of the Park Authorities. The degree of accessibility varies from park to park and within individual parks. Some have large areas where unrestricted access is already provided to the public, for example in the Peak District and Brecon Beacons. There are many other areas where access is widely available but generally restricted to linear routes, for example in the Lake District, North York Moors and Snowdonia. Access to mountain peaks and hill tops have always been sought by the public and are particularly popular for obvious reasons, for

General accessibility high already in some areas

example, Helvellyn in the Lake District and Y Wyddfa in Snowdonia.

5.2.2 Those moors which are managed for red grouse outside the National Parks generally have more restricted access opportunities, such as the North Pennines and parts of the Bowland Fells. In addition there are also substantial areas with no statutory or customary access, including significant areas kept closed for military training purposes, for example, Appleby Fells in Cumbria, parts of Northumberland, and Sennybridge in the Brecon Beacons.

Large areas with no access – grouse moors and MoD land

5.3 General Vulnerability of Sites with Mountain and Moor to Direct Impacts arising from Access

Key Points

The range of research in the uplands shows that:

- **Off path use can be as high as 30% where adjacent vegetation is amenable walking.**
- **Paths can have very substantial trampling widths in popular areas.**
- **Path networks and density can increase significantly with increasing use.**
- **People walk extensively in the uplands.**
- **Lichen-rich and *Sphagna*-rich communities are destroyed after c.50-80 passages.**
- **Wet vegetation on peat very sensitive.**
- **Acid grassland and young heather less vulnerable.**
- **Heather in montane situations more sensitive than at lower altitudes.**
- **Crowberry and *Vaccinium* species sensitive to trampling.**
- **Vegetation recovery may not be to pre-existing communities.**

On and off path use

5.3.1 Where the adjacent ground is rough, the vegetation tall and woody (heather in its mature and senescent states), or where very wet areas are present, visitors to mountain and moorland tend to keep to paths. However, the work by Anderson (1990), which involved counting visitors on and off paths in large areas of open access (or *de facto* access) moorland in the Peak District, showed that across all the vegetation types, on average, ***23.4% of people were off the path***. This was accentuated beside small rivers and on blanket bog. In the Peak District this habitat is mostly M19 *Eriophorum vaginatum* mire with minimal *Sphagnum* cover, or eroding, dissected blanket mire with cottongrass, crowberry and bilberry. Bayfield (1973) also recorded a ***high 30% off path*** use on a Scottish path.

Levels of off-path use on moorlands

5.3.2 In areas where hill tops are more pronounced (unlike the Peak District), walkers tend to keep more to the paths leading to their summits, possibly partly because of the sense of security this gives, especially in low cloud cover. However, there is a long tradition of fell or hill walking involving direction finding and

off-path use, especially in the South Pennines where much of the existing open access lies. Even where there are primary footpath routes like the Pennine Way and Offa's Dyke (across the Brecon Beacons), the intensity of use has resulted in eroding, boggy ground which pedestrians avoid as far as possible, resulting in an extension of the path widths. Porter (1988) reported a 300% increase in the bare widths of the Pennine Way from 1971 to 1987 in one of its busiest sections, with the average width expanding from 3.54m to 14.38m. In the worst affected stretches, it had reached a 70m wide trampled width (Pearce-Higgins and Yalden, 1997) prior to a multi-million pound restoration programme (Porter, 1990).

Increases in path networks and width

Increase in path networks and widths

5.3.3 In addition to extensive off-path use in existing accessible moorland, ***path networks have increased in extent and density***, as discussed in *Chapter 3, para. 3.4.8*, and have deteriorated in condition, with a proliferation of routes developing Bayfield and Aitken (1992). Bayfield (1973) and Huxley (1970) also describe how, if the path surface becomes difficult to walk on due to erosion, a new path forms alongside, thus increasing the impact width. Bayfield (1985) notes that path width can continue increasing for some time: at least 12 years on Stac Polly, 14 years on the Cairngorms, and longer on the Pennine Way in the Peak District.

5.3.4 Paths tend to spread out when the edges are indistinct, and the adjacent surface (vegetation or rock, etc.) is easier to walk on than the path (Huxley, 1970). Bayfield (1979a) found that path width increased with surface wetness, and was negatively correlated with the roughness of the edges. He also observed (Bayfield, 1971) that more people spread off steep paths in the downhill rather than the uphill direction.

Numbers of visitors and activities

Numbers of visitors

5.3.5 In many upland areas, unlike some lowland sites, a ***significant proportion of visitors typically walk more than two miles*** probably in areas where repeat visits and a general familiarity is greater, as in the South Pennines near the large conurbations where weekend rather than holiday visitors predominate. For example, the Peak Park Joint Planning Board Recreation Survey (1988) found 22% on average of 18.5 million visitors (more in winter, and fewer in summer) walked more than two miles.

5.3.6 A relatively new activity, ***gill scrambling***, is gaining in popularity in the Lake District, with the most favoured gills being used by upwards of 3,258 people/year. Although mostly an organised activity at present (and therefore excluded by the CROW Act provisions), this has the potential to increase as an unorganised recreational pursuit. Edwards, *et al*. (1989) found significant effects in the more popular sites with new paths, often beside the streams, damage to mossy, grassy slopes and flushes, and erosion.

Sensitivity of plant species

Relative tolerance of plant species

5.3.7 In relative terms, a sequence of ***less sensitive, to more sensitive communities*** have been identified in the Peak District moorlands (Anderson, 1990) as follows:

Less sensitive		
↓	Common bent/crested dog's-tail	As in some inbye land.
	Wavy hair-grass/sheep's fescue	On mineral soils.
	Heather	Young.
	Mat-grass	Usually on drier, thin peats or peaty mineral soils.
	Purple moor-grass	Usually on wetter flushed peaty soils.
	Bracken	Young plants.
	Heather	Old – old plants are brittle and easily broken.
	Crowberry/bilberry	On peat.
	Cottongrass spp.	Cottongrass mire on peat.
More sensitive	*Sphagna*	Flushes, mire on peat.

In addition, lichen-rich communities are very sensitive to trampling (*Chapter 6, para. 16.3.4 et seq.*) but do not occur in the Peak District moorlands.

Heather cover reduced to 50% by less than 400 passages

5.3.8 Harrison's (1981) studies on lowland heath showed that heather cover was reduced to 50% cover with only 400 passages (see *Chapter 4*, para. 4.3.3). Damage to heather on the moors is likely to occur more quickly where growth rates are lower, and be persistent on regularly used paths.

5.3.9 This is borne out by observations on an area in Scotland used regularly for teaching. Heather cover declined from around 90% to 50-60% with only 80 students/m^2 using it between March and November (Bayfield and Brookes 1979). Heather height also declined over time and consisted mostly of 0-20cm high plants. Bayfield (1979a) also recorded reductions of 50% of montane cover after only 80 tramples with recovery subsequently taking more than eight years. McDonald (1990) quotes the NCC Mountain Plateaux Ecology Project, which showed that ***only 50 tramples on montane heather resulted in measurable heather loss*** which was not made good after two years. Heather bruised by trampling was considered to be especially vulnerable to further damage, particularly winter frost browning (Watson *et al.*, 1966). Beeching (1975) noted how ***older, woody heather*** in the Peak District was ***more vulnerable*** to trampling than younger shoots.

Trichophorum Sphagnum, Vaccinium

5.3.10 Experiments undertaken by Bayfield (1971) at 650m in the Cairngorm showed how a ***Calluna-Trichophorum cespitosum*** wet sward near the car park tow was damaged by up to ***only 240*** tramples spread out over a two-month period. ***Sphagnum moss*** showed signs of saturation of response ***at about 80 tramples***. Heather cover 23 months after the summer trampling was still depressed at 18% against the original 35%. Deergrass recovered more rapidly in the same period and showed only 34% damage even under the highest rate of trampling (240 passages). ***Lichens declined rapidly up to 80 tramples and did not recover***. Bare ground increased from around 20% at 80 tramples, to 30% at 240 tramples, but was quite quickly recolonised within two years.

5.3.11 Young and Pendlebury (1969) found that ***50 tramples/day*** for 15 consecutive days also ***killed Sphagnum*** moss in some experiments in the Goyt Valley (Peak District). Bilberry also seems to be equally sensitive to trampling damage (see *Chapter 4, para. 4.3.5*) and Anderson (1961) noted a substantial increase in the rates of stem to leaf biomass in trampled bilberry.

Loss of species richness

5.3.12 Bayfield and Brookes (1979) found ***no evidence of a decline in species numbers*** (but from a species-poor community) and a modest influx under moderate and slight pressures as colonisation niches became available in the sward but, in the Caringorm, Watson (1985) noted the loss of bilberry, mosses and other species due to recreational use but the level of trampling was not recorded. Recovery from damage was found to be significantly slower with increasing altitude (Bayfield, 1974 and 1979a).

5.3.13 Emanuelsson (1984) conducted trampling experiments in sub-alpine and alpine areas in Northern Sweden where some of the vegetation was dominated by Northern crowberry, bilberry and cowberry. The crowberry was found to be severely affected and 60 passages was sufficient to reduce cover by 50%. Even two years after 200-400 tramples, the cover of crowberry-dominated vegetation was only 50% of its original value.

5.3.14 A study of track edges in the same area of Northern Sweden (Emanuelsson, 1984), revealed a characteristic zonation with a grass-dominated zone at the edges, fringed by cowberry and bilberry, but with the crowberry outside these zones. Abandoned tracks passing through these species recolonised very slowly and, even after 60 years, some were still recognisable.

5.3.15 ***High altitude vegetation can be very sensitive to trampling*** damage, especially where visitor pressure spread out on mountain tops. Watson (1985), for example, calculated that ***17% or 403ha*** of ***Cairngorm was damaged in the NNR away from the paths***. In these areas there was a higher proportion of grit on the vegetation, a lower vegetation cover, a higher proportion of the plants were buried, rill erosion was greater, and more stones and soil was dislodged.

Numbers of visitors in popular areas

5.3.16 The ***levels of trampling quoted are relatively low and easily reached*** on the more popular mountains and moorlands in a single season. To place this in context, annual numbers exceeding 25,000 have been recorded crossing the Pennine Way at the A57 Snake Pass in the Peak District (Yalden and Yalden, 1988). This National Park is the second most visited in the world, with an estimated 18.5 million visits per year (excluding those who walk into the Park from outside its boundaries).

Vegetation recovery

Recovery period rare in practice

5.3.17 Most of the experimental trampling studies have monitored a period of recovery after treatment. In practice, unless paths are alternated, use is continuous or concentrated in the holiday periods. Rather than recovery, the result is an increase in bare ground due to the lateral spread of visitors. This is accentuated where the path is wet and walkers move out to circumnavigate mud or wet peat. The wetter parts of the Pennine Way across the blanket peats prior to the recent restoration programme, exemplified this pattern particularly well.

5.3.18 Charman and Pollard (1994) chart the recovery of some tracks on Dartmoor previously used by vehicles (which could have resulted in greater compaction than from walkers, depending on the numbers involved). Grassland tracks abandoned in 1969 and 1975 showed a good recovery to similar vegetation to that adjacent, whilst the track flora across mixed heathland/grassland communities had recolonised after 1969 but not for those abandoned later. In contrast, the moorland/blanket mire sites had not regenerated, and one was changing to a grass-heath rather than mire community.

Other upland interest

5.3.19 There is no other readily available research on the effects of recreation on the other upland habitats described in *Section 5.1*. However, reference to the general impacts and the ecological principles behind them provided in *Chapter 3*, and information presented about different grassland types as given in *Chapter 8, Section 8.3* will assist in assessing the likely impacts in other upland habitats. Cross-referencing is also needed with the following to cover all aspects of the uplands:

Other sensitive habitats and species

Birds	*Chapter 12*
Mammals	*Chapter 13*
Herptiles	*Chapter 14*
Invertebrates	*Chapter 15*.

5.3.20 Upland breeding birds could be particularly susceptible to disturbance, especially if this were to result in a decline in populations on a site (see *Chapter 12*). Although little researched, upland invertebrates could be widely affected by low trampling levels where trampling zones beside paths or off-path use were significant. On the other hand, bare path edges can benefit some species (see *Chapter 15*).

5.4 Types of Site with Mountain and Moor with Particular Vulnerability to Access Related Issues

5.4.1 The ***vulnerability*** of the plant and animal communities will be related to ***the likely patterns of access***, intensity of use, the ***wetness and slope of the ground***, and to the ***sensitivities of the species***. Where open access (or *de facto* access) is currently available, the CROW Act is not likely to alter the situation significantly. However, where pre-CROW access is restricted to public paths, more off-path use might be expected from the introduction of area-wide access. This is most likely to be on short, more even vegetation (Huxley, 1970) and follow desire lines. ***A more extensive path network could develop if visitor numbers are significant.***

5.4.2 The ***significance of these effects*** will relate to ***habitats***, and those where key features, ***dense populations*** and ***rare species coincide*** with ***a significant increase*** in access use. Although detailed studies have not been conducted on all the vegetation types in the uplands, the general principles outlined in *Chapter 3*, and the consistency of the results obtained, indicate that some areas could be more vulnerable than others.

***Chapter 3* for general principles**

5.4.3 Those areas that are ***more vulnerable*** include:

More fragile areas

- ***montane areas*** which have thin soils and fragile vegetation;
- communities including ***mosses and lichens***;
- areas of ***impeded drainage or peat*** which support wet heath communities;
- ***flushed vegetation***; and

- ***blanket bogs***

all of which are much more susceptible to damage through trampling. Some rocky ground, crags and screes can also be susceptible to higher levels of access, where plants can easily be destroyed through trampling and loosening of the substrate.

5.4.4 Most upland vegetation types are moderately resistant to damage by trampling, with levels of some 200 to 400 passages leading to significant changes to vegetation cover, species composition and the development of bare ground.

Some upland vegetation types more resilient

5.4.5 Upland acid and calcareous grasslands are likely to be more resilient. Although the levels of use are very low, it is at these kinds of levels along one route that new paths will develop. There would have to be very high levels of use for 200 to 400 passages to be through every patch of vegetation on an area, and thus for all of it to be lost. In practice, there could be areas where the vegetation could be destroyed.

Wet soils and peat more vulnerable

5.4.6 On popular areas, ***paths are likely to expand in width***, especially where on wet peat, or steep slopes, and costly restoration schemes will be needed to avoid the effects of trampling and disturbance from spreading far into the surrounding habitats and affecting sensitive lichens, mosses and invertebrates. In areas where ***scree running or gill scrambling are popular***, and these coincide with key features of a site, then ***potential conflicts could occur***. ***Localised areas*** could experience widespread wear where walkers could spread out or where sensitive patches are crossed to reach other areas.

Expansion of paths,

Gill scrambling

5.4.7 This needs to be balanced by the fact that, away from the popular areas, many mountain and moorland areas tend to be remote, far from car parks, and not likely to be under significant open access pressure. In addition, in areas experiencing heavy grazing, the level of trampling from stock is likely to be more dispersed and higher than the impact of open access away from paths (Bayfield *et al.*, 1981).

Remoteness counter-balances some of sensitivity

5.4.8 The significance of these potential effects need to be assessed against the limits of acceptable change for the parameters used to define favourable condition of the site as a whole. It may be that the extent of bare and trampled ground and density of the footpath network is insignificant in the scale of the site and there is no cause for concern. On the other hand, it is possible that some, particularly sensitive areas or species, could be affected negatively, and such impacts will need to be avoided or reduced to acceptable levels in order to maintain or restore overall favourable condition.

5.5 Associated Interests

5.5.1 Certain areas of mountain and moor provide a suitable habitat for ***birds of conservation interest***, including raptors such as merlin, hen harrier and peregrine; waders such as dotterel, dunlin, golden plover and curlew; and both red and black grouse.

High values for birds

5.5.2 There are also areas of mountain and moor that support ***rich plant*** and ***invertebrate assemblages***. These are particularly associated with areas of wet heath, blanket bog, flushes, montane habitats, calcareous grassland and crags and limestone pavement. They also support a number of species that have a restricted distribution.

Plants and invertebrates

5.5.3 A number of ***Earth heritage features*** are associated with the uplands, see *Chapter 17* for further information.

Earth heritage features

5.5.4 In considering access to areas that contain these species, consideration should be given to the relevant species sections of this report (see *para. 5.3.19* above).

5.6 <u>Circumstances in which Statutory Exclusion or Restriction of Access should be Considered</u>

5.6.1 From the point of view of the upland habitat (ie. excluding consideration of their key bird populations – see *Chapter 12*), ***statutory exclusion is rarely likely to be necessary***. The mountain and moorland habitats tend to occur on a large scale, and can, to a certain extent therefore, absorb more visitors than a small site. Those which are more remote and likely to experience little open access, should show little effect, even if the habitats they contain are very sensitive.

Statutory exclusion unlikely to be needed for habitats

5.6.2 Where heavier open access use might be expected, with a potential expansion of the path network or where gill scrambling or variations on the theme could develop or expand, consideration will need to be given to the location and vulnerability of sensitive species and habitats. Every effort will need to be made to ***promote best practice management measures*** for remedial or preventive action, including control of car parking, routing of paths, establishing gates/stiles at critical points, and use of notices, way-marking and interpretational/educational material to encourage respectful and sensitive visitor behaviour.

Use of management measures, interpretation, to reduce damage

5.6.3 Where access points need to be controlled to ensure entrances are onto more resilient vegetation or to direct visitors away from sensitive sites, considerable works will be needed to secure the boundaries of open access areas before undesirable patterns of access develop.

Control of means of access will help direct visitors

5.6.4 If management measures are difficult or impossible to achieve within permitted management resource levels, then restrictions may be considered whereby visitors are confined to linear routes to avoid damaging the most sensitive areas including montane summits, wet heath, flushes, blanket bog, rocky slopes with skeletal soils, screes and certain calcareous grassland.

Possibility of short-term restrictions until management is available

5.6.5 It would only be in very exceptional circumstances that exclusions may need to be considered, for example where there are particularly sensitive breeding birds (see *Chapter 12*) or

where the site is small and sensitive, access levels high, and management measures have, or are, predicted to be insufficient.

5.7 Related Concerns

5.7.1 The most significant related issue is the increasing risk of ***wildfire*** in dry weather which is associated with open access when well-used by visitors (Anderson, 1986; Anderson *et al*., 1997). Section 25 of the CROW Act covers temporary exclusions at times of high fire risk, and Section 24 includes similar exclusions for management purposes. Careful management to provide firebreaks and reduce the flammability of vegetation adjacent to paths is essential in order to reduce the long-term damage upland fires can impose (Anderson, 1986; Anderson *et al.*, 1997), especially on deep peat. Anderson (1986) suggested retaining a pattern of tall, old heather immediately beside paths and burning overlapping blocks 30m wide set back beyond the paths.

Moorland fires in dry summers very damaging

5.7.2 Indirect issues of concern may arise in association with the statutory right of access. These especially include ***interference with grazing regimes*** (through leaving gates open, damage to fences or walls). Such issues are best addressed at a local level using appropriate access-management mechanisms and wardening, although these can be resource intensive. Such issues are covered under Section 24 of the CROW Act provisions.

Grazing management interrupted

5.7.3 In certain circumstances it may be appropriate for owners or occupiers to seek exclusions or restrictions specifically for land management reasons, such as burning practices associated with grouse management, and for shooting and driving game under Sections 22 or 24 of the CROW Act .

5.7.4 Mountains and moors can be ***hazardous***, especially to those individuals that are not familiar with the risks involved in visiting upland landscapes which have a rugged terrain containing cliffs, screes, steep slopes and areas of deep peat. These dangers can be increased through their general isolation and occasionally adverse weather conditions. However, the CROW Act removes the liability under the Occupiers' Liability Act 1984 in relation to hazards arising on access land from natural features (see Section 13 of the Act.

Public liability

5.7.5 Where there are also ***more localised dangers***, such as the presence of unexploded shells, owners and occupiers or appropriate authorities may seek exclosure or restriction for public health and safety reasons through the appropriate clause of the Act.

5.7.6 If intensive management were to be required to accommodate large numbers of visitors, then there could be a demand for ***surfaced paths***, and its concomitant drainage needs. On the one hand, Pearce-Higgins and Yalden (1997) show how the provision of a good quality path surface across blanket bog on the Pennine Way has reduced off path usage and disturbance significantly, whilst on the other, drainage of important flushes, springs etc could be damaging to the favourable condition of a site. A decision would

Pressure for surfaced and drained paths

need to be made in the local context. Bayfield and Aitken (1992) provide sound advice on how best to manage the impacts of recreation on vegetation and soils.

5.8 Opportunities Associated with a Statutory Right of Access

Interpretation and information

5.8.1 Many of the mountains and moors already form the core of most of the National Parks, such as Exmoor, Brecon Beacons, Snowdonia, North York Moors, Peak District and the Lake District. They already form a focus for visitors and are the subject of some useful interpretative materials. This is also true for some other upland areas that are not found within National Parks. However, there is room for ***more information and guidance*** which encourages the ***visitor to respect and understand the ecology of the uplands better***, and in so doing, help prevent, for example, the numerous, damaging moorland fires which still occur.

SUMMARY OF POTENTIAL SIGNIFICANCE OF ACCESS IMPACTS ON MOUNTAIN AND MOOR

	Direct Impacts		Indirect Impacts	
	Trampling	**Disturbance**	**Fire**	**Management**
Dry dwarf-shrub heath	xx		xxx	
Wet dwarf-shrub heath	xxx		xx	
Blanket mire	xxx		xxx	
Mountain	xxx		x	
Acid grassland	xx		xx	
Calcareous grassland	xx			xx
Flushes/springs	xxx			
Rock ledges	xx			
Screes	xx			
Breeding birds		xxx*	xxx	xx
Wintering birds (Raptor roosts)		x		
Invertebrates	xx		xx	x
Deer		xx		
Earth heritage	x?			

Key:

Least ← x xx xxx → most - degree of negative effects

\+ ++ +++ - degree of positive impacts

The assessment assumes a moderate to high level of use to have the above impacts. The scale of each impact depends on local site characteristics and size.

* See *Chapter 12, Section 12.4* for Mountain, and *Section 12.5* for Moorland, some species and situations more vulnerable than others.

6. LOWLAND RAISED BOG (ACTIVE AND DEGRADED)

6.1 Introduction and Context

Distribution

6.1.1 Raised bog is climatically controlled and merges with blanket bog where conditions for formation are most favourable. Elsewhere, it is confined to flat waterlogged land and basins in the lowlands. Reclamation for agriculture has generally occurred on all the more easily cultivated land, such as the fen which would often have originally surrounded the raised bog. This means that the boundaries of most raised bogs are now tightly defined as the interface between deep peat and intensive agriculture.

6.1.2 Lowland bogs occur throughout the world in the temperate zones, merging into tropical forest peat towards the equator and into permanently frozen palsamires (permafrost) towards the poles. Their structure and biota also vary with the degree of oceanity, most of those in England being towards the north and west of the country. Exceptions such as Thorne Moors occur in the east of England, and these are more continental in character. Although raised bogs occur widely across Europe, with highly natural examples in eg. Estonia and Finland, most examples in western Europe are seriously degraded. This is due to activities such as peat cutting, afforestation, landfill, and reclamation for agriculture.

Areas, SSSIs

6.1.3 ***Active raised bog*** (one which is currently accumulating peat) is a ***Priority habitat under the EC Habitats Directive***. About 70% of the English active and degraded resource have been identified for SAC designation. More have been notified as SSSIs in Wales, over 60% of the resource (3,000ha) is notified in 16 SSSIs, many of which are also identified as SACs.

***Sphagna,* Key species**

6.1.4 The most important peat builder in the northern hemisphere is ***Sphagnum*** moss; in parts of Australia and in New Zealand its place is taken by rushes of the *Restionaceae*. Consequently, in England and Wales it is the well-being of the *Sphagnum* moss which figures strongly in the assessment of the effects of access.

6.2 Accessibility of Sites with Raised Bog

Some have access

6.2.1 ***Managed access to raised bog*** is already ***possible*** on a number of nature reserves, both national and local. Examples are the Humberhead Peatlands (NNR), Risley Moss, Warrington (managed as a country park), Cors Caron NNR and Cors Fochno NNR in Wales.

But difficult terrain

6.2.2 Provision of access is ***accompanied by high health and safety risks***, as it involves proximity to deep water, including drains which have been blocked as part of the bog restoration. The terrain of an intact raised bog or one which is being successfully restored is inevitably very wet. In some cases large lengths of

boardwalk or other artificial substrates may facilitate access. Access for the disabled is a particular problem.

6.2.3 ***Access*** to raised bogs is often ***desirable in principle*** because they are amongst the least appreciated of habitats due to their poor accessibility, and public support for their conservation is essential.

Desirability of access

6.3 General Vulnerability of Sites with Raised Bog to Direct Impacts arising from Access

KEY POINTS

There is limited research on the effects of access on raised mires, but the general literature suggests:

- ***Sphagna* dominated areas are very susceptible to damage along with the hummock and pool patterning.**
- **Drier baulks are less susceptible.**
- **Peatlands are likely to be very susceptible to damage.**

6.3.1 *Sphagnum* moss can be slow growing, and research has shown how intolerant it is to trampling (see *Chapter 16, para.16.3.7*), with only 80 tramples destroying the moss. Flourishing under extremely wet conditions, repeated footprinting can soon cause gullying and a break in the vegetation cover. This is evident from the effects on the bog surface of making repeated water level measurements in fixed point dipwells. Drier peat, which often supports cottongrass species such as hare's-tail cottongrass, is not quite so vulnerable, but still falls within the group of most sensitive species (*Chapter 5, Section 5.3*). The general principles given in *Chapter 3* which outline the greater sensitivity of wet sites, and the vulnerability of peat in particular (*para. 3.3.19-20*), indicate that wet lowland raised bog is a potentially very sensitive habitat.

Susceptibility of different plants

6.3.2 The drier baulks where bracken or heather may predominate, will be more tolerant of trampling than the wet areas but, as is shown for lowland heaths and moorlands (*Chapter 4, Section 4.3* and *Chapter 5, para 5.3.7 et seq.*), these are only moderately resilient and bare paths could develop quickly with over 2-400 passages a year.

6.3.3 Surface patterning in the form of pools, hummocks and ridges is a quality feature on raised bogs. Too much access could break down the pattern, eg. by jumping from ridge to ridge.

Community patterns

6.3.4 Some bog plants such as sundews could benefit from the provision of bare peat for seed germination but this is not necessary for their survival. There are rare invertebrates (such as the beetle, *Bembidion humorale*) associated with bare peat, but they are mostly confined to the Humberhead Peatlands.

Invertebrates

Trampling damage to the invertebrate interest on raised bogs has not been investigated, but the general impacts described in *Chapter 15* need to be taken into consideration, including the potential benefits of bare ground.

6.3.5 Although there has been little research on recreational effects directed specifically at lowland raised mires, there is sufficient from other related habitats supporting the same plants to indicate that, as Brooks and Stoneman (1997) state, ***peatlands are susceptible to damage***, with the ***most severe damage likely to be on wet Sphagnum-dominated bog***, with dry, degraded bog still being susceptible, but less than for *Sphagnum* communities. There are no data, however, on animal species.

6.4 Types of Site with Raised Bog with Particular Vulnerability to Access Related Issues

6.4.1 ***Bogs dominated by Sphagnum mosses*** and with a high water table are most vulnerable to trampling effects but ***only where numbers of visitors are likely to be moderate to high***. Sites close to urban development are likely to be most susceptible.

***Sphagna* most vulnerable**

6.4.2 The potential needs to be assessed for effects arising from access which would compromise the limits of acceptable change for the parameters used to define favourable condition. It is possible that the numbers of visitors combined with the physical difficulty of access and good interpretation will limit the possibility of negative effects to within acceptable levels.

Assess against favourable condition parameters for whole site

6.5 Associated Interests

6.5.1 Raised bog is a very specialised habitat which supports particular plant communities only found in related circumstances such as wet heathland and blanket bog. Some provide habitat for special birds such as nightjar and hen harrier. The invertebrate fauna has affinities to that of dead wood and can be rich in rare and endangered species. For example there are in excess of 25 Red Data Book invertebrate species on the Humberhead Peatlands.

Birds, Invertebrates

6.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

6.6.1 To some extent, lowland raised mires will be self-protecting since the majority of visitors will not wish to risk traversing wet ground. It should be possible to address ***most access issues***, therefore, ***through non-statutory management measures***. The provision of way-marking, selected boardwalks and other visitor management measures should ensure the majority of visitors keep to paths (Brooks and Stoneman, 1997 provide detailed advice on this).

Self-protection, Management measures

6.6.2 Generally speaking, ***non-statutory management techniques*** are likely to be adequate for managing access on lowland raised bogs (unless there are vulnerable interests such as ground nesting birds in easily accessible areas). The degree to which free access is

likely to have an impact depends on the size of the site, but the public is unlikely to arrive *en masse* unless there is attendant publicity. The wetness of a good bog means that access can be controlled by the provision of boardwalks or other substrates.

6.6.3 With the exception of Country Parks such as Risley Moss (Warrington), it is unusual to find raised bog associated with 'honey-pot' access developments. However, here, the public is excluded from the bog land unless as part of an accompanied party. Mass access at Peatlands Park, Dungannon (Belfast) is controlled by using a narrow gauge railway to link a number of station stops linked by a network of paths. This limits the temptation to stray from the preferred routes.

Possible restrictions to linear routes

6.6.4 The majority of raised mires are distant from centres of population and, therefore, not likely to be under great pressure. However, those close to urban areas are likely to be more vulnerable, and strong encouragement of the use of linear routes may need to be considered if the likely impact of open access were considered to be unacceptable, particularly on small sites under c. 20ha. ***Only where management measures fail to achieve this or are inadequate***, and the condition of the site is at risk, should ***statutory restrictions be considered***.

6.6.5 It would ***only be in exceptional circumstances*** where access demand is such that it can not be managed by non-statutory means, the site is small and very vulnerable, and acceptable linear routes are absent, ***that statutory exclusion might be considered necessary***.

6.7 Related Concerns

Fire

6.7.1 Deliberate and accidental ***fire*** is a serious risk on certain lowland raised bogs, and dry peat once ignited can burn for protracted periods. Provisions for exclusion in extreme weather conditions at times of high fire risk are covered under Section 25 of the CROW Act.

Mechanised access

6.7.2 Abuse from ***mechanised*** access, such as mountain bikes and motorcycles, can cause excessive erosion and degradation, and this aspect may need active control. It is possible to erect crushes or kissing gates at access points to exclude motorcycles. However, these may be insufficient unless the perimeter of the site is also impenetrable. One of the most effective barriers is to dam the deep ditches normally surrounding such sites so as they fill with deep water.

Affecting the neighbours

6.7.3 Providing access to some raised bogs across adjacent agricultural land has increased trespass on the farmland and prejudiced relations with neighbours.

6.8 Opportunities Associated with a Statutory Right of Access

6.8.1 Greater numbers visiting raised bog nature reserves will bring increases in the demand for interpretative materials and even the provision of visitor facilities which may double up as equipment and volunteer bases. Any opportunities to buffer the raised bog habitats by creating supplementary habitats on adjacent land could well provide more resilient sites for open access from which interpretation of the mire itself can be provided.

Interpretation , Buffer habitats

SUMMARY OF POTENTIAL SIGNIFICANCE OF ACCESS IMPACTS ON LOWLAND RAISED MIRES*

	Direct Impacts			Indirect Impacts	
	Trampling	**Eutrophication**	**Disturbance**	**Management**	**Fire**
Wet *Sphagnum* mire	xxx			xx	
Dry baulks	xx	xx		xxx	xxx
Breeding birds			xxx	xxx	xx
Wintering birds (Raptor roosts)			xx		
Invertebrates	xx			xx	xxx

* Raised mires protect themselves largely by the nature of the wet ground

Key:

Least ← x xx xxx → most - degree of negative effects
+ ++ +++ - degree of positive impacts

The assessment assumes a moderate to high level of use to have the above impacts.
The scale of each impact depends on local site characteristics and size.

7. FEN (SWAMP AND INUNDATION COMMUNITIES)

7.1 Introduction and Context

Definitions

7.1.1 Fen encompasses terrestrialised wetlands sustained by a mixture of groundwater and rain, in contrast to raised bogs which are irrigated primarily by the latter. They vary hydroserally, in that they occur as narrow fringes of fen around open water bodies, which gradually encroach towards the centre, as well as in more extensive wetlands such as waterlogged or seasonally irrigated floodplains. Water may be supplied by precipitation, surface flow, groundwater seepage, or a mixture of any of these.

Types

7.1.2 Given geographical variations in climate, landform and geology in England and Wales, there is a wide range of fen types. Rich fen is supported by base-enriched groundwater, while poor fen is mineral-poor and is often a precursor to the development of raised bog, where all forms of plant nutrient are in particularly short supply.

7.1.3 Fen was formerly a component of larger wetland complexes, which might have included brackish or salt water, as well as raised bog. Today, they are isolated as discrete sites amongst land claimed for agriculture, or occur as mosaics in, for example, grazing marsh, in which fen is often located in the ditches.

7.1.4 In appearance it varies from a short sward maintained by grazing animals, through tall, single species stands such as common reed (then called reedbed), to fen carr, in which scrub and tree species dominate. Carr is in many cases a natural conclusion to vegetation succession and deliberate management, such as agricultural practice, is required to freeze fen in its intermediate conditions. It is these intermediate, open stages which are particularly valued for their rich and diverse flora and fauna.

7.1.5 While greater than average quantities of water are essential for the maintenance of fens, the roles of seasonal variation and vertical fluctuation in water levels are poorly understood.

7.1.6 In Wales there are approximately 6,600ha of fen habitat of which 1,700ha feature on 93 SSSIs. In England there are approximately 21,927ha of fen habitat of which 19,515ha are within SSSIs.

7.2 Accessibility of Sites with Fen

Some with access provided, otherwise physically difficult

7.2.1 Fen is an attractive habitat, in part due to the wildlife it supports, and can be alive with birdsong, flowers and certain showy invertebrates, such as swallowtail butterflies. There are many instances where nature reserves have been set up with visitor facilities, such as at Ranworth Broad and Wheatfen in the Norfolk Broads. A goods example of a reserve with visitor access in Wales is Cors Goch on Anglesey. These involve access using boardwalks (which are essential) to tall fen with wet ground conditions. Such

fens are inaccessible without such preparation as they are simply impenetrable. Fen carr is similarly difficult without deliberate provision.

7.2.2 Open herbaceous fens are potentially more accessible, especially in dry seasons. However, they contain deeper wetter patches, which can be difficult to negotiate.

7.2.3 Pioneer rafts of fen around open water bodies, or those which form a complete floating raft over a former lake or pond, may appear accessible but are extremely dangerous.

7.3 General Vulnerability of Sites with Fen to Direct Impacts arising from Access

KEY POINTS

There has been little research on the effects on access on fens. The literature review suggests:

- **Tall grass fen on wet soils are more susceptible to trampling than tough-leaved sedges on drier mineral soils.**
- **Species-rich fen on wet peat is very sensitive to trampling damage.**
- **Fens are largely self protecting by their impenetrability.**
- **Some trampling can break down dominance and open the sward up to other species.**
- **There is little information on the effects of access on animals but the low levels of accessibility should avoid impacting animals.**

7.3.1 Very little research has been conducted on the effect of recreation on fens. From the general principles given in *Chapter 3*, it could be deduced that because ***fens occupy wet or seasonally wet ground***, they would be ***very susceptible to trampling damage***. Indeed, Rees and Tivy (1977) subjected some loch shore dominants, including *Phragmites australis* to different levels of trampling, and found variable resilience, as follows:

Vulnerable Plants

More resistant	Common bent
↓	Bottle sedge
	Common reed
Less resistant	Reed sweet-grass

The taller grasses on very wet sites were found to be ***more susceptible to damage*** than the shorter sedges on drier, firmer substrates. They attributed this to the brittle leaves of the reed or the soft leaves of *Glyceria* compared to the dense growth of tough leaves in the sedges.

7.3.2 Controlled trampling studies (100 passages/year, all in August) in four rich fens in central Norway from 1977, for five years, resulted in severe damage (Arnesen 1999). Vegetation cover was reduced, woody species and herbs disappeared or were reduced in cover, but

some sedges, marsh horsetail, common cottongrass and certain bryophytes (*Campylium stellatum* and *Scorpidium cossonii*) appeared to be quite tolerant. *Sphagnum warnstorfii* was lost from the paths. Recovery was monitored from 1982 to 1995 and, even after this time, there were fewer species and less vegetation on the tracks. The trampling resulted in up to c. 7cms reduction in the ground surface, which flooded more regularly.

