



Section 4 EO Specifications Excerpt from the EO Data Standard (Feb 2002)

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NatureServe uses Element Occurrences to define meaningful units for conservation (e.g., populations, ecological assemblages). As such, EOs provide a standardized level of expert interpretation that makes data on species and natural communities useful in a conservation framework to those unfamiliar with Elements of biodiversity.

Creating EOs from survey data requires the use of specifications that define precisely what evidence constitutes a valid EO (i.e., the minimum size, quality, or persistence required), and what distances or factors (e.g., use of habitat, system characteristics) separate one EO from another. Utilizing standard specifications to develop EOs helps to insure that occurrences provide accurate and consistent information across jurisdictions for valid aggregation and analyses.

To prevent duplication of effort when developing the specifications for defining EOs, it may be practical to develop a set of criteria that would be broadly applicable to an entire functional group of Elements, identified as a "specifications group". Because Elements within a particular specifications group have similar components of species biology or community processes, EO specifications for the Elements within that group would differ only minimally, if at all. The EO specifications developed for the group could later be modified as appropriate for a particular Element in the specifications group, at which point the Element would be removed from the group; the initial set of group EO specifications would continue to be applied to the Elements remaining in the specifications group, however. Central Zoology, Botany, and Ecology should maintain documentation on EO specifications developed for specifications groups.

NatureServe Central Zoology has defined a number of specifications groups and has developed EO specifications for these groups, which are available via NatureServe Explorer (<http://www.natureserve.org/explorer/>). A list of the specifications groups, including separation distances, alternate separation procedures, and inferred extent information may be found in Appendix 1.

Developing EO Specifications

Poorly conceived EO specifications are likely to be interpreted differently by different individuals and/or at different times, and result in inconsistently identified EOs. This can misdirect conservation activities. Ensuring that specifications are developed in accordance with the characteristics listed above can be accomplished,

in part, by following standard guidelines. Separation distances and barriers should be identified in the EO specifications, as should location use classes and feature labels, where appropriate.

Characteristics of Elements may vary significantly in different parts of the range (e.g., for species using different habitat in different ecoregions). In such cases, specific minimum criteria and separation distances could be provided in the EO specifications for the different portions of, or habitats in, the range; however, this should be done only if absolutely necessary. Bear in mind that EO specifications are primarily for data management purposes and do not attempt to precisely reflect all variation in movement patterns. It is best to have specifications that apply range-wide and that facilitate multijurisdictional conservation planning.

In the absence of global EO specifications for a particular Element, jurisdictions are encouraged to develop them in coordination with Central Zoology, Botany, or Ecology. This can help avoid the inefficiencies that result from the development of multiple interim local guidelines.

Sources of information for developing EO specifications should include the scientific literature, scientific experts in and outside of the Heritage Network, those conservation data centers that track the Element, and personal field experience with the Element. Any information that would contribute to the detail and completeness of the EO specifications for a particular Element should be forwarded to Central Heritage Operations. Any questions or comments on specifications should be directed to Central Zoology, Botany, or Ecology.

Since inventory and research continually yield new biological and ecological information, the development of EO specifications is an iterative process that incorporates new data. However, due to the collective cost to data centers in implementing revisions, specifications should only be revised when there is substantial new information that would correct any existing specifications as they relate to EO viability or other conservation considerations. Central Zoology and Botany may make minor editorial changes to EO specifications to ensure stylistic consistency. It is recommended that data centers make copies of new EO specifications as they are created or received for archiving in manual files; as subsequent editions of specifications are developed for an Element, archived copies can provide information on the previous criteria utilized in identifying occurrences of that Element, thus indicating whether data need to be reevaluated using the updated specifications.

In cases when information on a particular Element is scant or incomplete (due to lack of thorough research or secretive behaviors of the Element), it may be useful to identify another Element that is presumed or hypothesized to be functionally similar and base the EO specifications for the lesser-known Element on those of the better-known Element. Alternatively, if a specifications group comprising of functionally similar Elements can be identified, then the lesser-known Element could be added to the group and existing group EO specifications utilized.

