



Langdon Ridge SSSI

Supporting Information

A supplement to the notification document

Contact points and further information

This supplement is issued on request by Natural England's West Anglia Area Team and is intended to be read in conjunction with the notification document for owners, occupiers and other notified parties. Our address for correspondence is:

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Summary

The Langdon Ridge SSSI is notified under section 28C of the Wildlife and Countryside Act 1981. The site supports a diverse mosaic of semi-natural habitats, including grasslands, fen-meadows, woodland, scrub and species-rich hedgerows. It is of special interest for the following nationally important features that occur within and are supported by the wider habitat mosaic:

- species-rich neutral grassland
- fen-meadows
- ancient and long-established semi-natural woodlands
- assemblages of invertebrates chiefly associated with open short sward and scrub-heath
- populations of the plant Deptford pink *Dianthus armeria*

1. Information used to support the selection of the Langdon Ridge SSSI

| Feature | Data source | Author | Date | Content |
|---------|---|--|------|--|
| General | Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapters: 2a. Woodlands; 11. Vascular Plants; 17. Invertebrates. Nature Conservancy Council (NCC), Peterborough | Nature Conservancy Council | 1989 | National selection guidelines for biological SSSIs. Re-published online by JNCC in 2012: http://jncc.defra.gov.uk/page-2303 |
| | Making Space for Nature: a review of England's wildlife sites and ecological network. Report to Defra | Lawton, J.H. <i>et al.</i> , | 2010 | Makes recommendations for increasing the coherence of ecological networks in England |
| | Guidelines for the Selection of Biological SSSIs. Part 1: Rationale, Operational Approach and Criteria for Site Selection. Joint Nature Conservation Committee, Peterborough. http://jncc.defra.gov.uk/pdf/SSSI_GuidelinesPart1_PUBLICATION_Dec2013v2.pdf | Bainbridge, I., Brown, A., Burnett, N., Corbett, P., Cork, C., Ferris, R., Howe, M., Maddock, A. & Pritchard, S. (eds) | 2013 | National selection guidelines for biological SSSIs |
| | Lawton and Langdon: the importance of the scheduled wildlife sites of the Langdon Living Landscape as a basis for establishing a permanent ecological network, as called for in the Lawton Report | Cole, R.L. | 2014 | Makes recommendations for taking a landscape-scale approach to conservation on the Langdon Ridge |
| | Biological data regarding Marks Hill Woodland and Hoppit's Shaw. Unpublished records | Basildon Natural History Society | 2017 | Biological data search for Marks Hill Woodland and Hoppit's Shaw |
| | Biological and geodiversity data regarding Langdon Woodland and Meadows, Langdon Hills. Unpublished records | Essex Field Club | 2017 | Biological data search for Langdon Ridge |

| Feature | Data source | Author | Date | Content |
|---|--|--|------|---|
| Species-rich neutral grassland and fen-meadow | The changing extent and conservation interest of lowland grasslands in England and Wales: a review of grassland surveys 1930-1984. <i>Biological Conservation</i> 40, 281-300. https://www.sciencedirect.com/science/article/pii/0006320787901212 | Fuller, R.M. | 1987 | Information on the national status of grassland habitats |
| | British Plant Communities. Volume 3: Grasslands and montane communities. Cambridge University Press | Rodwell, J.S. (ed.) | 1992 | National Vegetation Classification (NVC) for grassland communities |
| | Monitoring the condition of lowland grassland SSSIs. English Nature Research Report 315. http://publications.naturalengland.org.uk/publication/64033 | Robertson, H.J. & Jefferson, R.G. | 2000 | National extent of MG5 grassland |
| | Langdon Reserve NVC Grassland Analysis | EECOS (Essex Ecology Services) | 2000 | NVC survey across EWT land area at Langdon |
| | National Vegetation Classification: Field Guide to Mires and Heaths. JNCC, Peterborough. http://jncc.defra.gov.uk/page-2628 | Elkington, T., Dayton, N., Jackson, D.L. & Strachan, I.M. | 2002 | Description of fen-meadow communities |
| | The condition of lowland BAP priority grasslands: results from a sample survey of non-statutory stands in England. English Nature Research Report 636. http://publications.naturalengland.org.uk/publication/106007 | Hewins, E.J., Pinches, C., Arnold, J., Lush, M., Robertson, H. & Escott, S. | 2005 | Information on the national status of grassland habitats |
| | The European context of British Lowland Grasslands. Report, Joint Nature Conservation Committee 394 | Rodwell, <i>et al.</i> | 2007 | Range of unimproved grasslands in UK and assessment at a European level |
| | Chapter 6: Semi-natural grasslands. In: The UK National Ecosystem Assessment Technical Report. UK National Ecosystem Assessment, UNEP-WCMC, Cambridge | Bullock, J.M., Jefferson, R.G., Blackstock, T.H., Pakeman, R. J., Emmett, B. A., Pywell, R. J., Grime, J. P. & Silvertown, J. W. | 2011 | Report on semi-natural grassland in the UK |

| Feature | Data source | Author | Date | Content |
|---------------|--|---|------|--|
| | National Vegetation Classification: MG5 grassland. Natural England Technical Information Note 147 | Jefferson, R.G. | 2013 | Technical information on MG5 grassland |
| | Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 3. Lowland grasslands. JNCC, Peterborough. http://jncc.defra.gov.uk/pdf/SSSI_Chptr03_revision_2017(v2.0).pdf | Jefferson, R.G., Smith, S.L.N. & MacKintosh, E.J. | 2014 | National selection guidelines for SSSIs for lowland grasslands |
| | National Vegetation Classification - surveys of Langdon Meadows. Unpublished report for Natural England | Groome, G. | 2014 | Report from NVC grassland surveys conducted at Langdon in 2014 |
| | Fate of semi-natural grasslands in England between 1960 and 2013: A test of national conservation policy. <i>Global Ecology and Conservation</i> 4: 516-525. https://www.sciencedirect.com/science/article/pii/S2351989415300184 | Ridding, L.E. Redhead, J.W & Pywell, R.F. | 2015 | National study on loss rates of semi-natural grasslands within and outside protected sites |
| | Specialist support for notification of Langdon Ridge as a SSSI for grassland | Pinches, C.E. | 2018 | Support for notifying the site from Natural England's senior grassland specialist |
| Deptford pink | Flora of Essex | Jermyn, S | 1975 | Distribution of vascular plants in Essex |
| | Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. 11. Vascular plants, Nature Conservancy Council, Peterborough | Nature Conservancy Council | 1989 | National selection guidelines for biological SSSIs (re-published online by JNCC in 2012) |
| | The Vascular Plant Red Data List for Great Britain | Cheffings, C.M. & Farrell. L. (eds). | 2005 | Threat status of plants |

| Feature | Data source | Author | Date | Content |
|----------------|--|---|-------------|--|
| | England Red List – A Vascular Plant Red List for England. Botanical Society of Britain and Ireland, Bristol. | Stroh, P.A., Leach, S.J., August, T.A., Walker, K.J., Pearman, D.A., Rumsey, F.J., Harrower, C.A., Fay, M.F., Martin, J.P., Pankhurst, T., Preston, C.D. & Taylor, I. | 2014 | Threat status of plants |
| | Distribution of Deptford pink in the Langdon Ridge area. Unpublished note to Natural England from Essex Wildlife Trust | Stanley, N. | 2017 | Information of distribution of Deptford pink from the then warden for part of the site |
| | Status of Deptford Pink in Essex | BSBI (Botanical Society of Britain and Ireland) | 2018 | Distribution of Deptford Pink |
| | Specialist support for notification of Langdon Ridge as a SSSI for Deptford pink | Taylor, I. | 2018 | Support for notifying the site from Natural England's vascular plant senior specialist |
| Woodland | Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 2a. Woodlands | Nature Conservancy Council | 1989 | National selection guidelines for biological SSSIs (re-published online by JNCC in 2012) |
| | British Plant Communities. Volume 1: Woodlands and scrub. Cambridge University Press | Rodwell, J.S. (ed.) | 1991 | National Vegetation Classification (NVC) for woodlands and scrub |
| | Langdon Reserve NVC Analysis | EECOS (Essex Ecology Services) | 2000 | NVC survey across EWT land area at Langdon |
| | Essex Biodiversity Action Plan | Essex Biodiversity Partnership | 2011 | Document setting out local biodiversity priorities and outcomes |
| | Survey of Woodlands in Langdon Ridge. Unpublished Natural England report | Tilley, J. | 2015 | Woodland surveys carried out within Langdon Ridge |
| | Thames Valley Basin National Character Area Profile | Natural England | 2015 | Guidance document to help communities inform decision-making in the places they live |
| | Ancient Woodland Inventory | Natural England | 2018 | Dataset of woods considered to be Ancient Semi-Natural |
| | Specialist support for notification of Langdon Ridge as a SSSI for woodland | Bryant, M | 2018 | Support for notifying the site from Natural England's woodland specialist |

