DARTMOOR TRAINING AREA

ECOLOGY REVIEW

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Summary

S.1 RPS was commissioned by Defence Estates (DE) to review existing ecological surveys and data relating to the Dartmoor Training Area. This review provides a baseline of information on which decisions about further surveys can be based.

S.2 Surveys and other documents pertinent to the ecology of Dartmoor are tabulated in Appendix 1.

S.3 Chapter 1 outlines the data collection methods used in this assessment.

S.4 Chapter 2 describes the statutory designated areas of relevance to the ecology of the Dartmoor Training Area. These include Dartmoor National Park, Dartmoor SAC, five Sites of Special Scientific Interest, and the Dartmoor Environmentally Sensitive Area.

S.5 Chapter 3 describes the survey coverage of vegetation and habitats on the Dartmoor Training Area. On completion of the on-going NVC survey this coverage will be comprehensive.

S.6 Chapter 4 reviews the notable plants, fungi and lichens of Dartmoor.

S.7 Chapter 5 reviews surveys and records for vertebrate species on Dartmoor. Most studies focus on birds, and disturbance to birds has been investigated in several reports. Certain sites are particularly sensitive to recreational and other impacts. Surveys for bats have focused on the wooded valleys outside the Dartmoor Training Area. No surveys of other mammals, reptiles or amphibians have been identified. No fish records for rivers on Dartmoor were found.

S.8 Chapter 6 reviews the invertebrate survey coverage for Dartmoor. A number of notable species are present in the area. Vegetation management is likely to affect these species, although many are limited to specific areas of Dartmoor.

S.9 Chapter 7 reviews forthcoming surveys on Dartmoor, which include completion of the MoD NVC survey, English Nature SSSI condition monitoring, and swaling and grazing studies. DNPA is planning to continue various invertebrate studies. Further ongoing studies are to be undertaken by the Woodland Trust, Rural Development Service, Butterfly Conservation and various county recorders.

S.10 Chapter 7 draws conclusions regarding the extent of the existing survey information.

1 Introduction

1.1 RPS was commissioned by Defence Estates (DE) to review existing ecological surveys and data relating to the Dartmoor Training Area. This review provides a baseline of information on which decisions about further surveys can be based, which can be used to inform the management of the Dartmoor Training Area.

1.2 The review was undertaken in two phases. First, a pro-forma survey table was prepared on which to record all sources of ecological data pertinent to the Dartmoor Training Area. This pro-forma was initially populated by RPS using data sources known to RPS and DE. These generally relate to the Dartmoor area, although they also include wider surveys and datasets, e.g. national and countywide datasets. Where the distribution of individual species was reviewed, this was limited to species of conservation interest (e.g. protected species, Biodiversity Action Plan (BAP) species and other notable species). Data for these species was obtained from the surveys and other documents that were reviewed, and from the National Biodiversity Network website. Local and national species recorders were not consulted.

1.3 Statutory bodies were then consulted in order to identify additional data sources and advise on the nature and extent of further studies being undertaken or programmed within Dartmoor. These were English Nature, the Dartmoor National Park Authority (DNPA) and the Environment Agency. A series of meetings was undertaken to discuss the final survey form and obtain copies of relevant data.

1.4 This document includes the completed survey tables in Appendices 1 and 2. Appendix 3 lists the abbreviations used throughout the report. The text in Chapters 2 to 7 summarises the documents and datasets listed in these tables. Chapter 2 discusses the ecology-related statutory designated areas on Dartmoor; Chapter 3 discusses vegetation and habitat surveys; Chapter 4 discusses surveys of individual species of plants and fungi; Chapter 5 discusses surveys for vertebrate species such as birds, amphibians and mammals; Chapter 6 discusses surveys for invertebrate species such as butterflies and dragonflies. Chapter 7 discusses forthcoming or planned ecology surveys; and Chapter 8 draws conclusions about survey coverage. Chapter 9 is a full reference list for documents quoted in the text of this report.

2 Statutory Designated Areas

2.1 Information on the statutory designated areas on Dartmoor of relevance to ecology was obtained from English Nature, JNCC and DEFRA. This information included full citations for SSSIs and links to online location maps. The Multi Agency Geographic Information for the Countryside (MAGIC 2006) website and English Nature's *Nature on the Net* (English Nature 2006a) service were also consulted.

2.2 Full citations for SSSI and SAC sites are included in Appendix 4.

Dartmoor National Park

2.3 The Dartmoor National Park (95,400ha) was designated in 1951. The Park is administered by the DNPA, created in 1974. The current purpose and duties of the DNPA are laid down in Section 61 of the Environment Act 1995, and are outlined on the DNPA website thus:

The Statutory purposes of National Parks, which the Authority has the duty to pursue, are:

- *To conserve and enhance the natural beauty, wildlife and cultural heritage of the area,*
- *To promote opportunities for the understanding and enjoyment of the area's special qualities by the public.*

In pursuing these purposes we also have a duty to seek to foster the economic and social well being of the communities within the National Park, but without incurring significant expenditure in doing so.

2.4 The DNPA acts to protect and enhance the ecology of the National Park through its Dartmoor National Park Management Plan (DNPA 2001) and through projects such as Action for Wildlife, Restoring Ancient Woodlands, Dartmoor Hill Farm Project, and the Wealth of Wildlife Project (DNPA 2006). It hosts the Dartmoor Biodiversity Research Group, a link between researchers and conservation managers, and compiles lists of completed research relating to the biodiversity of Dartmoor.

2.5 All of the Training Areas on Dartmoor are located within the boundaries of the National Park.

Dartmoor Special Area for Conservation (SAC)

2.6 SACs are designated under the EC Habitats Directive, and are of international importance.

2.7 Dartmoor SAC (23,166 ha) has been designated for the Habitats Directive Annexe 1 habitats it contains, including northern Atlantic wet heaths, European dry heaths, blanket bogs and old sessile oak woods, and for its population of an Annexe II species, the southern damselfly. It includes the various SSSI sites on Dartmoor described below. A full citation for the site is included in Appendix 1.

Sites of Special Scientific Interest (SSSI)

2.8 SSSIs are notified under Section 28 of the Wildlife and Countryside Act 1981 (as amended). More than 40 sites within Dartmoor National Park have been notified as SSSIs, of which only one falls within the Dartmoor Training Area: North Dartmoor SSSI. In addition three SSSIs either lie adjacent or close to the Dartmoor Training Area, including South Dartmoor SSSI, Tor Royal Bog SSSI, and Wistman's Wood SSSI.

North Dartmoor SSSI

2.9 North Dartmoor SSSI (13,413 ha) has been notified for its large areas of upland semi-natural habitat, particularly western blanket bog and mixed valley mire, and for its diverse upland breeding bird community. Within the site lie Black Tor Copse, of national importance for lichens, and Black Ridge Brook of national geological importance.

2.10 All of Okehampton Training Area lies within this SSSI, with the exception of Okehampton Common in the north east of the area. Approximately 60% of Willsworthy Training Area lies within the boundary, with some parts of the west of the area lying outside the SSSI (e.g. south west of Nattor Down and west of the Rifle Ranges below White Hill). Approximately 50% of Merrivale Training Area lies within the SSSI, with the region around Great Mis Tor towards the south west of the area excluded. Cramber and Ringmoor Training Areas are outside and to the south of the SSSI.

South Dartmoor SSSI

2.11 South Dartmoor SSSI (9,668 ha) has been notified for its blanket bog, mixed valley mire, and unimproved acid grassland/heathland mosaic. It also contains a locality of national geological importance.

2.12 None of the Dartmoor Training Area lies within South Dartmoor SSSI. Cramber and Ringmoor Training Areas lie directly adjacent to the west.

Tor Royal Bog SSSI

2.13 Tor Royal Bog SSSI (58 ha) has been notified because it offers one of the best examples of blanket mire in Devon. It is an important representative of such mires in south west Britain.

2.14 None of the Dartmoor Training Area lies within the Tor Royal Bog SSSI boundary, but this site lies approximately 250m to the east of the Cramber Training Area boundary.

Wistman's Wood SSSI

2.15 Wistman's Wood SSSI (264 ha) has been notified because it offers a rare relict example of the ancient high woods of Dartmoor. The site also contains extensive areas of clitter (granite blocks), acid grassland, heath and mire communities characteristic of upland Dartmoor. Wistman's Wood is also designated an NNR (National Nature Reserve).

2.16 None of the Dartmoor Training Area lies within the Wistman's Wood SSSI or NNR boundaries, although the site lies c.500m east of the Merrivale Training Area boundary.

East Dartmoor SSSI

2.17 This site contains the largest area of heather moorland remaining on Dartmoor. It also has associated valley mire and acid grassland habitats.

2.18 None of the Dartmoor Training Area lies within the East Dartmoor SSSI. The site is located c.3km east of Okehampton and Merrivale Training Areas, to the south of Fernworthy Reservoir.

Dartmoor Environmentally Sensitive Area

2.19 Dartmoor Environmentally Sensitive Area (ESA) scheme, which started in 1994, covers some 100,275 ha, including all of Dartmoor Training Area. The area is subject to various voluntary ESA management agreements between DEFRA, commoners and landowners.

3 Vegetation and Habitats

Summary Documents

3.1 Summary documents relating to the broad habitats of Dartmoor include *Dartmoor: A Biodiversity Profile* (DNPA & EN 1997) and *Dartmoor Factsheet*: *Habitats of Dartmoor* (DNPA 2005). *The Moorlands of England and Wales*: *An Environmental History* (Simmons 2003) considers the development of moorland habitats more widely. These documents summarise the major habitats on Dartmoor, which include blanket and valley bogs, heather moorland, grassland and enclosed farmland. Additional habitats include broadleaved valley woodland (including upland oak woodland) and coniferous plantations, rhos pasture, traditional hay meadows, hedges and road verges, buildings, farms and churches, tors, rocks stone walls, rivers, streams and reservoirs. The blanket bogs and dwarf heath that make up the moorland, and the areas of upland oak woodland, are habitats of international importance under the EU Habitats Directive. Rivers of Dartmoor include the Dart, Bovey, Teign, Avon, Erme, Yealm, Plym, Meavy, Walkham, Tavy, Lyd, West Okement, East Okement and Taw (DNPA 2005).

3.2 As well as a detailed account of key wildlife habitats of Dartmoor, *Dartmoor: A Biodiversity Profile* includes a number of maps summarising the geology of Dartmoor, the location of some of the key habitats, the location of ancient semi-natural woodland and the major rivers.

3.3 Further broad scale studies of the habitats and vegetation of Dartmoor include *Dartmoor* (Harvey & St. Leger-Gordon 1953), *The Development of the Vegetation of Dartmoor* (Simmons 1962). *Vegetation of the Dartmoor Commons* (NCC 1969), *The Blanket Peat of Dartmoor: a comparative study* (Brown 1969), *The Vegetation of Dartmoor* (Ward *et al* 1972), *Dartmoor National Park: The Trees and forests* (Hall, 1977), *Dartmoor Rhos Pasture Survey 1994-1996* (Hughs 1997), and *The Common Lands of Dartmoor: A Biological Survey (*Aitchison and Ashby 2000).

National and Local BAP Habitats

3.4 The *UK Biodiversity Action Plan* (BAP) is implemented in Dartmoor by *Action For Wildlife: The Dartmoor Biodiversity Project* and the *Dart Biodiversity Project*. Key documents include *The Nature of Dartmoor: A Biodiversity Profile* (DNPA & EN 1997, DNPA 2001a), *Action For Wildlife: The Dartmoor Biodiversity Action Plan* (DNPA 2001b, DNPA 2005), *The Nature of Devon: Devon Biodiversity Action Plan* (Devon County Council 1998, revised 2005) and the *UK Biodiversity Action Plan* website (UK BAP 2006).

3.5 Key habitats on Dartmoor that are included under national BAP priority habitats include ancient and/or species rich hedgerows, blanket bog, fens, heath, blanket bog, lowland meadows, upland oak woodland and lowland dry acid grassland (UK BAP 2006).

3.6 Habitats on Dartmoor that are included as local habitats in the Devon BAP include caves and mines, oak woodland, and pits, quarries and cuttings. Local habitats on Dartmoor that are included in the Dartmoor BAP include heather, ponds, quarries, caves, mines, buildings, and reservoirs.

Broad Scale Habitat and Vegetation Surveys

3.7 Several broad habitat surveys have been carried out across Dartmoor since the *Dartmoor Ecological Survey* (NCC 1969). These differ in their methodology, extent and detail of coverage and in the habitat classification system that they employ.

3.8 General habitat surveys and assessments covering relatively large areas of Dartmoor include the *Dartmoor Ecological Survey* (NCC 1969) that contains information on the geology, soils and vegetation of the area, and *Dartmoor Habitat Survey 1994-1995* (Hughes 1995), which concentrates on rough land and enclosed farmland on the peripheries of the moorland. In the latter survey the principal plant communities identified included five types of mire (including several types of rhos pasture), swamp, heathland, upland grassland, mesotrophic grassland, scrub and woodland.

3.9 Habitat maps included in *Dartmoor Moorland Breeding Bird Survey 2000* (Geary 2000) show broad habitats (i.e. grassland and fragmented heath, bracken, blanket mire, and heather moorland) across Dartmoor for areas of moor and heath. These maps have been produced by combining ADAS land cover data (ADAS 1998) with the heather condition maps produced by Wolton *et al* (1992). These surveys are discussed further in the following sections.

3.10 Further broad habitat assessments of Dartmoor include *The Upland Survey of Dartmoor* (NCC 1986 & 1987), the *Upland Resource Survey Consolidation Project* (English Nature 1995) (these include tabulated habitat data (using broad categories) for the upland areas of Dartmoor), and *Habitats Directive Stage 2 Review First Pass Site Characterisation Report: Dartmoor* (Evans and Gibson 2002).

Further Habitat and Vegetation Surveys

3.11 More detailed vegetation studies have generally followed the National Vegetation Classification system (Rodwell *et al* 1991a, 1991b, 1992, 1995 and 2000). These include the *NVC of North, South Central and East Dartmoor SSSI* (NCC 1987) and *NVC of Part of South Dartmoor SSSI* (Ecological Services (Bangor) Ltd. 2005). These studies broadly agree with

the ESA surveys described above and indicate that the open moorland areas of Dartmoor are dominated by various calcifugous grassland, mire and heath communities. The last of these includes the locally characteristic south-western heath community H4, with western gorse (*Ulex galli*) and bristle bent (*Agrostis curtisii*). The former survey covers much of Okehampton, Merrivale and Willsworthy Training Areas, whilst the latter does not include any of Dartmoor Training Area.

3.12 Surveys which pre-date the NVC system, such as *The Environmental Baseline 1984/5* (Dartmoor Steering Group 1985), and *The Environmental Baseline: First Resurvey of the Crater Zone Plots* (NCC 1987) use a different although broadly similar vegetation classification system. This latter survey covered four 4km^2 plots within the Dartmoor Training Area and is discussed below under *Coverage of the Individual Training Areas on Dartmoor***.**

3.13 *An Ecological Study of Breeding Bird Populations and Vegetation on Open Moorland Areas of Dartmoor* (Mudge *et al* 1979) assessed vegetation types specifically with respect to their potential as habitats for birds, it includes summary descriptions of wet blanket bog, valley bog, damp low-altitude/*Calluna* moor, dry grassland, bracken and scrub and *Calluna* moor with *Vaccinium*.

3.14 The Dartmoor National Park Ancient Woodland Survey 1996-1997 (Hughes 1998) lists the areas of ancient woodland on Dartmoor. Accompanying GIS map files are held by the DNPA. The English Nature Ancient Woodland Boundaries GIS dataset (English Nature 2006b) shows the location and extent of these areas, all of which lie outside Dartmoor Training Area.

3.15 *A Woodland Strategy for Dartmoor National Park 2005-2010* (Countryside Associates, undated) briefly describes the current woodland of Dartmoor, which covers 11% of the National Park and includes 2750 ha of ancient semi-natural woodland, 4500 ha of other broadleaved woodland and 3900 ha of coniferous plantation. The upland oak woodland (e.g. NVC plant communities W11 and W17) is of particular importance, and seventeen woods are included within SSSIs. Five woods are also National Nature Reserves: Yarner Wood, Bovey Valley Wood, Dendles Wood, Wistman's Wood and Black Tor Copse; these lie outside Dartmoor Training Area.

3.16 More local vegetation surveys are recorded in *DNPA Habitat Survey Cards for Bagator Farm, Bearwalls Farm and Yellowmead Farm* (DNPA 1995).

Condition Assessments

3.17 A number of further condition assessments and surveys have been carried out on Dartmoor including *Vegetation and Heather Condition Maps for the Commons of Dartmoor* (Wolton *et al* 1992), Vegetation *Assessment of Western Heath Growth Rate in Dartmoor ESA* (Smallshire 1996a), *Heather Utilisation Survey at Dartmoor ESA* (Smallshire 1996b), *Willsworthy Military*

Range Heather Utilisation Survey (Keedle 1999), *Vegetation and Condition Assessment, Upper Plym National Trust Property* (Boyce 2004), and *The Condition of Moorland Vegetation on Ministry of Defence Land on Dartmoor,* (Kirkham *et al* 2004). Overgrazing has been a common finding in these studies.

3.18 Wolton's 1992 assessment of vegetation and heather condition covers the commons of Dartmoor. This area includes large areas of Okehampton, Willsworthy and Merrivale Training Areas. The results for the Dartmoor commons as a whole show 31% heathland, 36% blanket and valley bog, 15% grassland (which includes 1% dominated by purple moor grass), 11% bracken and the remaining areas consisting of whortleberry, gorse and scrub/woodland. Heather condition was described as healthy for 32% of the area, damaged for 32% and absent from the remaining 36% of the area. From an analysis of residual vegetation and soil types it was suggested that heather was completely lost from 31% of Dartmoor common land. Of the area showing damage, 32% showed severe damage. The causes of damage were generally confirmed as overgrazing and a high frequency of burning. Damage caused by military training, heather beetle, horse riding and letter boxing generally affected areas too small to be mapped.

3.19 Aitchison and Ashby (2000) surveyed the commons across the whole county of Devon in *The Common Lands of Devon: a Biological Survey.* This report is rather general and does not include much detail about individual commons on Dartmoor, or consider the Dartmoor commons as a whole.

3.20 Kirkham *et al*'s (2004) report surveyed eleven sites within the Dartmoor Training Area as part of a larger study of ESA land (referred to under *ESA Environmental Monitoring Surveys* below). This allows comparison with other parts of Dartmoor not used by the military, as well as previous surveys in the series. The assessment carried out at each site included a detailed study of vegetation composition made using a series of 8 x 4m quadrats, and measures of heather condition and abundance, also based on quadrats. Vegetation was described with reference to the NVC, and heather condition was assessed using percentage cover, stand age and growth stage, a grazing index and a grazing score. Signs of grazing animals were also recorded.

3.21 The dominant vegetation communities were M17 mire and U3 grassland. Heather age ranged form 6.2 to 10.1 years, and building stage heather dominated all sites except two, for which pioneer stage heather was dominant. Mature stage heather was almost completely absent. Heather cover ranged from 0.1 to 25.2% for grassland communities and from 0.2 to 32.0% from mires. Six of the sites showed evidence of grazing by ponies/cattle and sheep, one grazing by sheep only, and five showed no evidence of grazing animals. Areas of Dartmoor within the Training Area were generally found to have lower grazing index values and grazing scores than areas outside. However, the total dwarf shrub cover was no more than moderately high at any of the MoD sites. The authors suggest that the differences are largely due to lower

overall stocking density on MoD areas than on other ESA areas, and possibly also lower winter stocking densities.

3.22 Boyce's (2004) assessment covers the Plym Estate which lies adjacent to but outside the eastern boundaries of Ringmoor and Cramber Training Areas, and within the South Dartmoor SSSI. It repeats Wolton's (1992) survey in certain areas and the author compares the two surveys. Dominant NVC communities included M15, M17 and M25 mires, U4, U5 and U20 grassland and H12 heath. The heather condition survey revealed that for large areas, heather cover was severely reduced, but there were also significant areas where heather cover was good but growth was suppressed, and where heather cover was low but existing vegetation and soils suggest that heather cover would naturally be below 30%. Changes observed when the survey was compared with Wolton's (1992) survey of the area indicated the complete loss of heather from some areas, and a general decline in heather condition across the study area. The author suggests this decline almost certainly results from the continued over-grazing and excessive burning of the site.

3.23 Condition assessments conducted by English Nature were carried out in January 2006 for the four Dartmoor SSSIs discussed in the *Statutory Designated Sites* section above. These assessments can be found on the English Nature web site. For North Dartmoor SSSI, 43.9% of the areas was found to be in an unfavourable condition but recovering, 31.4% was favourable, 23.3 % was unfavourable with no change, and 1.3% was in unfavourable condition and declining. No area was destroyed or part destroyed.

3.24 For South Dartmoor SSSI, 53.1% of the area was found to be in unfavourable condition but recovering, 16.8% was unfavourable with no change, 16.4% was unfavourable and declining, and 13.7% was found to be favourable. Again, no area was destroyed or part destroyed.

3.25 For Tor Royal Bog SSSI, 100% of the area was found to be in favourable condition.

3.26 Lastly, for Wistman's Wood, 63.2% of the area was found to be in an unfavourable condition but recovering, 21.8% was unfavourable with no change, and 14.9% was favourable. No areas were unfavourable declining, or destroyed or part destroyed.

ESA Environmental Monitoring Surveys

3.27 A number of habitat and land cover surveys relating to the Dartmoor ESA have been carried out, including *Environmental Monitoring in the Dartmoor ESA 1994-1997* (ADAS 1998) and *Moorland Vegetation Monitoring in the Dartmoor ESA 1994-2003* (Kirkham *et al* 2005).

3.28 The 1994-1997 report included a 1994 survey of general land cover, and 1994 and 1997 surveys of moorland vegetation, hay meadows, and linear features. In this land cover survey the categories used included open moor and heath, hill and valley farmland, cultivated plateau

and fringe farmland. Okehampton, Merrivale, Ringmoor and Cramber Training Areas consisted entirely of open moor and heath. Willsworthy Training Area was dominated by open moor and heath but also contained small areas of hill and valley farmland. Dartmoor Training Areas contains none of the remaining two land classes: cultivated plateau or fringe farmland.

3.29 Across the Dartmoor ESA as a whole, open moor and heath consisted of the following composition of vegetation types: grassland moorland 40%, dwarf shrub heath 26%, fragmented dwarf shrub heath (a transitional class between the previous two land cover types) 13%. The remaining areas consisted of bracken, scrub and burnt land.

3.30 The moorland survey aimed to assess whether the botanical value, structure and condition of the moorland was being maintained. However, rather than a blanket survey of the area it consisted of 64 randomly chosen 8m by 4 m sample plots. Species composition, vegetation height, and heather condition were measured for some of these plots in 1994 and for some in 1997. Signs of grazing were also recorded. The assessment methods are directly comparable to those outlined above for Kirkham *et al* (2004).

3.31 In total, 12 NVC communities and 17 sub-communities were represented in these sample plots. Calcifugous grasslands included U3, U4, U5, and U20; mires included M15, M16, M17, and M25; and heaths included H4, H8 H10, and H12. Overall, calcifugous grassland dominated these sample pots. Heather frequency was generally low (10.3% in 1994) and showed a decrease between 1994 and 1997. Levels of heather utilisation were generally high (32% in 1994) and showed an increase on both calcifugous grasslands and heaths. The frequency of grazing signs showed an increase in those sample plots which were not subject to ESA agreements, and a decrease in plots which were. Grazing scores relating to vegetation composition showed a significant increase for non-agreement land, and a slight decrease for agreement land. Vegetation height showed a significant decrease on non-agreement land, and no change on ESA agreement land. Since only 21% of the area of Dartmoor ESA was subject to such agreements at the time, these results suggests that grazing pressure over the area as a whole increased over the period, and that this had noticeable impacts upon vegetation height and composition.

3.32 Along with swaling (the burning of large blocks of purple moor grass and heath to promote new grass growth), this report identifies overgrazing as a process that can have significant impacts on dwarf shrub heath and on mires, two key BAP habitats of Dartmoor.

3.33 The 1994-2003 report (Kirkham *et al* 2005) concentrated entirely on vegetation condition in relation to grazing, and followed the methods of the previous survey. By 2003 the majority of land in the Dartmoor ESA was subject to ESA land management agreements. Grazing pressure on heather, as indicated by the heather Grazing Index generally increased over the survey period, particularly between 1994 and 1997, and heather cover declined. These effects were greatest where heather cover was lowest, i.e. in acid grasslands. No other species of

dwarf shrubs or herbaceous plants (out of 12 that were assessed in addition to heather) showed significant changes in frequency between 1994 and 2003 except wavy hair grass which showed a decline. A general decrease in the grazing score was noted at heath sites. Estimated ages and growth stages of heather suggested a reduction in the frequency of burning. Mires appeared to be burned more frequently than heaths, perhaps because of uncontrolled purple moor grass burns.

Coverage of the Individual Military Training Areas on Dartmoor

Willsworthy Training Area

3.34 A number of the broad surveys discussed in the previous sections cover all or part of Willsworthy Training Area. In particular the land cover surveys of Dartmoor ESA provide complete coverage of the training area, and the NVC survey of North Dartmoor SSSI covers at least 60% of the site. The on-going NVC survey will provide complete and up to date coverage.

3.35 The 1984/5 baseline survey (Dartmoor Steering Group 1985) covered four 2km x 2km plots in north Dartmoor. One of these was located towards Doetor Common in the east of Willsworthy Training Area. The survey showed this site to be dominated by grass heath, and bracken, with areas of grassland and gorse, *Calluna/Molinia* moor, *Vaccinium* moor, valley bog, and blanket bog. A map of the survey area is included in the report. This survey was repeated in *Dartmoor Habitat Survey 1994-95: Final Report* (Michel Hughes Associates 1995).

3.36 Vegetation surveys specific to Willsworthy Training Area were reviewed in *Willsworthy Range: a Review of Vegetation Surveys* (RPS 2001). This review covers a number of the documents mentioned in the previous section, as well as the Willsworthy Site Dossier (Willsworthy Conservation Group 1995) which is continually updated, and the Integrated Land Management Plan (ILMP) for Willsworthy (RPS/MoD 1999). Sensitive habitat areas identified in the review include Doe Tor Common / Bearwalls Farm, Yellowmead Farm, White Hill, Hare Tor, Doe Tor, and Tavy Cleave.

3.37 The *Willsworthy Site Dossier* includes a Vegetation Units Plan that covers the whole training area. This indicates that moist heather moor, blanket bog, purple moor grass, dry heath, sweet grassland, and sour grassland dominate the area, with smaller areas of valley bog, improved grassland and whortleberry heath. The location of flushes and scattered trees are also indicated.

3.38 The ILMP for Willsworthy uses a different classification system, in which the dominant vegetation types are upland heath, lowland heath, blanket bog, and grass moor, with smaller areas of valley mire, and flower-rich grassland at the north west of the site.

3.39 The two most recent and comprehensive vegetation surveys of the area, include Willsworthy *Habitat Survey* (RPS 2002) and *NVC Survey of Willsworthy Training Area* (WSP 2003). These (the former based on satellite imagery and the latter based on field survey) indicate the dominance of a rather broad category: upland/heathland mosaic. Other NVC communities present included: H4 heath, U3 grassland, M17 mire, H18/H12 heath, U4 grassland, M17/M15 heath mosaic. The 2002 survey suggests that high levels of grazing are leading to the degradation of important habitats such as blanket bog and heathland, and that other factors such as stock movement, heather beetle damage, military activities and public access are also having impacts. The main recommendation is a reduction in grazing intensity to allow the regeneration of moorland.

3.40 Willsworthy *Heather Utilisation Surveys* include Archer (1993), DNPA (1998), Keedle (1998), Keedle (1999) and Keedle (2000). These surveys generally indicate overgrazing, for example 44% of the area was classified as overgrazed in 1993 and 57% in 2000. Heather beetle was also identified as a potential concern.