7.3.3 In some respects tall ***fen is self-protecting*** in that some of the ***most vulnerable types are impenetrable***. Some very light trampling in fens may not be detrimental overall, as the weakening of the dominants due to trampling may open the sward to light-demanding species such as orchids, but the Norwegian work quoted above shows very low levels of trampling having significant effects on the tracks. This structure is also likely to be advantageous to invertebrates. However, loss of water's edge reedbeds (as shown by Rees and Tivy 1977) to greater quantities of trampling would be deleterious (see *Chapter 10*, *Section 10.3* for further information on water's edge species).

Self-protective physical nature

7.3.4 Birds inhabiting reedbeds tend to be little affected by disturbance, as such habitat is generally impenetrable (but see *Chapter 12*). There are ***no research data available*** on ***fen invertebrates or other animals*** in relation to their susceptibility to trampling or disturbance, although general principles can be taken from *Sections 15.3* (invertebrates), *13.3* (mammals) and *14.3* (herptiles).

7.4 Types of Site with Fen with Particular Vulnerability to Access Related Issues

7.4.1 The limited research available, and the application of the general principles given in *Chapter* 3 suggest that ***spring-fed fens***, with their low-growing diverse vegetation, ***are likely to be vulnerable*** if trampling were sufficient to cause compaction of the soil, loss of vegetation, mixing of soil, litter and plants, and damage to shallow rooters already exploiting the more open circumstances. On open herbaceous fens trampling is likely to disadvantage shallow rooting plants, but others, such as tussocky purple moor-grass and black bog-rush are less likely to be eliminated. Open access could lead to the creation of alternative routes and desire lines as walkers are forced to avoid the more difficult patches on any sites which attract sufficient visitors. The significance of the effect will relate to the number and width of a path network in relation to the whole fen. This needs to be judged against the limits of acceptable change used for the parameters that define favourable condition of the whole site.

Diverse, short vegetation, Open fen

Assess against favourable condition parameters for whole site

7.4.2 ***Reedbeds*** have been shown ***to be susceptible to trampling*** and could be damaged unacceptably where alongside popular water's edge sites (see *Chapter 10*).

7.5 Associated Interests

7.5.1 Reedbeds and some other types of mixed tall fen provide nesting for a number of ***bird species***, particularly *Acrocephalus* warblers and buntings. Reedbeds are the principal habitat for bittern, a Priority BAP species. Marsh harriers and hen harriers may hunt the populations of small birds in fens.

Birds

7.5.2 There is a wide range of ***invertebrates*** associated with most types of fen, and variety of structure is often the key, as in grazing marshes.

Invertebrates

7.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

7.6.1 Although the sites are very sensitive, they are not likely to attract enough walkers to cause significant damage which cannot be managed through other means. ***Non-statutory measures are therefore likely to be the main means of managing access***. For example, directing access in vulnerable fens such as spring fens could be achieved through sub-compartmentalisation, such as may be necessary to manage grazing animals. Access can then be influenced by the nature of the fencing and the provision of stiles. Water courses and ditches will tend to steer movements overall, and can form part of an access management regime.

7.6.2 There may be cases where encouragement to use paths is necessary, but more often for safety and the visitor's convenience, rather than under Section 26.

Possible linear restrictions

7.6.3 It would be the exception if the open access provisions of the CROW Act result in the need for statutory exclusion in fens.

7.7 Related Concerns

7.7.1 A statutory right of access, the ***presence of dogs*** and issues relating to ***gates left open***, could lead to difficulties with the ***grazing management***, and it is essential to establish suitable regimes which take account of public usage. Section 24 of the CROW Act provides for measures to allow proper management. Fens can be inherently dangerous, leading to concerns about ***public liability***, and the removal or infill of features of interest. In addition, reedbeds in particular are vulnerable to fire at critical times of year, (see Section 25 of the Act and its exclusion provisions at times of extreme weather conditions).

Grazing management, Public liability, Fire, Urbanisation

7.7.2 ***Urbanisation*** may be a particular problem in that regular exposure of a population to the impenetrable provides a challenge which will be met by appropriately destructive techniques such as cutting and burning. ***Dumping of old machinery*** causes *inter alia* oil pollution and changes to the water quality. Even construction of tree houses (in carr) could lead to the general deterioration of the fen habitat through targeted trampling and rubbish disposal.

7.8 Opportunities Associated with a Statutory Right of Access

Interpretation, Increased public support, Better management, New habitats

7.8.1 Because fen-land can be attractive, and because it lends itself to channelling access movements in a controlled way in wetter examples, there are opportunities for providing ***interpretive or other facilities***, where health and safety issues permit. Giving exposure of the habitat to people in general is likely to increase public support for its conservation. On occasions, access is an eligibility condition of providing agri-environment schemes for fen repair or creation it may well be that, on balance, the ***provision of access becomes an advantage*** provided it can be adequately managed.

7.8.2 If there are opportunities to ***create new habitats*** to buffer small fens, these could be much more resilient to access pressure, and reduce the use of the fen, whilst also providing new opportunities for interpretation and education.

SUMMARY OF POTENTIAL SIGNIFICANCE OF ACCESS IMPACTS ON FENS*

	Direct Impacts			**Indirect Impacts**	
	Trampling	**Eutrophication**	**Disturbance**	**Management**	**Fire**
Tall fen	xx			xx	
Short fen	xxx	xx		xxx	
Medium height sedge fen	xx			xxx	
Breeding birds					
Wintering birds					
Invertebrates	xx				

* Fen vegetation would be generally self-protective as it is difficult to penetrate comfortably.

Key:

Least ← x xx xxx → most - degree of negative effects
+ ++ +++ - degree of positive impacts

The assessment assumes a moderate to high level of use to have the above impacts.
The scale of each impact depends on local site characteristics and size.

8. LOWLAND GRASSLANDS

8.1 Introduction and Context

8.1.1 This chapter combines several different types of lowland grasslands which share common issues and solutions. Information for the following grassland types is presented:

Covers all types

- Acid grassland.
- Marshy grassland.
- Calcareous grassland (downland).
- Unimproved neutral grassland.

Acid grassland

8.1.2 ***Lowland acid grassland occurs on infertile, acid soils*** over sands and gravels, on hard volcanic rocks or sandstones throughout lowland England and Wales. It often occurs in heathland landscapes, in old parklands and on commons, on valley slopes in rolling hilly country and more locally, on coastal cliffs and shingle. It has been estimated that a maximum of about 22,000ha now remain in England. It features prominently in the SSSI series in England with about 270 SSSIs having it as a key interest feature.

Location, Area

8.1.3 Extensive areas of acid grassland are included within sites registered as common land (86,354ha - 851 commons) but separate figures for lowland acid grassland are not available. However, it is likely to be a relatively small proportion of the total (less than 5%); the majority being upland acid grassland which is not a Priority habitat under BAP (but see also the moorland *Chapter 5* and species sections of this guidance). In Wales, there is approximately 40,000ha of acid grassland but only a small proportion of this (about 2,000ha) conforms to lowland acid grassland under the BAP definition. There are 32 SSSIs in Wales where lowland acid grassland is the principal interest feature.

Marshy grassland

8.1.4 ***Marshy grassland occurs where the water table is near the ground*** surface, for example in association with springs, seepage areas or slopes surrounding wet hollows. These conditions are typically found on undulating plateaux and hillsides and in stream and river valleys throughout England and Wales. It is a highly localised and fragmented habitat with many sites being small in size.

Location, Area

8.1.5 It is normally managed as permanent pasture for cattle rearing although occasionally some lowland sites may be managed as hay meadows. It has been estimated that a maximum of 7,000ha now remain in lowland England below the upper limits of enclosure. In England there are approximately 450 marshy grassland SSSIs of which a proportion will be in the uplands. The estimate of

13,521ha of marshy grassland on 635 registered commons includes marshy grassland in the unenclosed uplands and some less species-rich examples. Neither of these are covered by the Priority BAP type and the amount of this type on common land will be much lower.

8.1.6 In Wales, there is approximately 34,700ha of this grassland of which 1,500ha occurs on 125 SSSIs. Of the total, about 24,000ha conforms to the Biodiversity Action Plan purple moor-grass and rush pastures priority habitat.

Calcareous grassland

8.1.7 ***Lowland calcareous grassland*** or downland ***occurs on outcrops on chalk and limestone*** in discrete bands throughout England, and features on over 600 SSSIs which amount to about 75% of the total cover of about 39,000ha. A further 10,000ha occurs in the uplands on limestone above the upper limit of enclosure of which about 40% is within SSSIs. Over 80 of these downland SSSIs fall within international sites, and England holds a high proportion of the total European occurrence of this broad habitat type. In Wales there is approximately 2,000ha of calcareous grassland of which 892ha is within 39 SSSIs. The extent of lowland calcareous grassland here is about 1,000ha.

Location, Area

Neutral, unimproved grassland

8.1.8 ***Neutral grassland***, which covers the two Priority BAP neutral grassland types of ***lowland and upland meadows, occurs on level to sloping terrain on largely free-draining neutral soils*** throughout England and Wales. It is highly localised and fragmented with many sites consisting of small, isolated, enclosed fields normally below 350 metres. It is managed as either hay meadow or permanent pasture.

Location, Area

8.1.9 It has been estimated that a maximum of about 10,000ha now remain in England, where there are approximately 550 neutral grassland SSSIs. Only small areas of neutral grassland are included within sites registered as common land. The estimate of 2,100ha on 468 commons is probably an over-estimate with respect to the BAP Priority types as it also includes types not covered by the Priority habitat definition. In Wales 2,400ha of unimproved grassland remain of which 421ha is within 141 SSSIs. The extent of lowland neutral grassland here is approximately 1,500ha.

8.2 Accessibility to Sites with Lowland Semi-natural Grassland

Acid grassland

8.2.1 There are areas of ***lowland acid grassland on registered commons already open to the public***, particularly in south-east England and in north and south Wales such as the Gower and Lleyn Peninsulas including some in National Trust or institutional ownership. There

Some areas have access

are still substantial areas with no statutory or customary access, and a few areas are kept closed for military training purposes.

Marshy grassland

8.2.2 Some areas of ***marshy grassland have access*** through either ***existing rights of way*** or where sites are owned by conservation organisations or local authorities who allow ***open access***. There are areas of marshy grassland on registered commons already open to the public, particularly in South-west and Northern England, including some in institutional ownership. In Wales, areas open to the public include sites in the South Wales coalfields and Ceredigion. There are still, however, substantial areas with no statutory or customary access.

Calcareous grassland

8.2.3 There are ***extensive areas of downland already open to the public***, particularly in the Cotswolds, Chilterns and South-east England, many in National Trust or institutional ownership. In Wales, lowland calcareous grassland is largely confined to the coastal cliffs and headlands of North and South Wales with much having existing public access. There are still substantial areas with no statutory or customary access, and significant areas are kept closed for military training purposes.

Neutral, unimproved grassland

8.2.4 ***Some areas of neutral grassland have access*** through either existing rights of way or where sites are owned by conservation organisations or local authorities who allow open access. A high proportion, of sites, however, have no statutory or customary access.

8.3 General Vulnerability of Sites with Lowland Semi-natural Grassland to Direct Impacts arising from Access

Key Points:

Research on the effects of visitor use on grasslands shows that:

- **Low productivity grasslands are more sensitive to trampling than more productive ones.**
- **Some of the constituent species are more resilient to trampling, these can expand, but tend to be common pasture herbs.**
- **Light trampling can be beneficial in unmanaged grassland.**
- **Litter, flowering, biomass, cover, broad-leaved plants are all reduced at moderate or higher levels of trampling.**
- **Impacts are greater on wet ground or steep slopes.**
- **Sensitive species disappear on and beside paths, and impacts can extend 50m on either side of the path.**
- **Available phosphorus increased in zones adjacent to paths (10-65m wide) in some studies.**
- **Significant effects of even light trampling on invertebrates in unmanaged grassland.**

- **About 400 passages/year can result in 50% loss of cover and species.**
- **Some species benefit from trampling.**
- **Disturbance effects are covered in the chapters on animals.**

8.3.1 *Chapter 3* sets out the generic issues related to the effects of visitors. The results of compaction and changes in soils and its fauna, the potential for erosion, possible changes in nutrient levels, the general types of changes in the flora in terms of its diversity and resilience are given. The research presented shows that the ***pedestrian usage can cause ecological change in grasslands of all types*** (as Goldsmith, 1974 concludes), but the effects at any particular location will ***vary according to the nature of the soil, vegetation, topography, hydrology*** but crucially on the ***number of visitors per unit*** area, ***the nature of the activities*** being undertaken and the ***number and timing of visits***. The effects on semi-natural grassland can be usefully divided between those of trampling and soil eutrophication caused in particular by dog faeces.

***Chapter 3* for generic effects**

Trampling effects

8.3.2 There have been relatively few studies that have investigated the effects of trampling on the vegetation and fauna of semi-natural grasslands. Most of the studies in Britain that have been undertaken have looked at the effect of trampling on chalk grassland in southern England. These date from the late 1960s and early 1970s when visitor pressure began to increase significantly.

Most studies on chalk grassland in GB

8.3.3 In general, ***semi-natural grasslands*** are ***vulnerable to trampling*** impacts because of their ***generally low productivity*** (*Chapter 3*, para. *3.3.16 et seq*.). Those that are more productive (such as some grazing marshes) could be more resilient, but this could be negated by the fact that wet ground is more vulnerable to trampling damage than dry soils.

Sensitivity and low productivity

8.3.4 In contrast with some other habitat types, however, grasslands are ***often more resilient*** because more of their constituent species ***exhibit the features associated with resistance to trampling*** (see *Chapter 3, para. 3.3.24 et seq*.). Many species recognised as tolerant to moderate or light levels of trampling already occur in some grassland types where they could expand in response to trampling. In other instances, these species, being widespread and abundant, invade the grassland and spread in the trampled zone.

Key species are:-

Lolium perenne	Perennial rye-grass (more resistant than *Cynosurus*)
Cynosurus cristatus	Crested dog's-tail
Poa annua	Annual meadow-grass
Poa pratensis	Smooth meadow-grass
Plantago major	Great plantain

Festuca rubra	Red fescue
Bellis perennis	Daisy
Potentilla anserina	Silverweed
Trifolium repens	White clover (in some studies)
Plantago lanceolata	Ribwort plantain
Polygonum aviculare	Knotgrass
Carex flacca	Glaucous sedge
Thymus polytrichus	Wild thyme (in one study)
Taraxacum officinale	Dandelion
Medicago lupulina	Black medick (relatively tolerant)
Plantago media	Hoary plantain
Deschampsia cespitosa	Tufted hair-grass
Trifolium pratense	Red clover
Prunella vulgaris	Self-heal
Dactylis glomerata	Cock's-foot

Tolerant species

(Source: Bates, 1935; Chappell *et al.*, 1971; Liddle, 1975a; Liddle, 1997; Rogova, 1976).

Greater plantain and annual meadow-grass both have developed genotypes with a low growth form, others also have sufficient phenotypic plasticity to develop prostrate or dwarf growth forms resistant to close mowing and trampling (Warwick and Briggs, 1979). It can be noted that nearly all these species are common pasture herbs, and not usually indicators of semi-natural grassland.

8.3.5 General impacts of trampling on grasslands depend on the nature of the original sward. ***In tall grasslands***, ***light trampling results*** in the taller grasses being bent and broken, and the vegetation opens up. This level of trampling in unmanaged grassland ***could be advantageous*** in substituting for, at least on a local scale, grazing or mowing. More broad-leaved plants can establish and persist in such situations. However, at moderate or high levels of trampling, the species diversity declines as broad-leaved plants are lost, and more resilient grasses persist. Litter, total biomass, flowering and the sward height are reduced (see *Chapter 3*).

Advantages of low trampling levels

8.3.6 ***Studies on chalk downland*** in Southern England by Streeter (1971) (Box Hill, Surrey) and Chappell *et al.* (1971) (on clay with flints over chalk near the bottom of chalk downland on Farley Mount, Winchester) have shown the ***progressive disappearance*** of more sensitive chalk grassland species including:

Loss of species

Thymus polytrichus	Wild thyme (in one study)
Asperula cynanchica	Squinancywort
Sanguisorba minor	Salad burnet
Trifolium repens	White clover (in one study)
Leontodon hispidus	Rough hawkbit

under moderate to high levels of trampling (high here is the level at which bare ground is about 30%).

8.3.7 In Streeter's (1971) study, the ***extent of sward replacement*** by crested dog's-tail and perennial rye-grass ***extend to about 50m from the path***, even though soil compaction was pronounced only in the first 20-30m. Moreover, the peak in rye-grass was correlated

with ***peaks in available phosphorus*** which was apparent not in the bare path, but in the ***10-65m zone*** from it. Streeter did not offer an explanation for this phosphorus enrichment, and the changes in soil nitrogen were less pronounced, but it could be a product of dog faeces and waste food. The same phosphorus enrichment and rye-grass zone has been found in calcareous dune soils which share many of the downland species (Milwain, 1984), (see *Chapter 3*, paras. *3.3.12-13*). This contrasts with Chappell *et al.*'s study (1971) which found no changes in soil nutrients across light to heavy trampling zones on Farley Mount.

Changes to tolerant species 50m zone

Increase in phosphorus

8.3.8 The limited studies available suggest that there would be a ***difference in response to trampling on unmanaged and managed*** (especially by grazing) ***chalk grassland***. Since grazed grassland is already trampled, the sward would already be adapted to the level of stocking with fewer taller grasses and less accumulation of litter. There would be little opportunity for the increases in diversity and of broad-leaved plants which can occur in lightly trampled rank grassland. Additionally, the invertebrates would also be representative of such grazed conditions (Morris, 1967, Gibson *et al.*, 1992), and it could be predicted from the research results that trampling on well grazed grassland (all types) would have a less significant effect on invertebrates compared with the studies described in *Chapter 15, Section 15.3*. This is a subject area that needs further research.

Differential response in managed/ unmanaged grassland

8.3.9 In terms of the numbers of passages needed to induce changes in the vegetation, an indication is provided by Cole (1987) from a *Festuca* grassland in Western Montana, USA, which is in line with findings in other habitat types in Britain. The ***Festuca grassland*** was tussocky on nearly flat ground, with *Lupinus sericeus* and yarrow (an alien species in the USA). ***400 passes reduced the plant cover to 50%.*** (This compares with some of the more sensitive shrub and woodland communities where 40 tramples resulted in the same level of damage). ***50% of the species in the sward were lost after about 600 passes***, with more lost early in the first 100-200 passes, than later. Below 100 tramples/year, the loss of organic horizons in the soil was negligible, but the rate of loss was then constant as trampling levels increased. ***At 1,600 passes, exposure of organic horizons*** in the soil ***was 17%*** in the *Festuca* grassland.

Trampling rates and 50% cover

8.3.10 Unlike many of the studies described in this guidance, Cole (1987) monitored the effect of repeating his trampling experiments over three years. On the *Festuca* grassland, maximum deterioration occurred in two seasons with less than 300 passes/year. At higher intensities, vegetation loss after three seasons was substantially greater (80-90% loss of cover).

8.3.11 Rogova (1976) also gives some indication of the resilience of a neutral *Alchemilla baltica-Centaurea jacea* meadow in the Volga-Kama State Reserve in Russia. Some of the species are the same as in neutral grassland in Britain. He found that tufted vetch, bush vetch and cleavers had declined to 60-80% of their original cover after only 20 passages applied at his low trampling level of two

passes/day. The ***total vegetation cover*** declined to ***less than 50% under 350 tramples/week*** in less than 10 days, but it took about 20 days at 14 tramples/week to reach the same 50% level. Trampling only at the weekend allowed more resistant species to re-sprout, whilst an even spread through the week (50/day) gave no chance of recovery.

8.3.12 These various studies show that ***trampling can alter the grassland's composition and value. The width of the altered zone can reach 50m*** or more beside a path (but this will depend on the location of the path). The indications are that a relatively low level of trampling ***(up to 400 passages/year) could result in a 50% loss of vegetation*** (but this will also depend on slope and wetness). The increase in available phosphorus in an equally wide zone beside a path has the potential to be particularly damaging to highly diverse swards. Applying the findings in these studies and the general changes outlined in *Chapter 3* suggests that all grassland types would be similarly affected by trampling. ***The effects could be expected to be more pronounced on wet soils and steep slopes.***

Width of trampled zone

8.3.13 There are species, however, which ***benefit from trampling***, ***especially bryophytes*** on path edges on calcareous grassland (see *Chapter 16, para. 16.3.2*. Further consideration of the effects of trampling on invertebrates and the soil fauna can be found in *Chapter 15, Section 15.3.*

Effects of dog faeces on soils and vegetation

8.3.14 The deposition of dog faeces on semi-natural grassland has the potential to cause adverse changes in the semi-natural grassland vegetation. Research has clearly demonstrated that the ***application of nutrients in the form of inorganic fertilisers or organic manures to species-rich semi-natural grassland causes a reduction in the number and abundance of plant species in the sward***. Depending on the rate and periodicity of fertiliser application, this results in either a reduction in or a loss of nature conservation value (see Crofts and Jefferson (1999) for a summary and a list of references). Nutrient application stimulates the growth of competitive species (mostly grasses) at the expense of other plants, notably broad-leaved herbs.

Nutrient addition

8.3.15 The critical thresholds of deposition of nitrogen from the atmospheric sources over which vegetation changes may be expected in semi-natural grasslands range from 15-30 kg N ha^{-1} $year^{-1}$. Thus the ***levels of nutrients required to effect vegetation change are low***. Given this, dog fouling clearly has the potential to cause vegetation change but whether this occurs will depend on the spatial distribution, timing and intensity of deposition.

8.3.16 Some site managers on nature reserves with public access have expressed concern at the deposition of dog faeces in semi-natural grassland citing eutrophication and vegetation change as a likely outcome. However, there has been no proper study of this topic and actual cases where this has been clearly demonstrated are

lacking, although Milwain (1984) ***showed a correlation between enrichment and dog faeces on fixed sand dune grasslands***.

8.3.17 Investigations are needed to ascertain the relative additions of phosphorus, which is a key nutrient. Soils in semi-natural grassland generally have levels below 8mg/kg (Gilbert, in prep.). The deposition from dog faeces in relation to the number of dogs using the area and the relative importance of this compared with the deposition of nutrients from atmospheric sources (although this does not include phosphorus) needs to be researched. The spatial distribution of deposition will vary depending on the nature of the access routes and conditions for particular sites. However, the ***propensity for vegetation change due to nutrient additions*** is likely to be ***greatest along existing paths, access points*** and ***around facilities*** such as car parks, although changes in the vegetation may already have taken place due to the trampling pressure.

Effects of disturbance

8.3.18 The effects of disturbance on birds from recreational use, and methods for assessing the significance, are presented in *Chapter 12*. The effects of disturbance on mammals is provided in *Chapter 13*, *Section 13.3*, and on herptiles in *Chapter 14*, *Section 14.3*. Concerns about different groups of plants and rare ones are presented in *Chapter 16*, *Section 16.3*.

8.4 Types of Site with Lowland Semi-natural Grassland with Particular Vulnerability to Access Related Issues

Assessing significance of effects

8.4.1 The research shows that the grassland vegetation along the line of a path with over about 350-400 visitors will be lost, and changes can occur to plants and invertebrates in the adjacent trampled zones. This is only likely to be significant if the site is small and the total area of impact is large.

Assess against favourable condition parameters for site

8.4.2 The most vulnerable sites will be those that are:

- Small;
- Support rare or special species (as listed below in *Section 8.5*);
- Are on steep slopes or wet;
- Have the lowest productivity, and;
- Are also expected to be used by large numbers of visitors.

8.4.3 ***Where trampling effects are extensive*** on either side of a path (50m on either side would give 1ha of affected land per 100m of path), ***the significance of effects***, and their extent, ***need to be judged against site size*** and the limits of acceptable change for the parameters used to ***define favourable condition***. If path networks expand to the point of trampling zones meeting, the nature conservation value would be seriously compromised. The effect of visitor pressure on grassland attributes is summarised on Table 8.1.

TABLE 8.1 Response of Attributes

Impacts related to access	Extent	Sward composition: cover/frequency of positive plant indicator species/taxa	Sward composition: cover/frequency of negative plant indicator species/taxa	Grass/herb ratio	Sward height	Bare ground	Plant litter
Direct loss: (eg erosion from trampling)	↓						
Adverse change in hydrology: too dry (eg drainage)		↓					
Adverse grazing/cutting intensity: too high (disturbance to grazing livestock)		↓	↑		↓	↑	↑
Adverse grazing/cutting intensity: too low (disturbance to grazing livestock)		↓	↑	↓	↑	↓	↑
Adverse eutrophication: too high (eg dog fouling)		↓	↑	↓		↓	
Adverse disturbance: too high (trampling pressure)		↓	↑			↑	

The arrows (→) indicate the direction of response to the adverse impacts.

8.5. Associated Interests

8.5.1 The following are important species or groups of species associated with the different grassland types.

TABLE 8.2. Associated Interests of Semi-natural Lowland Grasslands

	Acid Grassland	Marshy Grassland	Calcareous Grassland	Neutral Grassland
Birds	+	+	+	+
Stone curlew	+			
Curlew		+		
Invertebrates	+	+	+	
Field cricket	+			
Marsh fritillary		+		
Large blue			+	
Silver-spotted skipper			+	
Fritillary spp.			+	
Plants	+	+	+	+
Orchids		+	+	+
Spp vulnerable to collection	+	+	+	+
Spp vulnerable to repeated photography	+	+	+	+
Spp vulnerable to trampling	+	+	+	+

8.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

8.6.1 In general, ***conservation objectives*** for lowland grassland sites are more likely ***to be met*** using a variety of ***management and non-statutory mechanisms***, especially taking care in the siting of any access points and paths, and ensuring that facilities such as car parks and interpretive material are provided in ways that steer people away from sensitive sites and areas. Where necessary, a responsive approach to repairing localised trampling or erosion is acceptable provided that this is necessary in only localised areas.

8.6.2 There may be cases where ***minor restrictions*** are necessary to facilitate adequate management of access, such as the provision of a statutorily defined access point to enter the land, or additional controls on dogs.

8.6.3 Significant statutory exclusions and restrictions are likely to be necessary for direct conservation reasons only in exceptional circumstances where best practice management measures have

failed or are predicted to be insufficient to avoid significant damage to nature conservation interests. The following are the most likely situations where application of statutory exclusions or restrictions may be necessary:

- Where access demand and wear is likely to be unusually high due to the proximity of major populations and the lack of alternative sites and where sites are small and vulnerable.
- On small sites on urban fringes where erosion could be severe.
- Where there are especially fragile grassland types and where these are vulnerable to damaging levels of pressure.
- Where there are vulnerable species interests (especially bird, invertebrate and plants) as specified in the other sections of this report.

Specialised and fragile grassland types would include the following:

- Sandy, parched acid grassland, especially where this is lichen-rich.
- Around springs and seepages.
- Lichen-rich chalk grassland.
- Presence of small populations of key species (plants or animals).

Other exceptional circumstances may be referred to appropriate specialists.

8.6.4 It may be sufficient to restrict visitors to linear routes, or to exclude them only from specific areas in order to safeguard these types of communities. Total exclusion would only be necessary in rare, exceptional circumstances.

8.7 Related Concerns

8.7.1 There is no doubt that domestic ***dogs disturb livestock*** including sheep, cattle and horses. The extent of disturbance can range from noise (barking) to actual mortality. Vulnerability varies according to stock type and breed and age of animals with ***sheep and young animals being the most susceptible*** to trauma, injury and death. Cattle and ponies are much less vulnerable to dog worrying but there are cases of fatalities, particularly amongst ponies on sea cliffs. There is little information available on the differing vulnerabilities of different breeds to worrying by dogs. However, there is no doubt that some sheep breeds are particularly nervous and would be better suited to sites where disturbance levels are low. Conversely, some breeds are more tolerant. Using such breeds would not eliminate disturbance but it may reduce mortality rates.

Dog's interference with grazing

Different breeds vary in sensitivity

8.7.2 ***Disturbance by dogs*** can have an indirect effect on nature conservation grazing schemes. It may ***prevent the introduction of livestock*** grazing to sites which have not been grazed for a number of years as graziers would be unwilling to risk injury or loss of

animals. Bull (1998) provides a more detailed summary of the effects of dogs on wildlife.

8.7.3 Apart from the obvious difficulties caused by visitors leaving gates open and the vandalism of fences, there is ***potential for visitors to alter the grazing pattern of livestock*** in a particular site. Although there appears to have been no research undertaken on this topic, it does seem possible that the presence of people has the potential to change the pattern of grazing of livestock such that they will graze preferentially in areas near to or at distance from visitors. The behavioural response will depend on stock type, breed and the animals' previous experience of contact with people.

Concerns regarding adequate grazing

8.7.4 In consideration of these indirect effects, the ***main issue of concern*** arising with the statutory right of access relate to the ***interference with grazing regimes*** (through leaving gates open, dogs worrying sheep, damage to fences or water supplies). Because lowland grassland is generally unproductive and marginal land, issues of this kind can make grazing economically unviable, and threaten the maintenance of conservation management. In extreme situations interference with grazing could lead to its withdrawal. This would lead to loss or degradation of nature conservation value due to an increase in coarse grasses and scrub invasion. The effects are summarised in Table 8.1.

Addressing issues of dogs

8.7.5 Such issues are best addressed at a local level using appropriate access-management mechanisms and wardening, although these can be resource intensive. There are various management solutions to the potential problems posed by dogs. Signs and notices requesting dogs be kept under close control at all times (not just from March to July as is provided under the CROW Act) could be used.

8.7.6 However, care needs to be exercised with cattle as these can become aggressive when dogs are present. Harm to a dog's owner could result if a dog was restrained on a lead. Signs could also be used to raise awareness of the other issues involved with dogs and livestock. Where practical, livestock types or breeds which are less vulnerable to disturbance from dogs could be grazed. Larger grazing units may also help in limiting the impact of dogs.

8.7.7 In certain circumstances it may be appropriate for owners or occupiers to seek exclusions or restrictions specifically for land management reasons under Section 24 of the Act.

Public safety

8.7.8 Certain acid grasslands occurring on harder rocks may be dangerous due to their steepness whilst on marshy and neutral grasslands, ditches and watercourses may pose a hazard. On calcareous grasslands, rock outcrops and screes are a similar hazard. Where these are natural features of the landscape there is unlikely to be a case for exclusion or restriction, although warnings may be appropriate. The CROW Act (Section 13) specifically ***removes liability under the Occupier's Liability Act 1957 for any natural features of the landscape***. Where there are other dangers,

such as the presence of unexploded shells, owners and occupiers or appropriate authorities may seek exclusion or restriction for public health and safety reasons through the appropriate clauses of the Act.

8.8 Opportunities Associated with a Statutory Right of Access

8.8.1 Because lowland grasslands are often relatively tolerant of normal low access levels, forming an integral part of attractive and sometimes historic landscapes, they lend themselves readily to the provision of ***interpretive material***. Opportunities for ***promoting interpretive, educational and informative material*** should be taken wherever this can be achieved without promoting public usage to unsustainable levels. Many lowland grasslands suffer from inadequate management, especially grazing. Where the provision of fences, gates, cattle-grids or other infrastructure is to be provided in association with the management of access, or vegetation management undertaken, consideration needs to be given to opportunities for ***enhancing habitat condition alongside***.

Interpretation

New management

Buffers and habitat creation

8.8.2 In addition, there are many lowland grasslands now in a fragmented state due to agricultural improvement, with consequent deterioration of both their access and wildlife potential. Assessors should consider the ***potential for promoting reversion schemes aimed at joining sites***. Such new grasslands, once established, could produce a ***more resilient habitat to absorb access demand,*** yet simultaneously provide an attractive recreational experience.

SUMMARY OF POTENTIAL SIGNIFICANCE OF ACCESS IMPACTS ON LOWLAND, UNIMPROVED GRASSLANDS

	Direct Impacts			**Indirect Impacts**
	Trampling	**Eutrophication**	**Disturbance**	**Management**
Acid grassland	xx/++	xxx		xxx
Downland	xx/++	xxx		xxx
Marshy grassland	xxx	x		xxx
Neutral grassland	xx	xx		xxx
Lichen-rich grassland (All types)	xxx	xxx		x
Breeding birds			xx(x)*	xx
Wintering birds (Raptor roosts)			xx	
Herptiles				
Invertebrates			++/xx?	+/x

Key:

Least ← x xx xxx → most - degree of negative effects
+ ++ +++ - degree of positive impacts

The assessment assumes a moderate to high level of use to have the above impacts.
The scale of each impact depends on local site characteristics and size.

* See *Chapter 12, Section 12.7* Downland - quail and stone curlew potentially very vulnerable. See also *para. 12.8.2. et seq. wet grassland*

9. WOODED COMMON LAND

9.1 Introduction and Context

9.1.1 Wooded commons include a mixture of ancient and recent woodland, both predominantly semi-natural. Ancient examples range from upland oakwoods on the fringes of some Lake District commons or around Snowdonia, to old wood-pastures with veteran oak and beech in Hampshire and Sussex or at the Punchbowl near Abergavenny. More recent woodland is often birch and oak that has developed in the last fifty years on former open heath or grassland.

Location, Areas

9.1.2 There are an estimated 2,415 commons with woodland or scrub in England, covering an area of 28,000ha. Broadleaved semi-natural woodland accounts for 15,000ha of this total, with a further 2,300ha of mixed semi-natural woodland, 2,200ha of conifer plantation, and 6,400ha of scrub (Aitchison *et al.*, 1999). There are some 82,000ha of broadleaved woodland in Wales, a significant proportion of which may be on common land. Some registered common land falls within woodland SACs (eg. Ebernoe Common, Epping Forest, The Mens, Meirionydd Oakwoods).

9.2 Accessibility of Commons with Woodland

9.2.1 Various surveys (mainly by the Forestry Commission and Countryside Agency) over the last decade have shown that ***people do value the access available in woods*** of different sorts (but what is important about a site may differ from place to place). The great majority of wooded commons already enjoy a level of public access, but the wooded element may be seen as desirable or undesirable. The 'closed-in' nature of woodland and woodland paths can be perceived as positive in screening out other people, cars and housing, and providing more of a wilderness experience. Other people feel somewhat hemmed in by the trees constraining them to paths rather than being able to wander free, and blocking wider views of the landscape. Woodland is sometimes even viewed as threatening. Much depends on how long the area has been wooded, but also on what opportunities have been taken to increase public awareness concerning nature conservation and positive management.

Access in woodland on commons

9.3 General Vulnerability of Sites with Wooded Commons to Direct Impacts arising from Access

KEY POINTS

The research on the effects of trampling in woodland shows that:

- **Low productivity species, especially ancient woodland ground flora and that on wet ground, are very easily damaged and lost.**
- **Plants like bluebells are reduced by trampling when in full growth, but not by picking the flowers.**
- **Lichens and some mosses under trees are sensitive to trampling damage.**
- **Levels of trampling as low as 40-50 passages can eliminate species and result in bare ground.**

- **Damage is greater under a dense canopy.**
- **Grassland in wood pasture is more tolerant of trampling.**
- **Impact of trampling on trees has not been well researched.**

Significance of impacts relate to their extent in relation to the size of the site.

General impacts Chapter 3

9.3.1 ***Relatively little work has been done on the impact that recreation may have on woodland***, but an extensive review was carried out for English Nature (English Nature, 1992). The main factors influencing the effect of trampling on the ground flora are set out in *Chapter 3* (Section 3.3). In woodlands, there is the additional factor that some plants adapted to shade have large leaf areas and thin cell walls, making them more susceptible to trampling (Cole, 1978, 1987), for example bluebell and enchanter's- nightshade.

Susceptibility of ancient woodland ground flora

9.3.2 Grime (1979) noted that the ***woodland herb layers in ancient woods tend*** to hold more ***stress-tolerant species*** than those in secondary woods, and ***stress tolerators with low productivity are particularly susceptible to trampling*** damage (Liddle, 1997) (see *Chapter 3, para. 3.3.16 et seq*.). Ancient woodlands are thus likely to be more susceptible than secondary woodlands. This is exemplified at one site heavily used for paintball games, where all the above-ground growth of herbaceous species undershade, especially bluebell and dog's mercury had been lost (Thomas, 1991). This is not an uncommon problem in open access woods close to high concentrations of people.

