# Element Occurrence Ranking

## Introduction

In the Heritage methodology, an Element is a unit of biological diversity, typically a species or ecological community. An Element Occurrence (EO) is an area of land and/or water in which a species or ecological community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location.

EO ranks provide a succinct 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

EO ranks may be used effectively in conjunction with Element conservation status ranks (state and global ranks) to guide which EOs should be recorded and mapped, and to help prioritize EOs for purposes of conservation planning or action, both locally and rangewide.

An Element Occurrence rank represents the relative value of an EO with respect to others for that Element.

Basic EO Ranks

| EO Rank | Description |
|---|---|
| A | excellent estimated viability |
| B | good estimated viability |
| C | fair estimated viability |
| D | poor estimated viability |
| E | verified extant (viability not assessed) |
| H | historical |
| F | failed to find |
| X | extirpated |

The basic “A” through “D” ranks are based on currently known factors (see below) that are used to estimate the viability of an EO. The more viable an EO is, the higher its EO rank and the higher its conservation value.

## Rank Factors

Because EO ranks are used to represent the relative conservation value of an EO as it currently exists, EO ranks are based solely on factors that reflect the present status, or quality, of that EO. There are three EO rank factors, each reflecting what is currently known (in an ideal situation) about an EO: size, condition, and landscape context. These factors are used as the basis for estimating the viability of an EO (i.e., its EO rank). Thus:

Size + Condition + Landscape Context = Estimated Viability = EO Rank

For community Elements, the term “viability” is used loosely, since communities are comprised of many separate species, each with their own viability. Thus, the viability of a community is considered to be the sum of the viability or persistence of the component species and their ecological processes. More directly, EO ranks reflect the degree of negative anthropogenic impact to a community (i.e., the degree to which people have directly or indirectly adversely impacted community composition, structure, and/or function, including alteration of natural disturbance processes). Occurrences with relatively less impacts would generally be ranked “A”, “B”, or “C” (at least “fair” viability), and those with significant degradation would be ranked “D” (“poor” viability). It is not necessary to have knowledge of each of the three rank factors to develop EO rank specifications (especially for species). For some Elements, information on one factor may be sufficient to rank an occurrence (e.g., a large population size may require, and thus imply, adequate condition and landscape context). For other Elements, information may be scant or incomplete. In such cases, EO ranks will be based on only one or a combination of the rank factors.

### Size

Size is a quantitative measure of the area and/or abundance of an occurrence. Components of this factor are:

a) area of occupancy (species and communities;
b) population abundance, (i.e., total count or qualitative estimate) (species);
c) population density (species);
d) population fluctuation (species).

For communities, size is equal to the area of the occurrence. For species, the (population) size of an EO can be determined in several ways. Most commonly, information on both population abundance and the area of occupancy is used to calculate population size; however when appropriate (e.g., for territorial and colonial species), population abundance alone can be used as the EO (population) size. If population density is to be used in determining the population size of a species occurrence (e.g., when sampling a population in order to estimate its size), density must be used in combination with the area of occupancy. In addition, information on population fluctuations can be considered when calculating EO population size, particularly for species known to typically have high fluctuations in population.

EO size varies as a function of both natural and anthropogenic factors. Larger EOs are generally presumed to be more valuable for conservation purposes, all other rank factors being equal. Larger occurrences are typically less influenced by edge effects, and less susceptible to degradation or extirpation by stochastic events.

**Condition**

Condition is an integrated measure of the quality of biotic and abiotic factors, structures, and processes within the occurrence, and the degree to which they affect the continued existence of the EO. Components of this factor are:

a) reproduction and health (species);
b) development/maturity (communities);
c) ecological processes;
d) species composition and biological structure
e) abiotic physical/chemical factors.

**Landscape Context**

Landscape context is an integrated measure of the quality of biotic and abiotic factors, structures, and processes surrounding the occurrence, and the degree to which they affect the continued existence of the EO. Components of this factor are:

a) landscape structure and extent, including genetic connectivity;
b) condition of the surrounding landscape (see components of "condition" listed above)

## Ranking EOs

**Species**

For species, the size, condition, and landscape context factors are generally considered together. In many cases, where knowledge permits, size is the primary factor influencing EO rank, with condition and landscape context used secondarily (or not at all for some vertebrates). This is because a large size (i.e., number) of breeding individuals would generally not occur without favorable condition and landscape context, especially for relatively short-lived species. For species where little information on size is available to develop rank specifications (especially many plants and invertebrates), condition and landscape context factors may be relied upon more heavily.

**Communities**

Because of the greater complexity of communities, due in part to the interaction of species and successional change, it is difficult to consider the influence of all rank factors concurrently. Thus, each factor is assigned a separate "A", "B", "C" or "D" rating, sequenced and weighted according to priority, and combined in an algorithm to calculate an EO rank value. This value is then translated according to an EO rank scale to determine the EO rank.