| Feature | Data source | Author | Date | Content |
|---------------|--|--|-------------|--|
| Invertebrates | British Red Data Books 2. Insects | Shirt, D.B. (ed) | 1987 | Status of insect species |
| | UK BAP: Tranche 2 Action Plans. Volume 4 – invertebrates. Report to English Nature | UK Biodiversity Group | 1996 - 1999 | Invertebrate Action Plans |
| | The development of ISIS: a habitat-based invertebrate assemblage classification system for assessing conservation interest in England. <i>Journal of Insect Conservation</i> 10 : 179-188 | Webb, J.R. & Lott, D.A. | 2006 | Description of the ISIS Prototype invertebrate assemblage classification system |
| | Surveying terrestrial and freshwater invertebrates for conservation value. Natural England Research Report NERR005 | C.M. Drake, D.A. Lott, K.N.A. Alexander & J. Webb | 2007 | Description of invertebrate sampling surveillance and analysis using ISIS |
| | Surveying terrestrial and freshwater invertebrates for conservation value. Natural England Research Information Note RIN005 - | C.M. Drake, D.A. Lott, K.N.A. Alexander & J. Webb | 2007 | Summary of NE Research Report NERR005 |
| | Synopsis of ISIS 2009 and its use in Common Standards Monitoring | Lott, D.A. | 2008 | Description of the ISIS assemblage type classification |
| | The state of brownfields in the Thames Gateway: project summary | Robins, J., Henshall, S. and Farr, A | 2013 | The importance and conservation challenges of brownfield sites for invertebrates in the Thames Gateway |
| | The National Pollinator Strategy: for bees and other pollinators in England | Defra | 2014 | Conservation of pollinators across the landscape. |
| | Langdon Hills Invertebrate Survey. Report to Natural England | EECOS (Essex Ecology Services) | 2017 | Survey report from invertebrate survey work conducted at Langdon in 2017 |
| | Langdon Invertebrate Report 2014 | Gibbs, D | 2014 | Survey report from Langdon meadows surveyed for invertebrates in 2014 |
| | Pantheon Database Version 3.7.4 http://www.brac.ac.uk/pantheon | Webb, J., Heaver, D., Lott, D., Dean, H.J., van Breda, J., Curson, J., Harvey, M., Gurney, M., Roy, D.B., van Breda, A., Drake, M., Alexander, K.N.A. and Foster, G. | 2017 | Analytical tool to assist in invertebrate conservation |

| Feature | Data source | Author | Date | Content |
|---------|--|------------|------|--|
| | Specialist support for notification of Langdon Ridge as a SSSI for invertebrates | Heaver, D. | 2018 | Support for notifying the site from Natural England's senior invertebrate specialist |

2. Explanation of how Langdon Ridge meets the SSSI selection guidelines

This section explains how the information listed in Section 1 has informed the decision to notify the SSSI, according to the *Guidelines for the selection of Biological SSSIs. Part 1: Rationale, Operational Approach and Criteria for Site Selection* (JNCC, 2013) and *Part 2: Detailed guidelines for habitats and species groups*, hereafter referred to as 'the Guidelines'. The maps and table in section 7 show the distribution and extent of the priority vegetation communities across the site.

Langdon Ridge SSSI supports a diverse mosaic of semi-natural habitats, including grasslands, broad-leaved woodlands, mature scrub, and species-rich hedgerows. It is of special interest for its species-rich neutral grasslands, fen-meadows, ancient and long-established semi-natural woodlands, assemblages of invertebrates chiefly associated with open short swards and scrub-heath, and populations of the plant Deptford pink.

2.1 Species-rich neutral grassland

Langdon Ridge SSSI is of special interest for its species-rich neutral grassland characterised by the nationally rare National Vegetation Classification (NVC) type MG5 crested dog's tail *Cynosurus cristatus* – common knapweed *Centaurea nigra* grassland. This grassland vegetation community forms part of the 'lowland meadows' priority habitat, which is included on the list of habitats and species which are of principal importance for the conservation of biodiversity in England, as required under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.

The MG5 community occurs on infertile to moderately infertile soils (phosphorous index of 0 or 1) that have a largely neutral pH, depending on the sub-community (Rodwell 1992). MG5 grassland is largely confined to the UK and Ireland (Jefferson 2013). It is the classic community of unimproved hay meadows and pastures and is now highly localised and fragmented.

Historically the area of semi-natural grassland in the UK (including MG5) has undergone a severe decline as a consequence of post-war agricultural intensification. It is estimated that by 1984 in lowland England and Wales, semi-natural grassland had declined by 97% over the previous 50 years (Fuller 1987). More recently a 47% loss has been reported between 1960 and 2013 on sites known to have supported species-rich grassland but SSSIs were found to have retained more grassland (91%), compared with non-protected sites (27%), thus highlighting their effectiveness as a means of protecting semi-natural grasslands (Ridding, Redhead & Pywell 2015).

Such widespread loss has led to extensive fragmentation, with remaining grasslands often isolated within the landscape. In addition to loss of habitat, the quality of unimproved grasslands has also declined. An assessment of the condition of semi-natural grasslands on non-statutory sites in England in 2002/2003 found that only 16% of lowland hay meadows were considered to be in good condition, with many lacking positive indicators in sufficient number and frequency due to neglect or agricultural intensification (Hewins *et al.* 2005). In England the remaining extent of MG5 grassland is estimated to be less than 6,000 ha (Robertson & Jefferson, 2000).

Langdon Ridge supports a network of meadows across the complex. These areas of species-rich neutral grassland are widely distributed and range from small pockets of less than a hectare, interspersed with woodland and scrub, to significant areas of interconnected meadows of over 10 ha (see section 2.6). The meadows are an important part of the ecological network of wildlife-rich habitats across the Langdon Ridge (Cole, 2014).

The Guidelines (Part 2, Chapter 3, section 4.10, p.7) state:

'For those grassland communities that are now rare (less than 10,000 ha in Great Britain or less than 10,000 ha in the British lowlands, as shown in section A of Annex 1) the

presumption is that all examples which are at least 0.5 ha should be selected for notification, singly or in combination.'

MG5 grassland is listed in section A of Annex 1 of the Guidelines and is shown as a community that is rare, accordingly all examples of at least 0.5 ha should be selected. Langdon Ridge SSSI supports 34.4 ha of MG5 grassland and an additional 1.6 ha of MG1e false oat-grass *Arrhenatherum elatius* grassland, common knapweed *Centaurea nigra* sub-community, which is considered to be derived from MG5 grassland currently in an unfavourable condition.

MG1e grassland is a community of high botanical value as defined in Section A of Annex 1 of the Guidelines but the Guidelines (Part 2, Chapter 3, section 4.12, p.8) go on to state that:

"It is important to recognise that, in the longer term, the objective for some stands of...MG1e might be to manage them towards...neutral grassland (eg MG5)...by, in particular, introduction of grazing or hay meadow management."

