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PROTECTED AREAS AND NATURE RECOVERY

Achieving the goal to protect 30% of UK land and seas for nature by 2030

BRITISH ECOLOGICAL SOCIETY

The **authors** of this report were: Joseph J. Bailey (York St John University), Constance M. Schéré (King's College London), Charles A. Cunningham (University of York), Chloë Alexia Metcalfe (UCL), Donal C. Griffin (Northern Ireland Marine Task Force), George Hoppit (University of Bristol), Rebecca K. Turner (UK Centre for Ecology & Hydrology; University of Kent), and Thomas Travers (University of Liverpool), supported by Jane K. Hill (University of York) and Paul Sinnadurai (Brecon Beacons National Park Authority and Cardiff University).

This report was edited by a **Steering Group** including Rick Stafford (Bournemouth University), David Allen (Natural Resources Wales), Nick Isaac (UK Centre for Ecology & Hydrology) and Ben Ross (NatureScot); the **BES Policy Team** (Daniela Russi, Bethany Chamberlain, Nick Harvey Sky and Sarah McKain) and India Stephenson (BES).

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CONTACT DETAILS

Email: policy@britishecologicalsociety.org

Address: British Ecological Society, 42 Wharf Road, London, United Kingdom, N1 7GS

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ACRONYMS

AONB	Area of Outstanding Natural Beauty
ASSI	Area of Special Scientific Interest
CBD	Convention on Biological Diversity
CSM	Common Standards Monitoring
Defra	Department for Environment, Food and Rural Affairs
FCS	Favourable Conservation Status
IFCA	Inshore Fisheries and Conservation Authority
IUCN	International Union for the Conservation of Nature
LNR	Local Nature Reserve
MCZ	Marine Conservation Zone
MNR	Marine Nature Reserve
MPA	Marine Protected Area
NI	Northern Ireland
NNR	National Nature Reserve
NP	National Parks
NR	Nature Reserves
NSA	National Scenic Area
NTZ	No-Take Zone
OECM	Other effective area-based conservation measure
PA	Protected Areas
PAME	Protected Area Management Effectiveness
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SI	Statutory Instrument
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
UK	United Kingdom
VMCA	Voluntary Marine Conservation Area
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

Joseph Bailey

Area-based conservation[i] on land and at sea will be a critical component of the United Kingdom's (UK's) efforts towards addressing the connected climate and ecological crises, for which the recovery of nature is crucial. This policy report provides an overview of the available ecological evidence on this topic, synthesised in response to the UK government's policy to protect 30% of all four nations' land and seas for nature by 2030 ('30x30'[ii]). The UK has helped lead this international commitment, which many other nations have also adopted, and now the commitments must be implemented to protect nature effectively. Failure to do so within this timeframe could result in continued and irrecoverable declines in biodiversity, ecosystem functions, and the array of associated societal benefits. Area-based conservation, inclusive of protected areas (PAs) and other effective area-based conservation measures (OECMs), will be an essential tool towards this effort.

[i] Note that a terminology table is provided in the *Terminology* section: all terms appear highlighted in the main text where first mentioned in each section.

[ii] Also referred to as 'thirty by thirty' or '30 by 30'.

There are some excellent examples of PAs that work for biodiversity, enabled by individuals and organisations across the UK's four nations. In domestic UK territories, areas under some sort of designation cover 27.8% of land and over 30% of the seas. However, not all these areas are fully effective at protecting nature. Both marine and terrestrial PAs face internal and external pressures that compromise biodiversity protection and recovery. The coverage of *effectively* protected terrestrial PAs could be as low as about 5% of UK territory.

The UK's protected sites are hugely valuable, and the natural environment is probably better than it would have been without them. However, there are substantial issues that constrain their ability to protect nature and, therefore, contribute to an effective 30x30 target, including insufficient funding, and a wide range of pressures inside and outside their boundaries. These issues extend to the wider network and spaces between PAs. Meanwhile, some of the UK's largest PAs designated as protected landscapes do not (and were not designed to) specifically prioritise biodiversity. Herein lies great potential, given the existence of governance frameworks associated with these designations, which should be adapted to improve nature protection.

The UK government must be cautious about what is counted towards 30x30; what criteria do areas need to fulfil to contribute to the 30%? The areas that count must *effectively* protect nature in practice, and not merely exist as lines on a map. In the UK, the main effort to meet 30x30 is less about designating new areas and more about transforming existing areas so that they can deliver for nature.

To move towards 30x30 requires political will and long-term political and financial commitments. Meaningful area-based conservation also calls for the empowerment and resourcing of statutory agencies, communities, and landowners to support management, monitoring, and enforcement, in a manner that includes and benefits local people as part of an effective and equitable system of governance.

This report recommends that transformative changes in thinking and policy are necessary for the UK to attain 30% coverage of effective area-based conservation designations by 2030, with findings echoing those published previously by others (e.g., the *Making Space for Nature*[iii] report). The current portfolio of PAs on land and in the seas across all four nations is extremely valuable for nature, providing substantial opportunities to protect the UK's biodiversity and contribute to the recovery of nature. Still greater ecological and societal benefits can be achieved through improved management and monitoring and reconfiguring PAs and the spaces between them as a connected network. Therefore, the ambitious goals around area-based conservation and the UK's environment are very welcome; now they must be delivered effectively.

QUESTIONS ADDRESSED BY THIS REPORT

Towards making policy recommendations and identifying evidence gaps, this report addresses the central role of PAs in nature conservation, and the important supporting roles of OECMs and the wider environment, by answering eight questions, which form the section headings of the report:

1. What kind of PAs are there in the UK?
2. What are the benefits provided by area-based conservation, and how can we measure them effectively?
3. What is the current state of protected areas and what are their biodiversity trends?
4. How can PAs and OECMs contribute to the wider ecological network?
5. How can the effectiveness of PAs be improved?
6. How can UK area-based conservation support nature's recovery on land and in the sea?
7. Which terrestrial area-based conservation approaches should count towards 30x30?
8. Which marine area-based conservation approaches should count towards 30x30?

Each of these questions is answered in as much detail as the scientific evidence allows, while highlighting evidence gaps and making policy recommendations, which are summarised in the table in the *Policy Recommendations* section. Evidence has been drawn from academic and non-academic works, as well as through surveying and interviewing experts from conservation charities, non-governmental organisations (NGOs), and various types of research institutions, as well as individuals such as landowners (see *Acknowledgements*).

[iii] Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J., and Wynne, G.R. 2010. *Making Space for Nature: A Review of England's Wildlife Sites and Ecological Networ*k. Report to Defra. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20130402170324mp_/http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf [Accessed 07 March 2022]

POLICY RECOMMENDATIONS

Designating an area of land or sea does not automatically make it an effective protected area (PA). Designation is simply the first step in a long process towards ensuring that long-term ecological benefits are delivered for nature and people. To be effective, a PA needs adequate implementation, enforcement, monitoring, and long-term protection.

More effective protection is necessary, but is not in itself sufficient for the recovery of nature in the United Kingdom; an integrated approach for land and sea is required. This means first targeting a core set of protected sites that prioritise nature, extensively complemented by a mix of other designations (including other effective area-based conservation measures (OECMs)), mechanisms, and activities that may not prioritise nature but still provide benefits for biodiversity. Indeed, while PAs are essential for nature's recovery, it is imperative to remember that no matter what their level of protection is, they cannot achieve the recovery of nature without the wider areas in between them working towards that same goal, nor without political will and societal responsibility for a sustainable environment.

A network of well-implemented and well-resourced PAs will deliver a wide range of environmental and socio-economic benefits. Partnerships between different sectors of society, supported by governance structures, are fundamental to realising this vision, alongside effective management, monitoring, and enforcement. This arrangement will support desirable outcomes for both nature and the people who live in, work in, benefit from, and visit these places.

The UK government and the three devolved administrations have committed to protect 30% of the land and sea of the four nations by 2030. In order to progress towards this objective, and the wider recovery of nature, UK governments need to expand and improve the existing network of PAs and complement it with OECMs across land and seas.

RECOMMENDATIONS FOR AN AREA TO COUNT TOWARDS 30X30

Based on evidence synthesised by this report, recommendations are presented around a set of **'ABCD' criteria** (also see *Section 6* of this report). These should be used to determine and inform: (i) what a site must achieve to be counted towards 30x30, and (ii) how these sites can be supported by the wider network. The 'ABCD' criteria apply both to protected sites and landscape designations.

A. Area delivers for nature in the long term

i. To be considered for the 30x30 target, a PA or OECM must deliver effectively for nature in the long term. Effectiveness and outcomes should be assessed by 2030 where there is available and reliable data.
   1. Where it is not possible to reliably assess effectiveness by 2030, which will be the case for many sites because of data shortfalls, the area must be legally committed to actions that will result in long-term nature protection.
   2. In this case, a mechanism that will allow effectiveness to be reliably assessed must exist by 2030.

ii. Pressures, both internal (e.g., damaging fishing activities, unsustainable land management, wetland drainage) and external (e.g., pollution from outside the PA), need to be addressed. This includes the need for areas to be valued holistically in the planning process (e.g., for infrastructure projects), with considerations going beyond just their direct economic value (e.g., fishing, agriculture) to include their wider benefits for nature and society.

iii. OECMs can be very important towards achieving 30x30 and offer a wide range of societal benefits, but an area can only qualify as an OECM if the longevity of nature protection is ensured. This will require legislation for this novel type of area-based conservation.

iv. A transformational change is needed for the UK's sizeable protected landscapes (including National Parks and Areas of Outstanding Natural Beauty) if they are to provide long-term protection for nature and count towards 30x30 as a continuous area (i.e., in places where they do not overlap with protected sites). Specific recommendations for these areas are detailed below the ABCD criteria.

B. Build ecological resilience and improve biodiversity in the face of climate change and other environmental pressures (e.g., population expansion, land use change).

i. This can be achieved using existing feature-based designations (e.g., where a site is designated for a particular habitat), but must also consider the wider ecosystem, including the areas between PAs (inclusive of buffer zones, habitat corridors and OECMs).

ii. Climate change is driving shifts in species' ranges. A resilient network should be pursued because it will help minimise negative impacts for some species (e.g., population declines and extinctions), and produce positive outcomes for others as they move around the PA network tracking climatic conditions into an uncertain future.

iii. The network, comprising PAs, OECMs, and the areas between, must support overall ecosystem health through representative habitat provision and connectivity across land, sea, freshwater, and coasts, accounting for the range of ecological functions within each.

iv. The networks will be more effective if coordinated between nations within the UK, and across international borders, so collaboration is encouraged.

C. Conservation outcomes achieved through effective management and monitoring

i. A site must be managed to ensure it delivers conservation outcomes, and monitored so that management can be adjusted when necessary.

ii. This will require site-specific management and monitoring approaches, the goals of which should be specified such that they benefit the whole network and national nature recovery efforts.

iii. The requirement to set goals that demonstrate clear improvements to biodiversity and monitor progress should be legislated to ensure consistency and accountability; this will also ensure reliable evidence for future assessments.

iv. Identification and monitoring of key ecosystem functions, and their maintenance and restoration, will enhance the UK's natural capital, therefore benefiting people and nature.

v. This increased need for management and monitoring will require substantial and sustained funding and resourcing across the four nations to ensure information is collected at regular time intervals to effectively monitor change and inform management. The increased availability of standardised data will be important for modelling future scenarios under climate change, taking species range shifts into account, thus supporting adaptive management efforts locally, regionally, and nationally.

vi. Monitoring should align with existing international standards where possible. This will enable better reporting of UK PAs.

vii. Greater participation from non-governmental organisations (NGOs) and citizens should be encouraged, as part of a consistent and coordinated monitoring approach.

viii. A coordinated effort is required to create a central inventory of habitat restoration and re-creation across the UK.

D. Developed and delivered inclusively

i. Co-designed systems of governance should be embedded to ensure that conservation goals, incentives, and penalties (to limit pressures on nature) are developed with local communities in partnership with landowners, NGOs, researchers, government agencies, and other stakeholders.

ii. In particular, incentives must make nature restoration worthwhile for landowners (e.g., through payments for ecosystem services), while meeting Criterion A regarding longevity. Skillsets, familiarity with local environments, and social relations take time to develop, but they are key to ensuring the acceptance, effectiveness, and long-term success of conservation goals.

iii. Schemes should carefully consider complementary public and private funding opportunities.

RECOMMENDATIONS FOR PROTECTED LANDSCAPE DESIGNATIONS

Sites designated as protected landscapes (including National Parks and Areas of Outstanding Natural Beauty) present unique opportunities for biodiversity in the UK. Given that they encompass a wide range of habitats and environmental conditions, their contribution to nature's recovery and society more generally could be immense. Protected landscape authorities have excellent relationships with people who own and work the land, which means change could be rapid, given adequate resourcing. However, until significant reform is delivered, this category of PA should not be automatically included in the 30x30 target[i]. This is because, while these areas may provide some biodiversity benefits, they do not necessarily deliver for nature in the long term in their totality. This is in no small part the result of chronic under-resourcing for actions on the ground, despite people who work for relevant authorities being passionate about nature.

Essentially, protected landscapes do not currently meet the ABCD criteria, so there are questions of what they must do and by when in order to meet these criteria and be considered for 30x30 by delivering for nature. Commitments to enhance biodiversity were made by these designations as part of the *Putting Nature on the Map*[ii] initiative in 2014, but this has not translated to changes on the ground due to underfunding. Substantial and sustained resourcing is required towards developing and actioning an aspirational roadmap.

A transformational change should repurpose protected landscapes to ensure nature's recovery, while ensuring that the goals of different protected landscape designations are complementary. This repurposing should make use of existing governance structures associated with these designations and ensure positive outcomes for the people who live in, work in, benefit from, and visit these special places, in line with recommendations made by the *Glover Review*[iii] for England.

For the inclusion of protected landscapes in 30x30, this report's recommendations are:

1. The development of a clear aspirational roadmap that commits protected landscapes to tangible actions that will benefit people and deliver for nature and landscapes. Pledged actions must align with the ABCD criteria.
    a. Substantial resources will have to be committed to support actions on the ground, including the ability of authorities to use their powers as part of their duty of regard.

[i] This is in agreement with the UK Government's response to the Glover Review, which states "At present, under their current statutory purposes, level of protection and management, protected landscapes cannot be said to contribute towards 30 by 30 in their entirety, and they must do more to drive the recovery of nature." https://www.gov.uk/government/publications/landscapes-review-national-parks-and-aonbs-government-response/landscapes-review-national-parks-and-aonbs-government-response. The Nature Recovery Green Paper also states that "Our current and future National Parks and Areas of Outstanding Natural Beauty (AONBs) could play an important role in achieving our 30 by 30 commitment, but we know that they must do more to drive the recovery of nature. Under their current statutory purposes, level of protection and management, it is our view that they cannot be said to contribute towards 30 by 30 at this time". https://consult.defra.gov.uk/nature-recovery-green-paper/nature-recovery-green-paper.

[ii] Crofts, R., Dudley, N., Mahon, C., Partington, R., Phillips, A., Pritchard, S. and Stolton, S., 2014. *Putting Nature on the Map: A Report and Recommendations on the Use of the IUCN System of Protected Area Categorisation in the UK*. United Kingdom: IUCN National Committee UK. [online] Available at: https://portals.iucn.org/library/sites/library/files/documents/2014-040-Summary.pdf [Accessed 08 March 2022].

[iii] Glover, J., 2019. *Landscapes Review: Final Report*. [online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/833726/landscapes-review-final-report.pdf [Accessed 08 March 2022].

   b. Commitments made must be associated with a formal follow-up process by government and statutory bodies to assess actions and outcomes. This recommendation is largely based on the fact that a consistent follow-up process was not set up for the commitments made in 2014 as part of the Putting Nature on the Map process.
   c. Landscapes and nature should be considered in tandem, meaning that their objectives should align towards mutual benefits.
   d. Some protected landscape designations will be better placed to deliver for nature according to their original designation, but all have potential to deliver for nature and should be supported to do this as a network.

2. If protected landscapes are to deliver for nature as effective PAs or OECMs, they should be treated as such, so that pressures (e.g., from infrastructure projects) are limited (see Criterion A). This extends to valuing the land within them beyond their agricultural value, and ensuring their true value is reflected in planning.

3. Protected landscape authorities should be given the resources to encourage and support landowners and farmers in coming together and accessing government schemes to support the recovery of nature across large areas. Protected landscapes cannot succeed as PAs without agricultural policies that support nature.

   a. Where agricultural schemes are tiered (e.g., Defra's Environmental Land Management schemes in England) or where more than one is on offer, higher level schemes that best protect nature should be prioritised across as wide an area as possible.

   b. Measuring effectiveness should take precedence over assessing promised actions. However, there will not be time to assess effectiveness by 2030 in most protected landscapes due to limited data availability. Therefore, if proposed commitments meet the ABCD criteria (in particular, that they are likely to be effective and will be long term), individual sites could contribute to 30x30.

   c. In line with the ABCD criteria, monitoring would then be used to demonstrate effectiveness beyond 2030. This should be embedded in the landscape's aspirational roadmap.

   d. At a larger scale, if these qualifying areas cover a sufficiently large proportion of the designated protected landscape in combination with other existing designations (e.g., Sites of Special Scientific Interest (SSSIs)), such that the area holistically meets the ABCD criteria, this may qualify the whole designated landscape for inclusion in 30x30.

   e. The boards of all protected landscape authorities should include nature experts, who should, as a matter of urgency, review the landscape's mandate to bring them in line with the ABCD criteria and policy recommendations towards 30x30.

4. Where areas using government schemes do not meet the ABCD criteria (e.g., because the protection is short term) they cannot count towards 30x30. However, their contribution to nature should still be recognised because they will improve prospects for the nature recovery network as a whole by making the space between PAs less hostile to nature.

5. This report is addressing inclusion of these landscapes in 30x30 according to the ABCD criteria and not recommending whether a given landscape should be considered a PA or an OECM. This should be based on the extent to which a protected landscape prioritises biodiversity, being an OECM if biodiversity benefits but is not the priority and a PA if biodiversity is prioritised.

KEY FINDINGS AND EVIDENCE GAPS

A summary of the questions addressed in this report, the answers to them (all sections) and evidence gaps identified *(Sections 1-5)*.

