Lichen Assessment Desk Study

Proposed Super National Nature Reserve, North Kent

A Report To: White Horse Ecology on behalf of Kent County Council c/o Kent Downs National Landscape Unit
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Quality Assurance

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Executive Summary

- The total number of lichen taxa recorded, based on the information available from this desk study is 164. Records date from 1966 to 2018, and 102 species have not been reported since 2014 and 38 are represented by only a single report (Annex 2).
- Most species occurred on bark or wood, with lesser numbers on stonework or the ground.
- All are assessed as of Least Concern apart from two which merit confirmation, but 14 are categorized as endangered, rare or vulnerable in the Kent Red Data Book (Annex 3).
- None of the species used in the New Index of Ecological Continuity (NIEC) are reported.
- The available records were analyzed by the 19 units under consideration as far as was possible from the locality information available (Annex 4). Cobham Hall School (unit 9) had the most lichens, 98 (of which 45 were on stonework). That unit, Ashenbank Wood (units 5 and 12), the Cuxton and Cobham Woodland Project (unit 3) and Ranscombe Farm (unit 4) were the most important.
- The Ashenbank Wood complex included the most species of county concern.
- The whole area was severely impacted by sulphur dioxide air pollution into the late 1970s, when conditions started to ameliorate. Many lichens would have been eliminated but a few that favour acidic bark and wood evidently appeared, but have since been lost. Species that tolerate or thrive under conditions of nitrogen oxides and ammonium emissions evidently are now well represented.
- The most promising areas for further work appear to be: (a) the West Park (unit 11) and adjacent Cobham Hall School (unit 9) and the avenue adjoining the Silverhand Estate (unit 10), and (b) Camer Park (unit 19) where several scarce species unreported from other units were present in 1986-87.
- In order to encourage lichen assemblages, attention should be paid to preventing mature and especially veteran trees of interest from rubbing by cattle and horses and the trunks free from shade with “halo” clearance if in woodland.
- Trees supporting species of interest should be mapped and tagged so they are not inadvertently felled or reduced.
- Coppicing regimes with standards should be established where no longer in place.
- Introduced non-native coniferous trees not of particular aesthetic or other interest, especially within wooded areas, should be felled to prevent their seed from becoming established.
- As this report is a desk study, some of the analyses and conclusions may require re-assessment as additional evidence comes to light.

Contents

1. Introduction

1.1 Project Background

In June 2024 White Horse Ecology on behalf of Kent Country Council c/o Kent Downs National Landscape Unit commissioned Middlemarch to undertake a Lichen Assessment Desk Study in support of a proposed Super National Nature Reserve extending across 19 sites in North Kent. In order to complete the required assessment Middlemarch subcontracted Professor David L. Hawksworth CBE (Lichenologist), with a summary of his academic and professional experience detailed in Section 1.2.

As part of the Lichen Assessment Desk Study White Horse Ecology on behalf of Kent County Council c/o Kent Downs National Landscape Unit requested that the below questions be addressed:

1. What are the most important lichen species in the study area?
2. Which are the key areas for lichens?
3. Where is more survey work required?
4. Habitat management and creation options.

The 19 areas being considered and to which this assessment relates are included in Annex 1.

1.2 Experience of Professor David L. Hawksworth CBE

Professor David L. Hawksworth CBE has been involved in the identification and survey of lichens since 1964, and publishing on them since 1966, with a PhD from the University of Leicester in 1970 and a DSc from the same university in 1980. He was employed at the International Mycological Institute at Kew from 1969-97, and as a research professor in the Facultad de Farmacia in the Universidad Complutense de Madrid from 2000-2016. He is currently an Honorary Research Associate at the Royal Botanic Gardens Kew, a Scientific Associate at the Natural History Museum London, and holds visiting professorships in the University of Southampton and Jilin Agricultural University in China. He has been a Chartered Biologist since 1986, and has been elected as a Fellow of the International Mycological Association, Linnean Society of London, and Royal Society of Biology.

Professor David L. Hawksworth CBE was appointed Commander of the British Empire in 1996 by HM Queen Elizabeth II for services to science, has been honoured with six medals and awards (including the Acharius Medal of the International Association for Lichenology) and has served as President of the British Lichen Society, British Mycological Society, International Mycological Association, and International Union of Biological Sciences. He also served as a member of the Council of English Nature (now Natural England).

Professor David L. Hawksworth CBE has published extensively on lichens, especially their nature and classification, but also on their ecology and application as practical bioindicators of air pollution, and has been involved in survey work and site assessments throughout his career, including sites in the Greater London area, Surrey, Devon, Derbyshire, Wiltshire, and Cumbria. His publications include the following books on lichens: *Lichenology: Progress and Problems* (1976); *Air Pollution and Lichens* (1973); *The Lichen-Forming Fungi* (1983); *Lichenology in the*

British Isles 1568-1975 (1977); *Lichens as Pollution Monitors* (1976); and *The Lichen Flora of Great Britain and Ireland* (1992).