This is the case at Langdon Ridge SSSI where, given the close of proximity of these areas, the 1.6 ha of MG1e grassland is judged to be derived from MG5 grassland due to insufficient management and the objective is to restore these areas to MG5. This will be best achieved by the introduction of grazing, either as permanent pasture or through aftermath grazing following July cutting. The MG1e areas support a number of MG5 positive indicator species with meadow vetchling *Lathyrus pratensis* being abundant and three species frequent or locally frequent, namely common bird's-foot-trefoil *Lotus corniculatus*, lady's-bedstraw *Galium verum* and oxeye daisy *Leucanthemum vulgare*, there is also a high cover of forbs.

Groome (2014) found MG5 to be distributed across all main areas of grassland at Langdon: Dunton Plotlands, Great Berry, Willow Park and One Tree Hill (see map in section 7). EECOS (2000) also conducted an NVC survey across part of the Langdon area (the area owned by Essex Wildlife Trust) and recorded MG5 at Dunton Plotlands and Willow Park. They noted that many of the meadows supporting MG5 are thought to have been top-soil stripped in the past in preparation for development, the plans for which were abandoned (EECOS 2000). No date is provided for the soil stripping but it probably occurred in response to large-scale developments in the Basildon area in the 1960s and was certainly well before the Essex Wildlife Trust took ownership of the Langdon Nature Reserve in the 1980s.

In the 2014 survey the majority of MG5 was classified as the MG5a meadow vetchling *Lathyrus pratensis* sub-community but over 4 ha of the MG5b lady's bedstraw *Galium verum* sub-community were also recorded (Groome 2014). MG5a is the typical MG5 grassland and occurs on soils with a pH of between 6.5 and 7.5; whereas MG5b supports a community of species that prefer more lime-rich soils. The fact that both the MG5a and MG5b sub-communities occur at Langdon Ridge adds to the diversity of interest at the site.

MG5 grassland is typically rich in widespread, unsown, native plants (Rodwell 1992) and herbaceous plants usually comprise a substantial proportion of the herbage (Cooper 1997; Jefferson, 2013). The characteristic herbs include agrimony *Agrimonia eupatoria*, common knapweed *Centaurea nigra*, oxeye daisy *Leucanthemum vulgare*, common bird's-foot-trefoil *Lotus corniculatus*, meadow vetchling *Lathyrus pratensis*, meadow buttercup *Ranunculus acris*, ribwort plantain *Plantago lanceolata* and common sorrel *Rumex acetosa*. All of these species were widespread and locally abundant across the Langdon meadows (Groome, 2014; EECOS, 2000).

The Langdon meadows support a number of nationally scarce species, including sulphur clover *Trifolium ochroleucon*, bithyian vetch *Vicia bithynica* and Deptford pink *Dianthus armeria*. In addition the orchid species green-winged orchid *Orchis morio* and common spotted-orchid *Dactylorhiza fuchsii* are locally abundant in a number of meadows. Other species of note include quaking grass *Briza media*, fairy flax *Linum catharticum*, adder's-tongue fern *Ophioglossum vulgatum* and pepper saxifrage *Silaum silaus*.

2.2 Fen-meadows

In the northern central part of the site there is a distinctly wetter seepage area where the grassland grades into a fen-meadow/rush pasture complex supporting the vegetation communities M22b blunt flowered rush *Juncus subnodulosus* – marsh thistle *Cirsium palustre* fen-meadow and M23a

soft/sharp flowered rush *Juncus effusus/acutiflorus* – common marsh bedstraw *Galium palustre* rush pasture (Groome 2014). M22 is a highly variable rush-dominated vegetation which occurs on wet, base-rich peats and mineral soils in lowland Great Britain (Jefferson *et al.* 2014). Sub-community M22b has a lower cover of rushes and sedges and supports a richer associated flora (Elkington *et al.*, 2002). Groome (2014) commented that the form of M22b recorded at Langdon was atypical with devil's-bit scabious *Succisa pratensis* the most common herb, along with an abundance of common fleabane *Pulicaria dysenterica*, creeping cinquefoil *Potentilla reptans*, meadow buttercup *Ranunculus acris*, common knapweed *Centaurea nigra*, meadow vetchling *Lathyrus pratensis*, greater bird's-foot trefoil *Lotus pedunculatus* and marsh thistle *Cirsium palustre*.

The Guidelines (Part 2, Chapter 3, Section 4.10, p. 7) state:

'For those grassland communities that are now rare (less than 10,000 ha in Great Britain or less than 10,000 ha in the British lowlands, as shown in Annex A of Annex 1), the presumption is that all examples which are at least 0.5 ha should be selected for notification, singly or in combination.'

M22 is considered to be a community of high botanical interest and is listed in section A of Annex 1. The extent of the M22b area is 0.96 ha and therefore above the 0.5 ha threshold above which all examples should be selected.

The Guidelines (Part 2, Chapter 3, Section 4.18) further state:

'Sites with a complex of semi-natural habitats reflecting variation in particular environmental parameters or exhibiting transitions between habitats are considered to have greater value....compared to single habitat feature sites.'

The small area of M23a (0.02 ha) is too small to be considered of significance in its own right it nevertheless contributes to the wider fen-meadow/rush pasture interest of the site.

2.3 Ancient and long-established semi-natural woodlands

Langdon Ridge supports an extensive network of around 220 ha of semi-natural woodlands ranging from ancient semi-natural woodland to other long-established semi-natural woodlands and areas of mature scrub. The mosaic of woodland and mature hedgerows and significant areas of species-rich neutral grassland is of considerable importance for nature conservation

Around 56 ha of woodland is ancient semi-natural woodland, with the largest block of 18 ha at Northlands Wood (Natural England, 2018). The underlying geology of Bagshot Beds and London Clay influences the composition of the woodlands creating a complex mosaic of W8 ash *Fraxinus excelsior* – field maple *Acer campestre* – dog's mercury *Mercurialis perennis* woodland and W10 pedunculate oak *Quercus robur* – bracken *Pteridium aquilinum* – bramble *Rubus fruticosus* agg. woodland communities. (Rodwell, 1991)

The presence of W8 and W10 communities across around 75 ha of woodland managed by Essex Wildlife Trust was determined by a robust NVC survey (EECOS, 2000). The recent rapid woodland survey (Tilley, 2015) confirms that this remains an accurate description of the communities present on this land and clarifies the distribution of these communities across the wider Landgon Ridge.

Pedunculate oak, ash and hornbeam *Carpinus betulus* are plentiful in the canopy along with notable components of wild cherry *Prunus avium*, the later species particular common in Hall Wood. Occasional wild service tree *Sorbus torminalis*, mature English elm *Ulmus minor* and hybrid oak *Quercus petraea* add to the diversity. Understorey present across the site, often in the form of recent and derelict coppice, includes field maple, hazel, and hornbeam. Ground flora characteristic of historic woodlands is present throughout with carpets of bluebells *Hyacinthoides non-scripta* and brambles, interspersed by bracken, dog's mercury, three-nerved sandwort *Moehringia trinervia*, yellow archangel *Lamiastrum galeobdolon* and wood anemone *nemorosa*; of note is the abundance of broom *Cytisus scoparius* that appears in Mark's Hill following coppicing. (Tilley, 2015).

Historically much of the woodland was managed as coppice; though now largely derelict some areas have been bought back into active management. Martinhole Wood is particularly noted for its stands of hornbeam coppice including a number of large, ancient stools.

The blocks of ancient woodland are linked together by long-established secondary woodland to create an ecological network stretching for 4 km. These secondary woodlands are developing towards W8/W10 communities found in the adjacent ancient woodlands, with similar habitats in terms of structure and diversity; bluebells, dog's mercury and lords and ladies *Arum maculatum* all feature as components of the field layer. In places, a range of exotic and non-local species such as beech *Fagus sylvatica*, scots pine *Pinus sylvestris* and sycamore *Acer pseudoplatanus* are present in low numbers.

The woodlands as a whole support locally important woodland breeding bird populations including lesser spotted woodpecker *Dendrocopos minor*, nuthatch *Sitta europaea*, tawny owl *Strix aluco* and treecreeper *Certhia familiaris*. The rides and glades also support butterflies including silver-washed fritillary *Argynnis paphia* and white admiral *Limenitis camilla* (EECOS, 2017).