SECTION	ANSWER	EVIDENCE GAPS
1. What kind of protected areas are there in the UK?	The UK's conservation portfolio comprises statutory and non-statutory protected sites and protected landscapes. 27.8% (land) and 38.2% (seas) are designated, but do not always prioritise or deliver for nature. For example, protected landscapes (recognised internationally as a type of PA) are included but are not designated primarily for biodiversity.	OECMs can help achieve 30x30, but more research is needed to define how they can be best deployed to support and enhance existing PAs in meeting the 30x30 target.
2. What are the benefits provided by area-based conservation, and how can we measure them effectively?	PAs have the potential to be one of the most effective tools for protecting biodiversity and delivering a wide range of ecosystem services, including human health and socio-economic benefits. OECMs can complement PAs and contribute to nature recovery and conservation while delivering other societal benefits.	Further research is needed to define which biodiversity metrics can be practically and usefully implemented to ensure that conservation targets can be transparently set and assessed, accounting for the dynamics of ecosystems and climate change.
3. What is the current state of protected areas and what are their biodiversity trends?	Only 43% – 51% of statutory protected sites are in favourable condition, but differences in reporting make it difficult to generalise and assess how many are recovering. Biodiversity data are limited, but it seems that representation of species' distributions within PAs is low. Overall, PAs support higher species richness than unprotected sites.	Information on the condition of key features and biodiversity are needed to fully understand ecological change in PAs. Up-to-date information on statutory site condition is often missing (with no data at all for many non-statutory sites) because of lack of resources, making it difficult to reliably monitor site condition at scale. There is no scheme to consistently assess biodiversity in PAs and for comparable areas outside PAs. There is no central inventory of habitat recreation and restoration, meaning the planned scale and pace of efforts is unknown.
4. How can PAs and OECMs contribute to the wider ecological network?	PAs are valuable for supporting biodiversity in the wider environment, but the current UK terrestrial PA portfolio does not constitute a functional or resilient ecological network; MPAs may be better but there are still large knowledge gaps. Where unfavourable conditions exist, positive change may be slow or impossible if external pressures are too substantial. Spaces between PAs need to be hospitable for species to move, which will benefit PAs and the wider environment.	Evaluations of PA networks are incomplete, particularly in terms of connectivity. Further research, supported by new modelling techniques, should focus on what is needed to create a resilient network. More work is needed on the potential role of rewilding as part of nature's recovery, where it could be most effective, and implications for monitoring rewilded sites.
5. How can the effectiveness of protected areas be improved?	PA effectiveness can be improved by ensuring that they can effectively address negative pressures, deliver positive management, and have the right monitoring in place to inform this. Combining top-down and bottom-up approaches to PA governance enhances landowner and stakeholder buy-in, promoting equitability and ownership.	Few empirical studies examine UK PAs through the eyes of the people on the ground and the communities who have a direct impact on their effectiveness through ownership and management. More research is needed to explore the potential of bottom-up initiatives, how to integrate them with top-down initiatives, and how to encourage and support them.
6. How can UK area-based conservation support nature's recovery on land and in the sea?	Effectiveness and coverage of PAs both matter. The effectiveness of existing area-based conservation can be assessed by the ABCD criteria: that the Area delivers for nature in the long term; Builds ecological resilience and maximises biodiversity; achieves Conservation outcomes through effective management and monitoring; and is Developed and delivered inclusively.	
7 and 8. Which terrestrial and marine area-based conservation approaches should count towards 30x30?	The success of PA networks cannot be based purely on coverage. Large differences exist between the types of PAs and their effectiveness for nature conservation. To be counted in the 30x30 target, conserved areas should contribute meaningfully to nature recovery (by meeting the ABCD criteria), producing positive outcomes for nature and people.	

SECTION 1

WHAT KIND OF PROTECTED AREAS ARE THERE IN THE UK?

Constance M. Schéré and Charles A. Cunningham

SUMMARY

The government in the United Kingdom (UK) has committed to protect 30% of its land and sea by 2030 through the 30x30 pledge to 'support the recovery of nature'. Within the UK, there are many terrestrial and marine protected area (PA) designations, each with different objectives and protection levels, which sometimes overlap. These comprise statutory and non-statutory protected sites and protected landscapes. A total of 27.8% and 38.2% of UK land and seas, respectively, are covered by at least one designation, although these vary in the extent to which they currently deliver for nature. For example, protected landscapes are included in these figures but do not consistently deliver for nature and were not designated for biodiversity conservation.

EVIDENCE GAPS

As well as protected areas, policymakers should also utilise recently-defined 'other effective area-based conservation measures' (OECMs). Although still a nascent concept, these could provide a valuable complementary approach to PAs by delivering for nature, even though biodiversity conservation is not their primary focus. OECMs have the potential to help attain 30x30 in a meaningful way, but more research is needed to define how they can be best deployed to support and enhance existing PAs in meeting the target.

1.1 INTRODUCTION TO THE 30X30 PLEDGE AND PROTECTED AREAS

In September 2020, the UK government pledged to protect 30% of its land by 2030 to support the recovery of nature[1], having previously made the same commitment for the oceans through the Global Oceans Alliance in 2019[2]. This 30x30 target was recently endorsed by the International Union for Conservation of Nature (IUCN) at its World Conservation Congress[3], and 30% protection will likely be a target included in the Convention for Biological Diversity (CBD) Post-2020 Global Biodiversity Framework[4]. In addition, 30x30 is part of the new strategy within the OSPAR[i] network of marine protected areas (MPAs)[5].

According to the Joint Nature Conservation Committee (JNCC), 27.8% of UK land[ii] and 38.2% of UK seas are protected[6]. However, this includes sites and whole designation types that do not deliver for nature because they are primarily protected for other purposes[7]. Hence delivering 30x30 in a way that supports the recovery of nature requires a suite of area-based conservation measures that deliver effective and equitable management for the most important areas for biodiversity and its contributions to people[8]. While a relatively small number of additional sites may be needed to achieve the 30x30 coverage target, a far greater effort is required to ensure that this 30% will deliver *effective* nature conservation. Effective area-based conservation can come from either protected areas (PAs) or 'other effective area-based conservation measures' (OECMs) (Box 1.1).

1.2 PROTECTED AREAS

PAs are an area-based conservation tool for protecting the most important areas for biodiversity. Within the UK, there are many terrestrial and marine PA designations, each with different objectives and protection levels.

PAs in the UK can be divided into three groups that can be considered against an international classification of PAs developed by the International Union for the Conservation of Nature (IUCN) (Box 1.2):

1) 'Statutory protected sites' with nature conservation as a primary purpose;

2) 'Non-statutory protected sites' with nature conservation as a primary purpose but not receiving statutory protection;

Much larger 'protected landscapes' designated for cultural, landscape or recreational value and with nature conservation recognised less clearly as a primary purpose[9,10,11].

Table 1.1. shows the types of designations and their coverage in the UK.

PAs are considered 'statutory' if they are legally designated, or 'voluntary' if protected and managed by non-governmental stakeholders[12]. Statutory and voluntary designations often overlap, particularly for marine sites[13]. While both terrestrial and marine PAs aim to prevent or reduce negative interventions (e.g., around certain fishing practices), a crucial difference is that terrestrial conservation more often involves positive management interventions to maintain certain habitat types or species, such as mowing to maintain a species-rich meadow. In fact, terrestrial conservation commonly targets 'semi-natural' or plagioclimax communities that require intervention for their continued existence. Such places may also provide cultural and provisioning services, e.g., hay meadow management providing a crop while also keeping a floristically diverse sward. In contrast, marine habitats are generally protected through removal of pressures to facilitate self-sustaining habitat conservation or recovery, requiring less or no active management[14,15]. Some interventions such as seagrass planting may speed up natural recovery, but are a start-up activity and do not involve ongoing management[16]. MPAs are also generally much larger than terrestrial PAs, with greater connectivity for many species.

BOX 1.1: USE OF TERMINOLOGY IN THIS REPORT

Area-based conservation: A term that encompasses PAs and OECMs

A protected area (PA) is defined globally by the IUCN as "A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values"[1].

Use of 'protected area' in this report. This report uses 'protected areas' to refer to all the UK's protected areas, including protected landscapes (National Parks and AONBs) and protected sites (e.g., SSSIs) (see Table 1.1).

Other effective area-based conservation measure (OECM): A geographically-defined area other than a PA, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and, where applicable, cultural, spiritual, socioeconomic, and other locally-relevant values. OECMs are not PAs and the terms are used distinctly.

Feature-based conservation: Conservation that aims to protect individual features (such as a particular species, habitat, or substrate), which may not always cover the entire area of a site[2].

[1] Dudley, N. ed., 2008. *Guidelines for applying protected area management categories*. [online] Available at: https://portals.iucn.org/library/sites/library/files/documents/PAG-021.pdf [Accessed 23/03/2022].

[2] Solandt, J.L., Mullier, T., Elliott, S. and Sheehan, E., 2020. Managing marine protected areas in Europe: Moving from 'feature-based' to 'whole-site' management of sites. In Humphreys, J., and Clark, R. W. E. (Eds), *Marine Protected Areas*. Elsevier.

[i] OSPAR is the mechanism by which 15 Governments and the EU cooperate to protect the marine environment of the North-East Atlantic. It is named after the original Oslo and Paris Conventions ("OS" for Oslo and "PAR" for Paris). https://www.ospar.org/.

[ii] Note that this falls to 10.6% terrestrial coverage when protected landscapes such as National Parks and Areas of Outstanding Natural Beauty are excluded.

BOX 1.2: IUCN CATEGORIES

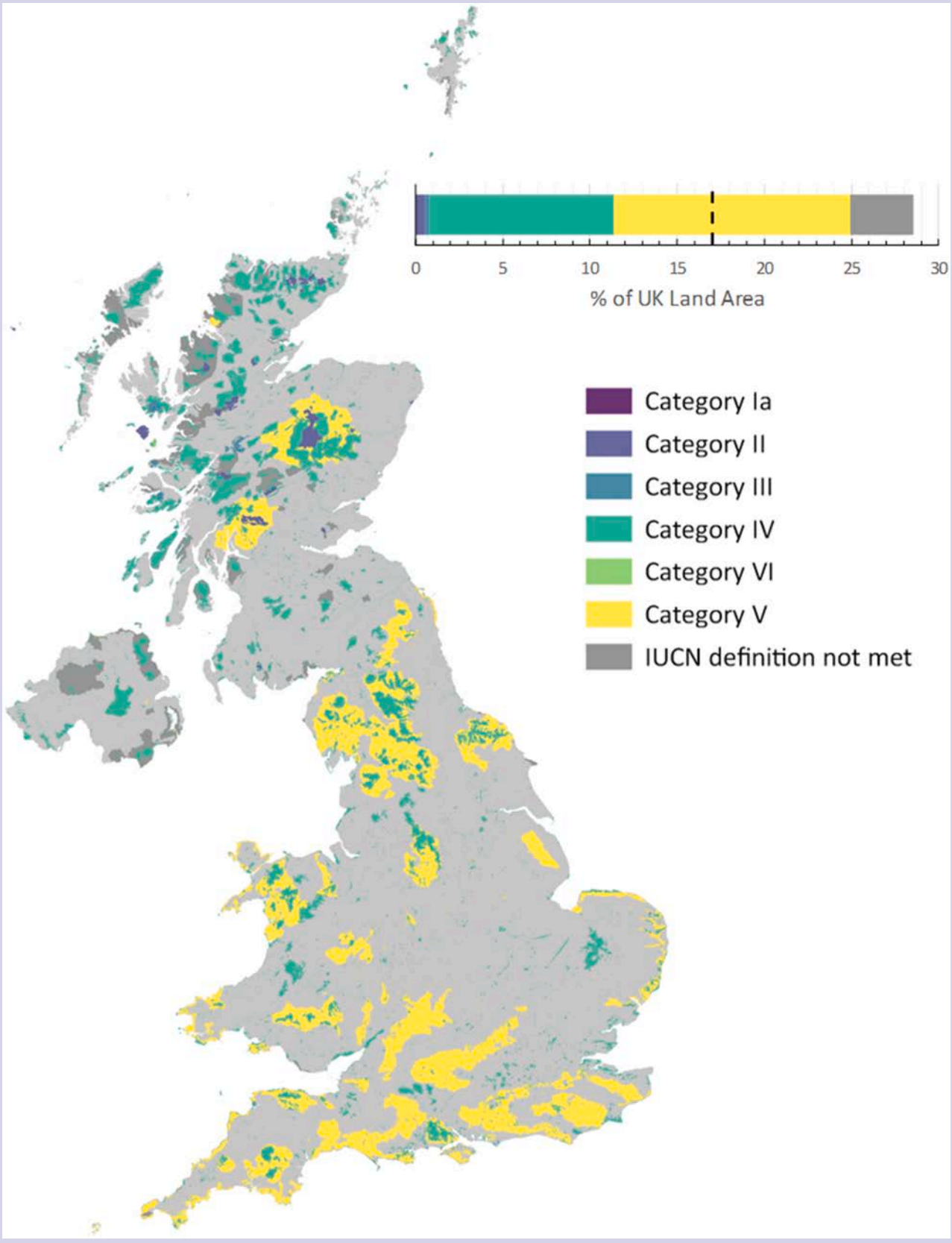
CATEGORY	TITLE	DETAILS	UK CONTEXT
Ia	Strict Nature Reserve	Strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphical features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values	The long history of human use of land in the UK means that very few and small areas are categorised in IUCN categories I to III, i.e., those that offer the highest level of biodiversity protection[1].
Ib	Wilderness Area	Large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation	
II	National Park	Large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities	
III	Natural Monument or Feature	Set aside to protect a specific natural monument, including geological or living feature	
IV	Habitat/Species Management Area	Aim to protect particular species or habitats and management reflects this priority	'Statutory protected sites', such as for example Sites of Special Scientific Interest (SSSI) and national Nature Reserves (NNR). These are usually less that 10 km^2, and typically much smaller.
V	Protected Landscape/ Seascape	The interaction of people and nature over time has produced an area of distinct character with significant, ecological, biological, cultural, and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values	'Protected landscapes' such as National Parks (NP) and possibly Areas of Outstanding Natural Beauty (AONB). Large landscape-scale protected areas, which offer lower levels of protection
VI	Protected area with sustainable use of natural resources	Conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems.	UNESCO biosphere reserves
Unclassified			'Non-statutory protected sites' such as Local Wildlife Sites (some may qualify as category IV)

Please note that in the UK context, the term "National Park" refers to a kind of landscape designation that falls under IUCN category V, and not category II.

IUCN category IV: Arran Northern Mountains, Scotland

BOX 1.2 (CONTINUED)

UK designated sites and their IUCN categories. Figure from Starnes *et al.* (2021)[1] reproduced under a CC BY 4.0 license



[1] Starnes, T., Beresford, A.E., Buchanan, G.M., Lewis, M., Hughes, A. and Gregory, R.D., 2021. The extent and effectiveness of protected areas in the UK. *Global Ecology and Conservation, 30*, p.e01745.

Table 1.1: UK protected area designations[17,18] and coverage values[19].
Brown designations are terrestrial, blue are marine and green can be either terrestrial or marine. Note that designations often overlap (e.g., an SSSI can be within a National Park) and that the coverage values given in the table for protected landscapes do not include the statutory protected sites within them. If we include overlap with statutory protected sites, 24.1% of land in Northern Ireland is covered by Areas of Outstanding Natural Beauty (AONBs)[1]; 12.7% of Scottish land is covered by National Scenic Areas (NSAs)[2] and 7.2% by National Parks (NPs); 14.5% of English land is covered by AONBs and 9.3% by NPs, and 4.5% of Welsh land is covered by AONBs and 19.9% by NPs[3,4].

TYPE	DESIGNATION AND ORIGIN	OBJECTIVES	COVERAGE (%)
Statutory protected sites	**Marine Conservation Zone (MCZ)** Marine Coastal Access Act 2009 and Marine Act (Northern Ireland) 2013.	MCZs protect a range of nationally important habitats and species in England, Wales, and Northern Ireland.	**At sea:** England, 40.3% Scotland, 36.9% Wales, 50.3% Northern Ireland, 35.6% United Kingdom, 38.2% **On land:** England: 6.5% Scotland: 17.6% Wales: 10.6% Northern Ireland: 9.8% United Kingdom: 10.6%
	Marine Protected Area (MPA) Marine (Scotland) Act 2010.	MPAs include sites for nature conservation, protection of biodiversity, sustainable management and protection of national heritage.	
	Marine Nature Reserve (MNR) Wildlife and Countryside Act 1981.	MNRs are a type of MPA intended to conserve particular species and habitats, or enable their recovery.	
	Special Area of Conservation (SAC) EU Habitats Directive, 1992.	Support internationally important habitats and/or species listed in the EU Habitats Directive by managing areas according to the ecological needs of the focal habitats or species.	
	Special Protection Area (SPA) EU Birds Directive, 1979.	Safeguard important habitats for the breeding, feeding, wintering or the migration of rare and vulnerable species of birds found within EU countries.	
	Wetlands of International Importance (Ramsar) Ramsar Convention, 1971	Conservation and sustainable use of all wetlands containing representative, rare, or unique wetland habitats that are contribute to global biological diversity.	
	Site of Special Scientific Interest (SSSI) National Parks and Access to the Countryside Act 1949, Wildlife and Countryside Act 1981 (as amended) and Environment Order (Northern Ireland) 2002.	Safeguard the diversity and geographic range of habitats, species, and geological and physiological features of national importance by ensuring appropriate management is in place to conserve its special features. Equivalent to Areas of Special Scientific Interest (ASSI) in Northern Ireland.	
	National Nature Reserve (NNR) National Parks and Access to the Countryside Act 1949.	Preservation of nationally- or internationally- important habitats, species, and geology and to provide opportunities for people to enjoy and engage with nature. NNRs promote places to conduct scientific research, which is an important objective of these sites.	
	Local Nature Reserve (LNR) Section 21 of the National Parks and Access to the Countryside Act.	Inspire people to value and conserve natural areas that are important for wildlife, geology, education, or public enjoyment; provide a positive use for land that might otherwise be perceived as available for development. (Considered not to meet any IUCN category description.)	
Non-statutory protected sites	**Site of Nature Conservation Interest/County Wildlife Site/Local Wildlife Site.**	Areas with substantiative nature conservation value that direct development away from ecologically valuable sites.	
	Voluntary Marine Conservation Area (Heritage Coast)	Run by various organisations and steering groups, often supported by community groups or volunteers. Many of the original UK VMCAs are now statutory MPAs[20].	
Protected landscapes	**National Park (NP)** National Parks and Access to the Countryside Act 1949, Environment Act 1995 and National Parks (Scotland) Act 2000.	Conserve and enhance the natural beauty, wildlife, and cultural heritage of landscapes; to facilitate opportunities for recreation that promotes the public understanding and enjoyment of the area.	England: 19.9% Scotland: 12.0% Wales: 18.8% Northern Ireland: 18.6% United Kingdom: 17.2%
	Area of Outstanding Natural Beauty (AONB) Countryside and Rights of Way Act 2000 (England and Wales), Nature Conservation and Amenity Lands Order 1985 and Amenity Lands Act 1965 (Northern Ireland).	Conserving and enhancing the natural beauty of landscapes encompassed by landform and geology, plants and animals, landscape features, and the rich history of human settlement.	
	National Scenic Area (NSA) Planning etc. (Scotland) Act 2006.	To identify and ensure the protection of areas of outstanding scenic value from inappropriate development. NSA are not considered to meet any IUCN category description.	
Other effective area-based conservation measures (OECM)	No current designations (but some existing schemes could be considered to fall within the definition, such as long-running Higher-Level Stewardship agreements).	Achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity with associated ecosystem functions and services and, where applicable, cultural, spiritual, socio–economic, and other locally-relevant values.	