Bluebells vulnerable

9.3.3 In experiments designed to establish the sensitivity of bluebell to picking of the flowers and trampling of the plant, Peace and Gilmour (1949) found that ***picking had no effect over 8 years***, but that ***heavy trampling*** over the same period ***resulted in progressive deterioration*** of the vegetation until only a few scattered plants remained (numbers unspecified). This is both the result of direct damage to the leaves, but also of a significant decline in bulb weight (Blackman and Rutter, 1950). Trampling later in the bluebell growing season was less damaging than that earlier in the season.

Wet soils more vulnerable

9.3.4 Plant communities on ***wet soils are less resilient to trampling***, as Webster and Adams (1989) note. Marsh fern, opposite-leaved golden-saxifrage, marsh marigold and sedge species were all damaged under high levels of activity in woodland. ***Ericaceous communities on sandy soils*** in woodland are ***also sensitive*** (Thomas *et al.*, 1994), and lichens and mosses under Scot's pine in the New Forest had not recovered a year after one orienteering event. For the sensitivity of bilberry, see *Chapter 5, para. 5.3 et seq*.

9.3.5 Other ground flora is equally sensitive. Exposed to 50 passages/day for 10 days, chickweed wintergreen disappeared in a Russian pine forest with bilberry (Rogova, 1976). The bilberry, cowberry and tufted hair-grass were more resilient. Kellomaki (1973) considered that ***broad-leaved*** plants, in woodland, in general, are ***more vulnerable than grasses***, and tend to disappear first, even under low levels of trampling.

9.3.6 The maximum number of passages by walkers rather than the periodicity is believed to have the greatest influence on vegetation cover, although individual species respond differently (Rogova, 1976). Cole (1987) also comments on the loss of woodland vegetation cover which is more rapid when low levels of trampling are introduced, and increases more slowly at high levels. In his woodland types, ***50% ground flora cover was removed with as little as 40 passes in 1 year***, but up to 100-200 in more resilient vegetation types. The more tolerant types were where mosses such as *Brachythecium* and *Dicranum* were abundant (see *Chapter 16* paras. *3.6.7-3.6.11* for more sensitive mosses). Cole (1987) also considered that a dense overstorey discourages the growth of more resistant grasses, and encourages adaptations to low light intensity like large leaf areas, thin cuticles, cell walls and stems, all of which make plants more susceptible to trampling damage.

Rapid losses with new trampling

Some more tolerant mosses

9.3.7 In a number of studies (eg. Cole, 1987; Rogova, 1976; Burden and Randerson, 1972) comparison of trampling effects in woodland and adjacent species-rich grasslands have shown the greater tolerance of the latter to trampling damage. This suggests that except on wet soils or steep slopes, ***wood pasture herb layers*** (which tend mostly to be grassland species) would be ***more tolerant than densely shaded woodland species.***

Greater impact under dense canopy

9.3.8 Woodland ***soils are prone to compaction under trampling*** (see *Chapter 3* for general effects of compaction), which can limit root development (Dunn, 1984). ***There is little information on the long-term effect on trees of compaction***, but Dunn (1984) identifies reduced root branching and number of feeder rootlets as a reaction, with possible impacts on fungal mycelia associated with loss of litter. Speight (1973) considered that tree death has resulted from root exposure and damage but presented no evidence. Westhoff (1967) and Brown *et al.* (1977) noted that at certain levels of trampling, tree growth (measured by timber increments) was reduced, but the levels of trampling were not defined. Species affected included oak and white pine in the USA.

Possible impacts on trees

9.3.9 The overall result of trampling is a decline in height of the herbaceous vegetation, a loss of sensitive species, and an increase in more resistant species. However, the more resistant species such as perennial rye-grass and annual meadow-grass cannot grow in heavy shade, so bare ground can develop more readily on the more densely shaded paths. Erosion and gullying is a potential consequence on steep slopes.

9.3.10 ***The extent of recreation*** impacts will ***determine the significance of the types of effects*** described. In woodlands with a ***low*** to moderate ***level of access*** on foot, people tend to ***stay on paths***, particularly distant from residential areas where visits are for walks rather than play. The paths may become heavily poached, but the overall impact of this is likely to be relatively limited, depending on the size of the wood.

Significance related to extent of impacts

9.3.11 Under ***higher levels of use***, and especially near high population areas, ***new footpath networks*** are likely to develop, and the ***proportion of trampled ground increase***.

9.3.12 Disturbance impacts on ***birds, mammals*** and ***trampling*** of ***invertebrates*** are covered in ***Chapters 12, 13 and 15*** respectively. Impacts on ***plants***, including bryophytes, lichens and key species are presented in ***Chapter 16***.

9.4 Types of Site with Wooded Commons with Particular Vulnerability to Access Related Issues

9.4.1 The available research suggests that the most vulnerable wooded commons are those with an ancient woodland ground flora, and where the canopy is relatively dense. In addition, the following are likely to be more sensitive:

- ***Wet woodland*** where excessive poaching may occur from even relatively few people.
- Woodland on ***steep hillsides*** where ground vegetation and the substrate may be disturbed easily and subject to erosion.
- Woodland with ***a fragile ancient woodland ground flora***.
- Localised disturbance to ***breeding birds***, ***roosting raptors***, ***rare or uncommon plants***, and ***invertebrates*** including butterflies and species associated with deadwood.

More sensitive wooded types

9.4.2 However, the ***sensitive sites will only be vulnerable if the access use is moderate to high***, and this will depend on their location, size and proximity to a substantial population wishing to visit on a sustained, regular basis. For example, woodland at honeypot sites, such as viewpoints and riversides, or near urban conurbations, which may experience considerable numbers of visitors. The scale of impact needs to be assessed in relation to the limits of acceptable change of the parameters used to define favourable condition for the site as a whole.

Assess against favourable condition parameters

9.5 Associated Interests

9.5.1 Woodland on commons may be important for lower plants, fungi, invertebrates, breeding birds and mammals. Their age and history, with features such as ancient pollards, woodland boundary banks and ditches, is an integral part of their value. In wood pasture in particular, veteran trees and their associated fauna and flora could be the prime key interest.

Importance of lower plants, invertebrates, history, birds, mammals

9.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

9.6.1 ***In most situations, access need not be restricted*** on the sites ***provided there is appropriate management***, for example in the siting of paths, design of routes, and provision of explanatory information. Permanent hazards (such as mine shafts, or cliffs) may need to be fenced-off. Old trees may need to be inspected periodically to ensure that they are safe. Note, however, that the

Non-statutory measures will mostly be adequate

amended Occupiers Liability Act 1984 confers no duty in respect of risks from natural features including trees, on access land (see CROW Act, Section 13 for the exact wording).

9.6.2 ***It is unlikely that total exclusion will be necessary anywhere***. However, there may be situations where some restrictions may be warranted, such as confinement to linear routes.

9.6.3 ***Sites where such restrictions could be needed are***:

Possible restricted areas

- Those with the most sensitive ground flora.
- Those with rare breeding birds known to be sensitive to disturbance.
- Those on steep slopes with low productivity.
- Those on wet soils.

but only where visitor numbers are likely to be such that unacceptable damage to the favourable condition of the key features occurs.

9.6.4 In these situations, access may need to be restricted to carefully ***planned linear routes***. It is only where sites are close to centres of population, where use is likely to be widespread and intensive, and the habitat particularly vulnerable (as described above) that greater restrictions may need to be considered.

9.7 Related Concerns

9.7.1 The principal related concern is the potential pressure from visitors, and for health and safety reasons, to ***over-manage trees*** which are deemed to be hazardous. Dead wood, old branches and veteran trees are an essential part of the key nature conservation interest of many woodland SSSIs. During passage of the CROW Act, the government emphasized that visitors must accept the countryside as it is, and this does include certain natural hazards.

Over-management of trees

9.7.2 Fire is not usually such a risk in dry periods in woodland, but ***fires started in old hollow trees*** can cause considerable damage. This needs to be taken into consideration in assessing the likely site use and the potential for educational programmes.

Fire

9.7.3 Access also needs to be considered in respect to developing and implementing ***appropriate management*** in woodland on commons. Issues that tend to attract attention from the public particularly are:

Management

- Fencing of commons to facilitate re-introduction of grazing.
- Clearance of undesirable trees or shrubs, eg. rhododendron.
- Management, particularly shooting of deer and (locally) wild goats, or the control of grey squirrels.

There will be a need to explain these activities to the relevant users and then access must be taken into account in their implementation.

Provisions for restrictions for management purposes are provided in Section 24 of the CROW Act.

9.7.4 Temporary (localised) restrictions on access may be needed where forestry operations such as felling or scrub clearance are in progress. Fences on commons need to include appropriate gates and access points and to be localised sensitively with respect to sight-lines etc.

Forestry operations

9.8 Opportunities Associated with a Statutory Right of Access

9.8.1 New access provides the opportunity to ***engage with the visiting public*** to gain further support for and understanding of nature conservation issues. There could be opportunities for local site-based interest groups to develop, and more conservation volunteers to assist in wardening and recording.

Interpretation

9.8.2 If the opportunity arises for more land to be provided for access around wooded commons, ***more woodland*** and other habitats could be ***created*** which would provide more resilient access areas and help absorb any pressure.

New habitats

SUMMARY OF POTENTIAL SIGNIFICANCE OF ACCESS IMPACTS ON WOODED COMMON LAND

	DIRECT IMPACTS		INDIRECT IMPACTS		
	Trampling	**Disturbance**	**DEAD Wood Removal**	**Fire**	**Management**
Ancient woods	xxx				
Wood pasture	xx				xxx
Veteran trees			xxx	xxx	
Secondary wood	xx				
Breeding birds (only heron and egret)		xxx			
Deer		xx			
Invertebrates	xx		xxx*	xxx*	

Key:

Least ← x xx xxx → most - degree of negative effects
+ ++ +++ - degree of positive impacts

The assessment assumes a moderate to high level of use to have the above impacts.
The scale of each impact depends on local site characteristics and size.

* Especially invertebrates of old/veteran trees.

10. OPEN WATER

10.1 Introduction and Context

Types and numbers

10.1.1 Open water that may be encountered on access land includes rivers, streams, lakes, reservoirs, pools, ponds and canals.

Rivers and streams

10.1.2 There are currently 28 riverine SSSIs in England (comprising 2.5% of the total river length) and four biological SSSIs on rivers in Wales. The headwaters of many of these can be found on moorland and this is the most likely freshwater habitat to be encountered on access land. Most riverine SSSIs occur in the lowlands.

Lakes and reservoirs

10.1.3 In England, natural lakes are restricted principally to mountain and moor, in particular the Cumbrian Lake District. Whilst the larger lakes are at lower altitudes, upland areas of the Lake District contain many smaller lakes. In Wales, the main lakes and reservoirs are in Snowdonia, but some also occur in mid-Wales. Man-made water bodies such as gravel pits and reservoirs occur throughout with the former occurring in lowland areas on the flood plains of rivers and the latter occurring in a range of urban and rural settings with some located in upland areas.

Pools and ponds

10.1.4 Natural dystrophic pools are located in upland and lowland bogs and heathland. Seasonal pools are also of interest. Ponds are man-made and many are located within productive agricultural areas or private residential premises or in urban areas. The pondscapes of north-east Wales, Cheshire and Lancashire are particularly important for great crested newts. They are mostly marl ponds. Few ponds occur on access land, although dew ponds are present in chalk down and limestone grassland areas.

Canals

10.1.5 Canals are distributed throughout England and in east and south Wales and connect all major urban areas. Although principally lowland, some of them traverse moorland and heathland.

BAP priority habitats

10.1.6 Chalk rivers and mesotrophic and eutrophic lakes are all BAP priority habitats, (although chalk streams do not occur in Wales). All these habitat types occur primarily in lowland areas.

10.2 Accessibility of Sites with Freshwater Habitat

Number of sites have access

10.2.1 ***Many lowland lakes and rivers*** are privately owned and managed exclusively for angling purposes and ***public access is not allowed***. This is less the case in upland sites, with many upland lakes occurring in the Lake District and Snowdonia National Parks. ***Upland streams*** will be similarly ***readily accessible***.

10.2.2 Canals usually have public access along their towpaths which is used by walkers, cyclists and anglers. A good number of lowland lakes in Wales (Valley Lakes on Anglesey; Bosherton Lakes in Pembrokeshire; and Llyn Tegid at Bala) all have public access already.

10.3 General Vulnerability of Sites with Freshwater to Direct Impacts arising from Access

Key Points

The general principles in *Chapter 3*, and the little research which has been undertaken, suggest that:

- **Water's edge vegetation in wet soils is sensitive to trampling damage.**
- **Drier ground specialist plants are replaced by common pasture species.**
- **Reed and reed sweet-grass are very susceptible to trampling.**
- **No relevant research is available on water's edge invertebrates or fish.**
- **Otters very sensitive to disturbance by dogs.**
- **Water's edge birds can be reduced in numbers by constant disturbance.**

Nature of use

10.3.1 Rivers, canals and lakes represent impassable barriers to walkers apart from at certain points (bridges or fords) and also form natural focal points. Consequently, ***walkers tend to follow the course of rivers and canals and the shores of lakes***. This puts pressure on riparian vegetation and can result in bankside erosion in cases of heavy usage. Where access is to sites which are attractive for paddling or bathing (which is specifically excluded in non-tidal waters in the CROW Act) a threat of damage to fringing aquatic macrophytes potentially exists as does the possibility of increased turbidity. Increased human traffic along river corridors could facilitate the spread of alien riparian plant species such as Indian balsam and giant hogweed, although this has not been substantiated by research.

Trampling effects – plants in wet soils most susceptible

10.3.2 There have ***not been many studies of the impact of trampling and disturbance on water's edge*** plants and animals. Some judgements can be made by reference to the general principles set out in *Chapter 3*. This shows the types of plants and conditions in which they grow which are more-or-less resilient to trampling. ***Plants growing in wet soils are more vulnerable*** than those in dry ones. It follows that

water's edge vegetation (not that in the water) in wet clays, silts or peats, will be more vulnerable than those in dry soils. Such conditions will pertain in moorland/upland situations in particular, or on clay or alluvial soils in grasslands or woodlands, especially in the lowlands. See *Chapters 5, 8* and *9* in *Sections 5.3, 8.3* and *9.3* respectively.

10.3.3 In woodlands, there is the added stress of shade, and ***plants adapted to wet and shady conditions*** and the soils they are in will ***be particularly susceptible to damage*** (see *Chapter 9, Section 9.3*). There are many situations where woodland on small, or more extensive valley slopes incorporate small, soligenous flushes or springs close to streams. These would be very vulnerable to trampling damage.

Water's edge species in woodland more susceptible

Less damage on rocky shores

10.3.4 ***Vegetation*** beside water will be ***less easily damaged*** if the ***shore is rocky or stony***, and visitors stand on these rather than the plants.

10.3.5 As far as ***marginal aquatic vegetation*** is concerned, some is quite vulnerable to damage. An extreme case was recorded by Sukopp (1971), who found that 31% of the reed swamps along the Havel River in West Berlin disappeared over a five year period with river-side access. However, recreational levels were very high, with 350,000 visitors in 95km of shore-line on one day (nine people/m^2/day of usable shore-line). At first, the disturbance allowed space for ruderal species, especially where meadows lay adjacent to the river, but the reed stands vanished with intensive use and the river margins then eroded.

Marginal aquatics can be lost

Differential tolerance to trampling, Sensitive species replaced by tolerant ones at moderate trampling levels

10.3.6 A contrasting study by Rees (1978) on Scottish loch shores reported narrow paths by fishermen and wildfowlers (30-45cm wide), parallel to the shore, usually at the junction of wet and dry vegetation types. On little-used paths, the marginal aquatic vegetation remained and increasing species numbers were noted, but with intermediate levels of use. Common reed, reed canary-grass and reed sweet-grass were replaced by bent grasses, meadow-grass species, amphibious bistort and knotgrass, ie. species found elsewhere (see *Chapter 3* and *Chapter 8, Section 8.3* on grasslands) to be general tolerators of trampling. Heavily used paths were just bare mud.

10.3.7 Although the CROW Act excludes fishing as an activity associated with access, some studies (eg. Liddle and Scorgie, 1980) have assessed the impact of fishing in terms of vegetation loss on the water's edge, and the cutting and clearance of plants in the water. The general trampling results match those for other habitats with the ***characteristic suite of common pasture herbs*** (see *Chapter 3* and *Chapter 8, Sections 3.3* and *8.3*) ***replacing the semi-natural vegetation beside the water.***

Numbers of tramples

10.3.8 Only one available study in Britain has examined the levels of trampling which cause damage (Rees and Tivy, 1977). At low levels of wear, common bent and bottle sedge on an organic substratum showed increased growth, but in all other situations the plant cover was depressed under increasing intensities of wear. The taller reed

grasses were more vulnerable to damage on very wet sites, whilst the shorter sedges on drier soils were more tolerant. The brittle leaves and stems of ***reed*** and the soft leaves of ***reed sweet-grass*** are ***easily broken***, even though they can withstand wave action.

10.3.9 The evidence suggests that water's edge habitat where trampling to the vegetation occurs (this would be negligible, for example, on most canal tow path managed surfaces) is particularly vulnerable on wet ground and in shade; and that some emergent species are equally susceptible to damage under moderate to heavy use.

10.3.10 The ***animal life*** associated with the aquatic environment is also likely to be vulnerable to visitor impacts, at least on a local scale, but ***no research*** has investigated the extent of the effects. For example, fine sediments can be washed into water, and stones or sediments in the water disturbed by paddling or dam-building, or by access being made across the stream. This could affect fish (salmon spawning, for example), and invertebrates and plants in the water, but is only likely to be significant under heavy erosion or in a confined water area. Crayfish and freshwater pearl mussel populations could conceivably be vulnerable if erosion was severe. However, the scale of such effects as a result of recreational use needs to be balanced against natural erosion and the impact of sediment run-off, for example, from bare, arable fields.

Aquatic animals

10.3.11 Under ***intensive use*** which destroyed marginal vegetation and bank structure, species like ***water vole could lose*** suitable habitat, but this extent of damage is ***likely to be uncommon***.

Water voles Chapter 13

10.3.12 The issue of disturbance to birds is covered in *Chapter 12*. One paper of particular relevance is that by Tydeman (1977) who found up to 58% more breeding birds on gravel pits when a coarse fish close season operated (March-June) than when fishing continued. Even common species such as coot and great crested grebe were reduced in numbers. Translated into walkers rather than fishermen, a site would probably need to be visited continually, all though the day, for an equivalent level of disturbance (see *Chapter 12*).

Birds Chapter 12

10.3.13 The sensitivity of otters to disturbance is addressed in *Chapter 13*, paras. *13.3.7-14*.) Although very sensitive to disturbance by dogs in particular, otters are less vulnerable as they can both operate nocturnally and are relatively tolerant of a range of disturbing activities. However, holts should not be disturbed (and it would be illegal under the Wildlife and Countryside Act 1981 to do so).

Otters Chapter 13

10.4 Types of Site with Freshwater Habitat with Particular Vulnerability to Access Related Issues

10.4.1 The general vulnerability of water's edge habitats will be related to the level of use which might be expected and to the detailed nature of the habitat. The ***most vulnerable situations*** where visitor use is expected to be moderate or high will be:

Sensitive situations

- Sites where ***overwintering or breeding bird*** populations are key features and susceptible to disturbance.
- ***Sensitive water-side vegetation***.
- Areas around ***otter*** holts.
- Any situation where crayfish populations are threatened (there is a theoretical possibility of visitors or dogs inadvertently spreading crayfish plague but no evidence to support this.
- ***Transfer of alien aquatic plants*** on boots, etc. from pond to pond (eg. New Zealand pigmyweed, *Crassula-helmsii*). Again, there is no scientific evidence that this occurs, but birds can certainly move species like Canadian waterweed and the risk of such activities associated with visitors or other agents needs to be assessed.

10.4.2 A summary of the vulnerability of freshwater habitat types is given in Table 10.1.

Table 10.1. **Freshwater Habitat Sensitivities**

Habitat type	**Nature of vulnerability**
Rivers and streams	Streams vulnerable to physical degradation from walkers.
Lakes and reservoirs	Sites with a breeding or overwintering bird interest are vulnerable to disturbance. Trampling of vegetation on lake edges.
Pools	Trampling of vegetation around pools on heathland. Access to pools on bogs is difficult and may result in lower impacts. Transfer of alien aquatic plants such a New Zealand pigmyweed and Canadian waterweed.
Ponds	Duck feeding may result in enrichment of small water bodies. Dogs causing turbidity in small pools/ponds.
Canals	Breeding birds vulnerable to disturbance.

10.5 Associated Interests

10.5.1 Some aquatic habitats are particularly important for ***breeding*** or ***wintering birds***, especially large lakes and reservoirs. Aquatic invertebrates, especially ***crayfish***, are important in all waterbodies, but their special value is more thinly distributed. Many waterbodies are key habitats for ***fish*** but, because the effects of recreation on water and fishing are not part of the provisions of the CROW Act, they have not been considered in this guidance. ***Otters*** and ***water voles*** are key mammals associated with water's edge habitats. Some ***Earth heritage*** features are associated with river-side exposures.

Birds
Invertebrates
Fish
Mammals
Earth heritage

10.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

10.6.1 In most cases, access ***can be managed*** to avoid potential conflict. This might involve ensuring paths are kept away from the water's edge in more sensitive areas, that screens are provided to protect birds, and signs and interpretive materials are used to encourage

Management not exclusion

most people to keep to paths, avoid more sensitive features or view them from a distance.

10.6.2 Such recreation management needs resources, sometimes including wardening. Where paths follow rivers, ideally they should do so some several metres away from the river to allow a vegetated, undisturbed marginal zone between the footpath and the river. Where this is impractical, and may result in visitors breaking through to reach the water's edge, a path can be constructed to meander to and away from the river at different points so as to allow undisturbed sections. Creating new paths beside open water which would result in levels of access which would necessitate the engineering of a hard surfaced path should be resisted.

10.6.3 Circumstances where access provision could unacceptably damage the key features of nature conservation could arise where visitor numbers were high and the habitats or species especially sensitive. The most likely locations would be:

Most sensitive locations

- Those important for ***breeding or overwintering birds*** (see *Chapter 12*).
- ***Water's edge, especially sensitive*** to erosion and plant loss.
- ***Otter*** holts.
- Important ***water vole*** populations.

It is possible, in exceptional circumstances, that total exclusion or restriction or seasonal exclusion to linear routes could be needed to protect these features should non-statutory measures fail or be predicted to be inadequate to protect the nature conservation interest.

10.6.4 The significance of the potential effects of high levels of visitor use need to be assessed against the limits of acceptable change for the parameters which define favourable condition for the whole site.

10.7 Related Concerns

Introductions, Poaching, Collecting, Management

10.7.1 There is the potential for ***various unauthorized or illegal activities*** to take place where access to waterbodies occurs. This includes release of fish or unwanted pet terrapins, which could affect great crested newts as well as the native fish and other aquatic species, the poaching of salmon or other fish, and the removal of crayfish or freshwater pearl mussels. There is an unsubstantiated danger of spreading crayfish plague. Amphibian spawn may be collected from ponds in newly accessible areas.

10.7.2 A key element in the successful management of access involving waterbodies is education to dissuade people from pursuing unauthorized activities, since these will often cause more damage than simple access on foot at moderate levels of usage.

Public liability

10.7.3 ***Health and safety*** in relation to water is a prime consideration. Drowning is a potential risk associated with any waterbody. Public liability under the Occupier's Liability Act 1984 is removed under the CROW Act (Section 13) from rivers, streams, ditches or ponds,

whether natural or not. While the risk of drowning is small in relation to walking beside a river or lake, actively swimming in lakes or rivers poses a greater risk, (although it is excluded under the CROW Act in non-tidal waters). ***Weil's disease*** is also a concern in this respect and periodic ***toxic algal blooms*** present a risk to people and dogs, and may necessitate clear guidance to the public at sites experiencing them.

10.7.4 Public access could restrict ease of ***management for fisheries***, and this should be addressed under Section 24 of the Act.

10.8. Opportunities Associated with a Statutory Right of Access

10.8.1 Increased human presence on inland waters could provide ***benefits*** in ***increased detection of pollution incidents or other negative impacts*** on the aquatic environment such as disturbance to protected species or poaching. There are also opportunities to provide ***information*** and ***interpretation*** of features for the public, thus enhancing the recreational experience whilst, at the same time, increasing awareness in respect of, and interest in, the nature conservation features.

Detect pollution, Interpretation, Create buffers

10.8.2 If opportunities arise for ***habitat creation*** around or along water features, including new ponds and other waterbodies, then these could provide ***more resilient features*** which could absorb some of the pressure on more sensitive sites.

SUMMARY OF POTENTIAL SIGNIFICANCE OF ACCESS IMPACTS ON OPEN WATER HABITATS

	Direct Impacts			Indirect Impacts	
	Trampling	**Eutrophication**	**Disturbance**	**Disease Transfer**	**Management**
Rivers and Streams	xx				x
Lakes and reservoirs					
soft edges	xxx				
rocky edges	x				
Pools and ponds	xx				
Canals					
Breeding birds			xxx		
Wintering birds			x		
Otters			xxx*		
Invertebrates				?x	x
Fish					x**
Soft earth heritage	x				

Key:

Least ← x xx xxx → most - degree of negative effects
\+ ++ +++ - degree of positive impacts

The assessment assumes a moderate to high level of use to have the above impacts. The scale of each impact depends on local site characteristics and size.

* Very sensitive to disturbance by dogs, otherwise not very vulnerable.

** Possibility of introducing fish or poaching.

11. COASTAL HABITATS

11.1 Introduction and Context

11.1.1 Coastal land is not included in the definition of open country within the CROW Act, although there is provision in the Action (Section 31) for the Secretary of State or the National Assembly of Wales to amend the definition in the future so as to include coastal land. This chapter, however, is prepared in order to give guidance where coastal habitats will qualify for a statutory right of access because of their incidental inclusion within registered common land.

11.1.2 The chapter includes ***supra-littoral habitats*** (coastal habitats above tidal areas) and ***littoral habitats*** (intertidal coastal habitats).

The supra-littoral habitats are:

- Maritime cliffs and slopes.
- Sand dunes.
- Shingle.

The littoral habitats are:

- Saltmarshes.
- Mudflats.

The definitions for all are based on the UK Habitat Action Plans.

Supra–littoral habitats

11.1.3 ***Maritime cliffs*** and slopes comprise sloping to vertical faces on the coastline where a break in slope is formed by slippage and/or coastal erosion. There appears to be no generally accepted definition of the minimum height or angle of slope which constitutes a cliff. The zone defined as cliff-top (also covered in the Maritime Cliff and Slope Habitat Action Plan) should extend landward to at least the limit of maritime influence (ie. limit of salt spray deposition), which in some exposed situations may continue for up to 500m inland, but on most sites will be narrower than this. Coastal heathland and grasslands are the main habitat on top of these cliffs. Approximately 1,082km of the English coastline has been classified as cliff. In Wales, there are 3,400ha of maritime cliffs with 1,460ha on 43 SSSIs.

Definition, Area

11.1.4 ***Sand dunes*** can form along the coast where there is a sufficient supply of sand in the intertidal zone to form a beach plain, the surface of which dries out between tides. Sand dune habitats are often present in a succession from embryo, mobile and fixed dunes, containing dune slack communities and sometimes leading into coastal forms of grassland, heath and scrub. Coastal sand dunes support specialised vegetation as well as a range of grassland, heath, scrub, mire and swamp communities that are more widely distributed. There are approximately 12,000 hectares of sand dune

Variety, Area

habitats in England and 6,100ha in Wales. Within the latter, 4,500ha are on 21 SSSIs.

11.1.5 ***Shingle*** is defined as sediment with an average grain size of 2-200mm. Vegetated shingle habitats are uncommon in the UK, with approximately 5,000ha in England and 3,100ha in Wales. The establishment and maintenance of vegetation is largely dependent on the mobility of the shingle, the properties of the matrix and its hydrological status. Vegetated shingle encompasses all perennial vegetation (pioneer, grassland, heath and scrub comminutes) on shingle features above the reach of tides, and a specialised strandline community, which may be associated with the seaward edge of shingle structures. The mobile shingle structures which support the vegetated areas are critical to the development of vegetation. Shingle features are often associated with saline lagoons, which are a very scarce habitat. There are 20ha of shingle in three SSSIs in Wales and 4,168ha on 25 SSSIs in England.

Definition, Area

11.1.6 Nearly all of the littoral and supra-littoral habitats in England and Wales are included within the range of interest features identified by national and international legislation or are covered in the UK BAP. In England these supra-littoral habitats occur on 143 designated SSSIs (3.5% of all SSSIs (4,088 total number)) covering more than 20,687ha. 117 of these SSSIs occur within sites designated for international interests (SPA/SAC/Ramsar). The statistics in Wales show that 106 SSSIs support over 13,000ha of supra-littoral habitat.

Overall statistics

11.1.7 There are 37 SPA/SPA complexes, 37 cSACs and 30 Ramsar sites which are designated for their coastal features in England. Many of these coincide with areas of common land eg. Morecambe Bay, Solway Firth, North Norfolk Coast, Essex Estuaries, Solent, Portland and various sites on the Cornwall and Devon coasts. There are 23 c and pSACs, 15 SPAs and 4 Ramsar sites in Wales. Many SACs, Ramsar and SPA sites are commons including Tywyn Aberfraw and the Burry Inlet The supra-littoral habitats covered by Annex 1 of the Habitats Directive are listed in Table 11.1 and covered in the criteria for SSSI selection.

11.1.8 For all of these habitats, the biological and Earth heritage interest is strongly related to the maintenance of physical coastal processes.

Littoral habitats

11.1.9 ***Saltmarshes*** develop on intertidal sediments where consolidation by halophytic plants takes place. They occur in a variety of situations where conditions allow a net accumulation of sediment. Saltmarsh areas must have some shelter from strong wave action and are thus usually found in estuaries, behind barrier islands or shingle pits, or in areas where wave energy is dissipated by the presence of shallow water offshore. Saltmarshes encompass vegetated intertidal flats from pioneer, at the seaward edge, to low, mid and high marsh communities. The upper limits of saltmarshes additionally support a range of upper marsh swamps and transitional habitats, including reedbeds and transitions to freshwater habitats and grasslands. Such transitions are often truncated by sea defences or reclaimed

Definitions, Area

agricultural land. There are approximately 35,000ha and 7,000ha of saltmarsh in England and Wales respectively. A significant proportion of this area is in 58 SSSIs in England and 22 SSSIs and Wales.

Table 11.1. Littoral and Supra-littoral Habitats covered by Annex 1 of the Habitats Directive and the Criteria for SSSI Selection

Annex I Habitats
Annual vegetation of drift lines
Perennial vegetation of stony banks
Vegetated sea cliffs of the Atlantic and Baltic coasts
Estuaries
Mudflats and sandflats not covered by seawater at low tide
Coastal lagoons
Salicornia and other annuals colonising mud and sand
Spartina swards
Atlantic salt meadows
Mediterranean thermo-Atlantic halophilus scrub
Embryonic shifting dunes
Shifting dunes along the shoreline with *Ammophila arenaria*
Fixed dunes with herbaceous vegetation ('grey dunes')
Atlantic decalcified fixed dunes
Dunes with *Hippophae rhamnoides*
Dunes with *Salix repens* ssp *argentea*
Humid dune slacks
SSSI Criteria Habitats
Saltmarsh vegetation
Seacliff vegetation
Sand dunes
Shingle vegetation

11.1.10 ***Mudflats*** are sedimentary intertidal habitats created by deposition in low energy coastal environments, particularly estuaries and other sheltered areas. Their sediment consists mostly of silts and clays with a high organic content. Towards the mouths of estuaries where salinity and wave energy are higher the proportion of sand increases. Mudflats are intimately linked by physical processes, and sediment cycling may be dependant on other coastal habitats such as soft cliffs and saltmarshes. They commonly appear in the natural sequence of habitats between subtidal channels and vegetated saltmarshes. In large estuaries they may be several kilometers wide and commonly form the largest part of the intertidal area of estuaries. However, in many places they have been much reduced by land reclamation.

Definitions, Area

11.1.11 There are about 32,700ha of intertidal mudflats in Wales of which around 27,980ha is a feature on 31 SSSIs. England has approximately 260,700ha of intertidal mudflats within 133 SSSIs.

11.1.12 Other intertidal features which may be present in a restricted number of sites are *Zostera* beds and intertidal *Sabellaria* reefs.

11.1.13 These littoral habitats are present in Wales in 82 SSSIs, covering almost 34,000ha. Over 30% of these SSSIs occur within sites designated for international interest (SPA/SAC/Ramsar), often in

Overall figures

association with supra-littoral features. There are 3 Ramsar sites, 6 SPAs and 7 SACs with littoral habitats present in Wales. In England there are over 180 SSSIs with littoral sediments, most of which are found within the 196,810ha of estuaries. There are 60 SACs and 35 SPAs with littoral habitats present in England.

11.2 Accessibility of Sites with Coastal Habitats

11.2.1 The National Trust owns c.978km of coastline, much of which is already accessible to the public. Many coastal areas have numerous nature reserves run by voluntary conservation organisations. Of the National Nature Reserves declared by English Nature, approximately 56% are maritime and English Nature manages a significant proportion of these. About 20% of the Welsh NNRs are maritime. There are two MNRs, Skomer and Lundy. Coastal habitats in general attract significant numbers of people for a wide range of recreational uses. There are restrictions on access in certain cases, for example, military use/training.

Many areas have open access

11.2.2 Many extensive intertidal areas have customary and *de facto* access, and inter-tidal sandflats in particular are used for the purposes of recreation during summer months. Although seawalls overlooking mudflats and saltmarshes are popular, access across these areas is less readily available or attractive, and they are more likely to be used by specialist groups such as fishermen, birdwatchers or wildfowlers.

11.3 General Vulnerability of Sites with Coastal Habitats to Direct Impacts arising from Access

Dunes

Key Points

The relevant research shows that:

- **Under light trampling plant diversity can increase.**
- **Under moderate to high trampling:**
  - **bare ground develops;**
  - **increased soil compaction;**
  - **more sensitive species reduced or lost;**
  - **trampling tolerant species increase in zone by paths;**
  - **height, diversity, flowering and seed production all reduced;**
  - **bare ground used by some annual plants;**
  - **marram very susceptible to trampling damage.**
- **Densities of path networks can be very high (>13% of one site comprised paths).**
- **On rank dune grassland, 800 passages are possible without loss of plant cover. Dune heath is twice as vulnerable. Marram dunes are ten times as vulnerable.**
- **Lichen-rich, strandline and marshy soils in slacks highly sensitive.**
- **Low level trampling impact on invertebrates can be severe in rank dunee grassland.**

11.3.1 Recreation has been a recognised issues for coastal habitats at many sites for at least the last three decades. Indeed, coastal sand dunes and coastal vegetated shingle were the two main habitats where recreation and access were identified in the UK Habitat Action Programme as factors affecting the habitat. The relevant research findings for each coastal habitat type separately are presented below. However, reference should be made to *Chapter 3*, which provides generic information on trampling and associated impacts.

Dunes and shingle vulnerable

11.3.2 There are several published studies on the impacts of trampling on ***dune habitats***, although there does not appear to be a recent systematic review of this work. This issue was identified as early as 1967 (Duffey, 1967) as a matter of concern. The impacts of trampling on dunes follows the general pattern described in *Chapter 3*. Under ***light trampling***, there can be a ***reduction of tall grasses and litter and increase in plant diversity in unmanaged dune grasslands***. (There is no evidence of this in grazed dunes).

11.3.3 ***At moderate to high trampling levels, bare ground develops***, with associated ***increase in compaction*** (which tends then to hold more available water on dune soils), more ***sensitive species are reduced*** in cover or disappear, and in the zones adjacent to the bare path, typical ***trampling-tolerant species occur***, which mostly tend to be common pasture herbs (a list is provided in *Chapter 8, Section 8.3*). The ***height of the vegetation and its diversity is reduced, along with flowering***, and ***therefore seed production***. In some species (such as lady's bedstraw and wall speedwell) flowering is delayed by up to three to four weeks. (Sources: Liddle, 1997; Trew, 1973; Carlson and Godfrey, 1989; Slatter, 1978; Boorman and Fuller, 1977; Schofield, 1967).

Impacts on sand dunes - loss of diversity, - vegetation height, - replacement species

11.3.4 Slatter (1978) (studying Ainsdale sand dunes) provided a useful list of species in relation to ***their relative resistance to trampling*** (Table 11.2). Some dune annuals seem to be able to utilise the bare areas along paths and complete their life cycle early in the season. It is notable that all the species deemed to be more resistant are hemicrytophytes and therophytes. ***Even light trampling*** on a dune system can result in a change in the competitive balance in ***favour of plants with a high level of productivity*** (as predicted and found by Liddle, 1975b and also found on dune plain grassland by Milwain, 1984).