In the first half of the 20th Century, the area surrounding Dunton Plotlands and parts of Lincewood consisted of small plots of land with weekend cottages, holiday bungalows and smallholdings. During the 1960s-80s the houses were demolished and in the intervening period scrub has encroached to create a mixture of scrub mosaics and open glades with an extensive system of rides and more formalised paths. These most closely match the W21 hawthorn *Crataegus monogyna* – Ivy *Hedera helix* scrub community with dense hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa* and elder *Sambucus nigra*. The tall scrub acts as the canopy layer with occasional pedunculate oak *Quercus robur* standards present at a low density. The dense scrub cover results in an impoverished field layer with a high proportion of bare ground and some colonisation by bryophytes (Tilley, 2015).

Notable numbers of apple *Malus pumila* and wild plum *Prunus domestica* trees are present within the scrub areas, including some distinctive old orchards, which relate to the historic use of the site as 'plotlands'. These fruit trees along with the hawthorn and blackthorn provide an important nectar source for invertebrates which are characteristic of scrub edge communities and favour the sheltered network of rides and trackways. The dense scrub also supports breeding birds including bullfinch *Pyrrhula pyrrhula*, nightingale *Luscinia megarhynchos* and turtle dove *Streptopelia turtur* (Essex Field Club, 2017).

The Guidelines provide the basis for selecting woodland SSSIs in terms of both their floristic composition and their structural form. The Guidelines (Part 2, Chapter 2a, section 3.31) state that:

'The total area of ancient semi-natural and other woodland, including wood pasture and parkland and veteran trees, selected as SSSIs in each Area of Search (AoS) should be sufficient to protect an adequate extent of, as well as the full range of variation in, native woodland habitat types, independently of other land-use policies.'

The proportion of England's woodland resource within SSSIs is much less than for many other habitats (between 10 and 25% depending on whether all woodland or Ancient Semi Natural Woodland (ASNW) is considered).

When assessing the quality of individual woodland stands and sites, the Guidelines recommend a number of specific attributes which are applicable to Langdon Ridge. The Guidelines (Part 2, Chapter 2a, section 3.4.1) state that:

'The criteria for assessing nature conservation sites were established in the NCR (Ratcliffe, 1977)...Particular emphasis is usually given to size, relative naturalness and diversity.'

The total area of woodland within the SSSI of over 220 ha is of significance in the Northern Thames Basin NCA¹ and within the county of Essex and supports one of the largest remaining

¹ National Character Areas (NCAs) divide England into 159 natural areas, each defined by a unique combination of landscape, biodiversity, geodiversity and economic and cultural activity. Langdon Ridge SSSI lies within the Northern Thames Basin NCA. NCAs are now used as 'areas of search' for the purposes of

connected stands of semi-natural woodlands in the area of search. In addition, there is good connectivity with smaller woods, scrub and the extensive networks of hedgerows and species-rich neutral grassland.

Table 1. Landon Ridge SSSI comparison with other woodland SSSIs in the Northern Thames Basin NCA

| SSSI name | NVC woodland types | Woodland area (ha) |
|---------------------------------------|---------------------|--------------------|
| Epping Forest SSSI | W10, W14, W15, W16 | 2,858.92 |
| Northaw Great Wood SSSI | W10, Q16 | 224.32 |
| Langdon Ridge SSSI | W8, W10, W21 | 220 |
| Wormley-Hoddesdonpark Wood South SSSI | W10 | 217.53 |
| Wormley-Hoddesdonpark Wood North SSSI | W10 | 148.65 |
| Thorndon Park SSSI | W10 | 148.51 |
| Hainault Forest SSSI | W10 | 135.20 |

Table 2. Landon Ridge SSSI comparison with other woodland SSSIs in Essex

| SSSI name | NVC woodland types | Woodland area (ha) |
|----------------------|---------------------|--|
| Hatfield Forest SSSI | W6, W8, W10 | 410.78 |
| Epping Forest SSSI | W10, W14, W15, W16 | 373.55 (2,858.92 including land outside Essex) |
| Langdon Ridge | W8, W10, W21 | 220 |
| Thorndon Park SSSI | W10 | 148.51 |
| Hainault Forest | W10 | 135.20 |

Woodland cover within the Northern Thames Basin NCA and Essex is broadly similar with an estimated 20,914 ha (7,742 ha ASNW) in the Northern Thames Basin NCA (Natural England, 2015) and 19,455ha (7,168 ASNW) in Essex (Essex Biodiversity Project, 2011). Langdon Ridge comprises one of the largest areas of woodland in both the NCA and the county and at 220 ha offer a considerable wooded landscape which is of significance in size terms, albeit as a series of closely associated sites and wooded linkages, rather than a contiguous block.

The Guidelines (Part 2, Chapter 2a, section 3.4.2) further state that:

‘A basic presumption is that the largest areas available of all the major types of woodland in an AoS should be protected.’

The woodlands at Langdon Ridge form a chain stretching for 4 km consisting of a mixture larger blocks of woodland including Hall Wood (10 ha), Willow Park (23 ha), Old Hill/Great Sutton Wood (13 ha), Plotlands (25 ha), Northlands (27 ha) and Marks Hill (40 ha), which form a connected network linked by smaller linear woodlands, mature hedges and other semi-natural habitats.

The Guidelines (Part 2, Chapter 2a, section 3.4.4) state that within each AoS:

‘...sites should be selected to include representations of the full range of woodland structures and natural processes.’

The Langdon woodlands support a variety of habitats which exhibit a high degree of naturalness; the areas of ancient woodland and much of the secondary woodland is aligned to W8/W10 oak communities which are characteristic of this area. Whilst the presence of exotic and non-local species in places reduces the degree to which the woodlands could be considered ‘natural’, they provide an important reflection of changes as a result of cultural and anthropogenic influences over the last 100 years. The range of tree species present also provides a wide range of ecological niches and offers a degree of resilience to the potential impacts of disease or climatic variation

SSSI selection (where appropriate) in England. For more information on NCAs, see <https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making>

over coming decades. In the longer term, these secondary or planted woodlands will move towards providing those ecosystem processes found in more 'natural' woods.

The range of lowland mixed deciduous woods of various ages; parkland and veteran trees; open glades and rides; ponds and ditches and the accompanying management interventions such as coppicing and natural woodland processes, along with the adjacent areas of open grasslands, including species-rich neutral grassland, provide a structurally and ecologically diverse ecosystem. This is reflected in the range of local and nationally notable bird, reptile, amphibian, mammal, invertebrate, vascular and non-vascular plant species recorded on the site; species recording at Marks Hill and Hoppit Shaw has produced a list of 335 vascular plants, 32 lichens, 54 mosses and liverworts, 388 moth and 28 butterfly species (Basildon Natural History Society records). The level of diversity found at Langdon Ridge demonstrates the level of ecological connectivity across the landscape, where species can move from the mature, well-established habitats to colonise new niches as they develop when successional processes take place.

The woodlands at Langdon Ridge are important in terms of their total area but also as part of a functioning ecological network of which they form part. Lawton *et.al.* (2010) concluded that it is vital to adopt the landscape-scale solution of creating and sustaining ecological networks to increase the resilience of landscapes and enable habitats and species to better respond to ongoing and future environmental changes including fragmentation, climate change and disease. Langdon Ridge offers connections of wooded and open grassland habitats across many kilometres; providing an ecosystem with a great range of structural mosaics, habitat types, ecological niches and refuges for the resident species. It allows movement and genetic exchange across the landscape to provide resilience as local conditions change due to factors such as succession or human influence.

The importance of the woodlands within a habitat mosaic is also recognised within the Guidelines, (Part 2, Chapter 2a, section 3.4.6) which state:

'Woods which adjoin or are in a mosaic with other habitats tend to be more valuable than those sharply abutted by arable or improved grassland.'