[1] Department of Agriculture, Environment and Rural Affairs [DAERA], 2020. *Natural Environment Map Viewer.* [online] Available at: https://www.daera-ni.gov.uk/services/natural-environment-map-viewer [Accessed 11 April 2022]

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[3] National Parks, 2020. *Key Facts and Figures for all 15 UK National Parks.* [online] Available at: https://www.nationalparks.uk/app/uploads/2020/10/Key-Facts-and-Figures-for-the-15-UK-National-Parks.pdf [Accessed 11 April 2022]

[4] Ordnance Survey, 2020. *Using data to explore Great Britain's AONBs and NSAs.* [online] Available at: https://www.ordnancesurvey.co.uk/newsroom/blog/using-data-to-explore-great-britains-aonbs-and-nsas#:~:text=AONBs%20are%20protected%20and%20enhanced,in%201980%20under%20planning%20legislation [Accessed 11 April 2022]

1.3 OECMs

In addition to PAs, 'other effective area-based conservation measures' (OECMs; Box 1.1) also deliver effective conservation of biodiversity, even though this may not be their primary objective[21] (Box 1.3). While PAs tend to be managed specifically for nature, OECMs do not have to be, so long as they are effective in delivering for nature in the long term (e.g., a section of a primarily resource-producing area (farm/commercial forestry etc.) that provides long-term biodiversity benefits)[22]. Although the importance of OECMs in supporting PAs was recognised within Aichi Target 11[23], a formal definition was not agreed until recently, which may explain why they have been largely overlooked in most national policies[24]. There are no formally recognised OECM designations within the UK and so there is a substantial opportunity to operationalise OECMs to support PAs through landscape-scale conservation projects.

1.4 CONSERVATION NETWORKS

Although area-based conservation measures are designated individually for a variety of reasons, collectively they are often referred to as networks. Despite this terminology, these networks do not necessarily constitute functional ecological networks; they simply refer to a collection of area-based conservation measures without reflecting key components of networks such as resilience and connectivity[25,26].

Conservation networks can be considered at different scales, depending on the scope of conservation objectives, from county level (e.g., Local Nature Recovery Strategies), to each of the four nations, to UK, to European (e.g., OSPAR; Case Study 1.1), to a global level (e.g., post-2020 global biodiversity framework CBD). These networks can deliver more for nature if coordinated with neighbouring and intersecting networks[27], although this may be more difficult for the UK MPA network and terrestrial PAs in Northern Ireland due to international borders. For example, freshwater systems impact on the marine environment[28], particularly estuaries, and this highlights how an integrated approach to management is needed to ensure land use and other terrestrial activities do not damage marine species and habitats[29,30]. Where possible, it would be more effective to coordinate the delivery of 30x30 across the UK than delivering 30x30 within each nation individually.

BOX 1.3: OECM CATEGORIES

OECMs can be grouped into three categories:

1. Ancillary conservation, where conservation is delivered as a by-product of management although not an objective (e.g., shipwrecks and some military training grounds);
2. Secondary conservation, where biodiversity outcomes are a secondary objective (e.g. some botanical gardens and traditional agricultural systems);
3. Areas that technically meet PA criteria, but where the governance authority does not wish the area to be reported as a PA.

UNEP-WCMC, IEEP and Trinomics, 2021. *Assess the potential of other effective area-based conservation measures as a driver for landscape-level conservation and connectivity in the EU.* Report for European Environment Agency. [online] Available at: https://biodiversity.europa.eu/protected-areas/other-effective-area-based-conservation-measures/final_report_oecms_in_eu_submitted_2021031.pdf/@@download/file [Accessed 22 December 2021].

CASE STUDY 1.1

OSPAR CONVENTION'S NETWORK OF MPAS

The Convention for the Protection of the Marine Environment of the North-East Atlantic[1] (also known as the OSPAR Convention because it resulted from the unification of the 1972 Oslo Convention and the 1974 Paris Convention) has been signed and ratified by 15 European governments and the EU. These parties cooperate through this Convention to protect the marine environment of the North-East Atlantic.

551 MPAs, covering almost 950,000 km^2, have been designated under the OSPAR network in Territorial Waters (TW), Exclusive Economic Zones (EEZ) and Areas Beyond National Jurisdiction. Of these, 366 are in the UK.

The table below shows the area and proportion of UK and total ocean area covered by OSPAR MPAs in the signatory countries.

[1] OSPAR Commission, 2022. *Key figures of the MPA OSPAR network.* [online] Available at: https://mpa.ospar.org/home-ospar/key-figures [Accessed 4 February 2022]

Contracting Party	Number of MPA	Coverage (km^2 and % of total surface area of that zone)							
		Territorial Waters		Exclusive Economic Zone		Areas beyond National Jurisdiction		Total area of North-East Atlantic[i]	
		km^2	%	km^2	%	km^2	%	km^2	%
United Kingdom	366	58,468.2	35.0	237,251.1	41.4			295,719.3	39.9
Total OSPAR zone	**551**	**184,719.3**	**16.9**	**297,922.9**	**4.3**	**464,839.7**	**8.2**	**947,481.9**	**6.9**

[i] Sum of Territorial Waters and Exclusive Economic Zones of all states that have ratified the OSPAR Convention and Areas beyond National Jurisdiction in North-East Atlantic. Maps available at OSPAR (2022)[1]

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SECTION 2

WHAT ARE THE BENEFITS PROVIDED BY AREA-BASED CONSERVATION, AND HOW CAN WE MEASURE THEM EFFECTIVELY?

Charles A. Cunningham and Donal C. Griffin

SUMMARY

In addition to ecological benefits, such as the protection and restoration of biodiversity, protected areas (PAs) and other effective area-based conservation measures (OECMs) can deliver a wide range of ecosystem services, well-being and socio-economic benefits. There are many PAs in the United Kingdom (UK) that were originally designated and managed primarily to protect site-specific features (e.g., a habitat or geological feature), but it is also important to recognise nature's diversity and broader benefits through a more systematic approach.

EVIDENCE GAPS

In order to improve site management and understand how well area-based conservation measures are working, we need to measure the degree to which sites are delivering benefits. Often metrics of effectiveness are based on individual site features, which alone may not give a full picture of how well the wider conservation network delivers for nature. Effective and practical biodiversity metrics need to be developed, agreed and implemented such that area-based conservation targets can be transparently set and assessed in a way that takes the dynamic nature of species and ecosystems, and climate change, into account.

2.1 WHAT ARE THE POTENTIAL BENEFITS PROVIDED BY PROTECTED AREAS AND OECMs?

2.1.1 Achieving site-based conservation objectives

Typically, protected site designations aim to ensure that specific features of nature conservation importance, such as rare or vulnerable species and the 'best' examples of habitat types or geological features, are protected from threats and pressures in the wider environment. Site conservation objectives may be based upon what was present at the time of designation and its condition (e.g., habitat quality or extent, species presence or abundance). If historic evidence exists, site objectives can also potentially be based on an earlier, more desirable, state. This sets a baseline against which future changes can be assessed and management prioritised[1]. One difficulty that arises from setting site conservation objectives against baselines is failure to account for pressures and drivers of change operating beyond the site boundary, such as species range shifts driven by climate change that management measures at individual site level may struggle to address[2,3].

2.1.2 Broader biodiversity benefits

As well as specific conservation benefits directly related to delivering site objectives, area-based conservation measures can also deliver a broader range of ecological benefits[4]. PAs and OECMs can prevent or mitigate threats and wider negative ecological pressures, such as habitat loss and degradation, species extinction and decline of ecosystem functioning[5,6], which involve complex spatial relationships within and between different species, communities[i], and habitats[7]. Broader ecological benefits are usually considered at a regional or network level and include contributing to the overall condition of sites, or the abundance and distribution of species and habitats[8]. It is important to distinguish both specific and broader conservation benefits of PAs and OECMs: while sites may qualify as meeting specific conservation objectives, they may be less successful in delivering for nature more widely.

2.1.3 Wider ecosystem service and socio-economic benefits

Both types of area-based conservation measure (PAs and OECMs) can also deliver benefits beyond biodiversity (e.g., societal benefits), and these may be the primary focus of a given OECM. By protecting the land and seas, these sites can safeguard the provision of ecosystem services, including carbon storage and sequestration, flood risk reduction, pollination, recreation, and water provision and filtration, amongst many others[9].

Area-based conservation can provide more direct economic benefits too, such as increased tourism revenue or replenishment of fisheries[10], and can also deliver positive human well-being outcomes[11,12]. However, equitable management involving local communities is important to ensure that socio-economic benefits are realised locally[13] (Case Study 2.1). There may be trade-offs between ecological and socio-economic benefits[14,15], and integrated planning and management can help find a compromise and create synergies between biodiversity protection and local livelihoods, promoting joint benefits[16].

2.2 HOW CAN WE MEASURE BENEFITS PROVIDED BY AREA-BASED CONSERVATION?

2.2.1 How do we define effectiveness?

In order for area-based conservation measures to deliver benefits, they must be ecologically effective. Ecological effectiveness can be defined as the degree to which sites collectively achieve long-term nature conservation[17] through: (i) meeting specific site-based conservation objectives (*Section 2.1.1*); and/or (ii) the degree to which broader benefits are delivered (*Sections 2.1.2* and *2.1.3*). The overall effectiveness of area-based conservation measures is determined by decisions made at the time of designation, such as sites chosen and objectives defined, influencing the total potential capacity to conserve long-term biodiversity, and long-term management decisions[18,19]. Management measures informed by overarching conservation goals are equally as important as initial location decisions to successfully ensure: (i) the persistence of species and communities, and (ii) the development of an ecologically coherent network[20].

2.2.2 Measuring area-based conservation coverage

National and international area-based conservation targets measure total land and sea coverage. Previous targets by the Convention for Biological Diversity (CBD)[21] set a protection target of 17% of terrestrial and inland water areas and 10% of coastal and marine areas globally by 2020, which was narrowly missed[22]. At a UK level, MPAs extend to more than 30% of the sea, covering 40%, 37%, 50%, and 36% of England, Scotland, Wales, and Northern Ireland's marine jurisdictions respectively[23]. Terrestrial PAs fall just short of the 30% target and make up 26.4% of England, 28.4% of Northern Ireland, 29.4% of Wales, and 29.6% of Scotland[24] (note that these coverage figures include protected landscapes).

Although easy to measure, land and sea coverage says nothing about *which* habitats and species are being protected[25]. Hence coverage of specific features by the conservation network (representation) is a valuable additional metric of performance to assess whether habitats and species are adequately included. Representation of individual habitat characteristics has been key to the site designation approach taken by the UK to date[26] (Box 2.1), but representation could also be considered more systematically in terms of proportion of habitat extent, population of species, or any other ecosystem service or feature of interest. Considering representation of all biodiversity features together determines how representative the conservation network is. Quantifying non-ecological features (e.g., geodiversity encompassing landforms, hydrology, and geology) captures broader benefits and can help assess resilience[27].

On land, many statutory protected sites (often IUCN category IV, e.g., Sites of Special Scientific Interest (SSSIs)) were designated to represent the best examples of habitat, which they do well. As a result of this, however, adequate representation of other features such as species and ecosystem services are less well achieved within the overall PA network.

[i] "An ecological community is the aggregate of groups of various species in ecological systems." (see https://www.sciencedirect.com/topics/earth-and-planetary-sciences/ecological-community)

CASE STUDY 2.1

THE LYME BAY MARINE PROTECTED AREA

Lyme Bay MPA was designated in 2008 by a statutory instrument (SI) which made the use of dredging and trawling (mobile gear fishing) illegal across 206 km^2 of Lyme Bay, which includes coastlines of Devon and Dorset. This was primarily to protect the inshore reef environment. Static gear fishing (pots and nets) and collection of scallops by SCUBA divers is still allowed. These restrictions resulted in positive changes in species richness, total abundance, and assemblage composition in the SI and seven of thirteen indicator species have increased in abundance[1,2].

Understandably, there have been social trade-offs, with mobile gear fishers experiencing economic losses and lower levels of reported well-being than static gear fishers (the situation has however improved through time for mobile gear fishers). In contrast, static fishers have benefitted from the restrictions, in particular thanks to the additional icing and port storage facilities and the Reserve Seafood brand, as well as from the voluntary Code of Conduct and Fully Documented fisheries projects. Lyme Bay shows that restricting certain practices can in fact increase fishing yields, as there have been significant increases in landings of scallops and brown crabs both inside and outside the MPA.

View from Golden Cap, looking towards West Bay and Chesil Beach in Dorset

[1] Davies, B.F., Attrill, M.J., Holmes, L., Rees, A., Witt, M.J. and Sheehan, E.V., 2020. Acoustic Complexity Index to assess benthic biodiversity of a partially protected area in the southwest of the UK. *Ecological Indicators, 111*, p.106019.

[2] Sheehan, E.V., Stevens, T.F., Gall, S.C., Cousens, S.L. and Attrill, M.J., 2013. Recovery of a temperate reef assemblage in a marine protected area following the exclusion of towed demersal fishing. *PloS one, 8*(12), p.e83883.

There is scope to improve representation through systematic conservation planning approaches[28,29]. For example, PAs disproportionately cover upland areas for a variety of historic and socio-economic reasons, even though priority species often occur in lowland areas[30]. Similarly, assessments of the representativeness of the UK's MPA network against the OSPAR principles[ii], particularly for broadscale sediment habitats, found that ecological coherence was not achieved in any of the four UK countries[31,32,33,34]. These representation gaps remain, despite subsequent MPA designations in England, Scotland, and Northern Ireland[35].

As well as ensuring adequate spatial coverage of conservation features, in order to be effective, designated areas also need to ensure nature's long-term protection and recovery.

BOX 2.1: RATCLIFFE CRITERIA

The Ratcliffe Criteria are based on A Nature Conservation Review (1977) by Derek Ratcliffe[1]. In this, Ratcliffe attempted to identify the highest priority sites for conservation in Britain by using a set of habitat criteria. Many of these sites have been designated as SSSIs or other designations, and the criteria still form the foundation of the principles that Defra recommends local authorities use to decide upon sites of local natural importance:

- Size
- Diversity
- Naturalness
- Rarity
- Fragility
- Typicalness
- Recorded history
- Position in an ecological/geographical unit
- Potential Value
- Intrinsic Appeal

[1] Ratcliffe, D., 1977. *A nature conservation review. Volume 1: the selection of biological sites of national importance to nature conservation in Britain.* Cambridge University Press.

2.2.3 Measuring long-term delivery of benefits

Sites need to be monitored regularly to assess how effective they are at achieving specific objectives and delivering broader ecological goals over time. These long-term measures can then inform (adaptive) management and interventions within the conservation network, facilitating development of dynamic conservation strategy. Hence robust and efficient site monitoring programmes are crucial in assessing and delivering long-term effectiveness. Currently within the UK, sites are monitored in terms of meeting specific conservation objectives (*Section 2.1.1*). Site effectiveness is typically assessed through Common Standards Monitoring (Box 2.2). This is a standardised method of assessing sites whereby the condition of features (conservation 'state') for which the site has been notified are judged against specific (condition) objectives[36] (also see *Section 3.3*).

However, biodiversity is multidimensional. There are many different ways that long-term effectiveness can be measured that consider other species and habitats (and potentially ecosystem services), as well as the features of interest. Although more comprehensive monitoring may give a clearer indication of the wider benefits that area-based conservation can deliver, measuring broader long-term delivery of benefits requires more data. Regular monitoring may involve assessment of how conservation 'states' change through time, such as species richness, representation, occurrence, status, condition, and abundance; or specific measures of 'change', such as rates of colonisation, extinction rates, species persistence, and abundance trends. Currently there are no formal datasets to evaluate this, but there are national surveillance schemes (e.g., the Breeding Bird Survey) that have recently been used to compare similar metrics between PAs and other areas[37,38].

Importantly, although area-based conservation measures may not be completely effective in achieving their conservation objectives or maintaining species populations, they have a positive conservation impact such that biodiversity trends would have been worse if they had not been designated[39]. Assessing impact requires monitoring data from outside area-based conservation measures, as well as data from inside, to use as a counterfactual. Data from outside protected areas are also needed in order to monitor the achievement of, and set objectives for, broader ecological and societal benefits of area-based conservation to the wider landscape.

[ii] The OSPAR convention states that the MPA network must be ecologically coherent. This is assessed using the OSPAR design principles:

- **Representativity** (representativeness) – The network should represent the range of marine species, habitats and ecological processes present;
- **Replication** – the network should contain multiple replicates of habitats and species;
- Adequacy – the network should be big enough to deliver its ecological objectives ad ensure long-term protection/recovery;
- **Viability** – the network should be made of self-sustaining geographically dispersed sites;
- **Connectivity** – the network should link individual MPAs;
- **Management** – MPAs should be managed to ensure protection of their protected features.

BOX 2.2: COMMON STANDARD MONITORING

In the UK, standardised assessments of the effectiveness of protected areas are only available for SSSI/ASSI (Site/Area of Special Scientific Interest), SAC (Special Area of Conservation) and SPA (Special Protection Area) designations. Other than this, monitoring can be carried out by National Park and local authorities, but this is not standardised and approaches are variable across the country.

Applying the national Common Standard Monitoring is one of the key responsibilities of the UK's nature conservation bodies (Natural England, Natural Resources Wales, NatureScot and the Department of Agriculture, Environment and Rural Affairs, Northern Ireland) and is supposed to give an assessment of feature condition, including species and habitats. The feature is assigned to a standard condition:

- **Favourable condition** – the objectives for that feature are being met
- **Unfavourable condition** – the state of the feature is currently unsatisfactory
- Destroyed (partially or completely) – the feature is no longer present and there is no prospect of being able to restore it

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SECTION 3

WHAT IS THE CURRENT STATE OF PROTECTED AREAS AND WHAT ARE THEIR BIODIVERSITY TRENDS?

Chloë Alexia Metcalfe and Constance M. Schéré

SUMMARY

A 2021 analysis of terrestrial and coastal Common Standards Monitoring (CSM) data in the United Kingdom's (UK's) statutory protected sites found that 43% – 51% are in favourable condition. Most sites and features classed as unfavourable are reported as recovering, but differences in reporting approaches between country agencies make it difficult to generalise.

Not all of the UK's species are well represented within protected areas (PAs), however PAs remain important spaces for conserving species and can achieve effective nature conservation. Overall, PAs support higher species richness than unprotected sites, but more monitoring of biodiversity (and its trends) is required.

EVIDENCE GAPS

The condition of statutory site features has been quite widely monitored in the recent past, while trends in biodiversity (e.g., number of species or individuals of a species) have not. Both sets of information are needed to fully understand and manage biodiversity change.

Statutory agencies are struggling to meet the level of monitoring set out in the original CSM statement, so up-to-date information about condition is often missing or out of date, making it difficult to monitor site condition at scale. Meanwhile, there is no central inventory of the scale of habitat recreation and restoration, meaning the planned scale and pace of efforts is unknown.

Existing national schemes to monitor biodiversity are extremely valuable (e.g., Breeding Birds Survey, UK Butterfly Monitoring Scheme), but are not always suitable for understanding local site-specific trends because they were designed to report trends at large scales. There is currently no scheme to assess species abundances or overall biodiversity in PAs, or for comparable areas outside them. There is also a data shortfall for priority species, of which there are 2,890 in the UK, and changes in relative abundance and distribution have only been assessed for 7%, and 14% of these species respectively.