Table 11.2. Occurrence Indices, Using Plant Frequency Measurements

Latin Name	English Name
Poa annua	Annual meadow-grass
Agrostis stolonifera	Creeping bent
Cerastium diffusum	Sea mouse-ear
Pilosella officinarum	Mouse-ear-hawkweed
Anthoxanthum odoratum	Sweet vernal-grass
Festuca rubra	Red fescue
Poa pratensis	Smooth meadow-grass
Carex flacca	Glaucous sedge

Luzula campestris	Field woodrush
Aira praecox	Early hair-grass
Hypochaeris radicata	Cat's-ear
Holcus lanatus	Yorkshire fog
Prunella vulgaris	Selfheal
Lotus corniculatus	Bird's-foot-trefoil
Cerastium semidecandrum	Little mouse-ear
Salix repens	Creeping willow
Anthyllis vulneraria	Kidney vetch

Taken from Slater (1978).

11.3.5 As well as changes in the vegetation, there are likely to be concomitant changes in the nutrients and pH of the soils associated with trampling effects. Slatter (1978) recorded an ***increase in pH from around 6.6 to 7.2*** correlated with compaction. This may be related to bringing less leached sand to the surface, as in rabbit burrowing which could be advantageous in some situations. Milwain (1984) found ***enhanced available phosphorus levels*** beside dune plain paths in Jersey which was probably derived from the high level of use by dog walkers and the faeces left beside the paths.

Changes in pH and nutrients

11.3.6 In ***unmanaged dunes***, there could be some advantages of ***light trampling*** which would not only ***reduce dominance of rank species***, but provide for ***enhanced opportunities for some annuals*** and shorter plants, as well as valuable habitat for specialist invertebrates (refer to *Chapter 15, Section.15.3*).

Bare ground good for some species

11.3.7 Not all the communities on dunes are equally susceptible to trampling. Boorman and Fuller (1977) ***found the marram dunes to be most susceptible***; a fact which could be predicted from its highly stressed environment, sand instability, lack of organic matter and sparse vegetation. Short grassland and scrub were more resilient, while rank grass and dune heath were moderately susceptible.

Yellow dunes most sensitive

11.3.8 The ***densities of paths*** on some dune systems ***are very high*** – a reflection both of the intensity of use and often the ease of moving off paths, thus creating new ones. Boorman and Fuller (1977) estimated that the area affected intensely on Winterton Dunes in Norfolk constituted ***13.6%,*** or 14.1ha ***of the whole area***. Altogether, there was 35.3km of paths >1m wide at an average density of 340m/ha, and a further 40km of narrower paths on the 104ha site. Similarly high levels of use are recorded on the Meijendel dunes near The Hague, where 71km of major paths and 22km of minor paths occurred in just 105ha (Packham and Willis, 1997).

Density of paths can be high

11.3.9 ***Experimental trampling studies*** and visitor counts give some guidance on the numbers of passages which different dune communities can tolerate with different levels of damage. Schofield (1967) found that 7,500 passages/year on open dunes eliminated the vegetation, whereas 4,000 on fixed dunes caused only local removal of the sward. Boorman and Fuller (1977) conducted experimental trampling on rank dune grassland which showed the following, two seasons after the experiment.

Numbers of visitors versus sensitivity

	% reduction in sward height	Bare Ground %
20 tramples/year	23 (±9)	0
120 tramples/year in June	34 (±4)	1
120 tramples/year in December	53 (±5)	2
120/year @ 10 monthly	62 (±5)	3
480/yr @ 40 monthly	75 (±4)	5
960/yr @ 80 monthly	8 (±2)	14

Extrapolating from these figures, the authors suggested the ***following carrying capacity for the rank dune grassland***.

	Path Width			
	0.4m	**0.5-1m**	**1.01-2m**	**2.01-4m**
With no sig. loss of cover	400	800	1,500	2,500
50% bare	1,500	3,000	5,600	9,400
100% bare	2,000	4,000	7,500	13,000

11.3.10 They estimate that the ***dune heath*** (heather) would be ***twice as vulnerable*** and the ***marram 10 times less resilient*** than the rank dune grassland, and add the comment that at nearby Holkham dunes, a 50% bare path, 20m wide was produced by 70,000 passages/year. The predictions would depend on visitors remaining on the paths, whereas, as more bare sand is exposed, the tendency is to move off the path to avoid uncomfortable walking conditions.

Sensitivity of lichens, Wet ground, Strandline

11.3.11 Although not specifically researched, the ***high sensitivity of lichens*** (see *Chapter 16, para. 16.3.12 et seq.*) and of ***wet ground*** vegetation (*Chapter 3*) suggest that both lichen-rich dune grassland and wet slacks would also be highly sensitive to trampling damage. A third habitat which is sensitive to damage is the ***strandline***.

Impacts on invertebrates and other mammals

11.3.12 There are also potential effects of ***trampling on invertebrates*** which ***could be severe*** on dunes if trampling is well spread out and regular (Buchanan, 1976; Duffey, 1967; Van der Ploeg and Van der Wingerden, 1977). Further consideration of these aspects are presented in *Chapter 15, para 15.3.8*. On some dune systems, herptiles may be important (see *Chapter 14*), and disturbance to breeding birds needs to be considered (*Chapter 12*).

Maritime cliffs

Key Points

There is very little research into the effects of visitor pressure on maritime cliffs, but see *Chapters 4 and 8* on heathland and grassland.

11.3.13 ***Maritime cliffs*** share many characteristics with ***various grassland types and heathlands***, and both *Chapters 8 and 4* (*Sections 8.3 and 4.3* respectively) provide useful information. Maritime cliffs, though, have the added stress of salt deposition and extreme exposure and may be more sensitive as a stressed environment to visitor use. The Kynance Cove project (Goldsmith *et al*., 1970) was one of the first studies of recreational trampling and ecological damage, which also set out a management plan for repairing the site. More recent studies on The Lizard by Bristol University (1982, 1985) investigate the effects of trampling on this area of Cornwall.

See heaths and grassland, *Chapters 4 and 8*

11.3.14 Other studies on maritime cliffs are lacking, although Hewitt (1973) describes their vulnerability from climbers removing vegetation and disturbing cliff-nesting birds (see *Chapter 12*) to the erosion of soft rocks where visitors scramble down to the beach to the extent that gullies can develop, and to the loss of vegetation and erosion on cliff tops, especially at view points. He gave examples at Penrhyn Wawr, Holyhead; Elegwg Stacks, Pembrokshire; Portland Bill, Dorset; and Beachy Head, Sussex where vegetation had been lost, soils eroded and the exposed rocks became polished and worn.

General effects, No studies

Coastal shingle vegetation

Key Points

The little research available shows that:

- **Shingle vegetation is easily damaged.**
- **Plant diversity is reduced by trampling.**

11.3.15 There are studies of the damage caused to shingle vegetation and the geomorphological structures of shingle which focus on the larger sites such as Chesil Beach, Dorset; Dungeness, Kent; and Orfordness, Suffolk. At the latter site there has been a LIFE project aimed at restoring past damage primarily from military activities, but management of public access has formed part of the project.

Easy to damage shingle

11.3.16 The causes of damage to vegetation at Dungeness include grazing, trampling, vehicles, excavation and development (Fuller, 1985) with their severity increasing in the same order. The shingle survey of Great Britain covers a number of sites in England and Wales (Sneddon and Randall, 1989). At many of these***, trampling was noted*** during surveys as one activity ***causing damage to fragile shingle vegetation*** (Sneddon and Randall, 1993a, 1993b, 1994). The ***damage to ridge structures*** is also an issue.

11.3.17 One of the main causes of damage is the ***breaking up of the surface layers of vegetation and the fine humic layer*** that may take many years to be deposited. As a result, damage to vegetation may ***not be possible to reverse***. Spokes (1997) studied shingle vegetation and trampling and compared data from 1991 with that collected in 1997

Loss of plant diversity from trampling

on a shingle habitat at Slapton. The results indicated that ***untrampled areas were more diverse*** than the trampled areas. Hewitt (1973) came to the same conclusion on Chesil Beach.

11.3.18 Invertebrates and birds are both important features of shingle areas, and *Chapters 15 and 12* need to be consulted for further information.

Coastal saltmarsh and mudflat

Key points

The limited research available suggests that:

- **Saltmarsh is sensitive to trampling.**
- **The infaunal community is affected by trampling.**
- **Plant composition may change as a result of trampling.**
- **Saltmarshes are partly self protective because of the difficulties of traversing them.**

11.3.19 There are limited references to trampling effects on saltmarsh habitats, although the work by Schofield (1967) indicates that ***saltmarsh*** within dune systems is of ***low resistance to trampling*** (see *para. 11.3.9*), a conclusion also reached by Hewitt (1973) for the saltmarsh around the Nelson monument on the Menai Straits, Anglesey, where visitors to the monument had trampled the saltmarsh to expose the underlying soil.

Saltmarsh and invertebrates in mud easily damaged

11.3.20 Human trampling in coastal recreational areas including saltmarshes, creates footpaths and reduces their natural beauty and amenity value (Vickery, 1995). Intertidal habitats have been little studied. At Lindisfarne, a study of the impacts of trampling on the tidal flat infauna on a regularly used Pilgrim route (Chandrasekara, 1986) concluded that ***trampling caused changes to the infaunal community***. He also indicates that the vegetated saltmarsh has developed a permanently distinguishable path along the route and that the vegetation composition may have been altered.

11.3.21 In areas where the sediments are poorly consolidated, damage from trampling can be clearly observed. These parts of a ***saltmarsh are normally unpleasant to walk*** on because of their muddy nature. Routes along the top or base of seawalls are often used instead, although the upper transitional marsh can be affected by trampling along the seaward base of the seawall.

Saltmarsh partly self protective

11.3.22 Saltmarshes and mudflats are of very high significance for wintering birds. The impacts of disturbance on these, and guidance on assessing its significance, is presented in *Chapter 12*.

11.4 Types of Site with Coastal Habitats with Particular Vulnerability to Access Related Issues

11.4.1 The ***significance of the impacts of access will be related to the sensitivity of the habitats and species, and the level and pattern of visitor use*** which might develop. On sites which are already effectively open access, further damage as a result of the CROW Act is unlikely and, indeed, there could be benefits in the bird breeding season since dogs have to be kept on a short lead from 1st March to 31st July inclusive.

Benefits of leashed dogs in bird breeding season

11.4.2 For sites ***where access could expand off-path***, the ***significance*** will be related to ***the degree to which off-path use develops***, the ***density of any new path network***, the ***extent of trampled zones and erosion problems***. If the path density is high, and trampled zones broad, a significant part of a site could be damaged. Coastal sites in general are often popular destinations and more vulnerable because of this.

11.4.3 However, within these generalisations, ***some coastal habitats and species are more sensitive*** than others. The least resilient are:-

More sensitive types

- Yellow marram dunes.
- Shingle habitats.
- Lichen-rich communities.
- Wet areas in slacks.
- Saltmarshes.
- Steep slopes used for access.

11.4.4 The ***relatively more resilient habitats*** are ***cliff-top grasslands*** and ***dune grasslands***. Saltmarsh may be vulnerable, but their inhospitable nature (with muddy creeks difficult to cross) probably provides good self-protection. In general terms, the numbers of studies which have been undertaken reflects the sensitivity of different coastal habitats – saltmarsh has received little attention, possibly because it has not been found, in practice, to be under as much pressure as habitats like dunes.

11.4.5 The ***studies show how sensitive dunes*** (a popular habitat) are, and calculation of the extent or potential extent of a path network and of trampling as a proportion of the whole habitat needs to be gauged against the criteria for favourable condition.

11.4.6 This has to be ***balanced against the benefits some low level of trampling*** may have in ***containing grass vigour*** and ***increasing diversity on unmanaged dune grasslands and coastal headlands***. Small areas of less regularly disturbed ***bare soil*** can benefit a variety of invertebrates (see *Chapter 15*), but ***trampling can also damage invertebrates of taller vegetation***. The proportions of each, and the importance of individual species or general biodiversity need to be considered. Surveys may be needed to assist in this process.

Benefits of light trampling

11.4.7 The significance of disturbance to birds is best judged from the guidance given in *Chapter 12*. The vulnerability of herptiles are

covered in *Chapter 13*. Aspects of erosion to important Earth heritage features, which often occur on the coast, are provided in *Chapter 17*.

11.4.8 The significance of the impact of access needs to be judged against the limits of acceptable change which define parameters on which favourable condition is judged for a whole site. This will take into consideration the predicted pattern of use and numbers of visitors under the CROW Act provisions and the extent of the effects of recreational pressure this engenders on the site.

11.5 Associated Interests

11.5.1 The coastal habitats listed may also support:

- Rare or scare species.
- Important assemblages of species.
- Nationally or internationally important populations of species (especially birds).
- BAP Priority species.

11.5.2 Supra-littoral habitats have a particularly long list of important species which are listed in the UK BAP. They are presented in Table 11.3. Wetlands within shingle sites are also important for *Hirudo medicianalis* (the medicinal leech) and great crested newt.

11.5.3 Birds are often of particular importance on coasts, and include colonial and solitary-nesting species, roosting and feeding colonies and overwintering populations (see *Chapter 12*). Some sand dune sites can support natterjack toads or sand lizards (see *Chapter 14*).

11.5.4 In littoral habitats in addition to bird interests (which may include feeding, roosting, over-wintering and colonial- and solitary-nesting populations) the following important BAP species are recorded from saltmarsh:

- *Euphrasia heslop-harrisonii* (eyebright).
- *Amara strenua* and *Anisodactylus poeciloides*, (ground beetles).
- *Bufo calamita* (natterjack toad).
- *Vertigo angustior* (snail).
- *Limonium* spp (endemic sea-lavenders).

Table 11.3 The Important Species associated with Supra-littoral Habitats

Maritime cliff and slope	
Invertebrates	
Bombus humilis	Brown-banded carder bee
Bombus ruderatus	Large garden bumble
Lasioglossum angusticepts	A mining bee
Osmia xanthomelana	A mason bee
Cathiormiocerus britannicus	A weevil
Cicindela germanica	A tiger beetle
Lygephila craccae	Scarce blackneck
Polymixis xanthomista statices	Black-banded moth
Zygaena loti scotica	Slender scotch burnet
Zygaena viciae	New Forest burnet
Plants	
Caloplaca aractina	A Lichen
Heterodermia leucomelos	Ciliate strap-lichen
Acaulon triquetrum	Triangular pygmy moss
Asparagus officinalis ssp prostratus	Wild asparagus
Coincya wrightii	Lundy cabbage
Euphrasia campbelliae	An eyebright
Euphrasia rotundifolia	An eyebright
Limonium (endemic taxa)	Sea lavender
Rumex rupestris	Shore dock
Sand dune	
Invertebrates	
Idaea ochrata cantiana	Bright wave moth
Evagetes pectinipes	A spider wasp
Cicindela hybrida	A ground beetle
Panagaeus crux-major	A ground beetle
Plants	
Gentianella uliginosa	Dune gentian
Liparis loeselii	Fen orchid
Bryum mamillatum	Dune thread moss
Bryum neodamense	A moss
Bryum warneum	A moss
Petalophyllum ralfsii	Petalwort
Shingle	
Invertebrates	
Calophasia lunula	Toadflax brocade
Hadena albimacula	White spot
Bombus humilis	Brown-banded carder bee
Bombus ruderatus	Large garden bumble bee
Bombus subterraneus	Short haired bumble bee
Aprhrodes duffieldi	The hopper
Plants	
Crepis foetida	Stinking hawk's-beard
Silene gallica	Small-flowered catchfly
Limonium spp.	Endemic sea lavenders
Galeopsis angustifolia	Red hemp-nettle

11.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

11.6.1 Coastal interests are often dependent upon the continuation of natural processes. These processes include erosion. Whereas it may be important to ensure that erosion is not arrested, it can also be necessary to prevent the accelerated erosion which may be caused from human pressures. The natural mobility and dynamics of cliff, dune, shingle and saltmarsh systems are important aspects in the assessment of favourable condition of coastal sites in meeting conservation objectives. Bare ground is important in the following circumstances:

- ***Cliff habitats***:-mosaics of bare ground with seepage zones, grassland and other features are critical for invertebrates in particularly and for maintaining succession.
- ***Dune habitats***:-as succession from embryo dunes to fixed dunes proceeds, there will be a decreasing amount of bare ground that will be acceptable. For fixed dunes, around 25% bare ground is acceptable as a result of natural processes. Over-stabilisation of dunes can result in a loss of interest in some features.
- ***Shingle***:- the vegetation developing on shingle structures is very vulnerable to disturbance from trampling, and recovery times are slow.
- ***Strandline*** vegetation does get disturbed by storms and coastal processes and the extent of this feature can be naturally discontinuous.

11.6.2 ***Intertidal areas*** in European Marine Sites will be covered by formal advice provided in association with Regulation 33 of the Conservation (Natural Habitats etc.) Regulations 1994, containing the conservation objectives, and Schemes of Management will be developed by management groups. ***Access is often identified*** in Regulation 33 Advice packages and ***may be addressed through Schemes of Management for European Marine Sites***. Where these involve consultation with holders of common rights, opportunities to raise understanding of conservation issues and how to develop management measures should be taken.

Intertidal areas and Regulation 33

11.6.3 The interests of ***saltmarshes and mudflats*** are dependent upon the continuation of natural processes, including erosion and deposition. It is important, when considering access related issues and any developments which may accompany them, to ensure that erosion and deposition are neither arrested nor accelerated. The natural mobility and dynamics of these habitats are important aspects in the assessment of favourable condition of coastal sites in meeting conservation objectives.

Need to maintain natural processes

11.6.4 In many cases, the natural difficulties associated with access across ***saltmarsh*** and ***mudflat habitats***, their lack of attraction, and the general uncertainty about whether there might already be customary or *de facto* access, means that the introduction of a statutory right will probably have no discernible effect on demand or practice. ***In many cases, action is unlikely to be necessary***.

Self protection of some habitats

11.6.5 Where local issues do arise, ***management and non-statutory mechanisms*** can be employed in most cases. Where accelerated erosion occurs, management mechanisms may be required to reduce the number of visitors coming into contact with sensitive habitats. These include controlling the availability and siting of car parks, influencing behaviour through vegetation management and fencing (which, whilst not precluding access, steer people along particular routes and away from critical areas), and the erection of notices. Wardening may be beneficial in certain areas, although this is resource intensive.

Apply management mechanisms

11.6.6 Certain benefits will be produced by influencing strategic coastal plans and policies to help minimise increased wear from poorly sited developments.

Use strategic coastal plans/policies

11.6.7 It will only be in exceptional circumstances where non-statutory mechanisms are unsuccessful, or unlikely to be so, because of the intensity of visitor pressure, or impracticality of controlling it using such means, statutory restrictions or exclusions may be required, especially at critical times of year, although, again, these may require wardening to be successful. Overall, however, statutory controls are more likely to be required where there are particularly sensitive interests where even short-term access can cause long-term damage, such as where bird colonies are present (see *Chapter 12*).

Statutory controls, Examples

11.6.8 The approach to ***supra-littoral habitats*** will be similar to that for littoral ones. In general, ***management and non-statutory mechanisms*** can be employed successfully to address conservation issues relating to the introduction of a statutory right of access. These include the same measures as listed in *para. 11.6.5* but, in addition, codes of practice are generally successful in influencing the use of faces for climbing.

Similar approach to littoral habitats

11.6.9 It will only be in ***exceptional circumstances***, where non-statutory mechanisms are insufficient to main a favourable conservation status for a site that ***statutory restrictions*** (eg. to linear routes) or exclusions (eg. to especially sensitive areas) will be necessary. Such circumstances could include:

- ***Lichen-rich dunes*** under pressure from trampling.
- Certain areas important ***for birds*** as defined in *Chapter 12*.
- ***Small dune sites*** with significant visitor pressure and sensitive communities.

The ***significance*** of the potential impacts has to be judged against the limits of acceptable change of the ***parameters used to define favourable condition*** for a whole site.

11.7 Related Concerns

11.7.1 Other issues to consider are ***health and safety, pressures for visitor facilities, fire risk, stock worrying***, decreased viability of agricultural management, and wildfowling. ***Issues of coastal***

Health and safety, Fire, Stock management, Coastal dynamics

dynamics and ***shoreline management*** may arise in relation to access, but existing strategic approaches should be used. It is essential that the introduction of a statutory right of access should not unduly interfere with managed retreat schemes.

11.7.2 ***Grazing management*** of supra-littoral habitats is often necessary to meet nature conservation objectives. There are often issues relating to control of dogs, stock worrying, and need for fencing and gates. Such infra-structure and management may not be economically productive. Consequently, where access is introduced, incentive or other schemes may need to be established alongside to enable the viability of appropriate grazing management and, where grazing is reduced, the adequate control of scrub.

Management, Managed retreat

11.7.3 A special case occurs when ***regular cleaning*** to remove seaweed and tidal flotsam takes not only the debris but also the invertebrates which live in it which, in turn, provide food for shore-line birds. Regular cleaning by local authority activity was found to be damaging to these interests on some beaches in South Wales (report on BBC Countryfile). The National Trust reports that such clearing can result in unnatural levels of compaction which reduce sand availability for dune building.

Sand cleaning impact

11.8 Opportunities Associated with a Statutory Right of Access

11.8.1 The introduction of a statutory right of access may provide opportunities for ***interpretation***, especially in popular seaside areas or where there are extensive views over land used by prominent wildlife features, ***reversion schemes*** (such as the re-establishment of cliff-top grasslands and habitats on former arable or intensive leys) and ***creation of buffer zones***. Consideration should be given to achieving BAP targets and actions, and linking with targets associated with other coastal initiatives such as AONBs and Heritage Coasts.

Interpretation, Habitat Creation, Linkages of BAP and other schemes

SUMMARY OF POTENTIAL SIGNIFICANCE OF ACCESS IMPACTS ON COASTAL HABITATS

	Direct Impacts			**Indirect Impacts**
	Trampling	**Eutrophication**	**Disturbance**	**Management**
Maritime cliffs				xx
Hard	x			
Soft	xxx			
Sand dunes				xx
Yellow dunes	xxx			
Fixed dunes	xx	xxx		
Dune meadows	xx	xxx		
Marshy slacks	xxx	xx		
Lichen-rich dunes	xxx	xxx		
Shingle	xxx			
Salt marshes	xxx			xx
Mudflats				
Special plants	xx	xx		xx
Breeding birds			xxx	
Wintering birds			xxx	
Invertebrates	xx(x)*			x
Earth heritage	xx			

Key:

Least ← x xx xxx → most - degree of negative effects
\+ ++ +++ - degree of positive impacts

The assessment assumes a moderate to high level of use to have the above impacts.
The scale of each impact depends on local site characteristics and size.

* Impacts will vary according to trampling resistance of vegetation.

12. *BIRDS*

12.1 Introduction

12.1.1 ***Concerns about*** the effects of a statutory right of ***access*** to the countryside on ***wild birds*** are amongst ***the issues most frequently voiced*** by those with interests in wild bird conservation, game management or in promoting access, and much has been written on the subject. This chapter, as a result, does not follow the pattern of the others, but presents integrated guidance related directly to the literature findings and the recommended mechanism for identifying potential significance of impacts.

Birds are a key issue for many

12.1.2 ***The chapter briefly reviews the information available*** which might form a scientific basis for the deliberations on the way wild bird populations might be affected by a statutory right of access to the countryside. ***It identifies those species*** for which it is judged the ***likely effects to be of such significance*** that there is cause for concern about the species' overall conservation status. It summarises the concerns by the habitat and land types specified in the Act.

Review effects of disturbance on birds

12.1.3 As in other chapters, this one ***does not reach hard*** and fast ***conclusions on the need for management measures or statutory restrictions/exclusions*** which should have universal application: rather, ***the need for these should be based on a combination of both conservation objectives for a site, and the likely demand for access to the site***. Accordingly, this chapter ***identifies those circumstances*** that will ***trigger consideration of appropriate action***. The nature and stringency of the action required, whether management measure or statutory restriction (including statutory exclusion), can be determined only at the site level. ***Any measures applied should be the least stringent necessary*** to protect the nature conservation interest of the site.

Identifies triggers, not universal solutions

12.1.4 The detail of any actual threat to a specific site, and the appropriate response to it, will need to be determined in the light of the assessment presented here, bird population levels and densities on the ground, and indications of the likely scale and pattern of access on the site in question. These will need to be ***assessed against*** the criteria and the limits of acceptable change for determining the ***favourable condition of the site.***

Assesses local context of birds and access pressure against criteria given

12.2 General Vulnerability of Breeding or Wintering Birds

12.2.1 Although there is a considerable literature concerning the effects of recreation, it is insufficient to enable the construction of a robust and thorough assessment of the likely significance of any impact of the introduction of a statutory right of access on wild bird populations as a whole. A number of recent reviews of the literature are available (eg. Hockin *et al.*, 1992; Sidaway, 1990, 1994) and the following comments draw on some key references.

Considerable literature but little evidence of overall population effects

Bird behaviour in response to disturbance

12.2.2 ***A number of studies***, such as those on golden plover (eg. Pearce-Higgins and Yalden, 1997; Yalden and Yalden, 1988, 1989a, 1989b, 1990), clearly and unambiguously ***demonstrate a behavioural response*** by individual wild birds to individual disturbance events (at its simplest, birds approached closely by humans tend to fly away). Other studies, such as those conducted in Holland by Van der Zande *et al*. (1984) and by Smit and Visser (1993) demonstrate that the ***nature or degree of the behavioural response varies between individuals and between species***: some birds may become motionless, relying on camouflage to avoid detection, whilst others may take noisily to the air to mob intruders. Others may temporarily leave an area altogether. The distance at which a response is elicited and the nature or degree of the response also appears to vary between individuals, species and habitats, the stage of a bird's breeding cycle and with a bird's previous exposure to the disturbing event.

Behavioural responses to disturbance clear, but varies between species

Disturbance effects on breeding birds

Key Points

- **Correlations between recreational activity and reduced breeding success or reduced breeding numbers have been shown in numerous studies.**
- **One experimental study has shown reduced parental care of chicks.**
- **Correlations do not prove a causal effect of recreational activity.**
- **Restricting use to linear routes and dogs under close control will be less disturbing than people roaming freely.**

12.2.3 A number of field studies report that birds' nests are trampled or driven over more frequently in disturbed than in undisturbed areas, that rates of abandonment of eggs or chicks or deaths to exposure are higher in disturbed areas or that rates of egg and/or chick predation are higher in disturbed than undisturbed areas.

Higher egg/chick losses

12.2.4 Various studies, notable amongst which are those on common sandpipers (Yalden, 1992a, 1992b), Kentish plovers (Schulz and Stock 1993) and piping plovers (Flemming *et al.*, 1988), find a ***more or less clear correlation between nesting densities and levels of disturbance, with fewer pairs nesting in disturbed areas***. Other studies show that feeding birds avoid disturbed areas. Yalden (1986) also reported that golden plover population levels varied between years in relation to the level of recreational disturbance, accentuated by untimely cold and wet weather: breeding numbers were greatest in years when recreational use was least.

Reduced nesting densities

12.2.5 There is some evidence that birds ***do not settle to breed***, ***may vacate a site, or breed in reduced numbers due to recreational disturbance***. Van der Zande (1984 and *et al*., 1984) found significant correlations between recreation intensities and densities of 8 out of 13 of the more abundant breeding birds in woodland on an urban fringe in the Netherlands. The constant use of the regular

Reduced breeding numbers

grid of cycle tracks and footpaths affected not only bush and ground-nesting species but also those more usually breeding in the tree tops. The effect was considered to be a product of chronic continuous disturbance, rather than peak week-end use.

12.2.6 On a sand dune site also in the Netherlands, Van der Zande (1984) found that ***curlew showed the most pronounced negative correlation*** with the logarithm of recreational intensity with 200-1,000 people/ha/year. Van der Zande also found that the wheatear, whinchat and lesser whitethroat showed strong indications of a negative correlation with the intensity of recreational use. No impact was found on woodcock, green woodpecker, woodlark and stonechat. However, these species were found mostly in the quiet zones that people probably avoid (due to the abundance of woodland or scrub) rather than on open dune vegetation.

Curlew most sensitive

12.2.7 Tydeman (1977) found a similar reduction of breeding bird numbers around two gravel pits near Wraysbury, Berkshire. In 1973, when the usual close season for coarse fishing (16th March to 15th June) was not in operation at two pits, common bird censuses were undertaken and compared with a nearby "control" pit where fishing continued. Tydeman (1977) recorded up to 58% more breeding territories on the two sites where fishing stopped. Both common terrestrial birds like jay, wren, long-tailed tit, willow warbler, blackcap and reed warbler and water birds such as coot, moorhen and great crested grebe benefited. Many of the extra territories either bridged the paths or occupied the fringe of the shallower pit edges where constant use by fishermen had prohibited territory establishment.

Reductions in breeding numbers, even of common species

12.2.8 A similar disturbance effect on goshawks and buzzards has been researched by Waardeburg (1976) on the Dutch-German frontier. On the Dutch side, the site lay in a popular recreational site and, here, nesting pairs were scarce, whilst 14 and 6 pairs of goshawk and buzzards, respectively, utilised the quieter German side of the wooded area. Limited hunting success was considered to be a contributory factor to the reduced nest building and breeding success (cited by Newton, 1979).

12.2.9 A negative correlation between the pattern of bird distribution and of recreational use does not necessarily reflect a causal relationship. It could simply be that humans are drawn to an area for recreational purposes by some factors which birds naturally avoid. Tydeman's (1977) study could be an exception in that the birds were absent when fishing took place and present, with much enhanced site populations, when fishermen were not on site in the breeding season. In addition, recent experiments by Verhulst *et al* (2001) showed reduced incubation and feeding of young oystercatchers with regular experimental disturbance over defined time periods. The authors conclude that, as chick survival is related to chick growth, disturbance equivalent to that imposed experimentally could result in reduced survival rates. This could affect the population if the disturbance were both sufficient and repeated annually over a period of time. A causal effect, of recreation, however, remains unproven in most studies.

Correlations do not prove cause and effect. Limited experimental studies available.

12.2.10 It is clear from the literature that not all disturbance events are equal. Some are more disturbing than others and so the behavioural response shown by any given species tends to vary with the nature, intensity and frequency of the disturbing event. Whilst few comparative experimental field studies have been made, Yalden and Yalden (1990) found that close approach by people disrupted incubation and brooding of chicks by golden plover and that people accompanied by dogs were more likely to cause such disruption. They also attributed some chick losses to predation by dogs.

Not all disturbance events have equal effect, dogs more likely to increase effect

12.2.11 These findings indicate that the ***restriction of walkers to linear routes, with dogs under close control*** (such as restraint by short leads) will tend to be ***less disruptive than allowing people and dogs to roam freely***, although individual birds breeding along the linear route may, as a result, be disturbed more frequently. A similar conclusion was drawn by Van der Zande (1984), who argued that a certain number of additional visitors would do disproportionately more harm in a still, quiet area than in an already disturbed one. He advocated policies of zoning rather than a more even distribution of visitors in an area to reduce disturbance effects.

Restriction to linear routes and dogs on short leads less effect than widespread access

Disturbance effects on wintering birds

Key Points

- **Most research is on water birds.**
- **Water-based recreation disturbs birds much more significantly than that based on the bank.**
- **Local site numbers could decline but this is unlikely to affect regional numbers.**

12.2.12 Most of the research on wintering birds has been on the effects of disturbance to ***waterfowl on lakes and reservoirs***. The subject has been comprehensively reviewed by Tanner (1979), Tuite *et al.* (1983), Ward (1990) and Ward and Andrews (1993). On the whole, ***water-based activities are far more disturbing*** than shore-based ones, but only the latter are part of the provisions of the CROW Act. The effects are related to the exposure of the visitors, and whether they are silhouetted against the skyline or sheltered by the background vegetation, (Whatmough, 1983) and the season for the birds (moulting, winter visitor etc.).

Wintering birds on water

12.2.13 Some species are more tolerant than others and can be approached from between 143 and 230m, (Whatmough, 1983). ***The more tolerant species*** are mute swan, tufted duck, pochard and mallard. ***Teal, shoveler and goldeneye are more sensitive***. ***Shore feeding*** species such as wigeon and mallard are ***more likely to be affected*** by walkers than diving ducks like tufted duck which feed more in open water. Where fishermen were at high concentrations round the shores of two reservoirs in South Wales, the wigeon, pochard and mallard clustered in the centre of the water bodies (Cryer *et al.* (1987).

Teal, shoveler, goldeneye, wigeon, mallard more likely to be affected

12.2.14 Tuite *et al.* (1984) has shown that the ***distribution of wildfowl*** in winter for at least some species is probably ***affected by water-based recreation***, ***but not the overall populations***. Water's edge recreation is unlikely to have an impact at a population level, but if there are insufficient refugia on the site, and disturbance levels are high, the ***numbers of more sensitive species*** on the site, particularly those that use the shallower water, ***may decline*** as birds move to other sites in the region. This could have a negative effect on the favourable condition status of the site, even though it might not affect regional population levels provided there are refugia available.

Birds move to refugia or centre of water, no changes in regional populations likely

Synthesis of the information available

Key Points

- **Energetic cost of disturbance may or may not be significant – evidence is conflicting.**
- **Losses of birds could be "compensatory".**
- **Implications of disturbance mostly unknown at population level.**
- **Managed access succeeds in combining important bird interests and recreation.**
- **Unknown how much greater bird populations could be in popular areas.**
- **One study of ringed plover has calculated an 85% increase in the site population without the presence of people.**
- **There will come a point when birds will be significantly affected – but where the point is for different species is not known.**
- **Concluded it is possible for access to have a significant impact on bird populations.**
- **A precautionary approach is warranted.**

12.2.15 ***None of these studies*** provides ***unequivocal evidence*** of a ***significant impact*** of recreation on wild bird populations ***on a regional or national scale***, although site reductions or loss have been documented. The fact that individual birds respond to individual disturbance events, or a series of such events, indicates that they ***have incurred an energetic cost***. This cost ***may or may not have a significant effect*** on their overall fitness, whether the bird remains in the disturbed area or moves away from it should other sites be available. Overall fitness may or may not be affected to such a degree that the bird's ability to forage, roost or breed successfully is affected. This is because individuals so disturbed may be able to accommodate the energetic cost within their existing energy budgets, they may compensate for it by increasing their food intake at the same time as reducing time spent engaged in other activities or even in inactivity, or they might habituate and cease to respond.

Disturbance has energy costs, may/may not be significant

12.2.16 The ***literature offers contrasting results*** (eg. Gill *et al.*, 1998; Platteeuw and Henkins, 1997a, 1997b), highlighting the site and species differences as well as differences arising from time of year. There need not, necessarily, therefore, be any impact on the numbers of birds breeding in a particular area, nor on their breeding success.

Contrasting results in the literature

And it might therefore be justified in concluding that the impact of the event or events was not significant.

12.2.17 The ***proven losses to birds caused by humans*** involved in recreation ***may be*** what is known as '***compensatory'*** - if the birds had not been killed (or their overall fitness reduced) by recreation, they might have suffered equally anyway at the hands of disease, predators, the weather or some other factor. The details of the interaction between these factors are largely unknown, even for the most intensively studied of species, and thus the population and nature conservation ***implications of losses to recreation*** (as opposed to any other factor) are ***largely unknown at the population*** level.

If not disturbed by recreation, could suffer from other pressures

12.2.18 In addition, ***managed access*** to some of the country's most important seabird colonies, as on the Farne Islands and on Grassholm, appears ***not to have had a significant adverse impact*** on the internationally important breeding seabird colonies present on the islands. Others might also note that ***some of the most important ground nesting wild bird populations*** in England and Wales ***are found in areas where recreational use is***, and has been for some time, ***considerable***. Notable amongst such sites are the moorlands of the South Pennines, the North Yorkshire Moors, the North Pennines, the heathlands of the New Forest, the Thames Basin, Dorset and East Devon. Others might point out though, that although the international importance of the wild bird populations is celebrated in these areas, ***how large or productive their wild bird populations might be if recreational disturbance was reduced or absent is not known.***

Managed access no apparent adverse effect, many SPAs already widely used for recreation

12.2.19 Just one exceptional, but as yet unpublished study, provides compelling ***evidence of a population level effect on a wild bird population***. Durwyn Liley studied the impact of recreational disturbance on a population of individually marked ringed plover on the Norfolk coast between 1995 and 1999. In his study area, human activity was mainly from holiday makers, peaked in summer and was concentrated around car parks. ***Disturbance*** was found to be a ***key component of ringed plover territory quality*** and birds avoided the most disturbed areas for nesting. ***Eight to nine percent of all nests found were lost to human activities***, mainly trampling. Chick behaviour was also affected, though disturbance had no effect on chick development.

