
2 EO DEFINITION

- 2.1 Principal EOs**
 - 2.2 Sub-EOs**
 - 2.3 Feature Labels**
 - 2.4 Location Use Classes**
 - 2.5 Persistence and Practical Conservation Value**
 - 2.6 Captivity/Cultivation**
 - 2.7 Anthropogenic Habitat**
 - 2.8 Reintroduction/Restoration**
 - 2.9 Introduction/Exotics**
 - 2.10 Historical EOs**
 - 2.11 Extirpation**
 - 2.12 Recordation and Representation**
-

An **Element Occurrence** (EO) is an area of land and/or water in which a species or natural 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. For species¹ Elements, the EO 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 community Elements, the EO may represent a stand or patch of a natural community, or a cluster of stands or patches of a natural community. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries.

An Element Occurrence record² is a data management tool that has both spatial and tabular components including a mappable feature and its supporting database. EOs are typically represented by bounded, mapped areas of land and/or water. EO records are most commonly created for current or historically known occurrences of natural communities or native species of conservation interest. They may also be created, in some cases, for extirpated occurrences.

There are two kinds of EOs: principal **EOs** and **SUB-EOs**. EOs may also be categorized according to descriptive classes and labels.

2.1 Principal EOs

The characteristics of principal EOs are globally defined for each individual Element (see Section 4, EO Specifications). A principal EO may be a single contiguous area or may be comprised of discrete patches or subpopulations.

¹ In this Standard, 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 “intraspecific taxa”. Other subsets of species (*e.g.*, geographically distinct population segments not recognized as intraspecific taxa) are sometimes designated as species Elements, and recurrent, transient, mixed-species animal assemblages (*e.g.*, shorebird concentration areas) may also be considered Elements.

² In this Standard, the term “Element Occurrence record” is used in a general sense to refer to a set of data associated with a particular EO. In many database implementations, this information will be contained in multiple tables.

For species, a principal EO conceptually represents the full **occupied habitat** (or previously occupied habitat) that contributes, or potentially contributes, to the persistence of the species at that location. Generally, a principal EO corresponds to a population or metapopulation.³ Principal EOs are typically separated from each other by barriers to movement or dispersal, or by specific distances defined for each Element across either unsuitable habitat, or suitable but apparently unoccupied habitat.

For community types⁴, principal EOs represent a defined area that contains (or contained) a characteristic species composition and structure. Principal EOs are separated from each other by barriers to species interactions, or by specific distances defined for each Element across adjacent areas occupied by other natural or semi-natural community types, or by **cultural vegetation**.

Rarely, principal EOs of the same Element can overlap or contain another principal EO; however, in such cases, the features must have significantly different levels of associated information (see Section 7.16.2, Overlapping Principal EOs). An example of a situation in which this might occur would be when an EO based on general historical information is created, and then a second, much smaller, EO is developed from new field survey data that locates it within the boundaries of the first. Both principal EOs should be retained until additional survey work establishes that the second EO is actually the same as first and should therefore replace it.

Although a principal EO conceptually represents the full occupied habitat (for species) or area (for communities), evidence for a particular occurrence may not necessarily provide complete knowledge of its full extent. Whether the full extent of occupied habitat or area is actually known for an EO may depend on different factors, including the intensity and extent of survey, the types of survey techniques employed, characteristics of the Element (*e.g.*, plants that seed bank, animals with secretive behaviors), and the level of expertise of the person(s) collecting data. In cases where knowledge of the full extent or area of an occurrence is not known, only the portion of the occupied habitat or area that is known should be recorded from the evidence available. The EO record should indicate whether the full extent of occupied habitat or area of an occurrence is known by distinguishing between situations where there is (a) confidence that the full extent of the EO is known; (b) confidence that the full extent of the EO is *not* known; and (c) uncertainty whether the full extent of the EO is known.

In some cases, a population or community may be so extensive that it is impracticably large for information management or site-level conservation action (*e.g.*, many migratory birds, whales, some riparian plants, some matrix communities). For example, all of the individuals of a migratory bird species breeding over an area hundreds of kilometers across may function as a single population, making it impractical to treat this population as a single principal EO. In these situations, principal EOs should be defined on the basis of separation distances, or natural or cultural geographic

³ For animals, metapopulation structure may arise when habitat patches are separated by distances that the species is physically capable of traversing, but that exceed the distances most individuals move in their lifetime (that is, the patches support separate subpopulations). If habitats are so close together that most individuals visit many patches in their lifetime, the system will tend to behave as a single continuous population (Gutierrez and Harrison 1996, McCullough 1996). For plants, demographically significant exchange among subpopulations can occur through dispersal of seeds, spores, pollen, and other propagules. Persistent dormant propagules may result in metapopulation dynamics over time as well as space.