APPENDIX A: NatureServe Zoology EO Specifications Groups

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|--|------------------------------|---------------------|--------------------|--|-------------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Ambystomatid Salamanders | 1 | 3 | Not applicable | | 0.3 | Inferred extent distance pertains to breeding sites (with the center of the circle in the center of the breeding site). Most ambystomatids stay within a few hundred meters of their breeding pool (see Separation Justification section in group specifications record in Biotics). |
| Anguid Lizards | 1 | 5 | Not applicable | | 0.2 | |
| <i>Anisota</i> , <i>Spingicampa</i> , etc. Moths | 2 | 10 | Not applicable | Multiple habitat patches within the same large community complex or in a generally wooded area will generally be treated as one metapopulation occurrence except in rare cases where the foodplant, generally a common to dominant oak or woody legume, really is absent over at least half the suitable habitat distance. | 1 | Inferred extent will usually be simply all available more or less contiguous habitat but to be conservative when dealing with single point observations cap it at 1kilometer. Habitats for these moths are normally far larger, but a few are known that are less than 1000 hectares. The smallest occurrence known to or even suspected by Schweitzer for an <i>Anisota</i> is about 100-200 hectares for <i>A. stigma</i> at Goat Hill barrens, Pennsylvania and that species persists as isolated colonies in a few (but not most) other small (500-1000 hectare) pine barrens remnants in the northeastern USA, suggesting it can tolerate smaller habitats than most of the group. He notes though that otherwise the genus had been virtually eradicated from small forest fragments in southeastern Pennsylvania before 1970. However, <i>A. senatoria</i> is still present (larvae in September 2001, T. McCabe) on the Albany Pine Bush in roughly 800 hectares of good habitat. Of species in this group only <i>Dryocampa rubicunda</i> seems to routinely do well in small forest scraps probably because it uses intervening planted maples in yards as well. However, no information on habitat size for <i>Sphigicampa</i> are available. |
| Anoles (Polychrid Lizards) | 1 | 5 | Not applicable | | 0.2 | |
| Antelope Squirrels | 1 | 5 | Not applicable | | 0.3 | Based on a mean home range of 6.7 hectares (Allred and Beck 1963). |
| Aquatic/Wetland Plethodontid Salamanders | | | Not applicable | Separation distance for stream-dwelling species along riverine corridors: 10 stream km. Separation distance for other freshwater aquatic and wetland habitats: 3 km. Separation distance for upland habitat: 1 km. | 0.1 | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---|---------------------------|------------------|--------------------|--|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Asterocampa Butterflies | 2 | 10 | Not applicable | When multiple colonies occur in the same canyon or stream course, in general they should be considered a single metapopulation occurrence subject to the suitable habitat distance; similarly where hackberry trees occur in small patches on ridges such as in Connecticut. | 1 | This is problematic since all habitat is extremely likely to be occupied at least part of the year if not all the time. If an observation of <i>A. clyton</i> or <i>A. celtis</i> were made in a 1,000 hectare bottomland forest with hackberry throughout in the core of the range of the butterfly, there is almost no chance the occurrence would be less than 1,000 hectares. But more commonly, especially where a species might be of conservation concern, occurrences are localized in a small groves several kilometers from any other. In such cases there is no obvious basis for extending the occurrence beyond the grove where the butterflies were seen. In riparian or canyon situations it certainly seems reasonable to infer presence at least one kilometer up and downstream from the observation if the hackberries extend that far. |
| Beaked Whales | 50 | 50 | Not applicable | | | |
| Black Coral | | | Not applicable | | | |
| Bog, Fen, Marsh Lepidoptera | 1 | 5 | Not applicable | When a species is occurring patchily within a large wetland complex apply the suitable habitat distance, except across forest or open water or if the larval foodplant is really absent over at least half the suitable habitat distance across more open terrain. | 0.5 | Use 0.5 kilometer only over contiguous basically suitable habitat. This small distance is suggested here in consideration that some of these species may have very exacting habitat requirements and so may be less widespread than expected. In most cases habitats are a few dozen to a couple hundred hectares and inferred extent is simply the entire habitat. |
| Bonneted Bats | 5 | 5 | Not applicable | | | |
