2014

PLANT LINK

PROGRESS TOWARDS THE GLOBAL STRATEGY FOR PLANT CONSERVATION

This report has been compiled by the Plant Link (PLINK) networks to map progress against the 16 Global Strategy for Plant Conservation targets. 2014 saw the UK reporting on progress against the GSPC in its 5th National Report to the United Nations Convention on Biological Diversity. The PLINK networks were key contributors to the GSPC report, the information that was gathered has been used to inform this report and to provide up-to-date information, highlighting some of the key successes along the way and identifying the key challenges that remain. This report draws on information gathered for Great Britain but occasionally refers to data and issues for the United Kingdom.

The PLINK networks represent all aspects of the botanical and fungal community in the UK, bringing together organisations, specialist societies and individuals interested in and working towards the conservation of wild plants and fungi. The GSPC is the key strategy driving the work of the PLINK networks and organisations aim to take forward action to deliver the GSPC. Working towards the GSPC requires action at both the UK and country level hence, there is a Plant Link UK (PLINK UK) group as well as country specific groups called Plant Link Scotland (PLINKS), Plant Link Cymru (PLINC) and Plant Link England (PLINK England).

In 2004 members of the PLINK networks contributed towards the publication of the UK's first response to the GSPC known as Plant Diversity Challenge; this publication set the plant conservation agenda across the UK for the remainder of the decade. Then in 2012 PLINK UK published Wild Plant Horizons: Taking forward the Global Strategy for Plant Conservation 2011-2020. This third report uses and builds on both of these and identifies the latest actions required to implement the strategy further.

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The results of the genetic diversity assessment of eight CWR on the Lizard Peninsula in Cornwall demonstrated that the site was not only a taxon diversity hotspot (as found in the *in situ* gap analysis carried out for England) but that it is also a hotspot of genetic diversity for these taxa. This finding gave a sound justification for the establishment of the first UK CWR genetic reserve in this location. Since this recommendation was made, written support of the work has been received from Defra, a set of minimum standards for this and future genetic reserves has been reviewed by Natural England and the University of Birmingham and updated and Natural England have taken significant steps forward in ensuring the site meets all these standards, including organising the collection of seed from key genetically

Objective I: Plant diversity is well understood, documented and recognized

Target 1: An online flora of all known plants.

Scope

A widely accessible working UK checklist of plants and fungi to enhance conservation programmes. When integrated with other, often scattered information concerning the taxonomy, systematics, nomenclature, distribution, frequency, habitat details and ecosystem function, such checklists become very powerful tools for setting priorities for both conservation action and ecological research.

Current Situation

The UK Species Inventory[1], which is managed by the Natural History Museum (NHM), provides standard reference names for all species of flora, fungi (and fauna) in the UK, bringing all of the names together in one place. It is formed by gathering species names from comprehensive and authoritative checklists compiled by government agencies, scientific experts and conservation organisations[2].The UK Species Inventory plays a crucial role in enabling species data to be made available electronically throughout the National Biodiversity Network (NBN).

A recent assessment by the NBN identified the major plant and fungal taxonomic groups which have complete coverage online and which groups are still incomplete. Plant Link (PLINK) UK is using this information and has identified a number actions required to complete Target 1 for all taxonomic groups. There are no major groups where no action is being undertaken, but for some, up-to-date uploads are still required and thus work continues in this area.

Key Successes

- Vascular plants, lichens[3], freshwater algal flora[4] and bryophytes have complete floras which are actively maintained and worked on.
- The British Phycological Society (BPS) has produced a draft UK checklist for seaweeds. This information has been included into the UK Species Inventory, and the seaweed recording portal is also up and running[5].
- Royal Botanic Gardens Kew (RBG Kew) maintains the Checklist of the British and Irish Basidiomycota (CBIB). This list also includes an indication of which species occur in each country.
- The Herbaria at the RBG Kew and Edinburgh house approximately 10 million specimens, collected from all around the world. RBG Kew and Edinburgh are making these collections more accessible by building an electronic Herbarium

[1] http://www.nbn.org.uk/Tools-Resources/NBN-Dictionaries/Species-Dictionary.aspx
[2] http://www.nhm.ac.uk/research-curation/scientific-resources/biodiversity/uk-biodiversity/uk-species/about-the-species-inventory/index.html
[3] http://www.britishlichensociety.org.uk/resources/lichen-taxon-database
[4] John, D .M., Whitton, B. A., Brook, A. J. (Eds) (2011) The Freshwater Algal Flora of the British Isles: An Identification Guide to Freshwater and Terrestrial Algae
[5] http://www.bpsalgalrecords.com/

Catalogue containing images of the specimens and information taken from their collection labels[6]. RBG Kew also has accessible basic online data for approximately 195000 UK specimens of fungi.

Looking to the future: key challenges

To secure the support and on-going commitment of UK country governments, statutory agencies and NGOs for the establishment, completion and regular updating of all the (relevant) online floras and checklists for plants and fungi; with comprehensive access to reliable species records to inform conservation.

Target 2: An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action.

Scope

In order to target action effectively it is essential to regularly assess the conservation status of species; thereby allowing the effectiveness of conservation action to be tracked. A set of internationally agreed criteria for making conservation assessments has been devised by the IUCN which provides a consistent system, based on assessing the degree of threat to each species. These are referred to as Red Lists[7] and unless referred to otherwise are relevant to Great Britain. Each country within GB has also identified its own list of species of conservation priority[8].

Current Situation

Red Lists

Officially approved Red Lists have been produced for the following:

Table 1: Organism groups and their Red List status for GB, and its constituent countries.

Taxon group	GB Red List	% threatened (Critically Endangered, Endangered and Vulnerable)	Country Red List	% threatened (Critically Endangered, Endangered and Vulnerable)
Algae	Yes (Provisional)[9]	11%[10]	No	
Bryophytes	Yes	15.9%[11]	Wales only	17.1%

[6] http://apps.RBG Kew.org/herbcat/navigator.do

[7] https://www.iucn.org/about/work/programmes/species/our_work/the_iucn_red_list/resources/iucn_red_list_categories_criteria/

[8] These have been based on the previous UK Biodiversity Action Plan (UK BAP) list and are identified in the Natural Environment and Rural Communities (NERC) Act 2006 and Nature Conservation (Scotland) Act 2004.

[9] http://www.nhm.ac.uk/resources-rx/files/draft-seaweed-list-132358.pdf

[10] Percentage for red, green and brown seaweeds combined; 34% Data Deficient

[11] Source: [11] A revised red list of bryophytes in Great Britain (2011) Hodgetts

Fungi	For Boletaceae family only	19%[12]	No	
Lichens	Yes	9.5%[13]	Wales Only	15.8%
Vascular Plants	Yes	20.1%[14]	Wales and England	17.4% in Wales 19.9% in England

The British Lichen Society (BLS) is drawing up a lichen Red List for England, and a draft UK Conservation Assessment for red, green and brown seaweeds has been developed by the British Phycological Society (BPS) and NHM[15].

Guide conservation action

Assessments of species' conservation threat status should guide conservation action. In England 402 fungal, vascular and non-vascular plant species[16] are identified in statute as being of principal importance for the conservation of biodiversity. In Wales and Scotland there are 224 and 1,414 species, respectively, of principal importance. Action to improve the conservation status of these species has been identified and work continues to ensure this action is delivered by Government and its partners.

Key Successes

JNCC has published the first official fungal Red List for a group of non-lichenized fungi in GB, covering the 68 taxa of the family Boletaceae (with molecular barcoding employed to confirm species identification). This was achieved by a collaboration between RBG Kew, Natural England (NE), British Mycological Society (BMS) and the Association of British Fungi Groups[17] (ABFG).

The on-going and systematic assessment of species conservation status allows action to be prioritised and conservation programmes to be developed to counter the causes of threat. This represents a major step forward and allows appropriate responses to be developed with the UK countries utilising the available opportunities and mechanisms as appropriate. RBG Edinburgh has gone on to be instrumental in helping other countries achieve this target.

Looking to the future: key challenges

Secure Government and agency commitment to a programme of Red Listing in all UK countries to inform priorities for plants, and fungi. Priority should be given to developing a

[12] It is worth noting that 27% were data deficient reflecting the significant and remaining challenge (as opposed to 3.8% data deficiency for vascular plants).
[13] Source: Woods, R.G. and Coppins, B. J. 2012. A Conservation Evaluation of British Lichens and Lichenicolous Fungi. Species Status 13. Joint Nature Conservation Committee, Peterborough. Excluding extinct species
[14] For the vascular plant this equates to 441 species divided by 2191 as this excludes hybrids and those already extinct.
[15] http://www.nhm.ac.uk/resources-rx/files/draft-seaweed-list-132358.pdf

[16] fungal and vascular and non-vascular plant species.
[17] Available at: http://jncc.defra.gov.uk/page-6497. Excluding extinct species

programme of GB Red Listing for non-lichen forming fungi, freshwater algae and seaweeds based on UK species lists; including the prioritisation of which fungal families to Red List.

Target 3: Information, research and associated outputs, and methods necessary to implement the Strategy developed and shared.

Research is essential to underpin both conservation and sustainable use of plant and fungal diversity. In recent years there has been a huge blossoming of such research, and there is now much experience in the UK and Europe that can be drawn upon to inform conservation programmes. This target acknowledges that 'best practice' examples, which draw on existing and new research and practical experience of management, are needed for plant conservation. Target 3 therefore seeks to provide the impetus for the development of such models, based on sound applied scientific approaches. This target is cross-cutting, underlying the implementation of many of the other targets.

Current Situation

Currently there are insufficient resources available to support research into plant and fungal conservation methods and to support monitoring and surveillance of plants and fungi.

Despite these inadequacies the PLINK networks provide important fora for organisations to exchange knowledge, experience and best practice, as well as working together to advance the conservation of wild plants and fungi. Without this cooperation little progress would have been made against target 3. The PLINK networks - facilitate the exchange of information between organisations involved in delivering wild plant and fungal conservation and remain the crucial fora for identifying key conservation issues, developing a sound evidence base and translating this into action on the ground through coordinated conservation programmes. Collectively the PLINK membership represents national specialists from across the academic, statutory and non-statutory sectors. Examples of their work include:

- From 2008-2012 the BSBI ran the *Threatened Plants Project* which provided valuable information on 50 priority species.
- RBG Kew's Seed Information Database is a compilation of seed biological trait data from the Millennium Seed Bank Programme's own collections and from other published and unpublished sources. The data is periodically updated and made available online[18]. Certain classes of data on UK species are shared with Ecological Flora of the British Isles[19]; and are also available to researchers under the TRY-IGP-QUEST-DIVERSITAS Initiative[20].
- RBG Edinburgh hosted a best-practice workshop, aimed at translating field work into data, followed up by integrated approaches to conservation, including in-situ and ex-situ protection, and education and outreach at all levels.

[18] RBG Kew's Seed Information Database http://data.RBG Kew.org/sid/
[19] ECOFLORA http://www.ecoflora.co.uk/
[20] http://www.try-db.org/TryWeb/Home.php

- The Natural History Museum is working on several projects to mobilise and improve digital access to national and regional museum herbaria for UK vascular plants and marine algae; this work is being done in partnership with various organisations including the Museums Association, BSBI and Herbaria@Home. In addition, a project to get Seaweed Collections Online has been completed[21]

- Plantlife is collating information regarding the identification and management of priority species, including published leaflets, management toolkits, guides and on-line dossiers.

- With support from PLINK members a National Plant Monitoring Scheme is being developed that will underpin the general aims of the GSPC and is a good example of the value of the PLINK network and strong partnerships amongst members.