In addition to the 220 ha of woodland, the Langdon Ridge mosaic includes species-rich neutral grassland, fen-meadow and semi-improved grassland which supports important invertebrate communities; collectively they form an extensive network of semi-natural habitat of around 345 ha. An area of semi-natural habitats of this size is now unusual in the English lowlands and particularly notable due to its proximity to the major urban area of Basildon and the accessibility of the woodlands and other semi-natural habitats to the local community.

2.4 Invertebrate assemblage

The Guidelines (Part 2, Chapter 17, section 3.4.2) state that:

'Nationally scarce species, known or estimated to occur in 16-100 10 km grid squares in Britain...should also be represented, where possible, in the SSSI series within each AOS where they occur. In practice, assemblages of nationally scarce species may be identified as of significance...'

With reference to nationally scarce species, the Guidelines (Part 2, Chapter 17, section 3.4.6) also state that these:

'...should generally be conserved as part of rich invertebrate faunal assemblages'.

Selection of assemblages is considered in Part 2, Chapter 17, section 3.5 of the Guidelines:

'The process of analysing species assemblages...is likely to provide a sound basis for

In England, an online analytical tool for assessing invertebrate interest, known as Pantheon, has been developed. Pantheon is a Natural England and Centre for Ecology & Hydrology database tool for analysing invertebrate sample data that recognises and scores the quality of characteristic invertebrate assemblage types in species lists. It is instrumental in identifying and assessing nationally important assemblages, both at a macro-habitat and micro-habitat scale.

The landscape-scale suite of habitats provided within the Langdon Ridge supports a mosaic of vegetation structures, including patches of bare ground, both short and tussocky swards, as well as areas of scrub and woodland. Many of the meadows are very flower-rich, whilst others are grassier but provide important cover for invertebrates and linkage across the landscape. The thick hedgerows and woodland edges abounding many of the meadows provide shelter and the southerly facing slopes and undulating landscape provide warm sunny areas and a variety of microclimates. All of these factors are important in meeting the nesting, foraging, hunting and overwintering requirements of invertebrates.

To assess the importance of habitat-based invertebrate assemblages and provide up-to-date data, Natural England commissioned bespoke surveys and these were conducted in 2014 and 2017. Gibbs (2014) concentrated the surveys on a selection of open grassland habitats spread across the Langdon complex, whilst EECOS (2017) targeted areas of grassland/scrub habitat mosaics and the three meadows that were previously notified as Basildon Meadows SSSI.

Ecological assemblages are collections of invertebrates characteristically associated with a particular environmental factor and/or habitat and these can be analysed and identified according to the 'Pantheon' software tool (Webb *et al.*, 2017). This tool can provide a broad biotype and specific assemblage type for invertebrate data at a habitat-scale and identify the quality and interest of assemblages.

The data collected by Gibbs (2014) demonstrate that when the results are combined for all meadows sampled, the archipelago of meadows supports a good example of the F112 short sward invertebrate assemblage. The meadows are said to support a typical representation of this assemblage. The findings from EECOS (2017) also identified that a cluster of meadows within a block of scrub support a good example of the F003 scrub-heath and moorland invertebrate assemblage.

At Langdon Ridge, the broad biotype of interest is open habitat and the specific habitats of interest at the site are grasslands, including flower-rich meadows, open habitat mosaics and the transitional areas of rougher grassland associated with scrub and woodland edges.

Both Gibbs (2014) and EECOS (2017) found that the area south of Dry Street (the southern-most area of the Langdon Ridge) was particularly strong in terms of total number species recorded and number of nationally scarce and rare species. This area supports a complex of flower-rich meadows, several of which are on southerly-facing slopes. The three meadows previously notified as Basildon Meadows SSSI are located within this area and all were found to have good invertebrate interest. The F112 assemblage was, however, found to be well represented in open areas across the Langdon Ridge. It is likely that the assemblage could be strengthened still further by enhancing the timing and variety of grassland management techniques across the landscape.

The F003 assemblage was found to be more localised (EECOS, 2017), recorded mainly within open areas in an extensive area of scrub and grassland mosaic at Willow Park, to the north of the Dry Street area. There was, however, also a component of the F003 assemblage recorded in the meadows to the south of Dry Street. A total of 11 species unique to the F003 assemblage were recorded.

The description of the habitats that support the F003 assemblage 'wet and humid heathlands' do not, on the face of it, sound like the habitats found at the Langdon Ridge. It should be noted, however, that invertebrate assemblage types can cross over various botanical habitats. The main area where the F003 assemblage is found is located within a relatively damp area, lying on the silts, sands and clays of the Claygate beds, deposited over the older London Clay. It is probable that the assemblage here is a remnant of a more widespread assemblage and that the succession to mature scrub/woodland of the surrounding area has been to its detriment. Efforts to clear scrub and revert areas to damp grassland are likely to help to restore the F003 assemblage across a wider area.

The Langdon Ridge supports a good number of Nationally Scarce and priority² invertebrate species (Essex Field Club 2017; EECOS 2017; Gibbs 2014). Some of these are considered to have a significant county population around the Langdon Ridge area, including the thin weblet spider *Meioneta mollis*; the beetle *Cryptocephalus bilineatus*; the fly *Dicraeus tibialis*; the carder bumble bee *Bombus humilis* and the grizzled skipper butterfly *Pyrgus malvae*. The distribution of scarce and priority species was across the areas surveyed at Langdon, although there were the highest number recorded in the Dry Street cluster to the south and the Dunton Plotlands area in the north.

Most invertebrates have annual life cycles and are very susceptible to changes in habitat conditions. They tend to have complex life histories in which the requirements of the larval stage may be very different to the more mobile adult stage. Invertebrates are vulnerable to extinction in areas of isolated habitat if the continuity of their life history requirements is broken even for a short period. Complex life histories result in a reliance on habitat mosaics and habitat heterogeneity for many species of invertebrate, which depending on the species may need to be provided at a large-scale across the landscape or a small more localised scale.

Many species of invertebrate operate as metapopulations, with separate populations interlinked across the landscape by occasional dispersal and colonisation. To ensure long-term viability of such populations a complex of sites supporting suitable habitat within dispersal distance is required. When drawing a SSSI boundary for an invertebrate site the importance of linkage and the avoidance of isolation is stressed, as is the need to view the area as an archipelago of sites as appropriate. This is exactly the approach being taken at Langdon Ridge where the archipelago of invertebrate sites will be included in the SSSI boundary at a landscape-scale, ensuring areas of linkage will be protected and promoting sustainability of the invertebrate assemblages and associated metapopulations that it supports.

There are five SSSIs within close proximity (<10 km) of Langdon Ridge that have invertebrate assemblages of open habitat mosaics/grassland as a notified feature (Table 3). All of these SSSIs are located slightly to the south of Langdon Ridge, towards the Thames Estuary. Three of the SSSIs (Canvey Wick, Pitsea Marsh and Grays Thurrock Chalk Pit) support the F112 open short sward assemblage and all five sites support assemblages of early successional habitats. This illustrates that the area within the vicinity of Langdon Ridge is of key importance to such invertebrate assemblages and the addition of this site to the cluster of sites will further increase the protection, maintenance and enhancement of associated habitats.

Table 3. SSSIs in south Essex that have similar invertebrate assemblages to Langdon Ridge

| SSSI name | Invertebrate assemblage* | Size of SSSI (approx. area of assemblage**) | Approx. distance from Langdon Ridge |
|-------------------------------|---|---|-------------------------------------|
| Pitsea Marsh | F112: open short sward | 92.34 ha (46 ha) | 2.5 km |
| Canvey Wick | F112: open short sward F111: bare sand and chalk | 93.19 ha (93.19 ha) | 5.5 km |
| Benfleet and Southend Marshes | F111: bare sand and chalk F2: grassland and scrub mosaic | 2373.69 ha (77 ha) | 7.0 km |
| Mucking Flats and Marshes | F1: unshaded early successional mosaic | 312.71 ha (18.37 ha) | 8.0 km |
| Grays Thurrock Chalk Pit | F111: bare sand and chalk F112: open short sward | 17.25 ha (1.3 ha) | 9.5 km |

*Invertebrate assemblages of similar habitats to those at Langdon Ridge; **Approximate area of habitat supporting assemblage

In terms of extent, Langdon Ridge is approximately 345 ha and within the mosaic of grassland, woodland and scrub the total area of grassland is approximately 125 ha. Therefore when compared to local SSSIs the area supporting open habitat for the F112 and F003 assemblages is

² Species listed as being of principal importance for the conservation of biodiversity in England under section 41 of the Natural Environment and Rural Communities Act 2006.

significant. In addition, none of the nearby SSSIs are known to support the F003 scrub-heath and moorland assemblage, which indicates that this assemblage has a sole representation at Langdon Ridge within the Area of Search. Consequently this assemblage is a particular priority for SSSI notification.