| Breeding Immigrant Lepidoptera | 5 | 20 | Not applicable | | 10 | The species is either present or it is not, and if it is all local habitats should be occupied to some extent during the season. |
| Bufonid Toads | 1 | 5 | Not applicable | | 0.5 | |
| Bullheads and Small Catfishes | 10 | 10 | Not applicable | | | |
| Caddisflies | 1 | 1 | Not applicable | | | |
| <i>Callophrys (Mitoura)</i> : Cedar Hairstreaks | 2 | 10 | Not applicable | In cases where the occurrence coincides well to a recognized natural community use the suitable habitat distance within the community including degraded or fragmented portions. On ridges or in canyons (or along rivers for <i>C. hesseli</i>) where multiple foodplant patches occur use the suitable habitat distance across sections where the foodplant cedar is sparse but not absent unless it is present only as shaded understory plants or unless gaps exceed half the suitable habitat separation distance. | 1 | This very low figure reflects mainly the fact that some of the taxa, most notably <i>C. hesseli</i> , often cannot be readily documented as occurring throughout the apparent contiguous habitat although some others such as <i>C. g. gryneus</i> usually do occupy the full patch. For <i>C. hesseli</i> and some other species male "lekking" areas can be very localized within the habitat. Probably females in fact do ultimately move more widely within habitats but for now this is not assumed. If the habitat is smaller than this consider the entire patch occupied. |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---|---------------------------|------------------|--------------------|--------------------------------|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| <i>Callophrys</i> in part (Green Hairstreaks, Elfins, etc.) | 2 | 10 | Not applicable | | 2 | This applies only in suitable habitats. The figure is arbitrary. In practice few habitats are that large, and in such cases inferred extent is the entire habitat. At least species such as <i>niphon</i> , <i>augustinus</i> , <i>polios</i> and <i>henrici</i> which often occupy large habitats usually occupy all available habitat where they occur. For these species occurrences in this range (ca. 1000 hectares) are not unusual, although all of them also have occurrences of only a few hectares. <i>C. irus</i> and probably <i>C. mossi</i> occur in smaller patches but these are usually clustered and typically nearly all occupied and some metapopulations of the former occupy more than 1000 hectares (at least in New Jersey and New York). Still there are sufficient unknowns that occurrence over a large area should not be assumed on the basis of one observation, |
| Cane Feeding Moths | 2 | 5 | Not applicable | | 0.5 | In most cases inferred extent is simply the entire immediate cane stand. However, some knowledge of the habitat needs of the species may be needed. For example some species are restricted to large unburned canes and others are not. Only suitable canes should be inferred as habitat. For large cane stand with most of these species it is not now possible to know if the stand is fully occupied, especially if age structure is heterogeneous or there have been fires. Some habitats can be very small. For example Schweitzer's colony of <i>Genus 3 species 2</i> in New Jersey produces around 200 adults per year yet occupies a bamboo patch within less than 50 square meters of ground. Another stand less than a kilometer away seems unoccupied and there is no native cane within several hundred kilometers. <i>Acrapex relictus</i> also can turn up in small cane stands of a few hectares or less. It seems not prudent to assume occupancy more than half a kilometer from an observation. |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|--|---------------------------|------------------|--------------------|---|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| <i>Catocala</i> Moths: most Rosaceae and Ericaceae feeders | 2 | 10 | Not applicable | These species often occur in well defined natural communities such as bogs, riparian forests, barrens or savannas on a generally wooded landscape. In such cases apply the suitable habitat distance across suboptimal wooded or brushy habitat if the larval foodplant is not completely absent over distances of > half the suitable habitat distance, except if the habitat is demonstrably unsuitable in some way for the adults. Females of this group do move around and both sexes rest in the woods even if the breeding habitat is open. | 2 | Habits for populations in suburban residential areas are hard to define, but otherwise the smallest habitat known to Schweitzer to have supported a fully contained occurrence of any of these species was about 1.0 square miles for <i>C. gracilis</i> in Pennsylvania. However habitat patches are often much smaller but clustered a few hundred meters or less apart in mostly wooded context obviously forming metapopulations. A few isolated bog occurrences, eg. in Ohio, might be smaller but the habitat in such cases includes