There is good representation between the PLINK networks and the delivery groups established by the country administrations under the devolved arrangements for achieving UK Government biodiversity commitments. This ensures that the best available information is guiding delivery of national biodiversity strategies and best practice is shared across all the countries in the UK.

In Scotland, the GSPC targets are embedded within the Scottish Biodiversity Strategy and Plantlife's role as Chair of the Habitat and Species Group ensures more effective delivery of plant and fungal conservation through the strategy. In Wales PLINK members input to an Evidence Gaps Register[22] that identifies biodiversity and ecosystem research issues and promotes them to relevant research institutions to ensure knowledge and information to deliver the GSPC is exchanged between the key partners. In England, groups of taxonomic experts have identified the necessary action required to reverse the decline of plant species of conservation priority (Section 41 species). This process has identified a number of research gaps on plant biology and ecology that need addressing for these species. This is helping focus and prioritise action with research councils and Universities. The development of this national assessment is helping develop new collaborative approaches for plant conservation with multiple statutory and non-statutory partners.

Key Successes

The on-going PLINK fora and their membership from across the statutory and non-statutory sectors help drive the achievement of target 3 by identifying and promoting key research needs.

PLINC has produced a series of site inventories for Section 42 priority species (for vascular plants, bryophytes, lichens and stoneworts), providing information on all currently-known sites. Such information is essential for site owners and managers, county planners, conservation organisations and schemes where better targeting of resources towards known sites is needed, such as AES and funding opportunities. Progress has been slower in the development and publication of best practice methods for plant conservation.

Plantlife has produced a number of briefing leaflets on Section 41 and Section 42 plants which provide some information on habitat management for the species. Plantlife

[21] http://seaweeds.myspecies.info/
[22] http://www.biodiversitywales.org.uk/en-GB/WBP-Evidence-Gaps-Project

Scotland has published conservation management frameworks for two priority habitats in Scotland: Atlantic woodland and pine woodland. Three more are in development for oceanic heath, coastal pasture and arctic alpine plant communities[23].

The development and use of DNA Barcoding has been particularly useful recently for plant and fungal identification. Examples are given below.

DNA Barcoding

- DNA barcoding of 100% of Welsh vascular plant flora and 90% of the UK vascular plant flora has now been completed. Details at http://www.gardenofwales.org.uk/science/barcode-wales/ and http://www.barcodeoflife.org/ (global multi-taxon resource). DNA barcoding - results are published on the Barcode of Life website (http://www.boldsystems.org/).

Facilitating taxonomy and specimen identification:

- RBG Kew are barcoding fungi to help confirm specimen identification. This will also help to enhance the fungal identification services carried out at Kew, to investigate inter- and intra-specific genetic diversity and species delimitation, and thus to enhance the utility and value of the collections held in Kew's fungarium[24]. The results will also be of benefit in working towards Targets 1 and 2 of the GSPC.

Developing the science of fungi systematics:

- The project '*Systematics, barcoding and ecology of fungi from waxcap grasslands*'[25] was carried out by the RBG Kew. It aimed to 'test existing species concepts using molecular sequencing methods, leading to the designation of diagnostic "barcode" sequences that can be used as an objective method to identify species'. This is of direct relevance to the revision of existing SSSI guidelines for grassland fungi.

National Schemes and Societies:

- There have been Defra funded projects 'to address knowledge gaps which have been identified as a barrier to the delivery of conservation targets for UK Priority Species'[26]. The projects aim to increase the stock of knowledge for a selected group of organisms as well as involve collaboration with relevant National Schemes and Societies and finally produce and dissemination guidance information. Projects that were successful included '*DNA Barcoding of Bryophytes- A Powerful Tool for Taxonomy and Conservation*[27]'. DNA barcoding of Bryophytes as carried out the RBG Edinburgh assessed 'the taxonomic status and conservation value of 30 UK priority bryophyte species. These species were selected because they had some level of

[23] www.plantlife.org.uk/scotland
[24] http://www.kew.org/science-research-data/directory/projects/FungalDNABarcoding.htm
[25] http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=17344&FromSearch=Y&Publisher=1&SearchText=waxcap&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description
[26] http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=17344&FromSearch=Y&Publisher=1&SearchText=waxcap&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description
[27] http://randd.defra.gov.uk/Document.aspx?Document=10610_WC0785_PolicyBriefDNABarcodingofBryophytes05Feb13.pdf

taxonomic uncertainty posing barriers to the implementation of conservation strategies.

Making evidence widely available and accessible:

- Conservation Evidence are developing a PlantSynopsis database which pulls studies, articles and papers on plant conservation management together. A synopsis of evidence aims to lists all the possible actions to take to conserve a given species group or habitat, or to tackle a particular conservation issue. The database was sent around the PLINK network for input and will be a useful tool once available.

Looking to the future: key challenges

To support dissemination of existing evidence and encourage further research to allow better integration of plant and fungi conservation into decision and policy making to better reflect the fundamental contribution they make to ecosystem services.

Ensure land management practices and incentives support better plants and fungi conservation. As despite the increasing evidence base of the value of plants and recognised good practice of how to integrate this into land management practices, the ecological requirements of wild plants and fungi remain poorly integrated into policy and state funded agri-environment schemes.

To recognise the role that individual species play in the delivery of ecosystem services and to ensure ecosystem based approaches aren't to the detriment of species conservation.

To ensure UK countries gathers information on the total extent of specific habitats, the area under protection and the condition of protected habitat is gathered and readily available in order to monitor progress towards Target 4.

To ensure that natural capital accounting procedures take account of present and future values of plants and fungi and their role in ecosystems.

Objective II: Plant diversity is urgently and effectively conserved

Target 4: At least 15 per cent of each ecological region or vegetation type secured through effective management and/or restoration.

Scope

This target seeks to conserve 15% of each of the world's ecological regions, including the associated plant diversity. These are broad ecosystem types, for instance grasslands or coastal ecosystems. The results of target 5 (which will help identify important plant areas within all ecological regions) should help this assessment. These data are available at country level for broad terrestrial and freshwater vegetation types and this information is collated and presented here.

Current Situation

Progress across the UK is variable. Each of the 4 countries has a series of designated sites including Sites of Special Scientific Interest (SSSIs) that represent a sample of characteristic habitats and species. Some of these sites are also classified as Special Areas of Conservation (SACs) under the European Habitats Directive. In total, 27.5% of the land area of the UK is within a designated site[28]. Important Plant Areas (IPAs), as further explored under Target 5, often overlap with both these designations. While IPAs are not a statutory designation they do signify the presence of botanical richness and / or threatened species and / or habitats. Collectively SSSIs and SACs cover 9% of the UK's terrestrial area and in Scotland 12%, Wales 9% and England 7% of land is covered.

A more detailed analysis of the management and condition of habitats covered by protected sites and IPAs does need to be carried out in order to assess progress against this target; as well as determining if this target is achievable through the protected site network. However, a broad analysis shows that in March 2013[29] just over 50.1% of the Areas of Special Scientific Interest (Northern Ireland) and SSSIs (England and Scotland) were in 'favourable' condition, with a further 35.5% recovering, hence a great improvement can be made with more effective management in place. Table 2 illustrates the percentage area of five broad habitat types that are covered by the SSSI network in England and Wales as well as what percentage of these habitats are in favourable condition across the UK SSSI network[30].

Table 2: the percentage of five broad habitats types covered by the SSSI network in England and Wales and the what percentage of the habitat is in favourable condition within the UK's SSSI network

[28] http://jncc.defra.gov.uk/page-4241
[29] http://jncc.defra.gov.uk/page-4241
[30] Figures for Northern Ireland and Scotland were not available at the time of writing.

Habitat	% of total habitat within SSSI		% habitat in favourable condition on SSSI	
Coastal	64	E+W	61	UK
Grassland	30	E+W	38	UK
Heathland	49	E+W	17	UK
Wetland	60	E+W	32	UK
Woodland	12	E+W	36	E+W+S

The last Article 17 report on the conservation status of habitats of European importance, carried out in 2013, found that of the 77 habitat types (including 8 marine habitats) only two were found to be in overall Favourable Conservation Status, with 26 in overall Bad-Stable Conservation Status. 18 were in Bad - Declining and 18 were in Bad - Improving. The rest were either in Inadequate Conservation Status or Unknown[31].

There are now 161 IPAs (1,700,000ha) covering approximately 7% of the UK. 87 IPAs lie within England, covering 850,000 ha (7%) of the total area of England, while 35%[32] of the IPAs in England overlap with SSSIs and SACs. The 47 IPAs in Scotland cover approximately 700,000 ha or 9% of the total area of Scotland, 60% of which overlaps with SSSIs and SACs, and the 23 IPAs in Wales cover about 85,000 ha or 4% of the total area of Wales. Finally, 44% of these IPAs overlap with SSSIs and SACs. Grassland and Woodland habitats are the most frequent dominant habitats within UK IPAs, supporting 77 and 68 IPAs respectively (48% and 42% of the UK IPA network). The majority of IPAs (129 IPAs / 80% of the entire UK IPA network) have been identified for their assemblages of plants and lower plants (lichens, bryophytes, mosses and liverworts) (referred to as criterion B), with species groups associated with Broadleaved woodlands being linked to the highest number of IPAs (47 IPAs, 29% of the UK).

In England, the Government's ambition, as set out in Biodiversity 2020: A strategy for England's wildlife and ecosystems services, is that at least 17% of land and inland water, especially areas of particular importance for biodiversity are conserved through effective and integrated and joined up approaches' and seeks to restore at least 15% of degraded ecosystems. Whilst these ambitions are welcomed further work is required to map out a clear route to achieving this ambition and securing improved environmental outcomes, on the ground. For example, the SSSI network in England covers around 7% of the country, in the January 2014 condition report, 37.50% of England's SSSIs were identified as in favourable condition, 58.71% unfavourable recovering condition, 2.21% unfavourable no change, 1.55% unfavourable declining and 0.03% destroyed or part destroyed[33]. While, there is no available breakdown for habitat type the headline statistics show progress is

[31] http://jncc.defra.gov.uk/page-6565

[32] Low overlap values for IPA coverage can be attributed to the large IPAs that have been included within the network but have not as of yet been refined to smaller cores (this is especially true of England where IPA coverage is said to be 35% - this can directly be attributed to huge IPAs such as East Hants Hangers, North South Downs, The Cotswolds, The Chilterns etc. which do not have specific cores).

[33] http://www.sssi.naturalengland.org.uk/special/sssi/reportAction.cfm?Report=sdrt15&Category=N&Reference=0

needed to improve the current situation and meet this target. Natural England's Improvement Programme for England's Natura 2000 Sites (IPENS) project aims to improve those unfavourable SACs (and SPAs[34]) through their Site Improvement Plans which will help deliver against this target.

18% of Scotland's land area is covered by nature conservation sites and of these, 66% of natural features were in favourable condition. While Scotland's Protected Area mechanism is not fully functional for vascular plants, fungi, lichens and bryophytes, the Important Plant Area network should be used to highlight gaps. Scotland has no national habitat map, although the 2020 Challenge document will put one in place by 2019 which is necessary for achieving this target. The Scottish Native Woodland Survey, led by Forestry Commission Scotland and completed in 2013, shows that 22.5% of woodland in Scotland is native woodland, with 46% of it in satisfactory condition for biodiversity. Scottish peatlands were assessed through the IUCN peatland programme, which found that 20% was in a natural or near natural condition. Of Scotland's freshwater habitats, Scottish Environment Protection Agency's Water Framework Directive monitoring shows that 56% of rivers are in good ecological status and 63% of lochs. Trends in habitat condition indicate that management for those features monitored is appropriate, as long as the trends continue to improve.

