HERITAGE CONSERVATION STATUS ASSESSMENT FACTORS

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Contents

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Introduction

History of Heritage Conservation Status Ranks

<Additional text introduction being drafted, incl. brief history from 1980's – LEM>

This (2001) edition of Heritage Conservation Status factors is the first substantive change to the rank factors since the early 1980's. Revisions to the fields and revisions to field values may be summarized as follows.

Revisions to fields:

- Abundance is separated into population size (species only) and area of occupancy
- Trends are subdivided into long- and short-term trends
- Threat now have three sub-factors and a calculated summation value
- Fragility redefined somewhat and renamed as Intrinsic Vulnerability
- Environmental Specificity added as formal factor

Revisions to field values:

- Adjustments to match most IUCN (IUCN 2001) breakpoints for compatibility in documentation of status and exchange of information as well as to more readily permit conversion of existing Heritage data
- Finer division of choices to more readily permit possible use of future rule/point based ranking algorithms
- Zero distinguished where pertinent (for extinct or possibly extinct species or communities)
- Changes in C, D, and E values for the number of occurrences reflect long-recognized need to have the "C" cutoff lower than 100 to provide a better breakpoint for species and communities that are vulnerable vs. those that are apparently secure. This change (breakpoint at 80) then led to another break point at 300 (based on roughly a four-fold increase at each level), which may be helpful in distinguishing apparently secure vs. secure elements.

General Definitions

Definitions, for purposes of this document, are provided below for several terms that are used generally in the definition and discussion of the status rank factors below. A few additional, more specialized terms are defined in the discussion of a particular factor.

Element.

An Element is a unit of natural biological diversity. Elements represent species (or infraspecific taxa), ecological communities, or other nontaxonomic biological entities (*e.g.,* migratory species aggregation areas). See Jenkins (1985,1986) for background.

Species. The **Species Elements** are plants, animals, fungi, and other organisms (in contrast to other Elements such as ecological communities). In this document, the term "species" includes all entities at the taxonomic level of species (including interspecific hybrids), as well as all subspecies and plant varieties. Subspecies and varieties are collectively termed "infraspecific taxa." Other subsets of species (*e.g.,* geographically distinct and evolutionarily significant population segments) may also be ranked, as well as recurrent, transient, mixed-species animal assemblages (*e.g.,* shorebird concentration areas).

Ecological Community. The **Ecological Community Elements** include terrestrial, freshwater aquatic, and marine types. Communities are assemblages of species that co-occur in defined areas at certain times and that have the potential to interact with each other (McPeek and Miller 1996). For terrestrial communities, elements are classified either by vegetation criteria using the association concept (Grossman et al. 1998) or by ecological criteria (Ecological Systems) by integrating multiple factors, including composition, structure, driving processes, and local environmental setting.

Occurrence (or Element Occurrence). An Occurrence is an area of land and/or water in which a species or ecological community is, or was, present. An occurrence should have practical conservation value for the species or ecological community as evidenced by historical or potential continued presence and/or regular recurrence at a given location. For further discussion of the element occurrence concept, see "Element Occurrence Data Standard" (The Nature Conservancy and Association for Biodiversity Information 1999).

For species, the occurrence often corresponds with the local population, but when appropriate may be a portion of a population (*e.g*., long distance dispersers) or a group of nearby populations (*e.g*., metapopulation). For many taxa, occurrences are similar to "subpopulations" as defined by IUCN (2001). "*Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).*" Note that IUCN also uses the concept of "location," referring to "a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations."

For ecological communities, the occurrence may represent a stand or patch of a natural community, or more typically a cluster of stands or patches of a natural community. Note that this definition applies primarily to terrestrial ecological communities, which are defined using the International Classification of Ecological Communities (Grossman et al. 1998), but in principle can also be used for freshwater-aquatic and marine occurrences.

Geographical Level (Global, National, Subnational). Heritage Conservation Status Ranks have been developed primarily at three geographical levels. Global ranks, and the corresponding individual rank factors, pertain to an element over its entire range (globally); in a given assessment, a particular element has only a single global rank. National ranks and rank factors apply to an element in a specified nation or comparable geographically distinct area (e.g., a disjunct portion of a nation that is customarily treated separately for

biogeographic or conservation purposes, such as Puerto Rico). Subnational ranks and rank factors apply to a principal subdivision of a nation, such as a state or province, but sometimes a nonpolitical region customarily treated as a subnational unit *(e.g.,* insular Newfoundland and mainland Labrador, which together form the Canadian province of Newfoundland and Labrador). Heritage Conservation Status ranks may also be used for other clearly bounded geographic areas *(e.g.,* national parks).

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Range Extent and **Area of Occupancy.**

Range extent is described by IUCN (2001) for taxa:

> *Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary that can be drawn to encompass all the known, inferred, or projected sites of present occurrence of a taxon, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distribution of a taxon (e.g. large areas of obviously unsuitable habitat) (but see 'area of occupancy').*

Area of occupancy is described by IUCN (2001) for taxa as:

> *Area of occupancy is defined as the area within its 'extent of occurrence' (see definition), which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases (e.g. colonial nesting sites, feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data.*

Figure 1 illustrates the differences between range extent and area of occupancy.

