A Global Standard for the Identification of Key Biodiversity Areas

Version 1.0

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Prepared by the IUCN Species Survival Commission and IUCN World Commission on Protected Areas in association with the IUCN Global Species Programme

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I. INTRODUCTION

At the World Conservation Congress, held in Bangkok, Thailand, in 2004, the IUCN Membership requested “a worldwide consultative process to agree a methodology to enable countries to identify Key Biodiversity Areas”. In response to this Resolution (WCC 2004 Res 3.013), the IUCN Species Survival Commission (SSC) and the IUCN World Commission on Protected Areas (WCPA) established a Joint Task Force on Biodiversity and Protected Areas. The Joint Task Force mobilised input from experts in the IUCN Commissions, Members and Secretariat staff, other conservation organisations, academia, governments, donors and the private sector to consolidate the criteria and methodology for identifying Key Biodiversity Areas (KBAs) as sites that contribute significantly to the global persistence of biodiversity.

The results of these efforts are summarised in this Global Standard for the Identification of KBAs (hereafter the KBA Standard), which builds on more than 30 years of experience in identifying important sites for different taxonomic, ecological and thematic subsets of biodiversity. These include, in particular, the 12,000 Important Bird and Biodiversity Areas (IBAs) identified by BirdLife International (2014), plus Alliance for Zero Extinction (AZE) sites (Ricketts et al. 2005), B-ranked sites (TNC 2001), Important Fungus Areas (Evans et al. 2001), Important Plant Areas (IPAs; Plantlife International 2004), Prime Butterfly Areas (van Swaay & Warren 2006) and KBAs covering multiple taxonomic groups in freshwater (Holland et al. 2012), marine (Edgar et al. 2008) and terrestrial systems (Eken et al. 2004, Langhammer et al. 2007) under previously published criteria.

The KBA Standard is formally taken to include definitions, the criteria and thresholds, and delineation procedures. It can be used by national constituencies to identify sites contributing significantly to the global persistence of biodiversity in terrestrial, inland water and marine environments. It is important that this Standard remains stable for a period of time to enable comparisons of sites qualifying as KBAs in different regions and over time. It is recognised, however, that the criteria and thresholds may need revision in the future as experience accumulates in their application and technological advances improve our measurement and understanding of biodiversity.

The aims of the KBA Standard are to:

- Harmonise existing approaches to the identification of important sites for biodiversity;
- Support the identification of important sites for elements of biodiversity not considered in existing approaches;
- Provide a system that can be applied consistently and in a repeatable manner by different users and institutions in different places and over time;
- Ensure that KBA identification is objective, transparent and rigorous through application of quantitative thresholds;
- Provide decision-makers with an improved understanding of why particular sites are important for biodiversity.

Data generated through application of the KBA Standard are expected to have multiple uses (Dudley et al. 2014). KBAs can support the strategic expansion of protected-area networks by governments and civil society working toward achievement of the Aichi Biodiversity Targets (in particular Target 11 and 12), as established by the Convention on Biological Diversity (Butchart et al. 2012); serve to inform the description or identification of sites under international conventions (such as Ecologically and Biologically Significant Areas described under the Convention on Biological Diversity, wetlands of international importance designated under the Ramsar Convention, and natural World Heritage Sites); inform private sector safeguard policies, environmental standards, and certification schemes; support conservation planning and priority-setting at national and regional levels; and provide local and indigenous communities with opportunities for employment, recognition, economic investment, societal mobilisation and civic pride.

It should be emphasised, however, that areas not identified as KBAs are not necessarily of lesser importance. For some regions current limitations on capacity and technology mean that it will take time to compile the necessary data and level of detail to demonstrate that sites meet the quantitative thresholds associated with the KBA criteria, and for the deep ocean it will be difficult and might be impossible in certain situations, at least over the next few decades. Initiatives that are working to highlight areas of importance for safeguarding biodiversity through expert-driven processes, such as Important Marine Mammal Areas (Hoyt 2015), can help fill data gaps and inform KBA identification (and vice versa).

In addition, other areas, which do not meet the global criteria and thresholds defined here may be important for other reasons, and in many cases, are managed as such. These include sites that meet (or will meet) criteria and thresholds of regional or national significance for biodiversity; sites considered to be important at global, regional or national levels for other reasons (e.g. maintaining productivity, ecosystem services, aesthetics or cultural heritage); and seascapes or landscapes important for the persistence of biodiversity beyond the site scale.

The criteria and thresholds in this global KBA Standard are not identical to those by which IBAs or KBAs for other taxa were identified using previously published criteria. There are already more than 13,000 such sites worldwide. Those that are shown to meet the criteria and thresholds in the KBA Standard, and for which minimum documentation requirements have been met, will be recognised as global KBAs. Those that are inferred, with justification, to meet global KBA criteria and thresholds, but for which the data have not yet been compiled to demonstrate the case, will be treated as global KBAs for an 8-12 year re-evaluation period and flagged as 'priority for update'. Those that do not meet global KBA criteria and thresholds but which do meet previously established regional criteria and thresholds will be recognised as regional KBAs.

The KBA Standard is outlined in several sections of this document. Section II, the Preamble, presents basic information about the context and structure of the Standard, and the procedures that are to be followed in applying the criteria to sites. Section III provides definitions of key terms used. Section IV presents the criteria and quantitative thresholds for assessing sites as KBAs. Section V provides delineation procedures. Annex 1 suggests a standard format for citing the KBA criteria; Annex 2 refers to the required and recommended supporting information for KBAs; and Annex 3 provides a summary of the KBA criteria and thresholds.

II. PREAMBLE

The information in this section is intended to direct and facilitate the use and interpretation of the KBA criteria and thresholds, and the delineation guidelines.

1. **Purpose of the criteria**
   The purpose of the criteria is to locate and highlight sites that make significant contributions to the global persistence of biodiversity. The KBA criteria incorporate elements of biodiversity across genetic, species and ecosystem levels, but their purpose is not to include every species or ecosystem within a KBA. The benefits that biodiversity delivers to people are not incorporated into the criteria, but it is recommended that the provision of such ecosystem services, including cultural values, are documented for each site. A principle for developing the Standard has been to keep it as simple as possible; however, having criteria and thresholds that both build from existing approaches and that can be robustly applied across taxonomic groups and all elements of biodiversity has meant that some complexity cannot be avoided.