One study calculates population level effects on ringed plover

12.2.20 The first two were, by far, the more important effects of disturbance. A ***complete absence of people*** was predicted to lead to a ***population increase of 85%.*** A third of all nests were predated, mainly by foxes, stoats and hedgehogs. Prevention of all predation was predicted to lead to a population increase of 134%. A sea-level rise of 50cm was predicted to cause an 11% decrease in population size. This study therefore not only ***provides convincing evidence for an impact of recreational disturbance*** on a wild bird population, it also ***places it in context with other factors affecting the population.***

No people, population increase predicted to be 85%

12.2.21 Knowing how other species react to disturbance, parallels can be drawn between the ringed plovers studies by Liley and species with a similar behaviour and reaction to disturbance. It is possible that other species would be affected in the same or a similar way.

Other species could be affected similarly

12.2.22 Intuitively, there will come a point when wild birds will be significantly affected by recreational disturbance. Birds may be deterred from settling in an area for breeding (as found by van der Zande's studies quoted above), or for using it to feed or roost, or they may be deterred from forming pairs, from nesting, or breeding, feeding or roosting successfully in the area subject to disturbance. Disturbed sites may also be sub-optimal so only less fit individuals settle to breed in them.

12.2.23 ***The decline in the number of nesting pairs or their breeding success will also***, at some point, ***have population and hence nature conservation consequences***. The problem is that ***this point is not known***. It is certain, however, that it will vary between sites, between species and between individuals and it can reasonably be expected to vary with, for example, the time of year, the weather, the phase of a bird's breeding cycle and the nature, intensity and frequency of disturbing events. It is precisely this level of uncertainty which allows such widely differing views to be held on the likely impact of a statutory right of access to the countryside.

Not known at what point disturbance could affect populations

12.2.24 This brief review leads to the ***conclusion that it is at least possible that first the introduction of a statutory right of access will have*** a ***significant impact on wild bird populations*** in England and Wales, and secondly, ***that particular species may decline or***, in an extreme situation, ***be lost from a site where the designation has been made*** on the basis of the ***numbers*** or ***percentage*** of the ***national*** or ***European population***. ***A precautionary approach*** to the assessment of the likely impact of the introduction of the right is therefore ***warranted***.

Conclude – it is possible that access could have significant impact on bird populations. Precautionary approach warranted

12.2.25 The approach outlined below will almost certainly need to be modified as information on likely levels of access demand grows, the conservation and legal status of birds change and as knowledge of the impacts of recreational disturbance on wild bird populations builds and is refined. It is recommended that the precautionary approach should be maintained until the weight of evidence demonstrates that there is no need to be concerned that the introduction of a statutory right of access will have any significant impact on wild bird populations in England and Wales.

Need to add new research when available

12.3 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

Methods for assessing these circumstances

12.3.1 In the absence of a body of hard scientific evidence concerning a population level effect, a ***precautionary approach*** has been adopted which makes ***five explicit assumptions*** concerning the likely impacts of the introduction of a statutory right of access to the countryside. These assumptions rely to only a limited degree on any

information gained from the scientific literature concerning the effects of disturbance on wild bird populations. The assumptions are labelled and highlighted i) to v) below.

Not all species equally affected

12.3.2 **i) The nature conservation consequences of any population-level effect of introducing a statutory right of access to the countryside will not be equal for all wild birds.**

Varies from large resilient populations to small and vulnerable or declining species

12.3.3 Some ***species may be so widespread*** and/***or numerous*** in England and Wales or their populations so resilient that the likely consequences are judged to be of ***limited nature conservation significance***, even where the local effects of the introduction of a statutory right of access may, in some cases, be marked. Conversely, the populations of some ***other birds are so small*** (from whatever cause) that any ***additional impacts*** upon them would be ***intolerable***.

12.3.4 The populations of ***other species*** may be ***declining so sharply*** or be of such international conservation significance that the Government is ***obliged to take special measures*** to prevent deterioration of their habitat (of which recreational use is one aspect).

Some species gather in susceptible colonies

12.3.5 Some ***species may be numerous*** but they may gather together at key stages of their life cycle in ***such concentrations*** as to make ***large fractions of their total populations vulnerable*** to one or a small number of individual disturbance events: tern and gull colonies, raptor roosts and grouse leks are examples of such highly vulnerable concentrations.

Greater concern for high status species

12.3.6 There is concern that the introduction of a statutory right of access will have ***population level consequences*** for any of the approximately ***550 species*** which have occurred in an apparently wild state in England and Wales and which:

- Are listed in *Birds of Conservation Concern* (a summary statement of the overall degree of national and international conservation concern for all regularly occurring species in the UK).
- Appear on *Annex 1 to EU Birds Directive 79/409* (species for which the Government is required to take special conservation measures).
- Are *Regularly Occurring Migratory Species* (for which the Government is also required to take special conservation measures under the EU Birds Directive).
- Appear on *Schedule 1 of the Wildlife and Countryside Act 1981* (it is an offence to disturb these species whilst they are at, on or near the nest).
- Are *BAP Priority species* (for which Government has published a UK Action Plan).

12.3.7 These species are listed in Appendix 6. Note that individual species may appear on more than one list. The CROW Act provides a statutory right of access on foot, with or without accompanying

dogs; climbing is covered within the meaning of access on foot. The deliberations are confined to the effects of such activities on the birds listed in Appendix 6. However, it should be noted that access of this nature may facilitate other open-air recreational activities which could be of greater, although probably localised, impact (eg. cliff angling or kite flying).

12.3.8 The other assumptions are that:

ii) The introduction of a statutory right of access to land is unlikely to affect individuals or groups of birds whilst they are on open water and that the nature conservation consequences of any impact on their populations will be minimal. It follows that species which occur only in the offshore and on inland waters of England and Wales are not highlighted.

Birds on open water not affected

iii) Any aggregation of feeding, roosting, lekking or breeding birds of national or international importance, in a predictable location (which can thus be mapped) on mountain, moor, heath, down or registered common land could be affected significantly by the introduction of a statutory right of access and that the effects may have significant nature conservation consequences.

Aggregations in a predictable place vulnerable

iv) The conservation status of species which do not gather to feed, roost, lek or breed on mountain, moor, heath, down or registered common land, or which do not do so in predictable locations in such habitats or which do not do so in numbers regarded as of national or international significance, is unlikely to be affected significantly by the introduction of a statutory right of access: whilst individuals may be affected, these widely-dispersed species are unlikely to be affected throughout their range in the specified habitats.

Conservation status of non aggregating species in predictable places unlikely to be affected

v) Extremely rare species, whose use of a particular area might not be entirely permanent and predictable (and hence mappable) may nevertheless be severely affected by the introduction of a statutory right of access. The management of access to sites of importance for these species will be but one of several concerns which need to be addressed and managed using 'species protection' type methods (eg. wardening, secrecy, provision of special visitor facilities, flexible exclusion arrangements). We assume that such species protection measures will be fully supported by the emergency exclusion arrangements.

Very rare species vulnerable

12.3.9 A large number of species likely to be affected by the introduction of a statutory right of access have been identified. The criteria by which each species qualified is indicated in Appendix 7. However, and for the sake of convenience, each of the species could be allocated to one or more of the following groups of birds:

Susceptible species Appendix 7

- Feeding and roosting wetland birds.
- Roosting raptors.
- Colonies of coastal nesting birds, including those on cliffs, offshore islands, beaches and dunes.
- Aggregations of vulnerable breeding wetland birds.
- Aggregations of vulnerable birds breeding on mountains and moors.
- Aggregations of vulnerable birds breeding on heathlands and downlands.
- Lekking birds.
- Exceptionally rare breeding birds and/or birds which may not nest regularly in predictable locations.

12.3.10 Each of these groups of species (other than the rare species) is broadly associated with one or more types of land to which a statutory right of access is envisaged by the Act (marked with an X in Table 12.1). The allocation of individual species to each group is given in Appendix 7.

Table 12.1. Associations between Broad Land Types and Groups of Species likely to be Vulnerable to Increased Levels of Recreational Disturbance by Walkers, their Dogs and by Climbers

	feeding and roosting wetland birds	roosting raptors	colonies of coastal nesting birds, including those on cliffs, offshore islands, beaches and dunes	aggregations of vulnerable wetland breeding birds	aggregations of vulnerable birds breeding on mountains and moors	aggregations of vulnerable birds breeding on heathlands and downlands	lekking birds
Mountain			X		X		
Moor		X	X		X		X
Heath		X				X	
Down						X	
Common Land: a) Wet Grass	X	X		X			X
b) Saltmarsh	X	X	X	X			
c) Sandflats and mudflats	X						

	feeding and roosting wetland birds	roosting raptors	colonies of coastal nesting birds, including those on cliffs, offshore islands, beaches and dunes	aggregations of vulnerable wetland breeding birds	aggregations of vulnerable birds breeding on mountains and moors	aggregations of vulnerable birds breeding on heathlands and downlands	lekking birds
d) Shingle	X		X				
e) Dunes	X	X	X				
f) Cliff			X				
g) Bog	X	X					
h) Reedbeds	X	X					
i) Woodlands	X	X		X			
j) Enclosed Waters and Lagoons	X		X				

12.3.11 For each of these habitats, concerns about the effects of the introduction of a statutory right of access on the wild bird populations associated with them are expanded below.

12.3.12 ***Internationally important populations*** are defined as those consisting of at least 1% of the national population of an EU Directive Annex 1 species or 1% of the biogeographic population of any other species listed in Appendix 6. Most areas supporting such important populations will be designated as SPAs. Note that an individual site which may not obviously support an internationally important population may be a constituent of a larger internationally important entity.

12.3.13 ***A nationally important population*** is one consisting of 1% or more of the national population of any species listed in Appendix 6. Areas supporting such important populations tend to be notified as SSSIs and this will normally be recognised in the SSSI citation. National importance is also implied in cases where SSSI citations recognise interest such as geographical location (extreme edge of range for example) or character (the site supports an outstanding example of a certain type of assemblage). These comments, of course, may be applied wherever a bird population is judged to be of local or regional importance but such judgements must be left to local decision makers.

12.3.14 The following sections address specific bird issues in each of the main habitat types included under the provisions of the CROW Act. They are summarised in Table 12.2. It should be noted that ***where management measures or statutory restrictions or exclusions are recommended***, wherever possible, ***the former should be considered first***. ***Only if non-statutory measures*** are judged to be ***inadequate*** to safeguard the nature conservation value and favourable status of the site should ***statutory mechanisms*** become ***necessary***. Even in this

event, it may be ***necessary*** to apply them to only the more vulnerable parts, not the whole site.

Table 12.2 Summary of Nature Conservation and Access Concerns in the Different Habitat Types

Habitat	Nature conservation concern	Access concern
Mountain	rare and vulnerable cliff and crag nesting species ground nesting birds	climbing high access demand and dogs
Moor	black grouse leks seabird colonies raptor roosts important concentrations of ground-nesting birds	high access demand and dogs
Heath	breeding stone curlew concentrations of breeding nightjar, woodlark, Dartford warbler raptor roosts	any access in case of stone curlew, otherwise high access demand and dogs
Down	quail in quail years breeding stone curlew	high access demand and dogs any access in case of stone curlew
Common Land: a) Wet grassland	important concentrations of breeding waders raptor roosts important waterbird feeding areas or roosts	high access demand and dogs
b) Saltmarsh	important concentrations of breeding birds important waterbird feeding areas or roosts raptor roosts	high access demand and dogs
c) Sand & mudflats	important waterbird feeding areas and roosts	high access demand and dogs
d) Shingle	important concentrations of breeding seabirds, including waders important waterbird roosts	high access demand and dogs
e) Dunes	important concentrations of breeding seabirds, including waders important waterbird roosts raptor roosts	high access demand and dogs
f) Cliff	cliff-nesting seabirds & raptors choughs	climbing
g) Bogs	important concentrations of breeding birds important waterbird feeding areas or roosts raptor roosts	high access demand and dogs
h) Reedbeds	important concentrations of breeding birds important waterbird feeding areas or roosts raptor roosts	high access demand and dogs
i) Woodlands	important heron or egret colonies important red kite roosts	high access demand
j) Enclosed waters and lagoons	important aggregations of bank-side breeding, feeding or roosting birds	high access demand and dogs

12.4 Mountain

12.4.1 The ***concerns relate to the disturbance of vulnerable ground-nesting birds*** by walkers (dotterel, golden plover, dunlin, ring ouzel) and to ***cliff and crag nesting species*** (such as peregrine, ring ouzel and chough) by ***climbers***. All these species currently nest in some areas where access is already open to walkers and/or climbers. Dotterel is an exceptionally rare species in England and Wales and,

Dotterel, golden plover, dunlin, ring ouzel, cliff/crag species

together with peregrine, is listed on Schedule 1: reckless disturbance of breeding birds is an offence under the Wildlife and Countryside Act .

12.4.2 ***Management measures or statutory restrictions/exclusions are unlikely to be required on mountains unless there are exceptional circumstances. These circumstances apply to sites where access levels are likely to increase substantially and lead to disturbance of breeding populations of vulnerable ground-nesting birds or important breeding populations of peregrines, ring ouzels or nesting and roosting chough on rocks and crags. Management measures (including the use of voluntary codes if adequate) or statutory restrictions/exclusions should be considered between mid-April and the end of July on land used by breeding ground-nesting birds, between the beginning of February and the end of August in areas used by climbers and by peregrines and throughout the year in areas used by chough. Additional controls on dogs (restraint by short leads or exclusion) may need to be considered on these sites.***

Restrictions unlikely unless substantial increases in access

Management measures or breeding season restrictions

12.5 Moor

12.5.1 The concerns here relate to the ***impact of the introduction of*** a ***statutory right of access to the countryside on vulnerable birds breeding on moorlands*** (eg. hen harrier, merlin, golden plover, dunlin, curlew, dotterel, redshank, lapwing, snipe, short-eared owl, ring ouzel and twite) ***to raptor roosts*** (merlin, hen harrier) to ***seabird colonies*** (lesser black-backed and herring gull) and to ***black grouse leks***. The last species is now confined to a small number (20-30) of known locations and there are very few (two or three) large gull colonies on moorland in England and Wales.

Hen harrier, merlin, golden plover, dunlin, curlew, dotterel, redshank, lapwing, snipe, short-eared owl, ring ouzel, twite, raptor roosts, sea bird colonies

12.5.2 Dotterel and hen harrier are exceptionally rare breeding birds and, together with merlin, are listed on Schedule 1: reckless disturbance of breeding birds is an offence under the Wildlife and Countryside Act. The ***vulnerability of raptor roosts*** on moorland is considered to be ***low***. This is because raptors rarely appear in the vicinity of the roost until dusk, when very few people will remain on the moor, even when the overall use of an area might have increased substantially.

Raptor roosts low vulnerability

12.5.3 Amendment, if necessary, of a ***Birdwatchers Code of Conduct*** to ***cover behaviour at dusk*** at moorland raptor roosts should suffice to protect roosts that become accessible to the public by the introduction of a statutory right of access under the Act.

Birdwatchers Code of Conduct for roost sites needed

12.5.4 In the absence of a definition of moorland in the Act, it is ***assumed*** that all ***unenclosed heathland and grassland will be included*** and that ***enclosed upland farmland will not***. Ground-nesting birds are widely distributed in some extensive areas and there is considerable scope for increased levels of recreational disturbance to impact on populations of these species. Several areas support particularly

important populations and these have been designated as SPAs in recognition of this: Berwyn, Migneint a'r Dduallt, Elenydd-Mallaen, Migneint-Cwm Hesgyn, Forest of Bowland, North Pennines, North Yorks Moors and South Pennines.

12.5.5 Whilst it is not considered that greater levels of access on foot to the Brecon Beacons, Dartmoor, Exmoor, the Lake District or to other parts of Snowdonia will have a significant impact on national populations of the UK's ground-nesting moorland bird populations, it is recognised that ***locally or regionally important populations may be affected*** and thus the ***local application*** here of ***specific access restrictions/exclusions*** might be judged to be ***appropriate***.

Possibility of local restrictions/ exclusions

12.5.6 ***The application of management measures (for instance mechanisms to encourage all visitors to remain on existing linear routes) or statutory restrictions/exclusions should be considered where access levels are likely to increase substantially and lead to disturbance of black grouse leks, breeding colonies of lesser black-backed and herring gulls or important concentrations of other ground nesting birds. Any measures or restrictions/exclusions should apply between the beginning of February and the end of July in areas used by lekking black grouse and from the beginning of March to the end of July in all areas important for colonies of lesser black-backed and herring gulls or other important populations of ground-nesting birds. Additional controls on dogs (restraint by short leads or exclusion) may need to be considered on these sites.***

Confine to linear routes, or exclusions possibly needed where access increases significantly affecting – leks, colonies, high concentration. Breeding season only

12.5.7 As people are likely to use routes in moorland areas to which they already have access and the use of which is promoted, consideration needs to be given as to whether - and if so what - action is needed to encourage the use of linear routes. Note that the ***recommended management measures or statutory restrictions /exclusions are likely to apply*** seasonally ***to several thousand square kilometres of high-risk moorland. Statutory restrictions /exclusions may need to be considered*** in areas ***where existing management measures*** (including promotion of access routes, appropriate siting of paths or gates, and the provision of notices) ***are inadequate and cannot be satisfactorily improved***.

12.6 Heathland

12.6.1 ***Heathland is of special concern*** because of the relatively ***small total*** area remaining and because many heathlands ***are small, vulnerable habitat fragments***, often adjacent or close to major urban centres. Many heaths support nationally or internationally important populations of threatened bird species. Of ***particular concern*** is ***increased disturbance to rare heathland birds***, especially some rare or local ground-nesting species (stone curlew, nightjar, woodlark) and Dartford warbler which is a rare heathland breeding bird, and ***to raptor roosts*** (hen harrier, marsh harrier, merlin). All of these species are listed on Schedule 1: reckless disturbance of breeding birds is already an offence. In addition, although not formally

Vulnerable – small sites. Stone curlew, nightjar, woodlark Dartford warbler, raptor roosts

researched, experience of those working with stone curlew has found them to be extremely sensitive to disturbance.

12.6.2 Areas of particular (but not exclusive) importance to these species are the Breckland, Dorset Heaths, East Devon Pebblebeds, New Forest, Suffolk Sandlings, Thames Basin Heaths and Wealden Heaths SPAs. Note that a high proportion of heathland already has either a statutory right of access (eg. Commons in Devon and Surrey designated under the 1925 Law of Property Act) or *de facto* access.

12.6.3 ***It is concluded that statutory restrictions/exclusions will need to be applied on heathland where stone curlews are breeding. In these circumstances, statutory exclusions and the exclusion of dogs are likely to be necessary throughout the year.***

Statutory restrictions needed for stone curlew all year

12.6.4 It is estimated that the recommendations in relation to ***stone curlew*** would affect ***new access arrangements to about 15 Breckland heaths***. ***Attention should not be drawn to exclusions*** to protect stone curlew, and breeding sites should be kept confidential. Consideration should be given to using powers to ***restrict access*** to ***land targeted within species recovery programmes***, even where this does not currently support breeding birds.

12.6.5 ***Management measures (including the promotion of particular access points and routes) or statutory restrictions/exclusions will need to be considered for heathlands with nationally or internationally important concentrations of other ground-nesting birds (nightjar, woodlark) or Dartford warblers between February and September inclusive and on sites known to be traditional raptor roosts between October and March inclusive, where access demands are likely to increase significantly and lead to disturbance of ground-nesting birds. Additional controls on dogs (restraint by short leads or exclusion) may be necessary on these sites.***

Consider management measures or restrictions for important ground-nesting species or Dartford warblers and raptor roosts

12.6.6 Whilst these sensitivities encompass the whole calendar year, local circumstances will determine the detail of the timing needed for any management measures or statutory restrictions/exclusions (eg. sites with breeding woodlarks may not have nightjars or raptor roosts).

12.7 Downland

12.7.1 The concerns in this habitat relate to ***breeding quail and stone curlew***. Quail are summer visitors which usually arrive in very small numbers but which occasionally appear in larger numbers (in 'quail years'). They mainly frequent cereal crops and natural and semi-natural grasslands and for the most part, their distribution is unpredictable. The larger populations tend to be associated with Salisbury Plain and Porton Down in Wiltshire. There are no

Quail, stone curlew

recommendations to restrict access to these areas, other than in ***quail years*** when ***emergency measures*** could be used to require the ***restraint by short leads or exclusion of dogs*** between mid-May and the end of August.

12.7.2 The stone curlew is a rare breeding bird, listed on Schedule 1 and appearing on the Red Lists of Birds of Conservation Concern and is a BAP Priority Species. The bird often has a protracted breeding season, from the end of February to the end of September.

12.7.3 ***Statutory restrictions/exclusions will need to be applied on downland where stone curlews are breeding. In these circumstances, statutory exclusions and the exclusion of dogs are likely to be necessary throughout the year.***

Statutory restrictions needed for stone curlew all year

12.7.4 Note, however, that these recommendations are likely ***only to affect*** new access arrangements to ***Salisbury Plain*** and ***Porton Down*** and ***to a small number of downland sites*** elsewhere. Access to Salisbury Plain and Porton Down is likely to be limited by other considerations. ***Attention should not be drawn to exclusions to protect stone curlew***, and breeding sites should be kept confidential. Consideration should be given to using powers to ***restrict access to land targeted within species recovery programmes***, even where this does not currently support breeding birds.

12.8 Common Land

12.8.1 As noted in the introduction, registered common land may contain examples of practically any habitat type. The comments concerning access to mountain, moorland, heathland and down apply equally to those habitats where they are registered as common land. The following assessments apply to other habitats that may be registered as common land. It should be noted here that access to many of these habitats, when common land, already exists by right or *de facto*. Whilst the creation of a statutory right of access *per se* is unlikely to increase the numbers of people using such land, promoting its existence by publishing maps detailing the whereabouts of such land may lead to an increase in the amount of recreational disturbance in any particular area.

Variety of habitats

Wet grassland

12.8.2 Wet grassland comprises seasonally flooded coastal grazing marshes and river valley floodplains. Such areas may support very ***high densities of vulnerable breeding wetland*** birds between March and July inclusive. Between July and March inclusive they may also support significant concentrations of ***feeding and roosting wetland birds***. Raptor roosts may also develop at any time of year. At least one species, ruff, uses significant areas of wet grassland for lekking.

Ruff, raptor roosts, wetland

12.8.3 ***Management measures or statutory restrictions/exclusions may need to be considered in areas supporting nationally or internationally important concentrations of vulnerable breeding wetland birds, feeding or roosting wetland birds or raptor roosts and where access demand is likely to increase significantly. Additional controls on dogs (restraint by short leads or exclusion) may also need to be considered on these sites. In the event of a severe weather ban on wildfowling, further management measures or, if these are inadequate, statutory restrictions/exclusions on open access may be necessary.***

Management measures or statutory restrictions for nationally important concentrations possible

12.8.4 Important breeding areas often support large roosts outside the breeding season and so some sites may have year-round sensitivities, but local circumstances will determine the timing needed for any management measures or statutory restrictions/exclusions. Note that most important wet grassland areas are nature reserves, SPAs etc. and few are likely to be common land. The implications of any statutory restrictions/exclusions are thus likely to be limited.

All year interests in some areas

Saltmarsh

12.8.5 The concerns here relate to disturbance to ***aggregations of feeding*** and ***roosting wetland birds, to raptor roosts***, ***to seabird colonies*** and to areas supporting ***high densities of other breeding shorebirds***. Many saltmarshes already have *de facto* access, but as many are hazardous, the introduction of a statutory right of access to the countryside may not lead to an increase in the level of access demand.

Shorebirds, wetland birds, raptor roosts, seabird colonies

12.8.6 ***Nevertheless, management measures or, if these are predicted to be inadequate, statutory restrictions /exclusions may need to be considered on saltmarshes which have important concentrations of breeding birds (between the beginning of March and the end of July) or roosts (from the beginning of August to the end of April) and where access demand is likely to increase significantly. Additional controls on dogs (restraint by short leads or exclusion) may also need to be considered on these sites. In the event of a severe weather ban on wildfowling, further management measures or statutory restrictions/exclusions on open access may be necessary.***

Management measures or statutory restrictions possible for high bird concentrations summer +/- winter

12.8.7 Important breeding areas often support large roosts outside the breeding season and so some sites may have year-round sensitivities, but local circumstances will determine the timing needed for any management measures or statutory restrictions/exclusions.

Sandflats and mudflats

12.8.8 These areas may support important ***concentrations of feeding and roosting waterbirds*** which may be disturbed by walkers and their dogs.

Water birds

12.8.9 ***Management measures or, if these are predicted to be inadequate, statutory restrictions/exclusions may need to be considered in the vicinity of important roosts or feeding areas (or within the WeBS count units containing important roosts or feeding areas) between the beginning of August and the end of April on sites where access demand is likely to increase significantly. Additional controls on dogs (restraint by short leads or exclusion) may also need to be considered on these sites. In the event of a severe weather ban on wildfowling, further management measures or statutory restrictions/exclusions on open access may be necessary.***

Winter restrictions possible

Offshore islands, shingle and dunes

12.8.10 The concerns here relate to vulnerable concentrations of ***roosting wetland birds***, to ***colonies of coastal nesting birds*** and to ***raptor roosts***. Many islands support dense colonies of breeding seabirds, some of international importance. Many undisturbed areas of shingle and dune also support dense seabird colonies and numbers of other shore-nesting species.

Raptor roosts, seabirds, shore and coastal birds

12.8.11 Outside the breeding season, many such areas act as ***high tide roosts*** for waterbirds which forage at other times elsewhere within the intertidal area. Some dune areas regularly support raptor roosts. Many of these areas already have open access but members of the public are deterred from inadvertently entering roosts and colonies by the presence of professional wardens, signing and fencing

High tide roosts

(predator exclusion fencing may also inhibit access), with some limited success.

12.8.12 ***Management measures or, if these are predicted to be inadequate, statutory restrictions/exclusions may need to be considered in those areas which support nationally or internationally important concentrations of breeding seabirds and other shore-nesting species, between the beginning of March and the end of July, and in areas with important waterbird and raptor roosts between the beginning of August and the end of April inclusive, where access demand is likely to increase significantly. Additional controls on dogs (restraint by short leads or exclusion) may also need to be considered on these sites. In the event of a severe weather ban on wildfowling, further management measures or statutory restrictions/exclusions on open access may be necessary.***

Management measures/ restrictions possible for important concentration s summer +/- winter

12.8.13 Important breeding areas often support large roosts outside the breeding season and so some sites may have year-round sensitivities, but local circumstances will determine the timing needed for any management measures or statutory restrictions/exclusions. Fenced exclosures and educative signing are flexible and potentially effective measures in restricting access but many areas may continue to require the vigilance of on-site wardens.

Cliffs

12.8.14 The concerns focus on the impact of disturbance, caused by ***climbers***, to vulnerable concentrations of ***cliff-nesting seabirds***, ***nesting peregrines*** and nesting and roosting ***choughs***.

Seabirds, peregrine, chough

12.8.15 ***Management measures (including the use of voluntary codes where these are adequate) or statutory restrictions/exclusions on climbing should be considered in areas with vulnerable concentrations of cliff-nesting seabirds and breeding Peregrines between the beginning of February and the end of August and to areas where choughs nest or roost, where restrictions/exclusions will need to apply throughout the year.***

Management measures/ restrictions possible in vulnerable areas

12.8.16 Several of the key species are listed on Schedule 1, and reckless disturbance of breeding birds is an offence under the Wildlife and Countryside Act. Presumably, rather few cliffs are common land and the recommendations will therefore affect few areas at present.

Bogs and reedbeds

12.8.17 These wetland habitats support some exceptionally rare, threatened and vulnerable ***breeding, feeding and roosting waterbirds*** and some important ***raptor roosts*** and there are concerns about the impacts of the introduction of a statutory right of access to the countryside on the conservation status of these birds. However, access on foot is already permitted and even encouraged along paths in or alongside many of the most important areas of bog and reedbed, as many are managed as nature reserves. To leave paths in such areas is often impossible, dangerous or unpleasant and it is not envisaged that the Act will lead to any significant increase in the demand for recreation on foot through these areas. Several of the key species are listed on Schedule 1, and reckless disturbance of breeding birds is already an offence.

Water birds, raptor roosts

Self-protecting habitats

12.8.18 ***Management measures or statutory restrictions/exclusions on access to bogs or reedbeds are unlikely to be required unless there are exceptional local circumstances, where demand for access to an area supporting nationally or internationally important concentrations of wetland birds or roosting raptors is likely to increase significantly. Important bird populations may be present at any time of year. Additional controls on dogs (restraint by short leads or exclusion) may also need to be considered on these sites.***

Measures unlikely to be required except in exceptional circumstances

Woodland

12.8.19 There are concerns solely about the potential impact of increased access on foot to aggregations of vulnerable breeding wetland birds which nest in woodland (***heron and little egret colonies***) and to roosting raptors (***red kites***). Most of the large and /or significant colonies and roosts are on private land or land already open to public access.

Heron, little egret, red kite

12.8.20 The Act makes no provision for greater access to these sites unless by dedication of land or on common land. Species protection measures may be appropriate in such circumstances, although ***discouragement of dedication in certain exceptional circumstances*** may be appropriate. Several key species of breeding raptor are listed on Schedule 1 of the Wildlife and Countryside Act and reckless disturbance of breeding birds is already an offence. Red kites may soon be sufficiently widespread and numerous that there is less cause for concern.

Possibly discourage dedication of woodland

12.8.21 ***Management measures or statutory restrictions/exclusions on access to woodland are unlikely to be required unless there are exceptional local circumstances, where demand for access to an area supporting nationally or internationally important breeding heron or egret colony or red kite roost is likely to increase significantly. Important heron and egret colonies will be***

Other measures unlikely to be needed except in exceptional circumstances

occupied between the beginning of February and the end of June and red kite roosts between the beginning of September and the end of March. Any restrictions/exclusions need apply only during these periods.

Enclosed water bodies and lagoons

12.8.22 There are concerns about disturbance to nationally and internationally important ***bank-side aggregations*** of ***roosting***, ***feeding*** and ***breeding wetland birds*** of many species. Many important sites (many of which are SPAs, SSSIs and are often managed as nature reserves) already permit carefully managed bank-side access for walkers. The real issue in such areas is to control water-borne recreation as this demonstrably affects the birds using affected water bodies (but this is outside the scope of the CROW Act.

Bank-side, roosting, feeding, breeding species

12.8.23 ***Management measures or statutory restrictions/exclusions on enclosed water bodies or lagoons are unlikely to be required unless there are exceptional local circumstances, such as where demand for access near to an important breeding colony or roosting area is likely to increase significantly. Additional controls on dogs (restraint by short leads or exclusion) may need to be considered on these sites. Important bird populations may be present at any time of year. In the event of a severe weather ban on wildfowling, further management measures or statutory restrictions/ exclusions on open access may be necessary.***

Measures unlikely to be needed, except in exceptional circumstances

13. MAMMALS

13.1 Introduction and Context

13.1.1 Mammals are a heterogeneous group, ranging from the common and widespread to the rare and restricted. Most species are widely dispersed and thus, at the national population level, are unlikely to be vulnerable to direct disturbance arising through increased access to the countryside. Many mammals are woodland species, and mountain, moor, heath and down do not generally include dense species assemblages.

Range of species

13.1.2 Species of conservation concern that might be considered vulnerable include those that gather into large aggregations at some stage of their life cycle, such as bats and seals, or those that use traditional sites for breeding, such as otter. SSSIs have been designated for maternity sites of Barbastelle bat, greater horseshoe bat and lesser horseshoe bat and for several nationally important hibernation sites for a range of bat species. Important breeding and haul-out areas for seals are included in SSSIs. BAP species are dormouse, brown hare, red squirrel, water vole, pipistrelle, greater horseshoe bat, lesser horseshoe bat, barbastelle and Bechstein's bat.

Key species

13.2 Accessibility of Sites with Mammals

13.2.1 Because they occur below the high-water mark, many important sites for ***seals*** already have full public access, though the remoteness of these sites mean that they are ***not subject to significant levels of disturbance***. Other sites, such as islands, are already subject to access control.

Accessibility of sites to Seals

13.2.2 Most ***bat breeding sites*** are in buildings and are thus not subject to the provisions of the CROW Act, though ***underground sites*** in areas subject to new rights of access ***may become more accessible***.

Bats

13.2.3 ***Otter breeding holts*** on rivers may fall within areas within new public access.

Otters

13.3 General Vulnerability of Mammal Sites to Direct Impacts arising from Access

Key Points

Little research has been conducted on the effects of access on mammals, but what is available shows:

- ***Badgers*** **emerge later and leave the sett area quickly when disturbed, but there is no evidence of a population effect in Britain.**
- ***Red deer*** **leave an area if disturbed, and need refugia of adequate quality to remain in an area.**

- ***Roe deer* seek cover or leave an area if disturbed.**
- ***Otters* will tolerate some disturbance, and bypass activities rather than retreat, but are very sensitive to disturbance by dogs.**
- ***Small mammals* can be reduced through loss of vegetation cover by trampling.**
- ***Bats* using caves may be affected by access. They are extremely sensitive to disturbance, including sound, flashlight, cigarette smoke and fire. Bats may desert a disturbed site for several years. Disturbing bats in winter can lead to their deaths.**

13.3.1 Very little research has been conducted on the effects of access on mammals, and even less is British in origin. The species most studied, badgers and deer, are not priority nature conservation species.

Badgers

13.3.2 Badgers ***react to disturbance by emerging later than normal*** (1-1.5 hours in setts studied by Neal (1977), or later if activities near the sett continue until dusk). Badger behaviour changes as well, disturbed animals hurry off to forage almost at once, whilst undisturbed animals play and socialise for up to an hour around the sett before foraging. Lindsay and Macdonald (1985) found a similar reaction to disturbance by sett stopping for fox hunting purposes. There is no evidence that badger populations are, or are not, affected by any kind of disturbance in general, although Aaris-Sørenson (1987) attributed the loss of some third of the badgers around Copenhagen from 1973 to 1985 to the increasing numbers of people, especially when accompanied by dogs off the lead.

Badgers emerge later, possibility of sett vacation

Red deer

13.3.3 Mitchell *et al*. (1977) suggested that red deer ***physiology, breeding success and survival could all be affected by disturbance***. Red deer react by leaving the area and this could force them to move to poorer feeding areas or suffer reduced food intake. It is unpredictable rather than predictable disturbance such as road noise that affects the deer (Mitchell *et al*., 1977).

Deer leave disturbed areas, especially sensitive to unpredictable disturbance

13.3.4 Yalden (1990) found that red deer in the Peak District had changed their distribution in the period 1972 - 1977 which coincided with increased recreational use of the moorlands and woodlands they had inhabited. After open access was provided over much of the area in 1976, the deer have virtually abandoned the area and moved to quieter nearby valleys where they come into conflict with farmers and are more vulnerable to poaching.

13.3.5 Barrow (1972) also found red deer avoided the areas used for recreation in the Gairloch Conservation Unit area (Wester Ross), and in Austria, Von Reimoser *et al*. (1987) found increased damage in forest areas where deer concentrated after being

disturbed by cross-country skiers. The significance of disturbance on deer will, therefore, depend on:

- the regularity and number of recreationists, and
- the availability of equal quality habitat in undisturbed areas.

Roe deer

13.3.6 Disturbance effects on roe deer seem to be similar to those of red deer, although there are fewer studies available. Jeppesen (1984) found that roe deer sought cover in their home range or left the area until the disturbance ceased. This was in reaction to orienteering in some Danish forests, an activity not included under the CROW Act. Nevertheless, orienteering could be regarded as equivalent to a quite high, dispersed visitor pressure under access arrangements, except that orienteering tends to be a specific event with a quiet period subsequently, unlike regular visitor pressure. Jeppesen (1984) considered that repeated disturbance might force roe (and red) deer to shift or expand their home range, and discussed the additional energy expenditure that might be involved. However, he failed to reach any clear conclusion on whether such an effect could be significant at the population level.

