3 EO NESTING

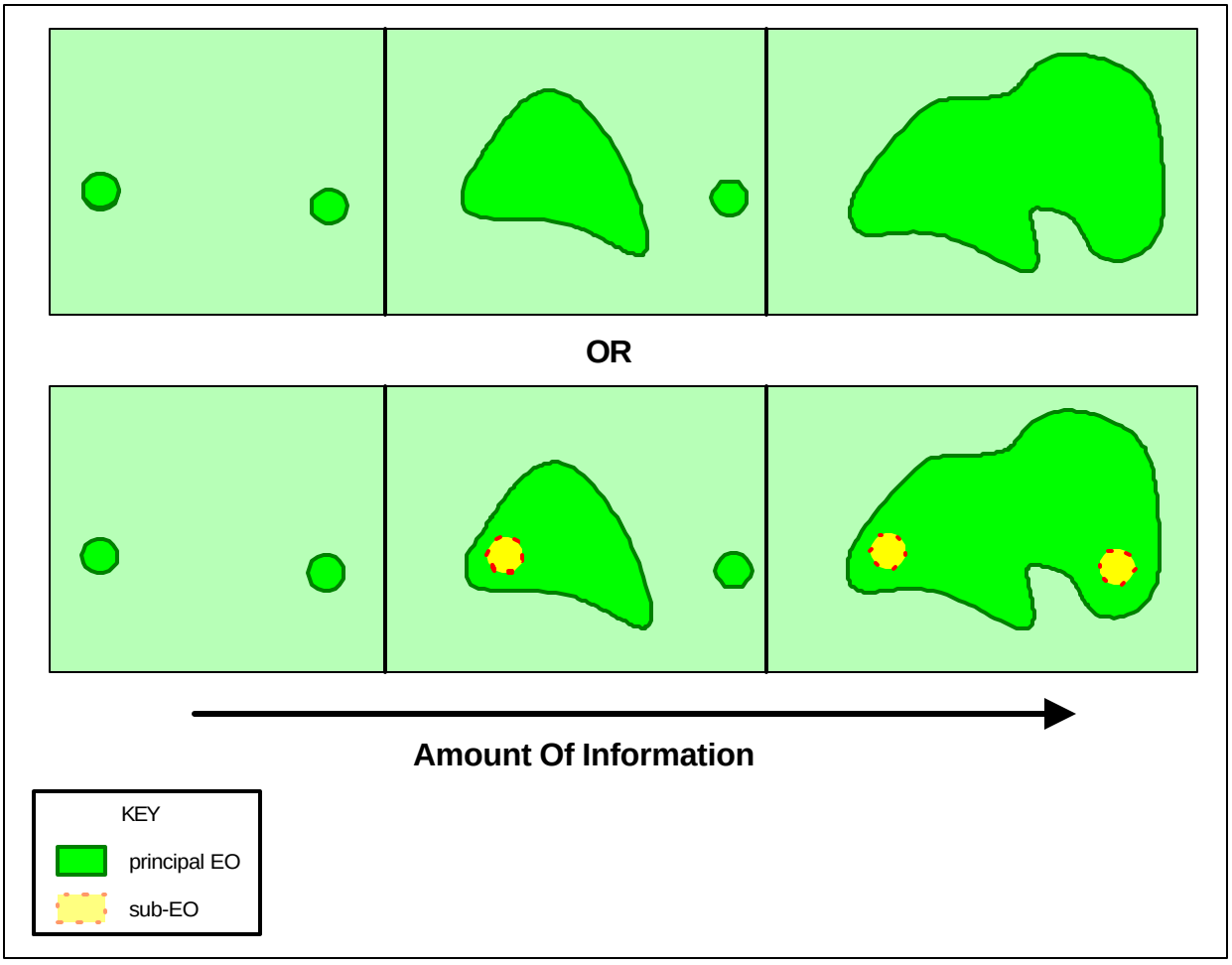
3.1 Principal EOs and Sub-EOs

All principal EOs should be tracked in an Element Occurrence file, regardless of whether they have sub-EOs nested within them. Assessing the number of principal occurrences of an Element is useful as one of several factors in Element ranking; another such factor is a measure of the estimated viability of each extant EO (*i.e.*, EO ranks). For certain Elements, it may be desirable to track sub-EOs as well. Sub-EOs may provide additional information on the Element at that location that would be useful for site-specific conservation planning, biological monitoring, or biological management purposes. EOs and sub-EOs can be identified using feature labels that describe what the EO is. (See Sections 2.1 through 2.4 for more specific information about EO definitions and descriptive feature labels and classes).

The distinction between principal and sub-EOs may be understood by considering how the amount of information can affect the delineation of EOs. Because knowledge about an EO may increase over time, what was once delineated as a principal EO may become a sub-EO (and optionally tracked) as more information about occupied area is obtained.