In Wales, an assessment of vegetation types by NRW (formerly CCW) indicates that 14.6% of the area of terrestrial semi-natural habitat is covered by SSSIs. The proportion varies by habitat, from tall herb and fen (73%) to grassland and marsh (3.6%) and arable (0.01%). In addition to the variability in SSSI coverage between these vegetation types, it's uncertain how effectively each of these is actually being conserved. Based on a 2006 Rapid Assessment of SSSI condition, NRW found that 71% of all SSSI habitat features are in unfavourable condition. More action is needed to assess the quality of vegetation in different habitat types. Detailed and regular monitoring of habitat features on SSSIs needs to be improved. However, it is also essential that habitat management on both protected sites and landscape-scale projects are fully documented and address the needs of all vegetation types on site, taking into account requirements for both maintenance and restoration.

Key Successes

For species rich grasslands there are two major UK wide projects running. Magnificent Meadows[35] is working to save up to 75,000 acres of wildflower meadows and grasslands (17% of what remains). The project aims to deliver conservation in nine strategic landscapes across the UK to enhance habitat connectivity and enable grassland species to adapt successfully to environmental change, through the restoration of wildflower meadows and grasslands to increase species diversity and improve habitats. Coronation Meadows is a partnership project between Plantlife, the Wildlife Trusts and the Rare Breeds Survival Trust. In 2014, at 29 Coronation Meadow sites across 22 counties, 317 acres of wildflower meadow will start being enhanced and restored with the aim of reaching 741 acres over the subsequent two years.

[34] Special Protection Areas

[35] Plantlife is the lead organisation working with 10 partner organisations, which includes: The Conservation Volunteers, Cotswolds Conservation Board, East Lothian Council, Northumberland Wildlife Trust, North West Kent and Medway Valley Countryside Partnership, Pori Natur a Threftadaeth (PONT), RSPB, Somerset Wildlife Trust, Ulster Wildlife Trust, Wiltshire Wildlife Trust.

Restoration of plantations on ancient woodland sites (PAWS) is being undertaken by many woodland owners, including the Forestry Enterprise, the Woodland Trust and private owners. In England, 9086ha of PAWS has been restored since 2011, 73% of which is on the Public Forest Estate. In addition, 2371 ha of open priority habitat within woodland (such as heathland) has either been restored or approved for restoration in the same period, 20% of which is on the Public Forest Estate[36].

The importance of flower rich habitats has attracted attention in part due to their provision of pollen and nectar resources for pollinating invertebrates. These often aim to re-connect fragmented habitat at the landscape-scale. Plant Link UK and Invertebrate Link have produced joint guidance to ensure that such planting projects undertake good practice to maximise benefits for biodiversity. In particular, planting should not be used as a replacement for maintaining existing flower-rich habitats or for restoring species diversity through changes in management[37].

Looking to the future: key challenges

To ensure all Rural Development Programmes better deliver for plants and fungi and put in place effective mechanisms to support land owner advice and management.

To ensure each country's statutory obligations and national targets for are met and are delivering for plants, fungi and habitats.

Target 5: At least 75 per cent of the most important areas for plant diversity of each ecological region protected with effective management in place for conserving plants and their genetic diversity.

Scope

Target 5 seeks to conserve areas most important for plant diversity (or 'Important Plant Areas') by identifying, protecting and managing a network of such areas in each ecological region (as defined by target 4).

Current Situation

The Important Plant Area (IPA) methodology[38] identifies 161 IPAs (1,700,000ha) covering approximately 7% of the UK. Of these, 155 (96%) are offered a degree of protection under a statutory site protection mechanism e.g. SSSIs. Whilst most of these sites have management plans in place these do not necessarily optimise the plant interest on the site/IPA nor effectively monitor this interest. Further work is required to investigate the effectiveness of this protection. In addition, the notified features in each SSSIs will be managed to achieve favourable condition however, there are many SSSIs where plants, fungi, bryophytes and lichens are not listed as notified features.

However, work is being carried out at the country level to address this. PLINKS, for example, are working with the Scottish government and SNH to assess this issue, while Natural England are carrying out a review of the SSSI series and seeking input from PLINK

[36]http://www.forestry.gov.uk/pdf/FC-England-Indicators-Report-2014.pdf/$FILE/FC-England-Indicators-Report-2014.pdf
[37] http://www.plantlife.org.uk/uploads/documents/Planting_For_Pollinators_Statement.pdf
[38]http://www.plantlife.org.uk/publications/important_plant_areas_in_central_and_eastern_europe

England. In Wales, PLINC has compiled detailed inventories of sites where priority plant and fungi species occur and these are now being used to check representation in the protected sites network. The IPA programme continues to be important in supporting, informing and underpinning existing policies and structures conserving plants and fungi

There are now several projects underway to improve our knowledge of IPAs. For example, in 2010, hotspot mapping was undertaken by Plantlife to complete Criterion B (species richness) selection and it has shown that additional mapping work needs to be carried out to refine boundaries for core areas of interest for some larger IPAs[39]. In addition, analysis on 2012 data from Plantlife's Arable farm survey and monitoring projects has identified nine potential new arable IPAs in England. These will also be added to the mapped IPA network, with mapping work carried out in 2014 – 2015. Finally, Plantlife carried out an analysis of the threats facing IPAs. Both abandonment and agricultural intensification pose significant threats to IPAs. Under the CAP reform, organisations within the PLINK network have been influencing the design of the Agri-Environment Scheme measures in order that they help deliver for IPAs and their habitats and features of interest.

In September 2011, 127 Marine Conservation Zones (MCZ) were recommended for designation in order to create an ecologically coherent network around England and Wales; some of which overlapped with the 83 Important Areas for Marine Algae that have been identified by the British Phycological Society (BPS)[40]. Only three[41] of the 83 Important Areas for Marine Algae (and three of the nine of European importance) have been included within the initial 27 MCZ designation in England in November 2013. In 2013, the Scottish Government consulted upon 33 Marine Protected Areas identified by JNCC and SNH, with a further 4 areas still to be assessed. Of these 33, 3 overlap with IPAs[42]. If all the proposed MPAs were taken forward for designation, the new MPAs would represent 11% of the area of Scotland's seas.

Key Successes

Plantlife lead the Important Plant Area programme in the UK. The identification of IPAs is based on three broad criteria, threatened species, botanical richness and threatened habitats and the selection criteria have also focused on the drawing of IPA boundaries, and the application of IPA criteria to different taxonomic or plant community groups, such as fungi, stoneworts, algae (including seaweeds) and arable plants. In 2007, Plantlife announced the establishment of 150 IPAs across the UK (which has now increased to 161 IPAs). Since identifying the areas, Plantlife has been actively raising awareness of these ecologically important habitats and encouraging their long-term protection and improvement through the adoption of an 'ecosystem-based' conservation approach. IPA work to date has been one of trailing activities through local partnership working[43]. This

[39] The core area of an IPA is where species and habitats are of sufficient quality to qualify; some IPAs include a surrounding Zone of Opportunity (ZoO) where habitat restoration would connect core areas allowing improved resilience and increase the qualifying features.)

[40] http://www.plantlife.org.uk/publications/important_plant_areas_for_algae

[41] They are Whiteness Cap in Kent (overlaps with Thanet Coast MCZ), Falmouth and Helford in Cornwall (overlaps with the Manacles MCZ), and Lundy Island Devon (overlap with Lundy.

[42] IPA Lamlash Bay Arran - MPA South Arran; IPA Loch Sween - MPA Loch Sween and IPA Loch Duich Head - MPA Lochs Duich Long and Alsh.

[43] Partnership working has involved working with land managing partners on plant-proofing local conservation plans, advising on and undertaking habitat restoration, developing and trailing site management best practice 'toolkits' for sustaining wild plant conservation in the long term, and recruiting and training volunteers from local communities to play an active part in the success of an IPA.

has delivered some vital outcomes for wild plants; amongst other successes this includes saving 28 of the rarest and most threatened species in Breckland.

Case Study: The Brecklands IPA and The Broads IPA.

Plantlife has worked with partners in numerous IPAs to ensure core IPA features are effectively managed.

The Brecklands covers an area of roughly 940 square kilometres, consisting of a number of habitat types from naturally-fluctuating mires, valley fens and chalk rivers to a range of woodland types, with botanical interest lying mainly in its dry grass heaths with their distinctive and rare plants such as the endemic prostrate perennial knawel. Fifteen Red Data Book species occur within the IPA, many of which are largely restricted to the area and are characteristic of its habitats. The Breckland area contains one of the most extensive areas of lowland heath remaining in Britain today and is of international importance. Plantlife has implemented a variety of experimental management techniques to promote early-successional habitats required for 28 priority plant species that occur here. Following positive results Plantlife launched a new project in 2013 to restore one the best known sites to demonstration the novel techniques and catalyse action by others.

The Broads is a man-made landscape of flooded peat diggings that date from between AD 900 to 1350. The Broads IPA consists of a 303 square kilometres network of wet woodland, wet grassland, broads, rivers, fens and marshes. The range of habitats and fresh and brackish waters support a diverse range of plants including the last location in England for Fen orchid (*Liparis loeselii)* and a key site for Crested buckler-fern (*Dryopteris cristata)* and stoneworts. Plantlife have initiated experimental management trials to test ways of recovering a wide range of rare fen species, particularly those that require early successional habitats. These demonstration sites have been instrumental in changing management measures and greater cultural recognition of the requirements of plants.

Looking to the future: key challenges

To ensure the protected area network fully contributes towards the conservation of plants, fungi and their habitats and that national targets for protected sites are met.

To ensure the IPA features of interest are used to inform the designation of protected sites.

To ensure landscape-scale initiatives provide ecological resilience and coherence through habitat restoration within and around IPAs using the Zones of Opportunity model, thus facilitating processes that encourage the flow of genetic material between and within populations to improve genetic diversity.

To ensure rural development scheme payments targeted at priority species and habitats help deliver for IPA features of interest.

Target 6: At least 75 per cent of production lands in each sector managed sustainably, consistent with the conservation of plant diversity.

Scope

70% of the terrestrial area of the UK is agricultural production land[44]. It is critical to the conservation of many species that this large part of the UK is managed consistent with plant diversity. Many of the UK's semi-natural habitats are a product of centuries of land management and their conservation is highly dependent on their continued management. Production lands have impacts on integral and adjacent natural or semi-natural habitats through the direct and secondary effects of land management practices. By managing production lands consistent with plant and fungi diversity conservation the negative impacts on ecosystems should also be reduced.

Current Situation

37% of the British flora is considered threatened or rare and of these 580 species 565 grow within the productive environment[45]. Over a third of upland flora and a quarter of arable plants are threatened with extinction in the UK, and since the 1990's there has been a decrease between 9-19% in woodland plant richness[46]. Thus, the majority of UK flora that is threatened with extinction is found the agricultural and forestry landscapes and it is imperative to ensure effective management for plant conservation and their genetic diversity with the productive landscape.

Based on a total area of 18.2 million ha of productive land in UK, 56% of land in the UK is in an Agri-Environment Scheme. Higher level Agri-Environment Schemes, which are known to have good potential to deliver for priority plant and fungi species, account for 18% of productive land, while Entry level Agri-Environment Schemes, which are less beneficial to priority species, make up 38%[47].