Roe deer leave disturbed areas

Otters

13.3.7 Although perceived as shy animals, there is evidence to suggest that ***otters will tolerate a degree of disturbance***. Three indices of human disturbance, namely the numbers of fishermen, the human population density in adjacent parishes and the density of campsites were shown by Macdonald and Mason (1983) not to be significantly correlated with the density of otter signs.

Otters not very sensitive to general disturbance

13.3.8 Jefferies (1987) documents studies that identified the means by which otters often used to by-pass a source of disturbance and remain unobserved, rather than retreating from it. Swimming underwater or traversing through cover provided by dense vegetation were the main avoidance behaviours.

13.3.9 There are also some relatively well-known examples of otters making use of structures in busy settings for holt sites. For example, one of the main jetties at the Sullom Voe Oil Terminal on Shetland was used as a holt to rear cubs (Taylor, 1956 in Jefferies, 1987).

13.3.10 However, the radio-tracking studies by Jefferies *et al*. (1986) as well as those of Green *et al*. (1984) showed that otters were not wholly tolerant of disturbance, with reactions differing depending on the stimuli. In only a small number of instances, disturbance from people walking along the river bank caused otters to move to other sites, although on one occasion, a female left a holt within minutes of being approached by people (Green *et al.*, 1984). It also appears that otters tolerate continuous and loud noise and light, but react adversely to sharp or sudden noise (Jefferies, 1987).

Can move from holts

13.3.11 The most recent national otter survey has shown that the species is increasingly using a number of rivers passing through urban areas with human populations in excess of 100,000 (Strachan and Jefferies, 1996). However, there is ***strong evidence*** to suggest that ***otters are particularly sensitive to disturbance from dogs***, perhaps viewing them as a greater threat. In Green *et al.*'s (1984) radio-tracking studies, otters reacted adversely to dogs, in one case abandoning a holt for approximately three weeks.

Otters sensitive to disturbance by dogs

13.3.12 As Jefferies (1987) notes, these studies based on radio-tracking and spraint data are largely gained from male otters, and although data on females are more limited, it appears that, especially during breeding and raising cubs, ***females are likely to be far more sensitive to disturbance***. This is illustrated by the fact that holts known to be used by breeding females tend to be the most secluded and secure (Strachan and Jefferies, 1996).

Less vulnerable because nocturnal, but protected by law

13.3.13 Otters' largely nocturnal habits make them less prone to the disturbance caused by activities associated with open access. Nevertheless, since disturbance to otters or their holts is illegal, this needs to be taken into consideration when assessing the impacts of access.

Small mammals

13.3.14 Where swathes of trampled vegetation have resulted in loss of litter and a short sward, (as described under heavier levels of trampling in *Chapter 3*) small mammals would be affected through loss of cover, and compaction of the ground reducing the availability of burrows. However, there is very little data available to demonstrate any effect.

13.3.15 Bykov (1985) (quoted by Liddle, 1997) noted a reduction of woodland small mammals and of numbers of animals in birch woodland near Moscow after trampling had reduced the vegetation cover and density. Watson (1979) found, in contrast, an increase of sightings of mountain hares on Cairngorm where they were attracted to feed on fertilized grassland sown to reduce soil erosion.

Reductions of small mammals with loss of cover

Bats

13.3.16 Bats that utilise trees for roosting or nurseries are not likely to be affected by recreational activity unless there are threats to the trees themselves (see *Chapter 9* on Woodlands, *Section 9.7*). However, ***bats using caves*** could be ***much more vulnerable*** where either the general public or specialist users such as cavers or potholers gained entrance. ***All bats can utilise caves for hibernating, roosting or nurseries***, although use for the later is rare. There tend to be more bats near cave entrances outside the hibernation period than further inside, although different species vary in their location. Horseshoe bats, for example, are in more open situations, and can use quite low passages (2m) where they are more visible and easily disturbed. In contrast the *Myotis* species more often are hidden in roof crevices and are less visible (R. Stebbings pers. comm.). It is essential to

Bats' use of caves

know which bats are using caves and mines on potential access areas before being able to assess their vulnerability to disturbance.

13.3.17 Robert Stebbings (pers. comm.) reports that all bats are extremely sensitive to disturbance. They are disturbed by sound (shouting to create echoes for example), flashlight, cigarette smoke and fires. The latter are frequently lit in cave entrances, using any flammable material to hand, and toxic smoke from burning plastic bags has been responsible for killing large numbers of protected species in the USA, (Stebbings, pers. comm.). Humphrey (1978) reported exceptional behaviour by visitors who threw rocks or burnt clusters of bats with flame torches. Researchers and naturalists studying bats have also been responsible for some the of the disturbance effects. ***Bats*** that are disturbed ***tend to leave the site and do not return, sometimes for several years***. The significance of this for the bats will be dependent on whether there are other, equally suitable roost or nursery sites available, but as all species are fully protected, ***it would also be an offence to disturb them***.

Bats very sensitive to disturbance in summer

13.3.18 ***Disturbance to bats in winter*** is also potentially damaging, and ***can result in death***. Bats generally hibernate at air temperatures of -1.6^{o}C to 1.7^{o}C. Even the mildest stimulus of sound, heat and light from a group of cavers is sufficient to produce arousal from hibernation that results in unnecessary energy expenditure. Stebbings (1988) states that one enforced arousal may use up to 40 days worth of fat reserves. Bat scientists avoid disturbance to the animals during hibernation to avoid adding to their energy demands.

And in winter

13.4 Types of Site with Particular Vulnerability to Access Related Issues

13.4.1 Underground hibernation sites for ***bats*** (caves, abandoned mines etc.) ***have the highest vulnerability to increased levels of human activity***. Although entering such sites is unlikely to be attractive to the majority, there is ***a danger that a small number of people*** may choose to enter and ***cause significant disturbance***. Such sites will need to be surveyed, and where necessary, access ***excluded using properly designed grills.***

Bat caves very sensitive

13.4.2 Increased access to riparian habitats may also result in potentially greater disturbance to ***otters and water voles***. However, the ***increase in disturbance is likely to be low and diffuse unless there are exceptional circumstances*** (eg. very heavy public usage, no effective refugia from disturbance etc.). As far as ***deer*** are concerned, a ***significant impact may be felt only where visitor numbers are high, regular and dispersed*** and where there are no sanctuary areas available. Badgers could retreat from setts where recreation disturbance is regular and persistent.

Otter holts

Deer

13.5 Associated Interests

13.5.1 Mammals occur in a wide variety of sites notified for other species or habitat interests, where action may be necessary to protect these interests alongside the statutory right of access.

13.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

13.6.1 In general with respect to sites important for mammals, ***access can be managed*** to ensure that critical areas are kept relatively free from disturbance. Statutory exclusion is unlikely to be necessary because direct damage to mammals of conservation concern is unlikely to occur or can be avoided using non-statutory mechanisms. Nevertheless, any sensitive populations of ***deer*** considered to be of importance will need to be monitored to ensure their long-term survival is not compromised. It may be appropriate to establish sanctuary areas where access is managed to avoid disturbing them. If this is predicted to be inadequate, sanctuary restrictions could be applied if shown to be necessary to dogs and people.

Ensure refuges for deer

13.6.2 In the case of known ***bat hibernation sites***, action can be taken such as the ***fitting of grilles to prevent access*** at certain times of year. Many of the most important sites are already protected in this way or by agreement with caving or mine history interest groups.

Protect bat caves

13.6.3 ***Otters*** are recolonising past haunts, and could well be increasingly present on rivers accessible for recreation. ***Site management will be necessary to avoid disturbance to holts. Dogs may need to be on short leads at all times***, and not just between 1st March and 31st July.

Protect holts

13.6.4 The significance of the impact of access on mammals will need to be judged against the limits of acceptable change set for the parameters used to define favourable condition.

13.7 Related Concerns

13.7.1 In certain cases where deer are present, worrying by dogs can cause animal welfare problems. Again the management of access, and the use of publicity can generally ensure that certain areas remain relatively undisturbed. The illegal collection of rare mammals is unlikely.

Animal welfare if dogs worry animals

13.8 Opportunities Associated with a Statutory Right of Access

13.8.1 Because they are often large and exhibit interesting behaviour, mammals can feature prominently on interpretive materials, even though many species will rarely be encountered.

Interpretation

14. REPTILES AND AMPHIBIANS (HERPETOFAUNA)

14.1 Introduction and Context

Rarity of species

14.1.1 It is generally recognised that all species of native herpetofauna are undergoing declines, of varying degrees, across their range in Britain. There are some signs of local recovery due to pro-active habitat creation or improved management, but overall the loss, modification and fragmentation of habitats appears to be continuing. The species are normally divided into "rare":

- sand lizard,
- smooth snake and
- natterjack toad

and "widespread":

- common frog,
- common toad,
- palmate newt,
- smooth newt,
- great crested newt,
- common lizard,
- slow-worm,
- adder and
- grass snake.

In addition to these, pool frog, a species that may have become extinct in recent years, is currently undergoing review as a possibly native species.

SSSIs, legal protection

14.1.2 ***Most of the sites for the rare species*** (in total, numbering a few hundred) ***are designated as SSSI***, or have some other form of site protection, while the vast ***majority of widespread species*** populations (many tens of thousands) ***occur on land subject to no designation***. The natterjack toad, great crested newt, sand lizard and pool frog are national Biodiversity Action Plan species. Some of the others feature on Local Biodiversity Action Plans. The three rare species and the great crested newt are listed on Annex IV of the Habitats Directive, and the great crested newt is also listed on Annex II.

14.1.3 ***Legislation*** effectively affords three levels of protection:

1. ***Trade only***: common frog, common toad, palmate newt, smooth newt.
2. ***Intentional killing, injuring***: adder, grass snake, common lizard, slow-worm.
3. ***Strict protection***, including trade, taking, killing, disturbance and damage to breeding/nesting sites: great crested newt, natterjack toad, sand lizard, smooth snake.

14.2 Accessibility of Sites with Reptiles and Amphibians

14.2.1 Public access to herpetofauna sites varies, with the majority of animals being found on private or wider countryside land. Hence, most sites would probably be closed to public access at present. Some of the larger sites supporting good assemblages are NNRs or open access heaths, and are therefore already subject to public access, but not necessarily open access.

Access mostly on heaths and NNRs

14.3 General Vulnerability of Reptile and Amphibian Sites to Direct Impacts arising from Access

Key Points

- **There is no relevant research on impacts of access on herptiles.**
- **Most populations likely to be robust.**
- **Rare species could be at risk in particular circumstances.**

14.3.1 There ***is no significant published research on the effects of access on herptiles*** in Britain or Europe, but there ***are reliable reports of damage at particular sites***. The only studies of recreational studies on lizards and related groups are American or from the Galapagos. In these, numbers and biomass of most species were reduced in compacted areas (usually by off-road vehicles - reported in Liddle 1997). There are no studies available on the impact of recreational trampling or disturbance on snakes.

No relevant research available on access effects on herptiles

14.3.2 Overall, reptile and amphibian ***populations are likely to be robust to direct impacts*** arising from access. Trampling, collecting, and disturbance in moderate levels would probably not have a major negative impact on the majority of populations (although it would be illegal intentionally to kill, injure or take any of the Schedule 5 species). However, it is likely that there will be ***some situations***, mainly for the ***rare species***, where such ***impacts could be serious***. This is most likely the case for the ***sand lizard*** and ***natterjack toad***, both of which have quite specialist habitat requirements and may be present in low numbers. Damage to sand lizard habitat through trampling and erosion could feasibly occur, and may be a problem on some sites. Disturbance may be an issue for sand lizards, and possibly some other species, during the breeding season. However, these concerns ***would relate to a minority of sites*** (especially the ***smaller ones***), and sites ***where paths were close to key habitat*** elements.

Herptiles probably not vulnerable to recreational effects

14.4 Types of Site with Particular Vulnerability to Access Related Issues

14.4.1 ***Sites with access routes close to key breeding sites, basking areas or foraging areas for sand lizard and natterjack toad*** would be particularly vulnerable. There might also be similar but

lesser concerns for smooth snake, adder and great crested newt sites. Because of the specific habitat requirements of these species, damage from trampling may occur.

14.5 Associated Interests

14.5.1 Virtually all of the most important rare reptile sites occur on lowland heathland; downland and some sand dunes may also be valuable for amphibians as well as reptiles. There is a wide variation in habitat types across herpetofauna, so it is difficult to generalise about other associations.

14.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

14.6.1 ***Non-statutory mechanisms to address potential impacts would be sufficient*** in most situations (e.g. re-routing paths away from sensitive areas).

Only where very sensitive rare species, only parts affected, not whole site

14.6.2 Only in the most exceptional circumstances should exclusion be considered (i.e. where significant numbers of people are predicted to impact on key areas, with no possibilities for control); whether this would ever be required is questionable.

14.6.3 ***Restriction of access*** should be considered when the situation suggests that there is a ***reasonable likelihood of damage*** to the population which ***cannot be managed*** using non-statutory means. In practice, the most common situations would be ***where access is likely to result in erosion or trampling damage to key basking, foraging or breeding sites for sand lizard, natterjack toad, smooth snake, great crested newt or adder***. In relation to the overall number of sites, however, this is unlikely to be a frequent occurrence and is not likely to require restrictions covering a whole site, but rather to particularly sensitive areas.

14.6.4 The overall significance of the impact of access needs to be judged against the limits of acceptable change applied to the parameters which determine the favorable condition of the site as a whole.

14.7 Related Concerns

14.7.1 There are ***serious concerns*** about the ***likely increase in some activities*** that would result from a statutory right of access, and could lead to problems at a number of herpetofauna sites. This applies particularly to the rare reptiles, where ***deliberate fires*** on public access heathlands are currently a major conservation concern. Additional fires on heathlands which are not currently subject to access would be equally serious.

Fires

14.7.2 Similarly, unauthorized ***fish introduction*** would be a worry at some great crested newt sites. There is increasing evidence that fish introductions are linked to high levels of public access, and that great crested newt populations can be seriously depleted as a result.

Fish introductions

14.7.3 ***Collection is rare*** but there are some reports of rare species being taken; the possibility for this could increase with access. Where monitoring is undertaken using traps or refuges the chances of collection are increased, though this is unlikely to be a major threat at most sites.

Collection – rare event

14.8 Opportunities Associated with a Statutory Right of Access

14.8.1 The main benefits of increased access would include ***improved opportunities for survey*** and monitoring; ***improved surveillance*** towards potential site threats; improved opportunities for ***interpretation*** and ***educational initiatives***.

14.8.2 There is also the potential for ***suitable habitat creation***, especially to link small patches together which are given access. This would provide an extension to, and links between, existing areas and significantly benefit reptiles and amphibians confined to the current patches. Such new habitat links could provide a more resilient recreational site which visitors can be encouraged to use through normal recreational management techniques.

Opportunities for surveying, monitoring, interpretation, habitat creation to buffer sites

15. INVERTEBRATES

15.1 Introduction and Context

15.1.1 Invertebrates are a vital component of almost every natural habitat. They are the major food source for many predatory mammals, fish, reptiles, amphibians and birds, as well as including many predators themselves. Many species are herbivores or detrivores, assisting in the natural dynamics of plant and animal successions and in nutrient re-cycling. They facilitate plant pollination and, in some cases, seed dispersal, as well as acting as vectors or intermediate hosts for a variety of animal and plant diseases. There are about 30,000 species of larger invertebrate in England and Wales, of which about 1,000 species are currently under threat of extinction.

Variety, Numbers

15.1.2 Primary legislation protecting invertebrates in England and Wales began with the Conservation of Wild Creatures and Wild Plants Act 1975 which gave protection to the large blue butterfly. This was followed by the Convention of European Wildlife and Natural Habitats (Berne Convention) in 1979, its implementation into British law as the Wildlife & Countryside Act 1981 and its implementation by the European Union as the Habitats & Species Directive in 1992. Protective measures were enhanced through the publication of The Conservation (Natural Habitats etc) Regulations in 1994 and through amendments of the Wildlife & Countryside Act in 1998. The latter currently gives full protection to 45 species and partial protection (usually sale or place of shelter) to a further 24 species of invertebrates. However, access proposals will probably affect few, if any, of these species.

Invertebrate protection

15.1.3 The Convention of Trade in Endangered Species and its implementation through the Control of Trade in Endangered Species Regulations and the European Union Regulation 338/97 placed additional international trading restrictions on many species of invertebrate animals, including the medicinal leech. No British invertebrates are currently protected under the Convention of Migratory Species of Wild Animals (Bonn Convention).

15.1.4 The Convention on Biological Diversity and its implementation via the UK Biodiversity Action Plan, whilst giving no additional statutory protection, has listed some 273 species of invertebrates as Priority species in need of urgent conservation action.

15.2 Accessibility of Sites with Invertebrates

15.2.1 Many populations of protected and Priority invertebrate species occur on SSSIs, both those with and those without access. There is no information on relative populations or incidence of Priority invertebrate species on access compared with non-access land.

15.3 General Vulnerability of Invertebrate Sites to Direct Impacts arising from Access

Key Points

Relevant research shows that:

- **In *grassland and sand dunes* the invertebrate fauna of unmanaged grassland litter is significantly reduced across most groups by very light trampling (5 or 10 tramples/month).**
- **In *woodlands* heavy trampling results in reductions or loss of some groups and species and increases in others preferring open ground.**
- ***Soil invertebrates***
  - **surface dwelling worms are reduced by more than 50% by soil compaction from trampling.**
  - **soil micro-arthropods reduced more than 12 fold under heavy trampling.**
  - **cranefly larvae on peat decline, but different species increased in other habitats.**
- ***Barrier effect* of tracks on invertebrates - the rate of invasion by some species could be significantly diminished.**
- ***Collecting* possibly an issue for very rare species.**
- ***Disturbing* stones/screes/logs etc may affect some species, but no evidence is available.**

Trampling key effect

15.3.1 The principal direct effect of recreational access on invertebrates is likely to be as a result of trampling. This increases soil compaction, reduces litter and vegetation height and usually its diversity, the intensity of which will depend on the soil and vegetation type (see Chapter 3, Section 3.3). The loss of flowers and of floral diversity would reduce the availability of nectar or pollen, the loss of height and changes in structure would impact the habitat for species preferring taller vegetation.

15.3.2 The impact on invertebrates of trampling has not been extensively researched, and most of the papers are over 20 years old. Nevertheless, there is a general consensus on the impacts and no, more recent, evidence which counters the earlier findings. The following review is ordered by the habitat type in which the research was recorded, to facilitate its use.

Terrestrial Invertebrates

Grasslands

15.3.3 A study of the effect of trampling on the invertebrate fauna of grass litter in a 7-year old grass ley under very low trampling intensities (5 or 10 tramples/month) was conducted by Duffey (1975). (See para. 3.3.8 in Chapter 3). His results are summarised in Tables 15.1 and 15.2 below.

Table 15.1. **Differences in the Fauna of Control and Treated Litter bags after 12 months, March 1971. Totals per 25 Litter Bags**

	Control litter bags	5 treads/ month	10 treads/ month	Significance of effect of treatment
Coleoptera	2003.4	349	320	Sig.
Coleoptera larvae	233.0	109	145	NS
Heteroptera	33.0	-	1	-
Homoptera	43.2	10	7	Sig.
Hymenoptera	4.5	2	-	-
Diptera	11.3	30	5	-
Diptera larvae	626.1	1032	1154	NS
Thysanoptera	50.0	42	38	NS
Lepidoptera larvae	58.0	24	29	Sig.
Araneae	275.0	75	44	Sig.
Isopoda	412.5	12	8	Sig.
Diplopoda	113.6	5	8	Sig.
Chilopoda	3.4	-	1	-
Mollusca	339.8	148	113	Sig.
Annelida	506.8	568	452	NS
Totals	**4713.6**	**2406**	**2345**	

Table 15.2. **Impact of Light Trampling on Grassland Invertebrates. Number of Individuals/Number of Species.**

	Control	5 treads/ month	10 treads/ month
Spiders (Araneae)	275 / 25	74 / 12	42 / 6
Woodlice (Isopoda)	412.5 / 4	11 / 3	8 / 3
Slugs (Mollusca)	314.5 / 4	133 / 2	120 / 2
Snails (Mollusca)	22.6 / 3	15 / 5	13 / 5
Millipedes (Diplopoda)	109.8 / 7	5 / 2	8 / 2

15.3.4 Key conclusions were that the ***invertebrate fauna of grassland litter is affected by trampling pressures which were much lower than those needed to induce changes in the structure and species frequencies of the living plants*** (bearing in mind that the grassland was a young ley and not species-rich). The same conclusion was reached by Buchanan (1976) on sand dunes.

Reduced invertebrates in grassland litter with very low levels of trampling

15.3.5 The species changes seemed to have been ***caused by changes*** in the ***structure of the litter habitat***, in particular, the smaller volume, smaller air spaces, fragmentation of leaves and stems, and the creation of a mud-litter mixture. The differences between 5 and 10 tramples per month were relatively small except for spiders, most species showing significant effects. Of the species or families found in sufficient numbers to be meaningful, only earthworms maintained their level of abundance, and only Diptera larvae

increased in the trampled litter (see Table 15.1).

15.3.6 Chappell *et al*. (1971) found ***similar results on chalk grassland*** at Farley Mount where there was unrestricted access. Comparing untrodden, intermediate trampling (5cm vegetation with no litter) and bare soil with ruts and odd plant tussocks, they found a decline in all invertebrate groups studied from plant/soil cores except Diptera larvae and Homoptera. Here, there were fewer worms in the bare zone, and molluscs showed only a reduction in density (but an increase in xerophytic types) in the bare zone. The trampling levels were unknown but obviously much higher than in Duffey's (1975) experiment.

Reductions in most invertebrate groups in soils and turves far greater for trampling than grazing

15.3.7 Although invertebrate numbers are known to be lower in grazed grassland rather than taller swards (Morris 1969), the differences Chappell *et al* were finding were far greater, which was attributed to the greater physical changes in the environment due to high levels of trampling.

Sand dunes

15.3.8 Very similar results have been recorded for trampling impacts on invertebrates on sand dunes. A decline in spiders associated with a tall, closed sward on dune systems under only very light trampling was shown by Liddle (1973) and Van der Ploeg and Van der Wingerden (1977). Liddle noted 10 times fewer invertebrates and a much smaller number of species on trampled dunes (with only 50 tramples per week) compared with adjacent untrampled areas. Buchanan (1976) found that trampling (at an unknown level) on a sand dune vegetation resulted in significant reductions in mites and springtails, which form the bulk of the terrestrial soil fauna. However, on heather covered dune-heath, passage of around 1,500 people/year did not result in a reduction of invertebrate numbers compared with the decreases experienced on bracken heath. Leney (1974) found an increase in molluscs in trampled old dune areas, although they decreased in other habitats studied.

Similar reductions on sand dunes

Woodlands

15.3.9 Only one study has examined the effect of trampling on terrestrial invertebrates, this being undertaken in two woodlands in Buckinghamshire (one an SSSI) in relation to paintball and combat games (Wisdom 1988). The impacts of trampling in one of the woods studied was severe, with "everything (vegetation, soils and invertebrates") affected whilst, in a second wood, the cumulative effect was less. Wisdom's pitfall trap results in the more heavily affected wood showed ***significant differences between untrampled and trampled plots in both woodlands***. Millipedes were absent from the trampled sites, carabid beetles were 3 times more abundant in the control plots, one rove beetle was more numerous in the control plots, whilst a second favoured the trampled areas. Slugs and wood ants were also more abundant in the control areas. Only harvestmen were fairly equally distributed between the trampled and untrampled areas, a finding which could be explained by differences in species (these were not identified).

Under severe trampling, millipedes absent, carabids reduced, slugs reduced, wood ants reduced

The effects in the less trampled wood were less marked, or reversed. Carabid and Staphynilids, and beetle larvae here, were more numerous in the trampled area, a finding Wisdom (1988) suggested could be attributed to the higher mobility and the predatory habits of many of them.

Soil Invertebrates

15.3.10 Earthworm density and biomass have been found to be correlated with compaction in pastures where trampling in gateways and along a footpath on farmland near Lancaster was heaviest (Piearce 1984). Surface-dwelling species were most affected, whilst the deep burrow species *Allolobophora longa* proved particularly resistant. All species showed a downwards shift in vertical distribution. However, *Allolobophora longa* is effective at ameliorating the effects of soil compaction and, if trampling ceases Piearce considered recovery of soil drainage through earthworm activity was likely.

Earthworms decline with trampling

15.3.11 In a study in Russian birch woodland by Yur'eva, Matveva and Trapido (1976), (quoted by Liddle 1997), where 300-3,000 people/ha/month visited from June to October, there was less than half the number of worm species and biomass on the heavier used areas compared with lightly trampled zones, but an increase in weight of the *Allolobophora* species that were most impacted (this was a deep soil species).

15.3.12 Similar results were found in an old Scot's pine stand in Uppsala, Sweden (Ingelog *et al.*, 1977 quoted by Liddle 1997), and in sheep pasture in New Zealand where the impact of sheep trampling was investigated (Edmond 1962).

15.3.13 In the same Russian birch forest study quoted above, the number of ***micro-arthropods were in an inverse proportion to the degree of compaction and vegetation damage***. The numbers ranged from:

0-10	in the most affected zone
20-200	in the medium trampled zone
120-600	in the minimum impact zone

taken from 5 x 5 x 5cm samples. The numbers reflected the extent of damage to the litter layer.

15.3.14 Of the soil micro-arthropods, Chappell *et al*. (1971) found nearly a ***six-fold reduction in springtails in the heavily used compared with minimal areas*** of wear on his chalk grassland study, whilst Little (1974), (quoted in Liddle 1997) noted roughly a ***14-fold decline in a trampled dune coastal valley*** in The Netherlands. Newton and Pugh-Thomas (1979) seemed to find more springtails on path edges at a sandy heath site (Kinver Edge), but this could reflect Ingelog's *et al*. (1977) conclusion that ***several species colonise the trampled habitat*** (in the Swedish Pine Forest***) at the expense of other species that are lost***. Newton and Pugh-Thomas (1979) also noted that ***mites*** in their ***heathland soils*** were ***less***

Soil arthropods reduced by trampling, new species colonise path edges

resilient to trampling than springtails. It is the deeper living soil springtails which seem to be more tolerant of trampling, as is the case with earthworms.

15.3.15 A similar picture emerges for soil mites, with deeper and smaller species surviving preferentially, compared with surface dwelling and larger ones (Liddle 1997).

15.3.16 Information on the effects of visitor use on moorland invertebrates is limited to Bayfield's (1979b) study of *Molophilus ater* (a cranefly). On a path on Stac Polly, in the Inverpolly National Nature Reserve, an average of 50 people/day walking across an area of *Eriophorum* (cottongrass) and *Trichophorum cespitosum* (deergrass) were sufficient to depress numbers of the cranefly by 75%. Bayfield considered physical crushing, a reduction in the numbers of eggs laid on the path, and poorer survival in the disturbed ground as possible factors accounting for the decrease.

Little data on moorland species – one cranefly greatly reduced by trampling

15.3.17 Bayfield's findings in a peatland habitat contrast with those of Chappell *et al*. (1971) on chalk grassland where, although numbers of cranefly larvae declined under trampled conditions, there was an increase in the number of free-living adults by a factor of 5. Leney (1974) also found increases in craneflies in different soil types associated with dunes, bog, heathland, loch margin and pine woods on the picnic sites she studied, but not in grasslands. Duffey's (1975) litter experiments also found an increase, but which was not significant, of cranefly larvae in the lightly trampled litter.

Craneflies increase with trampling in other habitats

15.3.18 In many of these studies, the samples are not identified to species levels, but where they are, there appears to be a ***change from species preferring the untrampled conditions, to those attracted to, or tolerant of, the new environmental conditions***. The significance for nature conservation will therefore depend on the value placed on different species, guilds or assemblages.

15.3.19 There is insufficient data on other soil inhabiting invertebrate groups for a meaningful examination, although the indications are that Isopoda (woodlice) can occupy trampled areas and pass through them (as found in pitfall traps on coastal dunes), but that some Homopterans (aphids) can increase (Chappell *et al*. 1971 on chalk grassland, and work by Camberlein (1976) on French dunes). Aphids in Duffey's litter bags declined significantly though under light trampling.

Lack of data for woodlice, aphids and other groups

Barrier Effect of Paths

15.3.20 Apart from trampling, the potential impacts of the development of paths is the ***barrier effect*** they could have on ***some invertebrates which tend to be less mobile***, and sensitive to the habitat or environmental changes associated with a path or track. Few studies have examined the implications, and little is known about these in relation to genetic biodiversity, but the research points to possibly significant effects for certain species. *See Chapter 3, paras. 3.4.8 et seq. for further discussion of this.*

Possible barrier effect on less mobile invertebrates

15.3.21 In a study of the ***land snail***, *Arianta arbustorum*, Baur and Baur (1990) found that ***movements were largely confined to the edges of two types of road*** – a paved, 8m wide, low traffic volume site, and an unpaved, 3m wide track. Several individuals moved far enough to have crossed the roads, but only 1 recaptured individual crossed the paved road, and 2 the track (809 released and 29% recaptured altogether). In contrast, 41.7% of recaptures of the same species ***had crossed an overgrown, 0.3m wide path*** only occasionally used by walkers. The conclusion was that the road and track acted as a barrier to dispersal.

A common snail did not cross 3m track

15.3.22 In a study on ground beetles, and some wolf spiders, Mader *et al*. (1990) investigated the barrier effect of narrow, paved, gravel or grassy agricultural roads, and a lightly used single track railway. The results indicate that ***all these barriers stimulate a lengthways dispersal and inhibited movements across them***. The percentage of recaptures which had crossed varied from 3% to 17% in different ground beetle species, with *Pterostichus madidus* being the most inhibited. In the controlled release of the Lycosid, *Pardosa amentata*, none crossed the field track, although Lycosids can disperse more widely to a variable degree as juveniles, by ballooning.

Common carabids and spiders crossed tracks very little

15.3.23 Mader *et al*. (1990) concludes that the ***rate of invasion of the species tested could be significantly diminished by roads and tracks acting as barriers***. For those animals adapted to disperse, for whatever reason, the ***network of barriers tend to guide them parallel with tracks*** and could reduce the average distances they can move if their energy supply becomes exhausted. As the distances between habitats increase, due to degradation or destruction, the chances decrease for the dispersal of many species.

15.3.24 There are some indications that other alien environments could reduce or inhibit dispersal in ground beetles. The preliminary results of a ***study of the Carabids in heathland patches separated by grassland*** on the playing areas of a golf course suggest that ***few venture out of the heathland*** to cross the grasslands (Lindsay, presentation to British Ecological Society 2001 conference).

Conclusions on the effect of trampling and paths

15.3.25 The research available suggests that there is the potential for ***significant effects on invertebrates*** in trampled zones from the ***direct and indirect effects of trampling***, but ***evidence is lacking on the long-term impact of this on populations, biodiversity and long-term sustainability.*** These will be related to ***trampled widths of paths***, or the ***extent of trampling off paths***, the number of people involved, their key activities (walking versus picnicking or informal games or other spread out activities), the extent of this and the proportion of these affected areas in relation to the site size. The likely significance of the effect on overall invertebrate biodiversity therefore needs to be set against the proportion of the site affected.

Main issues Trampling Possible barrier across wide, open tracks

15.3.26 Narrow paths have not been found to have a barrier effect on invertebrate movement, but ***tracks of 3m or more may inhibit dispersal of species*** that do not fly or do not have other means of moving between adjacent habitat patches. Where wide, grassy paths within another habitat (eg. dwarf-shrub heath or bare roots) subdivide a site into small parcels, this may cause a problem for some species.

Collecting/Disturbance

15.3.27 The issue of ***collecting*** is a sensitive one when rare species are threatened. There is ***no evidence that this is more a product of open access than footpath only access***, since the really determined will seek out their quarry wherever it lives. However, Ratcliffe (1967) considered that it would be difficult to exterminate a species, as it would be difficult to collect the last few individuals, although a number of butterflies and moths had been much reduced by collecting. Morris (1967) also felt that, although it was difficult to prove, collecting probably did little damage except for some rare species.

Collecting probably not an issue except some rare species

15.3.28 There is no evidence from experimental work that disturbance of the habitat has a direct impact on invertebrates although, intuitively, it could be argued that this could be the case. Disturbance could include moving stones, visitors disturbing screes by walking/scrambling on them, removing vegetation from rock ledges by climbers (although this is now discouraged), or children damming small streams (although this is not permitted under the CROW Act). Conducted on a significant scale, or where endangered populations of invertebrates occur, these could have a significant impact, but this has not been monitored.

Unknown effect of disturbing features eg. screes, rocks on invertebrates

15.4 Type of Sites with Particular Vulnerability to Access Related Issues

15.4.1 Although all types of site support invertebrates which are susceptible to damage to, or disturbance in, their habitats, and all invertebrate taxa, except perhaps those feared or avoided by the public, are vulnerable to careless acts of vandalism or damage, to deliberate collecting or to disturbance by unconcerned public, the ***greatest concern will focus on***:

Special invertebrate species and assemblages

- those species which are ***nationally rare***,
- those which are particularly ***large or showy***,
- those which are ***deliberately sought by naturalists*** including because they are collectible or photogenic,
- those which ***occur in particularly fragile habitats*** such as on thin or wet soils, friable scree and stone, or occur in deadwood and vegetation likely to be damaged, and
- those occurring in ***diverse assemblages***, with ***good numbers of rarities***, and typical of long-established habitats.

15.4.2 In relation to ***trampling damage, this is only likely to be an issue*** where a ***significant part of a site suffers from trampling*** (even light trampling), ***and the habitat is important for its invertebrate diversity***. Otherwise, ***a rare species*** would only be affected significantly if a ***path or trampled area coincided with the known, limited habitat*** in which it occurred, or on which it depended at some time in its life history. A judgment on the importance of such an event lies in prior knowledge of rare invertebrates on the site, their detailed distribution and habitat requirements throughout the year.

Key issue if large part of site is trampled, or rare species near a path

15.4.3 The issues of trampling need to be balanced against the ***opportunities for some specialist invertebrates in the loose, bare soil on the edges of paths***, Kirby (1992). Butterflies like grayling bask on bare ground on south-western heaths and dunes, while silver-spotted skipper seeks out annual meadow-grass in warm micro-climates, such as lightly trampled path edges for egg laying. Aculeate Hymenoptera include many species which favour loose soil on lightly trampled path edges, and some orthopterans favour egg-laying on bare ground on paths which are not too heavily compacted or used. Of the ground dwelling Coleoptera and Hemiptera some, especially predators seeking prey by vision, will favour short, open vegetation, particularly the *Lygaeidae* (ground bugs) and Carabids like *Amara* and *Notiophilus* species. Key (1994a and 1994b) give further examples of invertebrates which favour bare ground.

Balance losses with gains on bare ground

15.4.4 ***Species vulnerable to barrier effects are those that could be inhibited from crossing wide tracks or unsuitable habitat types*** such as short grassland within dwarf-shrub heath. Further research is needed on this subject to determine the types of species, particular ones, or specific habitats where this could be a significant problem. The scale of habitat fragmentation needs to be researched so that maximum path densities that avoid major impacts can be determined. Uncommon, specialist species in small populations, on small sites might, in theory, be considered to be the most vulnerable.

Barrier effect needs further research. Uncommon species more at risk

15.4.5 ***Species most at risk from disturbance will be those inhabiting the features on a site which are more likely to be moved or removed***. Screes used to access hill tops and water edges where children might remove stones and place them elsewhere could be sensitive niches, but the significance will depend on how local and vulnerable particular species are, and the proportion of the resource which might be disturbed.

Species at risk in disturbable habitats

15.4.6 It is the showy and rare invertebrates that are most at risk from naturalists, collectors and natural history photographers who do not comply with sensible codes of conduct.

15.5 Associated Interests

15.5.1 ***Invertebrates are the major food of many species*** of birds, herptiles and mammals. In theory, disturbance of their habitats

could lead to increased stress at nestling feeding times and to an overall decrease in predator populations. Disturbance of pollinating insects at flowers could lead to decreases in pollination success and reduced seed set, altering successional dynamics and recolonisation potentials. However, there is no evidence for this happening on any scale as a result of recreational access. This is possibly because predatory species may also avoid paths due to disturbance or habitat changes caused by visitors but, equally, the reductions in invertebrates on trampled areas probably do not affect overall invertebrate populations sufficiently to have local impacts on vertebrate predators. Many of the latter have broad diets and can switch between groups if some are in short supply.