2. **Relevant biodiversity elements**
   KBAs are identified for biodiversity elements for which specific sites contribute significantly to their global persistence. Some biodiversity elements, such as wide-ranging or migratory species that occur at low densities, may trigger one or more KBA thresholds at particular sites, even if their global persistence depends primarily on management at the scale of entire landscapes, seascapes, catchments, or migratory corridors (e.g. fishery regulations, integrated basin management, restoration of connectivity; Boyd et al. 2008). Similarly, the global persistence of other biodiversity elements may require targeted, species-specific interventions (e.g. wildlife trade enforcement, disease mitigation), even if the biodiversity elements trigger one or more KBA thresholds at particular sites. Safeguarding KBAs is hence complementary to land-/seascape-scale and species-specific management.

3. **Biological scope**
   The KBA criteria can be applied to macroscopic biodiversity in terrestrial, inland water and marine environments. Although not all KBA criteria may be relevant to all elements of biodiversity (e.g. not all species aggregate), the thresholds associated with each of the criteria have been developed to work across all taxonomic groups and ecosystems to which they are applicable.

4. **Role of the different criteria**
The different criteria address different ways in which sites contribute significantly to the global persistence of biodiversity. Sites should be assessed against all relevant criteria for which data are available, but meeting the thresholds under any one of the criteria or sub-criteria is sufficient for a site to be recognised as a KBA, assuming documentation requirements are met (Annex 1). Individual elements of biodiversity may trigger more than one criterion at the same site.

5. **Derivation of the quantitative thresholds**
The thresholds associated with each of the KBA criteria (and sub-criteria) are designed for identifying KBAs at the global level. They are informed by several decades of experience in applying quantitative thresholds to identify important sites for biodiversity, such as IBAs and AZE sites. The criteria and quantitative thresholds were developed through a series of technical workshops and subsequently refined through wide expert consultation and testing with datasets covering diverse taxonomic groups, regions and environments.

6. **Global vs. regional and national thresholds**
The criteria presented in this Standard are for the identification of KBAs meeting thresholds of global significance. Wherever possible, the process of applying the Standard should be led nationally with the involvement of relevant local stakeholders (section V). Some countries/regions may also desire to apply the criteria with less stringent thresholds to identify sites of national/regional significance. Sites can be identified as regional KBAs following guidelines for applying the KBA Standard at regional and national levels, while for KBAs already identified at the regional level, pre-existing criteria and thresholds will continue to apply. National constituencies are encouraged to establish and apply thresholds for identifying national KBAs if doing so is considered to be valuable within a given country. The set of global and regional KBAs will form the list of internationally significant KBAs.

7. **Data quality and metrics for inference**
The KBA criteria have quantitative thresholds to ensure that site identification is transparent, objective and repeatable. It is important to compile the best available data for KBA identification, but the availability of high quality data differs significantly between different taxonomic groups. Hence, for some of the population size-related criteria there is a range of metrics that can be used to estimate or infer whether a site holds a threshold proportion of a species' global population size, including number

of mature individuals, area of occupancy, extent of suitable habitat, range, number of localities, and distinct genetic diversity.

In assessing sites against the criteria, application of all metrics specified should be attempted, accepting that data will often be insufficient to allow this. Number of localities is only appropriate to use where sampling intensity is sufficiently high that the known localities can be assumed to represent adequately the range and area of occupancy of the species. Multiple localities may fall within a single KBA, and abundance may vary considerably across the different localities; thus it should not necessarily be assumed that a species occurring at 100 or fewer localities meets a 1% threshold at each of those localities. For the area-based metrics, a 1% threshold can typically be inferred where the site contains at least 1% of the global extent of a species' area of occupancy, extent of suitable habitat or range, assuming the species is documented to occur at the site. These metrics should be used cautiously, however, given that species tend not to be evenly distributed throughout their range, area of occupancy, or extent of suitable habitat.

Distinct genetic diversity differs from the other metrics in that it refers to the proportion of a species' genetic diversity that is encompassed by a particular area. A site holding more than the threshold proportion of a species' genetic diversity can qualify as a KBA (under criteria A1, B1 and B2), even if the proportion of the species' global population size at the site is insufficient to trigger KBA identification.

8. **Uncertainty**
The data used to assess whether quantitative thresholds of the KBA criteria have been met are often estimated with considerable uncertainty. Such uncertainty can arise from natural variation, vagueness in the terms and definitions used, lack of data, and measurement error. For example, estimates of the global population size of a species might range by more than an order of magnitude, the numbers of individuals or reproductive units at a given site might be subject to substantial inter-annual variation, and delineation may vary greatly in precision. The documentation standards (Annex 2) require assessment of the level of uncertainty in the identification and delineation of KBAs (see point 9), while the progressive reduction of such uncertainty is promoted by the periodic re-evaluation of KBAs (see point 10).

9. **Documentation**
KBA identification is an iterative process and requires the confirmed presence of one or more biodiversity elements (e.g. species, ecosystem

type) at the site that both trigger at least one KBA criterion and meet the corresponding threshold(s). These data must be traceable to a reliable source and be recent enough to give confidence that the biodiversity elements are still present given the history of land use change in an area. A minimum set of information is required for each KBA to support and justify the recognition of a site as a KBA, and an additional set of recommended information should ideally be compiled for each site (Annex 2).

10. **Re-evaluation**
    Sites should be re-assessed against the criteria and thresholds at least once every 8–12 years although more frequent monitoring of KBAs is recommended wherever possible. Both genuine changes in status and changes in knowledge of the biodiversity element(s) triggering the criteria and thresholds may affect the status of a site as a KBA, while other new sites may be found to qualify during this re-evaluation period. Sites that fail to meet any criteria will no longer be considered global KBAs, however, such sites may still meet thresholds for regional or national significance and/or become priorities for restoration.

11. **Climate and environmental change**
    Environmental changes resulting from a range of stressors, notably climate change, may affect the biodiversity in a KBA to such an extent that the site ceases to qualify, which will be determined upon re-evaluation (see point 9). It is also possible that a KBA may increase in importance as a result of climate change or that new sites will qualify. Re-evaluation of sites every 8-12 years will be important for maintaining accurate data over time.

    It is desirable to predict short-term impacts of climate change and other environmental stressors, such as habitat destruction, pollution and invasive species, and to conduct vulnerability analyses at sites. However, a prediction that a site is vulnerable to climate or other environmental change should not preclude its recognition as a KBA. Where manageability and topographic complexity allow (e.g. mountain systems that permit up-slope movement), site delineation may take into account the possibility of habitat refugia or areas suitable for near-term shifts of species and ecosystems at risk. This should only be done for sites where data are adequate to make a defensible case. Site management of KBAs should consider climate change and other impacts and manage them to the extent that this is possible, according to the best available guidance.