In the context of the wider area, Langdon Ridge is located directly to the north of the Greater Thames Marshes, which from a conservation perspective is renowned for its open habitat mosaics within the Thames Terraces and especially the incredible diversity of rare and scarce invertebrate species that it supports. The Greater Thames Marshes has been the focus of numerous invertebrate conservation projects and initiatives, including programmes under the Greater Thames Marshes Nature Improvement Area (NIA) (<http://gtgkm.org.uk/documents/gt-thames-bix-plan-1332275395.pdf>) and Buglife's 'All of a buzz in the Thames Gateway' project (Robins *et al.*, 2013).

Langdon Ridge provides connectivity with this invertebrate-rich area and this coupled with the flower-rich habitats it supports has resulted in it being included in Buglife's B-Lines Network (<https://www.buglife.org.uk/b-lines-hub>), which was set-up in response to the Government's National Pollinator Strategy (Defra, 2014). Consequently as well as being important to invertebrate conservation across the Langdon Ridge landscape and the cluster of associated SSSIs in the area, the SSSI notification will be promoting habitat connectivity for invertebrates across the wider south Essex landscape.

2.5 Deptford pink

Langdon Ridge supports a population of Deptford pink *Dianthus armeria*, a vascular plant species that is both Nationally Scarce and has suffered a drastic decline within the UK (hence its IUCN threat status of Endangered on both the GB (Cheffings, C & Farrell, L (eds.) 2005) and England (Stroh *et al.*, 2014) Vascular Plant Red Lists due to the decline in its area of occupancy). It is also legally protected by listing on Schedule 8 of the Wildlife & Countryside Act 1981 (as amended).

Deptford pink is a largely self-pollinated annual to biennial plant of dry grassy places on light sandy, slightly basic soils. It is found mainly in short grassland where there is some open ground maintained either by grazing or some other form of disturbance and dies out when shaded by coarse grasses or scrub. Its national decline is thought to be due to the loss of pasture land through conversion to arable or built development and from a lack of open areas at its remaining sites.

The Guidelines (Part 2, Chapter 11, section 3) state:

'There should be a presumption for selecting vascular plant sites on the following grounds:

3.1 Schedule 8 species

All species with viable populations should be selected.'

The Guidelines (Part 2, Chapter 11, Section 3.2) further state that:

'All RDB species localities should be regarded as candidate sites.'

And (Part 2, Chapter 11, Section 3.2.3):

'One RDB species qualifies a site for selection if it has a good population of the species in an AOS supporting a substantial proportion of the localities for the species.'

Deptford pink is included in Schedule 8 of the Wildlife & Countryside Act 1981, as amended and is listed as both Nationally Scarce and Endangered on the GB Red List and therefore qualifies for selection on both grounds.

Langdon Ridge is one of only three sites within Essex where Deptford pink is now regularly recorded (BSBI, 2018 – see Table 4, below). In 2014, Stroh *et al.* (2014) listed Deptford pink from only 27 10km squares in Britain, 25 of them in England. Only four other SSSI in England currently have Deptford pink as a notified feature: Farningham Wood; Benfleet And Southend Marshes; Chobham Common; and St Leonards And St Ives Heaths.

Due to the short-life cycle of this species and the requirement for disturbed ground, viability of a population cannot be expressed purely in populations; longevity of population, status of species on the site and habitat suitability must also be considered.

Table 4. Location of colonies of Deptford pink in Essex (BSBI, 2018)

| | | |
|---|---|---|
| Benfleet Downs | Persisted since at least 1941 but only in one location within the site. | |
| Belton Hills Local Nature Reserve (LNR) | Persisted since at least mid-1860s, population fluctuates with degree of scrub encroachment. The recent population has been supplemented from seed originally collected from the nature reserve and subsequently grown in a private garden prior to being reintroduced into the nature reserve. | |
| Sudbury | Small population discovered in late 1990s | |
| Langdon Ridge | Recorded within the complex since at least 1948. Now found in three - four locations within the SSSI | |
| | Old Hill | July 2000 - Several plants along a ride recently cut through secondary woodland in Old Hill |
| | Hawkesbury Bush | July 2000 – Single plant along recently cleared track through scrub 2016 – c12 present along edge of a path on grazed area of disturbed ground |
| | Bells Hill | Small numbers reported from mid-1980s onwards. Population supplemented by seed from Belton Hills population in mid-1990s. Doing well on roadside verges and in an adjoining meadow with c.30 plants flowering each year |

No formal surveys of Deptford pink are undertaken within Langdon Ridge, however the species is known to have been present for at least 70 years (Jermyn, 1975; Stanley, 2017; Cole, 2017).

Deptford pink can also be found in cultivation, from which it sometimes escapes and may then occur as an alien. It is known to produce abundant seed with apparent high viability and requires bare/disturbed ground for germination. As a result it can be difficult to distinguish native and alien populations in Britain, however the establishment of the Hawkesbury and Old Hill populations as a direct result of disturbance indicates the presence of a seed bank and consequently these populations are considered to be native to the site. Although the Bells Hill population has been supplemented by seed from Belton Hills, there are records of this species here that pre-date the introduction and therefore, the Bells Hill population is also considered indigenous.

The current and former native distribution of Deptford pink in Britain is virtually confined to an area co-incident with a July mean temperature in excess of 16°C and seems only to do well in thermophilic south-facing locations (BSBI, 2018) and in areas where competing vegetation is controlled by disturbance. Seeds present in the soil germinate well following disturbance. South facing slopes near Hawkesbury Scrub and Northlands Meadow provide the opportunity to target management to create disturbed and sparsely vegetated ground that will benefit both Deptford pink and early successional invertebrate assemblages.

2.6 Site boundary determination

The rationale for the boundary of the Langdon Ridge SSSI is described below but can be summarised as follows:

- All the best examples of remaining species-rich neutral grassland and fen-meadow, including mosaics with partially improved stands are included because they are important in their own right. In addition, the species rich neutral grassland and fen-meadow, along with a number of areas of semi-improved grassland and associated hedgerows and woodland edges are important for invertebrates.
- The woodland areas are included because they are ancient and long-established semi-natural stands and are important in their own right.

- Inclusion of areas of partially improved land at Northlands Meadow enhances habitat connectivity between Northlands Wood and Old Sutton Wood and provides opportunity for developing management to benefit a variety of habitats and species.
- The habitat mosaics throughout the SSSI are of considerable value for invertebrates. The boundary includes those habitats that are important for the integrity of the site, often supporting important species of flora and fauna, providing buffers to other habitats and linking other areas of important habitat.

Regarding setting SSSI boundaries for grassland communities the Guidelines (Part 2, Chapter 3, Section 5.1) state that:

'SSSI boundaries should be drawn to encompass the special features of the site and all land necessary to ensure the protection and sustainability of those features.'

Section 5.1 of the Guidelines continues by stating:

'Some examples of where the inclusion of supporting land containing vegetation types lacking special interest within a lowland grassland SSSI may be required:

- *the need to account for the ecological requirements of specific species or species assemblages that contribute to the site's special interest;*
- *to allow for notifying to an identifiable boundary.'*

At Langdon Ridge each meadow included within the SSSI boundary tends to support more than one NVC community across its area (Groome, 2014). Where an individual meadow includes the communities MG5, M22b or MG1e, the entire meadow area is included within the SSSI boundary with the relevant grassland community as a notified feature. This is to enable notification to an identifiable boundary to aid effective management but as importantly to ensure all grassland and associated elements of the open habitat mosaic are included within the boundary of the SSSI to support the important associated invertebrate assemblages (see section 2.4), which are themselves of special interest.