3.1 THE STATE OF PROTECTED AREAS

A 2021 analysis of terrestrial and coastal condition monitoring data at UK statutory protected sites revealed that only 43% – 51% of sites were in a favourable condition[1]. When considering the strictest International Union for the Conservation of Nature (IUCN) categories (Ia - IV), which make up less than 11.6% of UK land area, the study concluded that the proportion of effectively protected land might be as little as 4.9% of UK land. Terrestrial PAs have often been placed where there is relatively limited historical economic development potential[2,3], such as at high altitudes or on steep slopes. Indeed, land use change for economic growth (converting natural habitats to urban areas, arable and pastureland), is one of the main drivers of biodiversity loss[4]. Even when an area is designated, activities that are detrimental to the environment cannot always be prevented. For example, studies have shown that PAs have not prevented some forms of intensive land management that is damaging nature in the UK's uplands[5]. Meanwhile at sea, a recent report found that bottom trawling was taking place in 98% of UK offshore Marine Protected Areas (MPAs), and between 2015 and 2018, benthic habitats[i] were subjected to about 90,000 hours of bottom trawl fishing[6]. The UK's exit from the European Union (EU) may provide more opportunities to halt bottom trawling within PAs[7].

Common Standards Monitoring (CSM) is the existing, agreed UK approach to measuring the state of PAs. It involves setting targets that reflect the desired state of habitats and species, and collecting evidence to determine whether those targets have been met; a species or habitat that meets its target is said to be in favourable condition. The results of CSM assessments are combined to produce one of the UK Biodiversity Indicators, illustrating trends over time in the condition of Areas/Sites of Special Scientific Interest (ASSI/SSSIs). Since 2005, there has been little improvement, with about 50% of ASSI/ASSIs in favourable condition[8,9]. CSM results have also contributed to assessments of the broader concept of Favourable Conservation Status (FCS), a conservation goal that works at a much larger geographical scale than PAs alone[10]. FCS assessments[11] draw on a range of evidence sources, including CSM, wider species surveillance schemes, general biological recording and habitat maps, integrating results from site-specific and broader monitoring schemes.

National Parks and Areas of Outstanding Natural Beauty (AONB) cover large areas of land that offer prime opportunities for the recovery of nature in the UK and can provide ecosystem services. However, these areas were not specifically designated for biodiversity, and so species and habitats are exposed to many of the pressures driving declines elsewhere. A 2018 article reported that SSSIs outside England's National Parks and AONBs were more likely to be in favourable condition than those inside[12]. This may be because most National Parks are located in the uplands where there has been, and remains, widespread ecologically damaging land management, for example through overgrazing and burning[13]. Further to this, a review of the condition of SSSIs located within the seven National Parks in the English uplands[ii], reported that roughly the same percentage are in favourable condition inside National Parks compared to outside them (20% favourable condition inside upland National Parks and 18% favourable condition in the wider uplands)[14]. A major reform is necessary to ensure these designations are significantly improved for biodiversity.

National Parks and AONBs have not been set up in a way that allows them to secure effective protection and management for nature, because they were not designated primarily for nature conservation[15], meaning that nature may not be prioritised where there are perceived conflicts with their other primary purposes. The authorities responsible for these landscapes own little, if any, land and have no legal powers to secure the appropriate management of land across their areas[16]. Nature conservation outcomes within landscape designations might not be favourable due to insufficient management plans, inadequate implementation of management plans, or external pressures that cannot be controlled by the managing body's actions. Case Study 3.1 displays some of the complexities of achieving favourable condition.

South Downs National Park

[i] Benthic habitat is found at the lowest level of a body of water, for example the ocean floor.

[ii] Altitudes of more than 300m.

CASE STUDY 3.1

Llyn Tegid/Bala Lake

AFON DYFRDWY/RIVER DEE AND LLYN TEGID/BALA LAKE

The Afon Dyfrdwy/River Dee flows through north Wales and into north-west England. This freshwater ecosystem is covered by Sites of Special Scientific Interest (SSSIs) and Special Area of Conservation (SAC) designations that stretch from Llyn Tegid/Bala Lake (which is also a Ramsar site) to the Aber Afon Dyfrdwy/Dee Estuary; part of the river also falls within the Clwydian Range and Dee Valley AONB, and the estuary itself has additional Special Protection Area (SPA) and Ramsar status. Collectively, the SAC and SSSI designations recognise a variety of habitat, species and earth science features, with seven species features (five fish, one mammal, one plant) being common across the two designations. The SSSI recognises additional invertebrate, plant and habitat features. A recent exercise to assess the indicative condition of features considered most of them to be in unfavourable condition[1].

The Dyfrdwy/Dee faces various pressures both in-river and across the catchment. The river is highly regulated and there is a long history of modification for navigation, agricultural drainage, and development. Its flow has been controlled for around 200 years. The catchment provides drinking water for a large population in England and north-east Wales, it is popular for fishing and tourism, and is surrounded by farmland for most of its length[2]. Physical modifications such as channel straightening, removal of trees, embankments causing disconnection of the floodplain, and many weirs all contribute to habitat degradation[3]. Diffuse pollution from both rural and urban areas and point source pollution also threaten the species present[4].

Designation is just the start of the process to achieve positive biodiversity outcomes for a site, supporting the implementation of management that aims to maintain or bring about the favourable condition of recognised features. The complex mixture of pressures that act upon the river and its features make bringing them all into favourable condition a challenging and ongoing enterprise. There have been several management initiatives for the Dyfrdwy/Dee over the past 15 years, including the launch of a catchment partnership in 2013 to implement a catchment-based approach. More recently, the Dee LIFE project[5] represents a significant investment in actions aimed at restoring freshwater features in the River Dee and Bala Lake/Afon Dyfrdwy, a Llyn Tegid SAC.

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[5] *LIFE Dee River* [online] Available at: https://naturalresources.wales/LIFEDeeRiver?lang=en [Accessed 04 March 2022].

3.2 BIODIVERSITY WITHIN PROTECTED AREAS

PAs have historically been established in areas of high biodiversity or because of a feature of interest; this could be small (such as a patch of habitat) or large (such as a unique landscape). Over the last 40 years, sites with high levels of protection and/or high topographic variation have often been most effective at achieving long-term conservation outcomes[17].

Geographic distributions of species must be represented by the PA network. A recent analysis[18] of 5,254 habitat specialist species (covering reptiles, amphibians, bryophytes, lichens, insects, and non-insect invertebrates) in statutory protected sites found that representation (measured as the proportion of each species' predicted suitable habitat that overlaps with statutory protected sites) is less than 10% of species' potential habitat. Specialists' suitable habitats were better represented by PAs than generalists (except in Northern Ireland). Building on studies like this, it is important to account for specialist and generalist species when assessing how representative the PA network is.

To track biodiversity trends in PAs and other effective area-based conservation measures (OECMs), it is important to monitor PA condition as well as trends in ecological parameters (e.g., species richness and abundance). Within the UK, there are several long-term terrestrial monitoring schemes, such as the Breeding Bird Survey[19], the National Bat Monitoring Programme[20], and the UK Butterfly Monitoring Scheme[21]. Although none of these schemes were designed specifically to measure the effectiveness of PAs or OECMs, their spatially replicated design makes it possible for biodiversity trends to be investigated.

For the broader set of terrestrial PAs (i.e., National Parks as well as other designations), a recent national analysis has reported higher invertebrate species richness inside PAs than in areas with no recognised protection[22,23]. Meanwhile, a study of abundance data for birds and butterflies (as well as records for invertebrates, bryophytes, and lichens) has recently found that sites within PAs support higher species richness, but for nearly all groups of species there were negligible differences in species population abundance trends (i.e., change through time) inside compared with outside PAs[24]. Analysis of local extinctions of bird species in National Parks, AONBs and the wider countryside in England showed that AONBs afford only marginal additional protection, and that National Parks afforded no more protection to species than the wider countryside[25]. A key finding of this report is the lack of studies reporting trends in biodiversity within UK PAs[26] and OECMs, due to limited monitoring at the appropriate form and scale[27]. Indeed, there is also a data shortfall for priority species, of which there are 2,890 in the UK, and changes in relative abundance and distribution have only been assessed for 7%, and 14% of these species respectively[28]. Although studies such as the above do contain useful information for biodiversity trends, they do not offer an authoritative answer for biodiversity.

3.3 MONITORING AND INDICATOR SPECIES

There are many biodiversity metrics, such as species richness, abundance, genetic diversity and ecosystem diversity, that can be used to monitor how well an area designated for conservation is performing for biodiversity. Monitoring can be undertaken via citizen science recording schemes, such as Royal Society for the Protection of Birds (RSPB) Big Garden Birdwatch[29] and through apps such as iNaturalist[30], and long-term monitoring projects, such as the Environmental Change Network[31]. Technologies such as camera traps, computer vision, eDNA (environmental DNA) and passive acoustic monitoring are just some of the methods used to monitor biodiversity, and combining such monitoring with computer modelling can help to predict species range shifts in the face of anthropogenic pressures and climate change[32]. Software programmes can be used to assess risks for biodiversity to help businesses limit detrimental impacts. One such recent development is the Integrated Biodiversity Assessment Tool[33], which combines data from the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species, the World Database on Protected Areas, and the World Database of Key Biodiversity Areas. Other software programmes are able to undertake systematic conservation planning that designs efficient marine protected areas (MPAs)[34].

Indicator species (Box 3.2) are one way to monitor PAs, and they can provide insights into progress towards management goals and the health of an ecosystem if they react to certain characteristics of the habitat. They may signal the presence of other species, an ecosystem function or environmental condition. Indicator species are best used if they are selected to help achieve management objectives and inform actions[35], such as in CSM. However, they should not be used in isolation, nor as a substitute for wider research into a PA's ability to meet its conservation objectives[36].

BOX 3.2: INDICATOR SELECTION

The following steps should be followed when selecting an indicator: the management objective for the PA must be defined; alternative management actions and candidate indicator species should be named; the best indicator species that provides the best management outcomes has been chosen; selected actions are put in place; the process is evaluated; and learning is implemented[37]. Used correctly, indicator species can be of great use as they can be used to represent what is happening to wider biodiversity, without needing to monitor every part of a system. However, it is important to note that no single species can monitor the conservation goals of all UK PAs.

Indicator Group: Bees

Bees can indicate pollution impact[1], and they are also vital to the maintenance of semi-natural and agricultural systems[2].

Indicator Group: Seals

Seals are considered a top predator in certain marine systems and regulate food webs and cycle nutrients[3], thus, they are indicative of ecosystem function[4].

Indicator Group: Sea pens

Sea pens are the only octocorals capable of living in soft sediments and they are considered important indicators of good quality mud habitats and associated communities[5].

Indicator Group: Mussels

Mussels can form biogenic reefs that support numerous communities of species[6].

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SECTION 4

HOW CAN PROTECTED AREAS AND OECMs CONTRIBUTE TO THE WIDER ECOLOGICAL NETWORK?

Thomas J. P. Travers and George Hoppit

SUMMARY

Protected areas (PAs) are valuable for supporting biodiversity in the wider environment. However, in general, the United Kingdom's (UK's) terrestrial PAs are too small, frequently in unfavourable condition, poorly connected, and clustered together, which is not conducive to forming a resilient ecological network. Where unfavourable conditions exist and restoration measures are in place, positive change may be slow or never happen if external pressures are too substantial. UK marine protected areas (MPAs) appear better connected, but large gaps are still present in the network. The areas between habitats and PAs are an essential part of an ecological network; PAs cannot do the work of nature recovery in isolation. However, spaces between PAs are degraded such that much is inhospitable, making it difficult for most species to move, and negatively impacting the PAs themselves. Therefore, ensuring areas outside of the PA network are more hospitable to nature will aid the functionality of that network.

EVIDENCE GAPS

Evaluations of PA networks are incomplete, particularly in terms of connectivity. Further research, supported by new modelling techniques, should focus on what is needed to create a resilient network. More work is required on the potential role of rewilding as part of nature's recovery, where it could be most effective, and implications for monitoring rewilded sites.

4.1 WHY IS SPATIAL CONTEXT IMPORTANT?

PAs are highly valuable individually, but they do not exist in isolation. There has been growing recognition that PAs should be considered as part of a resilient network[i]. Consideration of the landscape context of protected areas is emphasised in the Lawton Review[1] (Box 4.1) and included in the conservation policy of all UK nations.

Species trends in neighbouring areas are connected and the persistence of species depends on plants and animals being able to move between suitable patches of habitat (plants move by seed dispersal across generations). Greater functional connectivity (Box 4.2) at multiple scales, facilitates movement and colonisation of surrounding areas[2,3]. This engenders adaptation to climate change through allowing range shifts[ii] and supporting populations stable enough to fuel such long-distance movements[4]. However, the landscape around a given habitat also impacts its functionality. If this is inhospitable, as is often the case in the UK[5], then detrimental 'edge-effects'[iii] can take hold[6], while the ability of species to move between areas of habitat is also impacted. It is not practical to protect the entire landscape for species, and therefore other effective area-based conservation measures (OECMs) can be instrumental in reducing the impact of otherwise intensively-managed intervening areas. For these reasons, it is useful to think of the design features that will allow the network to deliver successful conservation (Fig. 4.1[7]).

BOX 4.1: THE LAWTON REVIEW

In September 2010, Defra released a review entitled 'Making Space for Nature: A review of England's Wildlife Sites and Ecological Network', which was led by Professor Sir John Lawton[1]. This work has guided and influenced much of the thinking about the requirements for improving conservation in England over the last decade. Among other things, this report:

- Recognised the importance of a coherent and resilient ecological network and proposed that England needed one that would help wildlife cope with future challenges of climate and societal change
- Found that England's portfolio of sites did not comprise a coherent and resilient ecological network. Biodiversity is still rapidly being lost and many species are now restricted to wildlife sites.
- Proposed that enhancing the network can be summarised by the words "more", "bigger", "better" and "joined". This would require:
  - Improve the quality of current sites by better habitat management
  - Increase the size of current wildlife sites
  - Enhance connections between, or join up, sites, either through physical corridors, or through 'stepping stones'
  - Create new sites
  - Reduce the pressures on wildlife by improving the wider environment, including through buffering wildlife sites

[1] Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J., & Wynne, G.R. 2010. *Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network.* Report to Defra. Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20130402170324mp_/http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf [Accessed 07 March 2022]

[i] A resilient ecological network is able to absorb, resist or recover from damage and disturbances, both natural and man-made, while continuing to support biodiversity and providing ecosystem services.

[ii] A species has a climactic habitat as well as a physical habitat, as the climate changes, so too do the locations of climactic habitats. In order to survive, species track this movement, altering their distributions, such movements are called 'range shifts'.

[iii] 'Edge-effects' are the impacts species face along the boundary of two habitat types. These arise due to increased disturbance, such as pesticide run off from agriculture, and can manifest in changes in population structure, or risk of mortality. The amount habitat within the vicinity of an edge is related to its size and shape; smaller patches are usually more impacted by edge-effects than larger patches, as are long and thin patches than circular ones.

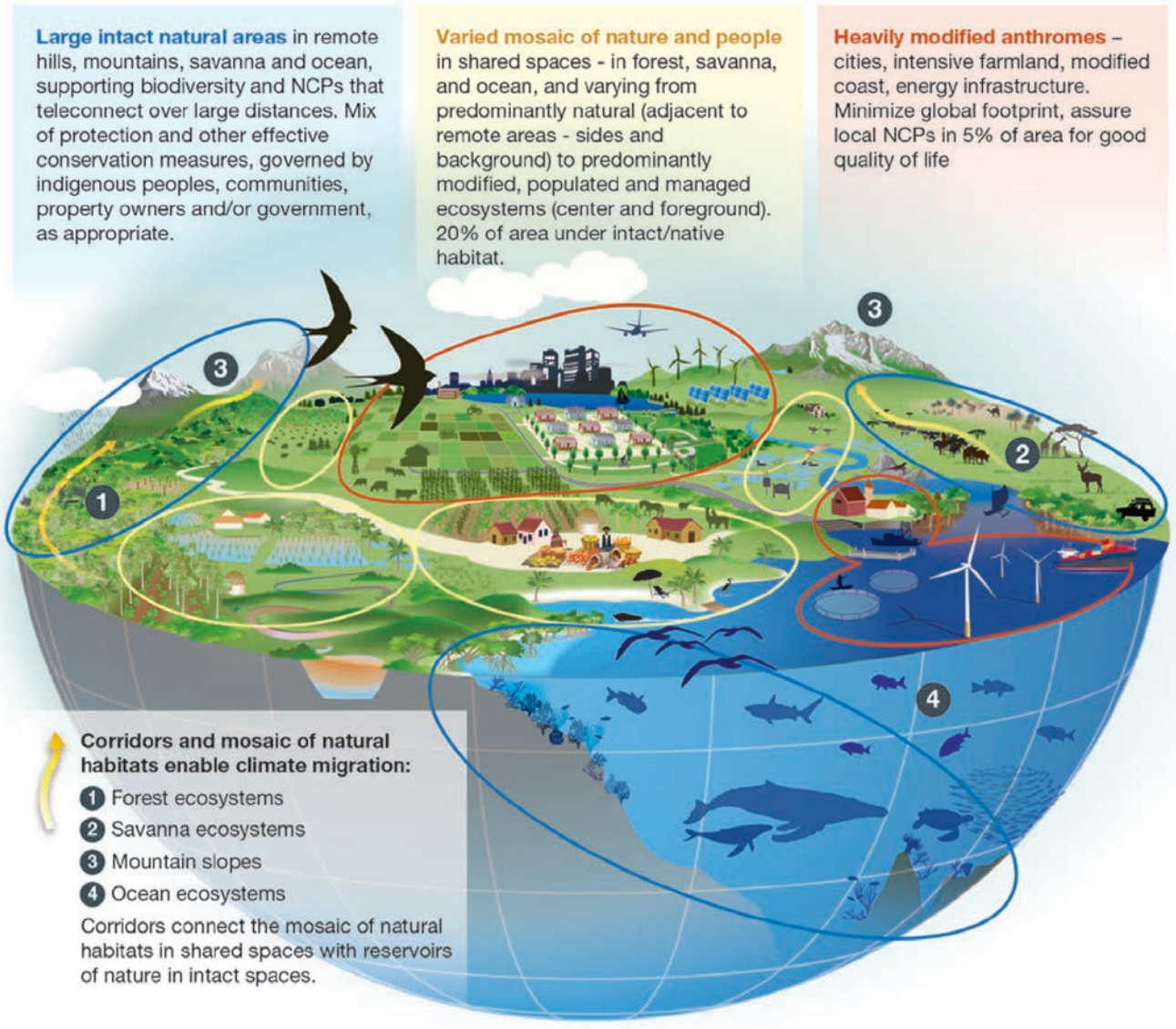
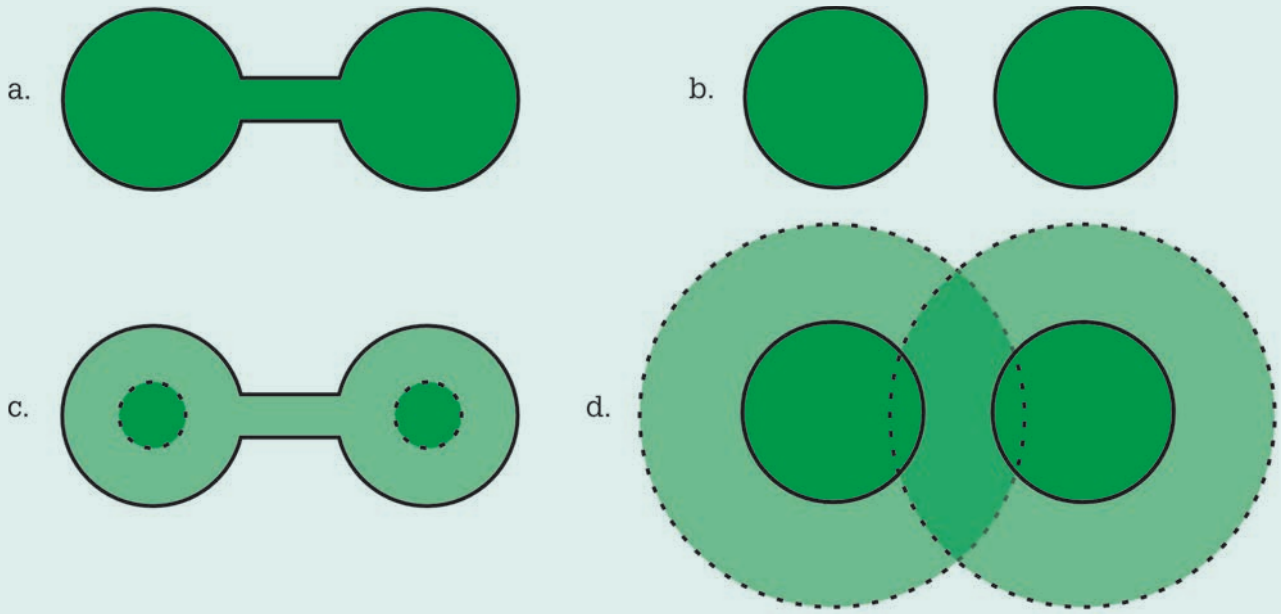


Figure 4.1 A general example of an ecological network for conservation. A landscape serving nature and people in the UK would consist of large semi-natural areas covering a variety of topographies and habitats (blue polygons). These areas would support local biodiversity and allow adaptation to climate change by acting as corridors. A varied mosaic of habitats encompassing a spectrum from predominantly natural to modified (yellow polygons), would benefit species movements, provide ecosystem services, as well as providing green spaces for people to connect with. Heavily-modified anthromes (red polygons) consisting of intensive farmland, modified coast, energy infrastructure and cities ensure humanity's global footprint can be minimised allowing more space for nature. Figure from Pörtner *et al.*, 2021[8] reproduced under a CC BY 4.0 license.