The first step in the process of determining a rank for a community EO is prioritizing the rank factors on the basis of the relative importance of each factor for that Element. The factor that is most important is considered the primary rank factor, the factor with less importance is the secondary rank factor, and the remaining factor, having the least importance, is the tertiary rank factor.

General Rank Factor Prioritization Sequence Guidelines
Based on Community Pattern Type

| Community Pattern Type | Primary Rank Factor | Secondary Rank Factor | Tertiary Rank Factor |
|---|---|---|---|
| Matrix | size | landscape context | condition |
| Large Patch | condition | size | landscape context |
| Small Patch | condition | landscape context | size |
| Linear | landscape context | condition | size |

**Matrix Community Pattern Type**
Size and landscape context are generally identified as the primary and secondary factors for a matrix community type. A matrix community, by definition, occupies a very large area with high connectivity to other community types; thus, size and landscape context are typically more important than condition, which could be quite variable (and in some cases, difficult to measure).

**Large Patch Community Pattern Type**
Condition and size are generally identified as the primary and secondary factors for a large patch community type; however, this sequence is quite flexible. Because this community type conceptually occupies the "middle ground" between matrix and small patch types, some large patch communities may be more similar to matrix types, while others more closely resemble small patch types, or linear types. In such cases, the general guidelines for rank factor prioritization for the community type most similar could be utilized for the large patch type.

**Small Patch Community Pattern Type**
Condition and landscape context are generally identified as the primary and secondary factors for a small patch community type. Small patch types vary much less in size, often contain more specialized species, and, because of their small size, are sensitive to factors affecting landscape context.

**Linear Community Pattern Type**
Landscape context and condition are generally identified as the primary and secondary factors for a linear community type. Linear types, having a large amount of edge and typically dependent on currents or flow regimes, are extremely sensitive to factors affecting landscape context. In addition, linear types often support very specialized species.

## Spatial Patterns of Different Community Types

Within an ecoregion, natural terrestrial communities may be categorized into four functional groups on the basis of their current or historical patterns of occurrence, as correlated with the distribution and extent of landscape features and ecological processes. These groups are identified as matrix communities, large patch communities, small patch communities, and linear communities.

### Matrix Communities

Communities that form extensive and often contiguous cover may be categorized as matrix (or matrix-forming) community types. Matrix communities occur on the most extensive landforms and typically have wide ecological tolerances. Individual Element occurrences of the matrix type typically range in size from 2000 to 405,000 hectares (approximately 5000 to 1,000,000 acres). In a typical ecoregion, the aggregate of all matrix communities covers, or historically covered, as much as 75-80% of the natural vegetation of the ecoregion. Any matrix occurrence is likely to have large patch and small patch occurrences embedded within it. Matrix community types are often influenced by large-scale processes (e.g., climate, fire), and are important habitat for wide-ranging or large area-dependent fauna, such as large herbivores or birds (e.g., bison, prairie chickens).

### Large Patch Communities

Communities that form large areas of interrupted cover may be categorized as large patch community types. Individual EOs of this community type typically range in size from 20 to 2000 hectares (approximately 50 to 5000 acres). Large patch communities are associated with environmental conditions that are more specific than those of matrix communities, and that are less common or less extensive in the landscape. In a typical ecoregion, the aggregate of all large patch communities covers, or historically covered, as much as 20% of the natural vegetation of the ecoregion. Like matrix communities, large patch community types are also influenced by large-scale processes, but these tend to be modified by specific site features that influence the community.

### Small Patch Communities

Communities that form small, discrete areas of cover may be categorized as small patch community types. Individual EOs of this community type are typically 20 hectares (approximately 50 acres) or less. Small patch communities occur in very specific ecological settings, such as on specialized landform types or in unusual microhabitats. In a typical ecoregion, the aggregate of all small patch communities covers, or historically covered, only as much as 5% of the natural vegetation of the ecoregion. Small patch community types are characterized by localized, small-scale ecological processes that can be quite different from the large-scale processes operating in the overall landscape. The specialized conditions of small patch communities, however, are often dependent on the maintenance of ecological processes in the surrounding matrix and large patch communities.

In many ecoregions, small patch communities contain a disproportionately large percentage of the total flora, and also support a specific and restricted set of associated fauna (e.g., invertebrates, herpetofauna) dependent on specialized conditions.

**Linear Communities**

Communities that form as linear strips are often, but not always, ecotonal between terrestrial and aquatic systems. Examples include coastal beach strands, bedrock lakeshores, and narrow riparian communities. Similar to small patch communities, linear communities occur in very specific ecological settings, and the aggregate of all linear communities covers, or historically covered, only a small percentage of the natural vegetation of the ecoregion. They also tend to support a specific and restricted set of associated flora and fauna. Linear communities differ from small patch communities in that both local scale processes and large scale processes, such as lake/ocean currents or riverine flow regimes, strongly influence community structure and function. This characteristic often leaves these communities highly vulnerable to alterations in the surrounding land and waterscape.