2. Previous Surveys

2.1 Desk study

Information was extracted from the following sources and that forms the basis of this desk study assessment:

- Kent and Medway Biological Records Centre (KMBRC) data provided by White Horse Ecology on behalf of Kent County Council c/o Kent Downs National Landscape Unit;
- British Lichen Society Recording Scheme data provided to me by Janet Simkin on behalf of the Society;
- Copies of the original 10 km square mapping cards made by the late Dr Francis Rose in 1966-69 provided to me by Janet Simkin on behalf of the British Lichen Society;
- Ranscombe Farm Reserve Provisional Lichen List prepared by Plantlife, “updated March 2020”;
- OS Explorer 1: 25,000 Sheet 148 (Maidstone & The Medway Towns) which provides some information on habitats, including woodland type; and,
- Google Earth Images, including aerial photographs of the sites which could be zoomed into.

The records were combined, and the nomenclature updated to provide an overall synthesis of the species reported, along with the dates of the more recent records and the substrates on which they grow (Annex 2).

Professor David L. Hawksworth CBE did not have access to copies of the *Bulletin of the Kent Field Club* when preparing this report. The *Bulletin* started in 1956 and includes reports of lichens by several lichenologists. Only selected numbers are available online (https://www.kentfieldclub.org.uk/the-bulletin-of-the-kent-field-club) and this merits examination in hard copy for possible additional reports from the sites of interest.

3. Results

3.1 Species Recorded

The overall list (Annex 2) includes 164 lichen taxa species, the earliest records dating from 1966 and the most recent from 2018[1]. Of those lichens, 102 have not been reported since 2014, with 19 not recorded this century. Most species (139) did not have more than 10 records, and 38 species were represented by single reports.

Most species reported were found on bark or wood (101 species), with fewer on stonework (61 species), and even less on the ground (15 species). All but two are categorized as of "Least Concern", although 4 are additionally classed as "Nationally Scarce". The two are *Myriolecis hagenii,* considered "Near Endangered" (although the identification should be verified if it has not been as the name was often misapplied}; and *Porina byssophila* which is scored as "Nationally Rare" but also noted as "Data Deficient".

Fourteen species are, however, listed as endangered, rare or vulnerable in the Kent Red Data Book (Annex 3).

Eleven lichens are included as priority species "most threatened and requiring conservation action" in the *Kent Nature Partnership Biodiversity Strategy 2020-2045,* but none of those are amongst the species recorded from the area under consideration here.

None of the recorded species on bark or wood are included in the New Index of Ecological Continuity (NIEC; Coppins & Coppins 2002), an index used to give a relative measure of the degree to which there has been continuous tree cover, or at least a succession of mature trees for many centuries. It is possible some were formerly present but were eliminated by the effects of sulphur dioxide air pollution prior to any lichen recording in the area.

No calicioid lichens ("pin lichens", e.g. *Calicium* and *Chaenotheca* species) were recorded at all, nor *Hypocenomyce scalaris*, all of which occur on somewhat acidic bark or wood and are present in some woodland sites around the Greater London built-up area. The presence of post-2000 records of *Lepra albscens, L. amara*, *Pertusaria hymenea,* and *P. pertusa* was considered to be interesting as these species are very slow to recolonize following pollution episodes and have failed to re-establish in Epping Forest, while this assemblage (apart from *P. pertusa*) has persisted through the sulphur dioxide regime at Bookham Commons where it is still present in one small area[2].

It has to be stressed that the list of species recorded has to be regarded as far from complete as there are few records from many of the units, based on limited visits, and the experience of the recorders varied considerably. It is also unclear to what extent the reports are based on field observations and how many identifications were checked microscopically or microchemically.

The list of species recorded overall and by unit is not therefore to be treated as in any way complete or exhaustive.

3.2 Notes on Recording Units

The numbers of lichen taxa reported from each of the 19 sites of interest are given in Annex 4, but these should be taken as indicative rather than absolute as it was not always clear from precisely where some records came. Further, in some cases lichens on stonework (saxicolous) or the ground (terricolous) were recorded while in others they were not, or those habitats were absent.

It also has to be stressed that the level of recording has to be considered a major factor in the extent of the lists as some units have been visited on several occasions over the years by experienced recorders while there are no records from others.

The unit with the most lichens recorded, however, was the Cobham Hall School area (unit 9), but the total is inflated compared with all the other sites because some 45 of the 98 species reported occurred on saxicolous substrates not represented at or recorded from in many of the other units.

The three units which emerge as of most importance for lichens on the basis of current records are Ashenbank Wood (unit 5), the Cuxton and Cobham Woodland Project (unit 3), and Ranscombe Farm (unit 4).