BOX 4.2 THE DIFFERENCE BETWEEN STRUCTURAL AND FUNCTIONAL CONNECTIVITY

In conservation, the connectedness of a landscape can be described in terms of "functional" and "structural" connectivity. A structurally connected network consists of areas of habitat that are physically joined to one another, rather than spatially separated. Functional connectivity considers the landscape from the perspective of the species. As such, it considers all the factors that contribute to a species' or community's life cycle, such as habitat arrangement and quality, and movement strategy. Therefore, a structurally connected pair of habitat patches (a) may be functionally disconnected to a species that avoids habitat edges (c). Two structurally disconnected habitat patches (b) may be functionally connected to well dispersing species such as those that fly (d). It should be noted that in the case of (d), structural connection would not be detrimental to the well-dispersing species.

Figure adapted from SCALETOOLS1.



[1] SCALES. SCALETOOLS. [online] Available at: http://scales.ckff.si/scaletool [Accessed 07 March 2022].

4.2 THE UK'S CURRENT PROTECTED AREA NETWORK

The UK's statutory protected sites are generally small[9], frequently in unfavourable condition[10], poorly connected[11,12], and often clustered in areas of relatively low economic and agricultural development[13,14]. None of these traits are conducive to forming a resilient network.

Evidence from Northern Ireland and Wales suggests UK MPAs may fare better than terrestrial PAs[15,16], potentially due to the fact that many species in marine systems are not impeded in their movements to the same degree as terrestrial species, even in areas subject to high human pressures[17]. Indeed, the most recent assessment of sites in the OSPAR network of MPAs found those in Celtic and North seas were nearing being considered well distributed, although significant gaps remain[18].

The spatial context of PAs is likely to become even more important in the future. This is because climate change will create conditions in which some PAs become unsuitable for many of the species they currently support[19,20,21]. Connectedness within terrestrial and marine PA networks is essential to facilitate climate-induced range shifts[22,23], and studies suggest targeted designation to enhance connectivity should be a particular focus in the UK[24].

4.3 CONSIDERATIONS FOR THE 30X30 INITIATIVE

The 30x30 initiative offers a unique opportunity to increase the resilience of UK ecological networks, with effective PAs at the heart. Connectivity should be considered as a factor in designating new sites and improving existing ones, but should not be the sole focus: without suitable habitat, populations cannot persist or produce dispersers[25,26], at which point the connectedness of the landscape is of little importance. With this in mind, the following are important considerations:

Be specific

Incorporating connectivity into conservation plans requires careful thought. Actions aiming to generally increase connectivity tend to favour species that are generalist and more mobile[27], although the most mobile species, able to traverse large gaps between PAs with ease, are unlikely to benefit either[28]. Furthermore, invasive species may exploit poorly considered connectivity improvements, a particular concern in freshwater systems[29]. However, on land the majority of invasive species are not limited by their dispersal abilities, so these concerns may be unfounded[30]. Ecological networks are complex, and conservation strategies should reflect this by being tailored to each circumstance considering factors such as species of focus, spatial scale, location, and desired outcomes[31,32].

Consider the different components of an ecological network

An ecological network is a summation of the landscape as a whole, not just PAs and focal habitats (Fig. 4.1). Therefore, conservation planners must consider these two components: existing habitat patches, and the intervening landscapes between them. While actions in the spaces between PAs may not meet the threshold for consideration against the 30x30 target, they are nonetheless important considerations in the context of a resilient network, given the impact those spaces have on the functionality of the habitats and the effectiveness of PAs to protect species.

When considering existing habitat, conservation actions that increase the amount present and size of existing patches (Lawton's 'bigger' - Box 4.1), or improve site condition, such as buffering sites to the impact of edge-effects (Lawton's 'better'), will help maintain stable populations of species, which may boost dispersal more than connectivity itself[33]. However, increasing the size of current patches alone would hamper range shifting[34], which is expected to become more frequent as climate change progresses[35,36]. Connectivity between PAs (Lawton's 'joined') can be achieved through corridors, contiguous swaths of habitat, or stepping-stone patches of habitat. There is mounting evidence of the use of these features by dispersing species[37,38], but the requirements of corridors can often be spatially or fiscally prohibitive[39], while stepping-stones are only beneficial to those species able to move between them[40]. Protection of important features of corridors or individual stepping-stones is an important consideration for 30x30, given that UK PA networks are currently poorly connected.

Management to make the intervening landscape more hospitable, such as hedgerow restoration, and set asides[iv] will not count towards the 30x30 target but increase connectivity[41] and ecosystem services[42], reducing negative impacts on biodiversity and PAs. The establishment of habitat corridors and stepping-stones, and actions affecting the intervening landscape can be implemented by landowners through OECMs. Agri-environment schemes also have an important role to play in all devolved nation's biodiversity strategies, such as Environmental Land Management schemes (ELMs)[43,44]. Additionally, accreditation schemes can encourage and reward activities that support nature, such as the 'Wildlife Estates Scotland' run since 2010 by Scottish Land & Estates[45,46]. Rewilding presents another dynamic approach to addressing the suitability of spaces between PAs[47]. However, objective, evidence-based assessments of rewilding initiatives are required[48].

Plan carefully

The designation of PAs in the UK has historically been piecemeal, without consideration of the wider landscape context[49], and this has constrained the effectiveness of PAs. A set of PAs that contributes to a resilient ecological network requires planning to balance an increase in the coverage and quality of habitat where possible, with protecting vital connectivity patches, and joining areas that have become disconnected (Fig. 4.1). Systematic conservation planning[50] (Box 4.3) is a powerful tool to carry out landscape planning, and has recently begun to gain traction in the UK[51,52]. Connectivity can be considered within the planning structure[53,54,55], with the utility to model specific dispersal abilities and focal species.

Thought must be given to "future proofing" the PA network, and the identification and protection of features such as future climate analogues[56] and climate refugia[57] will help protect species.

Systematic conservation planning identifies areas to protect to add value to the existing suite of PAs. This planning can help maintain connectivity, as well as identify current barriers to dispersal, such as large gaps in the habitat network, that require habitat creation/restoration[58,59], and could be implemented through OECMs. However, the outcomes of systematic conservation plans should be reported, as too few currently are[60]; this will enable us to learn from our successes and failures.

See the big picture

PAs should be at the heart of a resilient ecological network, and 30x30 can make that happen. Success will require that local actions are taken within a wider landscape context, and monitoring through concepts such as Favourable Conservation Status[61], which includes consideration of the functionality of the wider ecological network within that decision[62]. This landscape-scale approach is vital, as emphasised by the Lawton review, and typified by the establishment of Local Nature Recovery Strategies in England[63,64].

BOX 4.3: SYSTEMATIC CONSERVATION PLANNING/MAPPING

Planning that aims to meet explicit conservation goals by assessing the 'location of reserves in relation to natural physical and biological patterns' and considering 'reserve design, which includes variables such as size, connectivity, replication, and alignment of boundaries, for example, with watersheds'. This process evaluates how far the goals have been met in existing reserves then suggests new reserves that will complement existing ones using an explicit methodology[1].

Gap analysis

A process of identifying various features, (e.g., species, habitats, or other features of biodiversity) that are rare or absent in an existing protected area portfolio. This can then be used to set priorities for future conservation including the location of PAs to maximise the representativeness of the portfolio[2].

Conservation opportunity planning/mapping

Systematic conservation planning that also includes human and social factors such as the presence or absence of regulations, incentives and institutions that affect the feasibility of a new PA. This can span scales of the national, including policies such as payment for ecosystem services, down to the individual, such as the willingness of a particular landowner to participate in conservation schemes[3].

[1] Margules, C.R. and Pressey, R.L., 2000. Systematic conservation planning. *Nature*, *405*(6783), pp.243-253.

[2] Burley, F.W., 1988. Monitoring biological diversity for setting priorities in conservation. *Biodiversity*, *227*, p.230.

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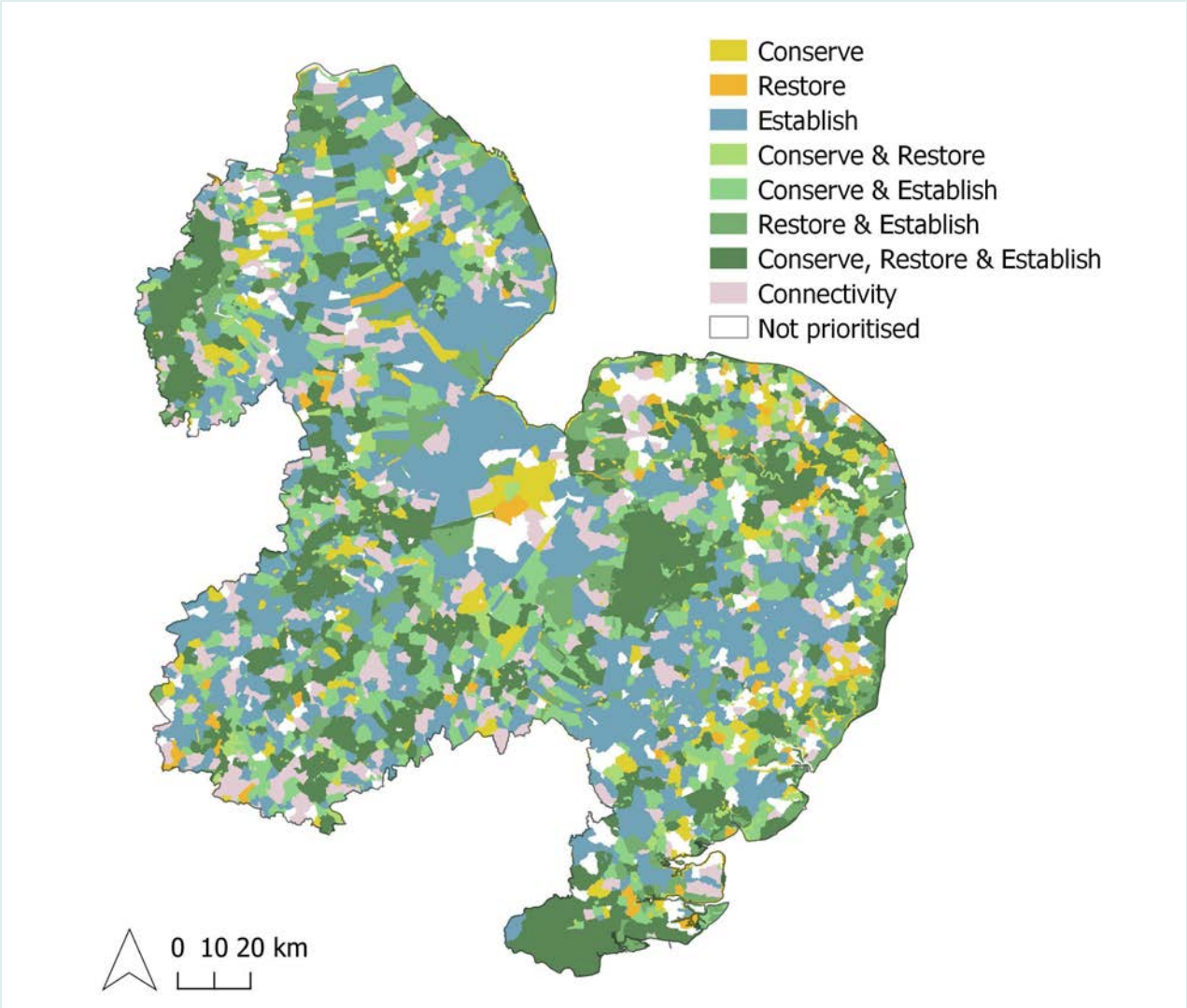
[iv] Many agri-environment schemes include the establishment of small patches of land within the agricultural landscape, such as buffer strips at the edges of agricultural fields. These areas are 'set aside' from farming, and can provide habitat and foraging resources for a variety of species.

BOX 4.3 (CONTINUED): EXAMPLE – SPATIAL MODELLING IN THE UK

Water Resources East is an independent, not for profit organisation with almost 200 members from all water use sectors in Eastern England, including national regulatory bodies. It was formed in 2014 from Anglian Water to encourage new and collaborative approaches to water management in Eastern England. In conjunction with Biodiversify and World Wide Fund for Nature (WWF-UK), they are developing a natural capital plan for the region[4]. This version of systematic conservation planning asks stakeholders what their natural capital objectives, actions and targets are, and builds the plan using an iterative 'inclusive dialogue'. While called 'systematic conservation planning', this process is more aligned with the 'conservation opportunity planning' as defined here. This plan considers biodiversity, climate, flood control, water quality and water control, and can recommend one of four actions for an area.

During the analysis, these actions were used to contribute to targets of conserving 80% of good quality priority habitat, restoring 75% of degraded habitat and creating 115,000 ha of new habitat largely drawn from the 25 Year Environment Plan. The result of this is a map of spatial prioritisation for the region that identifies 'where to act in order to most cost effectively achieve the shared vision for the landscape'. 20% of the region is recommended for establishing new habitats, restoring degraded habitat and conserving good quality habitat.



The consolidated results from the Eastern England spatial planning analysis showing which actions are recommended over the next 30 years. Figure reproduced with permission from Water Resources East & Biodiversify (2021)[4].

[1] Margules, C.R. and Pressey, R.L., 2000. Systematic conservation planning. *Nature*, *405*(6783), pp.243-253.

[2] Burley, F.W., 1988. Monitoring biological diversity for setting priorities in conservation. *Biodiversity, 227*, p.230.

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SECTION 5

HOW CAN THE EFFECTIVENESS OF PROTECTED AREAS BE IMPROVED?

George Hoppit and Rebecca K. Turner

SUMMARY

Many factors reduce the effectiveness of protected areas (PAs), including inappropriate management, external pressures, and site design. Effectiveness can be improved through regular monitoring and long-term management, as well as limiting damaging activities (through enforcement where necessary). A lack of formal obligation to create and implement resource management plans for PAs hinders their effectiveness. Combining top-down and bottom-up approaches to PA governance enhances landowner and stakeholder buy-in, promoting equitability and a sense of ownership. The resilience of PAs will be improved by increasing protection inside and outside their borders, and improving connectivity between existing sites.

EVIDENCE GAPS

Condition assessments for PAs are often lacking, preventing knowledge of the effectiveness of management measures. A lack of baseline data is a frequent problem when assessing PA effectiveness and how it is changing. Few empirical studies examine PAs in the United Kingdom (UK) through the eyes of local people who directly drive their effectiveness, and so more research is needed to explore the potential of bottom-up initiatives, and how to encourage and support them.

5.1 WHAT ARE THE MAIN PRESSURES ON BIODIVERSITY IN PROTECTED AREAS?

UK PAs on land often protect semi-natural ecological communities that require active management to maintain them because these ecosystems depend on human activity to halt ecological succession, such as maintaining grasslands[1]. Inappropriate management of sites, or inability to reconcile conservation and landowner objectives, can result in detrimental outcomes, often due to inadequate funding, lack of management plans, or ineffective means to influence management. Unfavourable conditions may also result from pressures that originate outside PA boundaries, such as deer grazing, air pollution, fertiliser runoff, or invasive species[2,3,4]. If competitive interactions arise between conservation features[5], there may be limited options for control.

Inappropriate management activities within and adjacent to PAs are long-recognised problems for Sites of Special Scientific Interest (SSSIs)[6]. For example, vegetation burning in upland PAs is practiced for game bird management to prevent ecological succession[7], creating an anthrome (a human-altered ecosystem) that does not prioritise biodiversity. Another significantly damaging activity is trawling, frequently permitted within marine protected areas (MPAs)[8], which destroys benthic habitats. Issues with PA site design such as isolation, human population density resulting in encroachment and overcrowding, and small size have long been recognised as drivers of declining environmental conditions in them[9].

The UK has a heavily degraded natural environment[10]. In the lowlands, most remaining semi-natural habitat is fragmented, and intervening areas are heavily modified and intensively managed[11]. High population density and competition for land can drive ecological decline if not managed effectively. In marine ecosystems, the main drivers of change are destructive fishing practices[12], with climate change an emergent issue[13]. Additionally, defining favourable conditions is challenging due to a frequent lack of baseline information of underlying ecological conditions[14,15] and lack of resources for monitoring. For instance, 78% of SSSIs have not been monitored within the last six years in England[16], and this lack of resources is exacerbated by static, out-of-date and poorly implemented management plans.

5.2 WHAT CAN BE DONE TO ADDRESS THE DRIVERS OF BIODIVERSITY LOSS?

Limiting resource extraction can deliver both ecological and societal benefits, as observed in the Lamlash Bay no-take zone in Scotland (Case Study 5.1). PAs with multiple designations are more likely to have management plans that increase the likelihood of favourable PA assessments[17], suggesting that overlapping designations may increase the likelihood of effective management. Increasing PA size may improve their effectiveness[18], and the establishment of appropriate buffer zones (which could include other effective area-based conservation measures (OECMs)) will enable critical features within sites to be protected from harmful external pressures, and allow populations of many species to increase.

