IUCN Standard for the Identification of Key Biodiversity Areas

Version 1.0

Prepared by the IUCN Species Survival Commission and IUCN World Commission on Protected Areas

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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 mobilized 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 summarized in this IUCN Standard for the Identification of KBAs, 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 (Plantlife International 2004), Prime Butterfly Areas (van Swaay & Warren 2003) and other KBAs in freshwater (Holland et al. 2012), marine (Edgar et al. 2007) and terrestrial systems identified under previously published criteria (Eken et al. 2004, Langhammer et al. 2007). The KBA Standard is formally taken to include the definitions, the KBA criteria and thresholds, and the KBA delineation methodology.

This Standard can be used to identify areas contributing significantly to the global persistence of biodiversity in terrestrial, inland water and marine environments. It specifically aims to:

- Harmonize 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 improved understanding of why particular sites are important for biodiversity.

The KBA Standard is expected to have multiple uses (Dudley et al. 2015). KBA data can guide the strategic expansion of protected-area networks by governments and civil society working toward achievement of the Aichi Biodiversity Targets, as established by the Convention on Biological Diversity; serve to identify potential sites for designation under international conventions; inform private sector safeguard policies, environmental standards, and certification schemes; support conservation planning and priority-setting at national and regional levels; and provide livelihood opportunities to local and indigenous communities through employment, recognition, economic investment, societal mobilization and civic pride.

The criteria and thresholds in this KBA Standard are not identical to those by which IBAs or KBAs for other taxa and ecosystems were identified using previously published criteria. There are already more than 13,000 such sites worldwide. Existing sites that are shown to meet the criteria and thresholds in the KBA Standard, and for which minimum documentation requirements have been met, qualify as global KBAs. Existing sites that are inferred, with justification, to meet global KBA criteria and thresholds but for which the data have not yet been compiled to demonstrate this will be treated as global KBAs for a transition period and flagged as 'priority for update'. Existing KBAs that do not meet global KBA criteria and thresholds but which do meet previously established regional criteria and thresholds will form part of the set of internationally important KBAs.

II. PREAMBLE

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

1. Purpose of the criteria

The purpose of the criteria is not to include every species or ecosystem within a KBA, but rather to locate and highlight sites that make significant contributions to the global persistence of biodiversity. The five KBA criteria incorporate elements of biodiversity across genetic, species and ecosystem levels. 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.

2. Relevant biodiversity elements

KBAs are identified for biodiversity elements that benefit from legal protection, safeguard or management at the site scale. Some biodiversity elements, such as wide-ranging species that occur at low densities, may not benefit from site-scale conservation even if they trigger KBA thresholds at particular sites. These species will often require actions at the scale of entire landscapes, seascapes or catchments (e.g. fishery regulations, integrated basin management) to ensure their global persistence. KBAs are hence complementary to these larger-scale approaches. Indeed, the long-term persistence of many biodiversity elements that trigger sites as KBAs will require maintaining or restoring connectivity between sites and reducing broad-scale threats.

3. Biological scope

The scope of the KBA criteria spans terrestrial, inland water and marine environments. However, it is limited to macroscopic biodiversity; the criteria are not designed to include the identification of sites important for micro-organisms. Although not all KBA criteria may be relevant to all biodiversity (e.g. not all species aggregate), the thresholds associated with each of the criteria have been developed to be applicable across taxonomic groups for which they are appropriate. Infraspecific taxa are only used as trigger taxa under sub-criterion A1, as the most practical way of identifying sites contributing significantly to the global persistence of threatened genetic biodiversity.

4. Role of the different criteria

Sites should be assessed against all relevant criteria for which data are available, but meeting the threshold under any one of the criteria or sub-criteria is sufficient for a site to be considered for qualification as a KBA. Individual elements of biodiversity (e.g. species or ecosystem types) may trigger thresholds for more than one criterion at the same site.

5. Derivation of the quantitative thresholds

The thresholds associated with each of the KBA sub-criteria are designed for identifying KBAs at the global level. They are informed by the history of experience in applying quantitative thresholds to identify important sites for biodiversity, such as IBAs and AZE sites, calibrated with complementarity-based quantitative calculations of irreplaceability, as used in systematic conservation planning. The formulation and quantitative values in the thresholds were developed through a series of technical workshops and refined through wide consultation and by testing with data covering diverse taxonomic groups, regions and environments. The values, agreed through expert consensus, are set at what are considered to be appropriate levels.