    It may be possible to predict the future locations of potential KBAs under climate change scenarios. Such predictive models will be important in national and regional conservation planning exercises. However, KBAs should be identified on the basis of the current presence of biodiversity elements, rather than on projected future distributions.

12. KBAs and protected areas

The identification of a site as a KBA on the basis of the criteria and thresholds presented here is unrelated to its legal status; however, such status will often inform site delineation (Section V3.2).

Many KBAs overlap wholly or partly with existing protected area boundaries, including sites designated under international conventions (e.g. Ramsar and World Heritage) and areas protected at national and local levels (e.g. national parks, indigenous or community conserved areas). However, it is recognised that other management approaches may also be appropriate; the identification of a site as a KBA simply implies that the site should be managed in ways that ensure the persistence of the biodiversity elements for which it is important. It is also understood that many protected areas are established for other conservation purposes and will not be identified as KBAs unless they also hold biodiversity elements meeting the criteria and thresholds.

13. KBAs and conservation priorities

KBAs are sites of importance for the global persistence of biodiversity. However, this does not imply that a specific conservation action, such as protected area designation, is required. Such management decisions should be based on conservation priority-setting exercises, which combine data on biodiversity importance with the available information on site vulnerability and the management actions needed to safeguard the biodiversity for which the site is important. It is often desirable to incorporate other data into priority-setting, such as conservation cost, opportunity for action, importance for conserving evolutionary history and connectivity. KBAs thus do not necessarily equate to conservation priorities but are invaluable for informing systematic conservation planning and priority-setting, recognising that conservation priority actions may also be outside of KBAs.

III. DEFINITIONS

This section defines key terms used in the definition of KBAs, in the KBA criteria and thresholds, and in site delineation procedures. It is necessary to refer to these terms when interpreting the criteria because they are defined in a narrow or particular sense.

A. Terms used in defining KBAs

KBAs are sites contributing significantly to the global persistence of biodiversity.

Biodiversity
Biodiversity is ‘the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems’, according to the Convention on Biological Diversity (CBD) (UN 1992).

Contributing/Contribution
The contribution of a site to the global persistence of biodiversity depends on the global distribution and the abundance of the biodiversity elements for which the site is important. Sites holding biodiversity elements that are globally restricted, or at risk of disappearing, make high contributions to the persistence of those elements. The global persistence of a biodiversity element occurring at any given KBA, unless it is entirely confined to the site, depends not only on the fate of the site itself but also on that of other sites and of the land-/seascapes where it occurs.

Global
Global implies that the contributions of a site to the persistence of a given biodiversity element are measured in relation to its worldwide population size or extent.

Persistence
Persistence of a biodiversity element means that its loss (e.g. species extinction, ecosystem collapse) or decline (e.g. of numbers of mature individuals of a species, ecosystem extent and condition) is avoided, both now and into the foreseeable future.

Significantly/Significant
Significant means that an outstanding proportion of a biodiversity element (e.g. species population size or ecosystem extent) occurs at the site, as defined by a quantitative threshold.

Site
A geographical area on land and/or in water with defined ecological, physical, administrative or management boundaries that is actually or potentially manageable as a single unit (e.g. a protected area or other managed conservation unit). For this reason, large-scale biogeographic regions such as ecoregions, Endemic Bird Areas and Biodiversity Hotspots, and land-/seascapes containing multiple management units, are not considered to be sites. In the context of KBAs, “site” and “area” are used interchangeably.

B. Terms used in the KBA criteria and delineation procedures

- **Aggregation (Criterion D)**
  A geographically restricted clustering of individuals that typically occurs during a specific life history stage or process such as breeding, feeding or migration. This clustering is indicated by highly localised relative abundance, two or more orders of magnitude larger than the species' average recorded numbers or densities at other stages during its life-cycle.

- **Area of occupancy (Criteria A, B, E)**
  The area within the range of a species that is actually occupied (IUCN 2012a).

- **Assemblage (Criterion B)**
  A set of species within a taxonomic group having: a) their ranges ≥95% predictably confined to a single ecoregion for at least one life-history stage; b) their ranges ≥95% predictably confined to a single biome for at least one life-history stage (for taxonomic groups with a global median range size >25,000 km^2); or c) their most important habitats in common with multiple other species.

- **Biodiversity element**
  Genes, species or ecosystems, as used by the Convention on Biological Diversity (CBD) definition of biodiversity (Jenkins 1988).

- **Biological process (Criterion D)**
  The demographic and life-history processes that maintain species such as reproduction and migration.

- **Bioregion (Criterion B)**
  Major regional terrestrial and aquatic habitat types distinguished by their climate, flora and fauna, such as the combination of terrestrial biomes and biogeographic realms (Olson et al. 2001) or marine provinces (Spalding et al. 2007, Spalding et al. 2012). These biogeographic units are typically about an order of magnitude larger in area than the ecoregions nested within them.

- **Complementarity (Criterion E)**
  A measure of the extent to which an area contains elements of biodiversity not represented, or that are underrepresented, in an existing set of areas; alternatively, the number of unrepresented or underrepresented biodiversity elements that a new area adds to a network (Margules & Pressey 2000).

- **Distinct genetic diversity (Criteria A, B)**
  The proportion of a species' genetic diversity that is encompassed by a particular site. It can be measured using Analysis of Molecular Variance or similar technique that simultaneously captures diversity and distinctiveness (frequency of alleles and the genetic distinctiveness of those alleles).

- **Ecological integrity (Criterion C)**
  A condition that supports intact species assemblages and ecological processes in their natural state, relative to an appropriate historical benchmark, and characterised by contiguous natural habitat with minimal direct industrial anthropogenic disturbance.

- **Ecoregion (Criteria B, C)**
  A 'relatively large unit of land (or water) containing a distinct assemblage of natural communities and species with boundaries that approximate the original extent of natural communities prior to major land-use change' (Olson et al. 2001). Ecoregions have been mapped for terrestrial (Olson et al. 2001), freshwater (Abell et al. 2008) and near-shore marine (Spalding et al. 2007) environments and are nested within bioregions or provinces.

- **Ecosystem type (Criteria A, B)**
  A defined ecosystem unit for standard and repeatable assessment, at an intermediate level in a globally consistent ecosystem classification hierarchy such as macrogroup or equivalent (Faber-Langendoen et al. 2014). It is defined by a particular set of variables related to its characteristic native biota, an abiotic environment or complex, the interactions within and between them, and a physical space in which these operate (Keith et al. 2013, Rodríguez et al. 2015). Other terms such as "ecological communities" and "biotopes" are often considered operational synonyms of ecosystem type.