PAs and buffer zones could integrate with intervening habitats, providing critical support for nature in the wider landscape. For example, large-scale conservation areas can increase the land designated for conservation, improve habitat representation, link up existing sites in PA networks[19], and offer a form of OECM. Terrestrial buffer zones should increasingly surround the core of a PA, preventing development or destruction of habitats[20,21]. There needs to be unified public and political support for ensuring PAs can meet their objectives. Skillsets, familiarity with local environments, and social relations take time to develop, and so increased funding will be insufficient if not sustained and integrated with local knowledge and stakeholders as part of an integrated system of governance. In situations where budgets or technical expertise are lacking, then co-management initiatives (e.g., collaborating with universities) can address resource gaps[22].

Approaches that give people opportunities to nurture a pro-environmental self-identity[23] and promote agency are linked to pro-environmental action. Engagement is essential for promoting long-term societal responsibility for the environment, within the wider context of PAs and OECMs. Combining governance by integrating top-down (strategic planning of PAs at the national scale) and bottom-up approaches is necessary to improve the effectiveness of PAs[24]. When top-down and bottom-up approaches are paired, PAs have been shown to deliver public benefits and support nature[25] (Case Study 5.1).

There are opportunities to leverage local wildlife groups and citizen scientists to augment statutory monitoring by conservation agencies to better understand current ecological conditions, and track change. Greater investment is needed in long-term monitoring of PAs generally; for example, a positive relationship between capacity and resources and improvements in species abundance highlights the importance of adequate resourcing to halt biodiversity loss[26]. A whole site approach to monitoring PAs might be beneficial to detect environmental signals not captured by current feature-based approaches; this should add to, and not replace, monitoring of the features for which the site is protected. For example, it is possible to manage sites for a protected feature while allowing local wildlife groups to create habitat for additional species. Conserving biodiversity relies on partnerships between voluntary, statutory, academic, and business stakeholders and this successful approach has been attributed to increases in populations of otter, stone curlews, and bitterns[27].

Biodiversity is not restricted to PAs, and if key drivers of biodiversity loss in the wider environment, such as nitrogen pollution and invasive species, are tackled, then benefits to PAs will follow. Climate change will exacerbate the establishment of invasive species and early detection of colonisation events will be necessary to address emerging threats to UK biodiversity[28].

CASE STUDY 5.1

LAMLASH BAY NO-TAKE ZONE

Intensive dredging and use of bottom-trawlers around the Isle of Arran, Scotland, led to the collapse of the local marine ecosystem and the loss of previously highly-productive fishing grounds from the mid-1980s. Concerned local residents on Arran formed the Community of Arran Seabed Trust (COAST) in response in 1995[1]. In 2008, after years of campaigning by COAST, a 2.67 km^2 area in Lamlash Bay became Scotland's first no-take zone, and only the second in the UK. This protection means that legally no fish or shellfish can be taken from the zone's waters, seabed, or shore area[1].

Since then, there have been significant increases in biodiversity as well as improvements in the size, age and density of commercially important species including the king scallop (now four times higher in density[1]) and European lobster (with higher egg production than outside the zone and increased body size). Observations also indicate that seabed biodiversity and fish are recovering[2].

Monitoring is undertaken by Marine Scotland Compliance (MSC) using Vessel Monitoring Systems supported by the community or individuals reporting suspicious activity in accordance with guidance from COAST. MSC are responsible for enforcing the legislation and require proof (i.e., photographs or videos) in order for legal action to be taken[2].

The Lamlash Bay no-take zone has helped demonstrate that with the correct monitoring, enforcement and community support, strong protection can allow nature to recover if it can stop a particular damaging activity.

Common sunstar and hydroids, Lamlash Bay

King scallop and Black brittle stars, Lamlash Bay

Lamlash Bay

[1] Stewart, B.D., Howarth, L.M., Wood, H., Whiteside, K., Carney, W., Crimmins, É., O'Leary, B.C., Hawkins, J.P. and Roberts, C.M., 2020. Marine conservation begins at home: how a local community and protection of a small bay sent waves of change around the UK and beyond. *Frontiers in Marine Science, 7*, p.76.

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5.3 DO THE EXISTING PROVISIONS FOR PROTECTION ENABLE US TO ADDRESS THE DRIVERS OF BIODIVERSITY LOSS, AND IF NOT, HOW CAN THEY BE ADAPTED?

The UK's PAs have been established over many decades, under different policy directions and conservation objectives, and some PAs will not achieve their contemporary goals because they were designed with different visions from current ones[29]. Conservation thinking is evolving following understanding of ecological change[30], but it is not clear whether the statutory basis for PAs is keeping pace with this shift.

The legislation used to create UK PAs focuses on the designation of sites, and restrictive zoning for activities such as infrastructure development[31]. Planning legislation requires agencies to be consulted in relation to proposed activities in and around SSSIs[32], in line with the UK's international and domestic commitments to nature conservation. Currently, development of management plans is optional for many PAs[33,34], except National Parks and Areas of Outstanding National Beauty (AONBs) where it is mandatory. While the size of National Parks and AONBs means their management plans may be less detailed than smaller PAs such as SSSIs[35], their plans need to set targets and actions to restore biodiversity that are monitored and reported against. This could draw on international frameworks, such as the International Union for the Conservation of Nature's (IUCN's) Protected Area Management Effectiveness (PAME) framework (see *Section 6*)[36]. Substantial efforts were required designate PAs, but without appropriate management many of them risk remaining sub-optimally managed for nature for the foreseeable future, hindering their ability to deliver conservation benefits.

Mechanisms for management agreements[i] (e.g., agreements between a conservation organisation and a landowner) exist but funding is limited. It is important to enforce the legally established Sandford Principle which states that 'where irreconcilable conflicts exist between conservation and public enjoyment in National Parks, then conservation interest should take priority'[ii]. Legislation in the UK should require that the conservation and recovery of nature will be the priority as stated in the IUCN definition of a 'protected area'. This action to redefine the focus of National Parks would need to come with enhanced tools and resources for the authorities responsible for these landscapes and stronger duties for public bodies operating in these areas to achieve it.

A systematic governance framework for PA designation, integrating top-down and bottom-up approaches, can set the legal and practical context for change. Laws, restrictions, and fines, devised in consultation with stakeholders, can provide powerful tools that support management measures[37], such as preventing littering in National Parks and disturbance of ground-nesting birds by dog-walkers in Special Protection Areas (SPAs). To protect biodiversity, authorities must have the resources and use the power to do so. However, these tools constitute extrinsic forms of motivation, which may only be effective for that particular context and may not address the underlying attitudes and intentions of local people and may therefore manifest in other, environmentally undesirable behaviours[38]. The expansion of area-based conservation beyond designation has gained traction in recent years[39,40], whereby the pursuit of enhanced biodiversity and ecological function considers the role of intrinsic drivers of sustained, pro-environmental human behaviour[41]. None of the existing provisions for protection would be possible without effective bottom-up action by motivated, capable individuals and communities with opportunities to address the drivers of biodiversity loss on the ground[42]. However, empirical information is lacking and more research is needed to explore the potential of bottom-up initiatives, and how to encourage and support them.

5.4 HOW CAN WE IMPROVE THE BUY-IN OF LANDOWNERS AND OTHER KEY STAKEHOLDERS?

Environmental policies should engage stakeholders in decision-making processes and should reflect the shared views of society together with priorities for the environment[43]. Yet, PA planning typically involves only a two-way debate between the political and scientific communities[44] and bottom-up stakeholder objectives and top-down management objectives of area-based conservation do not always align[45]. Therefore, central to addressing conflicts between conservation and development objectives in multi-use landscapes is building trusting relationships with relevant stakeholders[46,47] (Case Study 5.2). Understanding what matters most to stakeholders allows policymakers to quickly identify threats to participation and compliance[48], and improve the outcomes of environmental decision-making processes[49].

AONBs and National Parks are well-placed to bring landowners and stakeholders together from different sectors to plan and deliver action for nature at a large scale[50]. However, to do this their boards need to have a balance between different stakeholders and areas of expertise, including the recovery of nature. At present this is only achieved in England in one National Park – The Broads – because of a specific legislative requirement[51] to secure a balance of expertise and a requirement for around half the board to be drawn from different areas of expertise. This provision should be applied to other National Parks and AONBs.

The term 'protected area' can have negative connotations for some stakeholders, given the potential actions needed to achieve the conservation objectives, such as land use change for farmers[52]. In SSSIs, for instance, governance approaches are largely top-down, with overarching mandates to protect specific conservation features or habitats. This approach is beneficial because it results in the conservation of habitats that otherwise would have been lost. But across the UK powers given to statutory nature agencies, to require the appropriate management of SSSIs have rarely been used, at least partly due to reductions in agencies' budgets[53].

[i] An agreement between a conservation body and individual or organisation. See for example https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/management-agreements.

[ii] Section 62, *Environment Act 1995* c. 25, s. 62. [online] Available at: https://www.legislation.gov.uk/ukpga/1995/25/contents [Accessed 04 March 2021].

CASE STUDY 5.2

SUSSEX IFCA – COMMUNITY VOICE METHOD

The coastline around Sussex supports an exceptionally wide range of marine species, including dolphins, seals, seagrass, and kelp, and rich inshore fishing grounds. Within the Sussex Inshore Fisheries and Conservation Authority (IFCA) district there are a number of MPAs that protect the marine wildlife from damage and disturbance[1].

In order to manage pressures on the Sussex marine habitats, Sussex IFCA have established fisheries management plans for the various MPAs in the area. To develop and generate support for potential management measures in some of the Marine Conservation Zones (MCZ), Sussex IFCA also conducted extensive informal consultations. This included an innovative project utilising a film-based technique called the Community Voice Method and interviews to gather views on the Sussex MCZ management. This gave the opportunity for a full range of views and values to be gathered from across the area.

Additionally, six wider community MCZ management workshops discussed potential management options for different fishing activities. These management options were then developed by Sussex IFCA in consultation with Natural England, with key site users and the Authority's committee[2].

As a result of working with stakeholders, fishers and fisheries managers work together to protect these valuable natural assets and to help create sustainable fisheries within the Sussex IFCA[3]. The management measures in place in these MCZs used the best available evidence at the time of management formulation. Where adaptive management measures are in place, there will be a review of measures and agreed ongoing monitoring and research, developed with Natural England, to assess if conservation objectives are being met. The review period covers four years across many of the MCZs in the Sussex IFCA, with imminent reviews anticipated[2].

Seven Sisters Country Park

[1] Sussex Inshore Fisheries and Conservation Authority, 2022. *Environment*. [online] Available at: https://www.sussex-ifca.gov.uk/environment [Accessed 04 February 2022]

[2] Sussex Inshore Fisheries and Conservation Authority, 2022. *Kingmere MCZ*. [online] Available at: https://www.sussex-ifca.gov.uk/kingmere-mcz [Accessed 04 February 2022]

[3] Sussex Inshore Fisheries and Conservation Authority, 2022. *Fisheries*. [online] Available at: https://www.sussex-ifca.gov.uk/fisheries [Accessed 04 February 2022]

Where powers have been used this can create friction with local stakeholders. To address this, integrating bottom-up approaches with environmental governance that engages communities are essential[54]. These approaches could actively involve stakeholders in the designation processes for PAs, asking questions such as 'what would be the cost to you to protect x on your land' or 'what do you value in the landscape?'. In such cases, payment for ecosystem services[55] that offer nature-based solutions[56] can provide an important incentive, if done carefully with biodiversity remaining a priority. A good example of this is Scotland's Nature Restoration Fund, launched in July 2021[iii]. Further incentives for area-based conservation measures include compensation for financial losses and enabling the transfer of funds between conservation initiatives[57,58].

Greater community involvement can improve the effectiveness of PA networks by advocating the protection of Local Nature Reserves (LNRs) and other designated sites. Counties, boroughs, district councils or National Park Authorities need to own the land for its eligibility for designation as an LNR. Local partnerships have been important for delivering conservation in UK for many years, and the funding of Local Nature Recovery Strategies (England), Local Biodiversity Partnerships (Scotland), Local Nature Partnerships (Wales), and Local Biodiversity Action Plans (Northern Ireland)[59,60]. Additionally, acknowledging OECMs that have been introduced by landowners and stakeholders is key to achieving social equity and recognition of efforts to protect locally- and nationally-important conservation features[61]. Again, these ecosystem services can be rewarded via incentives to ensure their longevity.

There needs to be better communication and facilitation of knowledge sharing regarding management issues. For example, the monitoring of sites can fall to a range of organisations who do not coordinate or share information, resulting in knowledge silos[62,63]. One organisation might not be aware of the knowledge or expertise held by another. A greater emphasis must be placed on the interdisciplinary aspects of PAs because the ecological, economic, and social dimensions of PAs are often viewed in isolation from each other[64]. Research involving PAs must better incorporate the different ecological, human, health, and socio-economical dimensions to help generate a more holistic understanding of the systems being studied[65]. Fostering knowledge sharing will ground academic observations in real world experience.

5.5 WHAT IS NEEDED TO ENSURE FUTURE RESILIENCE?

While there are excellent local examples of good management, current PAs predominantly comprise small, high-quality isolated habitats, which are vulnerable to pressures from the wider landscape[66]. A resilient PA network depends on improving and expanding existing sites and ensuring that they are effective, while connecting important ecological sites at scale[67,68]. The Lawton Report's proposed principles to ensure the future resilience of PA networks – more, bigger, better, and connected sites – are still valid nowadays (Box 4.1)[69].

Expanding the focus of PAs from the current feature-based approach towards an ecosystem-based approach, recognising the full range of interactions within an ecosystem, will be an essential part of ensuring the resilience of PAs is sustainable[70]. Ecosystem-focused approaches are increasingly appearing in PA thinking and practice, including SSSI guidelines and Welsh National Parks and AONBs[71,72]. Feature-based approaches and ecosystem-based management are not mutually exclusive e.g., restoring hydrological regimes in pursuit of lowland bog restoration. UK PAs often preserve semi-natural communities, which are unlikely to retain their current characteristics, especially under climate change. Ecosystem-based management has been advocated in ecosystems such as coral reefs as a mechanism to promote resilience to climate change[73]. Ecosystem-based management places emphasis on restoring or maintaining ecosystem level functions such as ecological succession, and the Lawton principles will provide a foundation for this[74], as larger PAs will be needed to facilitate succession. This approach could take advantage of rewilding efforts; the Knepp Estate[75] in West Sussex providing a prime example. By using ecosystem-based management, wider ecological benefits may be achieved enabling PAs to deliver biodiversity conservation benefits beyond their original scope[76]. Protecting areas that are capable of supporting a high variety of geophysical (soil, topography, hydrology) conditions (i.e., geodiversity), will contribute towards a more resilient network, providing space for refugia and species range shifts[77,78]. The PA network needs to be representative[79] of a wide range of species' distributions, habitats, and physical conditions to allow for future change, and other wider landscape and seascape interventions will also be necessary to ensure future PA resilience. An ecosystem-based approach should sit alongside, and not replace, feature-based approaches. There will always be a need to ensure that important habitats and species populations are in good or actively recovering condition as this is the ultimate measure of success and will be needed to ensure international and national targets to restore nature are met.

A greater investment by government in long-term statutory monitoring of sites will provide the evidence base necessary to understand changing environmental conditions[80], which would detect if actions occurring within a PA were having detrimental impacts and would inform the necessary actions to correct them. Long-term monitoring will also be key to detect climate change impacts.

[iii] https://www.nature.scot/doc/nature-restoration-fund-nrf-successful-projects

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SECTION 6

HOW CAN UK AREA-BASED CONSERVATION SUPPORT NATURE'S RECOVERY ON LAND AND IN THE SEA?

Rebecca K. Turner and Donal C. Griffin[i]

[i] Authors contributed equally to this section

SUMMARY

The effectiveness of existing area-based conservation can be assessed on the basis that:

(A) Area delivers for nature in the long term;

(B) Builds ecological resilience and improves biodiversity;

(C) Conservation outcomes achieved through effective monitoring and management;

(D) Developed and delivered inclusively.

6.1 AREA-BASED CONSERVATION AND NATURE'S RECOVERY

To evaluate the effectiveness of existing area-based conservation approaches on land and in the seas, a dynamic suite of criteria should identify the existing weaknesses where the full potential for nature has not yet been realised, and outline a 'SMART' (specific, measurable, achievable, relevant, time-bound) roadmap towards achieving 30x30. Dynamic criteria will be adaptable, allowing modifications to accommodate changing ecological objectives.

Recommended ABCD criteria for a site's inclusion towards the 30%:

Based on conversations with experts (see acknowledgements) and literature, this report proposes the following criteria for evaluating the potential of area-based conservation to effectively support nature's recovery on land and at sea in 30x30 (Fig. 6.1)[i].

A. Area delivers for nature in the long term

Nature is protected against harm (e.g., pollution, invasive species, habitat degradation, over-exploitation, and persecution of species) to ensure the conditions for recovery. These conditions must be assured for the long term, underpinned by adequate resources for management and regular monitoring. Traditionally, specific legislation is often the basis through which protected areas (PAs) are designated to protect nature. Outside PAs, other effective area-based conservation measures (OECMs) are emerging as potentially powerful means of guaranteeing sustainable conditions for nature[1]. In addition to various extrinsic incentives (e.g., financial rewards) that promote responsible environmental actions (e.g., payments for ecosystem services), designating areas as OECMs may encourage effective management practices for the long term through intrinsic motivation of human behaviour (e.g., ethical motivations)[2], thereby securing the contributions of OECMs to conservation targets. This may also pave the way for recognising the contribution of voluntary conservation approaches, which can be highly effective for nature conservation.

B. Builds ecological resilience and improves biodiversity

An effective network of PA sites should promote ecological resilience under rapid global change[3]. Specific conservation objectives for sites and/or features are nature 'recovery' and/or 'maintenance', dependent on the pre-designation state of the site. Areas with improved resilience show signs of nature's recovery[4,5]. For instance, ecosystem functioning will have been 'improved' through designation and subsequent management, associated with the increased abundance and distribution of habitats and species within site boundaries. Such sites can also provide sources of biodiversity into the wider environment.