An example using *Haliaeetus leucocephalus* (bald eagle) is illustrated in Figure 3.1, with principal EOs represented by solid lines and sub-EOs represented by dashed lines. The first column shows two principal EOs delineated on the basis of limited knowledge about occupied area (*i.e.*, nests occupied by two pairs and minimally separated by a distance defined for the Element). The middle column shows a larger boundary delineating the known extent of a principal EO based on additional information about the occupied area (*i.e.*, breeding territory) for one of the two initial occurrences; the original information concerning the nest within the breeding territory may be optionally retained as a sub-EO. In the last column, additional information has been obtained on the breeding territory surrounding the other nest, and because the two territories are within the separation distance defined for the Element, they are merged into one large principal EO representing the area known to be occupied (by two adjacent pairs in this example). Again, nests may be optionally tracked as sub-EOs within the single principal EO. Breeding territory sub-EOs may also be optionally tracked, although this may not be particularly useful.

Figure 3.1 - Distinguishing Principal and Sub-EOs Based on the Amount of Information on the Occupied Area



Knowledge about community EOs may also increase over time. In relatively intact landscapes (*i.e.*, where no substantial barriers occur between stands), information might initially be managed for smaller areas within what could be an extremely large principal EO. The full extent of a principal EO may be difficult to determine without extensive field surveys that are often beyond the scope of a project. For example, a selective survey of unlogged old-growth portions of a northern hardwoods type in the Adirondacks may identify stands that occur within a very extensive area that is primarily second growth. In the short term these old-growth stands may be treated as principal EOs; over time, however, the full extent of the community may be identified as the principal EO, and the old-growth stands may become sub-EOs.

For information management purposes, records for principal EOs and sub-EOs have a parent-child relationship. A record for a principal EO may be linked to one or more records for sub-EOs. However, a record for a sub-EO cannot stand alone; it must be linked to its parent EO record.

3.2 Characteristics of Sub-EOs

Nested relationships typically occur for an Element when, in addition to the principal EOs, sub-EOs are delineated for conservation planning, biological monitoring, and/or biological management purposes. For such an Element, EOs that are located within larger EOs having a different feature label are represented as nested sub-EOs.

Examples:

- *Ursus arctos*, grizzly bear
  a den sub-EO located within an occupied-habitat EO
- *Marshallia grandiflora*, large-flowered Barbara's-buttons
  an individually monitored deme or subpopulation sub-EO located on a gravel bar within a metapopulation EO extending 40 kilometers along a river
- *Pinus ponderosa / Arctostaphylos uva-ursi* Woodland,
  ponderosa pine/bearberry woodland
  an old growth area sub-EO located within a larger second growth woodland EO of lower quality; note that while old growth and second growth woodlands are the same community type, they have different feature labels

For some Elements there may be multiple levels of EO nesting. In such cases, all sub-EOs, regardless of the level of nesting, are linked to the principal EO at the top of the nested set as the parent; a sub-EO is never a child of another sub-EO. Although multiple levels of nesting are possible for occurrences of some Elements, tracking more than two levels is not encouraged.

Examples:

- *Haliaeetus leucocephalus*, bald eagle
  a nest sub-EO located within a breeding territory sub-EO, which is located within a seasonal occupied-habitat EO for multiple pairs of eagles
- *Quercus alba - Quercus rubra - Carya ovata* Forest,
  white oak - red oak - shagbark hickory forest
  a high-quality old growth sub-EO located within an old growth sub-EO, which is located within early successional stage growth of the same community type

Nesting cannot occur between EOs having the same feature label for a given population of an Element.

Example:

- *Rangifer tarandus*, caribou
  a calving area cannot be located within another calving area of the same population of *R. tarandus*

3.2.1 Nesting Sub-EOs for Migratory Elements Having No Location Use Classes

Migratory Elements that utilize a single occupied habitat throughout the year have no location use classes (see Section 2.4, Location Use Classes). However, these EOs can contain nested sub-EOs.

Examples:

- *Acipenser fulvescens,* lake sturgeon
  a spawning area sub-EO located within an occupied-habitat EO (no location use class)
- *Rangifer tarandus,* caribou
  a wintering area sub-EO located within an occupied-habitat EO (no location use class)