6. Global vs. regional and national thresholds

The thresholds presented here are for the identification of KBAs at the global level. Sites of regional rather than global significance can be identified as KBAs if they use the same criteria and meet appropriate regional thresholds, while for KBAs already identified at the regional level, pre-existing criteria and thresholds will continue to apply. In addition, countries and institutions are encouraged to establish and apply thresholds for national significance, 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 important KBAs.

7. Population data quality and metrics for inference

The KBA criteria have quantitative thresholds to ensure that site identification is transparent, objective and repeatable. However, population count data are often not available to assess whether a site holds the requisite proportion of a species' or an infraspecific taxon's global population. Hence, several different metrics can be used to estimate or infer whether the thresholds have been met including (i) number of mature individuals, (ii) area of occupancy, (iii) extent of suitable habitat, (iv) range, (v) number of localities, or (vi) unique genetic diversity.

In assessing site identification against the population-related criteria, application of all metrics specified should be attempted, accepting that data will often be insufficient to allow this. Use of number of localities is only appropriate 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 or infraspecific taxon. Multiple localities may fall within a single KBA, and population size may vary considerably across the different localities. Thus, it should not necessarily be assumed, for example, that a species occurring at 100 or fewer localities meets a 1% threshold at each of those localities.

Unique genetic diversity differs from the other metrics in that it is not used to estimate global population but rather refers to the proportion of a species' genetic diversity that is unique to a particular area. A site holding more than a threshold proportion of a species' unique genetic diversity can qualify as a KBA under criterion XX even when the estimated population size of the species at the site is insufficient to trigger KBA identification under criterion XX.

8. 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 sufficiently recent to give confidence that the biodiversity elements are still present. 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 1).

9. Re-evaluation

Sites should be re-assessed against the criteria and thresholds at least once every 12 years. Both genuine changes in status and changes in knowledge of the biodiversity element(s) triggering the criteria and thresholds may affect the identification of a site as a KBA. Sites that no longer meet any criteria are subject to a process that will lead to their removal from the global KBA list unless there are compelling reasons for not doing so (e.g. restoration work underway).

10. Climate and environmental change

Environmental changes resulting from a range of stressors, most notably climate change, may

impact 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; again re-evaluation at appropriate intervals will be important to determine the site's status.

It is highly desirable to predict short-term impacts of climate change and other environmental stressors at sites and conduct vulnerability analyses. 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 designated on the basis of the current presence of species and ecosystems, rather than on future projections of distributions.

11. KBAs and protected areas

Identification as a KBA according to scientific criteria is unrelated to a site's legal status as a protected area; rather, this will often inform site delineation. Thus, many KBAs do overlap wholly or partly with existing protected area boundaries, including sites designated under international conventions (e.g. Ramsar and World Heritage) and at national and local levels. Formal protection may not be appropriate or even desirable for all KBAs, but identification as a KBA does imply that the site should be managed in ways that ensure the persistence of the biodiversity elements for which it is recognised.

12. KBAs and conservation priorities

Although KBAs are important for the global persistence of biodiversity, this does not necessarily imply that a particular type of conservation action is required, such as protected-area designation. In addition to biodiversity importance, conservation priority-setting requires additional data on site vulnerability, to assess urgency for action, along with an understanding of what type of management regime will support the persistence of key biodiversity elements. It is also often desirable to incorporate other data, for example conservation costs and opportunities, evolutionary history and connectivity. KBAs thus do not represent formal conservation priorities but are invaluable in informing systematic conservation planning and priority-setting.

III. DEFINITIONS

This section defines key terms used in the definition of KBAs as sites contributing significantly to the global persistence of biodiversity, and in application of the KBA criteria and thresholds and site delineation procedures. It is necessary to refer to these terms when interpreting the criteria because they are defined in a narrow sense.