- **Endemic (Criteria A, E)**
  A species having a global range wholly restricted to a defined geographic area such as a region, country or site.

- **Environmental stress (Criterion D)**
  Natural events like floods, droughts, storms, wildfires, earthquakes as well as high or low temperature caused by global change; it can also describe the lack of food due to the bottom-up effect of environmental stress or massive die off of prey in ecosystems due to infectious disease.

- **Extent of suitable habitat (Criteria A, B)**
  The area of potentially suitable ecological conditions, such as vegetation or substrate types within the altitudinal or depth, and temperature and moisture preferences, for a given species (Beresford et al. 2011).

- **Geographically restricted (Criterion B)**
  A biodiversity element having a restricted global distribution, as measured by range, extent of suitable habitat or area of occupancy, and hence largely confined or endemic to a relatively small portion of the globe such as a bioregion, ecoregion or site.

- **Intact ecological community (Criterion C)**
  An ecological community having the complete complement of species known or expected to occur in a particular site or ecosystem, relative to a regionally appropriate historical benchmark, which will often correspond to pre-industrial times.

- **Irreplaceability (Criterion E)**
  Either (a) the likelihood that an area will be required as part of a system that achieves a set of targets (Ferrier et al. 2000) or (b) the extent to which the options for achieving a set of targets are reduced if the area is unavailable for conservation (Pressey et al. 1994). Irreplaceability is heavily influenced by geographically restricted biodiversity, but it is a property of an area within a network rather than of an element of biodiversity and is related to the concept of complementarity.

- **Locality (Criteria A, B)**
  A sampling locality is a point indicated by specific coordinates of latitude and longitude. Note that the term “locality”, as defined here, is fundamentally and conceptually different from the term “location” used in the IUCN Red List Categories and Criteria (IUCN 2012a).

- **Manageability (Delineation)**
  The possibility of some type of effective management across the site. Being a manageable site implies that it is possible to implement actions locally to ensure the persistence of the biodiversity elements for which a KBA has been identified. This requires that KBA delineation consider relevant aspects of the socio-economic context of the site (e.g. land tenure, political boundaries) in addition to the ecological and physical aspects of the site (e.g. habitat, size, connectivity).

- **Mature individuals (Criteria A, B, E)**
  The number of individuals known, estimated or inferred to be capable of reproduction as defined in IUCN (2012a).

- **Population size (Criteria A, B, D)**
  The total, global, number of mature individuals of the species (IUCN 2012a). Population size is used throughout the Standard rather than simply "population", which IUCN (2012a) use to mean the total number of individuals of a species.

- **Predictably (Criterion D)**
  An expectation of species occurrence at a site during particular seasons or at one or more stages of its life cycle, based on previous or known occurrence, such as in response to specific climate conditions.

- **Range (Criterion A, B, E)**
  The current known limits of distribution of a species, accounting for all known, inferred or projected sites of occurrence (IUCN 2012a), including conservation translocations outside native habitat (IUCN Standards and Petitions Subcommittee 2014) but not including vagrancies (species recorded once or sporadically but known not to be native to the area).

- **Regularly (Criteria A, B)**
  The occurrence of a species is normally or typically found at the site during one or more stages of its life cycle.

- **Reproductive unit (Criteria A, B, E)**
  The minimum number and combination of mature individuals necessary to trigger a successful reproductive event at a site (Eisenberg 1977). Examples of five reproductive units include five pairs, five reproducing females in one harem, and five reproductive individuals of a plant species.

- **Restricted range (Criterion B)**
  Species having a global range size less than or equal to the 25th percentile of range-size distribution in a taxonomic group within which all species have been mapped globally, up to a maximum of 50,000 km^2. If all species in a taxonomic group have not been mapped globally, or if the 25th percentile of range-size distribution for a taxonomic group falls below 10,000 km^2, restricted range should be defined as having a global range size less than or equal to 10,000 km^2. For coastal, riverine and other species with linear distributions that do not exceed 200 km width at any point, restricted range is defined as having a global range less than or

equal to 500 km linear geographic span (i.e. the distance between occupied locations furthest apart). Species known only from their type locality should not automatically be assumed to have a restricted range, since this may be indicative of under-sampling.

- **Target (Criterion E)**
  A conservation target is the minimum amount of a particular biodiversity feature for which conservation is desirable through one or multiple conservation actions (Possingham et al. 2006).

- **Taxonomic group (Criterion B)**
  Taxonomic ranks above the species level.

- **Threatened (Criterion A)**
  Assessed through globally standardised methodologies as having a high probability of extinction (species) or collapse (ecosystems) in the medium-term future. Threatened species are those assessed as Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) according to The IUCN Red List of Threatened Species (IUCN 2012a). For the purposes of KBA criterion A1, Threatened also includes species assessed as regionally/nationally CR, EN or VU using the IUCN Red List Categories and Criteria (IUCN 2012b) that (a) have not been assessed globally and (b) are endemic to the region/country in question. Threatened ecosystems are those assessed as CR, EN or VU according to the IUCN Red List of Ecosystems (IUCN 2015).

- **Threshold (Criteria A-E)**
  Numeric or percentage minima which determine whether the presence of a biodiversity element at a site is significant enough for the site to be considered a KBA under a given criterion or sub-criterion.

- **Trigger (Criteria A-E)**
  A biodiversity element (e.g. species or ecosystem) by which at least one KBA criterion and associated threshold is met.

IV. KBA CRITERIA AND THRESHOLDS

A. Threatened Biodiversity

A1. Threatened species

Sites qualifying as KBAs under criterion A1 hold a significant proportion of the global population size of a species facing a high risk of extinction and so contribute to the global persistence of biodiversity at genetic and species levels.

Site regularly holds one or more of the following:

a) ≥0.5% of the global population size AND ≥5 reproductive units of a CR or EN species;

b) ≥1% of the global population size AND ≥10 reproductive units of a VU species;

c) ≥0.1% of the global population size AND ≥5 reproductive units of a species assessed as CR or EN due only to population size reduction in the past or present;

d) ≥0.2% of the global population size AND ≥10 reproductive units of a species assessed as VU due only to population size reduction in the past or present;

e) Effectively the entire global population size of a CR or EN species.