Food for other animals

15.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

15.6.1 Where vulnerable species are present, it may be possible to plan for access to avoid significant effects**.** ***If there are no footpaths***, and access represents a new status, a ***constraints analysis*** needs to identify sensitive locations and requirements for invertebrates whilst, at the same time, identifying likely patterns of use, desire lines, and features of interest. Access points, car parking (if any), and footpath zones can then be identified to avoid key features for invertebrates.

Plan for access re invertebrate interests

15.6.2 ***If footpaths and tracks already exist, a similar exercise is needed*** which takes into account the nature of the vegetation in terms of ease of passage and comfort walking through it, as well as desire lines, in order to predict likely use. Way-marking, signs, interpretation, education, information, vegetation and footpath management could all assist in avoiding conflict with key invertebrate localities and populations, assuming that the likely number of visits poses a potential risk.

15.6.3 It is anticipated that ***statutory exclusions or restrictions*** will be unnecessary on most sites. Nevertheless, in some cases, eg re-establishment trials, sole surviving colonies etc, it may be necessary to enforce seasonal exclusions until the populations are no longer under any identifiable threats. It is extremely unlikely that long-term or permanent exclusions would be necessary.

Statutory exclusion unlikely to be needed

15.6.4 The ***significance of the potential impact*** of access, and therefore the most appropriate measures to take, ***must be judged against*** the limits of acceptable change set for the parameters used to define ***favourable condition***.

15.7 Related Concerns

15.7.1 Public access can interrupt essential habitat management, including interference with favorable grazing regimes, or making land management uneconomically viable. Deliberate or accidental fires are a concern on many heathland and moorland sites. Invertebrate survey and monitoring equipment and markers are subject to damage or destruction such that some areas cannot be satisfactorily investigated because of interference by the public.

Management, Fires, Loss of equipment

These issues need to be addressed under Sections 24 and 25 of the Act.

15.8 Opportunities Associated with a Statutory Right of Access

15.8.1 A statutory right of access may enable ***further invertebrate survey*** work to be undertaken. For a few species, trampling can ***provide favourable open ground habitat***, and there may be occasions where access can be deliberately managed or channelled to provide benefits. Invertebrates can feature on ***interpretive displays***, especially where attractive or conspicuous features are involved, provided that this does not draw attention to vulnerable species.

New surveys, Interpretation, Habitat creation

15.8.2 There is also the possibility of encouraging ***habitat creation*** to link small access habitat patches together which could provide a more resilient access site capable of absorbing more of any recreational use.

16. HIGHER PLANTS, BRYOPHYTES, LICHENS AND FUNGI

16.1 Introduction and Context

Numbers, Legal protection, SSSIs

16.1.1 There are some 1,500 vascular plant species considered to be native in the British Isles, or more than 2,700 if introduced species occurring in the wild are included (Stace, 1997). These figures would be considerably higher if they included the large number of microspecies within the apomictic genera *Hieracium, Taraxacum* and *Rubus*. There are also approximately 1,000 bryophytes, comprising 700 mosses and 300 liverworts, within the British Isles. Lichens total some 1,700 with fungi topping 20,000 (although different authorities give different totals), and algae 15-20,000. The figures are for the British Isles - there are no separate figures for England and Wales.

16.1.2 Nine native extant British vascular plants and 4 native British bryophytes are listed in Annex II of the EU Habitats Directive. Nine British, extant vascular plants are also covered by Annex IV. Orchid-rich grassland is an Annex 1 habitat. Appendix I of the Bern Convention lists the same 9 vascular plant species as the Habitat Directive, with 4 British bryophytes also covered by Annex II. Two extant British orchids are on Appendix I of the Bern Convention, lady's slipper orchid and fen orchid. All orchids are also covered by the Convention on International Trade in Endangered Species.

16.1.3 Schedule 8 of the Wildlife and Countryside Act, 1981, as amended, lists 73 species of lower plants and 112 vascular plant species which are afforded legal protection, and there are 232 Priority plant species listed in the UK Biodiversity Action Plan, including 28 fungi, 41 lichens, 64 bryophytes, 12 stoneworts and 87 vascular plants.

16.1.4 Approximately ***25% of SSSIs are notified because of the presence of specified botanical interests*** in addition to habitat features. These botanical interests may hinge on the presence of one or more species listed in Red Data Books, or of a suite or 'assemblage' of Nationally Scarce species. Other species (not nationally rare or scarce) may be of special significance on some SSSIs but not on others, eg. SSSIs supporting species on the edge of their geographical range, or having outlying populations well beyond their core range, or having the largest populations within a particular 'Area of Search', may well have been notified, in part, because of this special botanical interest. SSSI citations will usually (but not always) specify the key botanical interests for which a site was originally notified, although one needs to be mindful of the fact that on some SSSIs there may be botanical interests that only came to light *after* the original notification.

16.2 Accessibility of Sites Supporting Particular Plant Interests

16.2.1 Many areas of mountain, moor, heath, down and registered common land lying within 'botanical SSSIs' will already be subject to public access to some extent, and in most cases this existing level of access is not damaging the botanical interest. A high proportion of sites which have a specific interest for bryophytes already have public access.

Many areas already have access

16.3 General Vulnerability of Sites with Higher or Lower Plant Interests to Direct Impacts arising from Access

Key Points

- **There are potential benefits of trampled areas for some rare plants.**
- **Other species much more fragile – rare species close to paths could be damaged by trampling.**
- ***Sphagna* very sensitive to trampling – 80 passages can kill them. Some bryophytes more tolerant.**
- **Terrestrial foliose lichens particularly susceptible to trampling damaged, up to 50m from well-used paths where off-path usage easy.**
- **Risk of inadvertent spreading of alien species by visitors.**
- **Eutrophication by dog faeces can result in the replacement of native flora with those of more productive soils.**

16.3.1 Public access has the potential to provide a range of positive and negative impacts concerning plant conservation. With respect to vascular plants, there are a ***large number of species that thrive in disturbed conditions***, such as along paths and tracks, around trampled pond margins, etc., including mossy stonecrop, brown galingale, mousetail, hairy bird's-foot-trefoil, bulbous meadow-grass and three-lobed crowfoot. On chalk downland old tracks which persist as rights of way are often good for bryophytes because light trampling pressure suppresses competing grasses, herbs and scrub. Trampling however with its high compaction component may be a relatively poor way of providing habitat requirements in certain conditions, especially in wet upland situations with their short growing season.

Benefits of trampling

16.3.2 With careful planning and management, it may be possible to organise an access regime within which many species might actually benefit from an increase in public access. For example, there are suites of rare vascular plant species associated with lowland heathland and calcicolous grassland that appear to require disturbance, and for which many areas of potentially (or historically) suitable habitat are currently 'under-managed', or not managed at all. In some cases, opening up areas to public access could be used as a management tool to restore appropriate habitat niches for these species. Thus, it is important to recognise that ***increased public access on some sites will provide opportunities***, provided the trampling pressure, compaction and eutrophication

from nutrient release or dog faeces do not exceed the levels required to achieve these.

16.3.3 On other sites, however, there may be problems, and there are ***some species*** for which unrestricted/unmanaged ***public access could be damaging***, eg. ***those associated with 'lightly managed'*** or ***physically fragile habitats*** (eg. certain mires, non-intervention woodlands, other wet habitats, sand dunes, shingle, screes, montane rock-ledges and snow-beds). There have been few reports of rare species being adversely affected by access; serious damage is much more likely to be caused by unauthorised activities. Access impacts include damage from trampling and erosion, dispersal of undesirable species, and nutrient enrichment.

Possible disbenefits

Trampling and Erosion

16.3.4 General reviews of the sensitivity of main habitat species is given in the chapters devoted to separate habitats, and the general relationship between increasing vulnerability and declining productivity and increasing wetness is explained in *Chapter 3*. This section focuses on particular impacts on key species.

Higher Plants

16.3.5 ***Some rare vascular plant species*** are in locations where they are ***exposed to and sensitive to trampling***, and populations may be seriously affected where there are high numbers of walkers, or where substrates are wet or brittle. For example, species like Chiltern gentian, tuberous thistle, dark-red helleborine and various broomrape species, usually associated with lightly grazed/ungrazed grassland or grass-scrub mosaics, would be likely to decline if their habitat coincided with significant levels of trampling. Upland flushes and rills can be very sensitive to trampling, and can support botanically rich floras, such as marsh saxifrage, bird's-eye primrose and hairy stonecrop. Some plants of ephemeral wet pools, such as English sandwort may also be vulnerable.

Particular rare plants

16.3.6 Under high levels of disturbance, the more specialised flora of many semi-natural habitats may be replaced by ubiquitous bare ground/ruderal species typically associated with disturbed soils, especially on more fertile substrates (see *Chapter 3*). However, on relatively infertile substrates ***many low-growing rare vascular plant species thrive under trampled or 'worn' conditions*** where the larger (often much more vigorous) competitors are kept at bay. There are numerous examples, for example: early meadow-grass, which on cliff tops is largely restricted to footpaths, viewing points and car-parks; suffocated clover, which on sand dunes and acidic 'heaths' can occur in huge populations along paths and on golf course fairways; mousetail, which favours wet rutted tracks and field gateways. It is likely that for many such species seed dispersal may be aided by the repeated passage of people.

Species which benefit

Bryophytes

16.3.7 Some upland heath communities dominated by *Sphagnum* species and *Racomitrium languinosum* (which gives its name to *Racomitrium* heath) may be affected by trampling if heavy and sustained. Similarly, most types of ***Sphagnum dominated mires could be degraded by persistent trampling and erosion***. Bayfield (1971) found only 80 tramples across *Sphagnum* in Cairngorm destroyed the plants (with no signs of recovery after 23 months), whereas, in the different climate of the Appalachian mountains in Virginia, Studlar (1980) found that 130 passages reduced *Sphagnum recurvum* to a few isolated leaves and stem and root fragments. Further, Studlar (1980) ranked several bryophytes he studied in order of their sensitivity to trampling as follows:

***Sphagna* very sensitive**

most sensitive	-	2 *Sphagna* species	
↓	-	*Polytrichum commune*	
	-	*Thuidium* spp.	
	-	*Ditrichum* spp. (protected meristem)	} both
least sensitive	-	*Hypnum* spp.	} pleurocarpus species

16.3.8 Studlar (1980) noted that bryophyte cover, frequency and species-richness was greater on his Appalachian trails than in the adjacent vegetation, possibly due to the reduction in litter and competition with taller vascular plants. The importance of the impact of trampling will, therefore, relate to which species are involved, and whether the key species are those that are more tolerant of trampling and can take advantage of the more open conditions.

More resistant bryophytes

16.3.9 Other studies have highlighted the more vulnerable species. *Racomitrium lanuginosum*, for example, was found to be very sensitive to trampling in Iceland (Jónsdóttir 1991). Studlar (1980) found that although in the adjacent forest, *Bryum argenteum*, *Ceratodon purpureus* and *Fumaria hygrometrica* were absent from the trampled areas on the trails.

16.3.10 ***Bryophytes, therefore, vary in their tolerance to trampling***. Studlar (1980) suggests that those with thick midribs, short, tough concave leaves, and protected meristems are more likely to show resilience to trampling.

Resistant features of bryophytes

16.3.11 Effects on bryophytes at the community level may be insidious and more significant in the long term; some may show delayed damage and the recovery potential may vary, although there is little direct evidence to support this. However, the principle follows that for the higher plants.

Lichens

16.3.12 ***Lichens are susceptible to considerable damage by trampling*** (Liddle 1997, who quotes from 8 studies which support this). Bayfield *et al*. (1981) reported damage to lichens, especially foliose species, which was immediately apparent as broken or crushed thalli after passage by walkers on Cairngorm. Liddle

Foliose lichens very sensitive all habitats

(1997) found the same effect on sand dunes at Aberffraw (North Wales) as did Grabherr (1985) in the Austrian Alps. Bayfield (1971) found a reduction of lichen cover (mostly *Cladonia* and *Peltigera* species) reduced from 17% on untrampled areas to 5% on plots trampled 240 times over 3 months on Cairngorm; with no recovery 23 months later.

16.3.13 In another study in the same area Bayfield *et al*. 1981 found damage to *Cladonia impexa, Cladonia arbuscula, Cladonia rangifernia* and *Cladonia uncialis* increased in relation to recreation use varying from 0.1 - 6.1 people/day to more than 18.8 people/day. *Cladonia uncialis* was more sensitive than the other species at all levels of use. Levels of damage were higher 1m from the paths, as might be expected, than further away. In the more heavily used areas (6.2 - 18.8 and more than 18.8 people/day), ***lichens were damaged 5 - 50m from paths*** except for *Cladonia impexa*. At many of the sites, mean levels of damage were low, especially for *Cladonia impexa*, at more than 1 - 5m from paths. The greatest extent of damage was where walking conditions were easy off the path compared to where paths were confined by tall heather or rocky ground.

Dry lichens more susceptible

16.3.14 Bayfield *et al*. (1981) also found from laboratory experiments that at ***water contents of less than 25% dry weight, breakage of the lichens increased dramatically***, in some cases to over 90% of total biomass. *Cladonia uncialis* was also more easily damaged than the other species even when wetter. These studies point to the ***likely sensitivity of foliose lichens in particular, and especially on dry sites in areas where the vegetation does not deter off-path use***. It is also apparent that foliose lichens in the lightly trampled zone adjacent to well-used paths, but where off-path use is easy, can be ***damaged more readily than vascular plants***. Bayfield *et al*. (1981) commented that foliose lichens could be eliminated close to busy paths.

Sensitivity of lichen-rich communities

16.3.15 The studies suggest that ***dry heathland bryophytes and extensive carpets of terricolous lichen communities***, especially those with reindeer lichens (*Cladonia arbuscula C. portentosa* etc) such as those which occur on certain ***Breckland heaths***, other ***lowland heaths***, and occasionally on ***dunes***, ***could be irrevocably damaged by excessive trampling*** (especially where exacerbated by accompanying problems of fire or eutrophication). Sites with *Fulgensia*, which occurs on coastal cliffs with sand over limestone and chalk (eg. on the Isle of Wight and Brean Down), are especially vulnerable to trampling when wet. The BAP species *Heterodermia*, which occurs in coastal locations, is also vulnerable to access related losses. Excessive disturbance could result in, for example, grass domination, or tipping the balance in favour of *Campylopus introflexus*, an introduced moss that is thought to be excluding native *Campylopus* species.

16.3.16 ***Some species appear to have an optimal level of disturbance***; for example the rare Cornish path moss *Ditrichum cornubicum* could be damaged by excessive traffic of horses and people, although a low level of use is desirable.

Spreading Species

16.3.17 ***Visitors to a site can be responsible for spreading (inadvertently) non-native species***, including garden plants and 'weeds'. In addition to replacing the specialised flora of important habitats with common or atypical species, in certain circumstances introduced plants may colonise and dominate land or water. It is ***not clear whether such dispersal would be increased by the open access*** provisions under the CROW Act, but it is more likely to be associated with urban fringe sites, and would be exacerbated by the undesirable habit of dumping garden waste onto high value sites.

Eutrophication of Soils

16.3.18 Sites used for dog walking especially may suffer from ***nutrient enrichment***, leading to the establishment of an impoverished flora of atypical or invasive species (see *Chapter 3, para.3.3.12-13*). This is most likely to be significant in urban fringe sites where regular dog walking is undertaken.

16.4 Types of Site with Particular Vulnerability to Access Related Issues

Sensitive species often in vulnerable habitats

16.4.1 Generally the ***most vulnerable species*** to a statutory right of access are those which ***are showy*** and are either deliberately sought because they are collectible, or are likely to be indiscriminately picked or uprooted, and those which ***grow in particularly fragile conditions***. Wetland sites, thin and friable soils, loose rock and cliff ledges are all particularly vulnerable to trampling, and popular locations, such as viewpoints and mountain tops may also suffer from wear. Bryophyte 'mats' are easily broken off certain rock communities by climbing or scrambling. On highly utilised sites such as the Dartmoor tors scrambling can cause damage to rock communities. Fragile screes, upland grassland on steep slopes with herb-rich ledge communities, water's edge communities and sand dunes are also vulnerable to disturbance and erosion.

16.4.2 Sarsen stones are another feature that could be impacted upon by increasing access to chalk downland (although there are few sites, and the largest and most important, Fyfield Down is an NNR). Damage to sarsens comes from two main sources: people, especially children, jumping on the stones and dislodging the lower-plants, and the difficulty of maintaining adequate sheep grazing on sites because of dogs or because of gates being left open, and the resulting tussocky grass growth and scrub overshading the stones.

Benefits for trample-tolerant species

16.4.3 Opportunities need to be seized to manage access to bring about ***benefits for those species actually requiring disturbance***, eg. on heathlands by routing access so as to create 'pinch-points' of high disturbance. This would benefit many of the rare species, eg. three-lobed crowfoot, chaffweed, allseed, etc.

16.5 Associated Interests

16.5.1 Most sites which are of importance for a specialised plant interest will also be notified ***for their habitat interests***, and may also have other species-group interests, such as invertebrates or breeding birds. The vulnerability (or fragility) of a habitat can usually be taken as a good predictor of the likely vulnerability of the plant species contained within it. In considering possible impacts of increased access on rare plant species one should therefore pay special attention to the relevant habitat guidance. It should however be noted that access restrictions for some species-groups (eg. ground-nesting birds) could conflict with what's needed for the plants if there were no other trampling, for example by grazing animals.

Habitat associations

16.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

16.6.1 On the great majority of access-land which has special higher or lower plant interests it ***should be possible to manage*** access in appropriate ways to protect the special interests. This may involve the control of car parking, careful routing of paths, and establishing gates/stiles at critical points. Where unauthorised activity is a problem, such as plant picking, there may be a need to establish a general information programme, involving notices and leaflets, campaigns through visitor centres or horticultural outlets, or other techniques.

Management solutions

16.6.2 ***Access may need to be restricted around the most important rock sites*** for lower-plants, such as the Wealden Sandrocks of Kent/Sussex, which are of international importance. This may not need to be large scale. Small scale seasonal exclusion using a simple, low fence round small patches of sensitive species and interpretive boards have been successful in deflecting pressure on pasqueflower and early purple orchid on Barnack Hills, for example. Such exclusions should seek to use non-statutory, visitor management methods.

16.6.3 In addition to using non-statutory mechanisms of managing access to avoid sensitive areas supporting certain vulnerable species/habitats, management regimes may also be established to ***actually encourage disturbance in certain areas where desirable*** for conservation reasons.

Designer trampling for specialist plants

16.6.4 ***Only in exceptional circumstances are statutory exclusions or restrictions likely to be necessary***:

- Where highly collectible or showy species are vulnerable, where local or short term exclusions or confinement to paths may be warranted.
- Where there will be unusually high access demand in proximity to vulnerable species, and where non-statutory management mechanisms are unlikely to be effective.
- Where special plants grow on exceptionally fragile habitats, such as cliff ledges used by climbers.

16.6.5 The significance of the impact of access provisions will need to be

assessed against the limits of acceptable change of the parameters used to define favourable condition of the whole site.

16.7 Related Concerns

Management

16.7.1 Many plants of particular conservation importance are often ***dependent on traditional management techniques***, especially grazing, occurring on land which is marginally productive. Steps may need to be taken to ensure that access is managed in ways which does not undermine traditional management, including where necessary, taking appropriate steps concerning dogs and managing access points such as gates to ensure that there are no unplanned stock movements.

16.7.2 Access restrictions may need to be applied to allow continuation of ***certain traditional management*** activities of the habitats on which the plants ultimately depend, eg. activities associated with grazing, shutting up hay-meadows in the spring. This is covered under Section 24 of the CROW Act.

Fire

16.7.3 ***Risk of fire*** is a key concern on heathland and moorland, and has the potential to cause irrevocable damage to certain communities. Section 25 of the CROW Act provides for exclusions in periods of high fire risk.

Removing dead wood

16.7.4 Clearance of ***overhanging branches*** for safety reasons on access land is also a concern where there are epiphytic lichens or bryophytes of interest.

Collecting

16.7.5 ***Unauthorised activities*** resulting from access could have impacts on nature conservation. Collecting or picking might put certain rare species (and certain populations of other species) at risk, and it is well known that some species have declined almost to extinction as a result of injudicious collecting (eg. lady's slipper orchid). The groups most under threat from such activities are the orchids, alpine plants such as (spring gentian) which is particularly at risk from collectors, bulbs in general (including snowdrop, the native daffodil and bluebell), ferns (all taxa) and fungi.

Uprooting gardens

16.7.6 With a burgeoning enthusiasm for 'wildlife gardens', some people might be all too easily tempted to uproot wild plants (or take cuttings) for use in their gardens, and wild flower 'posies' could include showier plants such as bluebell, cowslips, gentians and orchids. However, it is only where these are rare that picking might have an impact. Picking bluebells does not reduce their abundance (although trampling on them does – see *Chapter 9, para 9.3.3*). Edible plants could also be affected, including fungi and some seashore plants such as sea-beet and sea-kale.

Leaf mould and moss collecting

16.7.7 ***General plant material*** may also ***be collected***, including leaf mould, S*phagna* and other mosses. Bin-liners of moss may be collected for horticultural purposes, Christmas wreaths and hanging baskets. In certain cases this may be authorised eg Forestry Commission grant licences in certain forests (mainly coniferous) to collect moss. There is also a local business in

stripping off moss from stone walls in places such as the Peak District (for well dressings) and Yorkshire Dales. More access could lead people into areas less visited, thereby increasing the likelihood of collection.

16.7.8 ***Fungi can also be collected for food***. Even in areas where this has occurred on a large scale (eg. the New Forest) there is ***no evidence in Britain that it has an effect*** on the diversity and populations of fungi (Marren, 1997). However, there is no available research on the effect of intensive collection on the other species which are associated with or dependent on fungi (eg. some invertebrates like fungus gnats), although the British Mycological Society is seeking firm evidence on this (Rotheroe, 1998).

Fungi

16.7.9 With increased access to the countryside, gardeners might take action to 'prettify' wild areas through the ***unauthorised scattering*** of ***seed or planting*** of alien species. The spread of the alien Indian balsam, for example, has been assisted in some areas through deliberate introductions by Indian-balsam 'devotees' (Rotherham, 2000). Many fast-growing alien species outgrow their allotted space in private gardens and are then dug up and ***thrown out into the wild with garden rubbish***. ***Unwanted pond plants*** released into the wild can cause serious problems: witness, for example, the impact that aliens such as water fern, *Crassula helmsii*, Esthwaite waterweed and floating pennywort have had on aquatic ecosystems. Again, these are general problems, and there is no evidence that open access provisions will increase their incidence. Nevertheless, the possibility needs to be recognised.

Spreading alien species

16.8 Opportunities Associated with a Statutory Right of Access

16.8.1 Where access management techniques are introduced on land supporting rare plants, opportunities should be taken to ensure ***suitable habitat management alongside***. This may include vegetation management and control, habitat restoration and stock management. Increased access provides opportunities for using ***trampling as a deliberate habitat management technique***, especially on downland and heathland where cessation of grazing and trampling has been an underlying cause of the decline of so many rare vascular plant species. Careful siting of paths and gates to create pinch-points in critical areas may enable access trampling levels to be kept optimal.

Management, Designer trampling, Interpretation, New habitats

16.8.2 ***Interpretation*** and ***information*** on showy plants needs to be carefully balanced against the danger of losing those which are drawn to the visitors' attention. On the other hand, more could be made of less showy plants which are unlikely to be picked or collected and interpretive material can be provided to explain the importance of sites with plant interests. There is a ***code of conduct for collecting fungi*** which could be ***promoted*** on sensitive sites.

16.8.3 Any opportunities to ***expand habitats*** or to ***connect them*** can assist in managing access. Once established, flower-rich habitats can be more resilient to access and trampling, and help absorb pressures and reduce the incidence of damage to plants on higher value sites.

17. EARTH HERITAGE SITES

17.1 Introduction and Context

17.1.1 Earth heritage interests occur in a wide range of environments both natural and man-made. Natural features include coastal foreshore and cliff exposures, river and stream exposures, inland rock outcrops and landscape features (both static and actively eroding), cave systems and green field sites (effectively a concealed Earth heritage interest). Man-made features include active and disused quarries and mines as well as road, rail and canal cuttings. Approximately 1215 SSSIs in England (and 265 so far in Wales) have a designated Earth heritage interest.

Types and numbers

17.2 Accessibility of Sites with Earth Heritage Interests

17.2.1 ***Extensive areas with an Earth heritage*** interest are ***currently openly accessible***. Coastal sites, in particular foreshore areas, are typically open to the public as are areas of upland outcrop and stream section. Permission is normally required to enter caves, active quarries and some disused quarries, and this may also be the case for road, rail and canal cuttings.

Extensive open access already

17.2.2 The greater ***majority of visitors to open access*** Earth heritage sites are ***incidental to the interest***, that is, tourists visiting a known tourist attraction - beaches or dramatic scenery or for specific recreational purposes such as climbing or caving. Dorset and Yorkshire coastal areas, however, draw significant visitor numbers who will, as part of their visit, look for fossils. Open access sites are also widely used for educational and research purposes by the amateur to the professional geologist. Where access permission is required visitors are likely to have an amateur, an educational or a research interest. As a field based subject, access to Earth heritage sites is an essential part of the learning experience.

Earth science value not often known except fossil and cave sites

17.3 General Vulnerability of Earth Heritage Sites to Direct Impacts arising from Access

Key Points

In general, access has not caused significant impacts. However,

- **Little research is available on the effects of access on Earth heritage features.**
- **Finite resources, eg. fossils, can be vulnerable to over-use.**
- **Erosion can be important as a result of trampling, especially on soft rocks.**
- **Cave features can be damaged.**

17.3.1 In the ***majority of cases the current access pressures on Earth heritage sites cause few problems***. Visitor pressure on the fossils of the Dorset and Yorkshire coasts can cause local depletion in the resource usually balanced by natural erosion. ***Where an Earth heritage resource is finite*** (for example, a limited fossil deposit, a mineral deposit or a static landscape feature) open access sites can be ***vulnerable to over usage*** and erosion. High levels of access can also ***cause erosion impact*** in an otherwise natural system. Recreational caving and climbing can also cause erosional damage, and damage to features such as stalagmites and stalactites.

17.3.2 One of the few case studies describing damage to a geological site is that by Galloway (2001), who identifies the soft Cretaceous sandstones of Kent and East Sussex, which occur in 12 major outcrops, as particularly vulnerable to damage from climbing. Six areas are in SSSIs, and six are frequently used by climbers. Many of the outcrops also support important plant species such as Tonbridge filmy fern. It is these, the delicate weathering features, and the ground at the top and bottom of the rocks that are most sensitive to trampling. Rope abrasion and graffiti have destroyed the delicate polygonal cracking on some rocks, and ground levels had been reduced by more than a metre in places.

Only one study on effects in exceptional conditions

17.4 Types of Site with Particular Vulnerability to Access Related Issues

17.4.1 Vulnerable Earth heritage sites fall into three broad categories:

i. ***A finite fossil or mineral deposit***. For example, cave sediments rich in fossil bones, particularly fine fossil preservation with a limited extent or a discrete mineral vein or mineralisation associated with a specific mine dump. Visitor erosion on such sites may be a problem. However, it is likely that the impact of specimen collecting, as a consequence of access, will cause greatest damage to the Earth heritage interest.

ii. ***A discrete and non-replaceable landscape feature***. For example the Blakeney Esker, Chesil Beach, a wind eroded landscape feature such as a tor or a karstic feature such as a limestone pavement. Increased visitor erosion or an activity such as climbing may lead to deterioration of landscape features.

iii. ***A site demonstrating a natural process*** where a delicate natural balance needs to be maintained. For example, a natural cave system or a river monitoring site demonstrating specific fluvial features. Visitor erosion may disrupt natural processes and damage specific features.

Vulnerable sites:

- **finite fossil deposit**
- **non-replaceable landscape feature**
- **delicate natural process**
- **where construction could damage feature**

Provision of access infrastructure, such as the construction of paths and bridges, may also ***damage geological features***.

17.4.2 Damage may include the destruction of sensitive sites with limited resource (see i above), damage to discrete landscape features (see ii) and potential interruption of natural processes (see iii). Also, access infrastructure may impact on more robust geological sites

preventing access to part of the geological resource (for example, construction concealing key rocks in a geological sequence or key features such as fault or unconformity).

17.5 Associated Interests

17.5.1 There is a strong cross-over between Earth heritage and other nature conservation interests. Most Earth heritage sites support a range of habitats and species which may be more vulnerable to visitor access.

Most have associated biological features

17.6 Circumstances in which Statutory Exclusion or Restriction of Access should be Considered

17.6.1 ***Management of access*** is likely to be the commonest tool in ensuring protection of Earth heritage interests on access land. Provision of paths away from sensitive areas, signage and promotion of good practice would be the normal measures. Useful guidance on the management of fossil resources and on geological field practice is found within the English Nature *Position statement on fossil collecting* and the Geologists' Associations' *Geological Fieldwork Code*. Galloway (2001) gives details on how erosion can be controlled, paths redirected and repaired, and cracks in rocks sealed on soft sandstones. There is also a guide to good practice when climbing the southern sandstones (BMC 1999) which needs to be promoted.

Manage people with paths etc

17.6.2 ***Significant and minor restrictions*** may be required where visitors need to be strictly guided away from more sensitive areas, and to avoid erosion at key points where this cannot be achieved by non-statutory means.

Guide away from feature

17.6.3 There are very few circumstances in which formal statutory exclusion would be required. ***Permanent or at least partial exclusion may be required in exceptional circumstances*** where ***there is a demonstrable threat*** from ***erosion of an irreplaceable feature***, for example, trampling erosion or erosion from a specific activity such as climbing or ***irreversible disruption of a natural system*** for example, trampling erosion impacting on a natural fluvial system or disruption of caving system due to excessive use (such as change in humidity or change in water flow) and damage to cave features such as stalactites and stalagmites or the moving of cave sediments.

Over-usage, Erosion, Irreversible disruption

17.7 Related Concerns

17.7.1 Access to cliffs and exposures may lead to ***unauthorised collection of specimens***. Although the removal of rock samples is not specifically excluded from the CROW Act (unlike plants and animals), the ***collection*** of specimens or ***hammering of faces*** goes beyond the permitted "access on foot" and ***requires permission*** of the owner. Where unauthorised collection is a problem, steps may need to be taken to dissuade or prevent depletion, eg. through publicity and wardening.

17.7.2 ***Health and safety is a primary concern***. Most Earth heritage sites, by their very nature are potentially hazardous. Earth heritage sites are both natural and man-made and appropriate guidance on their safe usage may need consideration. A further concern is that anxieties about public liability may deter owners from agreeing schemes which clean faces and make them more accessible. The CROW Act, however, removes public liability associated with hazards arising from natural features on access land (see Section 13).

Public liability

17.8 Opportunities Associated with a Statutory Right of Access

17.8.1 Increased access to Earth heritage sites offers an excellent opportunity to ***promote a wider understanding and valuing*** of their importance, the need for their conservation and the promotion of best practice.

Promote understanding, Positive management

17.8.2 Greater access to sites may offer the opportunity for ***more positive management***, such as clearance of vegetation and rock exposures, thus also improving appropriate access to Earth heritage features. In doing so, this will also ***raise their educational*** value and provide ***new opportunities for interpretation***.

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APPENDIX 1. **A Summary of the Relevant Provisions Related to a Right of Access given in the Countryside & Rights of Way (CROW) Act, 2000**

A1.1. The relevant parts of the CROW Act to this document are Part 1 describing Access to the Countryside, which is divided into:

Chapter I	Right of access
Chapter II	Exclusion or restriction of access.
Chapter III	Means of access
Chapter IV	General

Schedule 1 "Excepted land for the purposes of Part 1" and Schedule 2, Restrictions to be observed by persons "exercising right of access" are particularly relevant.

CHAPTER I (Sections 1-20)

A1.2. ***The Act gives a right of access to enter and remain on access land for the purposes of open-air recreation.***

Section 1

A1.3. The types of access land to which the public have a right of access are:-

- "Open country" which is defined as land which consists wholly or predominately of mountain, moor, heath or down (excluding semi-improved and improved pasture). To qualify however, the extent of open country, which will be decided by the countryside bodies, will have to be shown on a map issued by these bodies.
- Registered common land.
- Land over 600m above sea level.
- Land dedicated by the owner for public access.

Section 1(2) and Schedule 1 details "excepted land" which cannot be taken as access land.

Section 2 & Schedule 2

A1.4. Section 2 entitles any person the right to enter and remain on any access land for the ***purposes of open-air recreation so long they do so without breaking or damaging*** any wall, fence, hedge, stile or gate and do not break any restrictions listed in Schedule 2 or Chapter II (see Sections 21 to 26).

A1.5. ***Schedule 2 restricts activities and behaviour*** which may be carried out by a person in relation to Section 2(1) on any land in pursuit of right of access. These include:

- Driving or riding any vehicle (other than invalid carriages), which excludes the use of bicycles or watercraft.
- Use of a vessel or sail board on non-tidal waters.
- Having with a person any animal other than a dog (thus excluding horse riding).
- Lighting or tending of fires or any act that may cause a fire.

- Intentional or reckless taking, killing, injuring or disturbing any animal, bird, fish, eggs or nests.
- Feeding of livestock.
- Bathing in non-tidal waters.
- Engagement in operations connected with hunting, shooting, fishing, trapping, snaring, taking or destroying of animals, birds or fish.
- Use or having with them any metal detector.
- Intentional removal, damage or destruction of any whole or part plant, shrub, tree or root.
- Obstruction of the flow of any drain or water course, sluice gate or other apparatus.
- Without reasonable excuse, interference with any fence, barrier or other device designed to prevent accidents to people or to enclose livestock.
- Neglecting to shut any gate or to fasten it where any means of doing so is provided, except where it is reasonable to assume that a gate is intended to be left open.
- Affixing or writing any advertisement, bill, placard or notice.
- Without reasonable excuse, doing anything that disturbs, annoys or obstructs any persons engaged in lawful activity on the land.
- Engaging in any organised games, or in camping, hand-gliding or paragliding.
- Engaging in any activity which is organised or undertaken for any commercial purposes.

A1.6. Any of these restrictions can be lifted by the Relevant Authorities with the consent of the owner so that wider rights can be exercised. Schedule 2 also requires that ***dogs are kept on a short lead*** (i.e. of fixed length and no more ***than 2 metres***) ***between the 1st March and the 31st July*** and also when in the vicinity of livestock. People who break any of the restrictions listed above are to be treated as trespassers by the owner or occupier of the land and have no right of access to enter the land for 72 hours. The right to enter land does not apply where entry is prohibited under any other public legislation.

Sections 4-11 and Schedule 3

A1.7. The Act stipulates that ***maps***, showing the extent of open country and registered common land separately (but with different categories of open country not distinguished), ***should be produced by the Countryside Bodies***. It is for the Countryside Bodies to decide whether to map small areas of open country and where to delineate boundaries to coincide with particular physical features. ***Land over 600m above sea level*** and ***registered common land immediately qualify as access land*** without any requirement for mapping, although such land is to be included in due course on the open country maps. Land irrevocably dedicated under Section 16 by the owner will be included as access land.

A1.8. Excepted land with no right of access under Schedule 1 includes land where:

- There are buildings.
- There is a golf course or parks.
- It is within 20m of a dwelling.

- Where it has been disturbed for the purposes of planting or sowing crops or trees within the past year.
- There are byelaws in force made by the MoD (where any existing access provided for in the byelaws will continue). There is already a statutory right of access (which will continue) under the Law of Property Act 1925 (Metropolitan, Urban and certain other commons) or under access agreements under the 1949 National Parks and Access to the Countryside Act.

A1.9. There is a procedure for ***public consultation on the draft maps***. The Countryside Bodies are required to take any comments during the consultation into account when revising the maps which are then issued as ***provisional maps***. There is a ***right of appeal*** against the showing of any land on provisional maps as open country which can be exercised by anyone with an interest in the land. Once all appeals in relation to the land shown on the map have been determined, a ***conclusive map*** is the final product. This map has to be reviewed within a 10-yearly cycle.

Section 13

A1.10. This section amends the Occupiers' Liability Acts of 1957 and 1984. The 1957 Act is amended so that the liability of occupiers of land owed to those exercising their right of access is reduced to the same level as that owed to trespassers. The 1984 Act is amended in addition so that the occupier of access land will owe no liability to those exercising the right of access, nor to trespassers, in respect of risk resulting from any natural landscape features (including any plant, shrub or tree), any river, stream, ditch or pond and from the passage over, under or through any wall, fence or gate, except by proper use of the gate or stile. However the occupier does become liable if the risk of danger is a result of anything done intentionally or recklessly by the occupier.