A. TERMS USED IN DEFINING KBAS

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
The contribution of a site to the global persistence of biodiversity depends on two factors, the global distribution of the biodiversity elements for which the site is important and their risk of loss. Sites holding biodiversity occurring in few other places make very high contributions to their persistence, as do sites holding biodiversity elements facing high risk of loss. Any given KBA by itself does not necessarily ensure the global persistence of the biodiversity elements occurring there (unless entirely confined to the site), but does so in combination with other sites.

Global
Global implies that the contributions of a site to the persistence of a given biodiversity element are measured in relation to the worldwide range and population of the element.

Persistence
The persistence of a biodiversity element implies not only avoidance of its loss (e.g. species extinction, ecosystem collapse) but also of its decline (e.g. of species populations, ecosystem extent and condition), both today and into the medium-term future. In many cases, safeguarding KBAs may contribute not just to persistence but also to recovery of species and ecosystems.

Significantly
Significant means that the proportion of a biodiversity element occurring at the site (e.g. species population size or ecosystem extent) exceeds a predetermined threshold of significance. Thus, sites meeting or exceeding the threshold hold more of a given biodiversity element than sites that do not.

Site
A geographical area on land and/or in water (both freshwater and marine) 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 regions such as ecoregions, Endemic Bird Areas and Biodiversity Hotspots, which often span multiple countries, 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 THRESHOLDS AND SITE DELINEATION PROCEDURES

Aggregation (Criterion D)
A geographically restricted clustering of individuals that typically occurs during a specific life history stage or process. This clustering is indicated by highly localised relative abundance, often

two or more orders of magnitude larger than the species' average recorded densities at other stages during its life-cycle.

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

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

Biological process (Criterion D)
Demographic and life-history processes that maintain populations.

Biome (Criterion B)
Biomes are major regional terrestrial and aquatic habitat types distinguished by their climate, flora and fauna. On continents, terrestrial ecoregions nest within biomes, and are typically about an order of magnitude smaller in area.

Biome-restricted assemblage (Criterion B)
A set of species within a taxonomic group having their ranges ≥95% predictably confined to a single biome for at least one life-history stage.

Complementarity (Criterion E)
A measure of the extent to which an area, or set of areas, would help to meet targets by adding poorly represented species to an existing area or set of areas (Margules & Pressey 2000).

Ecological integrity (Criterion C)
A condition that supports intact species assemblages and ecological processes in their natural state relative to a historical benchmark and characterized by contiguous natural habitat with minimal post-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 biomes or their marine equivalents.

Ecoregion-restricted assemblage (Criterion B)
A set of species within a taxonomic group having their ranges ≥95% predictably confined to a single ecoregion for at least one life-history stage.

Ecosystem type (Criteria A, B)
A defined ecosystem unit for standard and repeatable assessment. It is defined by a particular and described 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 (Rodríguez et al. 2015). Other terms often applied in conservation assessments, such as "ecological communities," "habitats," "biotopes" and (largely in the terrestrial context) "vegetation types," are regarded as operational synonyms of ecosystem type.

Endemic (Criteria A)
A species or infraspecific taxon having a global range wholly restricted to a defined geographic area such as a country or site.

Extent of suitable habitat (Criteria A, B)
The area of potentially suitable vegetation types within the altitudinal preferences and geographic range of the species (Beresford et al. 2011).

Functional 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).

Geographically restricted (Criterion B)
Having a restricted global distribution, as measured by range, extent of suitable habitat or area of occupancy, and hence largely or wholly confined to a relatively small portion of the globe such as a biome, ecoregion or site.

Infraspecific taxon/taxa (Criterion A)
Taxonomic ranks below the species level, but restricted to subspecies, varieties and subpopulations as defined in IUCN (2012b).

Intact species assemblage (Criterion C)
Having the complete complement of species known or expected to occur in a particular site or ecosystem, relative to pre-industrial historical benchmark.

Irreplaceability (Criterion E)
The likelihood that an area will be required as part of a system that achieves a set of targets (Ferrier et al. 2000). It is heavily influenced by geographically restricted biodiversity, but irreplaceability is a property of an area within a network rather than of an element of biodiversity.

Locality (Criteria A, B, D)
A sampling locality indicated by specific coordinates of latitude and longitude.