Okehampton Training Area

3.41 Three 2km x 2km plots within the Okehampton Training Area were surveyed for vegetation in *The Environmental Baseline 1984/5* (Dartmoor Steering Group 1985). These were located 1) 1km south of Okehampton Camp at the north of the training area, 2) around Steeperton Tor in the north east of the training area, and 3) around Dinger Tor in the centre of the training area. The survey report includes vegetation maps for these plots, which show that the Okehampton Camp plot was dominated by heath, grassland and grass heath, the Steeperton Tor plot was dominated by *Calluna/Molinia* moor blanket bog and grass heath, and the Dinger Tor plot was dominated by blanket bog, bracken, and *Calluna/Molinia* moor. This survey was repeated in *Dartmoor Habitat Survey 1994-95: Final Report* (Hughes 1995).

3.42 The area has been covered by the broad ESA land cover surveys, the NVC survey of North Dartmoor SSSI and a number of the other documents mentioned above. The on-going NVC survey will provide complete and up to date coverage.

Merrivale Training Area

3.43 No site-specific vegetation surveys have been carried out for the Merrivale Training Area, although the area has been covered by the broad ESA land cover surveys, the NVC survey of

North Dartmoor SSSI and a number of the other documents mentioned above. The on-going NVC survey will provide complete and up to date coverage of the training area.

Cramber Training Area

3.44 The Cramber Training Area has been covered by the broad ESA land cover surveys, the NVC survey of North Dartmoor SSSI, and a number of the other documents mentioned above. The on-going NVC survey will provide complete and up to date coverage of the site.

3.45 A full NVC survey of Cramber Training Area, which included disturbance monitoring, was carried out in 2002: *NVC survey of Cramber Tor* (CEH 2002). This indicated that the site was dominated by H4 and H12 heath, with smaller areas of M6, M15, M17, M21, and M23 Mire, and U20 and U4 grassland. There was a block of conifer plantation to the west of the site, and a small area of W1 woodland / M6 mire mosaic.

3.46 Intensive grazing was only recorded in two out of the 42 compartments. Most compartments showed moderate or locally moderate grazing intensity. Mature phase heather was present in all of the compartments where there was sufficient heather for its condition to be monitored. Degenerate phase heather was present in most of these, but very little pioneer or building phase heather was present.

3.47 Recreational disturbance was present in the form of track formation between known landmarks. Damage to vegetation was particularly evident on these tracks where they crossed wet areas. There were no signs of soil erosion or gully formation. No signs of military disturbance were found on the site. Abandoned mine-workings were present in 32 of the 42 compartments, these have a characteristic semi-natural vegetation cover associated with them. Some areas of vegetation showed damage that may have been caused by temporary folding or supplementary feeding of sheep, and some poaching was evident in wetter areas.

3.48 WSP has carried out an environmental impact assessment of military training on Cramber Training Area: *Cramber Training Area Dartmoor Environmental Statement* (WSP, 2002). This concluded that apart from minor trampling on popular routes, there were few signs of disturbance to or erosion of vegetation; there was no evidence that military dry training had an impact on the state of the vegetation

Ringmoor Training Area

3.49 No site-specific vegetation surveys have been carried out for Ringmoor Training Area, although the area has been covered by the broad ESA land cover, and a number of the other documents mentioned above. The on-going NVC survey will provide complete and up to date coverage of the training area.

Surveys Relating to Other Areas on Dartmoor

3.50 Further surveys and studies of areas on Dartmoor which lie outside the Dartmoor Training Area include *A Survey of Black Tor Copse Forest Nature Reserve* (Barkham 1965), *The Dart Valley: An Ecological Survey* (Field Studies Council 1997), *A Survey of Dry Heathlands within the South Dartmoor Woods cSAC* (English Nature 2001a) and *Vegetation Survey and Assessment of Crownhill Down and Smallhanger Waste* (Cross 2004).

Military and Recreational Impacts

3.51 A number of vegetation surveys have been carried out specifically for the purpose of assessing the impacts of recreational or military training activities on Dartmoor.

3.52 *The Environmental Baseline* report (Dartmoor Steering Group 1985) specifically included crater zone surveys, followed up in *The Environmental Baseline: The First Resurvey of the Crater Zone Plots* (Dartmoor Steering Group 1987). These studies showed that military craters tend to dry out and become re-vegetated over time. No increase in the number of craters was detected in the re-survey.

3.53 Several studies have been carried out to assess the frequency of military tracks and artefacts across the Dartmoor Training Area, including *Tracks and Military Artefacts on Okehampton Range* (MoD 1992), and *Tracks and Military Artefacts on Merrivale Range* (MoD 1993). *Long-term Vegetation Recovery after Vehicle Track Abandonment on Dartmoor* (Charman and Pollard 1996) assesses the recover of vegetation on tracks no longer in use. In *The Army and the Environment, an Environmental Impact Assessment on the Okehampton Army Ranges*, Bennett (1990) discusses the impact of training on vegetation and the public and concludes that the impact is small.

3.54 Studies which have addressed the impact of recreational disturbance on vegetation on Dartmoor include: *A comparison of the integration of recreation and conservation in two woodland nature reserves in Dartmoor: Yarner Wood and Wistman's Wood* (Jones 1992).

3.55 The NVC surveys of Cramber (CEH 2002) and Willsworthy (WSP 2003) discussed above included surveys of impacts on vegetation that could be attributed to recreational, military, agricultural and mining activities. No military impacts were detected.

Management Advice

3.56 General management advice for moorland habitats are included in *Sustainable practices on the South West Moors of England* (Smallshire *et al* 1996), *Draft Site Management Statements for Commons on North Dartmoor, East Dartmoor and South Dartmoor* (English Nature 1997a, 1997b and 1997c), and *The Upland Management Handbook* (English Nature 2001bh).

Gaps in Coverage and Recommendations

3.57 The vegetation of Dartmoor and the condition of heather have been extensively assessed since the 1980s. A full and detailed NVC survey of Dartmoor Training Area will only become available when the current survey is completed in 2006.

3.58 Habitat classifications and quality indices have not been produced for the aquatic habitats of Dartmoor (e.g. pools, lakes, streams, rivers).

3.59 Overall, overgrazing has been a major problem on Dartmoor, and stocking levels are likely to be the largest single influence on Dartmoor's biodiversity in the future. Dartmoor's location in the south of England may also make its upland mire habitats particularly sensitive to the effects of climate change.

4 Plants, Lichens, and Fungi

Biodiversity Action Plan Species

4.1 National BAP priority species listed on the in the Dartmoor BAP *Action for Wildlife (DNPA* 2005) include three vascular plants, one moss and four lichens. The vascular plants include flax-leaved St. John's wort (*Hypericum linarifolium*), Deptford pink (*Dianthus armeria*) and Irish lady's tresses (*Spiranthes romanzoffiana*), the moss is multi-fruited river moss (*Cryphaea lamyana*) and the lichens are *Bryoria smithii*, orange-fruited elm-lichen (*Caloplaca luteoalba*), *Graphina pauciloculata* and *Schismatomma graphodioides*. Further key species of vascular plant in the Dartmoor BAP include wild daffodil (*Narcissus pseudonarcissus* ssp. *pseudonarcissus*), bog orchid (*Hammarbya paludosa*), heather (*Calluna vulgaris*), and greater butterfly orchid (*Platanthera chlorantha*).

4.2 The Devon BAP (Devon County Council 2005) does not list any national *priority* plant species, although it does list the following local species: primrose (*Primula vulgaris*), Devon whitebeam (*Sorbus devoniensis* and related species) and the golden hair lichen (*Teoschistes flavicans*).

Surveys for Individual Plant Species

4.3 Publications relating to the distribution of individual plant species across Dartmoor include the *Flora of Devon: Mosses and Liverworts* (Barnes 1958) and *Atlas of the Devon Flora: Flowering Plants and Ferns* (Ivmey Cook 1984). At a coarser level, the *New Atlas of the British and Irish Flora* (Preston *et al* 2002) also provides coverage of Dartmoor; it maps the distribution of British and Irish plant species to a 10km grid square accuracy.

4.4 The following paragraphs discuss the survey coverage of the individual BAP species listed above, and other species of conservation importance. 10km grid square records from *New Atlas of the British and Irish Flora (*Preston *et al* 2002) and 10km grid square records from the National Biodiversity Network database (NBN 2006) have also been included.

Notable Species

Slender Birds Foot Trefoil (Lotus angustissimus)

4.5 Slender Bird's Foot trefoil is a small annual of thin drought prone soils on cliffs rocks and paths. The species is listed as *not threatened* on the *UK Vascular Plants Red Data List*

Cheffings and Farrel 2002), although it has a restricted distribution with only 21 known locations in the UK (Stewart 1999). A survey of Dartmoor carried out in 1999 listed several sites in the east of the area (Stewart 1999), and the *New British and Irish Flora* (Preston *et al* 2002) shows this species to be present in the 10km grids square covering the same region: SX78. These sites lie outside the Dartmoor Training Area.

Devon Whitebeam (Sorbus devoniensis)

4.6 This small tree species is endemic to Britain and Ireland and is very locally distributed, being native to only relatively small areas of Devon and south east Ireland. It is usually found in lowland hedgerows and rocky woodland, but is occasionally present in areas of more open moorland. It has been recorded from three 10km grid squares on Dartmoor: SX56, SX59 and SX69 (Preston *et al* 2002). The first of these grid squares includes areas of the Cramber and Ringmoor Training Areas, and the latter includes part of the northern section of Okehampton Training Area.

Deptford Pink (Dianthus armeria)

4.7 An annual or short lived perennial of open and disturbed sites; it generally occurs in short grassland in roadsides, field margins and as a casual on waste ground. It has also been recorded on fen peat (Preston *et al* 2002). This species is a national BAP priority species and is included in the Dartmoor BAP (DNPA 2005). Distribution maps in Preston *et al* (2002) indicate that this species has been recorded in grid square SX76 in the south east and SX87 in the north east of Dartmoor. These areas lie outside the Dartmoor Training Area.

Irish lady's tresses (Spiranthes Romanzoffiana)

4.8 This orchid is a rhizomatous herb of acidic, nutrient poor and peaty soils, often found by stream and lake margins. In the UK it is distributed largely in Ireland and North West Scotland, but it has also been recorded from Dartmoor (Preston *et al* 2002). It is a BAP *priority* species, is listed in the Dartmoor BAP (DNPA 2005), and is protected in the UK under the Wildlife and Countryside Act 1981.

This species has been recorded from the 10km grid square SX57 (Preston *et al* 2002), which includes parts of Merrivale and Cramber Training Areas.

Heather (Calluna vulgaris)

4.9 Heather is abundant across Dartmoor and is a key moorland species. It is listed in the Dartmoor BAP (DNPA 2005). Heather abundance and condition have been assessed for a number of areas on Dartmoor, including the Dartmoor Training Area. These studies have been discussed in the previous chapter.

Wild daffodil (Narcissus pseudonarcissus ssp. pseudonarcissus)

4.10 The wild daffodil is a bulbous perennial native to oak, ash woods, bracken stands and scrubby pastures. The limits of its range are unclear in the UK and it is believed to be introduced in a large number of areas (Preston *et al* 2002). This species is listed as a *local* species in the Dartmoor BAP (DNPA 2005).

4.11 This species is recorded from several 10km grid squares in the Dartmoor area, including SX47, SX57, and SX59 (Preston *et al* 2002). The first of these lies east of Dartmoor Training Area, the second includes part of the Merrivale Training Area, and the third includes the northern part of Okehampton Training Area.

Bog orchid (Hammarbya paludosa)

4.12 This species is a pseudobulbous orchid of boggy areas to 500m above sea level. It typically grows among saturated *Sphagnum*, but is also found on the edges of runnels and flushes. The draining of bogs and overgrazing appear to have caused a dramatic decline in this species in the 20th century. The bog orchid is recorded mainly from the uplands and therefore it is distributed in the north and west of Britain. It is is included in the Dartmoor BAP (DNPA 2005).

4.13 This species has been recorded from two 10km grid squares on Dartmoor before 1970: SX59 and SX77 (Preston *et al* 2002). These both lie outside the Dartmoor Training Area. It has been recorded from two 10km grid squares between 1987 and 1999: SX68 and SX69 (Preston *et al* 2002). These squares contain part of the eastern edges of Okehampton Training Area and parts of Okehampton and Merrivale Training Areas respectively.

Greater butterfly orchid (Platanthera chlorantha)

4.14 This orchid is a perennial herb of well drained habitats such as calcareous grassland. Rarely it grows on slightly acidic moorland or heathy pasture. It was lost from many sites during the 20th Century. This species is not a UK BAP *priority* species, but is listed in the Dartmoor BAP (DNPA 2005).

4.15 This species has been recorded from the following 10km grid squares (1987-1999) in the Dartmoor area: SX57, SX58, SX67, SX68, SX76 and SX77 (Preston *et al* 2002). SX57 contains eastern areas of Merrivale and Okehampton Training Areas, SX58 contains areas of Willsworthy, Merrivale and Okehampton Training Areas, SX67 contains eastern areas of Merrivale Training Area, SX75, SX76 and SX77 lie in east Dartmoor, outside the Dartmoor Training Area. In addition, a pre-1970 record exists for SX56 (Preston *et al* 2002), which includes areas of Cramber and Ringmoor Training Areas.

Flax-leaved St Johns Wort (Hypericum linarifolium)

4.16 Flax-leaved St. Johns wort is a rare plant in Britain, occurring only in South Devon, East Cornwall and Caernarvonshire (McDonnell 1999). It is a British red data book species with the IUCN category of *vulnerable*. The species is listed in the Dartmoor BAP (DNPA 2005).

4.17 The NBN database contains records for this species from a number of 10km grid squares in the Dartmoor area: SX46, SX 47, SX77, SX78, and SX79. All of these grid squares lie outside the Dartmoor Training Area.

4.18 A UK wide assessment of this species was produced by McDonnell in 1994 (McDonnell 1994), and a survey of the species was carried out by McDonnell in 1998: *Hypericum linarifolium: report of work undertaken in 1998*. McDonnell described the two Dartmoor populations of this species (Teign Valley and Dart Valley) and reported work undertaken in 1998 to aid its conservation. This work included the discussion of conservation options with landowners.

Vigur's Eyebright (Euphrasia vigursii)

4.19 This species is found in damp lowland heaths, grassland and maritime habitats. It seems to consist of a number of sub-species, but for the purpose of the UK BAP, all of these are currently included under the above name. It is characteristic of *Agrostis curtisii-Ulex galli heaths*. This species has substantially declined at its inland sites since 1950, for reasons including habitat destruction and the decline of grazing (Preston *et al* 2002). However, most of the UK Populations currently appear stable (UK BAP 2006). This species is a UK BAP *priority* species and is listed on the Dartmoor BAP (DNPA 2005).

4.20 The distribution maps in Preston *et al* (2002) include records from one 10km grid square on Dartmoor for the period 1987-1999: SX58. There are also 1970-1986 records from SX56, and pre-1970 records for SX47, SX57, SX68, SX69, and SX78. Of these, SX57 contains part of Merrivale Training Area, SX58 contains parts of Okehampton, Willsworthy and Merrivale Training Areas, and SX59 and SX69 contain part of Okehampton Training Areas.

Killarney Fern (Trichomanes speciosum)

4.21 This species is primarily a species of the UK, Ireland, Brittany and the Atlantic Islands. The sporophyte, which requires damp deeply shaded caves, has only been recorded from 14 localities in the UK. The gametophyte is more widespread but appears to exist in a state of arrested development (UK BAP 2006). The species is protected under the EU Habitats Directive, and thus the Conservation (Natural Habitats &c.) Regulations 1994, and under the Wildlife and Countryside Act 1981. The species is listed as *vulnerable* in the UK, is a UK BAP *priority* species and is listed in the Dartmoor BAP (EN & DNPA 1997).

4.22 The NBN database contains records from the 1990s from five 10km grid squares in the Dartmoor area: SX 58, SX67, SX77, SX78 and SX79 (NBN 2006). Grid square SX58 contains areas of Willsworthy, Okehampton and Merrivale Training Areas, and SX67 contains areas of Merrivale and Cramber Training Areas. The remaining grid squares lie outside the Dartmoor Training Area.

Multi Fruited River Moss (Cryphaea lamyana)

4.23 Multi-fruited river moss is a robust moss growing on exposed roots of trees, particularly sycamore and ash in the flood zone of river banks. It is also occasionally found on low-hanging horizontal branches, river bank rocks and bridge stonework. It is typically found growing on near-vertical surfaces and appears to avoid heavily shaded situations (UK BAP 2006).

4.24 The species has been recorded from several parts of Europe, including France, Switzerland, Spain, Italy and Portugal. It also occurs in Africa. In Britain it is confined to south-west England and south-west Wales. Its principal stronghold is the Afon Teifi in Wales, where occurs sporadically along an 80 km stretch of the lower part of the river. It has also been recorded in Devon and Cornwall, where there are several records for the middle and upper reaches of the River Tamar. It was last seen on the River Tamar in 1992, and there are more recent records on the Rivers Bovey, Taw and Dart. However, searches in Devon and Cornwall in 1996 failed to re-find the species (UK BAP 2006).

4.25 The species is classified as vulnerable in the UK, and is protected under the Wildlife and Countryside Act 1981. It is a UK BAP *priority* species and is included in the Dartmoor BAP (DNPA 2005).

4.26 The NBN database contains records for this species from two 10km grid squares in the Dartmoor region: SX47 and SX76. These both lie outside the Dartmoor Training Area.

Orange-fruited Elm Lichen (Caloplaca luteoalba)

4.27 This species is believed to have once been widely distributed in the UK, with a bias towards lower rainfall eastern areas. It is currently largely confined to the dry bark of mature elm trees (UK BAP 2006). It is a UK BAP *priority* species and is included in the Dartmoor BAP (DNPA 2005). The species is listed as vulnerable in the UK and is protected under the Wildlife and Countryside Act 1981.

4.28 The NBN database holds no records for this species outside Wales (NBN 2006).

A Lichen (Bryoria smithii)

4.29 This species is a dark brown beard like lichen of upland trees. It grows on acidic bark of mature trees, and on mossy boulders in sheltered but well lit locations. This species has only been recorded from two locations in the UK since 1970, both are on Dartmoor (UK BAP 2006). The species is listed as critically endangered in the UK and is protected under the Wildlife and Countryside Act 1981. It is a UK *priority* species and is included in the Dartmoor BAP (DNPA 2005).

4.30 The NBN database does not contain any record of this species outside Wales (NBN 2006).

A Lichen (Graphina pauciloculata)

4.31 This crusteose lichen grows on the smooth bark of trees such as hazel, holly and young oak in ancient damp woodlands. The species is very rare in the UK and is only recorded from two sites on Bodmin Moor and two sites on Dartmoor (UK BAP 2006). It is classified as vulnerable in the UK, it is a UK BAP *priority* species and is included in the Dartmoor BAP (DNPA 2005, UK BAP 2006).

4.32 The NBN database contains no records for this species in Devon (NBN 2006).

A Lichen (Schismatomma graphodioides)

4.33 This species is restricted to slightly nutrient-enriched bark on the trunk of beech, ash or oak trees in ancient parkland or open woodland. It is very rare in the UK and is recorded from only five to ten sites in eastern Scotland and south west England. It is listed as vulnerable in the UK, is a UK BAP priority species, and is listed in the Dartmoor BAP (UK BAP 2006).

4.34 The NBN database contains no records for this species in Devon (NBN 2006).

Other Species of Conservation Importance

4.35 Species noted in the *Vegetation survey and assessment of Crownhill Down and Smallhanger Waste, South Devon* (Cross 2004), areas which lie outside the Dartmoor Training Area include: marsh clubmoss (*Lycopodiella inundata*), spring quillwort (Isoetes echinospora), wild chamomile (*Chamaemelum nobile*) and Cornish moneywort (*Sibthorpia europaea*). A number of Red Data Book lichens are also noted.

4.36 With the exception of lists of fungi and lichens recorded from Willsworthy Training Area (undated), and lists of fungi recorded from Doetor Common (2000) and Bearwalls Farm (2000) (all included in the MoD Willsworthy Site Dossier held at Okehampton Camp), no surveys for fungi, lichens or lower plants have been identified.

Gaps in Coverage

4.37 No report or book giving an overview of the notable plants of Dartmoor appears to have been produced. Data required for such a study would include records of protected or otherwise notable plant species from Biological Records Centres, Botanical Society of the British Isles and local plant recorders.

5 Vertebrates

Birds

5.1 Dartmoor supports bird populations of regional and national importance and represents a southern outpost in the UK distribution of a number of moorland and upland species.

General Publications

5.2 Publications relating more generally to the birds of Dartmoor include *Birds of the Postbridge Area (*Dare and Hamilton 1968), *Checklist of the Birds of Dartmoor* (author unknown 1978), *Redstarts at Burrator* (Jones and Jones 1980), *The breeding bird survey: the first five years* (Bashford 1995), *Tetrad Atlas of Breeding Birds in Devon* (Sitters 1998), *The birds of Dartmoor* (Smaldon 2005), and the annual reports of the Devon Bird Watching and Preservation Society.

5.3 UK-wide bird distributions are published in *The New Atlas of Breeding Birds in Britain 1998-1991* (Gibbons *et al* 1993), and *The State of The UK's Birds* 2004 (RSPB 2004) summarises UK-wide population changes for most bird species.

National and Local BAP Species

5.4 UK BAP *priority* species listed in the Dartmoor BAP include skylark, cirl bunting, and woodlark; local BAP species include buzzard, curlew, dunlin, golden plover, red grouse, and ring ouzel. Priority species listed in the Devon BAP include night jar and cirl bunting; and local BAP species include barn owl and curlew (EN & DNPA 1997, UK BAP 2006, Devon County Council 2006).

Bird Surveys

5.5 A number of bird surveys and breeding bird surveys have been carried out for Dartmoor. These include the moor-wide *Ecological Survey of the Breeding Bird populations and vegetation on Open Moorland Areas on Dartmoor* (Mudge *et al* 1979) and more local surveys such as *Dartmoor Environmental Baseline 1986: Breeding Bird Survey* (Robins and Juston 1986), *An Environmental Baseline: 1992 Breeding Bird Survey* (Chown *et al* 1992), *Dartmoor Upland Bird Survey* (Hughes 1997), *Dartmoor Moorland Breeding Birds* (ADAS 1997), *Upland Bird Survey Dartmoor National Park* (Jones 1999), *Breeding Lapwing and Curlew* (Smaldon

1999), *and Breeding Wading Birds in the Dartmoor National Park* (Baines 2000). In addition, *Dartmoor Moorland Breeding Bird Survey 2000* (Geary 2000) was a comprehensive moor-wide survey using the standard British Trust for Ornithology (BTO) Breeding Bird Survey (BBS) methodology.

5.6 Mudge *et a*l's 1979 survey looked at the association between bird species and habitats on Dartmoor. It found that golden plover and dunlin are associated with blanket bog; snipe, grasshopper warbler and reed bunting are associated with valley bog; grey wagtail and dipper are associated with upland streams; lapwing and curlew are associated with damp low altitude grassland and heather moor; whinchat, stonechat, linnet and yellowhammer are associated with dry grassland and rocks; tree pipit, redstart, whinchat, stonechat, yellowhammer and woodlark are associated with bracken slopes and scrub; and red grouse, ring ouzel, whinchat and stonechat are associated with heather and bilberry moor. This study also assessed the threats to birds on Dartmoor and recommended measures to aid their conservation. Maintaining the cover of wet blanket bogs on Dartmoor was considered essential and therefore land drainage was considered an important threat. The reinstatement of bog pools, rational burning of moorland and gorse, the planting of scrub in some areas and the prevention of over grazing were also suggested. Monitoring of recreational activity on the moor, and the spreading of military activity on the moor throughout the year (to reduce training intensity in the breeding season) were recommended.

5.7 Robin and Jutson's (1986) baseline survey assessed breeding birds on the four 2kmx2km plots that were surveyed for vegetation in the *1984/5 baseline survey* (Dartmoor Steering Group 1985). These areas are centred on Blackdown (1km south of Okehampton Camp, and in the north of Okehampton Training Area), Dinger Tor (located towards the centre of Okehampton Training Area), Steeperton Tor (in the north east of Okehampton Training Area) and Doetor Common (in the north west of Willsworthy Training Area). Most notably, the survey found that snipe numbers had decreased since the 1979 survey, and that golden plover numbers had probably declined. Chown's 1992 survey repeated this survey and found that populations of most upland bird species were stable. However, two species exclusively associated with blanket bog (Golden Plover and Dunlin) were found to be declining. Vegetation was found to be changing within blanket bog and increasing in height. In addition, assessments of disturbance were made for golden plover and dunlin.

5.8 *Breeding Wading Birds in the Dartmoor National Park An Assessment of Factors potentially limiting population sizes* (Baines 2000) estimated current populations of lapwing and curlew to be 12-14 and 5 pairs respectively. Suggestions were made for improving the population sizes of these species, including crow trapping and habitat management .

5.9 *Dartmoor Moorland Breeding Bird Survey 2000* (Geary 2000) aimed to establish the populations of characteristic upland breeding bird species in Dartmoor. Target species included red grouse, lapwing, snipe, curlew, cuckoo, skylark, tree pipit, meadow pipit, redstart,

whinchat, stonechat, wheatear, grasshopper warbler, linnet, yellowhammer and reed bunting. Where appropriate, these counts were broken down into populations supported by open moorland, valley mire, gorse and rhos pasture habitats. Standard BBS survey methodology was used for open moorland areas, and an adapted version of the Brown and Shepherd (1993) methodology was used for valley mire, rhos pasture and gorse habitats.

5.10 The total population size estimates (numbers of pairs on Dartmoor) were: red grouse 18-30, lapwing 11 – 16, Snipe 100 – 200, curlew 4, cuckoo 45 – 185, skylark 11000 – 15000, tree pipit 200 – 300 meadow pipit 16750 – 22750, redstart 100 – 425, whinchat 350 – 800, stonechat 1200 – 2000, wheatear 2500 – 3800, grasshopper warbler 40 – 110, Dartford warbler 30 – 100, linnet 1100 – 2500, yellowhammer 267 – 785, and reed bunting 410 – 790. Species which showed a decline from Mudge *et a*l's 1979 estimates included red grouse, lapwing and cuckoo. Species showing little change included snipe, skylark, meadow pipit, and grasshopper warbler. Species showing an increase included tree pipit, redstart, whinchat, wheatear, Dartford warbler (a recent colonist), and reed bunting.

5.11 An assessment of the importance of Dartmoor for breeding birds was also made, and this put Dartmoor's stonechat population as *internationally important*, its whinchat and meadow pipit populations as '*likely to be of international importance*', and its skylark, wheatear and Dartford warbler populations as *nationally important*. Its golden plover, dunlin, snipe, red grouse, cuckoo, tree pipit, redstart, grasshopper warbler, linnet, yellowhammer and reed bunting populations were described as *regionally important.* It also had significant numbers of spotted flycatcher and willow tit.

5.12 An analysis of habitat preference revealed the following associations. Blanket mire was vital for golden plover and dunlin, and of importance for red grouse, skylark and meadow pipit. Valley mire was important from lapwing, snipe, curlew, meadow pipit and reed bunting. Gorse was important for stonechat, Dartford warbler, linnet, and yellowhammer. Heather moorland was important for skylark, meadow pipit, whinchat, and stonechat. Bracken was important for tree pipit, stonechat, wheatear, linnet, and yellowhammer, and rhos pasture was important for grasshopper warbler, sedge warbler, garden warbler, blackcap, chiffchaff, willow warbler goldcrest, willow tit, spotted fly catcher and reed bunting.

