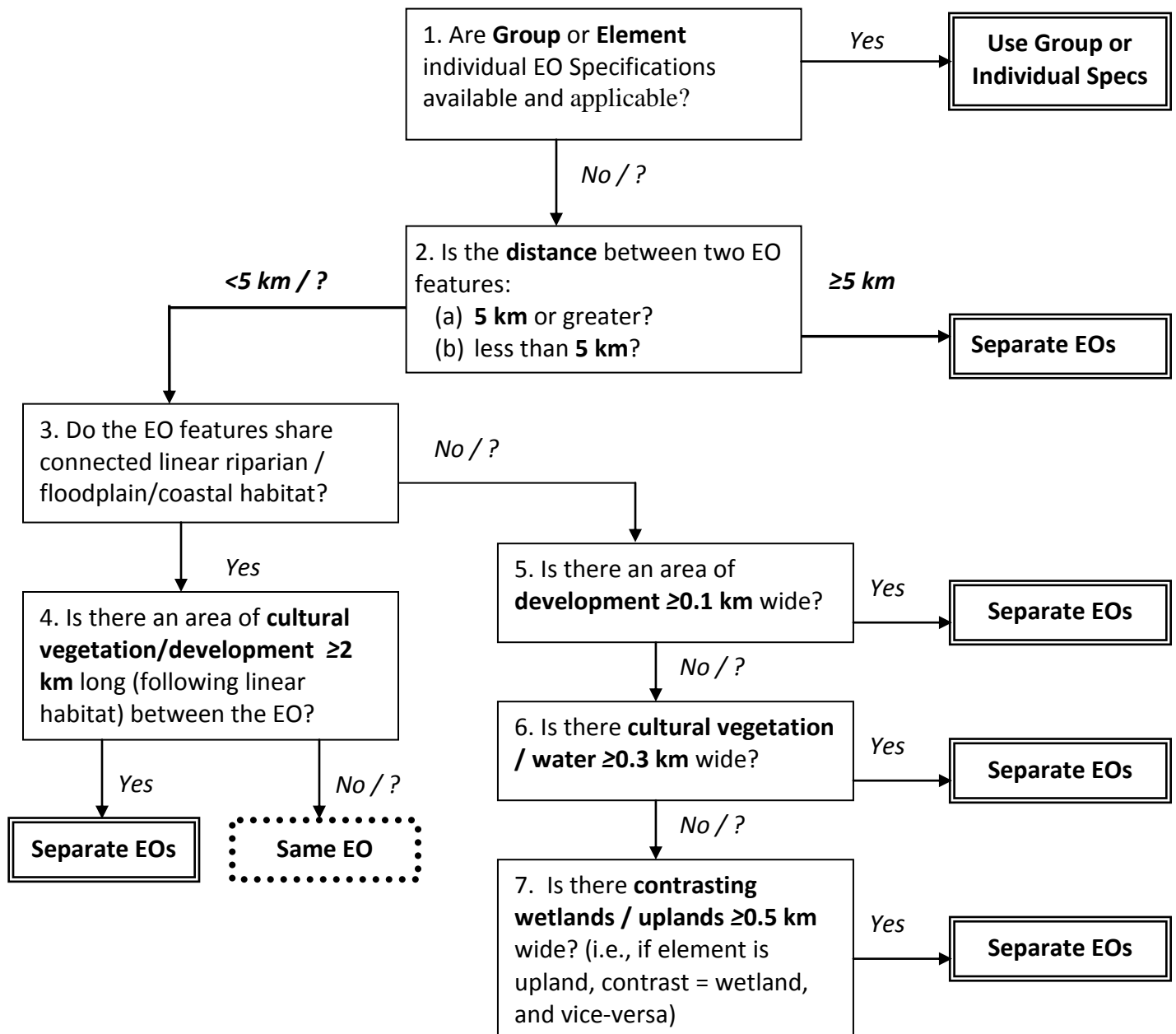


**Ecological Element Occurrence Delimitation Guidance, October 2006
(with Aug 2012 updates) [adapted from Botany guidelines October 2004].**



NOTES:

- An EO feature is any observation point, line, or polygon of a particular ecological type.
- EO polygons must meet Minimum Patch Size requirements. See Definitions.
- If the answer to a question is **unknown**, err on the side of **creating a single EO** (shown as ? above).
- Distances** are between the nearest edges of two EO features (if known), not their centers.