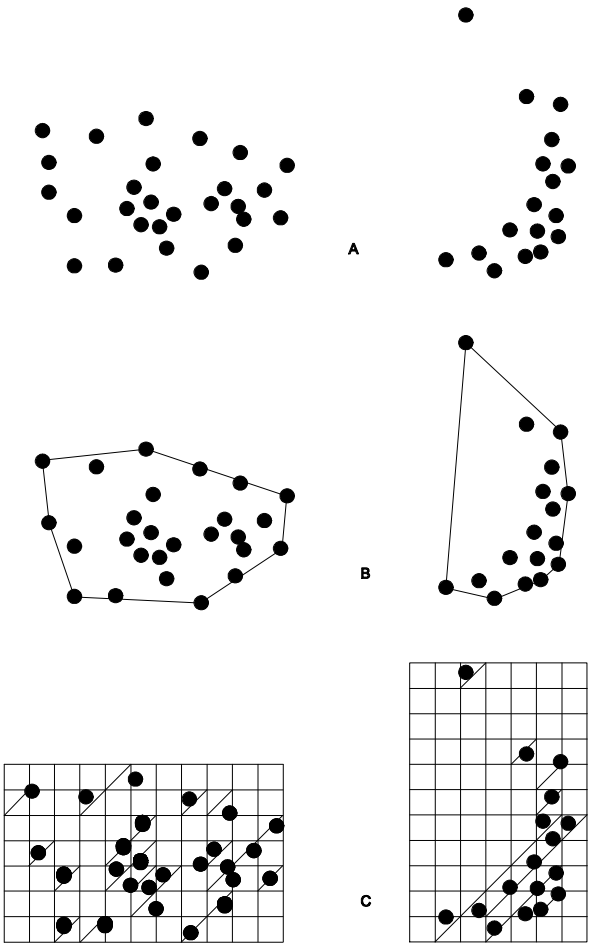

Figure 1. *Two examples of the distinction between range extent and area of occupancy. (A) Is the spatial distribution of known, inferred, or projected sites of present occurrence. (B) Shows one possible boundary to the range extent, which is the measured area within this boundary using a minimum convex polygon.* [Note that Burgman and Fox (2001) strongly recommend the use of α-hulls rather than minimum convex polygons to estimate range extent as otherwise significant overestimates (e.g., right side of example B) may result.] *(C) Shows one measure of area of occupancy, which can be achieved by the sum of the occupied grid squares. The most recent advice from IUCN Red List Standards and Petition Committee is to tally all of the occupied 2 x 2 km grid cells, unless there are large areas of unsuitable habitat. For riverine species, the area of occupancy can be estimated by using the length multiplied by the average width, again excluding areas of unsuitable habitat and discontinuities.*

Heritage Conservation Status Factors

NatureServe and its member programs and collaborators use the following factors in assessing conservation status of species of plants, animals, and fungi, as well as ecological communities. These factors may be used in assessing conservation status at global (rangewide), national, or subnational (state/province) levels, as well for other clearly bounded geographical areas *(e.g.,* a national park). When used globally, the factors address the element's status throughout its native range; when used at a national or subnational level, the factors address the element's status for its native range in the area of interest (nation, state, province, park, etc.).

Each factor, except Other Considerations, has at least two data fields: One or more fields for a short code (with an associated word or short phrase), and a text comment field. Codes are all expressed as either single capital letters (e.g., A, B) or as letter combinations indicating the estimated range of uncertainty (e.g., AB, BCD, or BD).

Definitions and guidance for use are provided individually for each rank factor below. See also the general definitions in the introductory section for terms used in discussion of more than one factor.

Number of Occurrences

Enter the code for the estimated, inferred, or suspected number of occurrences believed extant for the species or ecological community in the area of interest (globe, nation, or subnation).
Select from the following values:

Z = 0 (zero)
A = 1 - 5
B = 6 – 20
C = 21 – 80
D = 81 – 300
E = >300
U = Unknown
Null = Rank factor not assessed

Number of Occurrences with Good Viability

Enter the code that describes the estimated number of occurrences believed extant in the area of interest that have excellent or good viability (e.g., for species, at least a 95% probability of persistence for 20 years or 5 generations, whichever is longer -- up to 100 years) in the area of interest (globe, nation, or subnation); for communities, a 95% probability of persistence over the next 20-100 years, depending on the inherent dynamics of the element, with only minor to moderate alterations to composition, structure and/or ecological processes. Use comment field to provide specifics and additional information, such as the number of occurrences with fair or moderate viability.

When Element Occurrence (EO) ranks are available for individual occurrences, occurrence ranks of "A" or "B" indicate good (to excellent) viability. These ranks provide an assessment of estimated viability, or probability of persistence (based on condition, size, and landscape context) of occurrences of a given Element. In other words, EO ranks provide an assessment of the likelihood that if current conditions prevail an occurrence will persist for a defined period of time, typically 20-100 years. See NatureServe's Element Occurrence Data Standard (The Nature Conservancy and Association for Biodiversity Information 1999) for additional explanation of Element Occurrence ranking.