the surrounding woods, not just the bog. When the habitat is under 1000 hectares assume full occupancy. Occurrences can be virtually undefinable in extensive forests that go for hundreds of kilometers in which the foodplant is sparsely scattered throughout—for example in northern New England with <i>C. c. crataegi</i> or <i>C. blandula</i> utilizing naturalized apple trees and <i>C. gracilis</i> and <i>C. andromedae</i> in many acid soil regions. So some arbitrary limit is need and 2 kilometers seems reasonable when data are lacking. However, if contiguous habitat is more extensive, in reality so is the occurrence for the <i>Catocala</i> . Anything smaller than 2km would be assuming a truly miniscule, if not insufficient, habitat for this group. Another consideration in recommending this relatively small distance is that usually one does not have good information on the extent of the foodplant, and often it is limited. |
| <i>Catocala</i> Moths: default North American Species | 4 | 20 | Not applicable | For forest species the suitable habitat distance generally applies in wooded or semiwooded (includes wooded residential) terrain if the larval foodplant is present at all. In large contiguous or nearly contiguous forests the unsuitable habitat distance would seldom apply since adults seem to be quite mobile and live several weeks at least and most larval foodplants are not highly localized (although they are often sparse). However, use half the suitable habitat distance for separating occurrences if the larval foodplant is truly absent within continuous forest. | 1 | Where the habitat is truly extensive and contiguous use this figure, although these moths can persist in smaller areas. It is known that many individuals move much farther and given populations of mobile long-lived adults, unbroken or moderately fragmented habitat within and beyond this distance is almost certain to support at least continued recurrence. If habitat (usually forest) patches are smaller than 1000 hectares, infer presence throughout. |
| <i>Catocala</i> Moths: Oak Scrub Species | 4 | 10 | Not applicable | When dealing with remnants of formerly large communities separated by degraded but largely undeveloped areas or within an obvious edaphic feature like a ridgetop or sand plain, it is generally appropriate to recognize a single metapopulation by using the suitable habitat distance if the foodplant oaks are not entirely absent. Suitable habitat distance may be used in partially developed areas that were part of the original large-scale habitat if gaps between foodplant patches do not exceed half the suitable | 1 | Available observation invariably suggests these species are either absent or occupy all available habitat and such habitats are often hundreds or thousands of hectares. In most cases then the inferred extent is simply all contiguous or nearly contiguous habitat up to 500 hectares or a radius of 2 km. One consideration is that especially in very hot climates there could be unknown but important limiting habitat features that make occurrences more localized than their habitats. |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---|---------------------------|------------------|--------------------|--|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | habitat distance. Pine barren moth Specs may be substituted eastward when occurrences are in such habitats. | | |
| <i>Catocala</i> Moths: Prairie Species | 2 | 5 | Not applicable | Multiple colonies within a large prairie remnant or savanna should be treated as a single metapopulation occurrence subject to the suitable habitat distance. | 3 | Normally occurrences will be in small habitat remnants of dozens to a few hundred hectares so the inferred extent is simply all suitable habitat up to 400 hectares. Like most Lepidoptera these moths apparently will generally occupy during some or all years most to all contiguous suitable habitat in an area where they occur, but it is unclear if there are habitat features other than just adequate foodplant. Given the higher than normal (for <i>Catocala</i>) chance of patches being vacant some years, uncertainty about recovery time after fires (presumed to be 1-3 seasons with partial burns; potentially never after complete burns), somewhat sporadic occurrence of these species and often small habitat patches, a low inferred extent is suggested. |