3.3 Previous Surveys

A major influence on the lichen assemblages in the area is the changing pattern of air pollution. The region to the south-east of London was severely affected by sulphur dioxide air pollution into the late 1970s when it started to ameliorate. Dr Francis Rose's 10 km mapping card for TQ76 covering 1966-69 and labelled as "Burham Rochester areas" has the comment: " very polluted area"; no *Evernia prunastri* nor *Flavoparmelia caperata* were recorded. Indeed, a map showing the northern limits of *Hypogymnia physodes* and *F. caperata* from 1970 shows them as absent from the area of current interest (Annex 5). The fall in levels of this pollutant into the 1980s enabled such species to expand rapidly in London and surrounding areas (Hawksworth & McManus 1989), and they are now a conspicuous feature in the study area. Even the particularly sensitive *Parmotrema perlatum* is also recorded, although so far no species of *Usnea* have been reported. *Usnea* species, are however, adversely affected by nitrogenous air pollutants.

While the ambient sulphur dioxide levels were changing, this enabled some which required acid conditions to colonize and then disappear as levels fell further, which may explain why *Parmeliopsis ambugua* and *Platismatia glauca* have not been seen in the area since 2010 and 1999 respectively. The formerly often dominant *Lecanora conizaeoides*, clothing bark and wood in an often thick grey-green crust, and which evidently seems to have some requirement for sulphur and acid substrates, has also, or almost, disappeared with only two reports this century (in 2000 and 2010). This same pattern is seen in other areas studied by Professor David L. Hawksworth CBE over extended periods, including Bookham Commons SSSI, Epping Forest SAC, and the Ruislip Woods NNR. *Parmelia saxatilis* is a part of the same acid-living assemblage so it was a surprise to see that is evidently persisting within the study area, however this would be expected to decline.

More recently, nitrogenous pollution (NOx and ammonium) has come to dominate lichen assemblages in lowland Britain, exacerbated by vehicle emissions and some agricultural sprays.

This has resulted in explosions of certain species of *Physcia* and *Ramalina*, and particularly *Xanthoria parietina*, especially close to main roads, with the M2 expected to be having a major influence in the study area. These predominantly yellow-orange assemblages are conspicuous even to casual observers.

4. Assessment of the Importance of the Study Area for Lichens

4.1 Most Notable Lichen Species Identified within the Study Area

Within the study area, only two species scoring as of some national interest were reported (see Section 3.1). Fourteen were, however, indicated as of conservation importance in the Kent & Medway Biological Records Centre database, but five of those had not been reported in the area since 1968, and one not since 1999; *Caloplaca xantholyta* which would have been on stonework.

However, several species reported are indicative of mature trees in established (though not necessarily ancient), woodlands and are now rather scarce in south-east England, notably *Arthonia didyma*, *Bacidia phacodes* (declined since the ravages of Dutch Elm Disease in the 1970s), *Coenogonium pineti*, *Diarthonis spadicea,* and *Lecanographa decolorans*). *Enterographa crassa*, recorded from "Upper Halling" in 1986, also falls into this category but the precise location is unclear but could have been from part of Holborough Woodlands (site 15) so was included as from here in Annex 2; the recorder was not indicated in the KMBRC database but would be worth searching for in that general area.

It must be stressed that there may well be other species of note that would be discovered in the course of detailed surveys of the most promising sites (see Section 4.2 below).

4.2 Key Areas for Lichens Identified within the Study Area

The area with the lichens of most interest, on the basis of the records located in this desk study, emerged as Ashenbank Wood (units 5 and 12) which is not only species-rich compared with as it is there that those of most interest in a county context all occur (Annex 3; Section 4.1 above).

The next most promising is considered to be Ranscombe Farm (site 4) as that has *Bacidina phacodes* and *Coenogonium pineti* and so seems most likely to have other species of note awaiting recording.

As already noted, the high numbers reported from Cobham Hall School (site 9) and also some other sites are attributable to species on stonework and/or the ground being included.

An indication of the most promising lichen sites in an area can be obtained from an assessment of the nature of those sites, as evidenced by the categories employed on Ordnance Survey 1:25,000 sheets and views in Google Earth. Of most potential are ones with mature deciduous native trees in open situations with well-lit bark, such as long-established parklands. The Kent Wildlife Trust (2015) recognizes the value of wood pasture or parkland and veteran trees for designation as Local Wildlife Sites.

The most promising area with these features is West Park (unit 11) and the adjacent Cobham Hall School (unit 9); the avenue of deciduous trees (*Aesculus hippocastanum* and others) on the south side of West Park where it adjoins the Silverhand Estate (unit 10) could be especially worth a detailed inspection from the appearance in Google Earth and may have been planted when the grounds were remodelled in the late 18th century. The 17th century Hall is on the site of a former 12th century property, and so some trees may be particularly ancient. Ashenbank Wood (see

above), may well have some continuity with the original estate. Although many lichens in this area would have been eliminated from it by sulphur dioxide pollution, it is possible that a few may have remained in sheltered situations.