Select from the following values:

A = No (A- or B- ranked) occurrences with good viability

B = Very few (1-3) occurrences with good viability

C = Few (4-12) occurrences with good viability

D = Some (13-40) occurrences with good viability

E = Many (41-125) occurrences with good viability

F = Very many (>125) occurrences with good viability

U = Unknown what number of occurrences with good viability

Null = Rank factor not assessed

Population Size (Species Only)

For species, but not for ecological communities, enter the code for the estimated current naturally occurring wild total population of the species within the area of interest (globe, nation, or subnation). Count or estimate the number of individuals of reproductive age or stage (at an appropriate time of the year), including mature but currently non-reproducing individuals.

As guidance, consider the following points (from IUCN 2001) when estimating population numbers:

- *Mature individuals that will never produce new recruits should not be counted (e.g., densities are too low for fertilization) [But see note below regarding long-persisting nonreproductive clones.]*
- *In the case of populations with biased adult or breeding sex ratios it is appropriate to use lower estimates for the number of mature individuals, which take this into account (e.g., the estimated effective population size).*
- *Where the population size fluctuates use a lower estimate. In most cases this will be much less than the mean.*
- *Reproducing units within a clone should be counted as individuals, except where such units are unable to survive alone (e.g., corals).*
- *In the case of taxa that naturally lose all or a subset of mature individuals at some point in their life cycle, the estimate should be made at the appropriate time, when mature individuals are available for breeding.*
- *Re-introduced individuals must have produced viable offspring before they are counted as mature individuals*

Also consider:

- For species that produce more than one generation per year, use the size of the smallest annual reproducing generation in estimations.
- For seed-banking plants or other intermittently obvious organisms, consider population size to be the number of mature individuals in a typical "good" year, but not a "poor" year or an extraordinarily productive year. Although data will rarely be available, population size for such species should be conceptually considered the median of the population over a 10-year or 3-generation (whichever is longer) time span.
- For clone-forming organisms that persist or spread locally but rarely if ever reproduce, consider the population size to be the number of distinct, self-maintaining clonal patches (approximating the number of genets), rather than the number of physiologically separate individuals (ramets).

Select from the following values:

Z = Zero, no individuals known extant
A = 1-50 individuals
B = 50-250 individuals
C = 250-1,000 individuals
D = 1,000-2,500 individuals
E = 2,500-10,000 individuals
F = 10,000-100,000 individuals
G = 100,000-1,000,000 individuals
H = >1,000,000 individuals
U = Unknown
Null = Rank factor not assessed

Range Extent

Enter the code that best describes the estimated current range of the species or ecological community in the area of interest (globe, nation, or subnation). See general definitions in the introduction for definitions of range extent (extent of occurrence) as contrasted with area of occupancy. Use only values pertinent to the size of the area of interest; for example, only the A, B, C, or D values would be used in subnational ranking for Delaware or for Prince Edward Island.

Select from the following values:

Z = Zero (no occurrences believed extant)
A = <100 km^2 (less than about 40 square miles)
B = 100-250 km^2 (about 40-100 square miles)
C = 250-1,000 km^2 (about 100-400 square miles)
D = 1,000-5,000 km^2 (about 400-2,000 square miles)
E = 5,000-20,000 km^2 (about 2,000-8,000 square miles)
F = 20,000-200,000 km^2 (about 8,000-80,000 square miles)
G = 200,000-2,500,000 km^2 (about 80,000-1,000,000 square miles)
H = > 2,500,000 km^2 (greater than 1,000,000 square miles)
U = Unknown
Null = Rank factor not assessed

Table 1**.** Examples of geographical land areas approximating each Range Extent factor value threshold

	Threshold (km^2)	Threshold ($miles^2$)	Examples	Approx. area (km^2)	Approx. area ($miles^2$)
A/B	100	~40	Montserrat	98	38
			Nantucket, MA (USA)	121	47
B/C	250	~100	Martha's Vineyard, MA (USA)	250	96
C/D	1,000	~400	Rocky Mt. Nat'l Park, CO (USA)	1,077	416
D/E	5,000	~2,000	Delaware (USA)	5,004	1,932
			Prince Edward Island (Canada)	5,657	2,184
E/F	20,000	~8,000	New Jersey (USA)	19,342	7,468
			Massachusetts (USA)	20,264	7,824
F/G	200,000	~80,000	Nebraska (USA)	198,507	76,644
			Minnesota (USA)	206,028	79,548
G/H	2,500,000	~1,000,000	Combined area of Ontario and Quebec (Canada)	2,609,271	1,007,500

Area of Occupancy

Enter the code for the estimated current area of occupancy of the species or ecological community in the area of interest (globe, nation, or subnation). See general definitions in introduction for differences between area of occupancy and range extent.