| <i>Catocala</i> Moths: Riparian or Canyon Species | 5 | 20 | Not applicable | <p>These are mostly long lived (one to three months as adults) and very mobile moths. Some of the species apparently aestivate to some extent and may go to high altitude or otherwise cooler habitats during this period. It is assumed they scatter in late summer when eggs are laid. Both figures are arbitrary.</p> <p>Use the 20 kilometer figure if two collections are in the same canyon or riparian complex and there are no gaps of more than 5 kilometers in the distribution of the foodplant and no barriers. Marginal sparsely wooded habitat with few (but some) foodplant is to be considered suitable in this context.</p> | 2 | Apply this only where habitat is extensive and largely contiguous in canyons or riparian situations. Otherwise in non-linear bottomlands habitats the inferred extent is all essentially contiguous suitable habitat up to 1000 hectares. Note that occurrences of these moths will generally be more or less linear and therefore the inferred extent cannot really be applied as a radius. Rather it is inferred in both directions along the riparian corridor or canyon unless the habitat does not extent that far. |
| <i>Catocala</i> Moths: Localized Oak Feeders | 4 | 10 | Not applicable | In generally wooded terrain unsuitable habitat distance applies mainly to cleared lands. In wooded or partially wooded landscapes use the suitable habitat distance unless the foodplant oaks are completely absent or there is some other factor rendering the habitat unsuitable for adults over a gap of at least half the suitable habitat distance. | 2 | For most species larger values would be appropriate, but for some such as <i>connubialis</i> and in some regions <i>sp.</i> 1 populations can be more localized than is easily explainable based on habitat. Still most occurrences are clearly several kilometers in at least one dimension. Inferred extent to be conservative is all apparent habitat within 2 kilometer radius. Almost always additional sampling should extend such boundaries. With forest remnants less than 100 hectares assume full occupancy. |
| Cavefishes | | | Not applicable | Each separate hydrological system constitutes a distinct occurrence. Use a separation distance of 3 km if habitat continuity is uncertain. | | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---------------------------------------|---------------------------|------------------|--------------------|--|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Celastrina Species (Azures) | 2 | 10 | Not applicable | Within continuous forest use the suitable habitat distance unless there are gaps with no foodplant of at least half the suitable habitat distance. | 1 | Some occurrences of <i>C. neglecta</i> , <i>ladon ladon</i> , <i>C. ladon lucia</i> , and in New Jersey also <i>idella</i> , can easily be observed to extend over several kilometers in at least one direction. At least in Schweitzer's experience, occurrences under 50-100 hectares are unusual but occurrences of 200-500 hectares are rather routine for these four taxa. However some arbitrary limit is needed in places where the habitat and foodplant are contiguous for large distances. This figure is recommended with large habitats until additional sampling establishes the correct (generally larger) extent. With smaller habitats (up to 400 hectares) assume full occupancy. |
| Characids | 10 | 10 | Not applicable | | | |
| Chestnut Feeding Microlepidoptera | 1 | 2 | Not applicable | | 1 | Usually habitat will be small and apparent based on larval signs or simply because there are only a few chestnuts available at the collection site. Consider the entire area containing chestnut to be occupied up to about 400 hectares. |
| Chipmunks | 1 | 5 | Not applicable | | 0.1 | Based on a home range of about 1 hectare (see Separation Justification section in group specifications record in Biotics). |
| Cichlids | 10 | 10 | Not applicable | | | |
| Cicindelidae: Beach and Seashore Taxa | 5 | 10 | Not applicable | It seems reasonable to consider island populations as separate from mainland ones if more than about two kilometers off-shore. | 0.1 | Inferred extent is extremely problematic for this group, and while this distance seems unrealistic there is usually no choice but to confine it to the immediate location pending further exploration. Note that virtually by definition of this Specs Group a radius cannot be used. The distance should be applied linearly Occurrences at least for <i>C. dorsalis</i> originally often extended for many kilometers. Now however, most potential suitable habitat is really unsuitable. For example nearly all (>>99%) seemingly suitable habitat for <i>C. dorsalis</i> in states like New York and New Jersey and much of it in the Carolinas is unsuitable due to vehicular use at some time of year (often winter in parks or refuges). Other taxa are less reduced but still often excluded by disturbances. It is likely biocide use (mosquito and biting fly control) sometimes eliminates back dune and swale species from so-called "protected" areas (such as state parks) close to recreational beaches--or worse makes these areas significant ecological sinks. Insecticides are noted as a threat to <i>C. severa</i> , a Gulf coast species by Graves and Pearson (1973). There are also natural unknowns and mappers/observers may not really understand the exact habitat needs. So if the inferred extent would matter, the only reasonable course of action is to do field work to |