4.3 Areas Recommended for Further Surveys

On the basis of the information obtained during the desk study, while all units would benefit from critical recent surveys, as no records post-2018 were located and many sites have many fewer species recorded than would have been expected. That is especially so for the extensive Holborough Woodlands complex (unit 15) which is also the unit with some noteworthy ground-dwelling species, *Bilimbia sabuletorum*, *Cladonia furcata* subsp. *rangiformis*, and *C. pocillum*, and one of the few sites from which *Pertusaria pertusa* have been reported.

In addition to Ashenbank Wood, Cobham Hall School and West Park (units 5, 9, and 11) which are the most promising on the basis of reported species (see Section 6.2), Camer Park (unit 19) could also repay a fresh visit. Camer Park is the only unit from which *Diplotomma alboatrum, Physcia aipolia, Physconia distorta, P. perisidiosa* and *Pleurosticta acetabulum* and were reported amongst the sites of interest. These records date from 1986-87 so it would be pertinent to ascertain if these were still present as all five are categorized as endangered or rare in the Kent Red Data List (Annex 3).

In areas of dense woodland and neglected coppice, lichens may be most abundant on the upper branches and so can remain undetected. It can therefore be informative to conduct surveys in those areas after storms when branches have been broken off and fallen can be examined if that can be arranged.

4.4 Habitat Management and Creation

Where there are mature, and especially veteran, deciduous trees in open situations the trunks should be kept free from shade and any rubbing by cattle or horses. Such trees in closed woodland can benefit from “halo” clearance around the trunks to increase the light reaching them.

Where there are mature trees of importance for the lichens they support, consideration should be given to planting ones of the same tree species in the vicinity to provide the possibility of long-term continuity as they become colonized. It should be remembered that dispersal of lichen propagules is often by rain-splash or invertebrates crawling over them and operates over short distances.

There are areas marked as coppiced on the Ordnance Survey maps, especially in Cobham Woods (unit 2), the Cuxton and Cobham Woodland Project (unit 3), Ranscombe Farm (unit 4), Jeskyns Community Woodland (unit 6), Cobham Hall School (unit 9), and South Ashenbank Wood (unit 12). If coppicing is carried out periodically, for example every 10-15 years, this can encourage lichen development on any standard trees present by allowing more light to reach the trunks and lower branches. Note that hazel (*Corylus avellana*) coppice can be an important lichen substrate, for example some *Arthonia* and lirellate species (ones with elongate script-like sporing structures), if not too densely lit.

Coniferous trees are indicated as present in many of the units, but appear to be a particular feature of the western parts of the Holborough Woodlands (unit 15). These are presumably introduced

non-native species mostly planted for commercial forestry and unlikely to support lichens of interest. It would be prudent to fell any that are not of particular aesthetic or other interest to both provide new opportunities for native deciduous trees to establish and, most importantly, to prevent seed from them becoming established.

4.5 Management of and Threats to the Lichen Communities

The overriding threat to lichen communities in the area is undoubtedly increasing nitrogenous pollution, ambient and also more locally from major roads (notably the M2 in this case).

It is also good practice to map and tag particular trees of lichen interest, so they are not inadvertently felled or reduced.

Increasing shade can also be a factor in neglected coppice and in dense conifer-planted areas.

The management of veteran trees in open situations or woodland is discussed above in Section 4.4.

5. References

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Hawksworth DL & McManus PM (1989) Lichen recolonization in London under conditions of rapidly falling sulphur dioxide levels, and the concept of zone-skipping. *Botanical Journal of the Linnean Society* **100**: 99–109.

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Kent Wildlife Trust (2015) *Local Wildlife Sites in Kent (formerly Sites of Nature Conservation Interest): Criteria for Selection and Delineation.* Version 1.5. 51 pp. Maidstone: Kent Wildlife Trust.

Rose F (1970) Lichens as pollution indicators. *Your Environment* **1**: 185–189.

Woods RG & Coppins BJ (2012) *A Conservation Evaluation of British Lichens and Lichenicolous Fungi.* [Species Status No. 13.] 155 pp. Peterborough: Joint Nature Conservation Committee.