⁴ In this Standard, the term “community type” will be used to distinguish a community Element from a community EO (*i.e.*, ecological community) when the distinction is not apparent from the term “community” alone.

features (but not jurisdictional or cadastral⁵ boundaries) that subdivide the population or community (see Section 4.3, Separating EOs). In such cases, the population (or metapopulation) structure or full community extent should still be considered in protection and management planning.

2.2 Sub-EOs

Although the principal EO conceptually represents the entire occupied area, there may be smaller geographically distinct areas *within* the principal EO for which information could be useful for conservation planning, biological monitoring, or biological management at local levels. These geographically nested components are referred to as sub-EOs. Sub-EOs must be contained within a principal EO of the same Element. Note that sub-EOs should not be created simply to represent different parts of a principal EO comprised of noncontiguous patches.

Sub-EOs may be defined as

- a) areas utilized by species for specific behaviors or life history functions (*e.g.*, feeding areas, dens, nest sites);
- b) areas of differing composition, or higher density, quality, or conservation concern (*e.g.*, demes or subpopulations, different age stands or successional phases, old growth patches, concentrated breeding areas);
- c) discrete areas (within a principal EO characterized by noncontiguous patches) for which it is desirable to maintain information for each area in separate records (*e.g.*, to facilitate recordation of monitoring data); or
- d) other areas marked by non-biological divisions assigned for convenience in mapping, monitoring, or management (*e.g.*, geographic, political, and land survey map units). The creation of sub-EOs defined by these divisions should generally be avoided because they are not biologically significant.⁶

Sub-EOs could be used to facilitate information management in cases where a principal EO is particularly large, complex, or crosses jurisdictional boundaries. Such principal EOs may present challenges, including incomplete knowledge of the full extent of the EO, loss of detail about specific sub-populations or community patches, and difficulty in supporting information needs related to inventory, monitoring, management, conservation planning, and environmental review. However, sub-EOs should not replace the use of a principal EO to represent the full extent of the occurrence.

A single observation based on ephemeral circumstantial evidence (*e.g.*, tracks or scat for wide-ranging carnivores) should not be recorded as a sub-EO, but may be recorded in a manual Element file or in a separate observations database.

⁵ In this Standard, the term “cadastral” refers to ownership lines and public land survey lines (*e.g.*, townships, ranges, and sections in US public land surveys).

⁶ Some geographic units, such as watersheds, may sometimes reflect biological divisions, particularly for many freshwater Elements.

2.3 Feature Labels

An EO can be assigned an *optional* descriptive **FEATURE LABEL** indicating *what that EO is* (e.g., deme, nest, den, watershed). In practice, feature labels are most useful for sub-EOs. They may also be useful for those principal EOs that are based only on evidence for some component (e.g., nest, den) of the full occupied area⁷, but are generally not recommended for those principal EOs that may be conceptually characterized simply as “occupied habitat”. One notable exception for species with unusual life histories involves the use of feature labels to distinguish significantly different kinds of principal EOs representing the full occupied habitat (e.g., a clone-forming perennial plant occurring at a given site as a single gender or life history stage could be described using feature labels such as “male clone”, “gametophyte”, *etc.*).

The use of feature labels describing EOs is optional in a global context because the unit of conservation is the principal EO, and there is no need envisioned for multi-jurisdictional aggregation of information on sub-EOs (for which feature labels are most useful). In addition, feature labels (and sub-EOs) will be defined in more ways in different programs than can be predicted.

2.4 Location Use Classes

For migratory species that utilize geographically and seasonally disjunct (*i.e.*, not contiguous) locations, all EOs (both principal and sub-EOs) *should* be assigned a descriptive “class” name that *groups EOs by their season of occurrence*. Because a species may vary in vulnerability during different seasons (e.g., due to more or less aggregation), an EO for a species at a particular season may have greater or lesser conservation value than EOs for the same species at another season. These potential differences in seasonal conservation value between disjunct locations are indicated through the use of **LOCATION USE CLASSES** (e.g., “breeding”, “nonbreeding”, and “migratory stopover”⁸), thus helping to guide conservation planning. Assigning EOs to location use classes allows identification and conservation of EOs from each vulnerable class, which is vital to the conservation of such species.

Location use classes pertain only to Elements that occupy geographically disjunct locations at different seasons. Classes are not applicable to nonmigratory Elements, and are generally not applicable to terrestrial or freshwater migratory Elements that move between contiguous areas. See Appendix A: Migratory Status and Location Use Class for further clarification on the utilization of Location Use Classes and Feature Labels.

2.5 Persistence and Practical Conservation Value

A primary purpose for delineating EOs is to guide conservation (e.g., site protection, environmental review, inventory, recovery efforts, research) for the Elements represented by those

⁷ Use of a feature label for a principal occurrence representing a component of the full occupied habitat for the Element indicates that further field survey work is needed.