For species and ecological communities in linear habitats (e.g., riverine shoreline, or cliff-edge species, riparian ecological communities), enter the code for the total length of all currently occupied habitat segments. The area can be estimated by multiplying the length by the average width.

For migratory species, enter the code (area or length) that reflects the current area of occupancy (or length of occupied area) at the time of the year when occupancy is most restricted. In the comments field put information on the area of occupancy at different seasons (e.g., during periods of breeding and nonbreeding residency, and transient aggregations if the species is known to strongly aggregate during their migrations (e.g., some shorebirds, waterfowl, cranes).

Select from the following values:

Area:

Z = Zero (no occurrences believed extant)
A = <0.4 km^2 (less than about 100 acres)
B = 0.4-4 km^2 (about 100-1,000 acres)
C = 4-20 km^2 (about 1,000-5,000 acres)
D = 20-100 km^2 (about 5,000-25,000 acres)
E = 100-500 km^2 (about 25,000-125,000 acres)
F = 500-2,000 km^2 (about 125,000-500,000 acres)
G = 2,000-20,000 km^2 (500,000-5,000,000 acres)
H = >20,000 km^2 (greater than 5,000,000 acres)
U = Unknown

Length:

Z = Zero (no occurrences believed extant)
A = <4 km (less than about 2.5 miles)
B = 4-40 km (about 2.5-25 miles)
C = 40-200 km (about 25-125 miles)
D = 200-1,000 km (about 125-620 miles)
E = 1,000-5,000 km (about 620-3,000 miles)
F = 5,000-20,000 km (about 3,000-12,500 miles)
G = 20,000-200,000 km (about 12,500-125,000 miles)
H = >200,000 km (greater than 125,000 miles)
U = Unknown

Null = Rank factor not assessed

Long-term Trend

Enter the code that best describes the observed, estimated, inferred, or suspected degree of change in population size, extent of occurrence, area of occupancy, and/or number or condition of occurrences over the long term (ca. 200 years) in the area of interest (globe, nation, or subnation). Specify in the comment field the time period for the change noted, as well as a longer-term view (e.g., back to European or Polynesian exploration) if information is available. If there are data on more than one aspect, specify which aspect is most influential.

Select from the following values:

A = Very Large Decline (decline of >90%, with <10% of population size, range extent, area occupied, and/or number or condition of occurrences remaining)

B = Large Decline (decline of 75-90%)

C = Substantial Decline (decline of 50-75%)

D = Moderate Decline (decline of 25-50%)

E = Relatively Stable (±25% change)

F = Increase (increase of >25%)

U = Unknown. Long-term trend in population, range, area occupied, or number or condition of occurrences unknown

Null = Rank factor not assessed

Short-term Trend
Enter the code that best describes the observed, estimated, inferred, suspected, or projected short-term trend in population size, extent of occurrence, area of occupancy, number of occurrences, and/or condition of occurrences, whichever most significantly affects the rank in the area of interest (globe, nation, or subnation). Consider short-term historical trend within 10 years or 3 generations (for long-lived taxa), whichever is the longer (up to a maximum of 100 years), or, for communities, 10-100 years depending on characteristics of the type.

The trend may be recent, current, or projected (based on recent past), and the trend may or may not be known to be continuing. Trends may be smooth, irregular, or sporadic. Fluctuations will not normally count as trends, but an observed change should not be considered as merely a fluctuation rather than a trend unless there is evidence for this.

In considering trends, do not consider newly discovered but presumably long existing occurrences, nor newly discovered individuals in previously little-known occurrences. Also, do not consider increases in the number of occurrences due to fragmentation of previously larger occurrences into more but smaller occurrences, but instead consider fragmentation of occurrences as indicative of decreasing an area of occupancy.

Specify what is known about various pertinent trends in the comment field, including trend information for particular factors, more precise information, regional trends, etc. Also comment, if known, on whether the causes of decline, if any, are understood, reversible, and/or ceased. If the trend is known not to be continuing, specify that in comments.

Select from the following values:

A = Severely declining (decline of >70% in population, range, area occupied, and/or number or condition of occurrences)

B = Very rapidly declining (decline of 50-70%)

C = Rapidly declining (decline of 30-50%)

D = Declining (decline of 10-30%)

E = Stable (unchanged or remaining within ±10% fluctuation)

F = Increasing (increase of >10% in population)

U = Unknown (short-term trend unknown)

Null = Rank factor not assessed

Threats (Severity, Scope, and Immediacy)

Indicate the degree to which the species or ecological community is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest (globe, nation, or subnation). Use this field to evaluate the impact of extrinsic threats, which typically are anthropogenic but may be natural. The impact of human activity may be direct (e.g., destruction of habitat) or indirect (e.g., invasive species introduction). Effects of natural phenomena (e.g., fire, hurricane, flooding) may be especially important when the species or ecological community is concentrated in one location or has few occurrences, which may be a result of human activity. Characteristics of the species or ecological community that make it inherently susceptible to threats should be considered under the rank factor Intrinsic Vulnerability.