5.13 The report also includes a table listing the key sites on Dartmoor for 17 bird species and makes recommendations for the maintenance and enhancement of breeding bird populations. These include a general reduction in grazing pressure across the moor, a reduction in summer and winter grazing in selected areas, a return to shepherding practices to distribute grazing more evenly and avoid local overgrazing. However, certain areas could be specifically targeted for heavier grazing to encourage the shorter grass sward favoured by wheatear. Grazing on large areas of moderately grazed grassland should be maintained to support skylark numbers. Controlled burning would reduce the likelihood of the more damaging large-scale fires. Areas of blanket mire and heath with high densities of stonechat, Dartford warbler,

and red grouse should be targeted. Further recommendations include the restoration of heathland (for example on semi-improved farmland and former forestry plantation), removal of dead livestock in the vicinity of breeding waders on blanket or valley mire (in order to reduce predator density), the reduction of grazing pressure on valley mires and the discouragement of recreational use of sensitive sites during the breeding season.

Disturbance

5.14 Studies addressing the issue of disturbance of birds on Dartmoor include *An Ecological Survey of the Breeding Bird populations and vegetation on Open Moorland Areas on Dartmoor* (Mudge *et al* 1979), *The Effects of Recreational Disturbance on upland Breeding Birds 1997-1999* (Jones 2000) and *Dartmoor Moorland Breeding Bird Survey 2000* (Geary 2000).

5.15 Mudge *et al*'s study suggested that recreational pressure on Dartmoor should be monitored, and that military training activity be spread throughout the year rather than being concentrated in the breeding season.

5.16 Jones's (2000) study addressed the issue of recreational disturbance in more detail and assessed impacts on the following regionally or nationally important species: merlin, red grouse, golden plover, dunlin, ring ouzel, and wheatear. The merlin was not breeding on Dartmoor at the time of the survey, but did until 1965. Conditions in 2000 appeared suitable for this species. The red grouse was present but recreational disturbance (especially from dogs) was though to be an important factor in its 50% reduction in numbers in suitable habitat (comparable to Geary's (2000) finding of a 'slight decline' from 57 territories in 1979 to 18-30 pairs in 2000). Disturbance of golden plover at Cranmere Pool and Whitehorse Hill was found to be a problem, and there was evidence of disturbance effects on dunlin. Ring ouzel is prone to disturbance at its breeding grounds and is likely to suffer from recreational disturbance (e.g. at Headland Warren and Tavy Cleave). Wheatear occurs at a high density on Dartmoor and is vulnerable to disturbance from walkers and letterboxing.

5.17 Recreational activities which occur on Dartmoor and have the potential to cause disturbance to birds include: walking, letterboxing, climbing, abseiling, hang-gliding, paragliding, orienteering, expeditions and adventure training, mountain-biking, birdwatching, horse riding and off-road motoring.

5.18 Certain sensitive sites particularly prone to disturbance were identified including Cranmere Pool, Black Hill, the bog south of Cut Hill, the plateau of Whitehorse Hill, the entire valley of Tavy Cleave, the Headland Warren area, Birch Tor and Steeperton Tor.

5.19 The *Dartmoor Moorland Breeding Bird Survey 2000* (Geary 2000) incuded recommendations for the management of recreational activities. These included discouraging walkers from sensitive areas such as blanket mire favoured by golden plover and dunlin, key valley mire

sites that hold the remaining breeding lapwing and curlew, areas that hold breeding ring ouzel and red grouse (such as Tavy Cleave and Warren House/Birch Tor - a site which has recently held a winter communal roost of hen harriers). Disused quarries which may provide roost sites for breeding raptors (e.g. peregrine and raven) could also be protected.

Notable Species

5.20 The following sections describe the BAP species and other bird species of conservation concern on Dartmoor.

Skylark (Alauda arvensis)

5.21 The skylark is one of the most widespread of the British birds, with over 2 million breeding pairs and up to 25 million winter migrants (Gibbons et al 1993). However, Common Bird Census (CBC) and Breeding Bird Survey (BBS) counts show a decline of 60% between 1967 and 2002 (BTO 2006). Autumn-sown cereals, and fertilised (hence taller growing) grassland are possible causes of this decline (UK BAP 2006). The species is a UK BAP *priority* species.

5.22 The NBN database does not contain records for this species in Devon. Distribution maps in Gibbons *et al* (1993) show that this species is present and breeding in all 10km grid squares on Dartmoor (as well as throughout almost all of the rest of the UK). Geary (2000) estimated the Dartmoor skylark population to be 11000-15000 pairs, with no reduction over the period 1979 to 2000.

Cirl Bunting (Emberiliza cirlus)

5.23 The cirl bunting is closely associated with traditional mixed farming and was widely distributed across Britain in 1938. The population crashed in the 1980s however, and in 1989 only 118 pairs were present in the UK (Gibbons *et al* 1993). All but four were in south Devon. The population subsequently increased and the estimate for 1996 put it at 370 occupied territories (Gibbons *et al* 1993). The species is a UK BAP *priority* species. It is listed in the Dartmoor BAP.

5.24 The NBN database includes records for this species from a number of 10km grid squares to the south of Dartmoor but none of these lie within the Dartmoor Training Area (NBN 2006). The distribution maps in Gibbons *et al* 1993 indicate that this species is concentrated towards the south coast of Devon, and it was not recorded from Dartmoor in 1988-1991.

Woodlark (Lullula arborea)

5.25 The woodlark nests in a range of habitats including farmland, recently felled forestry and heathland. The species was formerly found across Britain south of Yorkshire. However, it is currently restricted to five core areas: Devon, east Dorset/south Hants, Surrey/Hants border, Breckland and the Suffolk Coast. The UK-wide population of this species increased from 250 pairs in 1986 to 600 in 1993 (Sitters *et al* 1996). 1550 pairs recorded in 1997 (Wotten and Gillings 2000). The species is a UK BAP priority species and is specially protected under the Wildlife and Countryside Act 1981 (listed in Schedule 1), and the EC Birds Directive (listed in Annexe 1).

5.26 The NBN data base includes records from a number of 10km squares on Dartmoor, including SX69 which includes part of Okehampton Training Area. Distribution Maps in Gibbons *et al* (1993) show that the woodlark was breeding in the Dartmoor area in 1988-1991.

Nightjar (Caprimulgus europaeus)

5.27 This species is a summer migrant that declined in range and numbers for much of the 20th Century. A low point of 2100 males was reached in 1981. The population recovered to 3200 males by 1992 (Gibbons *et al* 1993). RSPB estimates show that the species increased by 114% between 1981 and 2004 (RSPB 2004). The species currently breed mainly in southern England in lowland heathland and young forestry plantations (UK BAP 2006). The species is specially protected under the Wildlife and Countryside Act 1981 (listed in Schedule 1) and the EC Birds Directive (listed in Annex 1).

5.28 Distribution maps in Gibbons *et al* (1993) indicate that this species was breeding towards the east of Dartmoor in 1998-1991.

Buzzard (Buteo buteo)

5.29 This species is of low conservation concern nationally and has a dense population over much of the UK. Combined CBC and BBS counts for this species show a 407% increase between 1967 and 2002 (BTO 2006). It is included in the Dartmoor BAP (EN & DNAP 1997, DNPA 2005) because it is highly characteristic of the area and is a popular species.

5.30 Distribution maps in Gibbons et al 1993 indicate that it was present or breeding in all 10km grid squares on Dartmoor in 1988-91.

Curlew (Numenius arquata)

5.31 The curlew breeds throughout much of Britain but is absent from most of south east England. It is characteristic of upland habitats, although it can also be found in agricultural habitats such as pastures and cereals. The species expanded in some areas and declined in others over the period 1950-1990 (Gibbons *et al* 1993). BBS counts show a decrease of 27% for the UK over the period 1994 to 2003 (BTO 2006), although there is evidence for a slight increase of wintering curlew abundance in the UK (Pollitt *et al* 2003). The species is not a UK BAP *priority* species, although it is a *local* species in the Dartmoor BAP because of its small and probably declining population on Dartmoor (EN & DNPA 1997, DNPA 2005).

5.32 Distribution maps in Gibbons *et al* (1993) indicate that this species was breeding in the north of Dartmoor in 1988-91. Geary (2000) estimated the Dartmoor population to be 1-4 pairs, a decline from the 23 pairs estimated by Mudge *et al* in 1979.

Dunlin (Calidris alpina)

5.33 In the UK, the dunlin is largely confined to the uplands of Wales, northern England and Scotland. Its presence in southern England is confined to Dartmoor, and this population is reported to be the most southerly breeding population of this species in the world (Gibbons *et al* 1993). RSPB estimates suggest a UK-wide decline of 36% for this species between 1974 and 2003 (RSPB 2004). It is not a UK BAP priority species, but is included in the Dartmoor BAP because of its critically small population on Dartmoor (EN & DNPA 1997, DNPA 2005).

5.34 Distribution maps in Gibbons *et al* 1993 show that it was recorded from one 10km grid square on Dartmoor in 1989-91. Survey work by Robins and Jutsum (1992) suggest that numbers of this species are declining on Dartmoor.

Golden plover (Pluvialis apricaria)

5.35 As for the dunlin, the golden plover is an upland species, and in the UK is largely confined to Wales, Scotland and northern England. BBS counts for this species indicate a decrease of 9% from 1994 to 2003 (BTO 2006). Distribution maps in Gibbons *et al* (1993) indicate that it is present and breeding in Dartmoor. It is not a UK BAP *priority species*. However, it is included in the Dartmoor BAP as a *local* species because its population there is critically small (EN & DNPA 1997). It is specially protected under the EC Birds Directive (listed in Annexe 1).

Red grouse (Lagopus lagopus)

5.36 The red grouse is an upland species and confined to the north and west of the UK. Its population in southern England is limited to Dartmoor and Exmoor, as indicated by distribution maps for this species in Gibbons *et al* (1993). BBS counts for the UK indicate a 22% increase between 1994 and 2003 (BTO 2006). Although not a UK BAP species, the red grouse has a small highly valued population on Dartmoor and it is therefore listed in the Dartmoor BAP (EN & DNPA 1997, DNPA 2005). Geary (2000) estimated the Dartmoor red grouse population at 18 to 30 pairs, a decline from 57 territories in 1979 (Mudge *et al* 1979).

Ring ouzel (Turdus torquatus)

5.37 The ring ouzel is an upland and montane species and is confined to the north and west of Britain. Gibbons *et al* (1993) showed a decline of 27% in the number of 10km squares occupied by this species between 1968 and 1991 and it is thought to be declining throughout its UK range (EN & DNPA 1997). Wotten *et al* (2002) estimated a 58% decline in the population size of this species between 1988 and 1999. Distribution maps in Gibbons *et al* (1993) indicate that it is present and breeding in Dartmoor and Exmoor. Although not a UK BAP species, the ring ouzel is included in the Dartmoor BAP.

5.38 The species has received particular attention on Dartmoor and several targeted survey have been carried out. For example *An Ecological Study of Breeding Bird Populations and vegetation on Open Moorland Areas of Dartmoor* (Mudge *et al* 1979) looked at habitat preferences of ring ouzels on Dartmoor and *The Effects of Recreational Disturbance on upland Breeding Birds 1997-1999* (Jones 2000) assessed disturbance to this species. Specific ring ouzel surveys on Dartmoor have been carried out in 1997 (Jones 1997), 1998 (Jones 1998) and 2003 (RSPB 2003).

5.39 Mudge *et al* 's (1979) study showed that the ring ouzel is most closely associated with open *Calluna* and *Vaccinium* moorland vegetation on Dartmoor rather than habitats such as bog, grassland, rocks or bracken.

5.40 The 1997 survey visited 45 potentially suitable sites and found ring ouzels at 18 of them. In total 20 territories were identified and eight pairs were known to have bred. The estimate for the total number of breeding pairs for Dartmoor was 26 to 28 pairs. These figures were lower than anticipated, and the species was absent from a number of sites that were considered highly suitable for this species by the authors, e.g. Tavy Cleve.

5.41 Jones's (2000) assessment of the impact of recreational disturbance on upland breeding birds concluded that the species has declined by 10% on Dartmoor in the previous 10 years. This species is prone to disturbance at its breeding sites and it is particularly vulnerable to

recreational disturbance. Tavy Cleave and Headland Warren were thought to be susceptible sites.

5.42 The 2003 survey identified 23 territories, eight confirmed breeding pairs, five probable breeding pairs and one possible breeding pair. Important areas included Tavy Cleave, Hare Tor, Sharp Tor, Headland Warren, Steeperton Tor, Black Tor and Yes Tor. West Mill Tor was reported to be ideal habitat, but second broods were affected by military training activities at this site. Several other sites including Belstone Common, Oke Tor, Homerton Tor, Steng-a-Tor, Row Tor and East Tor are reported as possible sites for this species, but some are likely to be affected by military training activity. The report estimated 27 to 36 pairs of ring ouzels breeding on Dartmoor in 2003.

Barn owl (Tyto alba)

5.43 The barn owl is a species associated with farmland and rough grassland and is distributed across England and Wales. There is evidence for a decline in the UK population size of this species throughout the 20th Century (BTO 2006). A 1995-1997 national census estimated the UK population at 4000 pairs. Distribution maps in Gibbons *et al* (1993) show that the species breeds around much of the periphery of Dartmoor. The barn owl is not a UK BAP species, but is listed in Annex 1 of the Dartmoor BAP (EN & DNPA 1997): *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area* (EN & DNPA 1997). It is specially protected under the Wildlife and Countryside Act 1981 (listed on Schedule 1).

Bullfinch (Pyrrhula pyrrhula)

5.44 The bullfinch is a relatively common species found in woodland, farmland and scrub. It occurs throughout most of the UK, except for the far north and west (Gibbons *et al* 1993). CBC and BBS counts show a decline of 53% across the UK between 1967-2002 (BTO 2006). The species is protected under the EC Birds Directive. The bullfinch is a UK BAP priority species. It is not listed in the Dartmoor or Devon BAPs, but is included in Annex 1 of the Dartmoor BAP: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area.*

5.45 The NBN database does not contain any records for this species for Devon (although it is undoubtedly widespread throughout the county). Distribution maps in Gibbons *et al* (1993) indicate that it was breeding in most 10km grid squares on Dartmoor in 1988-1991.

Song Thrush (Turdus philomelos)

5.46 This species is common and widespread but declining throughout the UK. Large numbers of continental breeders overwinter in the UK. CBC and BBS counts indicate a decline of 51% between 1967 and 2002 (BTO 2006). The song thrush is a UK BAP priority species. It is not listed in the Dartmoor or Devon BAPs, but is included in Annex 1 of the Dartmoor BAP: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area*.

5.47 The NBN database does not contain any species records for this species in Devon (NBN 2006). Distribution maps in Gibbons *et al* (1993) indicate that the species was breeding in all 10km grid squares on Dartmoor in 1988-1991.

Linnet (Carduelis cannabina)

5.48 The linnet is a common and widespread species in the UK countryside. It favours weedy fields, gorse thickets, hedgerows, heathland and scrub. CBC and BBS counts indicate that numbers declined by 68% between 1967 and 2002 (BTO 2006). The UK range also declined slightly over this period (UK BAP 2006). This species is a UK BAP priority species. This species is not listed in the Dartmoor or Devon BAPs, but is included in Annex 1 of the Dartmoor BAP (EN & DNPA 1997): *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area*

5.49 The NBN database does not contain any records for this species in Devon, Distribution maps in Gibbons *et al* (1993) indicate that this species was either breeding or present in all 10km grid squares on Dartmoor (as well as throughout almost all of the rest of England and Wales) in 1988-1991. Geary (2000) estimated the Dartmoor linnet population to be 1100 to 2500 pairs.

Mammals

National and Local BAP Species

5.50 UK BAP *priority* species listed on the Dartmoor BAP include otter, dormouse, pipistrelle bat, barbastelle bat, greater horseshoe bat and lesser horseshoe bat. UK BAP priority species listed on the Devon BAP include, the water vole, brown hare, otter, dormouse and greater horseshoe bat (DNPA 2005).

Bats

5.51 All bats are protected in the UK under the Wildlife and Countryside Act 1981 (listed in Schedule 5) and the Conservation (Natural Habitats &c.) Regulations 1992 (listed in Annexe IV). The greater horseshoe bat (*Rhinolopus ferrumequinum*) is included on the Dartmoor BAP as it is declining throughout much of northern Europe, and the largest British nursery roost for this species is on Dartmoor (EN & DNPA 1997). The pipistrelle bat (*Pipistrellus pipistrellus*) is listed in Annex 1 of the Dartmoor BAP: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area* (EN & DNPA 1997).

5.52 Of the mammal surveys that have been carried out in the Dartmoor area, most focus on bats. Bat surveys carried out on Dartmoor include *A Pilot Study of the Use of Key Dartmoor Habitats by Bats* (Billington 2001a), *A Survey of the Use of the Upper Teign Valley Woods by Bats* (Billington 2001b), *Okehampton Training Camp Chiroptera Appraisal* (Kaczanow 2002), *Roosting, Dispersal and Foraging Behaviour of Barbastelle Bats in Hawns and Dendles Wood, Dartmoor* (Billington 2003a) and *Use of the Bovey Valley Woods by Bats Including an Assessment of Yarner Wood Beech Trees for Bats* (Billington 2003b). With the exception of Kaczanow (2002) which covers Okehampton Training Camp specifically, these surveys have concentrated on valleys and woodlands below the open moorland on Dartmoor, and outside Dartmoor Training Area.

5.53 The *Key Dartmoor Habitats* (Billington 2001) survey covered five areas using bat detector transects and mist netting. Ten bat species were confirmed including brown long-eared, Daubenton's, Natterer's, common pipistrelle, soprano pipistrelle, whiskered bat, barbastelle, greater horseshoe, lesser horseshoe, and noctule. Of these species, five are UK BAP *priority* species: pipistrelle, soprano pipistrelle, barbastelle, lesser horseshoe, and greater horseshoe. In total 10 roosting sites of six species were confirmed including four trees (in Hawns and Dendles Wood, and Yarner Wood), two houses, one church, one barn, one farm, and a disused mine. Six possible roosting sites were located in trees in Hawns and Dendles Wood.

5.54 The survey of the Upper Teign Valley woods (Billington 2003b) found 11 species of bats in four areas of woodland in the Teign Valley. These included lesser horseshoe, barbastelle (*Barbastella barbastellus*) and Nathusius's pipastrelle (*Pipistrelllus nathusii*). The former two species are both UK BAP *priority* species and the latter is one of Britain's rarest bats. In addition, nine roost sites were identified and 114 other potential roost sites were recorded. Important foraging areas included the River Teign valley, and Bridford, Broadmoor, and Upperton Woods. In general the results suggested that woodland and river valley habitats are particularly important for bats in the area. Crevices in the central pier of Hexworthy Bridge may also be used by bats. Important foraging areas included Holne Moor (with exceptionally high greater horseshoe activity).

5.55 The survey of Okehampton Camp (Kaczanow 2002) used building inspection, bat detector transects, fixed point bat detectors and trapping to assess the suitability of the site for bats. A total of eight bat species were identified including pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Brandt's (*Myotis brandtii*), whiskered (*Myotis mystacinus*), brown long-eared (*Plecotus auritus*), Daubenton's (*Myotis daubentonii*), lesser horseshoe (*Rhinolophus hipposideros*), Natterer's (*Myotis nattereri*), and noctule (*Nyctalus noctula*). In total, 12 buildings were examined internally and six were found to contain signs of bats. A further 17 buildings were considered suitable for bats but were not inspected internally. The text also refers to an observation of a greater horseshoe (*Rhinolopus ferrumequinum)* flying along the eastern boundary of the site.

5.56 The further survey of Hawns and Dendles Wood (Billington 2003a) involved mist netting and radio-tagging of barbastelle bats to find roosting sites and commuting routes. Four new roost sites were found in trees, one each in Hawns, Dendles and Fernfires Woods, and one in a hedgerow near Ivybridge. The tagged bats were recorded up to 8km to the south, although favoured feeding areas were in Dendles and Fernfires Woods, hedgerows around these woods and east of Torr, and much further south on the River Yealm south of Lee Mill and surrounding woodland and hedgerows. These areas all lie in the south of Dartmoor and beyond, and well outside the Dartmoor Training Area.

5.57 The Bovey Valley woodlands (Billington 2003) survey found eight species of bats present in the Bovey Valley and Yarner Woods, identified important foraging areas, and made recommendations for habitat improvements.

5.58 In summary, woodland valleys and watercourses with good woodland cover appear to be the key foraging habitat for bats on Dartmoor. This suggests that the open moorland which characterises the Dartmoor Training Areas is not a key habitat for bats.

5.59 Bats recorded in the Willsworthy Site Dossier (reviewed in 2005) include noctule and whiskered bat (recorded from Standon Farm in 1995), greater horseshoe (recorded from SX553809 in 1995), lesser horseshoe (recorded from SX553809 1995), and Natterer's (recorded from SX548811 in 1991).

Otter (Lutra lutra)

5.60 The otter was lost from much of the UK between 1950 and 1980. Recent surveys have shown an increase in many areas. The Environment Agency 2000-2002 survey (Environment Agency 2002) covered all adjacent squares but did not include the 50km grid square which covers Dartmoor: SX. The text reveals that surveys by Devon Wildlife Trust volunteers show a high level of otter usage throughout grid square SX, including Dartmoor. In fact Dartmoor is thought

to be an important area for movement of this species between the Devon watersheds (Environment Agency 2002).

Dormouse (Muscardinus avellanarius)

5.61 The dormouse is a species of woodlands with dense shrub layers, overgrown hedges and other scrub (Bright and Morris 2002). The species is rapidly declining in the UK and is included in the Dartmoor BAP (EN & DNPA 1997), it is not a UK BAP priority species however. It is protected under the EU Habitats Directive (listed in Annexe IV) and in the UK by the Wildlife and Countryside Act 1981 (listed in Schedule 5), and the Conservation (Natural Habitats &c.) Regulations 1994 (listed in Schedule 2). It is thought to breed in thick species rich hedges in the Dartmoor area (EN & DNPA 1997).

Water Vole (Arvicola terrestris)

5.62 In Britain the water vole is confined largely to the lowlands. It was once widespread but has suffered a significant decline. A national survey in 1989-1990 failed to find this species in 67% of sites where it had previously been recorded (UK BAP 2006). The water vole is a UK BAP *priority* species. It is not included in the Dartmoor BAP, but is listed in Annex 1 of the Dartmoor BAP (EN & DNPA 1997): *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area*. Burrows of this species and individuals using those burrows are protected under the Wildlife and Countryside Act 1981 (listed in Schedule 5).

5.63 Water voles are thought to be present within Cramber Training Area (WSP 2003).

Brown Hare (Lepus europaeus)

5.64 The brown hare is a UK BAP *priority* species. Although formerly abundant, the hare appears to have undergone a substantial decline since the 1960s (UK BAP 2006). It is not included in the Dartmoor BAP, but is listed in Annex 1 of that document: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area* (EN & DNPA 1997).

Mammals at Willsworthy Training Area

5.65 Mammal species noted in the *Willsworthy Site Dossier* (reviewed in 2005) include mole, hedgehog, short tailed vole, brown hare (listed as fairly rare), rabbit (listed as widespread),

brown rat, grey squirrel, fox, stoat, weasel, badger (for which a number of setts are confirmed from the mid 1990s, but details are not included here), otter (recorded from Standon Steps in 1991), mink (recorded from Tavy Cleave in 1995), pony, sheep, cattle, and roe deer (recorded from Doe Tor).

Amphibians and Reptiles

5.66 Amphibians and reptiles listed in the *Willsworthy Site Dossier* (reviewed in 2005) include common frog, marsh frog (listed as likely at Yellowmead and Doe Tor marshes), common toad, common lizard (recorded from rocks at Hare Tor), slow worm (recorded from the ruined walls at Doe Tor Farm), adder (listed as common on moorland), and grass snake. All of theses species are partially protected under the Wildlife and Countryside Act 1981.

5.67 The great crested newt may be present in ponds across Dartmoor. This species is protected by the Wildlife and Countryside Act 1981 (listed in schedule 5) and the EC Habitats Directive Annex IV, and thus the UK Habitats Regulations (Schedule 2). It is a UK BAP priority species.

Fish

5.68 The Willsworthy Site Dossier (reviewed in 2005) listed brown trout, sea trout and salmon as being present in part of the Willsworthy Training Area. The Environment Agency does not hold any fish data for the Dartmoor Training Area.

Military Activity and Vertebrates

5.69 WSP carried out an impact assessment of military training activities on Cramber Training Area in 2003. This included an assessment of impacts on vertebrates. Potential sources of disturbance included the firing of blank ammunition and use of pyrotechnics. These activities may affect water voles or breeding birds on the training area. The presence of troops during the nesting season may also have impacts, through direct damage to nests and disturbance of nesting birds.

Gaps in Coverage and Recommendations

5.70 There have been a number of extensive surveys of birds. Otherwise no systematic surveys have been carried out for vertebrates on Dartmoor. The moorland habitat is likely to support good numbers of reptiles, and populations of salmon may breed in Dartmoor streams. Water voles and otters may also be using streams in some areas. Bat surveys have previously only

covered some of the lower areas of Dartmoor outside the Dartmoor Training Area (other than a survey of Okehampton Camp), and the use of moorlands and upland areas in general by bats has not been studied. Further records for vertebrates from the Dartmoor area may be held by local recording groups (e.g. badger bat and amphibian groups) and biological records centres.

6 Invertebrates

Introduction

6.1 Dartmoor is well known for its important invertebrate fauna, in particular its butterflies, beetles and damselflies. As the most southerly area of upland and upland fringe habitats in the UK, with areas that have seen relatively little recent agricultural improvement, it offers an unique environment for invertebrates in Britain. For example, the extensive areas of rhos pasture, a habitat that is rare outside Devon and South Wales, support important colonies of marsh fritillary butterflies, various species of dragonflies and damselflies, including the only two colonies of southern damselfly known from the UK.

National and Local BAP Invertebrate Species

6.2 National BAP *priority* invertebrates included in the Devon BAP include the southern damselfly, pearl-bordered fritillary and marsh fritillary. No local BAP invertebrate species are included in the Devon BAP.

6.3 National BAP priority invertebrates included in the Dartmoor BAP include the blue ground beetle, high brown fritillary, pearl-bordered fritillary, marsh fritillary, southern damselfly, bog hoverfly and narrow-bordered bee hawk moth. No local BAP species are included in the Dartmoor BAP.

6.4 The following paragraphs describe the BAP invertebrate species of Dartmoor, along with other invertebrate species of conservation concern. Where no other data is available, 10km or 1km grid square records have been obtained from the NBN website (NBN 2006).

Butterflies and Moths

6.5 *The Millennium Atlas of Butterflies in Britain and Ireland* (Asher *et al* 2001) provides background information and conservation status for UK butterfly species. Species described in the following paragraphs have received particular attention from the DNPA and Butterfly Conservation on Dartmoor. The following paragraphs describe the BAP species and other invertebrates of conservation interest on Dartmoor.

High Brown Fritillary (Argynnis adippe)

6.6 The high brown fritillary favours bracken-dominated habitats, grass/bracken mosaics and limestone outcrops (the latter are not present on Dartmoor). Its larval food plants include various violet species. Its UK range has declined sharply since the 1950s and surveys carried out through the 1980s and 1990s indicate that it is only known from 50 definite localities. Its decline is though to be linked to a decrease of cattle grazing in bracken dominated habitats (Asher *et al* 2001). As well as a BAP priority species, the high brown fritillary is listed as vulnerable in the Red Data Book, and protected under the Wildlife and Countryside Act 1981.

6.7 The first survey carried out for this species on Dartmoor took place in 1989 (Oates 1989), and this was followed by *The Conservation of the High Brown Fritillary on Dartmoor* (Oates 1991). Further studies include *The High Brown Fritillary Butterfly on Dartmoor* (Grove and Knight 1992*), The High Brown Breeding Habitat Survey: 1997: Dartmoor and Exmoor* (Warren 1997), and most recently, *The Status of the High Brown Fritillary Argynis adippe* in *Dartmoor National Park* (Boyce 2000). These studies indicate that Dartmoor is the second most important area for this species in Britain, with four main meta-populations: the Dart Valley, Walkham Valley, Teign Valley and Haytor area. An addition small population exists at Skaigh and Belstone Cleave. Sites in the Dart Valley between Newbridge and Dartmeet, and the Walkham Valley from Horrabridge to Berra Tor are believed to be particularly important for this species (Boyce 2000).