With ongoing CAP reform, the extent to which production lands will deliver for fungal and plant conservation is unknown. However, the most recent Agri-Environment Scheme options (which are the most important support mechanism for productions lands to deliver for biodiversity) didn't deliver for the majority of farmland plants. For example:

- It is estimated that by 1984 in lowland England and Wales, semi-natural grassland had declined by 97% over the previous 50 years to approximately 0.2 million ha. Losses have continued during the 1980s and 1990s, and have been recorded at 2 - 10% per annum in some parts of England[48]. In England, only 5,000 ha of lowland hay meadows are left. For calcareous grassland, one of the richest habitats for wild flowers, less than 40,000 ha remain. While, acid grassland that supports rare flora has less than 25,000 ha remaining. 40% of threatened wild flowers are found within these lowland meadows and pastures, yet 80% of the threatened species were not covered by the last Agri-Environment Scheme (AES) entry level options. In upland meadows, 72% of threatened flowers were also not supported by the options. Yet, the AES entry level options accounted for 90% of the area covered by AES[49], which

[44] http://www.plantlife.org.uk/uploads/documents/Farmland_Eng_015_report_2013.pdf
[45] http://www.plantlife.org.uk/uploads/documents/Farmland_Eng_015_report_2013.pdf
[46] http://www.plantlife.org.uk/publications/the_ghost_orchid_declaration
[47] http://jncc.defra.gov.uk/page-4242
[48] UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock) 2008
[49] http://www.plantlife.org.uk/uploads/documents/Farmland_Eng_015_report_2013.pdf

in 2012 accounted 68% of agricultural land in England[50]. The higher level AES which had the potential to deliver for wild flora (99% of threatened lowland meadows could have been supported by the options[38]) only covered 16% of England's agricultural land[41].

- In Wales, of the 1,467 flowers in the Welsh flora, 302 (20.6%) are considered to be threatened or nearly so. The vast majority of these, 288 (95%), grow on productive farmland yet, just 18% of the land in Wales contributes to the aim of 75% under this target[51]. For example, over 10% of threatened species in Wales are found on heathland and moors, yet just 2.9% of the 91,500 ha of lowland and upland heath were included in the last Agri-Environment entry level;

- Arable land in England and Wales supports over 150 and 120 wild arable associated flora respectively. Despite being culturally significant, flowers such as poppies and cornflowers belong to Britain's fastest declining suite of plants[52]. AES could have delivered for wild flowers of arable land across the UK. Unfortunately, the lack of awareness about their plight and the low payments compared with current high crop revenues has led to poor uptake of arable options.

- In 2012, Scotland spent just 18% of rural development programme funding AES and of that funding, only 15% was approved for options that could benefit plants and fungi in enclosed production lands. With CAP reform influencing rural development schemes from 2014 onwards, there is an urgent need to ensure that schemes deliver for plants and fungi. In 2014, the Scottish government is leading an exercise to target Scottish Rural Development Programme options to priority species and habitats. This process needs to deliver AES that support nature friendly land management, especially in High Nature Value Areas. Current proposals from the Scottish Government in 2014 do not look set to deliver for plants and fungi, which will make meeting this target difficult[53].

Key Successes

Members of the PLINK networks have worked with the governments on CAP reform and redesign of the AES to make sure that the AES options are fit-for-purpose and will either solely or as a combination of management enable plant and fungi diversity to thrive. For example, Plantlife's farmland reports 'And on that farm...'[42,43,44], assessed the state of plants on farmland and whether the AES was delivering action that would maintain and enhance plant and fungi diversity on production lands. Recommendations were made under short-term and long-term action plans that would benefit farmland plants.

There are 9,742,00ha of permanent pasture in the UK[54] and as mentioned under Target 4, Plantlife is working in partnership on two wildflower meadows projects, Magnificent Meadows and Coronation Meadows; the two projects are aiming to save, restore and enhance close to 76,000 acres of wildflower meadows and grasslands (over 17% of what remains).

[50] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/252995/BIYP_2013.pdf
[51] http://www.plantlife.org.uk/publications/and_on_that_farm_he_had_wales_farmland_report
[52] http://www.plantlife.org.uk/uploads/documents/Farmland_Eng_015_report_2013.pdf
[53] http://www.plantlife.org.uk/uploads/documents/Farmland_Sco_014lores.pdf
[54] permanent pasture = grass over 5 years old and sole right rough grazing

Looking to the future: key challenges

To ensure that Agri-Environment Schemes include the right management options to deliver plant and fungi diversity, especially for priority species, and that the design of such options is ecologically sound and based on best-practise methodologies.

To ensure targeting of Agri-Environment Schemes options for plant and fungi conservation are prioritised to key areas to achieve the necessary large scale recovery of populations using IPAs and similar models as a guide.

Monitor the effect that Rural Development Programmes are having on priority plants, fungi and habitats to assess the effectiveness and contribution towards national biodiversity targets.

Undertake policy reform at the highest political level to address the issue of eutrophication and atmospheric nitrogen deposition.

Plant-proof all Agri-Environment Schemes options, fully recognising the fundamental role that native wild plants and fungi play in underpinning wildlife such as pollinators and farmland birds. All other ecological initiatives in productive landscapes, such as pollinator action plans and use of seed mixes for birds, must take a similar approach to improve delivery for wild plant and fungi biodiversity.

Target 7: At least 75 per cent of known threatened plant species conserved in situ.

Scope

Target 7 builds on the status assessment work of target 2 and seeks to ensure that the future of our most threatened plants and fungi, irrespective of the reasons why they became threatened, are secured. Crucially the target obliges action to ensure that threatened plants and fungi are protected in situ i.e. the places where they live in the wild

Current Situation

Of the 845 threatened vascular plants, bryophytes, stoneworts and lichens listed on the JNCC Designations Spreadsheet (2014[55]), 279 of them (33% of threatened) are not afforded any statutory protection and are unlikely to be receiving much focussed conservation management. Of those 279, 149 (18% of threatened) are either hybrids or apomictic.

Case Study:

In order to assess how effective conservation work has been in Wales an initial analysis to examine the current population status of all threatened (Red List) and priority (S42) species was carried out. This gives a proportion of threatened species that are being conserved (Table 2). 40% of the species on the current Section 42 list are plants and fungi.

Table 3: The table shows the number of red list threatened species in Wales and how many including the percentage cover are listed on Section 42 (species of principal conservation importance) of the NERC Act

[55] http://jncc.defra.gov.uk/page-3408

Group	Number of threatened species	Number on Section 42 list	Percentage conserved
Vascular plants	256	79	31%
Bryophytes	146	53	36%
Lichens	208	69	33%
Fungi	Unknown	27	-
Algae	Unknown	11	-
Total	**610+**	**239**	**39.1%**

The evidence given under Targets 4 and 6 also provides an indication of the state of threatened species, both within the protected network and on production land. It shows there is still much work and improvement on the current situation needed. However, in order to assess how effective this conservation work has been, it is useful to examine the current status of populations of all threatened (Red List) and priority (Section 42) species in Wales. Using best available expert opinion, this has been done for 867 taxa, assigning them to categories *increasing*, *stable*, *fluctuating*, *declining* or *unknown*. Taking the *increasing*, *stable* and *fluctuating* categories as being measures of effective conservation, 32.4% of threatened and Section 42 taxa can be considered as being effectively conserved.

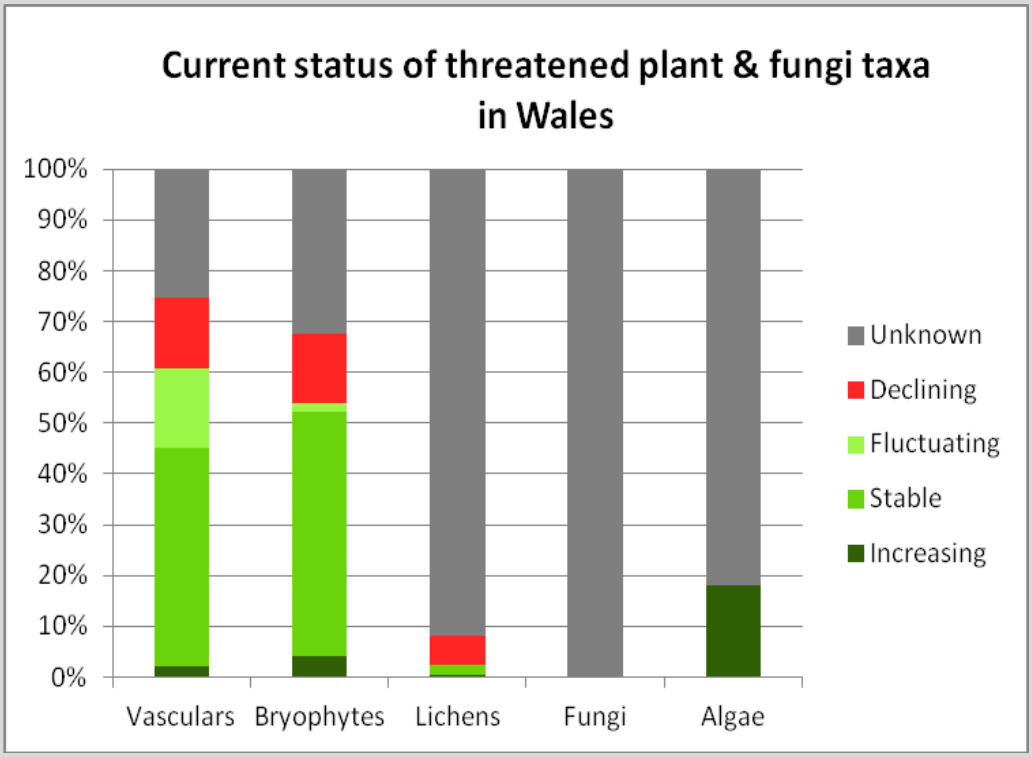

Figure 1: The number of threatened and Section 42 species whose population is either increasing, is stable, fluctuating, decline or unknown for the different taxon groups in Wales

In Scotland, 77% of the species on the Scottish Biodiversity List are plants and fungi. Of these threatened species however, it is not possible to say how many are the subject of conservation programmes in Scotland. The 2020 Challenge recognises a number of

priorities that would work towards meeting Target 7. These include integrating species management to ensure better results for whole ecosystems.

England is currently working towards developing Red Lists, which will mean England can then carry out a similar analysis as carried out in Wales. However, under the Terrestrial Biodiversity Group, the fungi, non vascular plants and vascular plants Taxon groups have identified 212 (of the 402 Section 41) species as needing urgent action[56]. Many of the actions identified in this process were considered to be deliverable through management of protected sites.

While focus has recently shifted towards the conservation and restoration of habitats at the site and landscape level, it remains essential that individual species are not lost from the equation. All SSSIs and protected landscapes must include conservation objectives to deliver for priority plants and fungi, and local-level delivery partnerships, including Local Biodiversity Action Plans, must include action for national priority plants and fungi. The strength of the Section 41 and 42 framework and Scottish Biodiversity List should not be diluted, and the links between species and habitat delivery must not be lost.

Key Successes

The conservation of threatened plants and fungi in situ is achieved through a wide range of methods and practices. In general, restoration and recovery programmes rely on a cycle of phases, each of which provides feedback as populations respond to management. These phases include research to assess the ecological needs of the species, translation of this research into management protocols, detailed monitoring and survey of existing populations, application of management protocols to sites and further monitoring to asses population response to management. Once a positive recovery is observed, a final phase is to disseminate management protocols to partner organisations, encouraging them to undertake similar management.

A huge number of such projects are underway on a wide range of priority plants, bryophytes, lichens and fungi, involving many PLINK partners. It is not possible to list them all so the following gives three examples from Scotland, England and Wales to provide a flavour of the range of the work being undertaken.

Scotland:

- Plantlife Scotland provides site visits and advice on managing for wild plants and fungi. Visits focus on priority species but include grassland management, juniper and woodland management. These are underpinned by demonstration days to promote management for native plants and fungi in priority habitats across Scotland: Atlantic woodland, pinewoods, trees of open habitat, coastal grasslands, arctic alpine communities and oceanic heath.