Threats considerations apply to the present and the future. Effects of past threats (whether or not continuing) should be addressed instead under the short-term trend and/or long-term trend factors. For species or ecological communities known only historically in the area of interest, but with significant likelihood of rediscovery in identifiable areas, current or foreseeable threats in those areas may be addressed here where appropriate if they would affect any extant (but unrecorded) occurrences of the species or ecological community.

Threats may be observed, inferred, or projected to occur in the near term. They should be characterized in terms of severity (how badly and irreversibly the species population or the area of occupancy of the ecological community is affected), scope (what proportion of it is affected), and degree of imminence (how likely the threat is and how soon is it expected). "Magnitude" is sometimes used to refer to scope and severity collectively.

Consider threats collectively, and for the foreseeable threat with the greatest magnitude (severity and scope combined), rate the severity, scope, and immediacy each as High, Moderate, Low, Insignificant, or Unknown, as briefly defined below. Identify in the comment field the threat to which severity, scope, and immediacy pertains, and discuss additional threats identified, or interactions among threats, including any high-magnitude threats considered insignificant in immediacy.

<u>Severity</u>

High: Loss of species population (all individuals) or destruction of species habitat or ecological community in area affected, with effects essentially irreversible or requiring long-term recovery (>100 years).

Moderate: Major reduction of species population or long-term degradation or reduction of habitat or ecological community in area affected, requiring 50-100 years for recovery.

Low: Low but nontrivial reduction of species population or reversible degradation or reduction of habitat or ecological community in area affected, with recovery expected in 10-50 years.

Insignificant: Essentially no reduction of population or degradation of habitat or ecological community due to threats, or populations, habitats, or ecological communities able to

recover quickly (within 10 years) from minor temporary loss. Note that effects of locally sustainable levels of hunting, fishing, logging, collecting, or other harvest from wild populations are generally considered Insignificant as defined here.

Scope

High: > 60% of total population, occurrences, or area affected

Moderate: 20-60% of total population, occurrences, or area affected

Low: 5-20% of total population, occurrences, or area affected

Insignificant: < 5% of total population or area affected

Immediacy

High: Threat is operational (happening now) or imminent (within a year).

Moderate: Threat is likely to be operational within 2-5 years.

Low: Threat is likely to be operational within 5-20 years.

Insignificant: Threat not likely to be operational within 20 years.

The system will calculate a rank factor value of A, B, C, D, E, F, or G, as shown in Table 2 below. If two of the three parameters are known, the rank factor value will be calculated by treating the unknown (or not assessed [null]) parameter as "Low." If only one of the rank factors is rated (as High, Moderate, or Low), the resulting rank factor value will be "U" (unknown). If any of the three factors are considered “Insignificant,” the resulting rank factor will be “H” (unthreatened).”

Threat values, calculated from scope, severity, and immediacy, or unknown, may be considered as follows.

A = Substantial, imminent threat. Threat is moderate to severe and imminent for most (> 60%) of the population, occurrences, or area. Ecological community occurrences are directly impacted over a widespread area, either causing irreversible damage or requiring long term recovery

B = Moderate and imminent threat. Threat is moderate to severe and imminent for a significant proportion (20-60%) of the population, occurrences, or area. Ecological community occurrences are directly impacted over a moderate area, either causing irreversible damage or requiring a long-term recovery.

C = Substantial, non-imminent threat. Threat is moderate to severe but not imminent (> 10 years) for most of the population, occurrences, or area.

D = Moderate, non-imminent threat. Threat is moderate to severe but not imminent for a significant portion of the population, occurrences, or area.

E = Localized substantial threat. Threat is moderate to severe for a small but significant proportion of the population, occurrences, or area. Ecological community occurrences are directly impacted over a small area, or in a small portion of their range, but threats require a long-term recovery.

F = Widespread, low-severity threat. Threat is of low severity but affects (or would affect) most or a significant portion of the population, occurrences, or area. Ecological community occurrences are not threatened severely, with changes reversible and recovery moderately rapid.

G = Slightly threatened. Threats, while recognizable, are of low severity, or affecting only a small portion of the population, occurrences, or area. Ecological community occurrences may be altered in minor parts of range or degree of alteration falls within the natural variation of the type.

H = Unthreatened. Threats if any, when considered in comparison with natural fluctuation and change, are minimal or very localized, not leading to significant loss or degradation of populations, occurrences, or area even over a few decades' time. (Severity, scope, and/or immediacy of threat considered Insignificant.)

U = Unknown. The available information is not sufficient to assign degree of threat as above. (Severity, scope, and immediacy are all unknown, or mostly [two of three] unknown or not assessed [null].)

Null = Rank factor not assessed, including instances in which the species is extinct (or extirpated from the area of interest) or the ecological community is irrecoverably destroyed.

Table 2. Calculation of Threats factor values from values for Severity, Scope, and Immediacy subfactors.