3.2.2 Nesting Sub-EOs for Migratory Elements Having Location Use Classes

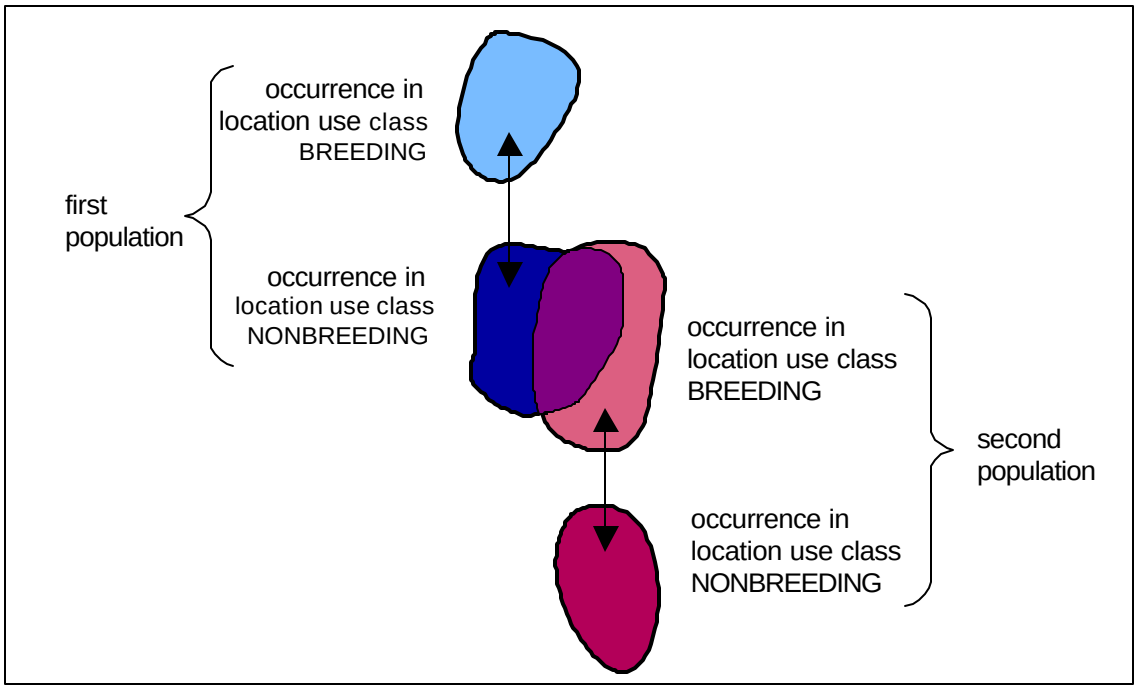
Migratory Elements that utilize multiple disjunct occupied habitats at different seasons have two or more location use classes. For these Elements, nesting can only occur within EOs of the same class.

Examples:

- *Calidris canutus,* red knot
  for location use class MIGRATORY STOPOVER: a roosting area sub-EO located within an occupied-habitat EO
- *Oncorhynchus tshawytscha,* Chinook salmon
  for location use class BREEDING: a spawning area sub-EO located within an occupied-habitat EO

Although EOs in different classes are typically geographically disjunct, it is possible for some species to have EOs in different classes that do overlap, although in different seasons (see Figure 3.2). This almost always involves different individuals. For a particular Element, occurrences that belong to different classes should not be nested because they represent different populations in different seasonal contexts.

Figure 3.2 - Example for a Particular Element Showing Overlapping Occurrences Belonging to Different Populations and Location Use Classes



3.2.3 Nesting Non-Biologically Defined Sub-EOs

In some cases, it may be useful to create nested relationships by the convenient division of an EO on the basis of extrinsic factors. Creating records for non-biologically defined sub-EOs makes it possible to track information that is unique to those sub-EOs. However, the creation of sub-EOs defined in this manner should generally be avoided because they are not biologically significant.

Extrinsic factors that occur naturally at a particular location *(e.g.*, geographic features, topographic features, landform features) may influence the division of an EO into sub-EOs, although this should be done with caution and the rationale for doing so documented in the record for each of the resulting sub-EOs.

Examples:

- *Haliaeetus leucocephalus,* bald eagle
  a watershed sub-EO that is a division of an occupied-habitat EO
- *Cardamine clematitis,* mountain bittercress
  watershed sub-EOs separated for convenience of monitoring
- *Schizachyrium scoparium – Bouteloua (curtipendula, gracilis) / Carex filifolia* Herbaceous Vegetation, northern great plains little bluestem prairie
  separate sub-EOs created for patches that occur on different landform features within an EO: a sub-EO for patches that occur within forested areas of ridges, and another sub-EO for patches of the same community type that occur on adjacent plains (since these two sub-EOs differ somewhat in composition and function, there is benefit in maintaining separate records)

Alternatively, extrinsic factors imposed by humans (*e.g.*, political and/or jurisdictional boundaries) may also determine the division of EOs into sub-EOs.

Examples:

- *Canis lupus*, gray wolf
  a sub-EO delineated by subnational boundaries that is a portion of a multi-jurisdictional occupied-habitat EO
- *Pinus ponderosa/Schizachyrium scoparium* Woodland,
  ponderosa pine/little bluestem woodland
  two sub-EOs created for different parts of an EO: one for that portion occurring within a Research Natural Area, and another for the portion occurring within an adjacent wilderness area, each of which has very different management objectives
- *Canis lupus*, gray wolf
  two sub-EOs (one being an area designated as a recovery zone, and the other an area designated as a non-essential experimental population) that are located within an occupied-habitat EO