Proportion of the global population size can be observed or inferred through any of the following:

(i) number of mature individuals,
(ii) area of occupancy,
(iii) extent of suitable habitat,
(iv) range,
(v) number of localities,
(vi) distinct genetic diversity.

Species that can trigger criterion A1 encompass those assessed as globally CR, EN or VU on The IUCN Red List of Threatened Species (IUCN 2012a), or species assessed as regionally/nationally Threatened using the *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels* (IUCN 2012b) where these both (a) have not been assessed globally and (b) are endemic to the region/country in question. Criterion A1 can be triggered by migratory species in both their breeding and non-breeding range; at non-breeding sites, the reproductive units threshold can be interpreted as the number of mature individuals.

Sub-criteria A1c and A1d apply to species that have experienced, or are currently experiencing, rapid decline in population size and thus are restricted to those species qualifying only under Criterion A of the IUCN Red List Categories and Criteria, in any of sub-criteria A1, A2, or A4. Species qualifying only under Criterion A3 of the IUCN Red List are expected to experience *future* rapid decline in population size but currently may still be quite abundant, and so these species are subject to the higher thresholds of KBA sub-criteria A1a and A1b. There is no reproductive units requirement for sub-criterion A1e because sites holding all remaining mature individuals of CR or EN species make a highly significant contribution to their persistence.

A2. Threatened ecosystem types

Sites qualifying as KBAs under criterion A2 hold a significant proportion of the global extent of an ecosystem type facing a high risk of collapse and so contribute to the global persistence of biodiversity at the ecosystem level.

Site holds one or more of the following:

a) ≥5% of the global extent of a globally CR or EN ecosystem type;

b) ≥10% of the global extent of a globally VU ecosystem type.

Threatened ecosystem types include those assessed as globally CR, EN or VU under the IUCN Red List of Ecosystems Categories and Criteria (IUCN 2015) using units at an intermediate level in a globally consistent ecosystem classification hierarchy, such as macrogroup or equivalent (Faber-Langendoen et al. 2014). Ecosystem collapse is characterised by a transformation of identity, loss of defining features, and replacement by a different ecosystem type (IUCN 2015).

B. GEOGRAPHICALLY RESTRICTED BIODIVERSITY

B1: Individual geographically restricted species

Sites qualifying as KBAs under criterion B1 hold a significant proportion of the global population size of a geographically restricted species and so contribute significantly to the global persistence of biodiversity at the genetic and species level.

Site regularly holds ≥10% of the global population size AND ≥10 reproductive units of a species.

Proportion of the global population size can be observed or inferred through any of the following:

(i) number of mature individuals,
(ii) area of occupancy,
(iii) extent of suitable habitat,
(iv) range,
(v) number of localities,
(vi) distinct genetic diversity.

In practice, many restricted-range species will trigger criterion B1, but having a restricted range is not a requirement under this criterion. Some species with large ranges may have many individuals concentrated in just a few areas within their range limits. The regular occurrence of all life stages of a species at a site distinguishes criterion B1 from criterion D1.

B2: Co-occurring geographically restricted species

Sites qualifying as KBAs under criterion B2 hold a significant proportion of the global population size of multiple restricted-range species, and so contribute significantly to the global persistence of biodiversity at the genetic and species level.

Site regularly holds ≥1% of the global population size of each of a number of restricted-range species in a taxonomic group, determined as either ≥2 species OR 0.02% of the global number of species in the taxonomic group, whichever is larger.

Proportion of the global population size can be observed or inferred through any of the following:

(i) number of mature individuals,
(ii) area of occupancy,
(iii) extent of suitable habitat,
(iv) range,
(v) number of localities,
(vi) distinct genetic diversity.

Sites holding multiple restricted-range species are frequently indicative of centres of endemism. Although criterion B2 can be applied to any taxonomic group, groups above Class and below Family are unlikely to be useful in practice.

B3: Geographically restricted assemblages

Sites qualifying as KBAs under criterion B3 hold assemblages of species within a taxonomic group that are globally restricted and so contribute significantly to the global persistence of biodiversity at the genetic, species and ecosystem levels.

Site regularly holds one or more of the following:

a) ≥0.5% of the global population size of each of a number of ecoregion-restricted species within a taxonomic group, determined as either ≥5 species OR 10% of the species restricted to the ecoregion, whichever is larger;

b) ≥5 reproductive units of ≥5 bioregion-restricted species OR 30% of the bioregion-restricted species known from the country, whichever is larger, within a taxonomic group;

c) Part of the globally most important 5% of occupied habitat for each of ≥5 species within a taxonomic group.

Because bioregions are larger than and inclusive of ecoregions, either criterion B3a or B3b, but not both, should be used for a particular taxonomic group. Criterion B3a is applicable to taxonomic groups for which the global median range size is <25,000 km^2, while B3b is applicable to taxonomic groups with a global median range size ≥25,000 km^2.

Proportion of the global population size under sub-criteria B3a can be observed or inferred through any of the following:

(i) number of mature individuals,
(ii) area of occupancy,
(iii) extent of suitable habitat,
(iv) range,
(v) number of localities.

Under sub-criterion B3c 'most important occupied habitat' can be observed or inferred through the following:

(i) density of mature individuals,
(ii) relative abundance of mature individuals.

Although criterion B3 can be applied to any taxonomic group, groups above Class and below Family are unlikely to be useful in practice. Sub-criterion B3b is formulated to account for the non-uniform way that species confined to bioregions, which are typically very large, are distributed across them. While greater numbers of species usually co-occur at or near their geographic centres, others are confined towards their peripheries. A proportional threshold based on the assemblage of species of the bioregion as a whole therefore would mean the exclusion of such species: the modifying clause "known from the country" addresses this.

B4: Geographically restricted ecosystem types

Sites qualifying as KBAs under criterion B4 hold a significant proportion of the global extent of a geographically restricted ecosystem type and so contribute significantly to the global persistence of biodiversity at the species and ecosystem level.

Site holds ≥20% of the global extent of an ecosystem type.

To ensure global consistency in application of the KBA criteria, criterion B4 should be applied to units at an intermediate level in a globally consistent ecosystem classification hierarchy, such as macrogroup or equivalent (Faber-Langendoen et al. 2014), as used for the IUCN Red List of Ecosystems for global assessments.

C. ECOLOGICAL INTEGRITY

Sites qualifying as KBAs under criterion C hold wholly intact ecological communities with supporting large-scale ecological processes and so contribute significantly to the global persistence of biodiversity at the ecosystem level.