SEVERITY	SCOPE	IMMEDIACY	VALUE	DESCRIPTION
High High Moderate Moderate	High High High High	High Moderate High Moderate	= A	Moderate to severe, imminent threat for most (>60%) of population, occurrences, or area
High High Moderate Moderate	Moderate Moderate Moderate Moderate	High Moderate High Moderate	= B	Moderate to severe, imminent threat for a significant proportion (20-60%) of population, occurrences, or area
High Moderate	High High	Low Low	= C	Moderate to severe, non-imminent threat for most of population, occurrences, or area
High Moderate	Moderate Moderate	Low Low	= D	Moderate to severe, non-imminent threat for a significant proportion of population, occurrences, or area

High High High Moderate Moderate Moderate	Low Low Low Low Low Low	High Moderate Low High Moderate Low	= E	Moderate to severe threat for small proportion of population, occurrences, or area
Low Low Low Low Low Low	High High High Moderate Moderate Moderate	High Moderate Low High Moderate Low	= F	Low severity threat for most or significant proportion of population, occurrences, or area
Low Low Low	Low Low Low	High Moderate Low	= G	Low severity threat for a small proportion of population, occurrences, or area

Number of Protected and Managed Occurrences

Enter the code that best describes the observed, estimated, inferred, or suspected number of occurrences that are appropriately protected and managed for the long-term persistence of the element in the area of interest (globe, nation, or subnation). Both criteria (protection and management) must be met to assign a given code. Assign the code that represents the most restrictive criteria. For example, if several occurrences are protected but none are appropriately managed, enter A.

Select from the following values:

A = None. No occurrences appropriately protected and managed

B = Few (1-3) occurrences appropriately protected and managed

C = Several (4-12) occurrences appropriately protected and managed

D = Many (13-40) occurrences appropriately protected and managed

E = Very many (>40) occurrences appropriately protected and managed

U = Unknown whether any occurrences are appropriately protected and managed

Null = Rank factor not assessed

Intrinsic Vulnerability

Enter the appropriate letter code for the observed, inferred, or suspected degree to which intrinsic or inherent factors of the Element (such as life history or behavior characteristics of species, or likelihood of regeneration or recolonization for ecological communities) make it vulnerable or resilient to natural or anthropogenic stresses or catastrophes. Examples of such factors include reproductive rates and requirements, time to maturity, dormancy requirements, and dispersal patterns. For ecological communities consider characteristics of the component species rather than environmental factors per se that make the community vulnerable. The latter belongs in the Environmental Specificity field.

Since geographically or ecologically disjunct or peripheral occurrences may show additional vulnerabilities not generally characteristic of the element, these factors are to be assessed for the species or ecological community throughout the area of interest, or at least for its better occurrences. Do not consider here such topics as population size, number of occurrences, area of occupancy, extent of occurrence, or environmental specificity; these are addressed as other ranking factors.

Note that the intrinsic vulnerability factors exist independent of human influence, but may make the species or ecological community more susceptible to disturbance by human activities. The extent and effects of current or projected extrinsic influences themselves should be addressed in the Threat comments field.

Describe the reasons for your selection in the Intrinsic Vulnerability Comments field. For ecological communities, describe the characteristics of the community that are thought to be intrinsically vulnerable and the ecological processes on which these characteristics depend. For example, a type may be defined by old growth features that require > 150 years to recover its structure and composition after a blowdown, or a pine forest type may be highly dependent on timing of masting or availability of seed sources to recover after a catastrophic fire, or a wetland may be dependent on periodic drawdowns or flash flooding for regeneration of species. Typically, intrinsic vulnerability is most readily assessed using the dominant species and vegetation structure that characterize the community. As another community example, in desert shrubland communities with an abundant cryptogram crust (important for nutrient cycling, N-fixation, and moisture retention), the recovery of an intact crust after disturbance may take a long time (> 50 years) due to the slow growth of the cryptogram layer.

Select from the following values:

A = Highly Vulnerable. Species is slow to mature, reproduces infrequently, and/or has low fecundity such that populations are very slow (> 20 years or 5 generations) to recover from decreases in abundance; or species has low dispersal capability such that extirpated populations are unlikely to become reestablished through natural recolonization (unaided by humans). Ecological community occurrences are highly susceptible to changes in composition and structure that rarely if ever are reversed through natural processes even over substantial time periods (> 100 years).

B = Moderately Vulnerable. Species exhibits moderate age of maturity, frequency of reproduction, and/or fecundity such that populations generally tend to recover from decreases in abundance over a period of several years (on the order of 5-20 years or

2-5 generations); or species has moderate dispersal capability such that extirpated populations generally become reestablished through natural recolonization (unaided by humans). Ecological community occurrences may be susceptible to changes in composition and structure but tend to recover through natural processes given reasonable time (10-100 years).

C = Not Intrinsically Vulnerable. Species matures quickly, reproduces frequently, and/or has high fecundity such that populations recover quickly (< 5 years or 2 generations) from decreases in abundance; or species has high dispersal capability such that extirpated populations soon become reestablished through natural recolonization (unaided by humans). Ecological community occurrences are resilient or resistant to irreversible changes in composition and structure and quickly recover (within 10 years).