6.8 Because it favours lower altitudes, this species is generally distributed outside the Dartmoor Training Area. However, it is present at Belstone Cleave and Skaigh which lie only c. 1.5km north west of the Okehampton Training Area.

Marsh Fritillary (Euphydryas aurinia)

6.9 The marsh fritillary is found in damp grassland, heath and mire vegetation and calcareous grassland (the last of these is not present on Dartmoor). Its main larval food plant is the devil's bit scabious, although it occasionally uses related species (Asher *et al* 2001). The species has declined severely since the 1950s and is thought to have been lost from 60% of its former UK range. In 1990 this species was known to be present from 432 sites in the UK. The Culm Grasslands of Devon are one of its strongholds, and rhos pastures are known to be an important habitat (Asher 2002). The marsh fritillary is a BAP priority species and is partially protected in the UK under the Wildlife and Countryside Act 1981.

6.10 One main survey for this species has been carried out on Dartmoor: *Marsh Fritillary and Narrow-Bordered Bee Hawkmoth in the Moreton-Manaton and Taw valleys 2003* (Boyce 2003). As its title suggests, this survey found the species to be present at two sites on

Dartmooor, with both adults and larval webs found at Moreton Manaton and the Tor Valley in 2003. The former site lies outside the Dartmoor Training Area on the northern border of the Okehampton Training Area.

Pearl Bordered Fritillary (Boloria euphrosyne)

6.11 The main habitats of this species include woodland clearings and well-drained mosaics of grass, dense bracken, and light scrub. It requires short sparse vegetation with abundant leaf litter and growths of its larval food plant, the common dog violet (*Viola riviniana*). This species has undergone dramatic decline in England and Wales since the 1950s, and a UK-wide survey carried out in 1997-8 revealed its probable disappearance from 60% of sites from which it was recorded in 1970-82. The survey revealed around 350 sites for this species with a large number in Scotland (Asher *et al* 2002). This species is a UK BAP priority species, and is partially protected from sale only in the UK under the Wildlife and Countryside Act 1981.

6.12 This species has been surveyed in Dartmoor in *The Status and Distribution of the Pearl Bordered Fritillary (Boloria euphrosyne)* in the *Dartmoor National Park* (Baker 1997). This species was present at 43 out of 92 sites surveyed, suggesting that Dartmoor is a major stronghold for the pearl-bordered fritillary. The species is found across Dartmoor and may be present in the Dartmoor Training Area.

Large Blue Butterfly (Maculinea arion)

6.13 The large blue butterfly is declining rapidly across Europe. It is known to have occurred in about 90 colonies in Britain, but numbers declined rapidly after the 1950s. The species became extinct in the UK in 1979, but has since been re-introduced at five sites in south west England using stock from Sweden (UK BAP 2006). It is listed as endangered on the IUCN red list, and is fully protected in the UK under the Wildlife and Countryside Act, the EC Habitats Directive (listed in Annex IV), and the UK Conservation (Natural Habitats &c.) Regulations 1994 (listed in Schedule 2).

6.14 The species is listed in Annex 1 of the Dartmoor BAP: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area* (EN & DNPA 1997). Dartmoor is listed here as a reintroduction site for this species. The NBN database holds (2005) one record for this species in the Dartmoor Area, in grid square SX76. However, this lies in south east Dartmoor, well outside the Dartmoor Training Area (NBN 2006).

Silver Studded Blue Butterfly (Plebejus argus)

6.15 The silver studded blue butterfly is a species of lowland heathland and calcareous grassland, and also occurs at a single peat land site in the UK. It requires a rather specific set of conditions, including short vegetation, moderate grazing, disturbed areas, a warm microclimate and the presence of ants of the genus *Lasius*. These conditions generally only last for 5 to 10 years in one area and therefore colonies of this species exist as meta-populations of fluctuating sub-populations. The species is estimated to have declined by 80% in the 20th Century, and is extinct in Scotland and northern England (UK BAP 2006). It is a UK BAP species and is protected from sale only in the UK by the Wildlife and Countryside Act 1981.

6.16 The species is listed in Annex 1 of the Dartmoor BAP: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area* (EN & DNPA 1997). However, the species is listed here as being extinct in the Dartmoor Natural Area. NBN data includes records of this species from five grid squares on Dartmoor: SX54, SX63, SX73, SX77, and SX87, from the period 1952 to 1985. All of these records lie outside the Dartmoor Training Area (NBN 2006).

Narrow Bordered Bee Hawk-moth (Hemaris tityus)

6.17 This species is found on a wide range of unimproved grasslands as well as wet acid bog and drier heath land. The larval food plant of the species is devil's bit scabious. It has declined severely in the UK and is thought to have retreated to the southwest of Britain, from Cornwall to Wiltshire (Waring *et al* 2003, UK BAP 2006). It is a UK BAP priority species.

6.18 A survey for this species was carried out in 2003: *Marsh Fritillary and Narrow Bordered Bee Hawk-moth in Moreton Manaton and Taw Valley 2003* (Boyce 2004). 29 adults were found at Moreton Manaton and this area is therefore considered to be important for this species. The site lies outside the Dartmoor Training Area. The NBN database does not hold any records for this species in the Dartmoor area (NBN 2006).

White Line Snout Moth (Schrankia taenialis)

6.19 The white line snout moth has been recorded from a range of habitats including open moorland, conifer plantation, and wet and calcareous woodlands. The larval food plant and lifecycle of this species is undescribed. It is distributed locally in the UK, and may be declining: it has only been re-recorded at a small number of known former sites. This species is listed as *nationally scarce* in the UK (JNCC 1996).

6.20 The species is listed in Annex 1 of the Dartmoor BAP: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area* (EN & DNPA 1997). The NBN database holds one (1974) record for this species in the Dartmoor. It lies in grid square SX77 in east Dartmoor, and outside the Dartmoor Training Area.

Double Line Moth (Mythimna turca)

6.21 The double line moth is found in grasslands and woodland clearings and rides. In south west England it is also found in more open habitats such as moorland. The larvae feed at night on common grass species. It is widely but locally distributed throughout Eurasia. In the UK, it is largely confined to South Wales and South West England and has shown signs of decline (UK BAP 2006). This moth is a UK BAP *priority* species and it is listed as *nationally scarce* in the UK (JNCC 2006). The species is listed in Annex 1 of the Dartmoor BAP: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area* (EN & DNPA 1997). The NBN database holds three (1967, 1970 & 1961) records for this species from east Dartmoor (SX67, SX67 and SX87). These locations lie outside the Dartmoor Training Area.

Waved Carpet Moth (Hydrelia sylvata)

6.22 The waved carpet moth is found in open and coppiced woodland, and its larval foodplants include young saplings of alder, birch, sallow and buckthorn. It is found across Europe and Asia but is thought to be declining in several European countries. In Britain the species has a highly localised distribution, with populations concentrated towards the south and south west of the country. This moth is a UK BAP species and it is listed as *nationally scarce* in the UK (JNCC 2006). The species is listed in Annex 1 of the Dartmoor BAP: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area* (EN & DNPA 1997). The NBN database holds one record of this species from the Dartmoor Area (SX77, 1974) (NBN 2006); this lies outside the Dartmoor Training Area.

Damselflies

6.23 The British Dragonfly Society undertook an *Inventory of Key Dragonfly Sites in Devon* (Smallshire 1996c). Within the Dartmoor National Park, this inventory lists seven key sites, including one site of international importance (Tor View Moor), five sites of national importance (Cadover Bridge, Lydford Station, the River Lyd around Lydford, Small Brook near Avon Down, and White Church Down) and one regionally important site (Haytor Down bog and

quarry). Further non-key sites include West Blackdown, Blackford Lake, and Mary Tavy Reservior.

6.24 Of these key sites, all lie outside the Dartmoor Training Area. The closest sites include Cadover Bridge c.1km south west of the Ringmoor Training Area, Lydford Station and the River Lyd c.1km west of Willsworthy Training Area.

Southern Damselfly (Coenagrion mercuriale)

6.25 The southern damselfly is a globally threatened species associated with heathland streams and runnels, rhos pasture, chalk streams and calcareous mires. It has suffered a 30% reduction in its UK distribution since 1960. It is found in south west Wales, Anglesey, Devon Dorset, and Hampshire, with its largest UK populations in the New Forest and Pembrokeshire (UK BAP 2006, BDS 2006). The southern damselfly is a BAP priority species, is listed as vulnerable on the IUCN red list and rare on the RDB. It is protected under the Wildlife and Countryside Act 1981 and is listed under Annex II of the EC Habitats Directive.

6.26 The species is known to be present on two Dartmoor sites, Tor View Moor and Moortown Bottom, both located on the north eastern fringes of Dartmoor at 245 and 285m respectively. These sites were surveyed in the 1998 *Dartmoor Scarce Damselfly Survey* (Baldock and Keedle 1998) and *Monitoring the Southern Damselfly on Dartmoor 2002* (Boyce and Baldock 2003). The species was found within runnels within M29 mire, surrounded by M25a, M21a and M16c mires. Both of the sites lie outside the Dartmoor Training Area.

6.27 The NBN website shows other recent records (1999 to 2005) to a 10km grid square accuracy. These records come from grid squares SX68 and SX69 (NBN 2006), the former contains parts Okehampton and Merrivale Training Areas, and the latter contains part of Okehampton Training Area.

Small Red Damselfly (Ceriagrion tenellum)

6.28 This species is rare and restricted to southern England and West Wales (BDS 2006). It is associated with acidic waters including bog pools and occasionally in slow flowing waters (d'Aguilar *et al* 1985).

6.29 The species was surveyed in *Monitoring the Southern Damselfly on Dartmoor 2002* (Boyce and Baldock 2003), and was found to be present at four sites. These were situated on the north west and north east edges of Dartmoor, between 200 and 300m. Three of the sites consisted of M29 runnels within larger areas of M21a and M25 mires, and the fourth had wider range of vegetation types. Sites in the north west of Dartmoor lies in the general area of the

Okehampton Training Area; the sites in the north east lie well outside the Dartmoor Training Area.

6.30 In addition the NBN website includes older records (1926 to 1988) from two 10km grid squares in the Dartmoor Region: SX58 and SX87 (NBN 2006). The former contains parts of Willsworthy, Okehampton and Merrivale Training Areas, and the latter lies outside the Dartmoor Training Area.

Scarce Blue Damselfly (Ischnura pumilio)

6.31 The scarce blue damselfly is predominantly a Mediterranean species at its northerly limit in the UK. It is most numerous in the south western counties of England and Wales. It is found in a variety of natural wetlands including shallow bog pools, valley mires, floodlands and artificial habitats. The most important features include shallow, still or slow moving water, muddy or silty substrate and minimal vegetation, but with some emergent plants present (BDS 2006).

6.32 The species was surveyed on Dartmoor in *Dartmoor Scarce Damselfly Survey* (Baldock and Keedle 1998). It was found to be present on 14 sites scattered around the west, south and east edges of Dartmoor, at altitudes between 140m and 265m. The western sites lie within a few kilometres of the Okehampton Training Area, and the eastern and southern sites lie well outside the Dartmoor Training Area.

6.33 The NBN website shows older records (1979-1988) of this species from four 10km grid squares in the Dartmoor area: SX56, SX57, SX58 and SX87 (NBN 2006). Grid square SX56 includes parts of Ringmoor and Cramber Training Areas, SX57 includes part of Cramber, SX58 contains parts of Willsworthy, Okehampton and Merrivale Training Areas, and SX87 lies to the east of Dartmoor, well outside the Dartmoor Training Area.

Beetles

Blue Ground Beetle (Carabus intricatus)

6.34 The blue ground beetle is Britain's largest ground beetle. It has been recorded from only 12 sites in the UK, all in Devon and Cornwall. It is present on several sites on Dartmoor. The species is entirely restricted to mature oak and beech woodlands with little ground vegetation and high humidity. The species is also associated with dead wood (UK BAP 2006). It is a BAP *priority* species and listed as *vulnerable* on the IUCN red list and *endangered* on the British Red Data Book.

6.35 Species records from the NBN include two 1km grid squares in the Dartmoor region: SX5258 and SX9473 (NBN 2006). These grid squares lie outside the Dartmoor Training Area.

Flies

Bog Hoverfly (Eristalis cryptarum)

6.36 The Bog Hoverfly is a scarce species known only from the heaths of Dorset and the New Forest, and scattered sites in Devon and Cornwall (Drake and Baldock 2005). It favours valley mires on the edges of open moor and rhos pasture systems in river valley. It is included as a *local* species on the Dartmoor BAP, and it listed as *vulnerable* in the RDB.

6.37 Surveys for this species on Dartmoor have recently been reviewed by Drake and Baldock (2005). The first survey was carried out in 1998 (Ramel 1998), and revealed six sites for this species. Further surveys were carried out in 2000 (Perett 2000) and 2004 (Drake and Baldock 2004). The sites are clustered in the eastern fringes of Dartmoor, between 240 and 380m, mainly in the catchments of the West Webburn and West Dart rivers. All records are from flush habitats (Drake and Baldock 2005). These sites lie outside Dartmoor Training Area.

6.38 Older records (1889 to 1998) for this species in the Dartmoor area are shown on the NBN website. This shows records for four grid squares: SX65, SX67, SX68, SX77 (NBN 2006). Grid square SX65 lies in south Dartmoor well outside the Dartmoor Training Area. SX67 lies several kilometres to the east of Cramber and Merrivale Training Areas, SX68 includes parts of Merrivale and Okehampton Training Areas, and SX77 lies in east Dartmoor well outside Dartmoor Training Area.

Ants

Narrow Headed Ant (Formica exsecta)

6.39 This species is distributed widely but locally in Europe. It has few sites in the UK, and historical records suggest only two centres: one based on the Dorset and Hampshire heaths, and one based on the Bovey Valley on Dartmoor. Surveys in the 1990s failed to find the species in the former area, but four locations were recorded for the latter, including Chudleigh Knighton Heath, and Bovey Heatherfield (UK BAP 2006). These lie outside Dartmoor Training Area. The species is listed as *endangered* on the UK red list and is a UK BAP *priority* species (UK BAP 2006). The NBN website contains no records of this species in Dartmoor (NBN 2006).

Aquatic Invertebrates

6.40 The Environment Agency supplied freshwater invertebrate data from two sites on the river Tavy in Dartmoor, SX54958293 and SX551830, both towards the centre of Willsworthy Training Area. Specimens have been identified to family level, and some to species level. The

data yields BMWP scores of 83-120 and 96-118 respectively, and ASP scores of 5.93-6.47 and 5.57-6.88 respectively. The data is included in Appendix 6.

The Cave Shrimp (Niphargellus glenniei)

6.41 The cave shrimp, thought to be an ice age relict species on Dartmoor*, i*s listed as a *local* BAP species (EN & DNPA 1997).

6.42 The NBN website contain records of this species from the following 10km grid squares in Dartmoor: SX56, SX76, SX77, and SX86 (NBN 2006). All of these records are from 1960 to 1972. Of these areas, SX56 includes parts of Ringmoor and Cramber Training Areas. The remaining grid squares lie outside the Dartmoor Training Area.

Freshwater Pearl Mussel (Margaritifera margaritifera)

6.43 This species is found in the north and west of the UK and is listed as *vulnerable* on the IUCN red list. It is a UK BAP species and is fully protected in the UK under the Wildlife and Countryside Act 1981. It is protected in Europe under the Habitats Directive (listed in Annex 5) in so far as its exploitation may be subject to management measures. The species is listed in Annex 1 of the Dartmoor BAP: *Globally threatened species, and those that are rapidly declining on a UK wide scale, found in the Dartmoor Natural Area* (EN & DNPA 1997).

6.44 NBN data shows that this species has been recorded from five 10km grid squares on Dartmoor: SX55, SX56, SX75, SX76, and SX88 (NBN 2006). Of these, SX56 contains parts of the Ringmoor and Cramber Training Areas, the remaining grid squares lie outside the Dartmoor Training Area.

Impacts of Military and other Activities on Invertebrates

6.45 No studies have been carried out into the effects of military activities on invertebrates on Dartmoor. However, it seems unlikely that direct physical disturbance or noise would have any significant impact compared with indirect effects resulting from impacts on vegetation and habitats (e.g. changes in vegetation structure or species composition through trampling digging or accidental fires). Such effects would seem likely to be small compared with the effects of changing land management regimes, such as altering grazing or burning regimes. For example, a number of important invertebrates are associated with valley bogs and rhos pasture habitats, and such areas are susceptible to hydrological changes that could result from land drainage schemes. Where the possibility of changes in vegetation and habitats due to military activity exist, subsequent impacts on invertebrates should be considered.

Gaps in Coverage

6.46 Invertebrates (particularly rare species) have been reasonably well surveyed, although much of the data relates to the margins of the moor. Additional records may be held by county recorders and local biological records centres.

7 Forthcoming Surveys

7.1 Consultation with the statutory bodies and other organisations identified the ecological surveys listed in Appendix 2.

7.2 The MoD NVC survey of the Dartmoor Training Area should be completed in 2006. It will provide comprehensive cover for all of the Training Area.

7.3 The Environment Agency currently has no plans for ecological surveys within the Dartmoor Training Area. Its regular river monitoring will continue on the lower areas of Dartmoor (Caroline Trevaskis personal communication).

7.4 English Nature is planning NVC surveys for SSSI areas outside the Dartmoor Training Area. It will continue its SSSI condition monitoring surveys, and is aiming to conduct satellite tracking studies of Dartmoor ponies in order to detect grazing patterns. It will also oversee a study into the historical patterns of swaling (controlled burning) on Dartmoor (Simon Bates, personal communication).

7.5 The DNPA is planning further surveys for the southern damselfly, greater horseshoe bat and salmon redds (breeding areas) in 2006. Marsh fritillary surveys will be undertaken under the Two Moors Project (Normal Baldock personal communication).

7.6 Other ongoing survey work includes bat and dormouse surveys by the Woodland Trust; RSPB surveys for a number of species including golden plover, dunlin and ring ouzel; surveys of ESA habitats by the Rural Development Service; surveys for moths by the County Moth Recorder; and surveys for high brown and pearl-bordered fritillary by Butterfly Conservation.

8 Conclusions

8.1 The vegetation of Dartmoor, and the condition of heather, have been extensively assessed since the 1980s. A full and detailed NVC survey of Dartmoor Training Area will become available when the current MoD survey is completed in 2006. This may provide some information on vegetation change on Dartmoor, although the historical data is in the form of a mosaic of records at different time periods with many gaps. The differing vegetation and heather condition classification systems used will also cause difficulties.

8.2 Habitat classifications and quality indices have not been produced for the aquatic habitats of Dartmoor (e.g. pools, lakes, streams, rivers).

8.3 Overall, overgrazing has been a major problem on Dartmoor, and stocking levels are likely to be the largest single influence on Dartmoor's biodiversity in the future. Dartmoor's location in the south of England may also make its upland mire habitats particularly sensitive to the effects of climate change.

8.4 With the exception of birds, no systematic surveys have been carried out for vertebrates on Dartmoor. The moorland habitat is likely to support good numbers of reptiles, and populations of the internationally important salmon may breed in Dartmoor streams. Water voles and otters may also be using streams in some areas. Bat surveys have previously only covered some of the lower areas of Dartmoor outside the Dartmoor Training Area (other than a survey of Okehampton Camp, and the use of moorlands and upland areas in general by bats has not been studied. Further records for vertebrates from the Dartmoor area may be held by local groups (e.g. badger, bat and amphibian groups) and biological records centres.

8.5 Invertebrates (particularly rare species) have been reasonably well surveyed, although much of the data relates to the margins of the moor. Additional records may be held by county recorders and local biological records centres.

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Wildlife and Countryside Act 1981 (As Amended)

Appendices

Appendix 1

Data Table A: Existing Ecological Survey Data

Topic Area	Title	Author	Date	Keywords	Summary	Data Format	Area covered	Survey Year	Text	Map Format	ISBN	Document Location
Ecology	Evaluation of the potential Impact of Air Pollution and Atmosphere Deposition on the Interest and Features of the Dartmoor cSAC.	Environment Agency	2004	Air Pollution	Document not seen.	Report	Dartmoor	2004	Y			
Ecology	Dartmoor National Park ancient woodland survey 1996-1997	Hughs M	1998	Ancient Woodland	Survey and inventory of the ancient woodland across Dartmoor.	Report	Dartmoor	1998	Y			EN Exeter
Ecology	Inventory of Ancient Woodland in the DNP	Hughs M	1998	Ancient Woodland	GIS files held at the DNPA.	GIS Files	DNPA	1998		GIS		DNPA
Ecology	The Nature of Devon: Devon Biodiversity Action Plan	Devon County Council	1998	BAP	Includes a range of species and habitats. Revised 2005 and available online.	Report	Devon		Y			Devon County Council Website
Ecology	Action for Wildlife: The Dartmoor Biodiversity Action Plan	DNPA	2005	BAP	Includes a range of species and habitats. Available online. Available from DNPA.	Report	Dartmoor		Y			DNPA website
Ecology	The Nature of Dartmoor: A Biodiversity Profile	English Nature / DNPA	1997	BAP	The Nature of Dartmoor - Biodiversity Profile. Document accompanying the Dartmoor BAP. General introduction to the geology, ecology and species of Dartmoor. 33 key species are listed and include otter, dormouse, greater horseshoe bat, red grouse, golden plover, dunlin, curlew, buzzard, woodlark, skylark, ring ouzel, cirl bunting, salmon, a species of freshwater shrimp, keeled skimmer dragonfly, southern damselfly, high brown fritillary, marsh fritillary, pearl-bordered fritillary, large blue butterfly, narrow-bordered bee hawk, blue groundbeetle, bog hoverfly, deptford pink, heather, Vigur's eyebright, greater butterfly orchid, bog orchid, Irish lady's tresses, wild daffodil, flax-leaved St. John's wort, string of sausages lichen, a *Graphina* lichen species. Legislation and conservation asessments for these species are also included.	Report	Dartmoor		Y			RPS
Ecology	Dart Biodiversity Project: the final report and evaluation 1st June 1998 - 31st May 2001	Dart Biodiversity Project Steering Group	2001	BAP Dart Biodiversity Project	Outlines the aims and objectives, sucesses, finances and partnerships of the DBP.	Report	Dartmoor		Y			DNPA, EN Exeter
Ecology	A review of the importance of Dartmoor's common land and wet pastures for priority and threatened invertebrates	Boyce D	2000	BAP Species, Invertebrates	A general review of the invertebrate interest on Dartmoor's extensively grazed commons and wet pastures, with special reference to BAP species and targets.	Report	Dartmoor	2000	Y			EN Exeter
Ecology	Roosting, Dispersal and Foraging Behaviour of Barabastelle Bats in Hawns and Dendles Woods, Dartmoor.	Billington G	2003	Bats	This survey follows up a pilot survey carried out in 2000 which first recorded the presence of a Barbastelle bat at Dendles Wood, and radio-tracking and roost surveys in 2002 and 2003. Four bats were radio tagged and this led to the discovery of four tree roosts, one each in Fernfires, Hawns and Dendles Woods and a hedgerow east of Ivybridge. Feeding areas included woodlands, hedgerows and the River Yealm south of Lee Mill.	Report	Hawns Wood, Dendles Wood	2003	Y			EN Exeter
Ecology	The Use of Holne Chase and Greypark Woods by Bats. Report to DNPA and the Woodland Trust.	Billington G	2003	Bats	Document not seen.	Report	Holne Chase, Greypark Woods	2003	Y			DNPA

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Ecology	A pilot survey of the use of key Dartmoor habitats by bats	DNPA	2001	Bats	Survey to improve understanding of bat activity in the area, and locate hot-spots, roosts, foraging areas and commuting routes. Mist netting and detector recording were used. Ten bat species confirmed, ten roosting sites of six bat species confirmed. Six possible roosting sites and several important foraging areas were also identified. Wooded valleys and watercourses with good woodland cover appear to be the key foraging habitats for bats on Dartmoor.	Report	Dartmoor	2001	Y			EN Exeter
Ecology	Bat Survey of Okehampton Training Camp	Kaczanow J	2002	Bats	Nine bat species were recorded from Okehampton Training Camp. Six buildings were found to contain signs of roosting bats.	Report	Okehampton Training Camp	2002	Y			DE Exeter, Okehampton
Ecology	The use of Bovey Valley Woods by bats including an assessment of Yarner Wood beech trees for bats	Billington G, DNPA	2003	Bats, Bovey Valley	Presents results of bat surveys carried out in Bovey Valley Woods. Eight bat species were confirmed, important foraging areas were identified and suggestions are made for habitat improvements.	Report	Bovey Walley, Yarner Wood	2003	Y			EN Exeter
Ecology	A survey of the use of the Upper Teign Valley Woods by bats	Billington G, DNPA	2001	Bats, Upper Teign Valley	Four woodlands in the upper Teign Valley were surveyed for bats. Eleven bat species were surveyed including lesser horseshoe and barbastelle bats which are priority species in the UK BAP, and Nathusis pipistrelle -one of the rarest bats. Nine confirmend roosts of at least seven species were located, and 114 potential roost sites were found.	Report	Upper Teign Valley	2001	Y			EN Exeter
Ecology	Action for Wildlife: The Dartmoor Biodiversity Action Plan	DNPA	2001	Biodiversity	Available online or hardcopy from Action for Wildlife. Outlines the habitats and species of particular importance for the county. Broad overview of the major habitats in Devon. Devon has the richest bryophyte flora of all English counties. Inportant animal species include cirl bunting and blue ground beetle. Includes a geological map of Devon. Lists key species for the Dartmoor Natural Area (EN) as golden plover, fritillary butterflies, blue ground beetle and various rare lichens.	Report	Dartmoor		Y			DE Exeter
Ecology	The Nature of Dartmoor : A Biodiversity Profile	English Nature / DNPA	2001	Biodiversity	The Dartmoor BAP. Online update of the 1997 document.	Report	Dartmoor		Y			DNPA website
Ecology	Moorland Breeding Birds	ADAS	1997	Birds	Document not seen.	Report	Dartmoor Moorland	1997	Y			ADAS
Ecology	Checklist of the Birds Of Dartmoor.	author unknown	1978	Birds	List of species.	Book	Dartmoor		Y			Okehampton Camp
Ecology	Breeding wading birds in Dartmoor National Park: an assessment of factors potentially limiting population size: report to the DNPA	Baines D	2000	Birds	Key breeding sites on Dartmoor for curlew, lapwing, snipe, and skylark were visited and recommendations made relating to ten of them. Improvements could inlcude increased cattle grazing and wetting up for snipe. Predators affected breeding success for curlew and lapwing so crow trapping is recommended for main breeding sites, along with reduced public access and local habitat improvement.	Report	Dartmoor	2000	Y			EN Exeter
Ecology	The Breeding Bird Survey: the First Five Years	Bashford	1999	Birds	Document not seen.	Report	Dartmoor	1999	Y			Okehampton Camp
Ecology	Dartmoor Environmental Baseline: 1992 Breeding Bird Survey. RSPB.	Chown D *et al*	1992	Birds	Document not seen.	Report	Dartmoor	1992	Y			EN Exeter, RSPB Exeter
Ecology	Birds of the Postbridge Area	Dare & Hamilton	1968	Birds	Small pamphlet of birds common around Postbridge.	Book	Postbridge		Y			Okehampton Camp
Ecology	The Devon Bird Report, Annual Reports of the DBWPS	DBWPS	Annually	Birds	Devon Bird Watching and Preservation Society.	Report	Devon	Annual	Y			DBWPS