Annex 1

Possible National Nature Reserve Sites

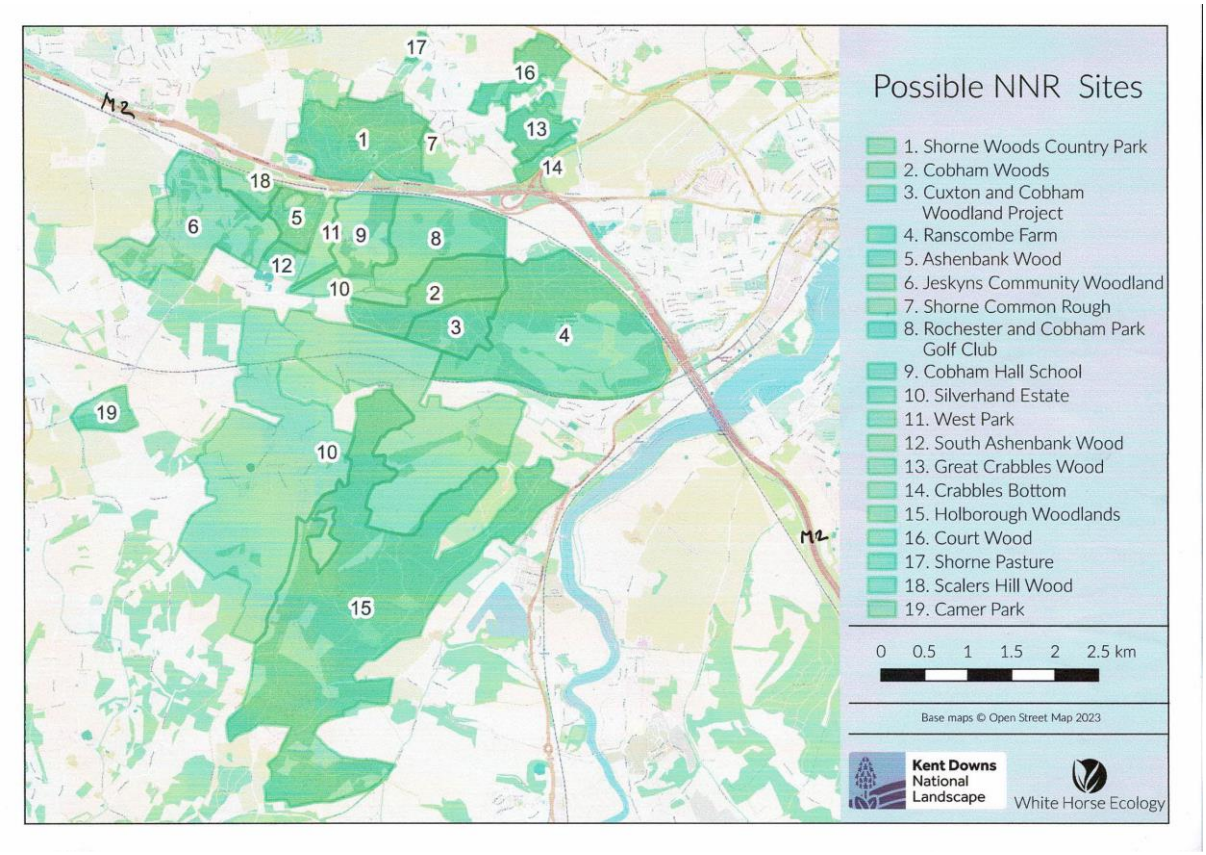

Figure 1: Possible National Nature Reserve Sites

Annex 2

Checklist of Lichen Taxa Recorded

Species	Most Recently Recorded	Total Number of Records	Substrate			Status
			cort	sax	terr	
Agonimia tristicula	1999	2	X			LC
Alyxoria culmigena	2016	1	X			LC
Alyxoria ochrochelia	2010	2	X			LC
Alyxoria varia	2010	2	X			LC
Amandinea punctata	2014	15	X			LC
Anisomeridium polypori	2014	2	X			LC
Arthonia atra	2016	5	X			LC
Arthonia didyma	2010	1	X			LC
Arthonia radiata	2018	10	X			LC
Aspicilia calcarea	2018	7		X		LC
Aspicilia contorta	2018	2		X		LC
Bacidia fuscoviridis	2018	2		X		LC, NS
Bacidia adastra	2010	1	X			LC, NS
Bacidia modesta	2011	1	X			LC
Bacidia phacodes	2016	1	X			LC
Baglietoa parmigera	1999	2		X		LC
Bilimbia sabuletorum	2003	3		X		LC
Blennothallia crispa	2018	4		X		LC
Buellia aethalea	1999	1		X		LC
Buellia griseovirens	2014	2	X			LC
Buellia ocellata	1999	3		X		LC
Caloplaca arcis	2018	2	X			LC
Caloplaca aurantia	1999	1		X		LC
Caloplaca chrysodeta	1999	1		X		LC
Caloplaca citrina s. lat.	2018	1		X		LC

Table 1: Checklist of Lichen Taxa Recorded (continues)