U = Unknown

Null = Rank factor not assessed

Environmental Specificity

Enter the appropriate letter code for the observed, inferred, or suspected vulnerability or resilience of the Element due to habitat preferences or restrictions or other environmental specificity or generality. Describe the reasons for your selection in the Environmental Specificity field. (For example, indicate in the comment field why environmental specificity affects vulnerability, but use the Habitat (species) or Key Environmental Factors (communities) field to record the specific habitat requirements.) For ecological communities environmental specificity often refers to substrate requirements (e.g., nutrients, moisture, soil depth), specific disturbance factors, or climate (microclimate). This factor is most important when the number of occurrences and the range extent or area of occupancy are largely unknown.

Select from the following values:

A = Very Narrow. Specialist or community with key requirements scarce. For species, specific habitat(s), substrate(s), food type(s), hosts, breeding/nonbreeding microhabitats, or other abiotic and/or biotic factor(s) are used or required by the Element in the area of interest, with these habitat(s) and/or other requirements furthermore being scarce within the generalized range of the element within the area of interest, and, the population (or the number of breeding attempts) expected to decline significantly if any of these key requirements become unavailable. For ecological communities, environmental requirements are both narrow and scarce (e.g., calcareous seepage fens).

B = Narrow. Specialist or community with key requirements common. Specific habitat(s) or other abiotic and/or biotic factors (see above) are used or required by the Element, but these key requirements are common and within the generalized range of the element within the area of interest. For ecological communities, environmental requirements are narrow but common (e.g., floodplain communities, alpine tundra).

C = Moderate. Generalist or community with some key requirements scarce. Broad-scale or diverse (general) habitat(s) or other abiotic and/or biotic factors are used or required by the Element, but some key requirements are scarce in the generalized range of the Element within the area of interest. For ecological communities, environmental requirements are broad but scarce (e.g., talus or cliff forests and woodlands, alvars, many rock outcrop communities dependent more on thin, droughty soils per se than specific substrate factors).

D = Broad. Generalist or community with all key requirements common. Broad-scale or diverse (general) habitat(s) or abiotic and/or biotic factors are used or required by the Element, with all key requirements common in the generalized range of the Element in the area of interest. For animals, if the preferred food(s) or breeding/nonbreeding microhabitat(s) become unavailable, the species switches to an alternative with no resulting decline in numbers of individuals or number of breeding attempts. For ecological communities, environmental requirements are broad and common (e.g., forests or prairies on glacial till, or forests and meadows on montane slopes).

U = Unknown
Null = Rank factor not assessed

Other Considerations

Provide and comment on any other information that should be considered in the assignment of a conservation status rank, especially when the status rank resulting from the overall assessment is different from the rank that the values for the formal status factors, taken alone, would suggest. This (text only) field may also be used for other general notes pertinent to multiple factors.

The following are some examples of Other Considerations:

- Preliminary rank assessment does not necessarily reflect current status, since the rank was done by inspection from review of published distribution and habitat information, or museum collection information.

- A population viability analysis may indicate that the species has x percent probability of surviving for y years (or an equivalent number of generations) in the same area of interest (globe, nation, or subnation). ***[Guidance to be developed to suggest possible equivalencies between conservation status ranks and the results of PVA analyses.]***

- Global rank is based on particular national or subnational rank(s), or national rank is based on particular subnational rank(s).

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ATTACHMENT 3: Thoughts on Global ranks, especially range ranks (G2G3 versus G3?) from Larry Morse

1. The long-term goal of element ranking is to have a precise rank for every element. Any rank short of this, including 'G#?' ranks, range ranks, 'GU', and the 'G?' placeholder itself, simply indicates that more research on that element is needed. It is not a question of whether one likes these provisional ranks or not -- it is a question of whether they have value to convey uncertainty in working ranks still being refined.

2. I strongly believe that 'G#?' ranks (including 'G1?' and 'G5?' have a unique role for which range ranks do not substitute. Range ranks, either 2-unit or 3-unit, similarly have unique roles for which 'G#?' ranks do not substitute. How often each of these kinds of situations appears in a dataset will vary with the nature of the data (esp. the depth of rangewide knowledge). However, to provide overall consistency in the ranks that we use, we should not be giving different guidance to botanists, zoologists, and ecologists for the identical situations (e.g., on whether 'G4' is a unique rank itself or a placeholder for things undecided between 'G3' and 'G5').

3. A precise rank indicates reasonably high likelihood that the rank is accurate, and will not change except with change of the element's actual on-the-ground status, or with new research results (e.g., new discoveries or reidentifications of older records). Information is sufficient to exclude other ranks. In general, basis for rank should be documented in an EGR, at least to level of rank reasons.