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Ecology	Dartmoor Moorland Breeding Bird Survey 2000 incorporating a survey of rhos pasture.	Geary S	2000	Birds	Extrapolated estimates were obtained for 17 target species: red grouse, lapwing, snipe, curlew, cuckoo, skylark, tree pipit, meadow pipit, redstart, whinchat, stonechat, wheatear, grasshopper warbler, Dartford warbler, linnit, yellowhammer, reed bunting. BBS (breeding bird survey) methodology was used which gave a density measure for various habitats, this was then multiplied by the areas of the varous habitat types obtained from other survey reports, to give total population estimates.	Report	Dartmoor Moorland	2000	Y			DE Exeter, Okehampton Camp
Ecology	The Devon Bird Report 1997. Annual Report No. 70 of the Devon Birdwatching and Preservation Society.	Glaves D J & Darlaston M	1999	Birds	Document not seen.	Report	Devon		Y			DBWPS
Ecology	Dartmoor Upland Bird Survey	Hughes M	1997	Birds	Document not seen.	Report	Upland Dartmoor	1997	Y			DNPA
Ecology	Redstarts at Burrator, Devon Birds 33: 38-41	Jones & Jones	1980	Birds	Report of redstarts at Burrator, 1980.	Journal Article	Burrator	1980	Y			DBWPS
Ecology	Upland Bird Survey DNP.	Jones R A J	1999	Birds	Document not seen.	Report	Dartmoor National Park	1998	Y			Okehampton Camp
Ecology	The Effects of Recreational Disturbance on upland Breeding Birds 1997-1999. Report for DNPA.	Jones R A J	2000	Birds	Considers regionally or nationally importatnt species including: merlin, red grouse, golden plover, dunlin, ring ouzel, and wheatear. All breed on Dartmoor except merlin (which did until 1965). Merlins do not breed but conditions are though to remain suitable. Red grouse are present but numbers have reduced by 50% in suitable habitat; rcreational disturance is though to be a significant factor, especially disturbance by dogs. Golden plovers breed in small numbers (e.g 5 pairs) and disturbance a particular problem at Cranmere Pool. Dunlin have a small stable population, with some evidence of recreational disturbance. Ring Ouzel declined by c.10% in the last 20 years, especially at Cranmere Pool, and Whitelese HIll. This species is pone to disturbance at breeding grounds and vulnerable to recreation (especially at Headland Warren and Tavey Cleave). Wheatear has a high breedig density on Dartmoor, it is vulnerable to walkers and letterboxing. Sensitive areas should be protected from impacts.	Report	Upland Dartmoor	1997-1999	Y			Okehampton Camp, EN Exeter
Ecology	An Ecological Study of Breeding Bird Populations and vegetation on Open Moorland Areas of Dartmoor	Mudge G *et al*	1979	Birds	Survey indicated the folowing habitat preferences: wet blanket bog: golden plover and dunlin, valley bog: snipe, grasshopper warbler, reed bunting, upland stream: grey wagtail and dipper, damp low altitude grassland/*Calluna* moor: lapwing and curlew, dry grassland and rocks: whinchat, stonechat, linnit, yellow hammer; bracken slopes and scrub: tree pippit, red start, whinchat, stonechat, yellowhammer, woodlark, *Calluna* moor and *Vaccinium*: red grouse, ring ouzel, whinchat, stonechat. Conservation of the bird value of Dartmoor to be maintained through maintenance of wet blanket bog habitats, no drainage, possible reinstatement of pools, rational burning, maintenance of scrub, gorse burining, prevention of overgrazing, monitoring of recreation. Military activities are currently concentrated in breeding season - these should be spread throughout the year.	Report	Dartmoor Moorland	1979	Y			EN Exeter
Ecology	The Birds of Dartmoor	R Smaldon	2005	Birds	Book outlining the bird species of dartmoor and their distribution and status.	Book	Dartmoor					Okehampton Camp

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Ecology	Tetrad Atlas of Breeding Birds in Devon	Sitters	1998	Birds	Atlas showing the distribution of records for breeding birds in Devon.	Book, Hardcopy Maps	Devon	1977-85	Y	Hardcopy		Okehampton Camp
Ecology	The Dartmoor Bird Report. Annual Reports of the Dartmoor Study Group.	Smaldon R	1996-1999	Birds	Document not seen.	Report	Dartmoor	1996-1999	Y			DNPA
Ecology	Dartmoor Bird Report	Unknown	1996	Birds	Document not seen.	Report	Dartmoor	1996	Y			Okehampton Camp
Ecology	A survey of Black Tor Copse Forest Nature Reserve	Barkham J P	1965	Black Tor Copse	Dissertation presented for conservation course 1965.	Report	Black Toe Copse	1965	Y			EN Exeter
Ecology	Blue Ground Beetle Report	Boyce D & Walters J	2003	Blue Ground Beetle	Document not seen.	Report	Dartmoor	2002	Y			DNPA
Ecology	The Ecology of the Blue Ground Beetle *Carabus intricatus* (Linn.)	Boyce D and Walters J	2001	Blue Ground Beetle	Document not seen.	Report	Dartmoor	2001	Y			DNPA
Ecology	The Bog Hoverfly in Dartmoor	Baldock N	2005	Bog Hoverfly	British Wildlife Article. Summarises DNPA reports on this species.	Journal Article	Dartmoor	2005	Y			
Ecology	*Eristalis Cryptarum* on Dartmoor in 2002 - surveillance, survey and ecology. Report to DNPA	Drake M & Baldock N	2002	Bog Hoverfly	The two Dartmoor sites, Tor View Moor and Moortown Bottom, were resurveyed. The species was found within runnels within M29 mire, surrounded by M25a, M21a and M16c mires.	Report	Dartmoor	2002	Y			DNPA, EN Exeter
Ecology	The Bog Hoverfly Eristalis cryptarum on Dartmoor - fieldwork in 2004 and summary of findings 1998-2004	Drake M & Baldock N	2004	Bog Hoverfly	Document not seen.	Report	Dartmoor		Y			
Ecology	*Eristalis cryptarum* : A Study of the Phenology and Extent of the Devon Population	Perrett	2000	Bog Hoverfly	Document not seen.	Report	Devon	2000	Y			DNPA
Ecology	Bog Hoverfly (*Eristalis cryptarum*) Survey on Dartmor	Ramel G	1998	Bog Hoverfly	Small populations of this species are documented on Dartmoor and a suite of indicator plant species is noted.	Report	Dartmoor	1998	Y			EN Exeter
Ecology	Report to English Nature on *Eristalis Cryptarum*	Ramel G	1998	Bog Hoverfly	The first survey for the bog hoverfly on Dartmoor.	Report	Dartmoor	1998	Y			DNPA
Ecology	The Flora of Devon: Mosses and Liverworts	Barnes EF	1958	Bryophytes	Descriptions of the lower plants of Dartmoor.	Book	Devon		Y		0852140 10X	Unknown
Ecology	The Epiphytic bryophyte communinties of the Dartmoor oakwoods	Proctor M C F	1962	Bryophytes	Report of the Devon Association for the Advancement of Science 94: 531-554	Journal Article	Darmtoor	1962	Y			Unknown

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Ecology	Establishment of a base line system for the long-term monitoring of bryophytes at Wistman's Wood NNR, Dartmoor	Brearley H & Barnett H	1997	Bryophytes, Wistman's Wood	82 species of moss and liverwort have been recorded at Wistmans Wood since 1958, at the last survey in 1981, 62 of these species were noted. Robust pleurocarps were abundant at ground level and on boulders, and acrocarpous species were prevalent above ground level, on tree trunks and branches. Future surveys should include both ground, epilithic and epiphytic species. Luzula species, bramble and bracken accounted for extensive areas of ground flora in the middle grove and north grove.	Report	Wistman's Wood	1997	Y			EN Exeter
Ecology	Wildlife in Buildings Survey. A report to Action for Wildlfie.	Bemmet G & Fee D	2003	Buildings	Document not seen.	Report	Dartmoor	2003	Y			DNPA
Ecology	A Study of the Effects of Burning on the Florstic Composition of Heathland Plant Communities, on the Dartmoor National Park	Chadwick L J	1998	Burning	University of Wales BSc Project	Report	Dartmoor National Park	1998	Y			DNAP
Ecology	Post-fire recolonisation of vegetation and invertebrates on Trendlebere Down, Dartmoor, Devon.	Hinshelwood E L	1998	Burning	Document not seen.	Report	Trendlebere Down	1998	Y			DNPA, Oxford Brookes University
Ecology	The Common Lands of Devon a Biological Survey	Aitchison J & Ashby M	2000	Commons	Gives the areas of phase 1 habitats for the whole of the Devon common lands. Woodland 3%, grassland 27%, tall herb and fern 14%, heathland 30%, (dry acidic 23% and wet heath or heath/grassland mosaic 7%), bog flush and fen 14%. Birds are important on the moorlands which form the main area of Dartmoor commons: red grouse, snipe, curlew, wheatear, skylark, ring ouzel, whinchat, golden plover, dunlin. List of insects. Report relates commons habitats to broad and priority habitats in the UK BAP. Provides a list of registered commons.	Electronic Report	Devon Commons		Y			DEFRA website
Ecology	A fine scale phytosociological study involving selected environmental and floristic parameters between populations of *Euphrasia vigursii* (Davey) (Cornish Eyebright) a rare annual endemic to Devon and Cornwall.	Granados L	2001	Cornish Eyebright	University of Plymouth Honours Project.	Undergraduate Dissertation	Devon	2001	Y			DNPA
Ecology	Dartmoor Natural Area Profile	English Nature	2006	Dartmoor Natural Area	Various descriptions and resources on the English Nature website relating to the Dartmoor Natural Area.	Report	Dartmoor Natural Area		Y			EN Website
Ecology	Dartmoor SAC description	JNCC	2006	Dartmoor SAC	Contains the following EU Annex I habitats: Northern Atlantic wet heaths, European dry heaths, blanket bogs, old sessile oak woods. Contains the Following Annexe II species: southern damselfly.	Electronic Report	Dartmoor SAC		Y			JNCC website
Ecology	The Development of a Belt Transect in Dendles Wood National Nature Reserve between 1988 and 1999.	Guy A	1999	Dendles Wood	University of Plymouth Honours Project.	Report	Dendles Wood	1998-1999	Y			DNPA
Ecololgy	*Dianthus armeria* (Deptford Pink) in 2001. Plantlife Report No. 210.	Wilson P J	2002	Deptford Pink	Document not seen.	Report	UK	2001	Y			DNPA

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Ecology	Dartmoor cSAC/North Dartmoor SSSI Condition Table	English Nature	2000	Designations SSSI Condition	For North Dartmoor SSSI, 43.9% of the areas was found to be in an unfavourable condition but recovering, 31.4% was favourable, 23.3 % was unfavourable with no change, and 1.3% was in unfavourable condition and declining. No area was destroyed or part destroyed.	Table	Dartmoor SAC		Y			EN Website
Ecology	A survey of dry heathland within the South Dartmoor Woods cSAC	Rodgers D	2001	Dry Heathland, South Dartmoor Woods cSAC	South Dartmoor Woods cSAC was originally noted for its sessile oak woodland. Dry heathland was specified as an additional feature. This survey asesses the extent and NVC type of dry heathland within the site.	Report	South Dartmoor SSSI	2001	Y			EN Exeter
Ecology	East Dartmoor SSSI Citation	English Nature	2006	East Dartmoor SSSI	This site contains the largest area of heather moorland remaining on Dartmoor. The area are also associated acidic grassland and valley mires.	Electronic Report	East Dartmoor SSSI		Y			EN Website
Ecology	Dartmoor Environmental Baseline. DNPA.	Anon.	1998	Ecology	Document not seen.	Report	Dartmoor	1998	Y			DNPA
Ecology	Dartmoor New Naturalists Series	Harvey & St Leger-Gordon	1974	Ecology	Book about the general natural history of Dartmoor, including its history, vegetation, birds etc.	Book	Dartmoor		Y		B0000CLFHB	EN Exeter
Ecology	English Nature GIS data	EN	2006	EN GIS	Boundaries of SSSI sites, ancient woodlands, NNRs, SACs, also habitat datasets available in England-wide coverage.	GIS data available from EN website	UK			GIS		EN website
Ecology	A comparison of agreement and non-agreement holders within the Dartmoor ESA 1995/96.	Edwards M F	1996	ESA	University of Plymouth Honours Project.	Report	Dartmoor ESA	1995-1996	Y			Unversity of Plymouth
Ecology	The effect of the Environmentally Sensitive Area and other Conservation Designation on the Wildlife of Dartmoor National Park.	Hooper D	2001	ESA	Oxford Brookes University Honours Project.	Undergraduate Dissertation	Dartmoor ESA	2001	Y			DNPA
Ecology	DEFRA ESA Draft Management Plan for the Forest of Dartmoor	Stevens P	2003	ESA	Describes critical environmental capital of dartmoor. Conservation of blanket bog can be inproved by control of stocking rate and uncontrolled fires. Conservation of dwarf shrub heath can be improved through control of stocking density and controlled burning.	Report	Dartmoor ESA		Y			Okehampton Camp
Ecology	Conserving Fritillary Butterflies through Countryside Stewardship at Great Torridge Common: Progress and Future Habitat Management Needs.	Bereton T M & Cox A	2000	Fritillary Butterflies	Document not seen.	Report	Great Torridge Common	2000	Y			DNAP
Ecology	Dartmoor Factsheet: General Information	DNPA	2005	General Information	General background to the National Park, topography, major land use, etc.	Electronic Factsheet	Dartmoor		Y			DNPA Website
Ecology	Dartmoor Environmental Baseline 1986 Breeding Bird Survey.	Robins & Jutsum	1986	Golden Plover, Dunlin	Baseline Bird Survey. Covers same 4 plots as 1984/5 survey. Evidence of decline in snipe and golden plover since 1979.	Report	Dartmoor	1986	Y			EN Exeter
Ecology	Environmental Baseline Survey	Robins & Jutsum	1992	Golden Plover, Dunlin, Whinchat, Wheatear	2 Red Data Book species present: red grouse and golden plover. Investigation of recreational and predator impacts. Blanket bog vegetation noted to be increasing in height. Management recommendations.	Report	Dartmoor	1992	Y			EN Exeter

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Ecology	Dry Unimproved Grassland Survey - Final Report 2003/2004	DNPA	2005	Grassland	survey and species lists for dry grassland on the peripheries of and moorland area of Dartmoor.	Report	Dartmoor	2003/04	Y			DNPA
Ecology	The Effects of Overgrazing on the Molinia/Calluna communities in Dartmoor National Park.	Archer R	1992	Grazing	University of Plymouth Honours Project.	Undergraduate Dissertation	Dartmoor National Park	1992	Y			University of Plymouth
Ecology	An Investigation into the Use of Grazing Ponies to control ecological succession for conservation purposes on the Castle Drogo estate.	Harris K	2000	Grazing	Document not seen.	Report	Castle Drogo	2000	Y			DNPA
Ecology	Sustainable grazing practices on the SW Moors of England	Smallshire D, Shorrock D J and Halshaw L	1996	Grazing, Moorland	Report concerned with approaches that can be taken to make grazing on Bodmin Moor and Dartmoor more sustainable.	Report	SW England		Y			DNPA
Ecology	The Dart valley; an ecological survey	Field Studies Council	1977	Habitats	Document not seen.	Report	Dart Valley	1977	Y			Unknown
Ecology	Dartmoor Habitat Survey 1994-1995: final report	Michael Hughes Associates	1995	Habitats	Habitat survey of rough land within enclosed farm land around the periphery of the moorland. This provides a resurvey of sites surveyed in 1983-84. A total of 388 sites with a total area of 988.76ha were surveyed. All sites were evaluated for their nature conservation interest (on a scale A to D). The Survey identified five key mire communities: M23a, M23b, M25a, M25b, M25c, covering 255ha in total. Other mire communities covered 136.6ha. The most important mire communities included M16a and M24c covering 4ha and 4.4ha respectively. This range of communities is recognised by English Nature of as rhos pasture. Swamp communities were identified to cover 23.27ha, upland grassland communities to cover 90.5ha and mesotrophic grassland to cover 178ha, tree and shrub communities covered 140ha and 103ha respectiviely. A total of 19 sites were found to have been totally lost as a consequence of agricultural inprovement. Key species found included: Kilarney fern and marsh fritillary butterfly. A strategy for the conservation of important rhos pasture habitat is provided.	Report	Dartmoor	1994-1995	Y			EN Exeter
Ecology	Dartmoor habitat survey 1994-1995: final report	Michel Hughes Associates	1995	Habitats	Vegetataion survey which concentrates on rough land and enclosed farmland on the peripheries of the moorland. The principal plant communities identified included five types of mire (including several types of rhos pasture), swamp, heathland, upland grassland, mesotrophic grassland, scrub and woodland.	Report	Dartmoor	1994-1995	Y			EN Exeter
Ecology	Report on the Dartmoor ecological survey 1969	Nature Conservancy	1969	Habitats	Background information on geology, soils, climate and some information on vegetation.	Report	Dartmoor	1969	Y			EN Exeter
Ecology	Habitats Directive stage 2 review: first pass site characterisation report: Dartmoor	Marcus Hodges Environment	2002	Habitats Directive	Summary of Dartmoor cSAC produced for the purpose of designation.	Report	Dartmoor		Y			EN Exeter
Ecology	Dartmoor Factsheet: Habitats of Dartmoor	DNPA	2006	Habitats, Vegetation	Broad scale habitat map (blanket and valley bogs, heather moorland, grassland, broadleaf valley woodland, conifer plantation, enclosed farmland, Rhos pasture traditional hay meadows, hedges and road verges, buildings, tors & rocks, rivers and streams, reservoirs.	Electronic Factsheet	Dartmoor		Y			DNPA Website

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Ecology	Haymeadows at Dunnabridge and Nattor Farms: a study of their floristics and environmental factors	Hatley S	1985	Hay Meadows	Documents the only five traditional hay meadows that remain on Dartmoor.	Report	Dunnabridge Farm, Nattor Farm	1985	Y			EN Exeter
Ecology	Mapping past dwarf shrub-heath extent on Dartmoor. Aspects of Applied Biology 58: 179-184.	Clark G J	2000	Heath	Document not seen.	Report	Dartmoor		Y			DNPA
Ecology	Willsworthy Heather Utilisation Survey	Keedle R	1998	Heather Condition	Ongoing heather condition survey for Willsworthy range.	Report	Willsworthy Range	1998	Y			Okehampton Camp
Ecology	Willsworthy Military Range Heather Utilisation Survey	Keedle R	1999	Heather Condition	Document not seen.	Report	Willsworthy Range	1999	Y			Okehampton
Ecology	Willsworthy Heather Utilisation Survey	Keedle R	2000	Heather Condition	Part of ongoing heather condition monitoring. 57% of the area classified as overgrazed.	Report	Willsworthy Range	2000	Y			RPS
Ecology	Heather Utilisation Survey	Unknown	1997	Heather Condition	Survey contributing to on-going heather condition survey.	Report	Dartmoor	1997	Y			Okehampton Camp
Ecology	The conservation of the high-brown fritillary on Dartmoor	Oates M	1991	High Brown Butterfly	Second of several surveys for this species on Dartmoor.	Report	Dartmoor	1991	Y			EN Exeter, Butterfly Conservation
Ecology	Species Action Plan: high Brown Fritillary *Argynnis adippe*. Butterfly Conservation.	Barnett L K & Warren M S	1995	High Brown Fritillary	Document not seen.	Report	UK		Y			Butterfly Conservation
Ecology	The status of the high brown fritillary, *Argynnis adippe*, Dartmoor National Park, 2000	Boyce D	2000	High Brown Fritillary	Re-visits of poorly-known sites and speculative surveys of areas with potential. The eastern fringes of Dartmoor represent the largest inland stronghold of this species in Britain. This report documents new locations for this species on Dartmoor.	Report	Dartmoor National Park	2000	Y			EN Exeter
Ecology	High brown fritillary breeding habitat survey 1997: Dartmoor and Exmoor (preliminary report)	Butterfly Conservation	1997	High Brown Fritillary	Dartmoor is the second most important are in the UK for this species, with four meta-populations based on Teign Valley, Haytor, Walkham Valley and Dart Valley.	Report	Dartmoor, Exmoor	1997	Y			EN Exeter
Ecology	High Brown Fritillary Breeding Habitat Survey 1998: Dartmoor and Exmoor (preliminary report). A contract report for butterfly conservation.	Clarke S A and Warren M S	1998	High Brown Fritillary	Document not seen.	Report	Dartmoor, Exmoor	1998	Y			DNPA, Butterfly Conservation
Ecology	High brown fritillary conservation on Dartmoor: West Down, Tavistock	Coombes P	1992	High Brown Fritillary	Consolidation of previous survey work by revisits to known sites and prospective visits to sites with potential to support this species.	Report	West Down, Tavistock	1992	Y			EN Exeter
Ecology	A Report on Surveys of the High Brown Fritillary Butterfly on Dartmoor	Grove S & Knight W	1992	High Brown Fritillary	Survey included revisits of poorly known sites and prospective surveys of areas of potnetial. Five new localities were discovered. E.g. Haytor Vale. Two combes south west of Holne, and an isolated colony on the northern fringes of Dartmoor near Sticklepath.	Report	Dartmoor	1992	Y			EN Exeter
Ecology	High Brown Fritillary Survey on Dartmoor	Oates M	1989	High Brown Fritillary	First of several surveys for this species on Dartmoor.	Report	Dartmoor	1989	Y			Unknown
Ecology	The Conservation of the High Brown Fritillary on Dartmoor	Oates M	1991	High Brown Fritillary	Summarises the natural history and the current status of the high brown, a rare and extreamly vulnerable butterfly which breeds on violets on wartm dry hillsides and woodland habitats and has declined dramatically in recent years. Four clusters exist on Dartmoor. Dartmoor is the second most important area for this species in Briatin. The Dart valley in particular is of national importance for this species.	Report	Dartmoor	1991	Y			EN Exeter

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Ecology	Action for the High Brown Fritillary; Progress 1996.	Warren M S, Bulman C & Baker N R	1997	High Brown Fritillary	Document not seen.	Report	UK	1996	Y			Butterfly Conservation
Ecology	Maintaining Conservation Progress on the High Brown Fritillary, Argynnis adippe.	Warren M, Kirkland P H, Baker N R & Bourn N A D	1996	High Brown Fritillary	Document not seen.	Report	UK		Y			1996
Ecology	ILMP for Willsworthy Training Area	RPS & MoD	1999	ILMP	Integrated Land Management Plan for Willsworthy Training Area	Report	Wilsworthy Range		Y			Okehampton Camp
Ecology	Cramber Training Area Dartmoor: Environmental Statement	WSP	2002	Impacts	Nature conservation section: NVC communities present include: heathland, grassland, mire, all of which are dartmoor BAP priorities and objectives. No rare or scarce plant species were recorded. No impact of dry training. Minor trampling on popular routes. Pyrotechnics and blank ammo could cause disturbance to mammals and birds. The only mammals of significance that were recorded were water voles and these are only likely to be affected if the disturbance ocurrs close th their burrows. Breeding birds could be displaced by loud bangs. RSPB and ATE are researching this issue more widely in ATE areas. Military training on Dartmoor does not significantly affect the cSAC which lies to the east. Overall there are some minor negative effects on nature conservation.	Report	Cramber Training Area		Y			RPS
Ecology	The Army and The Environment. An Environmental Impact Assessement on the Okehampton Army Ranges, Dartmoor. Biological & Geograpghy Joint Honours Bsc. Dissertation.	Benett S	1990	Impacts, Recreation	Undergraduate Project. Little Ecological Interest.	Undergraduate Dissertation	Okehampton Range		Y			EN Exeter
Ecology	Dartmoor : A New Study	Gill C	1970	Landscape	General Introduction to the grography, soils, agriculture and history of Dartmoor.	Book	Dartmoor Commons		Y		0715385 81X	EN Exeter
Ecology	Biological structure in the landscape: a case study: Black Tor Copse, Dartmoor.	Brown L V	1986	Lanscape Black Tor Copse, upland oak woodland	Dissertation for BSc Geography and Landscape Studies Degree. Looked specifically at variation in leaf physiognomy in the forest canopy.	Undergraduate Dissertation	Black Tor Copse	1986	Y			EN Exeter
Ecology	Breeding Lapwing and Curlew	Smaldon	1999	Lapwing, Curlew	Document not seen.	Report	Dartmoor	1999	Y			Unknown
Ecology	The Lichen Flora of Devon.	Benfield G	2001	Lichens	Document not seen.	Book	Devon		Y			DNPA
Ecology	Lichen Survey of Wray Cleave Woods	Benfield G	2002	Lichens	Document not seen.	Report	Wray Cleave Woods	2002	Y			DNPA
Ecology	Buckland in the Moor Woodlands (Part of Holne Chase SSSI) (VC 3 South Devon) Lichen Survey. Report to Fountain Forestry and English Nature.	Coppins A M & Coppins B J	1995	Lichens	Document not seen.	Report	Buckland in the Moor Woodlands	1995	Y			DNPA

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Ecology	Dendles Wood NNR (VC 3 South Devon) - Lichen Monitoring II . Report to English Nature.	Coppins A M & Coppins B J	2000	Lichens	Document not seen.	Report , Hardcopy Maps	Dendles Wood	2000	Y	Hardcopy		DNPA
Ecology	Black Tor Copse NNR, cSAC: Desk Study - to discover relevant information relating to past and present site history and management and the history of lichen prior to carrying out a lichen survey. Report to English Nature.	Coppins A M & Coppins B J	2002	Lichens	Document not seen.	Report	Black Tor Copse	2002	Y			DNPA
Ecology	Wistman's Wood NNR, cSAC (VC 3, South Devon): Desk Study - to discover relevant information relating to past and present site history and management and the history of lichen recording prior to carrying out a lichen survey. Report to English Nature.	Coppins A M & Coppins B J	2002	Lichens	Document not seen.	Report	Wistman's Wood	2002	Y			DNPA
Ecology	Black Tor Copse NNR, cSAC (VC4, North Devon): Lichen Survey with Emphasis on the Presence of Rare Species. Report to English Nature.	Coppins A M & Coppins B J	2003	Lichens	Document not seen.	Report	Black Tor Copse	2003	Y			DNPA
Ecology	Wistman's Wood NNR, cSAC (VC 3, South Devon): Lichen Survey with Emphasis on the presence of rare lichens. Report to English Nature.	Coppins A M & Coppins B J	2003	Lichens	Document not seen.	Report	Wistman's Wood	2003	Y			DNPA
Ecology	Lichens of the Dartmoor Rocks	Giavarini V J	1990	Lichens	Lichenologist 22: 367-396	Journal Article	Dartmoor		Y			unknown
Ecology	Lichen Monitoring Project, Riverside Trees, Holne Chase, Dartmoor. Report to English Nature.	Giavarini V J	2000	Lichens	Document not seen.	Report	Holne Chase	2000	Y			DNPA
Ecology	An investigation into the effects of bark fissuring on the distribution of lichens, with special reference to corticolous lichens on *Quercus robur* in Wistmans Wood, Dartmoor.	Irvine K L	1996	Lichens	University of Plymouth, Honours Project	Undergraduate Dissertation	Wistman's Wood	1996	Y			University of Plymouth
Ecology	Dendels Wood NNR Devon: Lichen Monitoring	O'Dare A M & Coppins B J 1991	1991	Lichens	Document not seen.	Report	Dendles Wood	1991	Y			DNPA