Manageability (Delineation)
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 over time of the biodiversity elements for which a KBA has been identified. This requires that KBA delineation considers relevant aspects of the socio-economic context of the site (e.g. land tenure, political boundaries).

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 (Criteria A, B, D)
The total number of individuals of the species or infraspecific taxon. Owing to differences between life forms, population size is measured as numbers of mature individuals only (IUCN 2012a).

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 or infraspecific taxon, accounting for all known, inferred or projected sites of occurrence (IUCN 2012a), excluding vagrancies, but including conservation translocations outside native habitat (IUCN Red Standards and Petitions Subcommittee 2014).

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

Restricted range (Criterion B)
Having a global range size of: a) less than or equal to 10,000 km^2; b) greater than 10,000 km^2 but less than or equal to the 25th percentile of range-size distribution in a taxonomic group within which all species have been mapped, up to a maximum of 50,000 km^2; or, c) less than or equal to 500 km linear geographic span (i.e. the distance between occupied locations furthest apart), for coastal, riverine and other species with linear distributions that do not exceed 200 km width at any point. The definition of restricted range excludes species only known from their type locality or single collections, which are likely to be indicative of under-sampling, unless there is evidence to believe that these do not occur more widely.

Species (Criteria A-E)
A group of individuals sharing common characteristics that actually or potentially can interbreed in nature.

Target (Criterion E)
A conservation target is the minimum amount of a particular biodiversity feature that we would like to conserve through one or several conservation actions (Possingham et al. 2006).

Taxon (Criterion A)
The terms “taxon” and “taxa” in this document are used to represent species and infraspecific taxonomic ranks. This differs from taxonomic group, which in this document refers exclusively to ranks higher than species, such as Genus, Family or Order.

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 (taxa) or collapse (ecosystems) in the medium-term future. Threatened taxa or ecosystems are Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) according to The IUCN Red List of Threatened Species (IUCN 2012a) or the IUCN Red List of Ecosystems (IUCN 2015). For the purposes of KBA sub-criterion A1, threatened can also include taxa assessed as regionally/nationally threatened using the IUCN Red List Categories and Criteria (IUCN 2012b) that both (a) have not been assessed globally and (b) are endemic to the region/country in question.

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.

Unique genetic diversity (Criterion B)
A spatial property of an area referring to a species' genetic diversity that is unique to that area.

V. CRITERIA AND THRESHOLDS

A. THREATENED BIODIVERSITY

A1. Threatened taxa

Sites may qualify as KBAs under sub-criterion A1 because they hold a high proportion of the population of a taxon which faces a high risk of extinction and so contribute significantly to the global persistence of biodiversity at genetic and species levels.

Site regularly holds one or more of the following:

a) ≥95% of the global population of a globally Critically Endangered (CR) or an Endangered (EN) taxon;

b) ≥0.5% of the global population AND ≥5 functional reproductive units of a globally CR or EN taxon;

c) ≥1% of the global population AND ≥10 functional reproductive units of a globally Vulnerable (VU) taxon;

d) ≥0.1% of the global population AND ≥5 functional reproductive units of a globally CR or EN taxon qualifying only under Criterion A of the IUCN Red List Categories and Criteria, in any of subcriteria A1, A2, or A4;

e) ≥0.2% of the global population AND ≥10 functional reproductive units of a globally VU taxon qualifying only under Criterion A of the IUCN Red List Categories and Criteria, in any of subcriteria A1, A2, or A4.

Proportion of the global population can be observed or inferred through any of the following (see item 6 of the preamble for details):

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

Taxa that can trigger sub-criterion A1 encompass species assessed as globally Critically Endangered (CR), Endangered (EN) or Vulnerable (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) that both (a) have not been assessed globally and (b) are endemic to the region/country in question. In addition, subspecies, varieties and isolated subpopulations (IUCN Standards and Petitions Subcommittee 2014) assessed as globally CR, EN or VU on The IUCN Red List of Threatened Species are eligible.