Criterion C identifies truly outstanding examples at the global scale of still-natural and intact places that maintain fully functional ecosystem types and their components. These sites are large and essentially undisturbed by significant industrial human influence. They maintain their full complements of species in their natural abundances or biomass, support the ability of species to engage in natural movements, and allow for the unimpeded functioning of ecological processes.

Site is one of ≤2 per ecoregion characterised by wholly intact ecological communities, comprising the composition and abundance of native species and their interactions.

Ecological integrity should be observed or inferred from both direct measures of species composition and abundance/biomass across taxonomic groups (particularly for species indicative of long-term structural stability and functionality or those known to be highly sensitive to human impact) and absence (or very low levels) of direct industrial human impact (as quantified by appropriate indices at the scale of interest and verified on the ground or in the water).

These metrics should be contextualised by information that allows inference of the historical bounds of variation using a regionally appropriate benchmark (e.g. the past 500 years) for diversity or abundance in the ecoregion. Pervasive global-scale threats that affect all marine and/or terrestrial areas (e.g. climate change, ocean acidification, overharvest of cetaceans) should not be included in metrics of direct industrial human impact.

KBAs identified under criterion C should ideally be delineated to be at least 10,000 km^2 in size, within the confines of manageability (including for transboundary sites). Where sites straddle ecoregional boundaries, delineation should proceed without respect to ecoregional division.

D. BIOLOGICAL PROCESSES

D1: Demographic aggregations

Sites qualifying as KBAs under criterion D1 hold a significant proportion of the global population size of a species during one or more life history stages or processes, and so contribute significantly to the global persistence of biodiversity at the species level.

Site predictably holds one or more of the following:

a) An aggregation representing ≥1% of the global population size of a species, over a season, and during one or more key stages of its life cycle;

b) A number of mature individuals that ranks the site among the largest 10 aggregations known for the species.

Proportion of the global population size can be observed from the following:

(i) number of mature individuals.

Aggregations typically occur for breeding, feeding or during migration and are indicated by highly localised relative abundance, two or more orders of magnitude larger than the species' average recorded numbers or densities at other stages during its life-cycle. Criterion D1 is not meant to identify sites that hold *all* key stages of a species' life cycle; those sites may triggered by criteria A1, B1, B2 or B3. The concept of aggregation is broad enough, however, to include species that remain aggregated throughout most or all of their life cycles as they move between sites (e.g. some flamingo, albatross and petrel species). In sub-criterion D1b, the threshold applies across all life-history functions rather than for specific functions (e.g. breeding or feeding). Along migratory corridors, KBAs should be identified for stop-over or bottleneck sites rather than for the entire corridor.

D2: Ecological refugia

Sites qualifying as KBAs under criterion D2 hold a significant proportion of the global population size of a species during periods of environmental stress, and so contribute significantly to the global persistence of biodiversity at the species level.

Site supports ≥10% of the global population size of one or more species during periods of environmental stress, for which historical evidence shows that it has served as a refugium in the past and for which there is evidence to suggest it would continue to do so in the foreseeable future.

Proportion of the global population size can be observed from the following:

(i) number of mature individuals.

Species at any life stage may become concentrated in sites that maintain necessary resources, such as food and water, during periods of environmental stress, when conditions elsewhere become inhospitable. These temporary changes in climatic or ecological conditions, such as severe droughts, may concentrate individuals of a species at particular sites on the scale of multiple years or decades. This longer time horizon differentiates ecological refugia from the demographic and geographic aggregations described in criterion D1.

D3: Recruitment sources

Sites qualifying as KBAs under criterion D3 are where a significant proportion of the global population size of a species is produced, and so contribute significantly to the global persistence of biodiversity at the species level.

Site predictably produces propagules, larvae, or juveniles that maintain ≥10% of the global population size of a species.

Proportion of the global population size can be observed from the following:

(i) number of mature individuals.

Unlike sites identified under criteria D1 and D2, where individuals of a species are moving *into* a site at globally significant proportions, albeit at different time scales, criterion D3 applies to species where individuals disperse *out of* the site in globally significant proportions. These sources make a large contribution to the recruitment of a species elsewhere, even though the number of mature individuals at the site may be low or zero. Hence, the threshold is applicable to the global adult population size occurring largely outside of the site, rather than to the number of immature individuals within the site.

E. IRREPLACEABILITY THROUGH QUANTITATIVE ANALYSIS

Sites qualifying as KBAs under criterion E have very high irreplaceability for the global persistence of biodiversity as identified through a complementarity-based quantitative analysis of irreplaceability.

Site has a level of irreplaceability of ≥0.90 (on a 0–1 scale), measured by quantitative spatial analysis, and is characterised by the regular presence of species with ≥10 reproductive units known to occur (or ≥ 5 units for EN or CR species).

The irreplaceability analysis should be based on the contribution of individual sites to species persistence. Targets for the quantitative irreplaceability analysis may be one of two types:

(a) Representing at least X mature individuals of each species, where X is the largest value among:

  i. the total number of individuals currently existing in the wild, if either: the global population size is fewer than 1,000 mature individuals; or the species' range is smaller than 1,000 km^2; or the area of occupancy is smaller than 20 km^2;
  ii. the population size necessary to ensure the global persistence of the species with a probability of ≥90% in 100 years, as measured by quantitative viability analysis;
  iii. 1,000 mature individuals;
  iv. the number of mature individuals expected to occupy, at average densities, 1,000 km^2 within the species' range or 20 km^2 within the species' area of occupancy (as appropriate);

(b) Representing at least an area of Y km^2 for each species, where Y is the larger value among:

  i. the total area where the species occurs, if either: the global population size is fewer than 1,000 mature individuals; or the species' range is smaller than 1,000 km^2; or the area of occupancy is smaller than 20 km^2;
  ii. the area necessary to ensure the global persistence of the species with a probability of ≥90% in 100 years, as measured by quantitative viability analysis, up to a minimum of 10% of

the total species distribution (i.e. range or area of occupancy, as appropriate);

iii. 1,000 km^2 within the range or 20 km^2 within the area of occupancy (as appropriate);

iv. the area corresponds to the range or the area of occupancy (as appropriate) necessary to include 1,000 mature individuals.

KBA assessment to identify sites under Criterion E should be implemented through complementarity-based irreplaceability analyses. The spatial units in which the study area is subdivided should be equal-area or approximately equal-area at the scale of approximately 100–1,000 km^2. The 0.9 threshold for site irreplaceability means that, given the biodiversity elements used in the analysis, and the targets set, area X is found in 90% of all possible minimum sets of areas meeting those targets. For the same given set of targets, any one element may not point to area X as irreplaceable, but a *set* of all elements and their targets can make area X irreplaceable.