DEFINITIONS

EO Features (observations?)– This Ecology Element Occurrence (EO) Delimitation Guidance addresses whether two separate features (observation points, lines or polygons) of the same element belong to the same EO, or to two different EOs, in the absence of more specific guidance (for example, element or group custom EO specifications). In the context of the Biotics EO Methodology, Basic Features should be compared, to assure consideration of locational uncertainty. (However, note that the differences between Basic and final Procedural Features are negligible here.) Each observation must independently meet the minimal EO criteria (see EO Data Standard) for that element prior to comparison (Fig 1). When one or both of two features have a high uncertainty, it may be that they should remain as separate EOs.

EO Patch Size, EO Aggregate Size, and EORANK - Recommended MINIMUM PATCH SIZES for the different community and system pattern types are: 10 hectares for matrix; 2 hectares for large patch; 0.05 hectares for small patch; and 100 (50?) meters in length for linear. *At the association-scale, it may be best to treat matrix and large patch as both having a default of 2 ha.* Patches below the recommended minimum size become difficult to judge in terms of ecological type characteristics. In some cases, it may be desirable to set the minimum patch size lower than the recommended sizes above, and the minimum occurrence size is actually a MINIMUM AGGREGATE SIZE; that is, the minimum requirement can be met either by a single patch or an aggregation of spatially close patches (depending on Separation distance requirements – see below). The recommended minimum aggregate sizes are the same as for the Minimum Patch sizes listed above. For example, a MINIMUM AGGREGATE SIZE for a large patch community (such as a hemlock-hardwood swamp) may be set at 2 ha, but a MINIMUM PATCH SIZE may be set at 0.5 ha. As long as two or more patches are within the maximum separation distance and together exceed 2 ha, they can be treated as a single EO. Patches or polygons that do not meet the minimum size or aggregate size specs can still be treated as “observations.” (Fig.2)

Note: EOs are typically defined both by patch size and EORANK or Ecological Integrity Rank. Many Heritage programs only define EOs for higher quality examples, so by definition, the delimitation of an EO includes aspects of its condition, and its size. Thus when aggregating polygons of various sizes, one should only aggregate patches of the same or similar condition (A, or A+B, C, and D).

Linear riparian/floodplain/coastal systems – Systems dominated by water-current dispersal in a linear zone generally <1 km wide (riparian corridors, shores, and similar narrow systems), including those with dispersal by occasional events (major floods, storm waves, etc.) that have a significant potential to occur during the next 25 years. Examples include many “100-year” riparian floodplains, coastal shorelines, shorelines of big lakes with large waves, estuarine shorelines and tidal zones, and floodplains of small streams or dry drainages subject to frequent flash floods. Small, quiet ponds and lakes, as well as wide marshes or backwater swamps, generally would not be included here. EO features are assumed to share linear flow if they are aligned in a reasonable flow direction along a river, stream, shore, etc., unless contrary data exist. This is usually not the case with upstream EO features on different tributaries or with EO features on opposite shores of rivers >1 km wide; however, such features may be indirectly connected if they each share flow with a common downstream EO feature. For an aquatic ecological type element inhabiting open

water of a river (aquatic vegetation types), assume connection by water-current flow unless evidence suggests that this is unlikely.

Development – Development is defined as medium to high intensity development that leaves little or no vegetation over a 0.1 km or more wide area, such as wide paved highways, buildings, parking lots, etc. For ecological element occurrences, development serves as a barrier that limits the expansion or alters the function of these types. These barriers may separate populations of many component species within the community or system, thus obstructing or severely limiting gene flow or ecological function. Development may also affect critical ecological functions that characterize the type. (Fig. 2). Developed Vegetation is treated as part of Cultural Vegetation (cf).

Cultural Vegetation / Water– Cultural Vegetation includes both Agricultural Vegetation (croplands, hayfields, orchards, etc.) and Developed Vegetation (lawns, gardens, etc.). Water includes lakes and rivers, as well as impoundments, canals, etc. Intervening cultural vegetation or water will likely inhibit the expansion or function of ecological element occurrences more severely than intervening wetland or upland habitat (see below). (Fig. 2)

Contrasting Uplands / Wetlands – If the EO under consideration is an upland EO, then the contrasting habitat would be a wetland (and vice – versa). For example, two bog patches separated by more than 0.5 km of upland jack pine forest are separate EOs, whereas two bog patches separated by up to 5 km of black spruce swamp are part of the same EO.