Thresholds A1d and A1e are for species and infraspecific taxa that have experienced, or are currently experiencing, rapid population decline and thus are restricted to species qualifying only under Criterion A of the IUCN Red List Categories and Criteria, in any of subcriteria A1, A2, or A4. Taxa qualifying only under Criterion A3 of the IUCN Red List are expected to experience rapid population decline in the future but may still be quite abundant, and so these taxa should be subject to the higher KBA thresholds of A1b and A1c.

A2. Threatened ecosystem types

Sites may qualify as KBAs under sub-criterion A2 because they hold a high proportion of the extent of an ecosystem which faces a high risk of collapse and so contribute significantly to the global persistence of biodiversity at the ecosystem level.

Site holds one 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.

For application of sub-criterion A2, threatened ecosystem types include those assessed as globally CR, EN or VU under the IUCN Red List of Ecosystems Categories and Criteria, which have a high risk of global collapse. The IUCN Red List of Ecosystems is under development and will allow for the application of sub-criterion A2 in a standardized and rigorous way.

B. GEOGRAPHICALLY RESTRICTED BIODIVERSITY

B1: Individual geographically restricted species

Sites may qualify as KBAs under sub-criterion B1 because they hold a high proportion of the global population of a 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 and ≥10 functional reproductive units of a species.

Proportion of the global population can be observed or inferred through any of the following (see item 6 of the preamble for details):

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

In practice, many restricted-range species will trigger B1, but having a restricted range is not a formal requirement under this sub-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 B1 from sub-criterion D1.

B2: Co-occurring geographically restricted species

Sites may qualify as KBAs under sub-criterion B2 because they hold a high proportion of the global populations of multiple co-occurring 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 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 can be observed or inferred through any of the following (see item 6 of the preamble for details):

(i) number of mature individuals,
(ii) area of occupancy,
(iii) extent of suitable habitat,

(iv) range,
(v) number of localities,
(vi) unique genetic diversity.

B3: Geographically restricted assemblages

Sites may qualify as KBAs under sub-criterion B3 because they hold important assemblages of species within a taxonomic group 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) Globally the most important 5% of occupied habitat for each of ≥5 species within a taxonomic group;

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

c) ≥5 biome-restricted species or 30% of the biome-restricted species known from the country, whichever is larger.

Proportion of the global population under B3b and B3c can be observed or inferred through any of the following (see item 6 of the preamble for details):

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

Most important occupied habitat under B3a should be measured through either of the following:

(vi) population density,
(vii) relative abundance.

Because biomes are larger than and inclusive of ecoregions, either the B3b or B3c threshold, but not both, should be used for a particular taxonomic group. Threshold B3c is applicable to higher taxa for which the median range size is >25,000 km^2, such as birds and mammals.

B4: Geographically restricted ecosystem types

Sites may qualify as KBAs under sub-criterion B4 because they hold a very high proportion of the extent of an ecosystem 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, sub-criterion B4 should be applied to units identified in a globally consistent ecosystem classification, such as that used for the IUCN Red List of Ecosystems, but is not dependent on assessments of their threat status.

C. ECOLOGICAL INTEGRITY

Sites may qualify as KBAs under criterion C because they hold the most outstanding global examples of intact species assemblages 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 complement of species in their natural abundances or biomass, support the ability of populations to engage in natural movements, and allow for the unimpeded functioning of ecological processes.

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

Ecological integrity can be observed or inferred from either of the following:

(i) Direct measures of species composition and abundance/biomass, contextualized by historical information that allows inference on the historical bounds of variation within the past 500 years for diversity or abundance in the ecoregion, particularly for species indicative of long-term structural stability and functionality or those known to be highly sensitive to human impact;

(ii) 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.

KBAs identified under criterion C should ideally be delineated to be at least 10,000 km^2 in size, within the confines of manageability. Where sites straddle ecoregional boundaries, delineation should proceed without respect to ecoregional division. Pervasive global-scale ongoing threats that affect all marine and/or terrestrial areas (e.g. climate change, overharvest of large marine predators and cetaceans, ocean acidification) are not included in metric *ii*.

D. BIOLOGICAL PROCESSES

D1: Demographic aggregations

Sites may qualify as KBAs under sub-criterion D1 because they hold a high proportion of the population 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 an aggregation representing ≥1% of the global population of a species during one or more, but not all, key stages of its life cycle.