- National Trust for Scotland (NTS), Royal Botanic Garden Edinburgh and others continue to work in partnership on the conservation of *Woodsia ilvensis*. NTS are monitoring the largest remaining colony of this fern in UK and are considering future reintroduction locations.

[56] The Vascular taxon group agreed a set of species, approximately 50 out of the 150 species which require urgent attention. The Bryophyte taxon group identified over 400 conservation actions for 77 Section 41 (S41) bryophyte species (21 liverworts and 56 mosses). The Lichen taxon group identified over 450 conservation actions for 97 S41 lichen species, including two lichenicolous fungi. Finally, the Fungi 'taxon group' prioritised 61 S41 species and identified ongoing actions.

- Rare alpine willows are the focus of conservation work by NTS and RBG Edinburgh. These include work on Montane Willow at three sites and Woolly Willow *Salix lanata* in Meall na Samhna, Corrie Garbhlach and Corrie Sharroch. Other willow species are also being planted in Corrie Sharroch. First monitoring has indicated that some of Woolly Willow will produce catkins in the spring.

Wales:

- Work by many partners including Plantlife, NRW, National Trust, the Highways Agency and several local authorities has led to a remarkable recovery in Three-lobed Water-crowfoot. Reintroduction of grazing management to heathland sites, movement of stock between sites and improved monitoring and survey have contributed to an increase in sites from 17 in 1999 to 48 in 2013.

- Improved management of Atlantic oak woodland within the Merioneth Oak Woodland IPA has resulted in early signs of a recovery in tree lungwort lichens. Young thalli of species such as Tree Lungwort (*Lobaria pulmonaria*) are beginning to appear and improved survey has led to the rediscovery of species such as Red-eyed Shingle Lichen, thought to be extinct in Wales.

- Ditch management work at Malltraeth Marsh on Anglesey by RSPB to benefit lapwing has provided perfect conditions for a wide range of wetland species. Pillwort is now present at 10 locations across the site, making one of the largest populations in Britain, and Marsh Stitchwort is also thriving.

England:

- Plantlife's work to restore open ground habitat through turf stripping at Cranwich Camp SSSI in Norfolk has resulted in successful recovery of Spanish Catchfly (*Silene otites*) from the native soil seed bank. Numbers of plants have risen from 0 in 2011 to in 2929 in 2014.

- NE and the National Trust have carried out surveys of Wild Asparagus in Cornwall that have indicated that this species is doing better than had previously been known; meanwhile young plants grown from pollination of the single female plant left in Dorset with male material collected from Trust land in Cornwall flowered for the first time in 2013.

- Surveys of thatch moss *Leptodontium gemmascens* focussed on National Trust estates in the South West of England with known concentrations of thatched roofs have revealed several new populations of this species which is no longer found in semi-natural habitat in the UK. Staff responsible for the buildings have been provided with guidance that should ensure its conservation.

Looking to the future: key challenges

To ensure national priority species and habitats are effectively conserved through appropriate management and protected from inappropriate land use change, and that such management is a requirement for funding support, including rural development schemes.

To ensure at least 75% of threatened species are safe-guarded within the protected site network and are supported by appropriate in-situ land management practices

To ensure each country's statutory obligations and national targets for threatened species are met through the protected site network.

To secure Government and agency commitment to implementing a monitoring programme of priority plants and fungi as part of their statutory obligations

To develop new innovative mechanisms to support on-going in-situ fungi and plant conservation.

Target 8: At least 75 per cent of threatened plant species in ex situ collections, preferably in the country of origin, and at least 20 per cent available for recovery and restoration programmes.

Scope

This target seeks to underpin the conservation of threatened plant species through the maintenance of living collections, citing botanic gardens, seed banks and tissue culture collections as examples. Priority should be given to those threatened species in the IUCN Red Data Book category of 'critically endangered', with a target of 90% of such species in ex situ conservation. In the UK, focus should include species listed in the Habitats Directive, and the GB and Irish Red Lists, in addition to those that are 'critically endangered' at a global level.

Current Situation

The UK has achieved this target for vascular plants. Royal Botanic Gardens Kew's Millennium Seed Bank Partnership has conserved seed collections from 77%[57] of the UK native (spermatophytes[58]) species appearing on the list of species with conservation designations[59]. Seed may be made available for recovery and restoration programmes where there are sufficient numbers in the collections. This includes at least 40% of UK collections to date.

Species that do not set seed e.g. bryophytes are also held in ex-situ conservation at RBG Kew. There are 111 priority bryophytes, the majority with ex situ conservation identified as a priority action. 25 species are in Cryo-storage with 4 additional species are in vitro awaiting cryopreservation. However, there are currently no appropriate ex situ methods for lichens.

In Scotland, the Royal Botanic Garden Edinburgh organised a collecting programme with national agencies (SNH) and other (e.g. BSBI), targeting 165 threatened listed species. There are now 143 species in cultivation at the RBG Edinburgh, following intensive efforts since 2005. Nine of the species are in recovery programmes. In addition, RBG Edinburgh holds seed for 150 out of 170 species selected for conservation.

[57] Please note the exclusions made when calculating this percentage: Infraspecific taxa where we hold a collection for the species, Extinct species (9), Desiccation sensitive/recalcitrant species (2), Species that have never been seen to fruit in UK (7), Hybrids (35)

[58] Seed producing plants

[59] This has been an annual programme of seed collecting from priority species that is coordinated, with assistance from BSBI, specialists from NGOs, agencies and private individuals across the UK; many of whom volunteers who assisted. Dr Tim Rich made a huge contribution to the collections of microspecies.

The two main botanic gardens in Wales (the National Botanic Garden of Wales and Treborth Botanic Garden) have living collections of threatened native plants. However, in neither institution are these being actively curated due to a lack of capacity, resulting in only 33 of the 256 threatened vascular plants being grown in the Botanic Gardens in Wales and 2 species are being used in recovery and restoration programmes

Key Successes

RBG Kew is looking at what connectivity in the landscape, in relation to the Lawton review and the Biodiversity 2020 Strategy, means for genetic diversity. They have worked on connectivity in the Chilterns with the flagship species Pasque Flower *(Pulsatilla vulgaris)*. It was feared that the suitability of genetically isolated populations made them less fit for reintroduction however, the research carried out has revealed it is not as bad first thought.

Several laboratories and organisations are now involved with ex situ conservation of bryophytes[60] with the aim of establishing a living tissue collection, a cryopreserved collection and a spore collection maintained at various sites within Europe. Samples of five species of threatened Irish bryophytes Tufted Fen-moss (*Paludella squarrosa)* (CR), Cornish Path-moss (*Ditrichum cornubicum)* (CR), black golf club moss (*Catascopium nigritum)* (NT), Varnished Hook-moss (*Hamatacaulis vernicosus)* (NT), Cernuous Thread-moss *(Bryum uliginosum)* (E) collected from multiple locations by team at Glasnevin Botanic Gardens are currently undergoing cryopreservation at RBG Kew.

Looking to the future: key challenges

To ensure all ex-situ conservation projects must have an in-situ conservation outcome, such as contributing to in-situ management work and reintroduction projects.

To improve information flow to ensure that ex-situ actions fully compliment in-situ conservation needs and priorities at population, species and community levels.

Target 9: 70 per cent of the genetic diversity of crops including their wild relatives and other socio-economically valuable plant species conserved, while respecting, preserving and maintaining associated indigenous and local knowledge.

Scope

The conservation of plant diversity is a key component of the Global Plan of Action on the conservation and sustainable use of plant genetic resources for food and agriculture. Theory and practice demonstrate that, with an appropriate strategy, 70% of the genetic diversity of a crop can be contained in a relatively small sample (generally, less than 1,000 accessions).

Current Situation

The University of Birmingham, with Natural England, Scottish Natural Heritage and Natural Resources Wales, have prepared a crop wild relative[61] (CWR) checklist and prioritised

[60] Rowntree et al (2011) A European network for in vitro conservation of bryophytes has been established (http://www.ebesconet.org

[61] The definition of a CWR used is any wild species found in the same genus as a crop.

inventory for each devolved administration. Taxa were prioritised according to a range of criteria including their potential use, i.e. CWR taxa that can easily transfer traits to their related crop, economic value and degree of threat. The taxa prioritised in each inventory have undergone both an *in situ* and *ex situ* gap analysis to identify sites with potential for the establishment of CWR genetic reserves and gaps in seed bank collections for these taxa. As an example, the analysis for England's 148 priority CWR identified 15 sites across the country that would be required as part of a genetic reserve network to conserve close to 100% of these taxa. The top three sites alone (Purbeck in Dorset, the Lizard Peninsula in Cornwall and south Cambridgeshire) would be sufficient to conserve over three quarters of these taxa (79.73%). Based on this result, a genetic diversity analysis was carried out on eight CWR taxa found on the Lizard Peninsula in Cornwall in order to justify establishing the site as the first UK CWR genetic reserve. Further work is now underway to investigate the suitability of Purbeck as a site for the second UK CWR genetic reserve. In terms of *ex situ* conservation, a number of gaps in current CWR collections have been identified as well as a number of taxa which are under-represented. Through the establishment of a genetic reserve network and systematic collection of CWR populations from each reserve it is hoped that CWR will be actively and systematically conserved in the long-term both *in situ* and *ex situ*.

UK landrace[62] diversity is under imminent threat of extinction through the replacement of landraces by modern cultivars and traditional maintainers retiring. The completion of the inventory of vegetables and fruits is critical, as it is likely in 10 years this material will be entirely lost if action is not taken. There is an urgent need for landrace *in situ* (on-farm) and *ex situ* (primarily seed) conservation action.

Work done by Plant Heritage has found that of the 12917 cultivars identified as threatened in the genera assessed to date as part of their Threatened Plants Project, 41% (9539) are in National Plant Collections, and 7% (2583) are in active conservation elsewhere.

Key Successes

The results of the genetic diversity assessment of eight CWR on the Lizard Peninsula in Cornwall demonstrated that the site was not only a taxon diversity hotspot (as found in the *in situ* gap analysis carried out for England) but that it is also a hotspot of genetic diversity for these taxa. This finding gave a sound justification for the establishment of the first UK CWR genetic reserve in this location. Since this recommendation was made, written support of the work has been received from Defra, a set of minimum standards for this and future genetic reserves has been reviewed by Natural England and the University of Birmingham and updated and Natural England have taken significant steps forward in ensuring the site meets all these standards, including organising the collection of seed from key genetically diverse populations for long-term *ex situ* storage and use. As a direct response to this, stakeholders working in Dorset have met to discuss repeating this process to establish the second CWR genetic reserve in Purbeck.

Looking to the future: key challenges

To ensure socio-economically important crop wild relatives, cultivars and land races are fully recognised and represented in collections, preferably living collections in an agricultural or horticultural context, or in botanic gardens and seed banks.

[62] A landrace is a variety of domesticated animal or agricultural plant species which has developed over a long period of time and as a result has adapted to the local natural environment in which it lives. It was a widespread practice of farmers and vegetable growers to save seed from their crops annually for the following year's cultivation.

To ensure the conservation of crop wild relatives through in-situ programmes.

To secure Government and agency commitment in order to compile UK checklists for crop wild relatives, cultivars and land races in order to understand the resource that is currently conserved

Target 10: Effective management plans in place to prevent new biological invasions and to manage important areas for plant diversity that are invaded.

