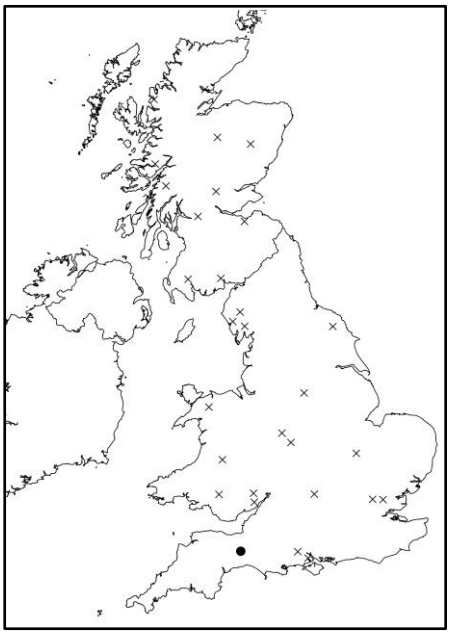
Assessing and addressing the impacts of oak decline on UK woodlands and species of conservation importance (Updated February 2020)

Case study: Britty Common (Ruttersleigh SSSI)



• = current case study site
X = other case study site

Dense understorey of hazel, holly and ash at Britty Common

Case Study key facts

Location: Somerset, England

Landscape context: The oak stand sits within a large woodland (92 ha) on a gently sloping site with a south westerly aspect, and is surrounded by woodland on all sides.

Case study area: The oak stand surveyed is 1.6 ha within a wider area of Britty Common (a predominantly grassland area) which is 92 ha.

Proportion of oak in stand canopy: 80%

Woodland type: Coppice with standards

NVC Woodland type: W10 (Pedunculated oak – bracken – bramble woodland)

Vulnerable oak-associated species: 0 obligate species, 20 highly associated species.

Likely scenario: No immediate changes in oak suitability are expected on this site, but extreme events are likely to become more frequent, and the surface water gley soils may

exacerbate the effects of drought. Oak trees may become increasingly stressed in the coming decades and tree health may decline by the 2080s.

Site Characteristics

Woodland type: High forest; SSSI ancient semi-natural woodland.

Soil type: Surface water gley

Stand structure: The stand in the case study area consists of mature trees >20 m tall and over 30 cm diameter. The canopy is dominated by oak (c. 80%) with the remainder of the overstorey being ash. There is no permanent open habitat and only c. 2% cover of temporary open habitat. Hazel, holly and ash are present in the understorey, with occasional hawthorn. Holly saplings and seedlings are dense throughout the area, and patchy hazel saplings are also common.

Ground vegetation: The ground vegetation is dominated by mosses (c. 40 %) and wood sorrel (20%), with bluebells, bramble, grasses, ferns, ivy, geranium and dog violet also present.

Current management: The long-term vision for the SSSI as a whole is to let natural processes continue to develop and to manually aid the gradual creation of sustainable open space in a mosaic with semi-natural woodland. The management of the woodland will aim to complement and enhance the SSSI. This will be primarily achieved through grazing and cattle are currently free to roam within the oak stand. Other management actions include halo thinning of trees casting heaviest shade on veteran trees to benefit lichen communities, thinning non-native stands toward predominantly native composition, and mechanically cutting scrub to keep grassland open.

Woodland Biodiversity

Designations: The wider woodland area comprises a mosaic of broadleaved woodland, scrub, bracken, mires and unimproved grassland which provides the habitat for several species of butterfly which are now scarce in Britain. The site woodland is also important for its lichens. The ground flora includes ancient woodland species of woodruff *Galium odoratum* and wood anemone *Anemone nemorosa*, also wood horsetail *Equisetum sylvaticum*, which is rare in Somerset. The epiphytic lichen flora is also typical of ancient woodland and includes species such as *Lobaria pulmonaria*. The nationally scarce *Opegrapha corticola* and the nationally rare *Chaenotheca stemonea* also occur. The woodland rides and glades provide ideal habitat for the nationally scarce and protected butterfly species wood white *Leptidea sinapsis* butterfly, this site having by far the strongest colony known in Somerset. Duke of Burgundy fritillary *Hamearis lucina*, Pearl–bordered fritillary *Boloria euphrosyne* together with small pearl – bordered fritillary *B. selene* and silver – washed fritillary *Argynnis paphia* all occur at the site. Three species of rare migrant birds breed in the woodland: nightingale *Luscinia megarhyches,* redstart *Phoenicurus phoenicurus* and wood warbler *Phylloscopus sibilatrix* (the latter two are protected species). Adder *Vipera berus*, slow-worm *Anguis fragilis,* grass snake *Natrix helvetica* and common

lizard *Lacerta vivipara,* all of which are protected species, have all been recorded recently The grassland provides habitat for the nationally scarce marsh fritillary *Eurodryas aurinia* butterfly. The woodland also supports the protected hazel dormouse (*Muscardinus avellanarius*).