The irreplaceability analyses need to take into account the entire range of species, and so must either (a) be conducted at a global scale, or (b) focus only on the endemics from the region analysed, or (c) set the targets to reflect the fraction of the global population size of each species that is included in the study area. The irreplaceability analysis would not in itself identify KBA boundaries, which should be defined in a subsequent delineation process (Section V). Once delineation has been undertaken, it may be useful or necessary to repeat the analysis using delineated boundaries as the spatial units to determine the irreplaceability score of the KBA.

V. DELINEATION PROCEDURES

Delineation is the process through which the boundaries of a KBA are drawn on a map; it is a required step of the KBA identification process. The aim is to derive site boundaries that are ecologically relevant yet practical for management. Taking the actual or potential manageability of sites into account in their delineation is likely to enhance prospects of biodiversity persistence, but no specific management prescription is implied by the delineation of KBA boundaries.

Delineation is an iterative process that typically involves assembling spatial datasets, deriving initial site boundaries based on ecological data, refining the ecological boundaries to yield practical boundaries, and documenting delineation precision. The process should occur in collaboration with stakeholders having expertise relevant to KBA identification and delineation, and who are free of political/economic bias or conflicts of interest. This usually includes scientists and other experts with local and traditional knowledge of the biodiversity elements occurring at the site, conservation and community groups working or living in the area, and government agencies tasked with managing natural areas or wildlife. Consultation with these constituencies (e.g. through workshops or informal meetings) can provide important context and data to inform delineation. As the extent to which KBA boundaries inform active management increases, more extensive consultation will be needed, for example with local and indigenous communities living in or near the site.

1. Assembling spatial datasets

In addition to locality data for the biodiversity elements triggering the KBA criteria, a number of data layers may be helpful for site delineation. These include but are not limited to:

- habitat suitability and extent;
- tracking and movement data, including migratory bottlenecks;
- known occurrence, feeding or breeding sites (including seasonally);
- seasonal refugia (e.g. deep pools in rivers);
- boundaries of any important biodiversity sites that have already been identified (e.g. IBAs, IPAs, AZE sites);
- land use, including roads, cities and agricultural areas (where useful);
- management units (e.g. protected areas, indigenous territories, private lands, concessions, administrative boundaries);
- topographic data (e.g. elevation, sub-catchments, seamounts, outer reef passages).

2. Deriving initial site boundaries based on ecological data

The boundaries for a KBA should initially be based on ecological considerations. This requires mapping the local extent of the biodiversity elements triggering the KBA criterion or criteria. For well-known biodiversity elements, deriving a boundary that represents the known local geographic extent may be possible. For lesser-known elements, it may be necessary to estimate approximate geographic extent using models or knowledge of habitat requirements combined with maps of remaining habitat. In addition to habitat, it is important to consider the spatial or physical properties of the site including size, edge and connectivity with other natural areas. The initial ecological boundaries should be defined based upon the information available, while acknowledging the limitations of such information.

There is no minimum or maximum size requirement for a KBA. On land, IBAs (KBAs identified for birds) are typically 100–1000 km^2 but range from 0.01 km^2 to over 330,000 km^2. The size of the KBA will depend on the ecological requirements of the biodiversity elements triggering the criteria and the actual or potential manageability of the area. Sites identified under criterion C, or in the open ocean, are likely to be larger on average than sites identified under other KBA criteria or on land. Wherever possible, delineation should aim to develop site boundaries that are large enough to allow persistence of the biodiversity for which the site is identified while minimising the inclusion of land or water that is not relevant to it.

KBAs will generally have fixed boundaries. Where dynamic features are important, as for many marine species but also freshwater/terrestrial species that depend on dynamic or ephemeral habitats, KBAs should be large enough to encompass these features, within the confines of manageability.

3. Refining the ecological boundaries to yield practical boundaries

In many cases, KBA identification will be triggered by multiple taxa and initial mapping based on ecological data may yield multiple overlapping and incongruent polygons. KBA delineation is therefore not complete until boundary refinement has been considered to yield a manageable site or sites. This often means refining ecological boundaries with additional data, especially in situations where the extent of a biodiversity element falls within or overlaps with an existing site of importance for biodiversity, an existing protected area, a large block of contiguous habitat or it overlaps incongruently with other biodiversity elements meeting the KBA criteria.

3.1 Delineation with respect to existing sites of importance for biodiversity

When important sites for biodiversity, such as IBAs, IPAs, AZE sites, and KBAs identified under previously published criteria, have already been identified in the region of interest, the identification and delineation of KBAs for new biodiversity elements or application of additional criteria should take into consideration their boundaries. Many of these sites have national recognition, active conservation and monitoring initiatives and/or are linked to legislative and policy processes. If the additional biodiversity element(s) triggering one or more of the KBA criteria falls within the boundary of an existing site, and it contains enough of the new element(s) to meet the threshold of significance, the boundary of that site should be used for the delineation, unless there is new information to indicate otherwise.

If the additional biodiversity element partially overlaps an existing site of importance for biodiversity, or is larger than the existing site, there are generally three options: disregard the area that does not overlap (if it is ecologically insignificant), extend the existing boundary in consultation with the individual or group who originally delineated the site, or delineate a new KBA adjacent to the site. The appropriate option will typically depend on how much of an overlap there is. Modifying the boundaries of existing sites to incorporate additional biodiversity elements without proper stakeholder consultation can be destabilising and might jeopardise positive management actions underway at the site, and so should be avoided where possible. Any relationship of a proposed KBA boundary to that of an existing important biodiversity site should be included in supporting documentation.

3.2 Delineation with respect to protected areas and other conservation areas

When a biodiversity element triggering the KBA criteria falls within an existing protected area or other recognised conservation area (such as a private reserve), and where active management is underway, it is often advisable to use the boundary of the protected or other conservation area to delineate the KBA. Most protected areas are recognised management units with the goal of safeguarding the biodiversity contained within them, although delineation of individual protected areas may be constrained by other considerations. The additional recognition of the site as a KBA, using the existing boundaries, helps to consolidate the importance of these management units. If the protected area boundary is used for KBA delineation, any data layers depicting the more detailed distribution of the biodiversity element within the protected area should be retained to support specific management actions and monitoring.