Topic Area	Title	Author	Date	Keywords	Summary	Data Format	Area covered	Survey Year	Text	Map Format	ISBN	Document Location
Ecology	Whiddon Deer Park and the Castle Drogo Estate, N. Devon: Lichen Survey. Report to the National Trust.	O'Dare A M, Rose F, Jarman R	1990	Lichens	Document not seen.	Report, Map	Castle Drogo	1990	Y			National Trust
Ecology	The Phytogeography of Dartmoor Bryophytes.	Proctor M C F	1964	Lichens	in Dartmoor Essays (ed. I. G. Simmons) pp 141-171 Devonshire Association, Torquay.	Book	Dartmoor		Y			unknown
Ecology	The distribution of *Usnea* spp. along the Plym Valley in Relation to Air Pollution. English Nature and Plymouth University.	Whalley S	1996	Lichens	Document not seen.	Report	Plym Valley	1996	Y			English Nature, University of Plymouth
Ecology	MAGIC datasets	Various	2006	MAGIC	Map layers of Grassland Inventory, Ancient Woodland (Ancient & Semi Natural and Ancient Replanted), National Inventory of Woodland and Trees.	GIS data viewed via MAGIC website	UK			GIS		MAGIC website
Ecology	Integrated Land Management Plans for the Duchy of Cornwall Dartmoor Estate. Unpublished ADAS report to the Duchy of Cornwall.	ADAS	1990	Management	Document not seen.	Report	Duchy Estate	1988-90	Y			DEFRA website
Ecology	North Dartmoor SSSI - Draft Site Management Statement for Commons	English Nature	1997	Management	Site management statement.	Report	North Dartmoor SSSI		Y			DE Exeter
Ecology	East Dartmoor SSSI - Draft Site Management Statements for Commons	English Nature	1997	Management	Site management statement.	Report	East Dartmoor SSSI		Y			DE Exeter
Ecology	South Dartmoor SSSI - Draft Site Management Statement for Commons	English Nature	1997	Management	Site management statement.	Report	South Dartmoor SSSI		Y			DE Exeter
Ecology	Declaration of Intent between MoD and English Nature	English Nature	first signed 1988, last renewed 2002	Management	Agreement between MoD and EN with reference to Nature Conservation.	Report	Dartmoor		Y			EN website
Ecology	Dynamics and management of semi-natural vegetation on Dartmoor	Weaver R, Kent M & Goodfellow S	1998	Management, Vegetation	In Blacksell M, Matthews J and Sims P (Eds.) *Environmental Management and Change in Plymouth and the South West.* University of Plymouth.	Report	Dartmoor	1998	Y			DNAP
Ecology	Marsh fritillary and narrow-bordered bee hawkmoth in the Moreton-Manaton and Taw valleys, 2003	Boyce D, DNPA	2004	Marsh Fritillary, Narrow Bordered Bee Hawk	114 marsh fritillary adults and 139 larval webs were found at Moreton Manton, mostly around Puddaven, Shepeley and Vogwell College. All were also important areas for the narrow bordered bee hawkmoth: 29 adults were seen June 2003. At Tor Valley 12 adultas and 23 webs of MF were seen and no narrow bordered bee hawks were seen.	Report	Moreton-Manaton Valley, Taw Valley	2004	Y			EN Exeter

Topic Area	Title	Author	Date	Keywords	Summary	Data Format	Area covered	Survey Year	Text	Map Format	ISBN	Document Location
Ecology	The autecology of the meadow thistle (*Cirsium dissectum*) on Devon Rhos Pasture with Particular Refernce to the Effect of Major Environmental Variables on the Population Dynamics	Ross J	1999	meadow thistle	University of Plymouth PhD Thesis	PhD Thesis	Devon	1999	Y			University of Plymouth
Ecology	The blanket peat of Dartmoor: a comparative study of the ecology of the peat formations of the north and south sections of the Moor.	Brown R W	1969	Moorland	Dissertation presented for conservation course 1968-1969	Undergraduate Dissertation	Dartmoor	1969	Y			EN Exeter
Ecology	Changes in the extent of moorland and roughland on Dartmoor; a preliminary survey to 1971.	Parry M L *et al*	1981	Moorland	Document not seen.	Report	Dartmoor	1981	Y			EN Exeter
Ecology	Changes in the extent of moorland and roughland on Dartmoor: a supplementary survey to 1979	Parry M L *et al*	1982	Moorland	Document not seen.	Report	Dartmoor	1982	Y			EN Exeter
Ecology	The Moorlands of England and Wales	Simmons I G	2003	Moorland	Academic account of the history and development of moorland.	Book	England & Wales		Y		7.5E+08	RPS
Ecology	The Condition of Moorland Vegetation on Ministry of Defence Land on Dartmoor	Kirkham *et al*	2004	Moorland, Vegetation	Monitored the condition of moorland through a sample of 11 sites randomly chosen from within areas of moorland of particular interest or concern to the MoD. The assessment carried out at each site included a detailed study of vegetation composition made using a series of quadrats, and measures of heather condition and abundance, also based on quadrats. Differences were found between habitats and between agreeement and non-agreement land. Dwarf shrub cover was no more than moderately high at any of the MoD sites. The authors suggest that the differences are largely due to lower overall stocking density on MoD areas than on other ESA areas, and possibly also lower winter stocking densities.	Report	Dartmoor ESA	2004	Y			RPS
Ecology	Moorland Vegetation Monitoring in the Dartmoor ESA 1994-2003.	Kirkham F W *et al*	2005	Moorland, Vegetation	This survey concentrated entirely on vegetation condition in relation to grazing, and followed the methods of the previous survey. By 2003 the majority of land in the Dartmoor ESA was subject to ESA land management agreements. Grazing pressure on heather, as indicated by the heather Grazing Index generally increased over the survey period, particularly between 1994 and 1997, and heather cover declined. These effects were greatest where heather cover was lowest, i.e. in acid grasslands. No other species of dwarf shrubs or herbaceous plants (out of 12 that were assessed in addition to heather) showed significant changes in frequency between 1994 and 2003 except wavy hair grass which showed a decline. A general decrease in the grazing score was noted at heath sites. Estimated ages and growth stages of heather suggested are reduction in the frequency of burning. Mires appeared to be burned more frequently than heaths, perhaps because of uncontrolled purple moor-grass burns.	Report	Dartmoor ESA	2005	Y			RPS

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Ecology	Multi-fruited River Moss (*Cryphaea lamyana*): Report on work carried out in England during 2001 and south Wales during 2002. Plantlife Report 204.	Holyoak D	2002	Moss	Document not seen.	Report	UK	2002	Y			DNPA
Ecology	NBN datasets	NBN	2006	NBN, Biological Records	Species records data is available for a range of taxonomic groups from the NBN website. These records can be obtained by 10km grid squares (10km squares within the Dartmoor Training Area include SX59, SX58, SX57, SX576, SX68, SX67, SX66).	species records from 10km BNG squares	UK	various years		BNG		NBN website
Ecology	North Dartmoor SSSI Citation	English Nature	2006	North Dartmoor SSSI	Designated for large areas of upland semi-natural habitat including blanket bogs and mixed valley mire communities. Also breeding birds such as golden plover, dunlin, whinchat, wheatear, and ring ouzel.	Electronic Report	North Dartmoor SSSI		Y			EN website
Ecology	NVC Survey of Cramber Tor	CEH	2002	NVC	This indicated that the site was dominated by H4 and H12 heath, with smaller areas of M6, M15, M17, M21, and M23 Mire, and U20 and U4 grassland. There was a block of conifer plantation to the west of the site, and a small area of W1 woodland / M6 mire mosaic. Intensive grazing was only recorded in two out of the 42 compartments. Most compartments showed moderate or locally moderate grazing intensity. Mature phase heather was present in all of the compartments where there was sufficient heather for its condition to be monitored. Degenerate phase heather was present in most of these, but very little pioneer or building phase heather was present.	Report	Cramber Tor	2001	Y			EN Exeter,
Ecology	DNPA Habitat Survey Card: Bagator Farm	DNPA	1995	NVC	SX 530 824. Grade A I site.	Survey Card	Bagator Farm	1995	Y			Okehampton Camp
Ecology	DNPA Habitat Survey Card: Bearwalls Farm	DNPA	1995	NVC	Bearwalls farm, Grade B site. Lydford.	Survey Card	Bearwalls Farm	1995	Y			Okehampton Camp
Ecology	DNPA Habitat Survey Card: Yellowmead Farm	DNPA	1995	NVC	NVC survey. 4.33ha. Grade I site. Yellowmead farm is just south of Willsworthy Camp SX 531 824.	Survey Card	Yellowmead Farm	1995	Y			Okehampton Camp
Ecology	NVC Survey of Willsworthy TA - Survey of Vegetation & Impact of Land Use	WSP	2003	NVC	Document not seen.	Report	Willsworthy Range	2003	Y			DE Exeter
Ecology	A study of grazing pressure and vegetation change on the Upper Plym Valley, Dartmoor and its ecological implications	Meredith O S	2001	Oak Woodland, Grazing	BSc Dissertation, Stirling University 2001. Investigates the grazing management and its influence on vegetation characeristics of the Upper Plym Valley. The site is generally over grazed, and a reduction in grazing, combined with its inclusion within the Dartmoor ESA would be beneficial for conservation.	Report	Upper Plym Valley	2001	Y			EN Exeter
Ecology	Dartmoor Scarce Damselfly Survey	Baldock N and Keedle R	1998	Odonata	Three scarce damselflies were surveyed: southern damselfly, small red damselfly and scarce blue tailed damselfly. 112 visits were made to 87 sites. All three species were associated with M29 runnel communities. Southern damselfly - 2 sites on NE edge of dartmoor (M29, M25a and M21 communities) 245 t o285m. Small Red: four sites in Nw and NE edges of dartmoor , 200-300m in M29, M25a and M21a communities. Scarce blue tailed damselfly: scattered in western edge of Dartmoor at 140 to 320m in M29 community.	Report	Dartmoor	1998	Y			EN Exeter
Ecology	Monitoring the southern damselfly on Dartmoor 2003	Baldock, D DNPA	2003	Odonata	Resurveys of the two known sites on Dartmoor.	Report	Dartmoor	2003	Y			EN Exeter

Topic Area	Title	Author	Date	Keywords	Summary	Data Format	Area covered	Survey Year	Text	Map Format	ISBN	Document Location
Ecology	Southern Damselfly (*Coenagrion mericuriale*) GB Site Asessment Project	Boyce D	2002	Odonata	60 sites were surveyed across Britain to asess their suitability for this species. Ten population centres are identified, the population in Dartmoor is small and isolated.	Report	UK	2002	Y			DNPA
Ecology	Monitoring the Southern Damselfly on Dartmoor in 2002.	Boyce D & Baldock N	2003	Odonata	The two Dartmoor populations (Tor View Moor and Moortown Bottom) of this species were monitored for nymphs and adults during 2002. Egg laying was noted on 4 occasions, when marsh St. Johns wort, bog pondweed and sharp flowered rush were used.	Report	Dartmoor	2002	Y			DNPA, EN Exeter
Ecology	Monitoring the Southern Damselfly on Dartmoor in 2003.	Boyce D & Baldock N	2004	Odonata	Present again at two sites Tor View Moor and Moortown Valley bottom. Heavy poaching of ground has meant distributional changes at the sites year-to-year.	Report	Dartmoor	2003	Y			DNPA, EN Exeter
Ecology	Monitoring the southern damselfy on Dartmoor in 2002	DNPA	2002	Odonata	Resurveys of the two known sites on Dartmoor.	Report	Dartmoor	2002	Y			EN Exeter
Ecology	A Study of Three Mires on Dartmoor, Two Containing the Southern Damselfly (*Coenagrion mercuriale*), and the other which does not, to determine the habitat requirements of this rare species.	Searle S	2001	Odonata	University of Exeter. Honours Project.	Undergraduate Dissertation	Dartmoor	2001	Y			DNPA
Ecology	Inventory of Key Dragonfly Sites in Devon	Smallshire D	1996	Odonata	Lists seven key sites, including one site of international importance (Tor View Moor), five sites of national importance (Cadover Bridge, Lydford Station, the River Lydford around Lydford, Small Brook near Avon Down, and White Church Down) and one regionally important site (Haytor Down bog and quarry). Further non-key sites include West Blackdown, Blackford Lake, and Mary Tavy Reservoir.	Report	Devon	1996	Y			British Dragonfly Society
Ecology	The Status and Distribution of the Pearl Bordered Fritillary within the Dartmoor National Park.	Baker N R	1997	Pearl Bordered Fritillary	Report of a survey carried out during the 1997 spring flight period. A total of 92 sites were visited, 43 of which produced positive records. It is clear that Dartmoor is a major stronghold for this species in the West Country and on a national scale. Of the 43 locations where the butterfly had some presence, 20 occurred on sites less than 5 ha in area, with small numbers of butterflies on the wing at any one time. From a trial mark-recapture study it is likely that the 43 sites can effectively be condensed down to around 17 and a number of nearby colonies have been listed for ease of recording.	Report	Dartmoor National Park	1997	Y			EN Exeter
Ecology	Species Action Plan: Pearl-bordered Fritillary *Boloria euphrosyne*. Butterfly Conservation.	Barnett L K & Warren M S	1995	Pearl Bordered Fritillary	Document not seen.	Report	UK		Y			Butterfly Conservation
Ecology	Pearl Bordered Fritillary National Survey 1997	Brereton T M *et al*	1998	Pearl Bordered Fritillary	National survey report indicating decline.	Report	UK	1997	Y			Unknown
Ecology	The Status and Distribution of the Pearl-Bordered Fritillary *Boloria euphrosyne* within Dartmoor National Park	Green D G	1998	Pearl Bordered Fritillary	Document not seen.	Report	Dartmoor National Park	1998	Y			DNPA

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Ecology	A comparison of the integration of recreation and conservation in two woodland nature reserves in Dartmoor: Yarner Wood and Wistman's Wood	Jones A	1992	Recreation, Disturbance	Conflicts between recreation and conservation in Yarner Wood and Wistmans Wood.	Report	Yarner Wood, Wistman's Wood	1992	Y			EN Exeter
Ecology	Dartmoor rhos pasture survey 1994-1996 supplement: survey site maps	Hughes M	1997	Rhos Pasture	Lists and maps rhos pasture at 79 sites across Dartmoor. Maps show the habitat classified by quality.	Hardcopy Maps	Dartmoor	1994-1996		Hardcopy		EN Exeter
Ecology	Ring ouzels breeding survey: Dartmoor National Park 1997	Jones R	1997	Ring Ouzel	45 sites were visited and ring ouzels were present at 18 of them. Estimated number of pairs in DNAP for 1997 are 28-36, with the lower end of this estimate more likely.	Report	Dartmoor National Park	1997	Y			EN Exeter
Ecology	Ring ouzels breeding survey of DNP	Jones RAJ	1998	Ring Ouzel	Document not seen.	Report	Dartmoor National Park	1997-98	Y			Okehampton Camp
Ecology	Ring ouzels breeding survey of DNP	R A Jones	1997	Ring Ouzel	Estimated to be 26-38 pairs of ring ouzel in DNPA.	Report	Dartmoor National Park	1997	Y			Okehampton Camp
Ecology	Ring Ouzels Breeding Survey, Dartmoor Natural Area	RSPB	2003	Ring Ouzel	Estimate of 27 to 36 pairs in Dartmoor Natural Area.	Report	Dartmoor Natural Area	2003	Y			Okehampton Camp
Ecology	Site characterisation of the Dartmoor cSAC and associated rivers for the purpose of the review of consents (ROC) project. WRc Plc.	Environment Agency	2004	Rivers	Document not seen.	Report	Dartmoor SAC	2004	Y			DNPA
Ecology	Water quality investigations in support of the site characterisation of Dartmoor cSAC and associated rivers. WRc Plc.	Environment Agency	2004	Rivers	Document not seen.	Report	Dartmoor SAC	2004	Y			DNPA
Ecology	Slender bird's foot trefoil (*Lotus angustissimus*) around the eastern edge of Dartmoor National Park	Stewart N F	1999	Slender Bird's Foot Trefoil	A rare species in Britain. The eastern fringes of Dartmoor represent the largest inland stronghold of this species in Britain. This report documents new locations for this species on Dartmoor.	Report	Eastern Edges of Dartmoor National Park	1999	Y			EN Exeter
Ecology	South Dartmoor SSSI Citation	English Nature	2005	South Dartmoor SSSI Citation	Designated due to the presence of blanket bog, mixed valley mire and unimproved acidic grassland/heathland mosaic. Fauna include red grouse, dunlin, snipe, winchat, and wheatear.	Electronic Report	South Dartmoor SSSI		Y			EN website
Ecology	The status of toadflax-leaved St. Johns wort in Britain in 1994	McDonnell E J	1994	Toad-flax Leaved St Johns Wort	Document not seen.	Report	UK		Y			Unknown
Ecology	*Hypericum linarifolium* (toadflax-leaved St John's wort) report of work undertaken in 1998.	McDonnell E J	1998	Toad-flax Leaved St Johns Wort	Plantlife Back from the Brink report no. 129. Surveys of the two Dartmoor populations (Teign Valley and Dart Valley) were made and conservation options were discussed with landowners.	Report	Teign Valley, Dart Valley	1998	Y			EN Exeter
Ecology	Tor Royal Bog SSSI Citation	English Nature	2006	Tor Royal SSSI	A prime site for blanket mire.	Electronic Report	outside search area, lies just east of Cramber Tor		Y			EN website

Topic Area	Title	Author	Date	Keywords	Summary	Data Format	Area covered	Survey Year	Text	Map Format	ISBN	Document Location
Ecology	An investigation into the impact of trampling on the footpath between Haytor and Saddle Tor in the Dartmoor National Park.	Palmer A	1999	Trampling	University of Plymouth Honours Project.	Undergraduate Dissertation	Haytor, Saddle Tor	1999	Y			DNAP
Ecology	The Upland Management Handbook	English Nature	2001	Uplands	Document not seen.	Book	British Uplands		Y			EN Website
Ecology	Upland Resource Survey Consolidation	English Nature/ Ecological Advisory Service	1995	Uplands	Combines Phase 1 survey data to place a boundary around 'upland' areas' little detailed ecological information on Dartmoor. Tabulates broad habitat coverage.	Report	Upland Dartmoor	1995	Y			RPS
Ecology	Soil Nutrient Status and Botanical Composition of Grasslands in the Dartmoor ESA. ADAS Report to MAFF (MAFF R&D Project BD1429)	Chambers B J, Chritchley N R, Rose S C, Bhogal A & Hodkinson D J	1998	Vegeatation	Document not seen.	Report	Dartmoor ESA	1998	Y			DNAP, DEFRA
Ecology	Dartmoor Environmental Baseline. Draft Report.	Armstrong McCaul Biological Consultants.	undated	Vegetation	Vegetation cover and effects of impact creaters.	Report	Dartmoor		Y			Okehampton Camp
Ecology	Vegetation and heather condition assessment, Upper Plym National Trust property	Boyce D	2004	Vegetation	Vegetation and heather condition survey of the Plym Estate, a large area of moorland on the south western firnge of Dartmoor, 6km North east of Plymouth. The estate forms part of South Dartmoor SSSI and Dartmoor SAC, it is all common land. Marked deterioration in heather condition was noticed across the survey area, thought to be due to excessive grazing. Unless the burning of blanket mires ceases, it seems unlikely that this habitat will recover forom its current unfavourable condition.	Report, Hardcopy Maps	Upper Plym Valley	2004	Y	Hardcopy		EN Exeter

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Ecology	The Environmental Baseline 1984/1985	Dartmoor Steering Group	1985	Vegetation	Vegetation surveys of four c.2km^2 areas (each containing the following areas of mapped semi-natural vegetation): Okehampton Camp (267ha), Dinger Tor (403ha), Steeperton Tor (400ha), Willsworthy (314ha). Habitats present include, blanket bog on all but Okehampton, burnt areas on Dinger tor, *Calluna/Molinia* moor on all sites, grassland on all sites, *Pteridium* grassland on all sites except Dinger Tor, *Calluna-Molinia* moor on all sites, valley bogs on all sites, heath on all sites, grassland and gorse on Willsworthy, grass heath on all sites, mosaics of blanket bog and Calluna-Molinia moor on all sites except Okehampton.	Report	Okehampton Range, Willsworthy Range	1984-1985	Y			Okehampton Camp, Exeter
Ecology	The environmental base line: first resurvey of the crater zone plots	Dartmoor Steering Group	1987	Vegetation	Three years after the crater zone plots were established it was found that 7% of craters had blended into the background vegetation to such an extent that they were no longer discernable. Craters became wider and drier and their vegetation changed from species favouring wet to drier conditions. No new craters were found in the sample plots.	Report	Okehampton Range, Willsworthy Range	1987	Y			EN Exeter
Ecoology	The Effect of Disturbed Land on the Distribution of Common Gorse (*Ulex europaeus*) on Dartmoor.	Dearing J	1975	Vegetation	DSc Thesis, University of Manchester.	DSc. Thesis	Dartmoor	1975	Y			Unknown.
Ecology	National Vegetation Classification of part South Dartmoor SSSI	Ecological Services (Bangor) Ltd	2005	Vegetation	Document not seen.	Hardcopy Maps	South Dartmoor SSSI	2005		Hardcopy		EN Exeter
Ecology	Moorland Vegetation Project. DNPA.	Hogan D	1987	Vegetation	Document not seen.	Report	Dartmoor	1987	Y			DNPA
Ecology	Upland Vegetation Survey: Map Files for East Dartmoor, North Dartmoor and South Dartmoor.	Horsefield A D, Hobbs A, Penford N, Dalby G	1987	Vegetation	Vegetation Survey Maps.	Hardcopy Maps	Upland Dartmoor	1987		Hardcopy		DNPA
Ecology	Dartmoor habitat mapping	Intertidal Data Services	2001	Vegetation	Document not seen.	Hardcopy Maps	Dartmoor	2001		Hardcopy		EN Exeter, DNPA
Ecology	Atlas of the Devon Flora	Ivimey-Cook	1984	Vegetation	Coverage of individual plant species present on Dartmoor.	Book	Devon	Y	Y		8.5E+08	Unknown
Ecology	The Vegetation of a Dartmoor Catchment	Kent M & Wathern P	1980	Vegetation	*Vetatio* 43: 163-172.	Journal Article	Dartmoor	1980	Y			Unknown
Ecology	Environmental Monitoring in the Dartmoor ESA 1994-1997	MAFF	1997	Vegetation	Survey of heather condition in Dartmoor ESA. Reveals general high intensity of grazing, but intensity and effects are habitat, and ESA agreement dependent.	Report	Dartmoor ESA	1994-1997	Y			RPS
Ecology	Vegetation of the Dartmoor Commons	NCC	1969	Vegetation	Vegetation survey report.	Report	Dartmoor Commons	1969	Y			Unknown
Ecology	Upland Survey of Dartmoor. NCC.	NCC	1986	Vegetation	Vegetation Survey.	Report	Upland Dartmoor	1986	Y			DNPA
Ecology	National Vegetation Classification of North, South Central & East Dartmoor SSSI	NCC	1987	Vegetation	Document not seen.	Hardcopy Maps	North, South, Central and East Dartmoor SSSI	1987		Hardcopy		EN Exeter, DNPA

Topic Area	Title	Author	Date	Keywords	Summary	Data Format	Area covered	Survey Year	Text	Map Format	ISBN	Document Location
Ecology	Notes on Mire Vegetation on Dartmoor	Proctor M C F	1989	Vegetation	Report of the Devon Association for the Advancement of Science 121: 129-151.	Journal Article	Dartmoor		Y			Unknown
Ecology	Changes in Wistman's Wood, Dartmoor: Photographic and Other Evidence.	Proctor M C F *et al*	1980	Vegetation	Report of the Devon Association for the Advancement of Science 112: 43-79.	Journal Article	Wistman's wood	1980	Y			Unknown
Ecology	Willsworthy Range: Review of Vegetation Surveys	RPS	2001	Vegetation	The Dartmoor BAP provides broad habitat categories for Dartmoor, the ILMP uses similar broad categories, Willsworthy Conservation Group uses a more complex classification, the DNPA surveys use phase 1 and NVC categories, Heather utilisation studies mostly followed the same methodology: Grazing Index, but smallshire used a Biomass Utilisation approach. There was agreement on the broad habitat classes present, but some disagreement about the fine detail of the habitats, and about location of habitat boundaries. Heather utilisation studies suggest cause for overgrazing concern.	Report	Willsworthy Range		Y			DE Exeter, RPS
Ecology	Willsworthy Range: Habitat Survey Methodology & Results	RPS	2001	Vegetation	30m resolution habitat map based on landsat imagery and ground-truthing from 80 locations. Classifies habitats into: improved grassland, watercourses, H4/U3, M17a/c, H18/H12, H4/mire mosaic, U4, H4, M17/M15 mosaic, upland/heathland mosaic.	Report	Willsworthy Range		Y			DE Exeter, RPS
Ecology	The development of the vegetation of Dartmoor	Simmons I G	1962	Vegetation	PhD Thesis, London University.	PhD Thesis	Dartmoor		Y			EN Exeter
Ecology	Assessement of Western Heath Growth Rate in Dartmoor ESA. ADAS Report to MAFF (R&D project BD 0805)	Smallshire D	1996	Vegetation	Vegetation study.	Report	Dartmoor ESA	1996	Y			DNPA
Ecology	Environmental Management & Change in Plymouth & the South West - Dynamics & Management of Semi-natural Vegetation on Dartmoor	University of Plymouth	circa 1997	Vegetation	Undergraduate Project.	Report	Dartmoor		Y			DE Exeter
Ecology	The Vegetation of Dartmoor. *Field Studies* 4: 505-533.	Ward S D, Jones A D & Manton M.	1972	Vegetation	Overview of the major Dartmoor vegetation types.	Journal Article	Dartmoor		Y			DNPA, FSC
Ecology	Vegetation survey and assessment of Crownhill Down and Smallhanger Waste, South Devon	Cross A	2004	Vegetation,	Two sites on the south western fringes of Dartmoor, a regionally important lowland heath ecosystem, currently designated as a County Wildlife Site. Under threat from mineral planning permission areas. This report includes a species list for the site, describes the vegetation, asesses habitat quality, evaluates its conservation status and compares the site with similar sites in the area. The core of the site is of SSSI quality.	Report	Crownhill Down, Smallhanger Waste	2004	Y			EN Exeter

Topic Area	Title	Author	Date	Keywords	Summary	Data Format	Area covered	Survey Year	Text	Map Format	ISBN	Document Location
Ecology	Environmental monitoring in the Dartmoor ESA 1994-1997.	ADAS	1998	Vegetation, Dartmoor ESA	The 1994-1997 report included a 1994 survey of general land cover, and 1994 and 1997 surveys of moorland vegetation, hay meadows, and linear features. In this landcover survey, the categories used included open moor and heath, hill and valley farmland, cultivated plateau and fringe farmland. The moorland survey showed that 12 NVC communities and 17 sub-communities were present inlcuding heath, mire and calcifugous grassland. Heather cover was generally low and showed a decrease between 1994 and 1997.	Report	Dartmoor ESA	1994-1997	Y			DNPA
Ecology	Dartmoor ESA Baseline Land Cover, 1994	ADAS, Bristol	1994	Vegetation, Habitats	ADAS have said that this report was published within the MAFF 1997 publication 'Environmental Monitoring in the Dartmoor ESA'	Report	Dartmoor ESA	1994	Y			DEFRA
Ecology	Dartmoor ESA Landcover Types Map 1994 Draft.	MAFF	1994	Vegetation, Habitats	Broad vegetation survey. Categories used included cultivated land, improved pasture, rough pasture, heather moorland, bracken, scrub, woodland etc. Scale 1:25,000.	Hardcopy Maps	Dartmoor ESA	1994		Hardcopy		Okehampton Camp
Ecology	Vegetation & Heather Condition Maps for the Commons of Dartmoor	English Nature	1994	Vegetation, Heather Condition	As a whole the Dartmoor Commons (which comprise 90% of the unenclosed moorland within the National Park) consist of 31% heathland, 36% blanket or valley bog,15% grassland (of which 1% is dominated by purple-moor grass), 11% bracken, and 6% scrub & woodland. 32% of the heather area is healthy, 36% shows some damage, and in 36% of the area, this species is effectively absent.	Maps: Hardcopy	Dartmoor Commons	1994	Y			RPS
Ecology	The Condition of Moorland Vegetation on MoD Land on Dartmoor. A report to the MoD on a vegetation survey carried out June 2003.	Kirkham F W *et al*	2004	Vegetation, Heather Condition	This survey extends the ESA vegetation monitoring carried out by ADAS and RDA in the Dartmoor Training Area. Asesses vegetation change and grazing intensity on particular (sensitive) sites across MoD land. THe dominant vegetation types were M17 mire and U3 grassland. Mature stage heather was completely absent. Generally MoD areas showed lower grazing intensity than other areas of the ESA, which the authors suggest reflects the lower overalla and winter stocking densities on MoD land.	Report	MoD Land of Dartmoor	2004	Y			Okehampton Camp
Ecology	Willsworthy Heather Utilisation Survey	MoD/DNPA	1993	Vegetation, Heather Condition	Willsworthy heather condition asessement.	Report	Willsworthy Range	1993	Y			Okehampton Camp
Ecology	Smallshire D (1996). Heather Utilisation at Dartmoor ESA prescribed stocking rates. ADAS report to MAFF (R&D project BD 0804).	Smallshire D	1996	Vegetation, Heather Condition	Heather condition assessment for Dartmoor ESA.	Report	Dartmoor ESA	1996	Y			DNPA
Ecology	Vegetation and Heather Condition Maps for the Commons of Dartmoor: a Practical Aid to their Sensitive Management	Wolton R J *et al*	1992	Vegetation, Heather Condition	94% of Dartmoor common land surveyed. 33% heathland, 33% mire and 33% grassland. Abundant heather damage. Reduction in grazing required to prevent heather loss.	Report	Dartmoor Commons	1992	Y			EN Exeter
Ecology	Long-term Vegetation Recovery after Vehicle Track Abandonment on Dartmoor, SW England, U.K. *Journal of Environmental Management* 45: 73-85.	Charman, D J & Pollard A	1996	Vegetation, Impacts	Study into rates of vegetation growth on abandoned tracks.	Journal Article	Dartmoor	1996	Y			DNPA