EXAMPLES:

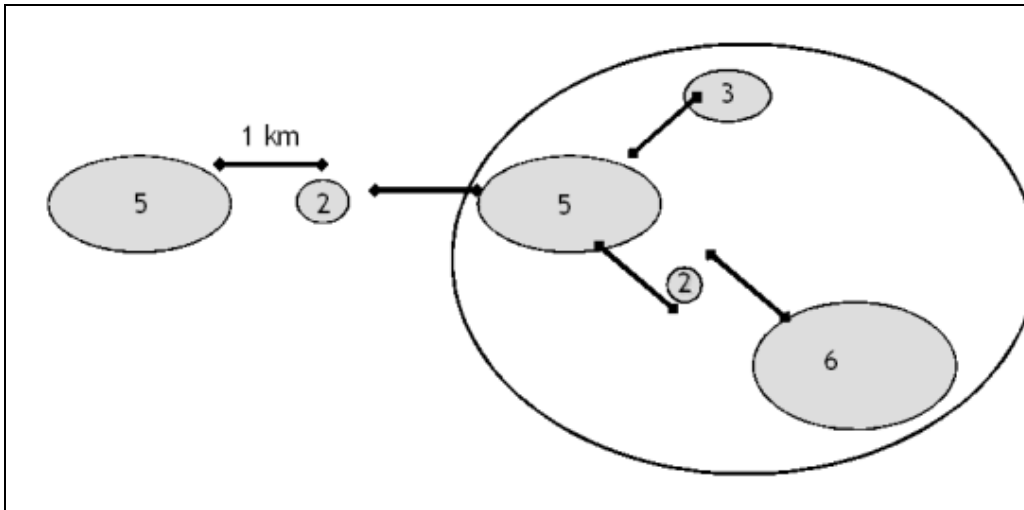


Figure 1. Application of occurrence requirements (EOSPECS) for a large patch ecological unit. Minimum patch or polygon size is set at 2 ha and the minimum separation distance is set at 1 km (note – we now use 5 km as a default). By these criteria the four polygons circled on the right qualify as multiple patches of a single occurrence (EO), which together are separate from the two polygons that comprise a separate EO on the left.

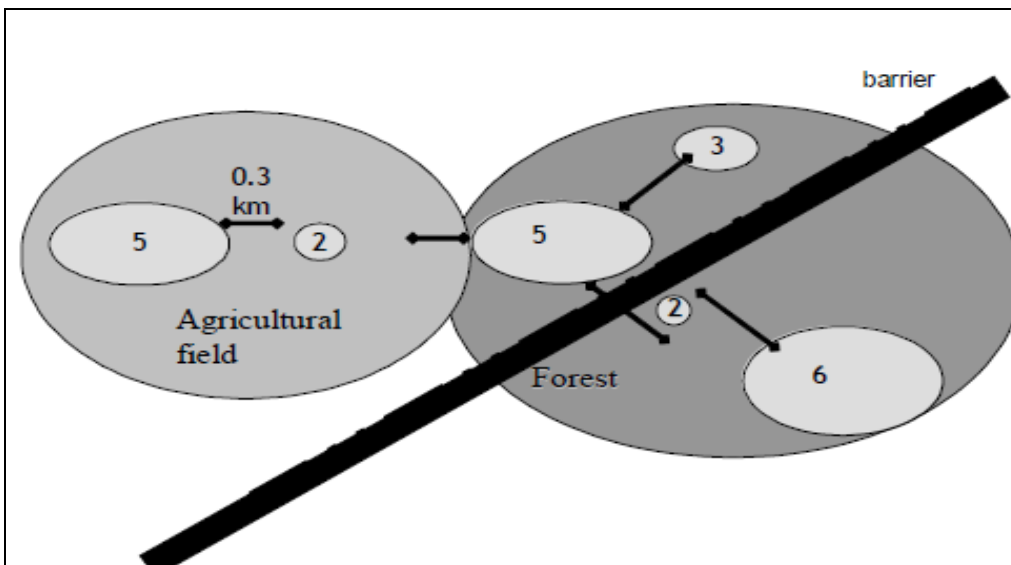


Figure 2. Application of EOSPECS for polygon observations of a matrix forming ecological type. Minimum patch (polygon) size is set at 10 ha minimum. A development barrier > 0.1 km wide, such as a 4-lane highway) divides one set of polygons of type from others. In addition, separation distances between polygons are based on whether the intervening vegetation is natural (0.5 km separation distance) or agricultural (0.3 km). Based on the minimum aggregate rule of 10 ha, there is no EO present. Polygons not belonging to an EO may be maintained as “observations.” **Note: EOs are typically defined both by patch size and EORANK/Ecological Integrity Rank.** Many Heritage programs only define EOs for higher quality examples, so by definition, delimitation of EOs includes aspects of condition and size. Thus when aggregating polygons of various sizes, one should only aggregate patches of the same or similar condition (A, or A+B, C, and D).