Species	Most Recently Recorded	Total Number of Records	Substrate			Status
			cort	sax	terr	
Caloplaca flavescens	2018	3		X		LC
Caloplaca flavocitrina	2014	3		X		LC
Caloplaca holocarpa s. lat.	2018	5		X		LC
Caloplaca oasis	2018	2		X		LC
Caloplaca ruderum	1999	1		X		LC
Caloplaca teicholyta	2018	4		X		LC
Caloplaca xantholyta	1999	2		X		LC
Candelaria concolor	2016	2	X			LC
Candelariella aurella	2018	1		X		LC
Candelariella medians	1999	2		X		LC
Candelariella reflexa	2016	7	X			LC
Candelariella vitellina	2018	11	X	X		LC
Catillaria chalybeia	2018	3		X		LC
Chrysothrix candelaris	1995	2	X			LC
Cladonia chlorophaea s. lat.	2011	6			X	LC
Cladonia coniocraea	2014	20	X	X	X	LC
Cladonia fimbriata	2006	4	X	X	X	LC
Cladonia furcata subsp. subrangiformis	2003	1			X	LC
Cladonia macilenta	2014	6	X		X	LC
Cladonia ochrochlora	2010	3	X			LC
Cladonia parasitica	1999	2	X			LC
Cladonia pocillum	1969	1			X	LC
Cladonia polydactyla	2011	3			X	LC
Cladonia pyxidata	1999	2			X	LC
Cladonia ramulosa	1999	2			X	LC
Cladonia squamosa s. lat.	1999	2	X		X	LC

Table 1: (continued) Checklist of Lichen Taxa Recorded (continues)

Species	Most Recently Recorded	Total Number of Records	Substrate			Status
			cort	sax	terr	
Cladonia squamosa var. subsquamosa	2010	1			X	LC
Cliostomum griffithii	2010	6	X			LC
Coenogonium pineti	2016	3	X			LC
Dendrographa decolorans	2010	4	X			LC
Diarthonis spadicea	2010	1	X			LC
Diploicia canescens	2018	8	X	X		LC
Diplotomma alboatrum	1967	1		X		LC
Enchylium tenax	2003	1			X	LC
Enterographa crassa	1986	1	X			LC
Evernia prunastri	2016	13	X			LC
Flavoparmelia caperata	2013	14	X			LC
Flavoparmelia soredians	2016	5	X			LC
Glaucomaria carpinea	2016	7	X			LC
Graphis elegans	2010	2	X			LC
Graphis scripta	2010	1	X			LC
Haematomma ochroleucum var. porphyrium	1968	3	X			LC
Hyperphyscia adglutinata	2016	3	X			LC
Hypogymnia physodes	2014	12	X			LC
Hypogymnia tubulosa	2014	1	X			LC
Hypotrachyna afrorevoluta	2014	2	X			LC
Hypotrachyna revoluta	1995	2	X			LC
Lathagrium fuscovirens	1999	2		X		LC
Lecanactis abietina	2010	3	X			LC
Lecania cyrtella	2014	3	X			LC
Lecania erysibe s. lat.	2018	2		X		LC
Lecania naegelii	2018	1	X			LC

Table 1: (continued) Checklist of Lichen Taxa Recorded (continues)

Species	Most Recently Recorded	Total Number of Records	Substrate			Status
			cort	sax	terr	
Lecanora barkmaniana	2016	1	X			LC
Lecanora campestris	2018	3		X		LC
Lecanora chlarotera	2018	16	X			LC
Lecanora compallens	2018	1	X			LC, NS
Lecanora confusa	2014	3	X			LC
Lecanora conizaeoides	2010	12	X			LC
Lecanora expallens	2016	14	X			LC
Lecanora polytropa	2018	2		X		LC
Lecanora saligna	2014	1	X			LC
Lecanora sulphurea	1999	2		X		LC
Lecanora symmicta	2018	8	X			LC
Lecidea grisella	1999	2		X		LC
Lecidella elaeochroma	2018	18	X			LC
Lecidella scabra	2018	5		X		LC
Lecidella stigmatea	2018	3		X		LC
Lepra albescens	2010	2	X			LC
Lepra amara	2010	5	X			LC
Lepraria incana s. lat.	2018	26	X	X		LC
Lepraria vouauxii	2010	3		X		LC
Lichenomphalia umbellifera	2003	2			X	LC
Melanelixia fuliginosa	2010	10		X		LC
Melanelixia glabratula	2000	2	X			LC
Melanelixia subaurifera	2014	13	X			LC
Melanohalea elegantula	2011	5	X			LC
Melanohalea exasperatula	2014	1	X			LC
Melanohalea laciniatula	1967	2	X			LC
Myriolecis albescens	2018	3		X		LC

Table 1: (continued) Checklist of Lichen Taxa Recorded (continues)