C. Conservation outcomes achieved through effective management and monitoring

A site must be effectively monitored to ensure it delivers conservation outcomes and informs effective management: planned, effective management, with sufficient financial backing and an appropriate governance structure is essential to deliver meaningful contributions to nature's recovery[6]. Adaptable management regimes, including restorative action (e.g., habitat restoration, halting detrimental pressures) should be carefully implemented to support nature's recovery. Regular monitoring provides data to evaluate and inform the

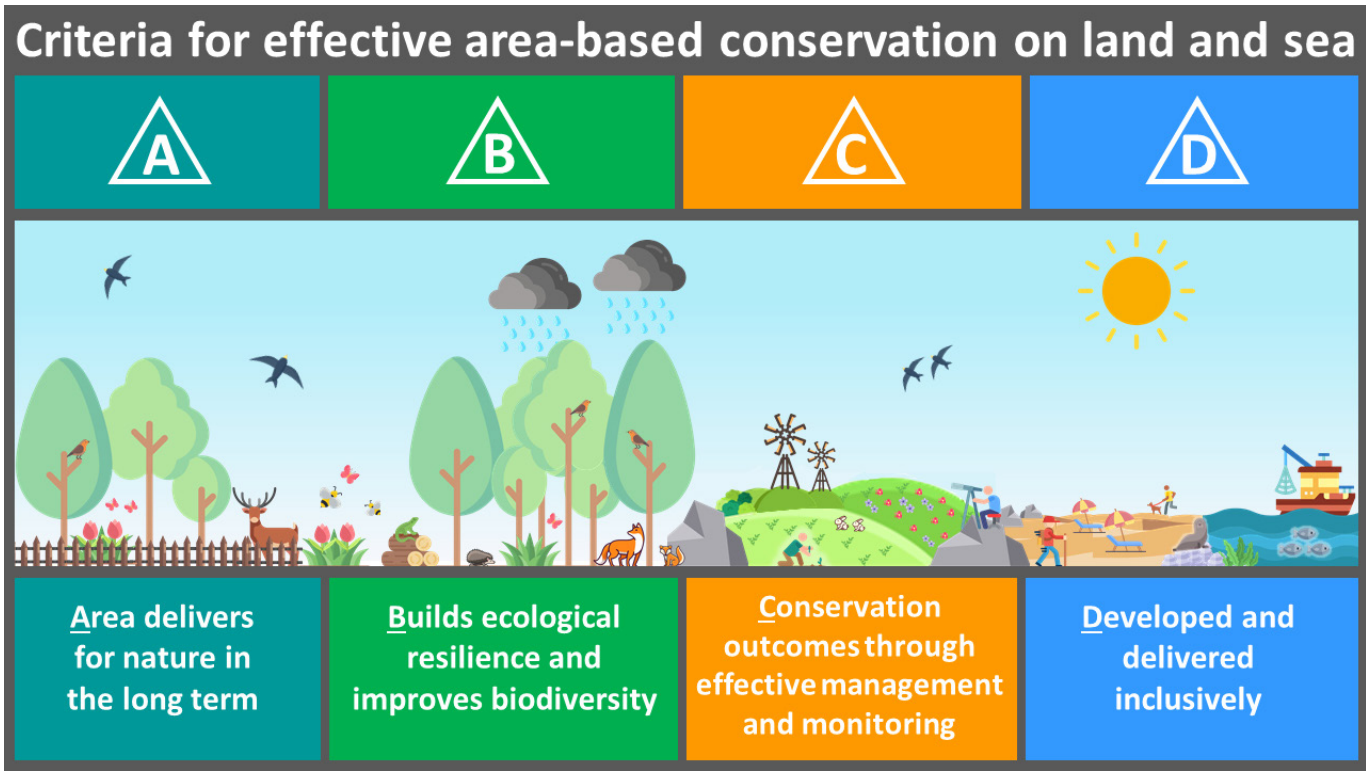

Figure 6.1 Criteria for effective area-based conservation that support nature's recovery. Graphics downloaded from https://www.flaticon.com/.

[i] These criteria were partly based on a consultation process with a number of experts (see acknowledgements).

effectiveness of management practices and keep track of the state of nature within sites. Monitoring whether management regimes improve the health of features or wider ecosystem functioning over time will be an essential component of delivering 30x30 to effectively support nature's recovery in the long term[7].

Protected Area Management Effectiveness (PAME) assessments provide such an audit framework as these tools provide baseline data to evaluate management performance, identify strengths and weaknesses in practice, and guide future planning and activities[8,9]. For example, the International Union for the Conservation of Nature (IUCN) World Commission on Protected Area Effectiveness Evaluation[10] outlines six fundamental steps in holistic management processes: (i) reviewing the context of management; (ii) ensuring that planning addresses clear objectives; (iii) allocating resources to work towards objectives; (iv) implementing actions according to accepted processes; (v) producing goods and services and (vi) anticipating measurable impacts or outcomes. Essential to these qualitative evaluation tools is the community knowledge held by local stakeholders[11,12].

D. Developed and delivered inclusively

Assessments of the effectiveness of area-based conservation need to reflect the ecological benefits derived from PAs for improved abundance and distribution of habitats and species, and outcomes for the health, well-being, and protection of people. Nature's recovery will be driven by people, although barriers (e.g., socio-economics, legislation, knowledge gaps and perceptions) can prevent individuals, communities, and organisations from adopting biodiversity-based practices[13]. Best-practice management accounts for local culture and traditions, sustains public and political stakeholder engagement, supports livelihoods and well-being of communities, addresses and delivers context-relevant resolutions to conflicts in management (Case Study 6.1), affords appropriate governance, and empowers social justice and sense of agency over natural landscapes[14,15,16,17]. Research on this topic should make use of existing international frameworks such as the IUCN's management principles for protected landscapes[18].

Increasing the number of PAs and OECMs will have benefits, but focusing only on the percentage of land and sea under protection to meet the 30x30 target is unlikely to achieve the conservation of nature[19]. Monitoring efforts and investments are required to determine whether expanding protection will have the desired conservation outcomes. It is vital that meeting the 30x30 target enhances biodiversity and habitats at scale, with assurances for nature, management and people guaranteed in perpetuity.

CASE STUDY 6.1

PEMBROKESHIRE MARINE CODE – A BOTTOM-UP APPROACH WITHIN A MARINE SAC

The marine environment around the Pembrokeshire Coast, west Wales, contains a range of habitats and wildlife and is designated as a Special Area of Conservation (SAC). To manage the pressures and disturbance of tourism (including commercial wildlife watching trips and kayaking), a voluntary kayakers' code and a voluntary agreement for boat operators, known as the Pembrokeshire Marine Code (PMC), were put in place in 20021.

The development and management of the PMC is overseen by a Project Officer under the umbrella of a non-statutory organisation, the Pembrokeshire Coastal Forum, which facilitates stakeholder engagement. The Pembrokeshire Coast National Park Authority were supportive of the scheme and in 2009 it was agreed that commercial wildlife watching, sea kayaking and recreational diving groups must be signed up to the PMC in order to advertise in National Park visitor centres and marketing publications[1].

The process of stakeholders deciding collectively on the content of the PMC through meetings has led to compromises in certain areas, but has also resulted in the wide engagement of stakeholders. This has helped with measures being understood and accepted by all stakeholders, and as a result, has meant they are more likely to be followed[1]. Measures included setting minimum approach distances for wildlife such as seals and seabirds as well as seasonal exclusion zones around most sensitive wildlife sites. It has been noted that the PMC has been a particular success for kayakers with a marked decrease in incidents of kayaker disturbance of wildlife[2].

However, a limitation of the voluntary approach has been limited funding to ensure the success of the PMC, as well as difficulties in self-policing and enforcement of the code leading to some conflict between users. In light of challenges, in 2011, a decision was taken to refocus efforts away from the commercial operators and maintain the focus on raising awareness about the PMC to a wider user profile[1].

Kayaking near Green Scar, Pembrokeshire

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SECTION 7

WHICH TERRESTRIAL AREA-BASED CONSERVATION APPROACHES SHOULD COUNT TOWARDS 30X30?

Rebecca K. Turner

SUMMARY

Large differences exist between the types of protected areas (PAs) on land and their effectiveness for nature conservation. To be counted in the 30x30 target, area-based conservation tools need to provide meaningful contributions to nature's recovery and meet a range of criteria that determine their effectiveness, producing positive outcomes for nature and people.

EVIDENCE GAPS

Without robust baseline data, the ability of those managing land to track and improve the state of nature within PAs is significantly constrained. There is also limited evidence on the drivers of pro-environmental behaviours within PAs in the UK, limiting the scope for reformation of practice. Likewise, the role of other area-based conservation measures (OECMs) within a PA network in the United Kingdom (UK) is unclear, and few systematic assessments of approaches which maximise the benefits of human-nature interactions for both people and nature are available.

7.1 DELIVERING EFFECTIVE AREA-BASED CONSERVATION ON LAND

Effective area-based conservation, supported by recovery in the wider environment, is needed to address biodiversity decline on land. PAs are one of the most powerful conservation tools available for safeguarding biodiversity and ecosystem services[1,2,3]. Recognising the potential contribution of OECMs arising through multiple land use is also gaining traction[4].

A significant challenge when it comes to the 30x30 target is finding a balance between maximising the positive outcomes for society and minimising negative impacts on nature[5]. Effective interventions which improve the outcomes in human-nature interactions account for: (i) the environment and how it is used; (ii) the context of conflict in human-nature interactions; and (iii) the agents, their decisions and behaviours that underpin these conflicts[6]. By integrating top-down (e.g., regulations) and bottom-up approaches (e.g., grassroot activities)[7], 30x30 could support nature's recovery through sustained pro-environmental human attitudes and responsible behavioural change[8,9,10]. If implemented appropriately, and if responsible activity also supports large-scale restoration, an effective network of well-connected, important ecological sites comprising of healthy ecosystems could emerge from protecting 30% of land. However, much of the current PA portfolio is poorly managed[11], and over-exploited[12,13,14], undermining the assumption that these areas stimulate ecological benefits and deliver on 30x30 nature conservation objectives.

Feature-based approaches to conservation allow the prioritisation of resources around specific habitats or species but can fail to deliver complementary conservation objectives and overlook the network as a whole. Balancing the objectives of PAs in the context of each other and the wider network is challenging, and environmental objectives can be conflicting. For example the objectives of expansion of Caledonian forest features on Glen Tanar Special Area of Conservation (SAC) could potentially have an adverse impact on the availability of suitable habitat to support the breeding hen harrier population on the overlapping Special Protection Area (SPA). Where the priorities are unclear, and there are strong opposing views on a matter[15], conflicts can arise between humans and wildlife, agriculture and land use, leading to restrictions on access, exclusion in participation and information sharing, or discrepancies in law[16,17].

Diverging from traditional feature-based conservation methods, some socio-ecological systems approaches have emerged in recent years (e.g., adaptive ecosystem-approaches, whole-site management, decentralised and participatory approaches)[18]. These approaches consider the incentives that drive[19] and promote the conservation and sustainable use of natural resources in an equitable way[20]. OECMs, for example, can tap into to the drivers of positive human-nature interactions[21], nurture environmental activity, and motivate local adoption of responsible action. However, the role of OECMs within an effective PA network is not yet understood.

7.2 WHICH APPROACHES COULD CONTRIBUTE TO NATURE'S RECOVERY ON LAND?

7.2.1 'More', 'bigger', 'better', and 'joined' site priorities for nature

A network of PAs that meets the four criteria proposed by the 'Making Space for Nature' review on UK protected areas in 2010, 'more, bigger', 'better', and 'joined' sites (see Box 4.1)[22], will maximise opportunities for improving biodiversity and ecological resilience beyond 30x30. A collaborative undertaking to expand the number of sites with strict statutory protection that provide long-term protection for nature will be needed to reach the 30% target on land. While designation alone will not meet conservation targets, it can provide a useful governance structure to ensure effective long-term nature recovery. However, some UK designated sites do not meet the International Union for the Conservation of Nature (IUCN)'s definition of PAs (Box 1.2). Maximising biodiversity at scale is a critical component for ensuring that nature within PAs and the wider environment builds ecological resilience for the future in the face of global change[23]. Therefore, it is important that UK protected areas prioritise biodiversity and all land selected for 30x30 achieve positive and sustained long-term outcomes for biodiversity.

7.2.2 A 'Better' and 'joined up' ecological network which helps to restore wider ecological function

To help restore ecological functions in PAs, and alleviate anthropogenic pressures beyond their boundaries, the periphery of core sites in an effective ecological network needs to integrate with intervening 'wildlife-friendly' patches and OECMs in the wider countryside[24]. Evidence suggests that at least 16% of strictly designated land should constitute the backbone of a resilient network of core sites to be effective for nature's recovery[25]. However, this minimum may not yet be realised across the UK, as only approximately 7% of land in England, 11% in Wales, 10% in Northern Ireland and 17% in Scotland is strictly designated as a Site of Special Scientific Interest (SSSI)[26,27,28]. Reforming existing designations will widen the scope for new areas to be incorporated, and reviewing the selection criteria for SSSI designations could allow more qualifying sites to be notified as SSSIs. A reformation of landscape designations should reflect the growing importance of conservation for nature recovery[29]. Currently, the protective measures that regulate potentially harmful activities in SSSIs, SPAs, SACs, and Ramsar Sites are stronger than those for protected landscapes such as Areas of Outstanding Natural Beauty (AONBs) or National Parks. However, the existing governance structures in protected landscape, if reformed, could be used to increase the focus on nature, enabling habitat restoration and recovery[30]. By strengthening and simplifying statutory purposes to prioritise nature's recovery, as well as empowering and supporting protected landscape authorities, public bodies, and individuals to safeguard landscapes, there are opportunities for much of the existing PA network to make substantial contributions to the 30x30 target and ensure that UK PAs deliver for nature, build ecological resilience in the face of global change, and maximise biodiversity in the long term.

7.2.3 'More' areas with 'better' management and monitoring

'More' sites with integrated management approaches, sufficient financial backing and an appropriate governance structure should form the core of a PA network on land. Designations should safeguard the diversity and geographic range of important habitats, species, geological and physiological features by ensuring that appropriate management is in place to conserve these features. Yet, there is often a lack of resources, monitoring and, ultimately, political will. The limited evidence available on how nature is faring within UK ecological networks is related to uncertainty about how the 'state' of nature within PAs and OECMs should be measured. This also limits the understanding of the long-term impacts of conservation measures including rewilding. Establishing an inventory of habitat restoration and recreation to monitor impacts would address this evidence gap. Increasing resources is critical for 'better' managing land, enforcing safeguarding measures and sustaining incentives where these are used. Monitoring the conditions of sites, the generation of data, and the effectiveness of management regimes are an integral part of ensuring that effective ecological networks, centred around management and monitoring, are delivered for people and nature.

The 'Making Space for Nature' report[31] (Box 4.1) suggested that of the four criteria identified for building a resilient ecological network, generally the most important was 'better' management to improve site quality and condition of existing habitats. This is because without ensuring that there are high quality sites for biodiversity, efforts to expand, create and connect habitats will prove ineffective in building such a network. Therefore, improving the management of existing areas of priority habitats inside and outside PAs, together with enhanced protection for those habitats outside PAs for example through the designation of more PAs, should be a priority.

7.2.4 'More' integrated approaches that deliver sustained benefits for people and nature

Strong public and political support is required to address deteriorating conditions of some sites. This could require a shift away from choosing between top-down governance of PAs or bottom-up participatory conservation approaches towards an integrated socio-ecological system that focuses on achieving better outcomes for society and nature[32]. While PA designation can attract opposition from landowners, OECMs may be more readily accepted, allowing nature to recover, while explicitly providing benefits for people[33]. For example, non-statutory designations (including some nature reserves) could fall within the definition of an OECM. These sites are not always underpinned by legislation, but they are often run by motivated, knowledgeable volunteers and are highly valued natural areas within communities. Their inclusion in 30x30 would require a high level of long-term protection.

OECMs, while still not yet clearly defined, could provide an integrated system for reaching the 30% target on land if they deliver biodiversity benefits, are guaranteed for the long term, and receive sufficient financing[34]. Substantial gaps in empirical evidence on the drivers of pro-environmental action within terrestrial UK PAs currently hamper this progression. Pro-environmental behaviour research in the context of PAs in the UK represents only 3% of the available literature[35]. However, the power of intrinsic pro-environmental attitudes and sustained responsible behaviours that can arise from positive human-nature interactions in differing contexts should not be underestimated[36,37,38,39]. Collaborative management of natural resources on privately-owned land within a PA network will be crucial for restoring natural systems and ecosystem services[40]. Approaches that encourage pro-environmental behaviours are urgently required[41]. This can be achieved through interdisciplinary research which integrates a range of empirical methods derived from the social, behavioural, and natural sciences[42]. The effectiveness of candidate measures should be assessed locally before national roll-out to avoid potentially negative impacts.

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SECTION 8

WHICH MARINE AREA-BASED CONSERVATION APPROACHES SHOULD COUNT TOWARDS 30X30?

Donal C. Griffin

SUMMARY

There are many different types of marine protected areas (MPAs) in the United Kingdom (UK), each with their own legislative drivers originating either in European or UK law. Currently, their contribution to conservation targets for protected areas (PAs) is judged according to percentage area coverage, which is the most commonly reported metric. However, this oversimplification fails to address the degree of effectiveness, which is influenced by a multitude of different factors. The inclusion of MPAs towards the 30x30 target should be based on a range of different criteria that determine whether MPAs and other effective area-based conservation measures (OECMs) are delivering positive ecological outcomes.

EVIDENCE GAPS

One of the largest barriers to achieving an ecologically coherent network of MPAs in the UK is the lack of sufficient monitoring of sites. Without such information and data, the suitability of adaptive management measures is less clear, and so declines in a site's health or features are permitted to continue.

8.1 MARINE PROTECTED AREAS

There are many types of MPA designations in the UK. A combination of European (Special Areas of Conservation – SAC, and Special Protection Areas - SPA), Ramsar and domestically designated sites (e.g., Marine Conservation Zones and Nature Conservation MPAs), form a network of MPAs which was in part designed with the principles of ecological coherence in mind, including representativity (representativeness), replication, adequacy, viability, connectivity, and management[1].

8.2 MPA DESIGNATION AND DELIVERY

In 2019, only four of 11 Marine Strategy UK indicators achieved Good Environmental Status (GES)[i,2]. Therefore, the UK Government's commitment to protect 30% of seas to support the recovery of nature by 2030 is welcome. However fully or highly protected MPAs represent only 2.9% of oceans globally[3,4]. The Marine Protection Atlas shows that 38% of UK waters are included in fully or highly protected MPAs[5], but almost all of these are in the seas around UK overseas territories. Around the UK itself, No-Take Zones (NTZs) cover less than 0.01% of Secretary of State waters (English inshore and English and Northern Irish offshore regions). The 2.67 km^2 NTZ in Lamlash Bay is the only such site in Scotland (Case Study 5.1). In England, many MPAs contain features which are deemed to be in an unfavourable condition[6] and therefore, are not achieving their conservation objectives. In other parts of the UK, information on MPA site condition and statutory monitoring is often not publicly available or easily accessible. In general, many MPAs in the UK do not have comprehensive management or enforcement, and therefore do not bring about the full range of biodiversity benefits that they could do otherwise. For example, many offshore MPAs (beyond 12 nautical miles from the coast) experience damage from bottom towed fishing gear despite being designated to protect benthic features[7] (Case Study 8.1). Protected Seas estimates that less than 1% of UK inshore waters offer a high level of protection from fishing activity[8].

Designation of an MPA is the first, rather than the final, step in ensuring its effectiveness in delivering for nature[9] regarding both (i) feature-based conservation objectives, and (ii) whole site ecological benefits, such as improved health, abundance, and distribution of non-feature species and habitats. Therefore, to ensure that 30x30 achieves benefits, decisions on which sites to include in the target must focus on factors relating to site-specific effectiveness rather than designation itself.

CASE STUDY 8.1

DARWIN MOUNDS OFFSHORE MPA

The Darwin Mounds Special Area of Conservation (SAC) lies approximately 160 km north-west of Cape Wrath, Scotland. It is characterised by an extensive area of sandy mounds, each capped with multiple thickets of cold-water corals.

Substantial damage was caused to the area by deep-water trawling, which increased with the late 1980s development of larger vessels and gear adapted to reaching previously inaccessible areas. In 2003, at the UK's request, the European Commission imposed a temporary ban on trawling in a 1380 km^2 area surrounding the Mounds, which became permanent in 2004[1]. Moving from a temporary to permanent ban on bottom-trawling in the area required a stepwise approach on the UK's part with a degree of compromise between competing interests, as well as the involvement of multiple different stakeholders[1].