⁸ “Breeding” and “nonbreeding” classes are applied to occurrences that represent seasonally resident populations. The “migratory stopover” class, even though also nonbreeding, is applied to occurrences that represent populations during a nonresident, migrating phase. Note that there may not be a one-to-one correspondence between location use classes and breeding and nonbreeding Element ranks for a particular species (e.g., the classes “migratory stopover” and “bachelor colony” both apply to the nonbreeding Element rank).

occurrences. It is therefore critical that EOs have **PRACTICAL CONSERVATION VALUE** for the Elements they represent. Persistence at a specific location typically establishes the conservation value of that location.

Generally, in order to qualify as an EO, the potential continued presence and/or regular recurrence of an Element at a given location is necessary. In other words, an Element must potentially persist at a location in order to be designated an EO. Evidence of likely ephemeral presence of an Element at a location, lacking persistence, should not result in the designation of an EO. For most Elements (especially perennial plant species, stable communities, and nonmigratory animal species), persistence is presumed to be established by evidence of presence. More specifically, for community Elements, stability is judged as persistence under natural processes for a time period specific to that Element.

For some plant species (*e.g.*, those with long-term seed dormancy or other dormant stages), very dynamic communities, and migratory animal species, persistence is often defined by real or apparent recurrence. This recurrence may be due to return migrations, periodic disturbance, or fluctuating environmental conditions. For aerial migrants during their migration, the designation of an EO requires temporary (*e.g.*, a week or more) presence in a given season, significant aggregation, and likely recurrence in different years. (See Appendix B: Persistence and Practical Conservation Value.)

Historical occurrences (despite their possible lack of persistence) and extirpated populations may also be designated as EOs (see Sections 2.10, Historical EOs and 2.11, Extirpation). Information on the location of these EOs may be useful for directing future field surveys, conducting range and trends analyses, and environmental review. Extirpated EOs, when suitable habitat remains extant, may be appropriate sites for reintroduction.

2.6 Captivity/Cultivation

Species in captivity or cultivation (*e.g.*, zoos, botanical gardens, tree farms) are not EOs. These populations are not dependent on natural habitat and may be readily moved.

2.7 Anthropogenic Habitat

Species populations that are regularly or periodically found in specific anthropogenic habitats may be EOs, particularly if the species arrived at the site without being transported there by humans and the habitat continues to provide appropriate conditions without specialized intensive management. Examples of such EOs include pelicans inhabiting reservoirs; peregrine falcons nesting on skyscrapers; plants along roadcuts; ferns growing on old masonry; bats roosting under bridges, in abandoned structures, and in mines; and plants growing in farm ponds or cemeteries. The captive, cultivated, or intensely managed species of such cultural settings as farms, tree plantations, horticultural landscaping, or ornamental ponds seldom qualify as EOs.

2.8 Reintroduction/Restoration

For species, areas occupied by populations that have been re-established within their native range are EOs. EOs may also represent habitat occupied by an Element that has been reintroduced, but that is not yet known to be established. See Section 5.2.3, Origin Status Subranks for a discussion

of labeling such occurrences; see also Section 5.4.2, EO Rank Sequence for a discussion of the relative conservation importance of reintroduced/restored EOs.

Communities that have been restored *de novo* by intensive planting or seeding (*e.g.*, restoration of a cornfield to a prairie) are generally not considered EOs, since it is thought that such communities, including their invertebrate fauna and microbial organisms, cannot readily be recreated. However, in some cases (*e.g.*, for very rare community types) it may be desirable to track restorations as EOs.

2.9 Introduction/Exotics

An area where a species is not native (*i.e.*, where it has been introduced, through direct or indirect human intervention, outside its historical range) is not an EO unless it is critical to the survival of that species. For example, sea lamprey is an exotic species in the upper Great Lakes; its presence there is a result of indirect human intervention, specifically the construction of the Welland Canal. However, a population newly established *through natural dispersal* to an appropriate natural, semi-natural, or anthropogenic habitat may be an EO, even if outside its historical range.

2.10 Historical EOs

EOs may be recorded for locations known to be previously occupied by a species or community, even if current field survey information is lacking. This is particularly useful for documenting locations where the Element might be expected to occur or re-occur at some future time, information that may be important in planning field research and in conducting environmental review. Historical EOs, in some cases, may also be useful for demonstrating the former distribution or pattern of decline of an Element. The timeline for categorizing an EO as historical is Element and location specific (*i.e.*, the time will vary by Element and location). See Section 5.2.1, Basic EO Ranks for guidance on designating an EO as historical.

2.11 Extirpation

EOs may represent locally extirpated Elements for the purpose of ranking, surveying, environmental review, and/or restoring the Element across its native range. This may include Elements for which the habitat is either extant or destroyed.

2.12 Recordation and Representation

Information related to EOs may be recorded in tabular form and displayed through the use of mapped representations. See Section 7, EO Spatial Representation for guidance on developing EO representations.