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

(i) number of mature individuals.

There are some species that remain aggregated throughout most or all of their life cycles, including when they move between sites (e.g. some flamingo species), and the concept of aggregation is broad enough to include these.

D2: Ecological refugia

Sites may qualify as KBAs under sub-criterion D2 because they hold a very high proportion of the population of a species during periods of environmental stress, and so contribute significantly to the global persistence of biodiversity at the species level.

Site supports ≥20% of the global population 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 can be observed from the following:

(i) number of mature individuals.

Species 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 sub-criterion D1.

D3: Source populations

Sites may qualify as KBAs under sub-criterion D3 because they produce a very high proportion of the population of a species, and so contribute significantly to the global persistence of biodiversity at the species level.

Site predictably produces propagules, larvae, or juveniles that maintain ≥20% of the global mature population of a species although the mature population at the site is usually below this threshold.

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

(i) number of mature individuals.

Unlike sites identified under sub-criteria D1 and D2, where individuals of a species are moving *into* a site at globally significant numbers, albeit at different time scales, sub-criterion D3 applies to species where individuals disperse *out of* the site in globally significant numbers. These source populations make a large contribution to the recruitment of a species elsewhere.

E. IRREPLACEABILITY THROUGH QUANTITATIVE ANALYSIS

Sites may qualify as KBAs under criterion E because they 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 functional reproductive units known or inferred 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 may be one of two types:

(a) Representing at least X mature individuals of each species, where X is the larger value among:
   i. the total number of individuals currently existing in the wild, if either: the global population is lower 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 necessary to ensure the global persistence of the species with a probability of ≥90% in 100 years, as measured by quantitative viability analysis or inferred by expert knowledge;
   iii. 1,000 mature individuals;
   iv. the population size 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 is lower 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 or inferred by expert knowledge, 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 a population of 1,000 mature individuals.

KBA assessment to identify sites under Criterion E should be implemented through complementarity-based irreplaceability analyses. 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 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 of each species that is included in the study area. The spatial units in which the study area is subdivided should be equal-area or approximately equal-area in the order of approximately 100–1,000 km^2.

A standard format for citing the KBA criteria, sub-criteria and thresholds is given in Annex 2, and a summary of the KBA criteria, sub-criteria and thresholds is presented in Annex 3.

V. DELINEATION

Delineation is the process through which the boundaries of a KBA are drawn on a map, and is a required step of the KBA identification process. The aim is to derive site boundaries that are biologically 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; however, no specific management prescription is implied by the delineation of KBA boundaries.

Delineation is iterative but typically involves four steps, all of which are ideally undertaken through consultation and engagement with relevant stakeholders.

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;
- known occurrence, feeding or breeding sites;
- seasonal refugia (e.g. deep pools in rivers);
- boundaries of any existing KBAs that have already been identified (e.g. IBAs, AZE sites)
- land use, including roads, cities and agricultural areas;
- 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 biological data

The boundaries for a KBA should initially be based on biological 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 some cases, a species or ecosystem may be so poorly known that the only biological information is the point locality itself. It is important that sensible and practical boundaries are defined based upon the information available, while acknowledging its limitations.

There is no minimum or maximum size set for a KBA. IBAs and other sites identified previously as KBAs are typically 100–1000 km^2 in size, but range from 0.01 km^2 to over 330,000 km^2. Wherever possible, delineation should aim to develop site boundaries that are large enough to allow persistence of the biodiversity element(s) for which the site is identified while minimizing the inclusion of land or water that is not relevant to it.

3. Refining the biological map to yield practical boundaries

In many cases, KBA identification will be triggered by multiple taxa and initial mapping based on biological 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 biological 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 overlaps incongruently with other KBA trigger elements.

3.1 Delineation with respect to existing sites of importance for biodiversity

When important sites for biodiversity, such IBAs, AZE sites and KBAs published under earlier 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 locality and extent of an additional biodiversity element triggering one or more criteria falls within the boundary of an existing site, and it contains enough of the new element to meet the threshold of significance, the boundary of that site should be used for the delineation.