This site became the first offshore MPA in the UK and was the first time the European Commission had closed an offshore fishery for nature conservation[1]. However, available evidence suggests that full ecosystem recovery is still far off with only limited regrowth[2]. This demonstrates that the biology of target species must be considered in protected area designation and governance, as cold-water corals are very slow growing. There are also issues with methods of enforcement relying on Vessel Monitoring Systems tracking fish activity and the rate at which data is required to be sent (every two hours), which may not be sufficient to detect bottom-trawling activity on the edge of a closed area. Site recovery may also be compounded by other issues such as seabed litter being brought into the site by currents[2].

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[i] The UK Marine Strategy is a keystone of marine policy and sets out how the UK will 'achieve the vision of clean, healthy, safe, productive and biologically diverse oceans and seas'. Good Environmental Status (GES) is 'about protecting the marine environment, preventing its deterioration and restoring it where practical, while allowing sustainable use of marine resources'. Eleven high-level descriptors are used as the basis for GES targets, including biological features such as biodiversity, physical features such as hydrographical conditions, and human interference such as marine litter.

8.3 TARGETS AT SEA: 30% OF WHAT?

A simple suite of criteria based on MPA effectiveness, and the associated factors identified as being important in MPAs becoming effective, should determine which sites qualify as contributing towards the 30% target. Crucially, for relevant public authorities, these criteria should also serve as a tool and guide to help identify and inform suitable action to improve MPA effectiveness in sites that are not delivering specific or wider ecosystem objectives.

Criteria used to make decisions on the 30x30 target should be based on objective aspects of MPA policy, governance, and implementation. The recently published MPA Guide[10] proposes a framework to ensure robust planning, design, and evaluation of new and existing MPAs, using scientifically grounded practices, and may be helpful in this regard (Box 8.1). While modifications or additions to the criteria may be warranted in the future to accommodate changing ecological imperatives from climate change, the foundational criteria (the ABCD criteria) for deciding which MPAs should contribute to 30x30 targets are outlined in Figure 6.1.

In summary, MPAs should:

1. Deliver for nature in the long term;
2. Build ecological resilience;
3. Achieve biodiversity outcomes by prioritising monitoring and restoration;
4. Benefit local communities by producing goods and services.

While a member of the European Union (EU), the UK committed to many high-level environmental targets, including some relating specifically to the marine environment, with varying degrees of implementation and success. Now that the UK has left the EU, the 30x30 pledge to protect 30% of its seas, as well as devolved nation commitments to designate highly protected marine areas in England and Scotland, are indicative of its ambition to become a world leader in marine management and contribute to global nature and biodiversity initiatives as an independent coastal state. When referring to MPA evaluation and effectiveness, the MPA Guide[11] draws attention to quality, not just coverage. Therefore, despite the inherent focus on coverage within the 30x30 target itself, it is important for the UK Government and devolved legislatures to also consider the quality and effectiveness of sites, if the overarching ambition to protect and promote nature is to be realised.

BOX 8.1: MPA GUIDE

A recently published framework, called MPA Guide, sets out categories of MPAs according to stage of establishment and level of protection, and links these to the likely outcomes for biodiversity and human well-being[1].

Stage of establishment (STAGE) and when to count an MPA

The guide sets out minimum criteria for an MPA to achieve each STAGE in its establishment:

- **Proposed/Committed**. Intent to create an MPA must be announced in some formal manner by a government, community, conservation organisation or other organising group.
- **Designated**. A designated MPA must have:
  - Defined boundaries,
  - Legal gazetting or equivalent Indigenous or traditional authorization or customary recognition,
  - Clearly stated goals and process to define allowed uses and associated regulations or rules to control impact.
- **Implemented**. Management plans are activated, resource users are aware of the rules, and mechanisms to promote compliance and enforcement exist.
- **Actively managed**. Management is ongoing, including monitoring, periodic review, and adjustments made as needed to achieve biodiversity conservation and other ecological and social goals.

Level of protection (LEVEL) for biodiversity conservation

- **Fully Protected**. No extractive or destructive activities are allowed. Non-extractive low-impact tourism or low-impact cultural activities may be compatible with fully protected areas, provided collective impact is low. Potentially impactful activities such as aquaculture are only allowed for restoration purposes and not extraction.
- **Highly Protected**. Only light extractive activities with low total impact are allowed, with all other abatable impacts minimized. Some allow a small amount of subsistence or small-scale fishing with minimal impact. Allowed activities include low-impact tourism and low-density, unfed aquaculture.
- **Lightly Protected**. Moderate to substantial extraction and other impacts are allowed. A larger number of fishing gear types might be used. Tourism could have moderate impacts on habitats and species, such as damage caused by high-intensity recreational diving. Aquaculture may occur by means of semi-intensive, unfed methods or small-scale and low-density fed methods.
- **Minimally Protected**. Extensive extraction and other impacts occur in a minimally protected area, but the area still achieves sufficient biodiversity conservation to satisfy the IUCN definition of an MPA. For example, the area must not allow industrial fishing.

[1] Grorud-Colvert, K., Sullivan-Stack, J., Roberts, C., Constant, V., Horta e Costa, B., Pike, E.P., Kingston, N., Laffoley, D., Sala, E., Claudet, J. and Friedlander, A.M., 2021. The MPA Guide: A framework to achieve global goals for the ocean. *Science, 373*(6560), p.eabf0861.

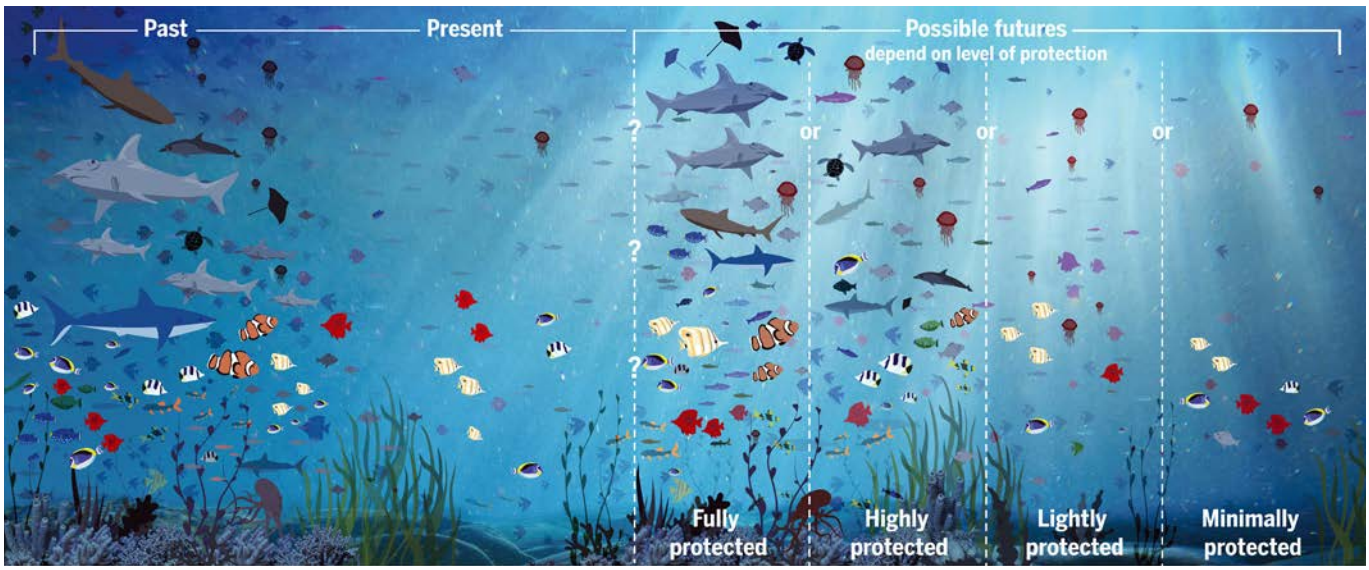

Figure 8.1 The level of protection, and therefore the effectiveness of MPAs, will greatly influence the future state of the ocean. Past ocean ecosystems were abundant and diverse in species and habitats. Over time, expanded and intensified human activities depleted and disrupted ocean ecosystems and reduced their services. MPAs, in conjunction with climate mitigation strategies and more sustainable usage of the ocean, can conserve and restore biodiversity and the resilient ecosystems needed for human well-being. Different levels of protection will result in different outcomes, if enabling conditions are satisfied.
Figure reproduced with permission from Grorud-Calvert *et al.*, 2021[12]

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8 Personal communication from Protected Seas researchers (https://protectedseas.net/).

9 Grorud-Colvert *et al.*, 2021. See reference 3.

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CONCLUSIONS

Joseph Bailey

Nature, climate, and society are intimately connected. The United Kingdom's (UK's) policies and legislation therefore need to address all three of these with equal urgency for UK biodiversity to have resilience and adaptability in the face of global environmental challenges.

The natural world provides humans with important ecosystem services that we need not only to thrive, but survive[1]. Resilient and healthy natural systems provide the foundation for a resilient and healthy society. Effective protected areas (PAs) have the potential to be the beating heart of the government's approach to the recovery of nature in the UK. These must support and be supported by Other Effective Area-based Conservation Measures (OECMs) and sustainably managed land and seas, connected by a well-designed network of wildlife habitat corridors and stepping-stones. All of these components are needed: PAs are crucial but can only be part of a larger approach.

Some of the PA shortcomings highlighted in this report are well known (e.g., see the 2010 'Making Space for Nature' report on England's wildlife sites[2]) and result from nature not being consistently prioritised, monitored, and managed. The UK's PAs face pressures within, and outside their boundaries from activities such as damaging fishing practices in marine protected areas (MPAs), habitat conversion or loss, housing developments, intensive and unsustainable land use, and pollution, leading to declining ecological conditions that prevent an area from achieving positive outcomes for nature.

Despite excellent efforts locally, the UK has a heavily degraded natural environment and a portfolio of designated sites that does not consistently – and was not wholly designed to – prioritise biodiversity. On land, much of the UK's designated land covers protected landscapes (including National Parks and Areas of Outstanding Natural Beauty), which do not effectively deliver for nature because of their other priorities[i]. There are substantial opportunities to reform existing governance structures in order to ensure that these protected landscapes are managed effectively for nature and people. Such reforms must include having nature experts on the boards that manage protected landscapes. Otherwise, these sizable areas will remain unable to support the recovery of nature. Many designated sites that do prioritise nature (e.g., Sites of Special Scientific Interest) are not in a favourable condition, despite widespread efforts to protect features of interest (e.g., a habitat or species). This is often due to external pressures, highlighting the necessity for more integrated approaches for ensuring nature's recovery on land and in the sea.

[i] Cunningham, C.A., Crick, H.Q., Morecroft, M.D., Thomas, C.D. and Beale, C.M., 2021. Translating area-based conservation pledges into efficient biodiversity protection outcomes. *Communications biology, 4*(1), pp.1-5.

The 30x30 agenda presents an opportunity to redefine our approach to area-based conservation and deliver a system that is tailored to not just protecting rare or vulnerable species, but supports the restoration of nature more widely and that can adapt to, and be resilient to, long-term change. Effective protection and recovery of nature should be a prerequisite for a site to contribute to the 30x30 target. A significant amount of work is still needed to get close to a meaningful 30% by 2030, which will require swift and substantial actions as part of a transformative change to the way we safeguard the UK's nature for future generations. Central to this is ensuring effective and representative PAs, but also that PAs are supported by a wider network of OECMs and well managed non-protected land and seas, which will still make up the majority of our landscapes and seascapes even if 30% is reached.

PAs and OECMs, underpinned by appropriate policies in the wider landscape and seascape, must deliver for nature in the long term (inclusive of the living and non-living components; biodiversity and geodiversity), build ecological resilience and be in a favourable or recovering condition, and subject to coordinated monitoring and management (inclusive of incentives and penalties to enforce protection). PAs should represent all habitat types, restore habitats as part of an ecosystem-wide approach, manage existing PAs for achieving favourable or recovering status, and ensure connectivity by using OECMs and other spaces between PAs effectively. All these approaches should proactively engage with people and businesses who live and work in these places.

The UK's approach must ensure biodiversity is prioritised in the extensive protected landscapes that are National Parks and AONBs, as well as smaller designated sites, so that all these spaces contribute effectively towards the 30% target.

There is some information on feature condition and biodiversity trends in PAs, but there are also substantial evidence gaps because of a lack of resources for management and monitoring. Thus, the condition of many PAs, and how they are performing for nature relative to unprotected areas, is not known. Management and setting of conservation goals relies on effective monitoring, so that conservation goals can be adaptive and fit for purpose in response to a changing landscape or seascape.

Overall, these requirements necessitate empowered government departments and statutory agencies that have sufficient funding so that they can take a leadership role, accept accountability for monitoring and management, and enforce the law to protect biodiversity. Management, incentives, and penalties to limit pressures must be undertaken in consultation with stakeholders and as part of a governance system integrating top-down and bottom-up approaches towards achieving conservation goals and restoring nature.

As we scan the horizon with optimism, the UK has an excellent opportunity to demonstrate political will, leadership, and commitment to protect nature and deliver an integrated nature recovery network for a healthy and sustainable society.

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TERMINOLOGY

TERM	DEFINITION	SOURCE
Abundance	The number of individuals of a single species.	NA
Adequacy	An adequate network is one that is sufficient to ensure that biotic features persist in the long term.	Kukkala, A.S. and Moilanen, A., 2013. Core concepts of spatial prioritisation in systematic conservation planning. *Biological Reviews, 88*(2), pp.443-464.
Area-based conservation (measure)	A term that encompasses PAs and OECMs.	Maxwell, S., Cazalis, V., Dudley, N., Hoffmann, M., Rodrigues, A., Stolton, S., Visconti, P., Woodley, S., Kingston, N., Lewis, E., Maron, M., Strassburg, B., Wenger, A., Jonas, H., Venter, O. and Watson, J., 2020. Area-based conservation in the twenty-first century. *Nature, 586*(7828), pp.217-227.
Bottom-up governance approach	Community and user-led approaches to environmental governance.	Jones, P.J., 2012. Marine protected areas in the UK: challenges in combining top-down and bottom-up approaches to governance. *Environmental Conservation, 39*(3), pp.248-258.
Coherence	A coherent ecological network is one that has all the elements necessary to achieve its overall objectives; the components are chosen to be complementary and mutually reinforcing so that the value of the whole network is greater than the sum of its parts.	Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J., and Wynne, G.R. 2010. *Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network*. Report to Defra. [online] Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20130402170324mp_/http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf [Accessed 07 March 2022]
Condition	Degree to which conservation objectives for PA are met, based upon features (biological or geological) for which site was designated, using Common Standards Monitoring methodology. Condition can be: 'unfavourable', 'partially destroyed', 'destroyed', 'maintained', 'recovered', 'recovering', 'no change' or 'declining'. Objectives vary with designation and conservation features. Applies to SSSI, ASSI, SPA, and RAMSAR.	JNCC, 2003. *Common Standards Monitoring: Introduction to the Guidance Manual*. JNCC Resource Hub. Peterborough. [online] Available at: https://data.jncc.gov.uk/data/f6fef832-93f0-4733-bf1d-535d28e5007e/CSM-Introduction-2004.pdf [Accessed 07 March 2022].
Ecosystem function	Capacity or capability of the ecosystem to do something that is potentially useful to people.	Turkelboom, F., Raquez, P., Dufrêne, M., Raes, L., Simoens, I., Jacobs, S., Stevens, M., De Vreese, R., Panis, J.A., Hermy, M. and Thoonen, M., 2013. CICES going local: Ecosystem services classification adapted for a highly populated country. In *Ecosystem Services* (pp. 223-247). Elsevier.
Effectiveness	Broad concept describing the extent to which conservation goals are achieved in the long term.	Rodrigues, A. and Cazalis, V., 2020. The multifaceted challenge of evaluating protected area effectiveness. *Nature Communications, 11*(1).
Efficiency	An efficient conservation plan is one which maximises conservation objectives while minimising cost or area, which is likely to be easier to implement.	Rodrigues, A., Tratt, R., Wheeler, B. and Gaston, k., 1999. The performance of existing networks of conservation areas in representing biodiversity. *Proceedings of the Royal Society of London. Series B: Biological Sciences, 266*(1427), pp.1453-1460.

TERM	DEFINITION	SOURCE
Impact of protected areas	The difference that protected areas make to one or more intended (or unintended) outcomes, relative to the counterfactual of no intervention or a different intervention.	Pressey, R.L., Visconti, P. and Ferraro, P.J., 2015. Making parks make a difference: poor alignment of policy, planning and management with protected-area impact, and ways forward. *Philosophical Transactions of the Royal Society B: Biological Sciences, 370*(1681).
Other effective area-based conservation measure (OECM)	A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in situ conservation of biodiversity, with associated ecosystem functions and services and, where applicable, cultural, spiritual, socio-economic, and other locally relevant values.	International Union for the Conservation of Nature [IUCN], 2019. *Recognising and reporting other effective area-based conservation measures*. [online] Available at: https://portals.iucn.org/library/sites/library/files/documents/PATRS-003-En.pdf [Accessed 16 December 2021].
Plagioclimax	A stable vegetation community arising from succession that has been deflected or arrested directly or indirectly as a result of human activities.	Allaby, M., 2015. *A Dictionary of Ecology*. Oxford University Press.
Protected area (PA)	A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. Should be used separately to OECMs: OECMs are not PAs.	Dudley, N., 2008. *Guidelines for Applying Protected Area Management Categories* (IUCN, 2008).
Representation	The occurrence of a single feature, i.e., species, within the conservation network or other area.	Kukkala, A.S. and Moilanen, A., 2013. Core concepts of spatial prioritisation in systematic conservation planning. *Biological Reviews, 88*(2), pp.443-464.
Representativeness	The degree to which a conservation network represents the breadth of biodiversity features.	Kukkala, A.S. and Moilanen, A., 2013. Core concepts of spatial prioritisation in systematic conservation planning. *Biological Reviews, 88*(2), pp.443-464.
Resilient network	A resilient ecological network is one that is capable of absorbing, resisting or recovering from disturbances and damage caused by natural perturbations and human activities (including climate change), while continuing to meet its overall objectives of supporting biodiversity and providing ecosystem services.	Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J., and Wynne, G.R. 2010. *Making Space for Nature: A Review of England's Wildlife Sites and Ecological Network*. Report to Defra. [online] Available at: https://webarchive.nationalarchives.gov.uk/ukgwa/20130402170324mp_/http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf [Accessed 07 March 2022]
Species richness	The number of species in a given area; this does not refer to the number of individuals of each species.	NA
Succession	The sequential change in vegetation and the animals associated with it, either in response to an environmental change or induced by the intrinsic properties of the organisms themselves.	Allaby, M., 2015. *A Dictionary of Ecology*. Oxford University Press.
Top-down governance	Environmental governance approaches lead via central government.	Jones, P.J., 2012. Marine protected areas in the UK: challenges in combining top-down and bottom-up approaches to governance. *Environmental Conservation, 39*(3), pp.248-258.

BRITISH ECOLOGICAL SOCIETY

British Ecological Society
42 Wharf Road
London N1 7GS
Tel: +44 (0)20 3994 8282
policy@britishecologicalsociety.org
www.britishecologicalsociety.org