Oak associated species: There are 191 oak-associated species that have been recorded in the area, none of which were obligate (only known to occur on oak trees). There were 20 highly associated species identified (all lichens), these are species that are predominately found only on oak trees but will occasionally occur on other tree species. Species that use oak more frequently than its availability in the landscape but use a wider range of trees than the highly associated species are termed partially associated species. There are 47 partially associated oak species recorded in the area: 1 bird, 45 lichens and mammals. Of the 191 oak-associated species 115 species use the dead wood associated with oak trees, this includes 10 bryophytes, 1 invertebrate and 104 lichens. These species may increase in abundance if there is an increase in dead wood associated with oak.

Management Plan for maximising oak associated biodiversity

Long-term vision: A resilient and diverse woodland-grassland mosaic, grazed by cattle, that supports and enhances biodiversity within the network of habitats surrounding the SSSI.

Management objectives: To develop, through sensitive cattle grazing, a woodland-grassland mosaic, the woodland with a tree species diversity and age structure that will support the biodiversity and adapt to climate change and other risks.

Target species composition and stand structure: Although the oak trees within the case study area are currently reported to be healthy, oak decline has been noted in the wider woodland area and the decline in tree health may worsen by the 2080s. If climatic conditions become drier oak may become less suitable for the site due to competition for soil moisture. Crown thinning of the overstorey would help to reduce water competition and would allow some other species to increase their presence in the canopy. It is likely that over the coming years the ash in the canopy will also die or decline, further reducing crown competition and creating canopy gaps.

As there are currently no young oak trees on the site, oak will be favoured to fill some of these canopy gaps and ensure long-term presence of oak on the site. Other native or naturalised species will also be encouraged so that their contribution to the overstorey increases, reducing the dominance of oak in the canopy to c. 60%. Suitable species that would help to support the oak associated biodiversity on the site are sycamore, beech, alder, Scots pine and yew (see Annex A).

Regeneration methods: Natural regeneration of oak on the site will be supported and encouraged in canopy gaps, as it is likely to be well adapted to the site and current climatic conditions. In addition, supplementary planting of oak including some from a southerly provenance, such as Northern France, may ensure elements of the stand can withstand radically changed conditions e.g. extreme drought events possible in the future and improve resilience of oak on the site. As the other species proposed for the overstorey are not

currently present on the site they will need to be introduced by planting material of a local, origin, possibly mixed with slightly southern provenance to ensure that the woodland is adapted to current and possible future site conditions.

Monitoring: A programme of monitoring is required to ensure that any changes in oak tree health are identified quickly, enabling managers to take action (e.g. enhance regeneration and diversify species mixture) as required. Changes in the stand structure and species composition should be recorded to ensure that the actions taken are consistent with the target species composition and structure and that natural regeneration and planting are successful. The extent of deer browsing should also be kept under review.

Operational factors: The current ground vegetation is not dense due to the low levels of light in the stand and access to browsing/grazing mammals. However, if crown thinning and die back of ash trees occurs the light levels are likely to increase and competitive vegetation may develop. This may need to be controlled if it threatens survival and growth of regenerating or planted trees.

Cattle currently graze the woodland and are free to roam. This may have a negative impact on naturally regenerating and planted tree survival and cattle may need to be excluded from some areas of the woodland, or trees individually protected, to ensure their safe establishment. In addition deer browsing has been observed in the woodland and this is also likely to limit establishment of trees unless controlled.

There is no road or track access within the stand and although access to the site is possible at certain drier times of the year the topography of the site makes it difficult to manage. The soil is prone to waterlogging and many springline mires feed streams throughout the site. One of the main access routes has been prone to landslips which are difficult and expensive to remedy, this can cut off large areas of the site from vehicular access.

The presence of non-native tree species such as sycamore in the woodland should be carefully considered, and may be accepted where they contribute to delivering the management objectives and do not pose a threat to any of the protected species of conservation importance in the woodland. Deadwood should be left in the woodland to support the large number of oak associated and other species that use it.

Britty Common has a wide range of protected species of conservation importance, including dormouse (a European Protected Species). It is important that any operations are compatible with protection and conservation of these species, and are carefully planned to ensure that the habitats of these species are maintained with no negative impacts.

The management recommendations set out in this case study scenario do not constitute consent for any operations, which would be required from the relevant body.

Annex A: Identification of additional tree species which are beneficial to oak-associated biodiversity

In the event of a significant loss of oak (not currently predicted for any of oak diseases present in the UK) it may be desirable to encourage a greater diversity of other beneficial tree species to support oak-associated biodiversity. If oak abundance were to significantly decline due to either climate change or disease it would be those species that are most reliant on oak, (obligate, highly associated and partially associated species) that would be at risk of declining in abundance. No other tree species will support obligate oak-associated species, therefore the analysis concentrated on identifying the tree species that would support the greatest number of highly and partially associated species present at the site using OakEcol[1]. Those tree species assessed as supporting a high percentage of the oak-associated biodiversity present at the site and that are able to establish and grow at the site based on soil and climatic factors[2] were selected. The mixture of tree species identified were selected by prioritizing the tree species supporting the greatest number of highly-associated oak-species and partially associated oak-species[3].