Scope

Invasive Alien Species are considered to be direct drivers of biodiversity loss across the globe[63]. Target 10 acknowledges the threats to plant diversity from invasive species and seeks to identify the necessary action to minimise this damage. It suggests that priorities should be set at a national level but action should be co-ordinated across the UK and internationally. The challenge is to identify those species that pose significant threats, to determine the nature of the response and then to co-ordinate action to alleviate the problems caused. Management plans should specify the mechanisms necessary to prevent, eradicate or control problem species so that our biotopes and native flora can be conserved successfully

Current Situation

The GB Invasive Non-Native Species Framework Strategy was published in 2008 and reviewed in 2013, with recommendations to progress the strategy published in 2014. The Strategy puts an onus on preventative measures, and to assist prevention horizon scanning has been carried out for plants and animals. 599 non-native freshwater and terrestrial plants were assessed by Plantlife and the Freshwater Biological Association, as well as assessments for animals by other organisations. 92 plants were ranked as critically requiring a detailed risk assessment and a further 55 species urgently requiring assessing. In addition to these threats from invasive non-native plants invasive animal species can also threaten plant diversity[64]. Following detailed risk assessments Invasive Species Actions Plans also form a key part of the GB Strategy and an ISAP has been produced for Water Primrose (*Ludwigia grandiflora*)[65] with a further four invasive plant species Actions Plans underway.

The EU Invasive Alien Species Regulation comes into force in January 2015. The Regulation requires better coordinated action between member states to prevent new IAS coming into the EU as well as better coordinated effort (i.e. cross-border) to either eradicate or manage and control IAS affecting regions of the EU. These will be underpinned by improved surveillance and management plans.

Many organisations (both within the PLINK networks and externally) are involved with invasive species removal across GB. For instance, the Non Native Species Secretariat (NNSS) website lists 55 Local Action Groups (LAGs) in Wales and England and 20 Local Action Groups (LAGs) in Scotland which help in supporting INNS initiatives and removal programmes. Organisational partnerships are also being developed for eradication projects such as that on Lundy Island, where Rhododendron is on track to be eradicated by

[63] http://www.cbd.int/invasive/
[64] http://www.plantlife.org.uk/publications/here_today_here_tomorrow
[65] http://www.nonnativespecies.org/index.cfm?pageid=294

2020 as the result of a partnership initiative by the Landmark Trust, Natural England and the National Trust. Partnerships are increasingly important as 37%[66] of Important Plant Areas have been found to be threatened by invasive species and over 10,000 hectares of SSSI land in the UK is known to be affected by INNS[67]. While members of the PLINK network are carrying out work to eradicate and control invasives across these botanically important sites, there is a need to gather the actions together and map them against the protected site and IPA network. This strategic approach is to ensure the limited resources are being used for maximum biodiversity benefit.

In Scotland, coordination of action against INNS is directed through the government led Invasive Non Native Species Group. This group has produced a code of practice to aid implementation of the Wildlife and Natural Environment (WNE) (Scotland) Act 2011, which introduced the presumption against planting or allowing non native plants to grow outside of their native range. In 2014, the group set up a series of species assessments designed to identify the type of action required in terms of surveillance and monitoring, removal or control. This work is supported by the inclusion in the WNE 2011 Act for Species Control Orders to be issued. Forestry Commission Scotland is leading a strategic review of *Rhododendron ponticum* control with partners.

In Wales, the Wales Biodiversity Partnership Invasive Non-Native Species group has been developing management plans for key species and the inclusion of actions for SSSIs in the NRW Sites Actions database. This group also makes the information on ongoing projects available through the Biodiversity Action Reporting System (BARS)[68]. Plantlife and BSBI have also produced a list of around 50 sites where populations of priority Section 42 plant species are threatened by invasive non-native species. These "*Sites in Peril"* include Great Orme (non-native Cotoneasters), St David's Heaths (New Zealand Pygmyweed *Crassula helmsii*), Stackpole (Evergeen Oak *Quercus ilex*), Pembrey Burrows (Sea-buckthorn *Hippophae rhamnoides*) and Arthog (Rhododendron). The results of this report have been made available to the WBP Invasive Non-native Species Group.

Key Successes

From April 2014 five aquatic species are banned from sale in England, with Wales soon to follow suit. These include New Zealand pigmyweed *Crassula helmsii*, Floating pennywort *Hydrocotyle ranunculoides*, Parrot's-feather *Myriophyllum aqauticum*, Water primrose *Ludwigia grandiflora, L. peploides, L. uruguayensis* and Water fern *Azolla filiculoides*.

The IAS Regulation was agreed and will be implemented January 2015 with list of invasive alien species to be agreed by 2016.

Looking to the future: key challenges

To ensure there is support and commitment to fulfil statutory obligations and existing policies to prevent the arrival, establishment and spread of new invasive species.

To implement effective management plans on the ground to control and or eradicate invasive non native species especially within the protected area network and IPAs and put in place effective early warning systems to prevent new invasions.

[66] Invasive species are present on 53 of the 145 IPAs with threat data in the database so this equates to 37%.
[67] http://publications.naturalengland.org.uk/file/6532878091419648
[68] http://ukbars.defra.gov.uk/project/show/27225

To improve and further research effective management techniques for INNS, including assessments of costs, and to make available best-practise guidance (link to Target 3).

Objective III: Plant diversity is used in a sustainable and equitable manner

Target 11: No species of wild flora endangered by international trade.

Scope

Internationally, many plants are legitimately traded in a sustainable way. This target is directed at those species endangered or potentially endangered by this international trade. It is linked to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). However, the action is focussed on the impact of trade on the UK's flora, rather than the impact of UK consumers on plants abroad.

Current Situation

The UK National Wildlife Crime Unit (NWCU) which has been formed to assist in the prevention and detection of wildlife crime, but is mainly focused on non plant species as reflected in their priorities[69]. As the NWCU has limited capacity they are advised by the Wildlife Crime Conservation Advisory Group on the impact of crime on the conservation status of protected species[70] and one of their priorities is the illegal trade in CITES timber (with a focus on agarwood). However, the Royal Botanic Gardens Kew acts as the UK CITES Scientific Authority for plants. RBG Kew is part of the Partnership for Action Against Wildlife Crime UK (PAW UK), which helps statutory and non-government organisations to work together to tackle wildlife crime. Between 2006 and 2011, RBG Kew advised on 20,000 applications to import, export, or hold species covered by the EU Wildlife Trade Regulations, which covered timber, live plants, traditional medicines, cosmetics and extracts. In addition, over 900 UK Police, Customs Officers and Wildlife Inspectors were trained on CITES implementation for plants[71].

Key Successes

The RBG Kew acts as the UK CITES Scientific Authority for plants. In this role, between January 2011 to December 2013, RBG Kew provided training on CITES implementation for 617 participants (UK and international), including 297 UK enforcement officers. In addition, Kew and international partners developed CITES capacity building tools, including two editions of CITES User Guides on ramin and cacti[72].

An international market for the Tree Lungwort *Lobaria pulmonaria*, was identified that could have resulted in large volumes of the lichen being collected for the homeopathic medicine industry. Harvest of the quantities required was considered unsustainable so it was recommended that the species be added to Schedule 8 of the Wildlife and Countryside Act (1981). This has been implemented in England and Wales and is soon likely to be implemented in Scotland[73].

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[69] http://www.nwcu.police.uk/what-are-priorities-and-intelligence-requirements/priorities/
[70] http://jncc.defra.gov.uk/page-4098
[71] http://www.kew.org/science-conservation/research-data/science-directory/projects/cites-uk-scientific-authority
[72] http://www.cbd.int/doc/world/gb/gb-nr-05-en.pdf
[73] Schedule 8 the Wildlife and Countryside Act 1981 lists plant species that are protected, under Section 13, from being picked and or part or all of that plant being sold. Schedule 8 is updated with

Looking to the future: key challenges

To ensure that RBG Kew continues to have the capacity to be able to fulfil their part in UK Government's obligations around CITES.

To ensure no UK species is threatened by the importation of non-native species that pose an invasive risk or are highly likely to pose such a risk, including plant diseases.

Target 12: All wild harvested plant-based products sourced sustainably.

Scope

Plants and their derivatives provide a range of products including amongst other things fuel, food, shelter, clothing and medicines. Sustainable management of these systems relates to environmental as well as social issues, including fair trade, equitable sharing of benefits and participation of indigenous and local communities. Target 12 therefore should be considered alongside targets 3, 6, 11 and 13 in terms of production lands, trade, ecological services and sustainable livelihoods

Current Situation

The PLINK networks want to improve awareness over the impacts of unsustainable use and collection of fungi, seaweeds and wild plants. One way to do this is through a document that sets out overarching guidance principles of responsible levels of collection whilst referring to each of the current Codes of Conduct. However, more research is needed to assess the impact of collection and to gather the data with which to promote sustainable approaches.

BMS have developed a wild mushroom pickers Code of Conduct, entitled The conservation of wild mushrooms. BSBI and JNCC produced a Code of Conduct for the conservation and enjoyment of wild plants. The leaflet has been written for botanists, teachers and people who wish simply to enjoy wild plants. It aims to indicate where collecting and picking are acceptable and which wild plants should not be taken. However, both these are currently being updated.

In addition, this target includes sustainable use of fungal and plant products. Plants and fungi form the basis of many of the products used every day. The impact of unsustainable use is much more difficult to quantify. However, a useful start would be to work to ensure that plants and fungi are taken into account in Natural Capital accounting procedures. This would mean including known, as well as unknown value. This requires a paradigm shift in how we currently value nature. Lessons from the insurance industry should be taken in this respect.

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each Quinquennial Review (QQR). As part of the 5th QQR changes to the England and Wales to the Wildlife and Countryside Act were made in 2011 with two plants being added; Rock Nail *Calicium corynellum* and Tree Lungwort *Lobaria pulmonaria* (in respect of section 13(2) only). Scotland has not yet made a decision about the 5th QQR. The up to date list of Schedule 8 (and 5) species based on the 5th QQR are yet to be reflected in public lists. The 6th QQR is underway and submissions from various groups are being analysed with a view to a report being sent from JNCC to Defra, Scottish Government and Welsh Government in December 2013.

Key Successes

The Scottish Wild Mushroom Forum, a group of representatives from conservation organisations, landowners, mushroom buyers and pickers, created the Scottish Wild Mushroom Code, and this was updated in 2010. This provides guidance to ensure that harvesting is sustainable. Analysing visitor numbers to a website hosting the guidance leaflet[74] shows that there are annual peaks during the main fruiting and collecting season, with the webpage on identifying fungi to eat as the third most visited page on the site.

Plantlife, SNH, Reforesting Scotland and independent collectors also drew up collection codes for mosses and bulbs. (The Scottish Moss Collection Code and The Scottish Bulb Collection Code). These are voluntary codes, which ethically minded businesses in Scotland have signed up to. Whilst this guidance has been developed within Scotland, the sustainability principles are more widely applicable across the UK[75]. In addition, Natural England published a Code of Conduct for seaweed harvesting in 2014.

There are examples of business who rely entirely on the sustainable use of plant products. The Vera Bluebell Farm (Gwynedd), for example, sells native bluebell bulbs and seed collected under licence. As part of the licence agreement with NRW, experimental trials have been undertaken to determine the sustainable level of bluebell harvest, and the results are used to inform the annual quantities of bulbs that are harvested e.g. *the Powys Wild Food Project* [76], and the current status and development potential of woodland and hedgerow products in Wales.

Looking to the future: key challenges

To understand the scale of collection of wild species across the UK in order to be able to raise awareness of unsustainable levels of collection and promote responsible practices.

To improve public awareness, where necessary, about the potential impacts of commercial collection of wild edible plant material and fungi for marketing through the restaurant trade and other outlets.

To provide guidance for appropriate levels of sustainable collection and, where these levels are unknown, undertake research required.

Target 13: Indigenous and local knowledge innovations and practices associated with plant resources maintained or increased, as appropriate, to support customary use, sustainable livelihoods, local food security and health care.