Topic Area	Title	Author	Date	Keywords	Summary	Data Format	Area covered	Survey Year	Text	Map Format	ISBN	Document Location
Ecology	Willsworthy Habitat Survey	RPS	2002	Vegetation, Heather Condition	A large number of habitat studies have been carried out over the last few decades. Unfortunately these use different habitat classification systems and comparison is difficult. It is clear that the area is composed of a mosaic of several habitat types including blanket bog, heathland, and grassland, together with some aquatic habitat. Contans a list of key species of nature conservation interest, and a list of recommendations for future management. Generally grazing levels are too high and reductions in grazing intensity across the site are recommended, along with future monitoring of effects.	Report	Wilsworthy	2002	Y			Okehampton
Ecology	Breeding Wading Birds in the DNP	Baines D	2000	Waders	Lapwing populations are estimated at 12 to 14 pairs, and curlew 5 pairs. Suggestions are made for measures to improve breeding success through crow trapping and habitat management.	Report	Dartmoor National Park		Y			Okehampton Camp
Ecology	Willsworthy Environmental Site Dossier	Willsworthy Conservation Group	2005	Willsworthy	A large binder containing reports and records of species from Willsworthy.	Site Dossier	Willsworthy Range		Y			Okehampton Camp
Ecology	Wistman's Wood SSSI Citation	English Nature	2006	Wistman's Wood SSSI	The site is designated for its relect upland old sessile oak woodland noted for its lichens.	Electronic Report	Wistman's Wood SSSI		Y			EN website
Ecology	Twenty five years of change in population of oak saplings in Wistman's Wood, Devon. English Nature Research Report No. 348.	Mountford E P, Page PA & Peterkin G F	2000	Wistman's Wood SSSI	Document not seen.	Report	Wistmans Wood	2000	Y			DNPA
Ecology	A Woodland Strategy for Dartmoor National Park 2005-2010	Countryside Acssociates	undated	Woodland	Summarises the current state of woodland on Dartmoor: woodland covers 11% of the DNP (2750ha of ancient semi-natural woodland, 4500ha of other other broadleaved woodland, and 3900ha of coniferous plantation). It sets out a rather limited strategy for 2005-2010 centred on maintenance of woodland coverage.	Report	DNPA		Y			DNPA
Ecology	Ecological Effects of Afforestation: A Case Study of Burrator.	Essex S & Williams A	1992	Woodland	*Applied Geography* 12: 361-379	Journal Article	Burrator		Y			Unknown
Ecology	Developing New Native Woodland in the English Uplands: Final Report. English Nature Research Report 230.	Good J E G	1997	Woodland	Document not seen.	Report	English Uplands		Y			English Nature website, DNPA
Ecology	Dartmoor National Park: the trees and forests	Hall A	1977	Woodland	Document not seen.	Report	Dartmoor National Park	1977	Y			EN Exeter
Ecology	New Native Woodland on Dartmoor. English Nature Research Report 417.	Ince R	2001	Woodland	Document not seen.	Report	Dartmoor		Y			DNPA
Ecology	The Development of Beech Woodland at Dendles Wood National Nature Reserve, Devon. English Nature Research Report No. 433.	Mountford EP, Page P A & Peterkin G F	2001	Woodland	Document not seen.	Report	Dendles Wood	2001	Y			DNPA
Ecology	The Effects of Enclosure and Grazing on Vegetation in Wistman's Wood, Dartmoor.	Brown J W	1983	Woodland, Management	Dissertation presented for BA in Environmental Studies	Undergraduate Dissertation	Wistman's Wood	1983	Y			Unkown

Topic Area	Title	Author	Date	Keywords	Summary	Data Format	Area covered	Survey Year	Text	Map Format	ISBN	Document Location
Ecology	An investigation of the age structure of Piles Copse: ancient woodland or plantation?	Goddard R	1994	Woodland, Piles Copse	BSc Hons Environmental Science Dissertation. Piles Copse is an ancient woodland with various anthropogenic influences, unsucessful regeneration can be traced to grazing. Uniform distribution indicated prevalance of past management. Unbalanced age structure, with few young trees. Suggestions for conservation management include reducing but not eliminating grazing.	Undergraduate Dissertation	Piles Copse	1994	Y			EN Exeter
Ecology	A study of a pedunculate oak woodland in a severe environment, Piles Copse, Dartmoor	Hemery G E	1991	Woodland, Piles Copse	BSc Dissertation,	Report	Piles Copse	1991	Y			EN Exeter
Ecology	A Study of Changes that Have Ocurred in the Composition of Ground Flora Within Non-Intervention Managed Areas of Yarner Wood National Nature Reserve Between 1957 and 1994.	Owen M	1995	Yarner Wood	Document not seen.	Report	Yarner Wood	1957, 1994	Y			DNPA

Appendix 2

Data Table B: Forthcoming Ecological Surveys

Dartmoor action plan or research type	Organisation	Contact name	Brief description of monitoring project	Frequency of monitoring	How is the data gathered?	Who gathers the data?	What format are the results in?	Where are the results kept?	Who holds the copyright?	Comments
Woodland	**Woodland Trust**	James Mason	compartment stand data - approximate species composition and structure	5 years	observation by officer based on sample plots	In-house	Electronic report (specify software in comments)	central office server	Woodland Trust	Results are part of management plan database
Bats	**Woodland Trust**	James Mason	JM personal records of site and roost observations	continual	ad hoc field work and participation in NBMP	Volunteers			Woodland Trust	
Dormice	**Woodland Trust**	James Mason	presence survey and new box monitoring including latest tube project	5 years	standard dormouse survey conditions	Volunteers	Paper maps, report & record cards	local office	Woodland Trust	Contractors also collect data
Impacts - land management	**Woodland Trust**	James Mason	every site where physical site management occurs is monitored to ensure that use is sustainable and damage (detrimental change) is not occuring to any other key feature of the site.	0 years	officer observation of specific conservation features	In-house	Electronic report (specify software in comments)	central office server	Woodland Trust	Results are part of management plan database
Impacts - recreation	**Woodland Trust**	James Mason	every site where recreation occurs is monitored to ensure that use is sustainable and damage (detrimental change) is not occuring to any other key feature of the site.	1 year	officer observation of specific conservation features	In-house	Electronic report (specify software in comments)	central office server	Woodland Trust	Results are part of management plan database
Golden plover and dunlin	**Royal Society for the Protection of Birds**	Helen Booker	population monitoring with DBWPS in 2002	1 year	DBWPS use standardised method, but this year, we're not - just site checks	In-house	Paper maps, report & record cards	DBWPS and RSPB Exeter	DBWPS and RSPB	This is a joint project with DBWPS
Ring ouzel	**Royal Society for the Protection of Birds**	Helen Booker	National population monitoring	10 years	systematic survey determined in consultation with DBWPS & DNPA	In-house	Digital maps (specify software in comments)	RSPB HQ	RSPB	In-house research staff gather data. Excel and MapInfo software.
Other habitat, species or geological features relevant to Dartmoor	**Devon Birdwatching & Preservation Society**	Bob Jones	Population monitoring of curlew for Devon BAP			Volunteers		DBWPS	DBWPS	
Moorland	**Rural Development Service**	Pete Stevens	Dartmoor ESA management plan reviews	2 year initially	survey (follow up from original mapping exercise)	In-house	Paper maps, report & record cards	DEFRA hardcopy files	DEFRA	
Woodland	**Rural Development Service**	Pete Stevens	Dartmoor ESA management plan reviews	2 year initially	survey (follow up from original mapping exercise)	In-house	Paper maps, report & record cards	DEFRA hardcopy files	DEFRA	
Rhos pasture	**Rural Development Service**	Pete Stevens	Dartmoor ESA management plan reviews	2 year initially	survey (follow up from original mapping exercise)	In-house	Paper maps, report & record cards	DEFRA hardcopy files	DEFRA	
Impacts - land management	**Rural Development Service**	Pete Stevens	Dartmoor ESA management plan reviews	2 year initially	Proformas filled out by land managers	Volunteers	Paper maps, report & record cards	DEFRA hardcopy files	DEFRA	
Other habitat, species or geological features relevant to Dartmoor	**Barn Owl Trust**	Mark Green	Inspection of Barn Owl breeding/roosting sites sites	Annual	Ad hoc	In-house	Digital record cards	Barn Owl Trust	Barn Owl Trust	In addition to records generated by BOT fieldwork we also record all Barn Owl sightings reported to us by the public
Moorland	**Devon Moth Group**	Roy McCormick	Collecting moth records and monitoring BAP and local species, mostly by light trapping, at various sites	Monthly	Ad hoc, when weather allows	Volunteers	Electronic report (specify software in comments)	Roy McCormick,Devon Moth Group,36 Paradise Road,Teignmouth,Devon,TQ14 8NR	Devon Moth Group & Devonshire Association	Clarion' database 'clone'. Roy McCormick retains results as county lepidopteran recorder and on behalf of Devon Moth Group and Devonshire Association (Entomological Section). Paper reports are also produced as well as the Clarion database.
Woodland	**Devon Moth Group**	Roy McCormick	Collecting moth records and monitoring BAP and local species, mostly by light trapping, at various sites	Monthly	Ad hoc, when weather allows	Volunteers	Electronic report (specify software in comments)	Roy McCormick,Devon Moth Group,36 Paradise Road,Teignmouth,Devon,TQ14 8NR	Devon Moth Group & Devonshire Association	Clarion' database 'clone'. Roy McCormick retains results as county lepidopteran recorder and on behalf of Devon Moth Group and Devonshire Association (Entomological Section). Paper reports are also produced as well as the Clarion database.
Field boundaries and isolated trees	**Devon Moth Group**	Roy McCormick	Collecting moth records and monitoring BAP and local species, mostly by light trapping, at various sites	Monthly	Ad hoc, when weather allows	Volunteers	Electronic report (specify software in comments)	Roy McCormick,Devon Moth Group,36 Paradise Road,Teignmouth,Devon,TQ14 8NR	Devon Moth Group & Devonshire Association	Clarion' database 'clone'. Roy McCormick retains results as county lepidopteran recorder and on behalf of Devon Moth Group and Devonshire Association (Entomological Section). Paper reports are also produced as well as the Clarion database.
High brown and pearl-bordered fritillary	**Butterfly Conservation**	John Randall	Transects at Aish Tor SX707710 (by John Barkham), Dunsford SX785891 (Stephen Hatch) & West Down SX484704 (John Randall)	Weekly from the last week of April to the last week of August	Field survey of transects	Volunteers	Transect results are inputted to the BC 'Transect Walker' software which is provided free to all transect walkers who have a PC capable of running it.	Walker' that allows the results to be submitted via floppy disk or Email to BC Head Office, Manor Yard, East Lulworth, Wareham, Dorset. BH20 5QP. Tel : 01929 400210. Email info@butterfly-conservation.org	Butterfly Conservation	
Mosses, lichens and ferns	**British Bryological Society**	Mark Pool	County tetrad surveys of mosses and liverworts	Ad hoc	Ad hoc	Volunteers	Digital maps (specify software in comments)	Mark Pool, British Bryological Society	Mark Pool	Data also gathered 'in-house'. Digital maps (DMAP), digital record cards (BIOBASE) and some electronic reports (Lotus Word Pro).

Dartmoor action plan or other type of monitoring project	Who gathers the data?	What format are the results in?	Organisation	Note 1
Moorland	Volunteers	Digital maps (specify software in comments)	Barn Owl Trust	Is it systematic survey (i.e. is there a repeatable, standardised method) or is it ad hoc?
Woodland	Contractors	Electronic report (specify software in comments)	British Bryological Society	
Freshwater	In-house	Digital record cards	British Canoe Union	
Rhos pasture	Other (specify in comments)	Paper maps, report & record cards	British Lichen Society	
Haymeadows and species-rich dry pasture		Other (specify in comments)	Butterfly Conservation	
Field boundaries and isolated trees			China Clay Assocation	
Rocks (including tors, clitter, quarries, caves, mines and buildings)			Country Landowners Assocation	
Mosses, lichens and ferns			Dartmoor Commoners Council	
Deptford pink			Dartmoor National Park Authority	
Flax-leaved St.John's wort			DEFRA	
Vigur's eyebright			Devonshire Association	
Blue ground beetle			Devon Birdwatching & Preservation Society	
Bog hoverfly			Devon Caving Club	
High brown and pearl-bordered fritillary			Devon County Council	
Marsh fritillary and narrow bordered bee hawk-moth			Devon Hedge Group	
Scarce dragonflies			Devon Moth Group	
Golden plover and dunlin			Devon RIGS Group	
Ring ouzel			Devon Rural Skills Trust	
Bats			Devon Wildlife Trust	
Dormice			Duchy of Cornwall	
Other habitat, species or geological features relevant to Dartmoor			English Nature	
Impacts - land management			Environment Agency	
Impacts - recreation			Forest Enterprise	
Impacts - pollution			Forestry Commission	
Impacts - other			Fountain Forestry	
Other (specify in comments)			Ministry of Defence	
			National Farmers Union	
			National Trust	
			None	
			Other (specify in comments)	
			River Dart Country Park	
			Royal Society for the Protection of Birds	
			Rural Development Service	
			South West Water	
			Timber Growers Assocation	
			West Country Rivers Trust	
			Wild Trout Society	
			William Pengelly Trust	
			Woodland Trust	

Research	Organisation	Contact name	Brief description of project	Frequency of monitoring	Data Collection	Who gathers the data?	Output	Where are the results kept?	Who holds the copyright?	Comments
Woodland	Woodland Trust	James Mason	Compartment stand data - approximate species composition and structure	5 years	observation by officer based on sample plots	In-house	Electronic report (specify software in comments)	central office server	Woodland Trust	Results are part of management plan database
Bats	Woodland Trust	James Mason	JM personal records of site and roost observations	continual	ad hoc field work and participation in NBMP	Volunteers			Woodland Trust	
Dormice	Woodland Trust	James Mason	Presence survey and new box monitoring including latest tube project	5 years	standard dormouse survey conditions	Volunteers	Paper maps, report & record cards	local office	Woodland Trust	Contractors also collect data
Impacts - land management	Woodland Trust	James Mason	Every site where physical site management occurs is monitored to ensure that use is sustainable and damage (detrimental change) is not occuring to any other key feature of the site.	continual	officer observation of specific conservation features	In-house	Electronic report (specify software in comments)	central office server	Woodland Trust	Results are part of management plan database
Impacts - recreation	Woodland Trust	James Mason	Every site where recreation occurs is monitored to ensure that use is sustainable and damage (detrimental change) is not occuring to any other key feature of the site.	1 year	officer observation of specific conservation features	In-house	Electronic report (specify software in comments)	central office server	Woodland Trust	Results are part of management plan database
Golden plover and dunlin	Royal Society for the Protection of Birds	Helen Booker	Population monitoring with DBWPS in 2002	1 year	DBWPS use standardised method, but this year, we're not - just site checks	In-house	Paper maps, report & record cards	DBWPS and RSPB Exeter	DBWPS and RSPB	This is a joint project with DBWPS
Ring ouzel	Royal Society for the Protection of Birds	Helen Booker	National population monitoring	10 years	systematic survey determined in consultation with DBWPS & DNPA	In-house	Digital maps (specify software in comments)	RSPB HQ	RSPB	In-house research staff gather data. Excel and
Other habitat, species or geological features relevant to Dartmoor	Devon Birdwatching & Preservation Society	Bob Jones	Population monitoring of curlew for Devon BAP			Volunteers		DBWPS	DBWPS	
Moorland	Development Service	Pete Stevens	Dartmoor ESA management plan reviews	2 year initially	survey (follow up from original mapping exercise)	In-house	Paper maps, report & record cards	DEFRA hardcopy files	DEFRA	
Woodland	Development Service	Pete Stevens	Dartmoor ESA management plan reviews	2 year initially	survey (follow up from original mapping exercise)	In-house	Paper maps, report & record cards	DEFRA hardcopy files	DEFRA	
Rhos pasture	Development Service	Pete Stevens	Dartmoor ESA management plan reviews	2 year initially	survey (follow up from original mapping exercise)	In-house	Paper maps, report & record cards	DEFRA hardcopy files	DEFRA	
Impacts - land management	Development Service	Pete Stevens	Dartmoor ESA management plan reviews	2 year initially	Proformas filled out by land managers	Volunteers	Paper maps, report & record cards	DEFRA hardcopy files	DEFRA	
Other habitat, species or geological features relevant to	Barn Owl Trust	Mark Green	Inspection of Barn Owl breeding/roosting sites sites	Annual	Ad hoc	In-house	Digital record cards	Barn Owl Trust	Barn Owl Trust	In addition to records generated by BOT fieldwork
Moorland	Devon Moth Group	Roy McCormick	Collecting moth records and monitoring BAP and local species, mostly by light trapping, at various sites	Monthly	Ad hoc, when weather allows	Volunteers	Electronic report (specify software in comments)	Roy McCormick,Devon Moth Group,36 Paradise	Devon Moth Group & Devonshire Association	database 'clone'. Roy McCormick retains results as county
Woodland	Devon Moth Group	Roy McCormick	Collecting moth records and monitoring BAP and local species, mostly by light trapping, at various sites	Monthly	Ad hoc, when weather allows	Volunteers	Electronic report (specify software in comments)	Roy McCormick,Devon Moth Group,36 Paradise	Devon Moth Group & Devonshire Association	database 'clone'. Roy McCormick retains results as county
Field boundaries and isolated trees	Devon Moth Group	Roy McCormick	Collecting moth records and monitoring BAP and local species, mostly by light trapping, at various sites	Monthly	Ad hoc, when weather allows	Volunteers	Electronic report (specify software in comments)	Roy McCormick,Devon Moth Group,36 Paradise	Devon Moth Group & Devonshire Association	database 'clone'. Roy McCormick retains results as county
High brown and pearl-bordered fritillary	Butterfly Conservation	John Randall	Transects at Aish Tor SX707710 (by John Barkham), Dunsford SX785891 (Stephen Hatch) & West Down SX484704 (John Randall)	Weekly from the last week of April to the last week of August	Field survey of transects	Volunteers	Transect results are inputted to the BC 'Transect Walker' software which is provided free to all transect walkers who have a PC capable of	There is a 'Package' facility within 'Transect Walker' that allows the results to be submitted via	Butterfly Conservation	
Mosses, lichens and ferns	British Bryological Society	Mark Pool	County tetrad surveys of mosses and liverworts	Ad hoc	Ad hoc	Volunteers	Digital maps (specify software in comments)	Mark Pool, British Bryological	Mark Pool	Data also gathered 'in-house'. Digital
Dartmoor Pony Grazing	English Nature	Simon Bates	Staellite Tracking of pony movements in order to assess distribution of grazling pressure on Dartmoor.	beginning 2006		Contractor				
SSSI Consdition Assessments	English Nature	Simon Bates	Monitoring of change in habitat conditions.	1 year		English Nature	Electronic Summaruy Reports on EN website	EN Exeter	English Nature	
Dartmoor NVC Surveys	English Nature	Simon Bates	Monitoring of SSSI areas outside the Dartmoor Training Area.	beginning 2006		English Nature	Survey Reports	EN Exeter	English Nature	
Historical Use of Swaling	English Nature	Simon Bates		beginning 2006		English Nature		EN Exeter	English Nature	
Marsh Fritillary Surveys	Two Moors Project									
Invertebrate Suveys	DNPA	Nigel Baldock	Individual surveys for species such as the southern damselfly and bog hoverfly.	1 year		DNPA	Survey Reports	DNPA	DNPA	
Salmon Redds	DNPA	Nigel Baldock	Surveys to identify areas used by salmon for breeding.	beginning 2006		DNPA	Survey Reports	DNPA	DNPA	

Appendix 3

Abbreviations Used in this Document

ADAS	Agricultural Development and Advisory Service
ASPT	Average Species Per Taxon
BAP	Biodiversity Action Plan
BBS	Breeding Bird Survey
BDS	British Dragonfly Society
BMWP	Biological Monitoring Working Party
BSBI	Botanical Society of the British Isles
CBC	Common Bird Census
DE	Defence Estates
DTA	Dartmoor Training Area
DEFRA	Department for Environment, Farming and Rural Affairs
DNPA	Dartmoor National Park Authority
EN	English Nature
ESA	Environmentally Sensitive Area
IUCN	International Union for the Conservation of Nature and Natural Resources
JNCC	Joint Nature Conservation Committee
MAGIC	Multi Agency Geographic information for the Countryside
NBN	National Biodiversity Network
RDB	Red Data Book
SSSI	Site of Special Scientific Interest

Appendix 4

Full Citations for Statutory Designated Areas

County: Devon **Site Name: Tor Royal Bog**

District: West Devon

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act, 1981

Local Planning Authority: West Devon District Council
Dartmoor National Park Authority
Devon County Council

National Grid Reference: SX 605722 **Area:** 58.0 (ha) 143.3 (ac)

Ordnance Survey Sheet 1:50,000:202 **1:10,000:** SX 67 SW

Date Notified (Under 1949 Act): 1969 **Date of Last Revision:** 1976

Date Notified (Under 1981 Act): 1984 **Date of Last Revision: –**

Other Information:
The site lies in Dartmoor National Park.
The site boundary has been amended.

Description:
Tor Royal Bog is one of the best examples of blanket mire in Devon, and is an important representative of such mires in South West Britain.

The site lies on the granite massif of Dartmoor at an altitude of c. 390 m and comprises a discrete area of grazed blanket mire edged by unimproved acidic grassland. The mire is dominated by hare's-tail cottongrass *Eriophorum vaginatum* and the bog moss *Sphagnum papillosum*. Altogether, seven species of *Sphagnum* have been recorded on the site, including the now uncommon and declining *S. imbracatum*, once the dominant peat-forming species in the British Isles. Other plant species characteristic of the mire community are bog asphodel *Narthecium ossifragum*, cross-leaved heath *Erica tetralix*, bilberry *Vaccinium myrtillus*, deer sedge *Scirpus cespitosus* and round-leaved sundew *Drosera rotundifolia*. A water course flows south-eastwards through the centre of the site, and at its southern end it is associated with mire characterised by an abundance of soft rush *Juncus effusus* and bog mosses *Sphagnum* spp., and by the presence of lesser spearwort *Ranunculus flammula*, round-leaved crowfoot *R. omiophyllus*, marsh violet *Viola palustris* and marsh thistle *Cirsium palustre*.

Of additional interest are the drier peripheral areas which comprise unimproved acidic grassland. Here, the herb flora includes lousewort *Pedicularis sylvatica*, common milkwort *Polygala vulgaris*, tormentil *Potentilla erecta* and heath bedstraw *Galium saxatile*.

CITATION

COUNTY: DEVON SITE NAME: SOUTH DARTMOOR

DISTRICT: WEST DEVON, SOUTH HAMS

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981 as amended

Local Planning Authority: DEVON COUNTY COUNCIL, Dartmoor National Park

National Grid Reference: SX 630690 Area: 9668.2 (ha.) 23890.2 (ac.)

Ordnance Survey Sheet 1:50,000: 202 1:10,000: SX 56 SE; SX 56 NE; SX 66 NW; SX 66 SE; SX 66 SW; SX 67 SE; SX 67 SW

Date Notified (Under 1949 Act): 1952 Date of Last Revision: 1976

Date Notified (Under 1981 Act): 1989 Date of Last Revision: –

Other Information:
Site name changed from Central South Dartmoor. Boundary amended by extension and deletion. The site now includes High-house Waste, which was formerly part of Hawn's Wood and High House Moor SSSI (now Dendles Wood SSSI). Part of the site originally notified in 1951 has since been renotified as part of the Holne Woodlands SSSI Nature Conservation Review Site. Geological Conservation Review Site (in part). Site lies wholly within Dartmoor National Park.

Description and Reasons for Notification:
This upland site contains some of the most extensive areas of blanket bog, mixed valley mire and unimproved acidic grassland/heathland mosaic in southern Britain. Several of the communities present are restricted to South West England. It also contains a locality of national geological importance.

The site is located on the southern part of the Dartmoor granite outcrop, at an altitude of between 350 and 500 metres. The annual rainfall is very high, reaching 200cm on the highest ground. The headwaters of several of the major rivers of southern Devon are found within the site. The soils are acidic and consist mainly of peats, more than a metre thick in places, and gleyed stagnohumic soils. The area is virtually treeless and heavily grazed by livestock.

Blanket bog occurs on the highest ground, characterised by the presence of abundant bog mosses, especially *Sphagnum papillosum*, *S. auriculatum*, *S. capillifolium*, and *S. magellanicum* along with flowering plants such as Common Cottongrass *Eriophorum angustifolium*, Hare's-tail Cotton-grass *E. vaginatum*, Purple Moorgrass *Molinia caerulea*, Cross-leaved Heath *Erica tetralix*, Heather *Calluna vulgaris* and Deergrass *Trichophorum cespitosum*. The rare *Sphagnum imbricatum* is present.

Many of the slopes are covered the acidic upland grassland of a type restricted to South-West England with Purple Moor-grass, Sheep's Fescue *Festuca ovina*, Mat-grass *Nardus stricta* and Bristle Bent *Agrostis curtisii* as the dominant species. In many areas this vegetation forms a mosaic with Heather and Bilberry *Vaccinium myrtillus*; in other areas Bilberry alone is the dominant shrub, and here mosses such as *Pleurozium schreberi*, *Rhytidiadelphus loreus*, *Racomitrium lanuginosum*, *Hylocomium splendens*, *Thuidium tamariscinum* and *Hypnum jutlandicum are* abundant. The granite boulders strewn across much of the site have rich upland lichen flora, with the large *Umbilicaria pustulata* being particularly conspicuous.

The mires and bog pools occurring in the valley bottoms are among the finest and least disturbed of their type in Britain. They are characterised by the bog mosses *Sphagnum palustre*, *S. pulchrum*, *S. recurvum* and *Polytrichum commune*, and herbs such as Bottle Sedge *Carex rostrata*, Star Sedge *C. echinata*, Soft-rush *Juncus effusus* and Sharp-flowered Rush *J. acutiflorus* are common. Marsh Clubmoss *Lycopodiella inundatum* is one of the more unusual plant species present.

Birds breeding on the site include Red Grouse *Lagopus lagopus*, Dunlin *Calidris alpina*, Snipe *Gallinago gallinago*, Winchat *Saxicola rubetra*, and Wheatear *Oenanthe oenanthe*, all species uncommon in Southern England.

Blacklane Brook provides important palynological data on Flandrian vegetation history and environmental change on southern Dartmoor. The pollen sequence is calibrated by radiocarbon dating and constitutes a valuable record of the palaeoecological history of this important area of S W England.

COUNTY: DEVON SITE NAME: NORTH DARTMOOR

DISTRICT: WEST DEVON

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act, 1981, (as amended).