A number of fields are mosaics of species-rich communities and semi-improved stands. These fields support plants that are good indicators of unimproved habitats which in turn are particularly important for supporting other interest features, such as invertebrates. In some cases a few fields which are a mix of species-rich and semi-improved grasslands are managed the same way or link other areas of habitat of nature conservation importance.

Langdon Ridge supports a network of meadows across the complex. These areas of species-rich neutral grassland are widely distributed and range from small pockets of less than a hectare, interspersed with woodland and scrub, to significant areas of interconnected meadows of over 10 ha. The Guidelines (Part 2, Chapter 3, section 5.3) state that:

'The normal minimum size threshold for grassland communities of high botanical interest is 0.5 ha and this applies at the site level including where the total extent may be spread across a number of discrete fields or management units.'

Section 5.4 (Part 2, Chapter 3) of the Guidelines goes on to describe the principles to be applied when drawing a boundary around non-contiguous grassland blocks:

'Decisions as to what constitutes a 'site' where there are non-contiguous fields or units (a compound site) should be guided by one or more of the following criteria applying, with the exception of the first which may not be enough on its own, depending on the distance apart of fields or units:

- *the component fields are similar in terms of their vegetation composition (eg same NVC community type or broad NVC grouping) and occur on similar soil types/geology within a discrete landscape or occur in similar topographical situations (eg disjunct flushes along a valley);*
- *it is very likely that local habitat fragmentation has caused the current disjunct nature of the habitat(s) and that the elements would formerly have been linked;*

- *where different vegetation types are present, there is evidence that these once occurred in previously contiguous mosaics and transitions reflecting local changes in soils, hydrology etc, within a similar landscape setting;*
- *there is a high likelihood that individual sub-components provide an overall habitat resource for certain wide ranging species.'*

At Langdon Ridge, the rationale for including discrete grassland patches within a single compound SSSI is as follows:

- Many of the component fields support similar MG5 species-rich neutral grassland communities on a common underlying geology (Bagshot Sand overlying Claygate Beds and London Clay) and extend across the Langdon Ridge landscape.
- The presence of semi-improved communities (such as at Northlands Meadow) indicates that the species-rich habitats were formerly more linked than they are today and that this is as a result of land use and land management changes, including agricultural management.
- The historical land use and land management changes associated with the 'Plotlands' (see section 2.3) provide a good explanation of the current distribution of woodland, scrub and grassland communities, consistent with the underlying soils and hydrology, which remain contiguous over significant areas.
- The species-rich grasslands in combination with other open habitats (see section 2.4) provide an overall habitat resource for nationally important assemblages of invertebrates, including relatively wide-ranging species such as bees, butterflies and moths.

Consequently the entire grassland complex is of ecological importance to both the botanical and invertebrate interest of the area, which further emphasises the importance of the landscape-scale archipelago of meadows to conservation. The importance of the SSSI is of further significance in that it includes one of the largest areas of semi-natural habitats remaining in this part of Essex. Outside of the SSSI there is very little agriculturally unimproved habitat.

In relation to the inclusion of areas of partially improved land as habitat linkage and for potential, the Guidelines (Part 2, 5.12.1) states that potential interest can be considered as a basis for selection where:

'...vegetation succession can be fairly readily encouraged, reversed or deflected by suitable management...where part of a site, sometimes consisting of a different habitat, is in a poorer condition than the rest but its inclusion contributes strongly to the overall interest.'

The land at Northlands Meadow currently has limited interest but has the potential for its condition to be readily recovered to provide additional habitat to support the species-rich neutral grassland, invertebrates, Deptford pink and semi-natural woodland features. Inclusion of this block also links Northlands Wood with the nearby Old Hill and Great Sutton Wood and creates a network which will provide for persistence of species under different climate change scenarios.

3. Current condition of the Langdon Ridge SSSI

This section contains information on the current condition of the SSSI, the distribution of the interest features within the site and the remedial action that needs to be carried out to achieve favourable or recovering condition in those areas of the site where the interest features are currently assessed as being in adverse condition.

Table 5. Distribution of interest features in the Langdon Ridge SSSI by unit

| Interest features | Site unit numbers |
|------------------------------|---|
| Unimproved neutral grassland | 1, 5, 7, 12, 13, 14, 15, 16, 18, 25, 26, 27, 30, 33, 34, 35 |
| Fen Meadow | 15 |
| Woodland | 2, 3, 6, 8, 9, 10, 14, 17, 19, 20, 21, 22, 24, 29 |
| Invertebrate assemblage | 1, 2, 3, 4, 5, 7, 9, 11, 12, 13, 14, 15, 16, 18, 23, 25, 26, 27, 28, 30, 31, 32, 33, 34, 35 |
| Deptford Pink | 22, 31, 35 |

Table 6. Current condition of the Langdon Ridge SSSI

| Site unit* | Interest features | Reported condition** | Date of last assessment |
|------------|--|-------------------------|-------------------------|
| 1 | Neutral grassland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 2 | Woodland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 3 | Woodland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 4 | Invertebrates | Favourable | 08 February 2018 |
| 5 | Neutral grassland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 6 | Woodland | Unfavourable recovering | 08 February 2018 |
| 7 | Neutral grassland, invertebrates | Favourable | 08 February 2018 |
| 8 | Woodland | Unfavourable recovering | 08 February 2018 |
| 9 | Woodland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 10 | Woodland | Unfavourable recovering | 08 February 2018 |
| 11 | Woodland | Unfavourable recovering | 08 February 2018 |
| 12 | Invertebrates | Favourable | 08 February 2018 |
| 13 | Neutral grassland, invertebrates | Unfavourable Recovering | 08 February 2018 |
| 14 | Neutral grassland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 15 | Neutral Grassland, invertebrates, woodland | Unfavourable recovering | 08 February 2018 |
| 16 | Neutral grassland, fen meadow, invertebrates | Unfavourable recovering | 08 February 2018 |
| 17 | Neutral grassland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 18 | Woodland | Unfavourable recovering | 08 February 2018 |
| 19 | Neutral grassland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 20 | Woodland | Unfavourable recovering | 08 February 2018 |
| 21 | Woodland | Unfavourable recovering | 08 February 2018 |
| 22 | Woodland, Deptford Pink | Unfavourable recovering | 08 February 2018 |
| 23 | Invertebrates | Favourable | 08 February 2018 |
| 24 | Woodland | Unfavourable recovering | 08 February 2018 |
| 25 | Neutral grassland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 26 | Neutral grassland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 27 | Neutral grassland, invertebrates | Favourable | 08 February 2018 |
| 28 | Invertebrates | Favourable | 08 February 2018 |
| 29 | Woodland | Unfavourable recovering | 08 February 2018 |
| 30 | Neutral grassland, invertebrates | Unfavourable recovering | 08 February 2018 |
| 31 | Invertebrates, Deptford Pink | Favourable | 08 February 2018 |
| 32 | Invertebrates | Favourable | 08 February 2018 |
| 33 | Neutral grassland, invertebrates | Favourable | 08 February 2018 |
| 34 | Neutral grassland, invertebrates | Favourable | 08 February 2018 |

| Site unit* | Interest features | Reported condition** | Date of last assessment |
|------------|---|----------------------|-------------------------|
| 35 | Neutral grassland, invertebrates, Deptford Pink | Favourable | 08 February 2018 |

* **Site units** are divisions used by Natural England for administrative purposes only.

**** Reported condition**

SSSIs are notified because of special biological or geological features. When these features are being managed so that their special nature conservation interest is being maintained they are said to be in favourable condition. This is a United Kingdom standard and the terminology and definitions are more fully described in 'A Statement on Common Standards Monitoring', produced by the Joint Nature Conservation Committee in 1998.