Scope

Target 13 focuses explicitly on the status of knowledge and practices that underpin the use of plants by local people. Such plant resources may be either domesticated or wild, and their products include the material (e.g. for food, medicines, firewood, ecological services), and the immaterial (e.g. aesthetic, cultural or spiritual).The link between local, rural people and local plants is reinforced by the target's reference to sustainable livelihoods – implying a right of access – and to the knowledge that helps underpin them.

[74] https://sites.google.com/site/scottishfungi/home
[75] http://www.forestharvest.org.uk/guidelines/harvestingguidelines.htm
[76] www.glasu.org.uk/en/uploads/documents/report%20PowysWildFoodProject%20Report.pdf

The target recognises the intricate relationship between biodiversity conservation and local sustainable use.

Current Situation

Companies across the UK have begun trading in promoting traditional skills, such as foraging, bushcraft, natural navigation and survival skills. Interest has increased steadily year on year and there appears to be a push to ensure we do not lose this knowledge from an increasingly urbanised society. It is important to use the knowledge that comes with indigenous skills but also adapt and modify these to meet the modern day environment. There are many forums and podcasts and You Tube videos available, which help to promote interest. Many books are being written on bushcraft skills, some of which are highlighted here[77]. There is also a website, foodforagingcourses.co.uk, that is dedicated to finding foraging courses in any local area[78]. In addition, there are still many companies, societies and forums that promote and discuss the uses of herbs for medicinal purposes, as well as cosmetic and eating. The Herb Society for example runs courses and provides school education packs as well as providing links to many other UK companies and societies who are based on the use of herbs[79].

There are other industries in the UK which are based on indigenous practices. Some have formed societies and forums to allow them to come together, and amongst other purposes, share knowledge and information on their trade and practices. Two examples are listed below.

- The National Hedgelaying Society is 'the only conservation organisation dedicated to maintaining the traditional skills of hedgerow management.'[80] Hedgelaying is a country craft which has been practiced for hundreds of years and this society provides membership and training to keep this industry alive.

- Traditional charcoal production, using locally sourced wood, is still carried out by a few within the UK. Similarly, the traditional handmade Sussex trug[81] are being made. This wooden basket dates back to the 1500s, and has a handle and rim of made of coppiced Sweet Chestnut (*Castanea sativa*) wood and the body is made of five or seven thin boards of Cricket Bat Willow (*Salix alba* var. *caerulea*). Both arts are hand-shaved with a drawknife.

Key Successes

- 2013 saw the launch of the National Coppice Federation[82] which will bring regional coppice groups together. In addition to providing a unified voice for the industry it will help to provide one forum to share knowledge and information on best practice and promote coppicing as a form of woodland management. Plantlife's report - Forestry Recommissioned - highlights the role coppicing can play at improving plant diversity in some English and Welsh woodlands.

[77] http://originaloutdoors.co.uk/bushcraft-general/10-bushcraft-books-you-should-read-that-arent-by-ray-mears/.
[78] http://foodforagingcourses.co.uk/
[79] http://www.herbsociety.org.uk/
[80] http://www.hedgelaying.org.uk/
[81] A wooden basket mainly used for gardening
[82] www.ncfed.org.uk

Looking to the future: key challenges

To provide improved mechanisms to enable traditional knowledge and practises to be collected and shared, utilizing modern media where this encourages engagement.

To encourage the development of modern farming methods that take a sustainable approach to resource management, drawing on lessons to be leant from traditional farming practices (linked with Target 6).

Objective IV: Education and awareness about plant diversity, its role in sustainable livelihoods and importance to all life on earth is promoted

Target 14: The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes.

Scope

"People conserve what they love, they love what they understand and they understand what they are taught". Target 14 seeks to implement this old Sri Lankan proverb and influence communication, awareness and education programmes to help deliver the Global Strategy.

Current Situation

Recent data shows that both the volunteer time within BSBI and Plantlife and the visitor numbers to Royal Botanic Gardens, Kew and Royal Botanic Garden Edinburgh have been stable recently.

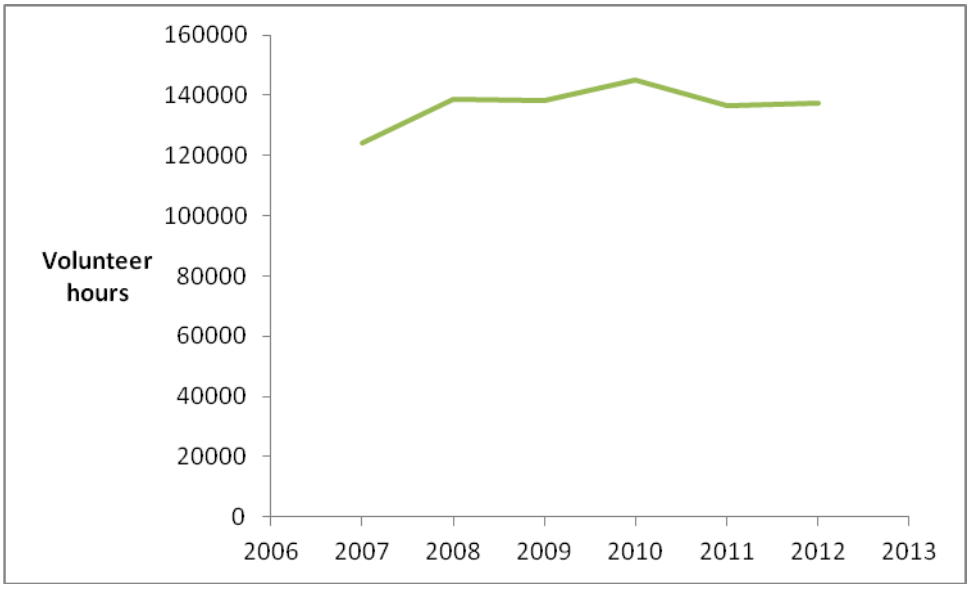

Figure 2: Total volunteer hours recorded by the Botanical Society for Britain and Ireland and Plantlife from 2007 to 2012.

The UK Biodiversity Indicator for 'awareness, understanding and support for conservation' shows that between 2002-2012 there was a strong increase in volunteer time spent in selected UK conservation organisations (note not just fungal and plant focused organisations). However, between 2007-2012 there has been a decline of approximately 6% in volunteer hours[83]. Therefore, it is positive that plant focused organisations did not experience the same decline and actually recorded an increase as shown in Figure 2.

[83] http://jncc.defra.gov.uk/page-4253

An analysis of visitor numbers to RBG Kew and RBG Edinburgh shows there has also been an increase (even if slight) but in general visitor numbers have remained quite stable. This is a small proportion of the total number of visitors to gardens and plant collections in the UK, since the Botanic Gardens Conservation International has records of over 9 million visitors per annum to UK gardens[84].

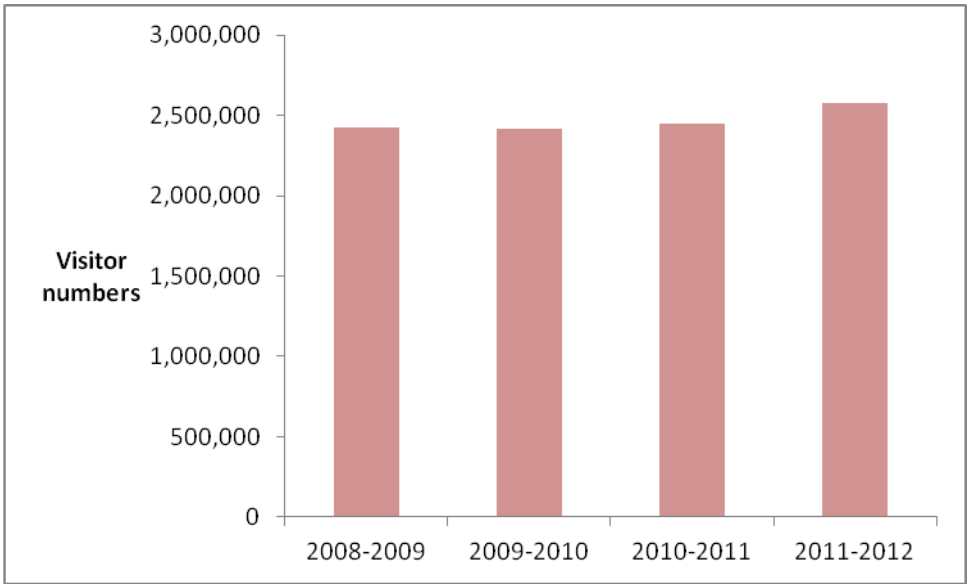

Figure 3: Visitor numbers for Royal Botanic Gardens, Kew and Royal Botanic Garden Edinburgh.

Most of the organisations within the PLINK network run a range of workshops, events, identification courses, conservation advice projects and outreach programmes that are aimed at raising awareness of plant and fungal diversity. A Defra study on 'engaging people in biodiversity' found that just under 80% of the population claim to worry about changes to the UK countryside and loss of native animals and plants. However, the same study found that 73% had given 'a little' to 'no' thought about biodiversity loss in the UK before the survey[85]. The importance of conserving biodiversity is being communicated through educational programmes such as those highlighted in the key successes. This should lead to a positive change in behaviour.

Key Successes

Scotland's Environment Web[86] is designed to be a one stop shop for anyone wanting to find out and / or participate in citizen science programmes for Scotland's wildlife. The Scottish Fungi website[87] also collates activities and information about fungi in Scotland.

Since 2009, Plantlife has reached over 100,000 children and people through the *Wild About Plants* programme[88]. This includes over 10,000 school children per year through the *Bee Scene* survey[89], over 1000 teachers have been help train to develop skills that allow

[84] http://www.cbd.int/doc/world/gb/gb-nr-05-en.pdf
[85] http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=18411&FromSearch=Y&Publisher=1&SearchText=WC1056&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description
[86] http://www.environment.scotland.gov.uk/.
[87] https://sites.google.com/site/scottishfungi/
[88] http://www.wildaboutplants.org.uk/
[89] http://www.wildaboutplants.org.uk/beescene/

botanical knowledge and identification skills, through *Make the Small Things Count*[90] project 7000 children and adults have learnt about lower plants in Atlantic woodlands inspiring monitoring and conservation action. In 2013, 5 Flora Guardian groups were involved with the conservation of 4 priority species and 70 individual Flora Guardians are now monitoring 20 species at 60 sites across Scotland. Finally, Plantlife has also developed the *Wild and Wonderful* leaflets, which are beginners guides to Scottish wild flowers, fungi, lichens, mosses and liverworts and seaweeds[91].

An example of a positive reaction to a biodiversity threat when communicated to the public:

Discovered in Scotland in August 2013, *Phytophthora austrocedrae* is a relatively new disease and its spread is still not understood. Plantlife with Forestry Commission Scotland and Forest Research is coordinating a national survey to assess the health of juniper. In August 2013, the first case of *Phytophthora austrocedrae* was discovered in Scotland and has been found at more sites since. Plantlife devised a simple survey for members of the public to complete to help us assess the health of juniper populations across Scotland in general and to identify any sites where *Phytophthora* may be occurring. In 4 months in 2014, volunteers had surveyed more than 85 sites.

Looking to the future: key challenges

To secure commitments from UK country governments and statutory agencies to provide support to enable specialist societies and other organisations to provide opportunities that allow individuals to improve their field botanical and mycological skills.

Continue to provide readily accessible learning and recreational activities linked to plants and fungi for schools and community groups to use, to assist them in exploring and understanding their environment and encouraging local action to look after it.

To encourage and assist society as a whole to engage with nature, including plants and fungi by taking advantage of a wider and broader range of media, education and recreation opportunities, in order to demonstrate the role plants and fungi play in everyday life and the benefits that come from engaging with nature.