Review Questions Under Consideration:

1. Is > 5 km (> 3 miles) a suitable maximum default for ecological elements? Note that Botany used a > 10 km default; but we feel that, because ecological elements have many more species and processes to consider (and therefore many more metrics to be used to assess integrity), too large a distance prevents a coherent assessment of the integrity of the occurrence (i.e. assigning an EORANK becomes difficult). Many community and system occurrences will be larger in scale than species occurrences.

Leah Oliver (Sept 2006): I wonder if even 5 km is too high given the tendency for the EOs to be very large and hence difficult to EO rank? I agree that erring on the side of more, smaller, discreet EOs allows for easier and more accurate assessment of EO ranks and conservation prioritizing. The best thing to do here is to find out what's worked best for ecologists in the member programs. Other than 5 being half of 10, I can't think of a biological reason why the max distance should be 5 km. What's practical?

2. Is the 2 km of cultural vegetation / development (i.e., agricultural fields / housing developments) a suitable separation distance for riparian vegetation? The 2 km distance is suggested rather than the 0.1 to 0.3 km used in boxes 5 and 6 because the riparian etc. vegetation can disperse seeds through the water.

Leah Oliver (Sept 2006): How does moving water help increase the likelihood of an ecological community or system colonize an area? Seeds could move through the water, but abiotic aspects and functional processes can't be dispersed. One can argue that species can go (spread) lots of places systems and communities can't. I'm even wondering if that branch is needed for communities and systems. Could the flow chart go from 2 to 5 (removing steps 3 and 4)?

3. How do we handle multiple types of land uses when looking at separation distances? See Jim Drake's proposed solution below:

Jim Drake (Sept 2006): Perhaps we need recommendations for handling two or three types of intervening habitat, where no one of them meets the criteria to establish separate EOs. For example, two patches of an upland forest System are separated by 80 meters of highway (development) AND 160 meters of hayfield (cultural vegetation) AND 300 m of marsh (contrasting habitat). Are those separate EOs? We could decide to account for additive effects between multiple intervening habitats between patches as follows

1. Calculate the amount of each intervening habitat as a percentage of the minimum needed to create separate EOs;
2. Add those up;
3. If they add up to more than 1.0 then create separate EOs and if they don't then combine the patches into one EO.

Example: You have two upland forest System patches separated by:

- 80 m of development AND

- 160 m of cultural vegetation AND
- 300 meters of wetland.

Add $(80/100) + (160/200) + (300/500)$ because 100 m is the minimum distance of development necessary to force splitting patches; 200 m is the minimum distance of cultural vegetation; and 500 m is the minimum distance of contrasting habitat .

The final answer would be 2.2 so those would be separate EOs.

Example: If you have 80 meters of development and 30 meters of cultural vegetation between the patches you would add $(80/100) + (30/200) = 0.95$ so you would not have separate EOs.

4. Steps 5 – 7 move from stronger to weaker separation distances. It appears to make sense to start with the shorter distances based on the fragmenting strength of the intervening habitat. Do you agree? E.g., a 0.1 km wide area of development that occurs between two patches would lead to creating a separate EO, and would override a 0.2 km area of cultural vegetation that would suggest keeping it as a single EO.

Leah Oliver (Sept 2006): I think one could argue that 0.2km of an active soybean field is as much of a barrier as a road, and that in both cases there should be 2 EOs given the 'fragmentation strength'. Going along with the earlier inclination, it seems that perhaps the tree should be changed a bit here too. What about in 5, 'is there an area of development of > 0.1km or 0.2 km of cultural/water?'

5. If uncertain of an answer (i.e., a Y or N answer is not possible), then err on the side of keeping it as the same EO, since most of the questions deal with readily observable features, and uncertainty suggests that the feature being asked about is not there. For example, if we can't really tell whether the intervening habitat is cultural vegetation or not (i.e. it's an abandoned pasture dominated by native species), then we err on the side of combining the polygons into one EO. Or if we are uncertain as to the degree to which a particular barrier truly is a barrier, we err on the side of combining the polygons into a single EO.
6. Is there a reason to limit the size of an EO (i.e., to set a maximum size). For example, can an EO be 100,000 ha in size?

At this time we permit EOs to be of any size. It may be that Sub-EOs could be used to track different portions of very large EOs, particularly if they have different ownerships or management practices.