When a biodiversity element triggering one or more criteria partially overlaps and/or extends well beyond the boundaries of an existing protected area, there are generally two options. The first is to use the existing protected area boundary for the delineation of one KBA and delineate a second KBA covering the portion of the biodiversity element outside the protected area, assuming both areas meet the thresholds of significance in their own right. The second option is to include the additional habitat adjacent to the protected area within the boundaries of a single larger KBA, which would be partially protected. This second option will generally be appropriate only when there is a realistic possibility that the additional habitat adjacent could be managed together with the protected area as a single unit, either through formal expansion of the protected area or through other forms of coordinated management, or if in delineating two sites one or both would fail to meet the criteria and thresholds.

3.3 Refining boundaries using other management data

When delineating sites that fall outside existing KBAs and protected areas, it is often necessary to incorporate other data on land/water management to derive practical site boundaries. These management data layers should be of an appropriate scale or grain of land- or water-use and can include private lands managed for biodiversity, language groups, national and sub-national administrative boundaries, catchments in the case of integrated basin management, and other permanent management units. Where sites overlap one or more national boundaries, a single KBA can be delineated when transboundary management is either in place or a realistic possibility. More typically, identifying separate KBAs in each country may be most consistent with potential manageability.

In some cases, refining site boundaries based on management units is not feasible because the units themselves (a) are too small or too large to be useful, (b) do not meet the requirements of the biodiversity elements that trigger the KBA, or (c) do not exist (e.g. as on the high seas). In these cases, using ecological boundaries derived from maps of suitable habitat or the local extent of biodiversity elements triggering the criteria is the best approach. When these data do not exist or do not overlap in a coherent way, topographic and environmental data such as elevation, ridgelines, seamounts, geological features and other identifiable elements on the land/seascape can be used to derive site boundaries.

4. Documenting delineation precision

KBA delineation is an iterative process that makes use of better and more recent data as they become available. Stable boundaries are desirable but the delineation process must be able to accommodate changes in knowledge (including local and indigenous knowledge) and the reality on the ground. A description of how the boundary was derived should be included in the documentation. The level of precision of KBA boundaries should be recorded in the documentation and used when KBAs are displayed on maps.

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ANNEX 1. CITATION OF THE KBA CRITERIA

In order to promote the use of a standard format for citing the KBA criteria and sub-criteria, a hierarchical alphanumeric numbering system is used similar to that used for the IUCN Red List of Threatened Species (IUCN 2012a).

Criteria are indicated by the use of numbers (1-4), except for criteria C and E. Where more than one sub-criterion is met, these are indicated by the use of the lower-case alphabet characters (a-e), listed without any punctuation. The metrics used to observe or infer thresholds are indicated with roman numerals (i-vi). These are placed in parentheses (with no space between the preceding alphabet character and start of the parenthesis) and separated by the use of commas if more than one is listed. Where more than one criterion is met, they should be separated by semicolons.

The following are examples of such usage:
A1a(i,ii)b(i,ii,iii); B1(iii); D1a(i)
A1c(v); A2b
B1(i,v,vi); B2(i,v,vi); B3a(vi)b(v)
B3c(v); C(ii)
E

ANNEX 2: DOCUMENTATION FOR KEY BIODIVERSITY AREAS

KBA identification requires a minimum set of supporting information. This information supports and justifies the identification of a site as a KBA and enables analyses of KBA data across taxonomic groups, ecosystem types and countries. It also helps users to search and find information easily on the website.

The Documentation Standards for Key Biodiversity Areas are available for download on the KBA website (www.keybiodiversityareas.org) and include:

- Required supporting information for all KBAs
- Required supporting information under specific conditions
- Recommended supporting information

Note that the Documentation Standards for Key Biodiversity Areas will be updated on a regular basis. Users should check the KBA website for the most current version of this reference document.

ANNEX 3. SUMMARY OF THE KBA CRITERIA AND THRESHOLDS

A. Threatened Biodiversity	*Biodiversity element at site*	*% global pop. size/extent*	*RU*[1]
A1. Threatened species	(a) CR or EN species	≥0.5%	≥5
	(b) VU species	≥1%	≥10
	(c) CR or EN species Threatened only due to population size reduction in the past or present	≥0.1%	≥5
	(d) VU species Threatened only due to population size reduction in the past or present	≥0.2%	≥10
	(e) CR or EN species	Entire global population size	
A2: Threatened ecosystem types	(a) CR or EN ecosystem type	≥5%	
	(b) VU ecosystem type	≥10%	

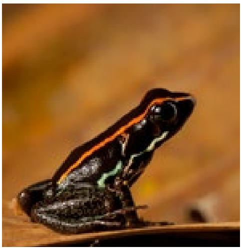
B. Geographically restricted biodiversity	*Biodiversity element at site*	*% global pop. size/extent*	*RU*
B1: Individually geographically restricted species	Any species	≥10%	≥10
B2: Co-occurring geographically restricted species	Restricted-range species: ≥2 species OR 0.02% of total number of species in taxonomic group, whichever is larger	≥1%	
B3: Geographically restricted assemblages	(a) ≥5 ecoregion-restricted species[2] OR 10% of the species restricted to the ecoregion, whichever is larger	≥0.5%	
	(b) ≥5 bioregion-restricted species[2] OR 30% of the bioregion-restricted species known from the country, whichever is larger		
	(c) Part of the globally most important 5% of occupied habitat of each of ≥5 species within a taxonomic group		
B4: Geographically restricted ecosystem types	Any ecosystem type	≥20%	

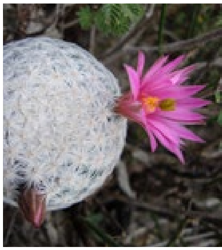
C. Ecological integrity	*Biodiversity element at site*	
	Wholly intact ecological communities	≤2 sites per ecoregion

D. Biological processes	*Biodiversity element at site*	*% global pop. size*
D1: Demographic aggregations	(a) Species aggregation during one or more key stages of its life cycle	≥1%
	(b) Among the largest 10 aggregations known for the species	
D2: Ecological refugia	Species aggregations during periods of past, current or future environmental stress	≥10%
D3: Recruitment sources	Propagules, larvae or juveniles maintaining high proportion of global population size	≥10%[3]

E: Irreplaceability through quantitative analysis	*Biodiversity element at site*	*Irrepl. score*	*RU*
	Site has high irreplaceability measured by quantitative spatial analysis	≥0.90 on 0–1 scale	≥10 (or ≥5 for EN/ CR sp)

[1]RU=reproductive units; [2]wtihin a taxonomic group; [3]refers to global population size rather than immature individuals produced.





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