4. Selection of 'operations requiring Natural England's consent'

Natural England selects operations from a master list when determining the list of operations requiring consent for individual SSSIs. The selection is based on the likelihood that the operations may cause damage to the special features that are the reasons for notification of the SSSI. As well as selecting operations from the master list, the precise wording of each operation may be tailored to suit the particular circumstances at the site.

It is not possible to predict every possible eventuality that may arise on a site but the aim is to identify all operations where it is reasonably foreseeable that, if carried out at certain times or in a particular manner somewhere within the SSSI, they are likely to damage the special interest features. The table below records at least one reason justifying the inclusion of each operation in the list for the Langdon Ridge SSSI. It is not intended to be exhaustive and in most cases there will be other ways in which the specified operation is likely to cause damage.

| Standard reference number | Type of operation | At least one reason for listing |
|---------------------------|--|--|
| 1. | Cultivation, including ploughing, rotovating, harrowing and re-seeding | Important habitats and associated flora/fauna could be damaged or destroyed. |
| 2. | Grazing, and alterations to the grazing regime (including type of stock, intensity or seasonal pattern of grazing) | Important habitats, plants and invertebrate assemblage are sensitive to over or under grazing and changes to the grazing regime. |
| 3. | Stock feeding, and alterations to stock feeding practice. | Risk of nutrient enrichment and poaching, which could damage important habitats, plants and/or invertebrate assemblage. |
| 4. | Mowing or cutting vegetation, and alterations to the mowing or cutting regime (such as from haymaking to silage). | Important habitats and associated flora/fauna are sensitive to cutting and mowing. |
| 5. | Application of manure, slurry, silage liquor, fertilisers and lime. | Risk of nutrient enrichment and damage to important habitats. |
| 6. | Application of pesticides, including herbicides (weedkillers) whether terrestrial or aquatic, and veterinary products. | Important habitats and associated flora/fauna are sensitive to the application of these. |

| | | |
|------|--|--|
| 7. | Dumping, spreading or discharging of any materials. | Risk of direct or indirect damage to important habitats, plants and invertebrate assemblage. |
| 8. | Burning and alterations to the pattern or frequency of burning. | All notified features at the site are sensitive to burning. |
| 9. | The release into the site of any wild, feral, captive-bred or domestic animal, plant, seed or micro-organism (including genetically modified organisms) | Could lead to unforeseen ecological changes and potentially the introduction of new pathogens. |
| 10. | The killing, injuring, taking or removal of any wild animal (including dead animals or parts thereof), or their eggs and nests, including pest control and disturbing them in their places of shelter. | Risk of ecological impact to important grassland and woodland habitats and direct damage to species interests. |
| 11. | Destruction, displacement, removal or cutting of any plant or plant remains, including tree, shrub, herb, hedge, dead or decaying wood, moss, liverwort, lichen, fungal fruiting body, leaf-mould or turf. | Important habitats, plants and invertebrate assemblage could be directly or indirectly damaged by changes to vegetation. |
| 12. | Tree and/or woodland management, and alterations to tree and/or woodland management (including planting, felling, pruning and tree surgery, tinning, coppicing, changes in species composition and removal of fallen timber). | Risk of direct damage to important woodland and scrub habitat and associated flora and fauna. |
| 13a. | Draining (including the use of mole, tie, tunnel or other artificial drains). | Important habitats and associated flora and fauna are sensitive to changes in drainage. |
| 13b. | Modification to the structure of water courses (rivers, streams, springs, ditches, drains), including their banks and beds, as by re-alignment, regrading, damming or dredging. | Risk of direct or indirect impact to important habitats. |
| 13c. | Management of aquatic and bank vegetation for drainage purposes | Risk of damage to important habitats. |
| 14. | Alterations to water levels and tables and water utilisation (including irrigation, storage and abstraction from existing water bodies and through boreholes). Also the modification of current drainage operations (e.g. through the installation of new pumps). | Important habitats and associated flora and fauna are sensitive to changes in water levels. |
| 15. | Infilling or digging of ditches, drains, ponds, pools, marshes, pits or shafts | Direct damage/loss of water features and risk of damage to invertebrate assemblage and important habitats. |
| 20. | Extraction of minerals including clay, hard rock, shingle, sand and gravel, topsoil, subsoil and spoil | Direct loss/damage of important habitats and associated flora and fauna. |
| 21. | Destruction, construction, removal, rerouting or regrading of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, including soil and soft rock exposures or the laying, maintenance or removal of pipelines and cables, above or below ground. | Direct loss/damage of important habitats and associated flora and fauna. |
| 22. | Storage of materials | Risk of obscuring/smothering important habitats and the features they support. |

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| 23. | Erection of permanent or temporary structures or the undertaking of engineering works, including drilling. | Direct loss/damage of important habitats and associated flora and fauna. |
| 26. | Use of vehicles or craft other than on made up roads and tracks | Risk of damage to important habitats, such as through compaction, erosion or rutting. |
| 27. | Recreational or other activities likely to damage or disturb the features of special interest. | Risk of damage to important habitats, for instance due to excessive trampling, and/or disturbance to species. |
| 28a. | Game and waterfowl management and hunting practices, and alterations to game and waterfowl management and hunting practice. | Inappropriate location and types could damage habitats and species, for instance due to nutrient enrichment around feeders. |

5. Site unit map

The map on the following page shows the provisional boundaries of the site units, which are divisions used by Natural England for administrative purposes only.

Insert site units maps

6. Distribution of vegetation community types within the Langdon Ridge SSSI

7. Photographs – Aerial Photo



Photograph 2. MG5 unimproved neutral grassland at Langdon Hills Recreation ground, showing abundance of *Orchis morio* (green-winged orchid) – (photo credit: Justin Tilley)



Photograph 3. Herb-rich MG5 neutral grassland at Willow Park – (photo credit: Giles Groome)



Photograph 4. MG5 unimproved neutral grassland with abundance of *Oenanthe pimpinelloides* (corky-fruited water-dropwort) at One Tree Hill – (photo credit: Giles Groome)



Photograph 5. Area of M22 (fen meadow) grassland at Willow Park – (photo credit: Giles Groome)



Photograph 6. *Trifolium ochroleucon* (sulphur clover) – nationally scarce plant in MG5 grassland at Langdon Ridge (Photo credit: Rod Cole)



Photograph 7. *Platanthera chlorantha* (greater butterfly orchid) – nationally threatened plant in MG5 grassland at Langdon Ridge (Photo credit: Rod Cole)



Photograph 8. *Dianthus ameria* (Deptford pink) – Schedule 8 and nationally scarce plant at Hawkesbury Bush – (Photo credit: Peter Furze)



Photograph 9. Typical invertebrate-rich meadow at One Tree Hill – (Photo credit: Luke Love)



Photograph 10. View towards the Thames Estuary from One Tree Hill – (Photo credit: Zoe Ringwood)



Photograph 11. Wide grassy ride within W21 scrub community at Dunton Plotlands – (Photo credit: Justin Tilley)



Photograph 12. Area of mature scrub at Dunton Plotlands – (Photo credit: Justin Tilley)



Photograph 13. Grassy clearing and remains of plotlanders building within W21 scrub at Dunton Plotlands – (Photo credit: Justin Tilley)



Photograph 14. The Haven Museum (plotlanders bungalow) at Dunton Plotlands – (Photo credit: Justin Tilley)



Photograph 15. Woodland flora in W8/W10 habitat at Northlands Wood – (photo credit: Luke Love)



Photograph 16. W8/W10 woodland habitat at Martinhole Wood – (Photo credit: Justin Tilley)



Photograph 17. Standing dead wood within W8/W10 woodland habitat at Coombe Wood – (Photo credit: Justin Tilley)



Photograph 18. W08/W10 woodland habitat at Lincewood – (Photo credit: Justin Tilley)



Photograph 19. *Pyrgus malvae* (grizzled skipper) butterfly at One Tree Hill – (Photo credit: Peter Furze)



Photograph 20. *Limenitis camilla* (white admiral) butterfly at Marks Hill – (Photo credit: Peter Furze)