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|--|---------------------------|------------------|--------------------|--|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | | | establish boundaries--ideally based on larvae as well as adults. |
| Cicindelidae: Eastern Sand Barren and Scrub Taxa | 4 | 10 | Not applicable | It is acceptable to slightly violate either separation distance in order to keep multiple colonies within a well defined isolated barrens or scrub community as once occurrence (especially if the community has been recently fragmented). However this should not be carried to extremes in the New Jersey Pine Barrens which are so large that multiple EOs seem reasonable or elsewhere (e.g., parts of Michigan and Wisconsin) if the general supporting sand barrens community is extensive. | 1 | Inferred extent is problematic since colonies tend to occur in many small patches in a community and patches may come and go. It is not certain that all patches in the area that seem suitable will be occupied although over time they probably all are. In fact though seemingly unoccupied patches may well be occupied on another day the same season. Adults might be distributed slightly differently than larvae and the latter are more important from a conservation perspective. Further seemingly suitable habitat patches may be in some way unsuitable, perhaps due to soil or microclimate differences or (at least in Florida mosquito spraying). Patch occupancy is somewhat variable for the Florida endemics. Obviously the patch where the collection was made will be assumed occupied and it seems safe to assume the same for any others in the same overall community or edaphic feature within a kilometer. Further exploration should be conducted to document occupancy farther away, even when it seems "obvious" the occurrence is large. In some cases the patch will be separated sufficiently that it alone is the inferred extent. |
| Cicindelidae: Flightless Species | 1 | 10 | Not applicable | With arid country taxa especially, but also others, it is reasonable to cluster all populations in an obvious landscape feature like a canyon or along a stream as one occurrence even if the separation distances are somewhat violated. Generally in such cases the suitable habitat distance applies. | 1 | While there are no data it seems very unlikely an occurrence would not extend at least a kilometer from an observation site if the habitat does. In few, if any cases, would a population consistently occupy much less than at least all contiguous habitat. However, never use Inferred Extent to extend an occurrence beyond the extent of normal habitat. |
| Cicindelidae: Generalized Sand Inhabiting Taxa | 2 | 10 | Not applicable | In generally wooded areas on sandy soils consider it one occurrence when there are scattered colonies in disturbed areas that are more or less connected by sand roads. While the sand roads may or may not provide suitable breeding habitat they certainly are often used by adults of species such as <i>C. tranquebarica</i> , <i>scutellaris</i> and less often <i>formosa</i> . | | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---|---------------------------|------------------|--------------------|---|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Cicindelidae: Generic Specs for Western Taxa | 4 | 10 | Not applicable | For taxa characteristic of specific and known edaphic conditions such as alkali flats, a mesa, limestone outcrops etc. all colonies in a given edaphic system should generally be considered one metapopulation occurrence. If the edaphic feature is well isolated the suitable habitat separation distance may be somewhat exceeded to keep the more distant colonies within the larger occurrence. | 0.5 | Inferred extent is problematic and hard to predict and probably would vary by species or more so by habitat. At minimum the entire habitat patch where the observation was made up to half a kilometer, other patches a few kilometers away probably should not be without more field work or expert input although they are unlikely to be vacant if they are suitable. |
| Cicindelidae: Outcrop and Woodland Opening Taxa | 5 | 10 | Not applicable | | 1 | This is problematic but it would be very unlikely other suitable patches within a kilometer would be unoccupied. If the occurrence seems isolated such as in a gravel pit inferred extent is only the immediate habitat (e.g., the sides of the pit). Given that potential habitat is often more or less linear it probably will not be warranted to apply this distance as a radius. |