Species	Most Recently Recorded	Total Number of Records	Substrate			Status
			cort	sax	terr	
Myriolecis crenulata	2014	2		X		LC
Myriolecis dispersa	2018	18	X		X	LC
Myriolecis hagenii	2016	3	X			NE
Myriolecis persimilis	2014	1	X			LC
Ochrolechia subviridis	1968	1	X			LC
Opegrapha vulgata	2016	3	X			LC
Parmelia saxatilis s. lat.	2011	15	X			LC
Parmelia sulcata	2016	25	X			LC
Parmeliopsis ambigua	2010	2	X			LC
Parmotrema perlatum	2016	8	X			LC
Pertusaria coccodes	1968	1	X			LC
Pertusaria hymenea	2005	1	X			LC
Pertusaria pertusa	2014	4	X			LC
Phaeophyscia orbicularis	2018	17	X	X		LC
Phlyctis argena	2014	7	X			LC
Physcia adscendens	2018	26	X	X		LC
Physcia aipolia	2000	2	X			LC
Physcia caesia	2018	5		X		LC
Physcia tenella	2016	21	X			LC
Physconia distorta	1968	2	X			LC
Physconia grisea	2016	10	X			LC
Physconia perisidiosa	1968	1	X			LC
Placidium squamulosum	1969	1			X	LC
Placopyrenium fuscellum	2018	2		X		LC
Placynthiella icmalea	2010	3	X			LC
Placynthium nigrum	1969	2		X		LC
Platismatia glauca	1999	2	X			LC
Pleurosticta acetabulum	1968	1	X			LC

Table 1: (continued) Checklist of Lichen Taxa Recorded (continues)

Species	Most Recently Recorded	Total Number of Records	Substrate			Status
			cort	sax	terr	
Porina aenea	2018	4	X			LC
Porina byssophila	2014	1		X		DD, NR
Porpidia tuberculosa	2018	2		X		LC
Protoblastenia rupestris	2018	5		X		LC
Protoparmeliopsis muralis	2018	5		X		LC
Pseudevernia furfuracea var. ceratea	2014	1	X			LC
Pseudoschismatomma rufescens	2018	1	X			LC
Psilolechia lucida	2018	2		X		LC
Punctelia jeckeri	2016	5	X			LC
Punctelia subrudecta	2016	12	X			LC
Pyrrhospora quernea	2010	3	X			LC
Ramalina farinacea	2014	11	X			LC
Ramalina fastigiata	2014	1	X			LC
Ramalina subfarinacea	2000	2		X		LC
Rhizocarpon reductum	2018	1		X		LC
Rinodina oleae	2003	3	X			LC
Scoliciosporum chlorococcum	2016	5	X			LC
Tephromela atra	1999	3		X		LC
Trapelia coarctata	1999	2		X		LC
Trapelia placodioides	1999	2		X		LC
Trapeliopsis flexuosa	2010	4	X			LC
Trapeliopsis granulosa	2010	1	X		X	LC
Verrucaria hochstetteri	2013	4		X		LC
Verrucaria macrostoma f. furfuracea	2018	2		X		LC
Verrucaria macrostoma f. macrostoma	2018	3		X		LC

Table 1: (continued) Checklist of Lichen Taxa Recorded (continues)

Species	Most Recently Recorded	Total Number of Records	Substrate			Status
			cort	sax	terr	
Verrucaria muralis	2018	5		X		LC
Verrucaria nigrescens	2018	5		X		LC
Verrucaria nigrescens f. tectorum	2018	1		X		LC
Verrucaria viridula	2018	2		X		LC
Xanthoria candelaria	2010	3	X			LC
Xanthoria parietina	2018	29	X	X		LC
Xanthoria polycarpa	2014	11	X			LC
Xanthoria ucrainica	2014	3	X			LC, NS
Total Taxa		164	101	61	15	

Table 1: (continued) Checklist of Lichen Taxa Recorded

* = Total excludes forms, subspecies and varieties where the species itself is also reported.

Status: DD = Data deficient, LL = Least concern, NE = Not evaluated, NR = Nationally rare, NS = Nationally scarce (Woods & Coppins 2012, https://britishlichensociety.org.uk/resources/lichen-taxon-database).

Abbreviations: cort = corticolous (growing on bark), sax = saxicolous (growing on rocks, walls, memorials or buildings), terr = terricolous (growing on the ground).

Annex 3

Lichens Recorded as Endangered, Rare or Vulnerable in the Kent Red Data List

Species	Status	Site No.	Site Name	Last Recorded
Alyxoria culmigena	Vulnerable	4	Ranscombe Farm	2016
Alyxoria ochrocheila	Endangered	5	Ashenbank Wood	2010
Alyxoria varia	Endangered	5	Ashenbank Wood	2010
Arthonia didyma	Rare	5	Ashenbank Wood	2010
Bacidina phacodes	Endangered	4	Ranscombe Farm	2016
Caloplaca xantholyta	Vulnerable	9	Cobham Hall School	1999
Candelaria concolor	Vulnerable	4	Ranscombe Farm	2016
Diarthonis spadicea	Vulnerable	5	Ashenbank Wood	2010
Diplotomma alboatrum	Endangered	8	Cobham Park	1967
Melanohalea exasperatula	Endangered	3	Cobham Nor Wood	2014
Physcia aipolia	Endangered	19	Camer Park	1968
Physconia distorta	Endangered	8	Cobham Park	1967
Physconia perisidiosa	Endangered	19	Camer Park	1968
Pleurosticta acetabulum	Rare	19	Camer Park	1968

Table 2: Lichens Recorded as Endangered, Rare or Vulnerable in the Kent Red Data List

Note: Categorization taken from the Kent and Medway Biological Records Centre; the actual Red List was not available to me.