[90] http://www.wildaboutplants.org.uk/england/projects/make-the-small-things-count/
[91] http://www.plantlife.org.uk/publications/the_wild_and_wonderful_world_of_scottish_wild_flowers

Objective V: The capacities and public engagement necessary to implement the Strategy have been developed

Target 15: The number of trained people working with appropriate facilities sufficient according to national needs, to achieve the targets of this Strategy.

Scope

Target 15 aims to strengthen and co-ordinate human and technical resources, improving communication and knowledge management to advance the conservation and sustainable use of plants and their habitats. These goals will be achieved by prioritising research and training needs and by enhancing technical and scientific co-operation[92].

Current Situation

There are a number of examples of training workshops and projects for plants and fungi and there are a large number of expert volunteers that contribute to the understanding of plants and fungi in the wild across the UK. However, while amateur recorders make significant contributions to monitoring and surveillance, the expertises of the professional recorders, and in particular for the more specialist families, are being lost. For example, there is currently only one active stonewort specialist in the UK. It is a similar story with professional mycologists, lichenologists, and bryologists but the situation is less drastic for botanists. The situation is not being helped by the number of botanic and fungal specialists jobs declining in government agencies and a lack of funding to support roles in herbaria, museums and universities. This knowledge base will gradually be lost if the situation doesn't change.

However, the Societies do have a number of recorders registered with them. Some of these recorders have speciality areas, and through training events run by the Societies the next generation of professional recorders could emerge.

Table 5: Shows the number of recorders registered with the specialist societies.

Society	Number of recorders registered to Society
The Association of British Fungus Groups	124 recorders 30 ABFG field recording groups
British Mycological Society	BMS has 34 fungus groups (There is some overlap between the ABFG field recording groups and BMS fungus groups)

[92] 'Trained' people are defined as individuals possessing more than basic identification or other conservation-related skills; 'facilities' are any element of the infrastructure that aids those activities (not only analytical laboratories but also libraries and web-based tools); and 'conservation' is defined in a broad sense.

	No register of BMS recorders
British Lichen Society	60 active lichen recorders
British Bryophyte Society	810 unique recorder codes (* since '09 and some records might be duplicates
Botanical Society for Britain and Ireland	152 Vice-county Recorders covering 119 Vice Counties in the UK
British Phycological Society	No official record set up yet
Kew	8 trained professional mycologists employed at Kew (1 on short-term contract).

In addition, Plantlife's *Wildflower Count* is an annual, national, easy to do survey of common plants. It is in the process of being incorporated into the National Plant Monitoring Scheme that will provide additional, more robust, data on priority habitat condition in partnership with BSBI, CEH and JNCC, and this should secure a long term future for the plant survey. The survey is being designed so that there are different levels allowing volunteers of differing abilities to take part and to improve their plant identification and maybe move up through the levels.

BSBI has developed the Botanical Skills Pyramid to help assess botanical identification skills. Once the skill level has been identified BSBI will provide some guidance on what the participant is qualified to do, and what to do to progress to a higher level. BSBI also provide a Field Identification Skills Certificate which is becoming established as the industry standard for assessing botanical survey skills. The test will determine your botanical skill level on a scale from 1 (beginner) to 5 (professional) with 6 being awarded in exceptional cases[93].

Key Successes

RBG Edinburgh has an active training programme, including an MSc in Biodiversity and Taxonomy of Plants and a Practical Certificate in Field Botany, both of which have excellent track records in translating enthusiasm into expertise.

The Conservation Volunteer (TCV) body for Scotland's Natural Talent Apprentice scheme[94] has provided up to 18 month apprenticeships in key conservation fields, using Heritage Lottery funding. Since its launch in 2006, the scheme has trained 10 apprentices in plant and fungi related areas (e.g. Machair management, Peatland management, Bryophytes, Lichens, Fungi, Seaweeds, Grassland Fungi, Wetland Habitat, Saltmarsh habitats) and it concentrates on areas where future expertise is required.

The Lichen Apprenticeship Scheme was established in Wales in 2009. The scheme provides specialist training for field lichenologists through lab-based workshops and field meetings, along with the development of a website[95]. While no government funding is available for the scheme, participants from agencies and organisations are encouraged to attend courses within their work time.

[93] http://www.bsbi.org.uk/field_skills.html
[94] http://www.tcv.org.uk/scotland/learning/natural-talent-apprenticeships
[95] http://www.wales-lichens.org.uk/content/lichen-apprentice-scheme-wales.

The Esmée Fairbairn Foundation recently funded the 5-year RBG Kew project, "Lost and Found Fungi" which will employ 2 people to be trained in working with species of conservation concern and will provide further training for field recorders.

Since 2009 BMS have held 12 BMS specific training events with 133 separate individuals attending (but many attending multiple events). BMS also hold weeklong recording forays with 265 attendees since 2009 (there is also overlap with those individuals who attend workshops and many general events). These events do not include official training however, there are learning elements within the event for those that attend via discussion of species and help from others with more experience during discussions about changes in Taxonomy. The next generation of professional Mycologists will hopefully emerge from training events such as these

The number of unique bryophyte recorders submitting records to the BBS between January 2009 and December 2013 was 810.

Looking to the future: key challenges

To develop and implement plant and fungi Apprenticeship Schemes and other similar training and skills development programs to ensure field-trained individuals are available to fulfil needs of survey, monitoring and provision of technical advice.

To provide opportunities for trained apprentices to gain meaningful employment building and using newly acquired skills.

To ensure the UK Government supports Universities in improving training skills during undergraduate and post-graduate degrees.

Target 16: Institutions, networks and partnerships for plant conservation established or strengthened at national, regional and international levels to achieve the targets of this Strategy.

Scope

Implementation of the Global Strategy targets will rely on the enthusiasm, expertise and commitment of a range of different people. The challenge is for these people, who work (or volunteer) for different organisations across the UK, to come together to share experiences and expertise and agree collaborative action. Target 16 acknowledges that co-operative action is usually more effective than independent action. Emphasis is therefore placed on the development of networks to deliver plant conservation priorities.

Current Situation

The Plant Links (PLINK) networks[96] and partnerships are working for plant and fungi conservation and to take forward action to deliver against the GSPC. PLINK networks form important fora for organisations to share information and work together to advance the conservation of wild plants. PLINK networks are all formed with the specialist societies, environmental NGOs and government bodies, and the work is outcome led to achieve 'conservation products'. In addition, the PLINK networks work as a forum to ensure the fungal strategies, currently addressed by Fungal Taxon Group, PLINK UK, PLINK Eng.,

[96] www.plantlife.org.uk/campaigns/plantlink/

Scottish Fungus Conservation Forum, BMS, ABFG, RBG Kew and one fungal conservationist (RBGK) are communicated effectively.

There are other of the UK partnerships highlighted below:

- The Millennium Seed Bank Partnership, which is also represented at PLINK UK, is coordinated by the RBG Kew, to deliver Target 8 of the GSPC in particular.
- RBG Edinburgh has active links across more than 40 countries, many of which are directly involved with local efforts in plant conservation.
- The Secretariat for Botanic Gardens Conservation International is based in the UK – this also acts as the Secretariat for the Global Partnership for Plant Conservation (GPPC). The GPPC is a global network established to implement the GSPC. At least five UK institutions are GPPC partners to date.
- PlantNetwork[97] is the national network of botanic gardens, arboreta and other documented plant collections. PlantNetwork promotes botanical collections in Britain and Ireland as a national resource for research, conservation and education. It also facilitates networking and training among holders of plant collections through a programme of conferences and workshops, a regular newsletter and a well referenced website.
- The British Ecological Society (BES) was established to promote and foster the study of ecology. Its core activities are the publication of results of research in ecology, the development of scientific meetings and the promotion of ecological awareness through education at all levels. The BES currently has around 4,500 members spread around the world

Key Successes

Plant Link Scotland (PLINKS) works to implement GSPC, conserve plants, fungi and their habitats and to help bring about change by:

a) identifying and engaging in legislative and other parliamentary opportunities for improving plant conservation in Scotland;
b) maximising strategic opportunities for influencing the work of the Scottish Government as it impacts on plant conservation in Scotland;
c) contributing to strategic opportunities in the Scottish Biodiversity Strategy in Scotland, by helping to influence the work of other key stakeholders including Scottish Natural Heritage, Forestry Commission Scotland, the Scottish Environment Protection Agency and the Scottish Government
d) provide a means of ensuring that the best experience of plant conservation from a global and a UK perspective is applied effectively in Scotland;
e) identify and use opportunities for ensuring that scientific research in Scotland is directed and applied in such a way as to encourage the protection and enhancement of plant species and habitats in Scotland;
f) facilitate the exchange of information that would help to achieve objectives (a) to (e) above.

Plant Link England, formed in 2012, aims to advance the conservation of wild plants and fungi by:

[97] PlantNetwork is a registered charity run by a board of 16 trustees, supported by an administrator

a) taking forward action to deliver the Global Strategy for Plant Conservation in England supporting the delivery of Biodiversity 2020 outcomes
b) facilitating the exchange of information between organisations involved in delivering wild plant and fungus conservation in England
c) undertaking joint initiatives to influence and advocate for policy and legislation to conserve wild plant and fungus diversity in England.

Plant Link Cymru (PLINC), established in 2007, frames its 'work programme' around delivery of the GSPC in Wales, co-ordination of Section 42 Priority Species for plants and fungi, and responses to consultations. PLINC also facilitate the exchange of information and advocate for the policy changes needed to deliver the strategy in Wales.

Looking to the future: key challenges

To ensure plant and fungi organisations achieve added value from governments by working together more effectively to deliver national and international targets for biodiversity

To ensure PLINK networks remain key fora and networks to identify, share and promulgate research and conservation methodologies to implement the Strategy effectively.

For Government and country agencies, through the recognition of the importance of the PLINK networks, to provide sufficient support of the PLINK networks in order to expand and improve their effectiveness at implementing the GSPC.

To co-ordinate environmental, conservation and educational programmes to achieve the GSPC targets.

Acronyms

Agri-Environment Scheme (AES)
Association of British Fungi Groups (ABFG)
Biodiversity Action Reporting System (BARS)
Biological Records Centre (BRC)
British Bryological Society (BBS)
British Lichen Society (BLS)
British Mycological Society (BMS)
British Phycological Society (BPS)
Botanical Society of Britain and Ireland (BSBI)
Centre for Ecology and Hydrology (CEH)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES
Countryside Council for Wales (CCW)
Important Plant Area (IPA)
Invasive Non Native Species (INNS)
Invasive Alien Species (IAS)
Joint Nature Conservation Committee (JNCC)
Local Action Groups (LAGs)
National Botanic Gardens Wales (NBGW)
National Biodiversity Network (NBN)
Natural England (NE)
Natural Environment and Rural Communities Act (NERC Act)
Natural History Museum (NHM)
Natural Resources Wales (NRW)
Non Native Species Secretariat (NNSS)
Marine Conservation Zones (MCZ)
Plant Link (PLINK)
Plant Link England (PLINK Eng)
Plant Link Scotland (PLINKS)
Plant Link Cymru (PLINC)
Plant Link UK (PLINK UK)
Royal Botanic Gardens Kew (RBG Kew)
Royal Botanic Gardens Edinburgh (RBG Edinburgh)
Royal Horticultural Society (RHS)
Royal Society for the Protection of Birds (RSPB)
Scottish Natural Heritage (SNH)
Section 41 (S41)
Section 42 (S41)
Site of Special Scientific Interest (SSSI)
Special Area of Conservation (SAC)
Wales Biodiversity Partnership (WBP)
Wild Flowers Count (WFC)
Wildlife and Natural Environment (Scotland) Act (WNE)

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