Local Planning Authority: DEVON COUNTY COUNCIL, Dartmoor National Park

National Grid Reference: SX 580850 Area: 13,413.2 (ha.) 33,143.9 (ac.)

Ordnance Survey Sheet 1:50,000: 191 1:10,000: See below

Date Notified (Under 1949 Act): 1952 Date of Last Revision: 1976

Date Notified (Under 1981 Act): 1989 Date of Last Revision: –

Other Information:
The site boundary has been amended by extension and deletion.
The extensions include the formerly separate Gidleigh Common SSSI and Black Tor Copse Forest Nature Reserve.
This Copse and the former North Dartmoor SSSI are Nature Conservation Review sites; the SSSI also contains a site listed in the Geological Conservation Review and it lies wholly within Dartmoor National Park.

1:10,000: SX 58 SW, SX 58 SE, SX 68 SW, SX 68 NE, SX 59 SW, SX 59 SE, SX 68 SE, SX 58 NW, SX 58 NE, SX 68 NW, SX 69 SE, SX 57 NE, SX 67 NW, SX 69 SW

Description and Reasons for Notification:
North Dartmoor contains one of the largest areas of upland semi-natural habitat in southern Britain. It is particularly important for western blanket bog and mixed valley mire communities, but also supports a diverse upland breeding bird community. Within the site lies Black Tor Copse, of national importance for lichens, and also Black Ridge Brook, of national geological importance.

The site is located on the northern part of the Dartmoor granite. It comprises a plateau lying between 300 and 600m, cut by many valleys and the headwaters of many of the major rivers of Devon are found here. The highest areas are capped by tors and rocky buttresses, often flanked by granite clitter. The area receives a high rainfall of 150--230 cm per year and experiences strong prevailing southwesterly winds. The soils are very acidic. Higher areas are covered with raw peat deposits, several metres thick in places, while on the lower slopes thinner gleyed soils and podzols with much organic matter occur.

Western blanket bog occupies parts of the highest ground, characterised by abundant bog-mosses, principally *Sphagnum capillifolium, S. papillosum* and *S. auriculatum*. Typical associated plants are Purple Moor Grass *Molinia caerulea*, Hare's-tail Cottongrass *Eriophorum vaginatum*, Common Cottongrass *E. angustifolium*, Deergrass *Trichophorum cespitosum*, Cross-leaved Heath *Erica tetralix*, Heather *Calluna vulgaris*, Round-leaved Sundew *Drosera rotundifolia* and Bog Asphodel *Narthecium ossifragum*. Many pools containing *Sphagnum cuspidatum* and *S. auriculatum* occur within this blanket bog, while on the drier banks and rocks and moss *Racomitrium lanuginosum* is abundant.

The valley mires within the site are of two types. Where water movement is restricted, a plant community similar to that of the blanket bog occurs, although with *Sphagnum pulchrum* often a major constituent. Where water movement is

greater, the mires have abundant *S. recurvum*, *S. auriculatum* and *Polytrichum commune*, along with Soft Rush *Juncus effusus*, Sharp-flowered Rush *J. acutiflorus*, Bottle Sedge *Carex rostrata*, Star Sedge *C. echinata*, White-beak Sedge *Rhyncospora alba* and Bogbean *Menyanthes trifoliata*.

Large areas of both wet and dry heathland are also found within the SSSI, dominated by Heather, Purple Moor Grass and Cross-leaved Heath, together with Western Gorse *Ulex gallii* and Bilberry *Vaccinum myrtillus*. In amongst this heathland patches of acidic grassland are frequent, the main components of which are Bristle Bent *Agrostis curtisii*, Sheep's Fescue *Festuca ovina*, Mat-grass *Nardus stricta*, Heath Rush *Juncus squarrosus* and Green-ribbed Sedge *Carex binervis*. Both these heathland and grassland communities are restricted to South-west Britain. Occasionally Bilberry alone is the dominant shrub and here mosses such as *Pleurozium schreberi*, *Rhytidiadelphus loreus*, *Racomitrium lanuginosum*, *Hylocomium splendens*, *Thuidium tamariscinum* and *Hypnum jutlandicum* are abundant, while lichen-rich patches with *Cladonia arbuscula*, *C. uncialis* and *C. impexa* also occur.

Among the more unusual species recorded on site are Cranberry *Vaccinium oxycoccus* on the open moor, Fir Clubmoss *perzia selago*, Lemon-scented Fern *Oreopteris limbosperma*, Tunbridge Filmy-fern *Hymenophyllum tunbrigense* and Wilson's Filmy-fern *H. wilsonii* in wet shaded crevices in scree slopes, Bog Orchid *Hammarbya paludosa* in a few mires, and the liverwort *Anastrepta orcadensis* on the highest tors.

The bird community includes the only regular breeding populations of Golden Plover *Pluvialis apricaria* and Dunlin *Calidris alpina* in southern Britain. Also present are breeding populations of Whinchat *Saxicola rubetra*, Wheatear *Oenanthe oenanthe* and Ring Ouzel *Turdus torquatus*, a species which breeds here in greater numbers than anywhere else in Southern England.

Black Tor Copse is one of three high altitude stunted Pedunculate Oak *Quercus robur* woodlands on Dartmoor. It has developed on thin humic and podzolic soils with extensive granite clitter on a south-west facing slope above the West Okement River. The vascular plant community is limited to strict acid-loving species such as Bilberry, but the moss and lichen floras are rich. Many of the granite boulders are covered with a carpet of mosses, with species such as *Rhytidiadelphus loreus*, *Thuidium tamariscinum* and *Plagiothecium undulatum* being abundant. The Copse is nationally important for the lichens which clothe the trees, mosses and rocks, with exceptionally well-developed Parmelietum laevigatae and Usneion communities. Many species present are rarely found outside the uplands of Scotland and Wales, including *Mycoblastis affinis*, *Usnea filipendula*, *Sphaerophorus melanocarpus*, *Arthonia stellaris*, *Micaria botyroides*, *M. cinerea*, *M. violacea* and *Gyalideopsis muscicola*, and also *Alectoria smithii* known from only two other sites in Britain. Notable species growing on rocks in the vicinity include *Massalongia carnosa*, *Ochrolechia tartarea*, *Pilophorus strumaticus* and *Parmelia discordans*.

Black Ridge Brook provides an important palynological record of the Flandrian vegetation history and environmental change on north Dartmoor. The pollen sequence covers the whole period from the late Devensian/Flandrian boundary almost to the present day and is supported by radiocarbon dating. In addition to the relatively long record, the site provides pollen evidence for local tree cover and relatively early burning.

COUNTY: DEVON SITE NAME: WISTMAN'S WOOD

DISTRICT: WEST DEVON

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981 as amended

Local Planning Authority: DEVON COUNTY COUNCIL, Dartmoor National Park Authority

National Grid Reference: SX 613770 Area: 263.9 (ha.) 652.0 (ac.)

Ordnance Survey Sheet 1:50,000: 191 1:10,000: SX 67 NW

Date Notified (Under 1949 Act): 1964 Date of Last Revision: 1976

Date Notified (Under 1981 Act): 1985 Date of Last Revision: –

Other Information:
The site is described in 'A Nature Conservation Review', 1977, Cambridge University Press. It lies within both the Dartmoor National Park and the Devon Structure Plan's Dartmoor Nature Conservation Zone. Part of the site is managed by agreement between the Duchy of Cornwall and the Nature Conservancy Council as a Forest Nature Reserve. It includes a number of Scheduled Ancient Monuments. The site has been extended. The revised boundary incorporates the Wistman's Wood FNR and the former Wistman's New Intake SSSI.

Description and Reasons for Notification:
Wistman's Wood is a rare relict example of the ancient high-level woodlands of Dartmoor. It is situated on the lower west-facing slopes of the West Dart Valley at an altitude of 380--435 metres and is an outstanding example of native upland oak woodland developed on soils derived from the hard rocks of western Britain. The site contains extensive areas of clitter (granite blocks) and in addition to the woodland it includes acid grassland, heath and mire communities characteristic of upland Dartmoor.

The wood is dominated by Pedunculate Oak *Quercus robur* and the trees have a gnarled and twisted growth-form, many with their lower branches resting on the clitter which forms the woodland floor. Rowan *Sobus aucuparia*, Holly *Ilex aquifolium* and Eared Willow *Salix aurita* also occur. The ground flora is characterised by areas of Bilberry *Vaccinium myrtillus*, Creeping Soft Grass *Holcus mollis*, Great Woodrush *Luzula sylvatica* and Bramble *Rubus fruticosus*. The fern flora within the wood is diverse; the Filmy Ferns *Hymenophyllum tunbrigense*, and *H. wilsonii* occurring here. The epiphytic flora is luxuriant, and lichens are well represented, including the rare *Alectoria smithii*. Of the numerous species of bryophyte with a western distribution, *Antitricha curtipendula* is of particular note. Bryophyte mats also occur amongst the clitter.

The remainder of the site and surrounding valley slopes comprise characteristic unimproved acidic grassland incorporating areas of dry heather *Calluna vulgaris* and

Bilberry. There are also areas of Western Gorse *Ulex gallii* and acidic marshy grassland characterised by Purple Moor Grass *Molinia caerulea*.

Of additional interest are several wet flushes giving rise to mire communities dominated by Soft Rush *Juncus effusus* and with Bog Mosses *Sphagnum* spp., Bog Asphodel *Narthecium ossifragum*, Round-leaved Sundew *Drosera rotundifolia*, Lesser Spearwort *Ranunculus flammula* and Marsh St John's Wort *Hypericum elodes*.

With the exception of a small fenced area of the wood the whole valley is open to grazing by sheep, cattle and ponies. The turbulent West Dart River courses southwards through the site and there is a representative breeding bird population, including Stonechat *Saxicola torquota*, Whinchat *S. rubetra* and Wheatear *Oenanthe oenanthe*.

File ref:

County: Devon **Site Name: East Dartmoor**

District: Teignbridge, West Devon

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act, 1981, as amended.

Local Planning Authority: Devon County Council, Dartmoor National Park, Teignbridge District Council, West Devon Borough Council

National Grid Reference: SX 695815 **Area:** 2,088.1 (ha) 5,159.7 (ac)

Ordnance Survey Sheet 1:50,000: 191 **1:10,000:** SX 67 NE, SX 68 SE, SW, SX 77 NW, SX 78 SW

Date Notified (Under 1949 Act): 1976 **Date of Last Revision:** 1976

Date Notified (Under 1981 Act): 1987 **Date of Last Revision:** –

Other Information:
The site boundary has been amended by extension and deletion. The site is within Dartmoor National Park and the Devon County Structure Plan Dartmoor Conservation Zone.

Description and Reasons for Notification:
This site contains the largest area of heather moorland remaining on Dartmoor. The submontane acidic dwarf shrub heath concerned is associated with acidic grassland and valley mires. Birch Tor, within the site, is of national geological importance.

East Dartmoor SSSI is located towards the easternmost extent of the Dartmoor granite outcrop at an altitude of 350 to 530 metres. The soils are mainly podzolic, with peaty upper horizons causing restricted drainage. The site is largely unenclosed, treeless and grazed by cattle, sheep and ponies.

Extensive areas are dominated by dwarf shrubs, mainly heather *Calluna vulgaris*, bell heather *Erica cinerea*, cross-leaved heath *E. tetralix*, bilberry *Vaccinium myrtillus* and western gorse *Ulex gallii*. This vegetation also forms a mosaic with a grassy sward, the main components of which are purple moor-grass *Molinia caerulea*, mat-grass *Nardus stricta*, sheep's fescue *Festuca ovina*, common bent *Agrostis capillaris* and bristle bent *A. curtisii*, the last being restricted in Britain to the south-west.

In the valley bottoms various mire communities occur. Where the water flow is restricted the vegetation is characterised by abundant bog-mosses, notably *Sphagnum papillosum*, *S. auriculatum* and *S. capillifolium* and by common cottongrass *Eriophorum angustifolium*. Where water movement is greater, the characteristic mosses are *S. recurvum*, *S. palustre*, *S. squarrosum* and *Polytrichum commune*, occurring with soft rush *Juncus effusus* and sharp-flowered rush *J. acutiflorus*. Within these mires are bog pools containing species such as *Sphagnum cuspidatum*, bottle sedge *Carex rostrata*, star sedge *C. echinata*, bogbean *Menyanthes trifoliata*, marsh lousewort *Pedicularis palustris* and bog asphodel *Narthecium ossifragum*. Uncommon plants found on the site include stag's-horn clubmoss *Lycopodium clavatum* and black bog-rush *Schoenus nigricans*.

Moorland birds such as red grouse *Lagopus lagopus*, snipe *Gallinago gallinago*, curlew *Numenius arquata*, wheatear *Oenanthe oenanthe* and whinchat *Saxicola rubetra* breed within the site, as does the ring ouzel *Turdus torquatus*. The emperor moth *Saturnia pavonia* is among the many invertebrates that occur.

The coarse magacrystic biotite granite at Birch Tor, part of the Dartmoor mass (of Permo-Carboniferous age), is remarkable for the wide variety of xenoliths of varied size, shape and composition contained within it. In addition to metasedimentary fragment some are igneous and the possibility exists that both pre-granite and cognate (i.e. fragments of igneous precursors to the granite) varieties are present. The biotite is now considered to be restitic (i.e. material inherited from the source rock without melting) in origin. A critical site for research into the early-stage derivation of the Cornubian granite magmas, as well as their subsequent modification by incorporation of extraneous material.

Dartmoor

Site details

Location of Dartmoor SAC/SCI/cSAC

Country	England
Unitary Authority	Devon
Grid Ref*	SX590864
Latitude	50 39 37 N
Longitude	03 59 40 W
SAC EU code	UK0012929
Status	Designated Special Area of Conservation (SAC)
Area (ha)	23165.77

* This is the approximate central point of the SAC. In the case of large, linear or composite sites, this may not represent the location where a feature occurs within the SAC.

General site character

Inland water bodies (standing water, running water) (1%)
Bogs. Marshes. Water fringed vegetation. Fens (42%)
Heath. Scrub. Maquis and garrigue. Phygrana (40%)
Humid grassland. Mesophile grassland (12%)
Improved grassland (2%)
Broad-leaved deciduous woodland (1%)
Inland rocks. Screes. Sands. Permanent snow and ice (2%)

Boundary map and associated biodiversity information on the NBN Gateway.

Natura 2000 data form for this site as submitted to Europe (PDF format, size 30kb).

Interactive map from MAGIC (Multi-Agency Geographic Information for the Countryside).

Annex I habitats that are a primary reason for selection of this site

4010 Northern Atlantic wet heaths with *Erica tetralix*

Dartmoor is representative of upland wet heath in south-west England. M15 *Scirpus cespitosus – Erica tetralix* wet heath predominates and together with other mire communities and small areas of drier heathland, forms a distinctive mosaic of vegetation types not fully represented elsewhere. Smaller amounts of M16 *Erica tetralix – Sphagnum compactum* wet heath occur. Additionally, there are transitions to areas of M21 *Narthecium ossifragum – Sphagnum papillosum* valley mire.

4030 European dry heaths

Dartmoor is representative of upland heath in south-west England. The site is notable because it contains extensive areas of H4 *Ulex gallii – Agrostis curtisii* heath, a type most often found in the lowlands, and H12 *Calluna vulgaris – Vaccinium myrtillus* heath, a predominantly upland type. *Calluna – Vaccinium* heath generally occupies the steeper, better-drained slopes, with *Ulex – Agrostis* heath occurring on the lower slopes of the moor. A number of predominantly northern species occur on the southern edge of their national range. Plants found on dry heaths that are rare in south-west England include crowberry *Empetrum nigrum* and stag's-horn clubmoss *Lycopodium clavatum*.

7130 Blanket bogs * Priority feature

Dartmoor is the southernmost **blanket bog** in Europe and is representative of blanket bogs in south-west England. The main vegetation community is M17 *Scirpus cespitosus – Eriophorum vaginatum* blanket mire. Many of the bogs are dominated by purple moor-grass *Molinia caerulea* and micro-topography is poorly developed. There are also widespread peat-cuttings, dug by hand in the 19th Century, but these have revegetated and many once again support a healthy cover of *Sphagnum* bog-mosses. Nevertheless, good areas are frequently encountered that are very wet, support frequent and widespread *Sphagnum* mosses of a range of species, and display small-scale surface patterning. Of particular note is the rare *Sphagnum imbricatum*, which occurs at two localities.

91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Three main areas of oak woodland are included within this site. Wistman's Wood is notable as a high-altitude relict surviving on a granite clitter slope. Unusually for old oak woods in the UK, it is dominated by pedunculate oak *Quercus robur* rather than sessile oak *Q. petraea*. The epiphytic and ground-covering bryophyte flora, with filmy ferns, is species-rich, although there are some indications that some species may have declined in recent years, possibly because as the tree canopy has grown conditions below it have become less humid. Wistman's Wood has a well-documented record of changes over the last century.

Dendles Wood is dominated by pedunculate oak *Q. robur*, but with substantial areas of beech *Fagus sylvatica* on the lower slopes (considered to be a possible outlier of

the native range of beech). The ground flora is a mixture of grasses, bracken *Pteridium aquilinum*, bluebell *Hyacinthoides non-scripta*, with locally many boulders supporting a species-rich bryophyte mat. There is a luxuriant epiphytic lichen flora including several rare species. Although selected for its oakwood community, the beechwood is a fragmentary outlier of *Ilicio–Fagion*.

Black Tor Copse has similarities to Wistman's Wood, consisting of stunted trees developed on granite clitter. The vascular plant species-richness is limited, with much bilberry *Vaccinium myrtillus*, hard-fern *Blechnum spicant* and ivy *Hedera helix*, but the bryophyte and lichen assemblages are very rich including nationally-rare species and others seldom found outside the uplands of Scotland and Wales.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site

Not applicable.

Annex II species that are a primary reason for selection of this site

1044 Southern damselfly ***Coenagrion mercuriale***

A valley mire at 280 m altitude supports a **southern damselfly** ***Coenagrion mercuriale*** population of 20–100 individuals, first discovered on the site in 1998. The stronger population occurs in the northern portion of the mire, where springs feed shallow soakways that flow through wet heath. The southern part of the mire has a higher water table with *Sphagnum* bog-mosses dominating.

Annex II species present as a qualifying feature, but not a primary reason for site selection

1106 Atlantic salmon ***Salmo salar***

1355 Otter ***Lutra lutra***

Appendix 5

Aquatic Invertebrate Data Supplied by the Environment Agency

Environment Agency - BIOSYS
Analysis Report

Analysis Date From	01-Jan-90
Analysis Date To	31-Dec-05
Site Name	R.TAVY, DOWNSTREAM WILLSWORTHY LEAT

	SX-54950-82930 19/05/1999 11:15	SX-54950-82930 31/08/1999 12:00	SX-54950-82930 17/11/1999 12:00	SX-54950-82930 12/05/2000 16:45	SX-54950-82930 26/07/2000 16:50	SX-54950-82930 01/08/2001 10:55	SX-54950-82930 05/10/2001 10:40	SX-54950-82930 30/05/2002 12:00	SX-54950-82930 20/05/2003 11:45	SX-54950-82930 20/05/2003 11:45
TAXA	NUMBER ESTIMAT	NUMBER ESTIMA	NUMBER ESTIMA	NUMBER ESTIMA	NUMBER ESTIMA	NUMBER ESTIMAT	NUMBER ESTIMA	NUMBER ESTIMA	NUMBER ESTIMAT	NUMBER ESTIMATED
Oligochaeta	*	*	*	33	33	33	20	70	80	80
Hydracarina	*	*	*	*	*	*			20	20
Collembola						*				
Baetidae	*	*		*	33	*	*			
Baetis	*			*		*	4	4	4	4
Baetis fuscatus	*									
Baetis rhodani		*			33	*	8			
Baetis scambus				*		*				
Baetis vernus	*	*			*	*	80	3	40	40
Heptageniidae	*	*	*	*	*	33	2			
Heptagenia	*		*	*	*				40	40
Ecdyonurus		*					20	60		
Ecdyonurus dispar			*						1	1
Ecdyonurus venosus							7			
Electrogena lateralis							2			
Leptophlebiidae			*							
Paraleptophlebia			*							
Ephemerellidae	*				*	*				
Serratella ignita	*				33	33			2	2
Nemouridae	*	*	*	*	*	*	*			
Protonemura						*				
Protonemura meyeri	*	*	*	*	*	*	60		20	20
Amphinemura sulcicollis	*		*	*				7	30	30
Leuctridae	*	*	*	*	*	*	*			
Leuctra	*	*		*	*	*	5	5	8	8
Leuctra fusca		*	*	*	*	*				
Leuctra hippopus							50			
Leuctra inermis			*	*				2	7	7
Leuctra moselyi						*				
Perlodidae	*	*	*	*	*	*	*			
Perlodes microcephala		*	*		*	*	7			
Isoperla		*					1			
Isoperla grammatica	*		*	*	*	*	1	10	30	30
Chloroperlidae	*		*	*						
Chloroperla torrentium	*		*	*				10	20	20
Dytiscidae		*		*						
Oreodytes sanmarkii				*						
Hydrophilidae						*				
Helophorus						*				
Helophorus brevipalpis						*				
Hydraenidae		*		*		*				
Hydraena gracilis		*		*		*				
Elmidae	*	*	*	*	*	*	*			
Elmis aenea	*	*	*	*	40	*	70	20	200	200
Esolus parallelepipedus					*					
Limnius volckmari	*	*	*	*	40	*	50	30	40	40
Oulimnius	*	*	*	*	20	*	10	2	60	60
Oulimnius tuberculatus		*		*	10	*	1	8	30	30
Rhyacophilidae	*	*	*	*	*	*	*			
Rhyacophila		*	*	*	*	*			5	5
Rhyacophila dorsalis	*	*	*	*	*	*	2		10	10
Rhyacophila munda	*			*		*				
Psychomyiidae	*									
Polycentropodidae	*	*	*	*	*	*	1			
Plectrocnemia				*		*		2	4	4
Plectrocnemia brevis	*									
Plectrocnemia conspersa				*				1	1	1
Polycentropus						*			3	3
Polycentropus flavomaculatus		*	*		*		1			
Hydropsychidae	*	*	*	*	*		33 10			
Hydropsyche	*									
Hydropsyche siltalai		*	*	*			80	10	20	20
Lepidostomatidae				*						
Lepidostoma hirtum				*						
Limnephilidae	*		*	*					2	2
Drusus annulatus								1		
Potamophylax								7		
Chaetopteryx villosa	*			*						
Limoniidae			*	*		*	*			
Dicranota			*	*		*	1		1	1
Psychodidae		*								
Ceratopogonidae								1		
Simuliidae		*	*	*		33	33 30		1	1
Chironomidae	*	*	*		33	33	333 10	3	60	60
Rhagionidae					*					
Atherix marginata					*				1	1
Empididae		*	*	*	*	*			5	5
Clinocera					*					
Wiedemannia			*	*						
Muscidae		*								
Limnophora		*								
Planariidae	*	*	*	*	*	*	*		11	11
Phagocata vitta								2		
Crenobia alpina						*	5			
Heptagenia lateralis									60	60
Polycentropus kingi									4	4
BMWP		108	88	106	120	88	98	83	83	110	110
ASPT		6.75	5.87	6.63	6.32	6.29	6.13	5.93	6.38	6.47	6.47
No Of Taxa		16	15	16	19	14	16	14	13	17	17

Environment Agency - BIOSYS
Analysis Report

Analysis Date From	01-Jan-90
Analysis Date To	31-Dec-05
Site Name	R.TAVY, DOWNSTREAM WILLSWORTHY LEAT

	SX-54950-82930 19/05/1999 11:15	SX-54950-82930 31/08/1999 12:00	SX-54950-82930 17/11/1999 12:00	SX-54950-82930 12/05/2000 16:45	SX-54950-82930 26/07/2000 16:50	SX-54950-82930 01/08/2001 10:55	SX-54950-82930 05/10/2001 10:40	SX-54950-82930 30/05/2002 12:00	SX-54950-82930 20/05/2003 11:45	SX-54950-82930 20/05/2003 11:45
TAXA	NUMBER ESTIMAT	NUMBER ESTIMA	NUMBER ESTIMA	NUMBER ESTIMA	NUMBER ESTIMA	NUMBER ESTIMAT	NUMBER ESTIMA	NUMBER ESTIMA	NUMBER ESTIMAT	NUMBER ESTIMATED
Oligochaeta	*	*	*	33	33	33	20	70	80	80
Hydracarina	*	*	*	*	*	*			20	20
Collembola						*				
Baetidae	*	*		*	33	*	*			
Baetis	*			*		*	4	4	4	4
Baetis fuscatus	*									
Baetis rhodani		*			33	*	8			
Baetis scambus				*		*				
Baetis vernus	*	*			*	*	80	3	40	40
Heptageniidae	*	*	*	*	*	33	2			
Heptagenia	*		*	*	*				40	40
Ecdyonurus		*					20	60		
Ecdyonurus dispar			*						1	1
Ecdyonurus venosus							7			
Electrogena lateralis							2			
Leptophlebiidae			*							
Paraleptophlebia			*							
Ephemerellidae	*				*	*				
Serratella ignita	*				33	33			2	2
Nemouridae	*	*	*	*	*	*	*			
Protonemura						*				
Protonemura meyeri	*	*	*	*	*	*	60		20	20
Amphinemura sulcicollis	*		*	*				7	30	30
Leuctridae	*	*	*	*	*	*	*			
Leuctra	*	*		*	*	*	5	5	8	8
Leuctra fusca		*	*	*	*	*				
Leuctra hippopus							50			
Leuctra inermis			*	*				2	7	7
Leuctra moselyi						*				
Perlodidae	*	*	*	*	*	*	*			
Perlodes microcephala		*	*		*	*	7			
Isoperla		*					1			
Isoperla grammatica	*		*	*	*	*	1	10	30	30
Chloroperlidae	*		*	*						
Chloroperla torrentium	*		*	*				10	20	20
Dytiscidae		*		*						
Oreodytes sanmarkii				*						
Hydrophilidae						*				
Helophorus						*				
Helophorus brevipalpis						*				
Hydraenidae		*		*		*				
Hydraena gracilis		*		*		*				
Elmidae	*	*	*	*	*	*	*			
Elmis aenea	*	*	*	*	40	*	70	20	200	200
Esolus parallelepipedus					*					
Limnius volckmari	*	*	*	*	40	*	50	30	40	40
Oulimnius	*	*	*	*	20	*	10	2	60	60
Oulimnius tuberculatus		*		*	10	*	1	8	30	30
Rhyacophilidae	*	*	*	*	*	*	*			
Rhyacophila		*	*	*	*	*			5	5
Rhyacophila dorsalis	*	*	*	*	*	*	2		10	10
Rhyacophila munda	*			*		*				
Psychomyiidae	*									
Polycentropodidae	*	*	*	*	*	*	1			
Plectrocnemia				*		*		2	4	4
Plectrocnemia brevis	*									
Plectrocnemia conspersa				*				1	1	1
Polycentropus						*			3	3
Polycentropus flavomaculatus		*	*		*		1			
Hydropsychidae	*	*	*	*	*		33 10			
Hydropsyche	*									
Hydropsyche siltalai		*	*	*			80	10	20	20
Lepidostomatidae				*						
Lepidostoma hirtum				*						
Limnephilidae	*		*	*					2	2
Drusus annulatus								1		
Potamophylax								7		
Chaetopteryx villosa	*			*						
Limoniidae			*	*		*	*			
Dicranota			*	*		*	1		1	1
Psychodidae		*								
Ceratopogonidae								1		
Simuliidae		*	*	*		33	33 30		1	1
Chironomidae	*	*	*		33	33	333 10	3	60	60
Rhagionidae					*					
Atherix marginata					*				1	1
Empididae		*	*	*	*	*			5	5
Clinocera					*					
Wiedemannia			*	*						
Muscidae		*								
Limnophora		*								
Planariidae	*	*	*	*	*	*	*		11	11
Phagocata vitta								2		
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