Table 1. Number and cumulative number of oak associated species known to be supported by the most suitable beneficial tree species and mixtures of tree species. Number of species are based on records showing a total of 191 oak-associated species at Britty Common, which include 20 highly associated and 47 partially associated species.

	Number of oak-associated species supported at the site.			Cumulative number (and percentage) of species supported by the addition of each new tree species (from the top of the list downwards).		
	Highly associated	Partially associated	All	Highly associated	Partially associated	All
Alder	3	9	36	3 (15%)	9 (19%)	36 (19%)
Sycamore	2	17	80	5 (25%)	25 (47%)	105 (55%)
Scots pine	2	9	20	7 (35%)	32 (68%)	119 (62%)
Beech	2	10	41	7 (35%)	34 (72%)	127 (66%)

It is stressed that the suggestions above for alternative trees are designed to demonstrate how OakEcol can be used to consider management for species that would be affected by a decline in oak. We have not provided a detailed assessment of the impact of these suggestions on the wider ecology of the woodland (but see Table 2 below), or on other species present, nor have we considered how this fits into the wider balance of threats and risks to oak woodland. These wider issues should be considered in developing comprehensive resilience approaches to woodland management.

[1] The OakEcol database is available at: https://www.hutton.ac.uk/oak-decline

[2] Site suitability (climate and soils) for different tree species was based on: Pyatt DG, Ray D, Fletcher J. 2001. An ecological site classification for forestry in Great Britain: bulletin 124. Edinburgh: Forestry Commission

[3] See accompanying methodological documentation: Mitchell et al Managing oak woodlands to maximize support for oak associated biodiversity: 30 cases studies. Available at https://www.hutton.ac.uk/oak-decline

Summary: Additional beneficial tree species.

Based on the analysis above Alder, Sycamore and Scots Pine (which would all grow at the site) would support 7 out of the 20 highly associated species and 32 out of 47 partially associated species known to occur at the site. Thus, these three tree species would support over half the partially associated oak species and over one-third of the highly associated species. Sycamore is a non-native tree species and currently planting non-native tree species in existing native woodland is not recommended, although sycamore is generally tolerated where it is already present. If a more diverse woodland was established including beech then 72% of the partially associated species would be supported but this would not increase the number of highly associated species supported. After the addition of beech to the mix, none of the other tree species studied would increase the number of high or partially associated oak species supported. These tree species may need to be grown in different areas or within compatible mixtures within the wood to match site micro-climate conditions and species light requirements. Some of these beneficial tree species are already present at the site (see above) and their abundance could be increased by natural regeneration but others are not. If planting is considered it is important that the trees are sourced from stock grown in the UK to reduce the risk of spreading other pests/pathogens.

While we have concentrated on identifying trees to support oak-associated biodiversity it should be noted that a change in tree canopy composition due to loss of oak and increased abundance of these beneficial tree species, will drive changes in ground flora composition (due to changes in shading) and in ecosystem functioning such as litter decomposition, soil chemistry and carbon storage (Table 2). When deciding which beneficial tree species to encourage a trade-off may have to be made between supporting oak-associated species and changes in these other woodland functions.

Table 2. Likely impact on selected ecosystem functions and shading of ground flora of selected beneficial tree species compared to oak.

	Functioning*	Shade**
Sycamore	Faster litter decomposition. Litter and soil have a higher nitrogen concentration and lower carbon concentration	Similar
Alder	Faster litter decomposition. Litter and soil have a higher nitrogen concentration and lower carbon concentration	Lighter shade
Beech	Similar to oak but with slightly slower litter decomposition. Litter and soil have a slightly higher carbon concentration and slightly lower nitrogen concentration	Darker shade
Scots Pine	Slower litter decomposition. Litter and soil have a high carbon concentration and lower nitrogen concentration.	Darker shade in winter as evergreen but may be lighter in summer?

*Functioning information based on extensive literature reviews of comparative data and analysed in Mitchell et al (2019) Collapsing foundations: the ecology of the British oak,

implications of its decline and mitigation options. Biological Conservation. On line early DOI 10.1016/j.biocon.2019.03.040

**Shading information based on expert judgement. The above provides a broad comparison of individual tree species compared to oak; the overall shade cast will depend on the mix of species in the canopy, the age of the trees and the density of trees. If the shade cast by the tree species is lighter than oak then light demanding ground flora species may increase in abundance. If the shade cast by the tree is darker than oak then light demanding ground flora species may decrease in abundance.

Acknowledgements: The work was funded by Defra through the BBSRC grant Protecting Oak Ecosystems (PuRpOsE): BB/N022831/1. With additional support from the Forestry Commission England and the Scottish Government's Rural and Environment Research and Analysis Directorate 2016-2021 strategic research programme. We thank Duncan Ray and Andrew Rattey for help with the predictions of changes in oak condition over time and the Forest Research Technical Support team for their help with the fieldwork. Finally we thank the site owners for access to their land.

Citation: Mitchell R.J., Broome A, Hewison RL, Stokes V. (2019) Protecting Oak Ecosystems: Managing oak woodlands to maximize support for oak associated biodiversity. Case study: Britty Common. Available at https://www.hutton.ac.uk/oak-decline