Section 16

A1.11. Landowners can dedicate land for access. Such dedications are irrevocable. The person dedicating the land can also provide for a relaxation of any of the restrictions listed in Schedule 2 (*see para. A1.5 above*). Relaxed restrictions cannot later be re-imposed. Access land can be so dedicated in order to lift Schedule 2 restrictions.

Section 17

A1.12. Access authorities are given new powers to ***make byelaws*** by Section 17 to preserve order, prevent damage to land or anything on or in it and to secure the enjoyment of others on the land from interference by the behaviour of others.

Sections 18 and 19

A1.13. These cover how access authorities or district councils can ***appoint wardens*** to secure compliance of byelaws, enforce restrictions imposed and advise and assist the public, and enables access authorities to ***erect and maintain notices indicating the boundaries*** of access and excepted land, informing the public of the effect of restrictions or exclusions and any other matters relating to access to access land.

Section 20

A1.14. The Countryside Bodies are to issue and revise a ***code of conduct for the guidance*** of persons using and persons interested in access land (such as landowners, commoners, farming tenants) under this section, they are also to ensure that the public are informed of the situation and extent of, and means of access to, access land and that the public and persons interested in land are informed of their rights and obligations.

CHAPTER II (Sections 21-33)

A1.15. Chapter II sets out the exclusions or restrictions of access which form part of the Act.

Section 22

A1.16. Under Section 22, landowners or other persons having interest in the land (for example farm tenants) can, by informing the relevant authority, ***exclude or restrict access on one or more days*** specified in the notice for a ***maximum of twenty-eight days*** each calendar year. However, restriction or exclusion of access cannot occur on bank holidays, Christmas Day and Good Friday, on more than four days in any calendar year which are either a Saturday or Sunday, on any Saturday between the 1st June and the 11th August and any Sunday between the 1st June and the 30th September.

Section 23

A1.17. The owners of land managed for the breeding and shooting ***of grouse*** can ***exclude dogs*** at any time but for no more than a 5-year period. The owners of land in connection with ***lambing*** can ***exclude dogs*** for a period of up to ***six weeks*** in any calendar year in any field no more than 15 hectares in which there are sheep.

Sections 24, 25 & 26

A1.18. These sections describe how ***access can be excluded or restricted*** by the relevant authority or the Secretary or State, who should impose only the ***minimum restriction required***, for a fixed period or at a time determined by a person specified to do so in accordance with the regulation. Where this period is to be of a six-month duration or longer, the local access forum must be consulted. Applications for restriction and exclusion can be made in anticipation of land becoming access land, but only if this is likely.

A1.19. Under Section 24, the relevant authority can ***exclude or restrict access***, on application by a person interested in the land for the ***purposes of managing*** the land.

A1.20. The relevant authority can ***exclude or restrict access to land*** during a specified period for the purposes of ***fire prevention*** under Section 25 by reason of any exceptional weather conditions or change in the condition of land, or for the purposes of avoiding danger to the public by reason of anything done or proposed to be done on the land or adjacent land. The relevant authority may impose restrictions or exclusions after application by persons interested in the land or without any such application.

Section 26

A1.21. This section allows the relevant authority to ***exclude or restrict access*** to access land for the purposes of ***conserving flora, fauna or geological or physiological features*** of the land, ***any scheduled monuments*** under the Ancient Monuments and Archaeological Areas Act 1979 or any other structure, work, site, garden or area which is of historic, architectural, traditional, artistic or archaeological interest. As with land under Sections 24 and 25, the ***period of restriction or exclusion*** can be for a ***specified period*** in every calendar year or during a period determined by a specified person in accordance with the direction. For land under Section 26, ***this period can also be indefinite***. The relevant authority, in deciding on exclusion or restriction, should take advice from the relevant advisory body. In England, these bodies are English Nature or the Historic Buildings and Monuments Commission for England, whichever appropriate. In Wales this is the Countryside Council for Wales in respect of nature conservation (who will also advise National Park authorities and the Forestry Commission) or the National Assembly for Wales with respect to heritage and archaeological importance.

Section 27

A1.22. The ***local access forum*** is to be ***consulted*** on any ***exclusions*** or ***restrictions*** under ***Sections 24-26*** which are proposed to be ***indefinite or to exceed 6 months***. Such exclusions or restrictions can be varied or revoked by a subsequent direction by the relevant authority. Long term restrictions or exclusions are to be reviewed at least every 5 years.

Section 28

A1.23. The Secretary of State can ***exclude or restrict access*** for ***defence*** or ***national security*** purposes.

Sections 29 and 30

A1.24. Section 29 provides for a reference by a relevant advisory body in relation to Section 26 where the advice given to the relevant authority has not been taken. The advisory body can make a reference to the appropriate Minister or to the National Assembly for Wales who may require the authority to make the exclusion or restriction as they see fit. Section 30 provides for an appeal by the applicant for a direction under Sections 24 and 25.

CHAPTER III (Sections 34-39)

A1.25. This sets out the arrangements for access to be secured or improved to access land. It allows the access authority to seek agreement with landowners or the creation or safeguarding of means of access, or to secure this by carrying out necessary works.

CHAPTER IV (Sections 40-46)

A1.26. This sets out powers of entry for purposes of Part 1, compensation relating to this, sets out the interpretation of Part 1, and lists repeals and amendments to previous legislation.

APPENDIX 2. The Extent of Nature Conservation Designations in England on Land qualifying for a Statutory Right of Access

Broad BAP Habitat Types	Possible equivalent access category	Total Area within SSSI, '000 hectares[1]	Total number of SSSIs containing habitat type[2]	Number of SSSIs with international designations (and %)
Lowland Heath	Heath	34.7	267	212 (86%)
Lowland Acid Grass	Heath?	10.2	225	64 (28%)
Upland Acid Grass	Mountain/ Moor?	34.5	58	
Lowland Calcareous Grassland	Down	18.2	509	50 (10%)
Upland Calcareous Grassland	Down?	26.0	79	31 (39%)
Upland Heathland	Mountain/ Moor?	157.2	87	46 (53%)
Bog	Mountain/ Moor?	137.8	60	
ALL ABOVE HABITATS:		418.6	ie 40% of total SSSI area 70% of terrestrial SSSI area[3]	
Land over 600m	Mountain	26.3	ie 64% of land over 600m[4]	

Source: ENSIS, 17.1.00

[1] Exclusive figures - may be totalled

[2] Not exclusive figures - must not be totalled

[3] Based on total SSSI area of 1,037,000ha of which 450,625ha is maritime

[4] Based on total area of land over 600m of 41,300ha

APPENDIX 3. The Extent of Nature Conservation Designations in Wales on Land qualifying for a Statutory Right of Access

Broad BAP Habitat Types	Possible equivalent access category	Total Area within SSSI, '000 hectares[1]	Total number of SSSIs containing habitat type[2]
Lowland Heath	Heath	1.3	105
Lowland Acid Grass	Heath?	0.7	178
Upland Acid Grass	Mountain/ Moor	29.7	55
Lowland Calcareous Grassland	Down?	0.6	39
Upland Calcareous Grassland	Down/ Mountain?	0.5	16
Upland Heathland	Heath/ Mountain/ Moor	34.1	50
Bog	Mountain/ Moor	20.8	62
ALL ABOVE HABITATS:		87.7	ie 37% of total SSSI area[3]
Land over 600m	Mountain	14.5	21

Source: CCW 13.3.00

[1] Exclusive figures - may be totalled

[2] Not exclusive figures - must not be totalled

[3] Total terrestrial SSSI area of 234,871ha

APPENDIX 4. Habitat Classification and Relationships to BAP Categories

Habitat/landscape categories		BAP broad habitat types[1]	BAP priority habitat types
Categories of land specified in Act	Mountain (land >600 m)	Montane habitats Inland rock *(cliffs, rock ledges & screes)*	-
	Moor	Dwarf shrub heath *(upland)* Bogs *(blanket bog)* Acid grassland *(upland)* Calcareous grassland *(upland)* Bracken Fen, marsh and swamp *(flushes)* Inland rock *(limestone pavement)*	Upland heathland Blanket bog Upland calcareous grassland Limestone pavement
	Heath	Dwarf shrub heath *(lowland)*	Lowland heathland
	Down	Calcareous grassland *(lowland)*	Lowland calcareous grassland
Other habitats which may occur on common land	Woodland	Broadleaved, mixed and yew woodland Coniferous woodland	Upland oak woodland Lowland beech woodland Upland mixed ash woodland Wet woodland Lowland wood pastures and parkland
	Dry grassland	Acid grassland *(lowland)* Neutral grassland	Lowland dry acid grassland Lowland hay meadows Upland hay meadows?
	Wet grassland	Fen, marsh and swamp *(wet grassland)*	Purple moor-grass and rush pasture
	Lowland mires	Fen, marsh and swamp *(fen & swamp)* Bogs *(raised bog)*	Lowland raised bog Fens Reedbeds
	Coastal habitats	Supralittoral rock Supralittoral sediment Littoral sediment *(saltmarsh & mudflats)*	Coastal sand dunes Maritime cliff & slope Coastal vegetated shingle Coastal saltmarsh Mudflats
	Open water	Standing open water and canals Rivers and streams	Mesotrophic standing waters Eutrophic standing waters Aquifer-fed naturally fluctuating water bodies Chalk rivers

[1] Broad habitat types shown in normal font. Where only certain forms of a broad habitat are relevant, this is indicated by the text in italics.
Some broad habitat types may occur in more than one habitat/landscape category, e.g. bracken is a common component of moorland, but may also occur on heaths or on common land. Each broad habitat type has generally been listed only once in the table – for the habitat/landscape category of which it is most characteristic.

APPENDIX 5 . List of Plant and Animal Species mentioned in the Text

(Scientific and English Names of birds are given in Appendix 6)

Scientific Name	**English Name**
Higher Plants	
Achillea millefolium	Yarrow
Agrostis capillaris	Common bent
Agrostis curtisii	Bristle bent
Agrostis stolonifera	Creeping bent
Aira praecox	Early hair-grass
Alchemilla baltica	Baltic lady's mantle
Ammophila arenaria	Marram
Anagallis minima	Chaffweed
Anthoxanthum odoratum	Sweet vernal-grass
Anthyllis vulneraria	Kidney vetch
Arenaria norvegica ssp anglica	English sandwort
Asparagus officinalis ssp prostratus	Wild asparagus
Asperula cynanchica	Squinancywort
Azolla filiculoides	Water fern
Bellis perennis	Daisy
Beta vulgaris subsp. maritima	Sea beet
Betula spp	Birch species
Calluna vulgaris	Heather
Caltha palustris	Marsh marigold
Carex flacca	Glaucous sedge
Carex rostrata	Bottle sedge
Centaurea jacea	Brown rayed knapweed
Cerastium diffusum	Sea mouse-ear
Cerastium semidecandrum	Little mouse-ear
Chrysosplenium oppositifolium	Opposite-leaved golden saxifrage
Circaea lutetiana	Enchanter's nightshade
Cirsium tuberosum	Tuberous thistle
Coincya wrightii	Lundy cabbage
Crambe maritima	Sea-kale
Crassula helmsii	New Zealand pigmyweed
Crassula tillaea	Mossy stonecrop
Crepis foetida	Stinking hawk's-beard
Cynosurus cristatus	Crested dog's-tail
Cyperus fuscus	Brown galingale
Cypripedium calceolus	Lady's slipper orchid
Dactylis glomerata	Cock's-foot
Deschampsia cespitosa	Tufted hair-grass
Deschampsia flexuosa	Wavy hair-grass
Drosera spp	Sundew species

Scientific Name	**English Name**
Elodea canadensis	Canadian waterweed
Empetrum hermophroditum	Northern crowberry
Empetrum nigrum	Crowberry
Epipactus atrorubens	Dark-red helleborine
Erica ciliaris	Dorset heath
Erica cinerea	Bell heather
Erica tetralix	Cross-leaved heath
Eriophorum vaginatum	Hare's-tail cottongrass
Euphrasia campbelliae	An eyebright
Euphrasia heslop-harrisonii	Eyebright
Euphrasia rotundifolia	An eyebright
Fagus sylvatica	Beech
Festuca ovina	Sheep's fescue
Festuca rubra	Red fescue
Galanthus nivalis	Snowdrop
Galeopsis angustifolia	Red hemp-nettle
Galium aparine	Cleavers
Galium verum	Lady's bedstraw
Gentiana pneumonanthe	Marsh gentian
Gentiana verna	Spring gentian
Gentianella germanica	Chiltern gentian
Gentianella uliginosa	Dune gentian
Glyceria maxima	Reed sweet-grass
Heracleum mantegazzianum	Giant hogweed
Hieracium spp	Hawkweed species
Hippophae rhamnoides	Sea-buckthorn
Holcus lanatus	Yorkshire fog
Hyacinthoides non-scriptus	Bluebell
Hydrilla verticillata	Esthwaite waterweed
Hydrocotyle ranunculoides	Floating pennywort
Hymenophyllum tunbrigense	Tonbridge filmy fern
Hypochaeris radicata	Cat's-ear
Impatiens glandulifera	Indian balsam
Juniperus communis	Juniper
Leontodon hispidus	Rough hawkbit
Limonium spp.	Sea lavender species
Liparis loeselii	Fen orchid
Lolium perenne	Perennial rye-grass
Lotus corniculatus	Bird's-foot-trefoil
Lotus subbiflorus	Hairy bird's-foot trefoil
Luzula campestris	Field woodrush
Lycopodiella inundata	Marsh clubmoss
Medicago lupulina	Black medick
Mercurialis perennis	Dog's mercury
Molinia caerulea	Purple moor-grass
Myosurus minimus	Mousetail

Scientific Name	**English Name**
Narcissus pseudonarcissus	Daffodil
Nardus stricta	Mat-grass
Orchis mascula	Early purple orchid
Orobanche spp.	Broomrape species
Phalaris arundinacea	Reed canary-grass
Phragmites australis	Common reed
Pilosella officinarum	Mouse-ear-hawkweed
Pinus strobus	White pine
Pinus sylvestris	Scot's pine
Plantago coronopus	Buck's-horn plantain
Plantago lanceolata	Ribwort plantain
Plantago major	Greater plantain
Plantago media	Hoary plantain
Poa annua	Annual meadow-grass
Poa bulbosus	Bulbous meadow-grass
Poa infirma	Early meadow-grass
Poa pratensis	Smooth meadow-grass
Polygonum amphibia	Amphibious bistort
Polygonum aviculare	Knotgrass
Potentilla anserina	Silverweed
Primula farinosa	Bird's-eye primrose
Primula veris	Cowslip
Prunella vulgaris	Sealfheal
Pteridium aquilinum	Bracken
Pulsatilla vulgaris	Pasqueflower
Quercus spp	Oak species
Radiola linoides	Allseed
Ranunculus tripartitus	Three-lobed crowfoot
Rhododendron ponticum	Rhododendron
Rumex rupestris	Shore dock
Salix repens	Creeping willow
Salix repens ssp argentea	Creeping willow
Sanguisborba minor	Salad burnet
Saxifraga hirculus	Marsh saxifrage
Schoenus nigricans	Black bog-rush
Sedum villosum	Hairy stonecrop
Silene gallica	Small-flowered catchfly
Taraxacum officinale	Dandelion
Thelypteris thelypteroides	Marsh fern
Thymus polytrichus	Wild thyme
Trichophorum cespitosum	Deergrass
Trientalis europaea	Chickweed wintergreen
Trifolium pratense	Red clover
Trifolium repens	White clover
Trifolium suffocatum	Suffocated clover
Ulex europaeus	Gorse
Ulex gallii	Western gorse

Scientific Name	**English Name**
Vaccinium myrtillus	Bilberry
Vaccinium vitis-idaea	Cowberry
Veronica arvensis	Wall speedwell
Vicia cracca	Tufted vetch
Vicia sepium	Bush vetch
Mosses	
Acaulon triquetrum	Triangular pygmy moss
Brachythecium spp	
Bryum argenteum	
Bryum mamillatum	Dune thread moss
Bryum neodamense	
Bryum warneum	
Campylopus introflexus	
Ceratodon purpureus	
Dicranum spp	
Ditrichum cornubicum	
Fumaria hygrometrica	
Polytrichum commune	
Racomitrium languinosum	Woolly hair moss
Sphagnum recurvum	
Lichens	
Caloplaca aractina	
Cladonia arbuscula	
Cladonia impexa	
Cladonia portentosa	
Cladonia rangifernia	
Cladonia uncialis	
Fulgensia spp	
Heterodermia leucomelos	Ciliate strap-lichen
Peltigera spp.	
Liverworts	
Petalophyllum ralfsii	Petalwort
Mammals	
Arvicola terrestris	Water vole,
Barbastella barbastellus	Barbastelle bat
Capreolus capreolus	Roe deer
Cervus elaphus	Red deer
Erinaceus europaeus	Hedgehog
Lepus europaeus	Brown hare
Lepus timidus	Mountain hare

Scientific Name	**English Name**
Lutra lutra	Otter
Meles meles	Badger
Muscardinus avellanarius),	Dormouse
Mustela erminea	Stoat
Myotis bechsteinii	Bechstein's bat
Oryctologus cuniculus	Rabbit
Pipistrellus pipistrellus	Pipistrelle
Rhinolophus ferrumequinum	Greater horseshoe bat
Rhinolophus hipposideros	Lesser horseshoe bat
Sciurus carolinensis	Grey squirrel
Sciurus vulgaris	Red squirrel
Vulpes vulpes	Fox
Amphilians and Reptiles	
Anguis fragilis	Slow-worm
Bufo bufo	Common toad
Bufo calamita	Natterjack toad
Coronella austriaca	Smooth snake
Lacerta agilis	Sand lizard
Lacerta vivipara	Common lizard
Natrix natrix	Grass snake
Rana lessonae	Pool frog
Rana temporaria	Common frog
Triturus cristatus	Great crested newt
Triturus helveticus	Palmate newt
Triturus vulgaris	Smooth newt
Vipera berus	Adder
Fish	
Salmo salar	Salmon
Butterflies and Moths	
Calophasia lunula	Toadflax brocade
Eurodryas aurinia	Marsh fritillary
Hadena albimacula	White spot
Hesperia comma	Silver spotter skipper
Hipparchia semele	Grayling
Idaea ochrata cantiana	Bright wave moth
Lygephila craccae	Scarce blackneck
Maculinea arion	Large blue butterfly
Papilio machaon	Swallowtail butterfly
Plebejus argus	Silver-studded blue
Polymixis xanthomista statices	Black-banded moth
Zygaena loti scotica	Slender scotch burnet
Zygaena viciae	New Forest burnet

Scientific Name	English Name
Other Invertebrates	
Bombus humilis	Brown–banded carder bee
Bombus ruderatus	Large garden bumble
Bombus subterraneus	Short haired bumble bee
Lasioglossum angusticepts	A mining bee
Osmia xanthomelana	A mason bee
Evagetes pectinipes	A spider wasp
Formica candida	Black bog ant
Bembidion humorale	A beetle
Cicindela germanica	A tiger beetle
Cicindela hybrida	A ground beetle
Panagaeus crux-major	A ground beetle
Pterostichus madidus	A ground beetle
Arianta arbustorum	Land snail
Austropotamobius pallipes	White-clawed crayfish
Margaritifera margaritigera	Freshwater pearl mussel
Pacifastacus leniusculus	Signal crayfish
Vertigo angustior	Snail
Dolomedes fimbriatus	Raft spider
Pardosa amentata	A spider
Allolobophora longa	Earthworm
Aprhrodes duffieldi	The hopper
Cathiormiocerus britannicus	A weevil
Gryllus campestris	Field cricket
Hirundo medicinalis	Medicinal leech

APPENDIX 6. Birds which are Afforded some Statutory Protection or are of Conservation Concern

English Name	Scientific Name	Annex 1	Schedule 1	BoCC	BAP	Migrants
Red-throated diver	*Gavia stellata*	X	X	Amber		
Black throated diver	*Gavia arctica*	X	X	Amber		
Great northern diver	*Gavia immer*	X	X	Amber		
Great crested grebe	*Podiceps cristatus*					X
Red-necked grebe	*Podiceps grisegena*			Amber		
Slavonian grebe	*Podiceps auritus*	X	X	Amber		
Black-necked grebe	*Podiceps nigricollis*		X	Amber		
Fulmar	*Fulmarus glacialis*					X
Cory's shearwater	*Calonectris diomedea*	X	X			
Great shearwater	*Puffinus gravis*					X
Sooty shearwater	*Puffinus griseus*					X
Manx shearwater	*Puffinus puffinus*			Amber		
Storm petrel	*Hydrobates pelagicus*	X		Amber		
Leach's storm petrel	*Oceanodroma leucorhoa*	X	X	Amber		
Gannet	*Morus bassanus*			Amber		
Shag	*Phalacrocorax aristotelis*	X		Amber		
Bittern	*Botaurus stellaris*	X	X	Red	X	
Little bittern	*Ixobrychus minutus*	X	X			
Little egret	*Egretta garzetta*	X				
Grey heron	*Ardea cinerea*					X
Purple heron	*Ardea purpurea*	X	X			
Spoonbill	*Platalea leucorodia*	X				
Bewick's swan	*Cygnus columbianus*	X	X	Amber		
Whooper swan	*Cygnus cygnus*	X	X	Amber		
Bean goose	*Anser fabalis*			Amber		
Pink-footed goose	*Anser brachyrhynchus*			Amber		
Greenland white-fronted goose	*Anser albifrons*	X				
Lesser white-fronted goose	*Anser erythropus*	X				
Greylag goose (Hebridean)	*Anser anser*			Amber		
Barnacle goose	*Branta leucopsis*	X		Amber		
Brent goose	*Branta bernicla*					X
Shelduck	*Tadorna tadorna*			Amber		
Wigeon	*Anas penelope*			Amber		
Gadwall	*Anas strepera*			Amber		
Teal	*Anas crecca*			Amber		
Mallard	*Anas plathyrhynchos*					X
Pintail	*Anas acuta*			Amber		
Garganey	*Anas querquedula*		X	Amber		
Shoveler	*Anas clypeata*			Amber		
Pochard	*Aythya ferina*			Amber		
Tufted duck	*Aythya fuligula*					X
Scaup	*Aythya marila*		X	Amber		
Eider	*Somateria mollissima*			Amber		
Long-tailed duck	*Clangula hyemalis*		X			
Common scoter	*Melanitta nigra*		X	Red	X	
Velvet scoter	*Melanitta fusca*		X	Amber		
Goldeneye	*Bucephala clangula*			Amber		
Smew	*Mergellus albellus*	X				
Red-breasted merganser	*Mergus serrator*					X
Goosander	*Mergus merganser*					X
Honey buzzard	*Pernis apivorus*	X	X	Amber		
Red kite	*Milvus milvus*	X	X	Red		
White tailed eagle	*Haliaeetus albicilla*	X	X	Red		
Marsh harrier	*Circus aeruginosus*	X	X	Red		
Hen harrier	*Circus cyaneus*	X	X	Red		
Montagu's harrier	*Circus pygargus*	X	X	Amber		
Goshawk	*Accipter gentilis*		X			
Sparowhawk	*Accipter nisus*					
Buzzard	*Buteo buteo*					
Golden eagle	*Aquila chrysaetos*	X	X	Amber		
Osprey	*Pandion haliaetus*	X	X	Red		

Kestrel	*Falco tinnunculus*			Amber		
Merlin	*Falco columbarius*	X	X	Red		
Hobby	*Falco subbuteo*		X			
Gyr falcon	*Falco rusticolus*		X			
Peregrine falcon	*Falco peregrinus*	X	X	Amber		
Red grouse	*Lagopus lagopus*					
Ptarmigan	*Lagopus mutus*	X				
Black grouse	*Tetrao tetrix*			Red	X	
Capercaillie	*Tetrao urogallus*	X		Red	X	
Grey partridge	*Perdix perdix*			Red	X	
Quail	*Coturnix coturnix*		X	Red		
Water rail	*Rallus aquaticus*			Amber		
Spotted crake	*Porzana porzana*	X	X	Amber		
Corncrake	*Crex crex*		X	Red	X	
Coot	*Fulica atra*					X
Crane	*Grus grus*	X		Amber		
Oystercatcher	*Haematopus ostralegus*			Amber		
Black-winged stilt	*Himantopus himantopus*	X	X	Amber		
Avocet	*Recurvirostra avosetta*	X	X	Amber		
Stone curlew	*Burhinus oedicnemus*	X	X	Red	X	
Little ringed plover	*Charadrius dubius*		X			
Ringed plover	*Charadrius hiaticula*			Amber		
Kentish plover	*Charadrius alexandrinus*		X			
Dotterel	*Charadrius morinelus*	X	X	Amber		
Golden plover	*Pluvialis apricaria*	X		Amber		
Grey plover	*Pluvialis squatarola*			Amber		
Lapwing	*Vanellus vanellus*			Amber		
Knot	*Calidris canutus*			Amber		
Sanderling	*Calidris alba*					X
Little stint	*Calidris minuta*					X
Temminck's stint	*Calidris temminckii*		X	Amber		
Curlew sandpiper	*Calidris ferruginea*					X
Purple sandpiper	*Calidris maritima*		X	Amber		
Dunlin	*Calidris alpina*			Amber		
Ruff	*Philomachus pugnax*	X	X	Amber		
Snipe	*Gallingo gallingo*			Amber		
Woodcock	*Scolopax rusticola*			Amber		
Black-tailed godwit	*Limosa limosa*		X	Red		
Bar-tailed godwit	*Limosa lapponica*	X				
Whimbrel	*Numenius phaeopus*		X	Amber		
Curlew	*Numenius arguata*			Amber		
Spotted redshank	*Tringa erythropus*					X
Redshank	*Tringa totanus*			Amber		
Greenshank	*Tringa nebularia*		X	Amber		
Green sandpiper	*Tringa ochropus*		X			
Wood sandpiper	*Tringa glareola*	X	X	Amber		
Common sandpiper	*Actitis hypoleucos*					X
Red-necked phalarope	*Phalaropus lobatus*	X	X	Red	X	
Grey phalarope	*Phalaropus fulicarius*					X
Pomarine skua	*Stercorarius pomarinus*					X
Arctic skua	*Stercorarius prasiticus*					X
Long-tailed skua	*Stercorarius longicaudus*					X
Great skua	*Stercorarius skua*			Amber		
Mediterranean gull	*Larus melanocephalus*	X	X	Amber		
Little gull	*Larus minutus*		X	Amber		
Sabine's gull	*Larus sabini*					X
Black-headed gull	*Larus ridibundus*					X
Common gull	*Larus canus*			Amber		
Lesser black-backed gull	*Larus fuscus*			Amber		
Herring gull	*Larus argentatus*			Amber		
Iceland gull	*Larus glaucoides*					X
Glaucous gull	*Larus hyperboreus*					X
Great black-backed gull	*Larus marinus*					X
Kittiwake	*Rissa tridactyla*					X
Sandwich tern	*Sterna sandvicensis*	X		Amber		
Roseate term	*Sterna dougallii*	X	X	Red	X	
Common tern	*Sterna hirundo*	X				
Arctic tern	*Sterna paradisea*	X		Amber		

Little tern	*Sterna albifrons*	X	X	Amber		
Black tern	*Childonias niger*	X	X			
Guillemot	*Uria aalge*			Amber		
Razorbill	*Alca torda*			Amber		
Black guillemot	*Cepphus grylle*			Amber		
Little auk	*Alle alle*					X
Puffin	*Fratercula arctica*			Amber		
Stock dove	*Columba oenas*			Amber		
Woodpigeon	*Columba palumbus*					X
Collared dove	*Streptopelia decaocto*					
Turtle dove	*Streptopelia turtur*			Red	X	
Cuckoo	*Cuculus canorus*					X
Barn owl	*Tyto alba*		X	Amber		
Snowy owl	*Nyctea scandiaca*	X	X			
Long-eared owl	*Asio otus*					X
Short-eared owl	*Asio flammeus*	X		Amber		
Nightjar	*Caprimulgus europaeus*	X		Red	X	
Swift	*Apus apus*					X
Kingfisher	*Alcedo atthis*	X	X	Amber		
Bee-eater	*Merops apiaster*		X			
Hoopoe	*Upupa epops*		X			
Wryneck	*Jynx torquilla*		X	Red	X	
Green woodpecker	*Picus viridis*			Amber		
Lesser spotted woodpecker	*Dendrocopos minor*					
Woodlark	*Lullula arborea*	X	X	Red	X	
Skylark	*Alauda arvensis*			Red	X	
Shorelark	*Eremophila alpestris*		X			
Sand martin	*Riparia riparia*			Amber		
Swallow	*Hirundo rustica*			Amber		
House martin	*Delichon urbica*					X
Tree pipit	*Anthus trivialis*					X
Meadow pipit	*Anthus pratensis*					X
Rock pipit	*Anthus petrosus*					X
Water pipit	*Anthus spinoletta*					X
Yellow wagtail	*Motacilla flava*					X
Waxwing	*Bombycilla garrulus*					X
Dunnock	*Prunella modularis*			Amber		
Robin	*Erithacus rubecula*					X
Nightingale	*Luscinia megarhynchos*			Amber		
Bluethroat	*Luscinia svecica*	X	X			
Black redstart	*Phoenicurus ochruros*		X	Amber		
Redstart	*Phoenicurus phoenicurus*			Amber		
Whinchat	*Saxicola rubetra*					X
Stonechat	*Saxicola torquata*			Amber		
Wheatear	*Oenanthe oenanthe*					X
Ring ouzel	*Turdus torquatus*			Amber		
Blackbird	*Turdus merula*			Amber		
Fieldfare	*Turdus pilaris*		X	Amber		
Song thrush	*Turdus philomelos*			Red	X	
Redwing	*Turdus iliacus*		X	Amber		
Cetti's warbler	*Cettia cetti*		X	Amber		
Grasshoper warbler	*Locustella naevia*			Amber		
River warbler	*Locustella fluviatilis*					X
Savi's warbler	*Locustella luscinioides*		X	Amber		
Aquatic warbler	*Acrocephalus paludicola*	X		Red	X	
Sedge warbler	*Acrocephalus schoenobaenus*					X
Marsh warbler	*Acrocephalus palustris*		X	Red	X	
Reed warbler	*Acrocephalus scirpaceus*					X
Icterine warbler	*Hippolais icterina*			Amber		
Melodius warbler	*Hippolais polyglotta*					X
Dartford warbler	*Sylvia undata*	X	X	Red		
Lesser whitethroat	*Sylvia curruca*					X
Whitethroat	*Sylvia communis*					X
Garden warbler	*Sylvia borin*					X
Blackcap	*Sylvia atricapilla*					X
Wood warbler	*Phylloscopus sibilatrix*					X
Chiffchaff	*Phylloscopus collybita*					X
Willow warbler	*Phylloscopus trochilus*					X

Goldcrest	*Regulus regulus*					X
Firecrest	*Regulus ignicapillus*		X	Amber		
Spotted flycatcher	*Muscicapa striata*			Red	X	
Pied flycatcher	*Ficedula hypoleuca*					X
Bearded tit	*Panurus biarmicus*		X	Amber		
Marsh tit	*Parus palustris*			Amber		
Willow tit	*Parus montanus*			Amber		
Crested tit	*Parus cristatus*		X	Amber		
Short-toed treecreeper	*Certhia brachydactyla*		X			
Golden oriole	*Oriolus oriolus*		X	Amber		
Red-backed shrike	*Lanius collurio*	X	X	Red	X	
Great grey shrinke	*Lanius excubitor*					X
Jay	*Garrulus glandarius*					
Magpie	*Pica pica*					
Chough	*Pyrrhocorax pyrrhocorax*	X	X	Amber		
Jackdaw	*Corvus monedula*					X
Rook	*Corvus frugilegus*					
Carrion crow	*Corvus corone*					
Raven	*Corvus corax*					
Starling	*Sturnus vulgaris*			Amber		
Tree sparrow	*Passer montanus*			Red	X	
Chaffinch	*Fringilla coelebs*					X
Brambling	*Fringilla montifringilla*		X	Amber		
Serin	*Serinus serinus*		X	Amber		
Greenfinch	*Carduelis chloris*					X
Goldfinch	*Carduelis carduelis*			Amber		
Siskin	*Carduelis spinus*					X
Linnet	*Carduelis cannabina*			Red	X	
Twite	*Carduelis flavirostris*			Red		
Redpoll	*Carduelis flammea*					X
Crossbill	*Loxia curvirostra*		X			
Scottish crossbill	*Loxia scotica*	X	X	Red	X	
Parrot crossbill	*Loxia pytyopsittacus*		X	Amber		
Scarlet rosefinch	*Carpodacus erythrinus*		X	Amber		
Bullfinch	*Pyrrhula pyrrhula*			Red	X	
Hawfinch	*Coccothraustes coccothraustes*			Amber		
Lapland bunting	*Calcarius lapponicus*		X			
Snow bunting	*Plectrophenax nivalis*		X	Amber		
Cirl bunting	*Emberiza cirlus*		X	Red	X	
Reed bunting	*Emberiza schoenichlus*			Red	X	
Corn bunting	*Miliaria calandra*			Red	X	

Annex 1 to EU Birds Directive 79/409
Schedule 1 of the Wildlife and Countryside Act 1981
BoCC, Birds of Conservation Concern
BAP Priority species
Migrants, Additional, migratory species not in other lists

APPENDIX 7. Species Composition of Key Groups of Vulnerable Species
Latin names are given in Appendix 6

Feeding and Roosting Wetland Birds

Bittern
Black-necked grebe
Bewick's swan
Whooper swan
Bean goose
Pink-footed goose
Greenland white-fronted goose
Barnacle goose
Brent goose
Shelduck
Wigeon
Teal
Mallard
Pintail
Shoveler
Pochard
Eider
Oystercatcher
Avocet
Ringed plover
Golden plover
Grey plover
Lapwing
Knot
Sanderling
Purple sandpiper
Dunlin
Black-tailed godwit
Bar-tailed godwit
Whimbrel
Curlew
Redshank
Greenshank
Turnstone
Black-headed gull
Lesser Black-backed gull
Herring gull
Great Black-backed gull
Sandwich tern
Roseate tern
Common tern
Arctic tern
Little tern

Roosting Raptors

Marsh harrier
Hen harrier
Red kite
Merlin
Short-eared owl

Colonies of Coastal Nesting Birds, Including Those on Cliffs, Offshore Islands, Beaches and Dunes

Fulmar
Manx shearwater
Storm petrel
Gannet
Shag
Peregrine
Oystercatcher
Ringed Plover
Mediterranean gull
Black-headed gull
Lesser black-backed gull
Herring gull
Great black-backed gull
Kittiwake
Sandwich tern
Roseate tern
Common tern
Arctic tern
Little tern
Guillemot
Razorbill
Black guillemot
Puffin
Chough

Aggregations of Vulnerable Breeding Wetland Birds

Black-necked grebe
Bittern
Little egret
Heron
Garganey
Shoveler
Pochard
Marsh harrier
Crane
Spotted crake
Oystercatcher
Avocet
Ringed plover
Lapwing
Black-tailed godwit
Curlew
Ruff
Snipe
Redshank
Mediterranean gull
Black-headed gull
Lesser black-backed gull
Herring gull
Great black-backed gull
Black tern
Cetti's warbler
Aquatic warbler
Bearded tit

Aggregations of Vulnerable Birds Breeding on Mountains and Moors

Hen harrier
Merlin
Peregrine
Black grouse
Dotterel
Golden plover
Lapwing
Dunlin
Snipe
Curlew
Redshank
Black-headed gull
Lesser black-backed gull
Herring gull
Short-eared owl
Chough
Ring ouzel
Twite

Aggregations of Vulnerable Birds Breeding on Heathlands and Downlands

Quail
Stone curlew
Nightjar
Woodlark
Dartford warbler

Lekking Birds

Black grouse
Ruff

Exceptionally Rare Breeding Birds and/or Birds Which may not nest Regularly in Predictable Locations in any of the Above Habitats

Red-necked grebe
Little bittern
Purple heron
Spoonbill
Honey buzzard
Montagu's harrier
Golden eagle
Spotted crake
Corncrake
Black-winged stilt
Kentish plover
Little gull
Black tern
Bluethroat
Bee-eater
Hoopoe
Wryneck
Golden oriole
Red-backed shrike
Savi's warbler
Marsh warbler
Icterine warbler
Firecrest
Parrot crossbill
Scarlet rosefinch