If the additional biodiversity element partially overlaps an existing site or is larger than the existing site, there are generally three options: disregard the area of overlap (if it is trivial), 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 destabilizing and might jeopardize 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

When a biodiversity element triggering the KBA criterion or criteria falls within an existing protected area, and where active management is underway, it is often advisable to use the protected area boundary to delineate the KBA. Most protected areas are recognized management units with the goal of safeguarding the biodiversity contained within them, and 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 habit adjacent to the protected area within the boundaries of a single larger KBA, which would initially be partially protected. This second option will generally be appropriate only when there is a realistic possibility that the protected area could be formally expanded.

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, identifying separate KBAs in each country may maximize the potential manageability of the site, but there are exceptions where it is essential for the persistence of the biodiversity triggering the KBA and transboundary management is either in place or a realistic possibility.

In some cases, however, refining site boundaries based on management units is not feasible because the units themselves are too small or too large to be useful, or fail to meet the requirements of the biodiversity elements that trigger the KBA. In these cases, using congruent biological boundaries is the best approach. When the actual extent of a KBA trigger element is

unknown, and the locality falls within a large block of contiguous habitat without useful management units for aiding delineation, 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. Consulting key stakeholders

Site delineation should occur in collaboration with relevant stakeholders, which often include scientists and other experts with local and traditional knowledge of the biodiversity elements occurring at the site, government agencies tasked with managing natural areas or wildlife populations, and conservation or community groups working or living in the area. Stakeholder consultation should come as early in the process as possible, and workshops or informal meetings with these constituencies can provide additional context and data to inform delineation. As the extent to which KBA boundaries inform active management increases, more extensive consultation will be needed.

5. Documenting delineation precision

KBA delineation is typically 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 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. 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 will be available for download on the KBA website (TBD) 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 2. CITATION OF THE KBA CRITERIA AND THRESHOLDS

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

Sub-criteria are indicated by the use of numbers (1-4) and if more than one is met, they are separated by means of the '+' symbol. Where more than one threshold is given under a sub-criterion (A1, A2, B3, B4, E), 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); D1(i)
A1c(v)+A2b
B1(i,v,vi)+B2(i,v,vi)+B3a(vi)b(v)
B3c(v); C(ii)
Ea(ii)
B1(v); D3(i)

ANNEX 3. SUMMARY OF THE KBA CRITERIA AND THRESHOLDS

A. Threatened Biodiversity	*Biodiversity element at site*	*% global pop./extent*	*FRU*[+]
A1: Threatened taxa	(a) CR or EN taxon	≥95%	
	(b) CR or EN taxon	≥0.5%	≥5
	(c) VU taxon	≥1%	≥10
	(d) CR or EN taxon qualifying only under Criterion A of the IUCN Red List in any of subcriteria A1, A2, or A4	≥0.1%	≥5
	(e) VU taxon qualifying only under Criterion A of the IUCN Red List in any of subcriteria A1, A2, or A4	≥0.2%	≥10
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./extent*	*FRU*
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) Globally most important 5% of occupied habitat of each of ≥5 species within a taxonomic group		
	(b) Ecoregion-restricted species: ≥5 species OR 10% of the species restricted to the ecoregion, whichever is larger	≥0.5%	
	(c) Biome-restricted species: ≥5 species or 30% of the species known from the country, whichever is larger		
B4: Geographically restricted ecosystem types	Any ecosystem type	≥20%	
C. Ecological integrity	*Biodiversity element at site*		
	Wholly intact species assemblages	≤2 sites per ecoregion	
D. Biological processes	*Biodiversity element at site*	*% of global pop./extent*	
D1: Demographic aggregations	Species aggregation during one or more, but not all, key stages of its life cycle	≥1%	
D2: Ecological refugia	Species aggregations during periods of past, current or future environmental stress	≥20%	
D3: Source populations	Propagules, larvae or juveniles maintaining high proportion of global mature population	≥20%*	
E: Irreplaceability through quantitative analysis	*Biodiversity element at site*	*Irrepl. score*	*FRU*
	Site has high irreplaceability measured by quantitative spatial analysis	0.90 or higher on 0–1 scale	≥10 or (≥5 for EN or CR sp)

[+]FRU=functional reproductive units; *Threshold refers to global mature population rather than propagules, larvae or juveniles.