Annex 4

Lichen Taxa Recorded from the 19 Sites of Interest

Site No.	Site	Lichen Taxa
1	Shorne Woods Country Park	5
2	Cobham Woods	36
3	Cuxton and Cobham Woodland Project	55
4	Ranscombe Farm	41
5	Ashenbank Wood	69
6	Jeskyns Community Woodland	0
7	Shorne Common Rough	3
8	Rochester and Cobham Park Golf Club	13
9	Cobham Hall School	98
10	Silverhand Estate	0
11	West Park	11
12	South Ashenbank Wood	0
13	Great Crabbles Wood	31
14	Crabbles Bottom	0
15	Holborough Woodlands	28
16	Court Wood	0
17	Shorne Pasture	0
18	Scalers Hill Wood	0
19	Camer Park	32

Table 3: Lichen Taxa Recorded from the 19 Sites of Interest

Note: The totals should be taken as indicative not absolute as precise sites of records were not always clear. In particular some records from Ashenbank Wood (Site 5) may be from South Ashenbank Wood (Site 12). Also, note that these totals include records from all substrates, and so are higher where stonework was examined as well as bark and wood, as in the case of Cobham Hall School.

Annex 5

Limits of Certain Macrolichen Species in South-East England in 1970 (after Rose 1970)

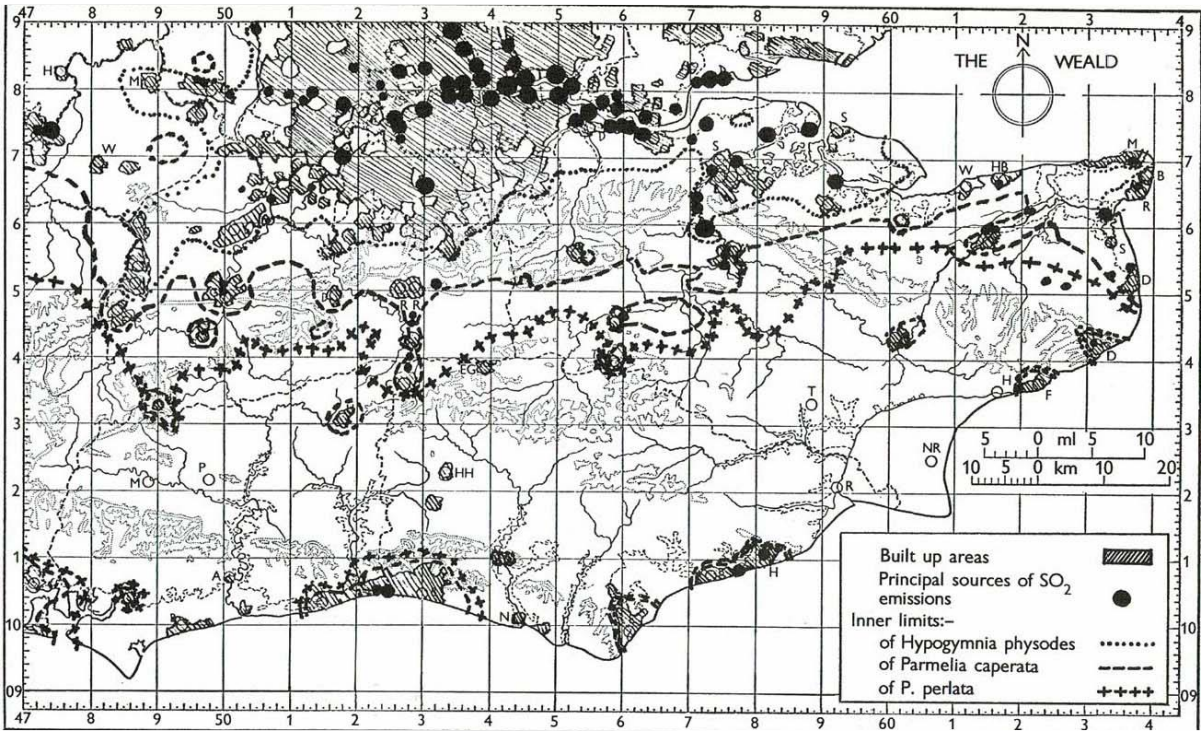

Figure 2: Limits of Certain Macrolichen Species in South-East England in 1970 (after Rose 1970)

Note: The sizes of the black dots indicating sulphur dioxide emission sources are proportional to the size of the source. *Parmelia caperata* and *P. perlata* are now known as *Flavoparmelia caperata* and *Parmotrema perlatum*, respectively. All three species now extend though the areas of current interest.