4. A question-mark numerical rank ('G#?') indicates that there is a good chance that the rank is correct, based on available information and best judgement, but that there is either poor documentation or still enough uncertainty that the rank may change to an adjacent rank. Therefore, the current rank should not be relied on as a decision threshold without further consideration of the facts and the data gaps involved. 'G#?' ranks are always temporary, subject to refinement to precise ranks, or (more rarely) change to less precise ranks or other ranks as new information indicates. In well-known element groups (such as gymnosperms or vertebrate animals), the need for 'G#?' ranks may be minimal and quite transient. [MSR comment: whereas in an evolving vegetation classification there may be Lots of G#? ranks]

As a concrete example, I include 'G3' ranks in the national list of globally rare plants, but exclude 'G3?' ranks. We changed a fair number of poorly documented 'G3' ranks to 'G3?' ranks last year for this reason; there was no reason to suspect that they are anything but G3's, yet not high confidence that they were correctly ranked and clearly qualify for inclusion in this list. Changing all of these to G2G4 ranks would have overstated the concern.

This reasoning on 'G#?' ranks applies equally well at the ends of the scale as at the middle; thus, 'G1?' and 'G5?' are meaningful, and different from other possibilities (the precise 'G1' or 'G5' and the less precise 'G1G2' and 'G4G5').

Having '+' and '-' ranks, on the other hand, has long been rejected as being essentially a further subdivision of the scale, producing a 15-level rather than a 5-level system. I agree; that's more detail than we need or want. When necessary (as in California and Hawaii), decimal ranks can be added to state ranks to provide further resolution within large groups of the identical rank combinations.

5. The range ranks ('G2G4', 'G3G4', etc.) indicate a greater spread of uncertainty, with more difficulty in deciding what rank may apply. Basically, they show what has been eliminated on the G1-G5 number scale, and what possibilities are left, with no indication of preference among the possibilities.

Note that the 'G4' rank is not a placeholder between 'G3' and 'G5' but a rank of its own, indicating something beyond the 'G3' rank that is known to meet some but not all (i.e., known not to meet all) of the criteria for G5 (i.e., widespread, abundant, secure). Lack of knowledge is not reason to select 'G4' instead of 'G5'; such cases should be ranked 'G4G5' unless there is evidence for preferring a more precise rank. Put briefly, 'G4' means, amongst other things, known not to be a 'G5'; the 'G4' should not be used for cases that may instead be 'G5' -- that is the role of 'G4G5'.

For broad-range ranks ('G1G3', 'G2G4', and 'G3G5), the great range of uncertainty helps flag such elements as ones in need of further study; substituting these for 'G2?', 'G3?', and 'G4?' would muddle these different levels of uncertainty. In better-known groups, the broad-range ranks soon disappear, but may persist almost indefinitely for poorly known elements, particularly those ranging into comparatively poorly known areas, such as Latin America or Siberia, even when the North American status of the element is well known. [MSR comment: in portions of the western region, we have a large number or G2G4 ranks exactly because of the uncertainty, most especially in Nevada and Utah].

Suggested Procedure to Use When Ranking Poorly Known Species for which only a few collections are known and survey work is inadequate to estimate the number of known populations (e.g., many invertebrates, many tropical vertebrates)
November 2002 DRAFT – L. Master

For many groups of invertebrates, knowledge of their taxonomy and distributions is so incomplete that any attempt to rank most species other than GU is unsupportable (e.g., many Coleopteran families). However, many invertebrate, and some tropical vertebrate, species are poorly but nevertheless sufficiently known that they can be assigned a range rank with some degree of confidence, based on the number of known records (populations/occurrences), even with little or no knowledge of habitats used.[1] Given no knowledge of restriction to rare or insular habitats, and assuming that the number of known populations represents a decreasing proportion of the actual number of populations as the latter increases, a preliminary range rank may be assigned from the number of known populations as follows.

# Known Populations	GRANK
1	G1G2
2-4	G1G3
5-9 (and narrow range extent – e.g., <250,000 km^2)	G2G3
5-9 (and broad range extent)	G2G4
10-20	G3G4
20+ (and narrow range extent)	G4
20+ (and broad range extent)	G5

When there is more specific information on which to base a rank (e.g., species restricted to one island or to a rare habitat), use that information to assist in assigning a rank, which may be more precise than the above conservation status ranges.

GH is used when there is considerable uncertainty that the species is still extant [typically known collection(s) are > 20 years old and there has been some unsuccessful searching of historical locales or it is thought that the historic locale(s) may have been destroyed]; finding a current record would normally cause it to be ranked in the G1-G2 range.

GU should be used under the following circumstances.

- When the uncertainty spans a range of four or more numeric ranks (e.g., G1G4, G2G5).
- When there are less than five collection sites known, but they span a great distance, and there is nothing (e.g., restricted habitat) to indicate global rarity.
- If there is sufficient uncertainty that it is not known if the species is GH or G1-G3 (or possibly more common). For example, some grasshoppers have not been collected since they were first described in the early 1900s, they are not environmentally restricted (e.g., to rare habitats or insular areas), and there is no reason to expect that they would have been subsequently collected as no one is thought likely to have encountered them even if they were extant.
- When it is certain that a species, otherwise ranked G4 or G5, is composed of multiple as-yet-undescribed species.

[1] Note that elements should be assessed on the basis of **estimated** numbers of populations, EOs, range, etc., but the guidelines above are an alternative when one is loathe to estimate numbers based on very limited knowledge.