| Cicindelidae: Riparian Taxa | 5 | 10 | Not applicable | | 0.5 | Inferred extent is extremely problematic, and while this seems unrealistic there is usually no choice but to confine it to the immediate location pending further exploration. It does seem reasonable that if the observer notes very similar habitat within half a kilometer up or down stream that it be included. Occurrences of most or all taxa originally often, if not always, extended for many kilometers and adults are good fliers. Now however, much potential suitable habitat is really unsuitable due to factors such as flood control practices ORV use, heavy trampling by people or livestock. There are also natural unknowns and mappers/observers may not really understand the exact habitat needs. So if the inferred extent would matter, the only reasonable course of action is to do field work to establish boundaries--ideally based on larvae as well as adults. |
| Cicindelidae: Salt Marsh and Estuarine Taxa | 5 | 10 | Not applicable | Island occurrences may be considered separate if at least two kilometers from any mainland ones. | 1 | These species should occupy substantial areas if the habitat does--which is the normal situation. Any contiguous habitat as close as 1 kilometer can certainly be considered as occupied or potentially so (e.g., if currently excluded by biocide use). On the east coast where salt marshes are still extensive this figure is unrealistically low but is suggested pending better information. However consider whether mosquito control practices could be excluding the species. This could be a concern if there is frequent adulticiding except for low doses of Malathion. |
| Colonial Seabirds | 5 | 5 | Breeding | Where colonies are closer than 5 kilometers, separate occurrences may be created if research shows little genetic mixing between colonies. | 2 | Somewhat arbitrary, but generally very conservative for this group, many members of which travel long distances to foraging grounds. |
| Colonial Seabirds | 10 | 10 | Nonbreeding | | | |
| Colonial Wading Birds | 5 | 10 | Breeding | | 3 | Based on foraging ranges from breeding rookeries. |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---|---------------------------|------------------|--------------------|--|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Colonial Wading Birds | 10 | 10 | Nonbreeding | | | |
| Coots and Moorhens | 5 | 10 | Breeding | | | |
| Coots and Moorhens | 5 | 10 | Nonbreeding | | | |
| Cormorants | 5 | 10 | Breeding | | 5 | Somewhat arbitrary, but well within foraging distances of this group. Not applicable for colonies that are distinctly separate from foraging grounds. |
| Cormorants | 10 | 10 | Nonbreeding | Roost and loafing sites associated with specific foraging concentration areas should be included with the foraging occurrence, even if they are separated by more than the nominal separation distance. | | |
| Cottontail Rabbits | 2 | 10 | Not applicable | | 0.2 | Based on an average home range size of about 3.5 hectares (Fitch 1947, Trent and Rongstad 1974, Althoff and Storm 1989). |
| <i>Crambidia. Cisthene</i> , Most Other Lithosiinae | 2 | 5 | Not applicable | If the occurrence seems to be linked to a specific type of woodland, consider all collections within this woodland as one occurrence regardless of distance. | 0.5 | Given that it will seldom be possible to really define the local habitat and probably never possible to know the larval foodplant, and that some occurrences seem to be small it seems best to use a very conservative IE with this group. In most cases additional sampling will reveal a much larger occurrence but this cannot be assumed. |
| Crayfishes | 2 | 2 | Not applicable | Freshwater cave (troglobitic) species may occur from near entrances to very deep in cave systems. For cave species, each cave where an observation or collection was recorded (see Minimum EO Criteria in group EO specifications record in Biotics) constitutes an element occurrence regardless of separation distance unless caves are part of a single hydrological system (see below). Occurrences are additionally separated by underground physical barriers to movement. Multiple caves within a single hydrological cave system are considered to be a single element occurrence when they are less than one kilometer apart. Multiple caves within a single hydrological cave system are considered separate element occurrences when hydrological connections have not been determined or when separated by a distance of at least one kilometer. | | |
| Crotaphytid Lizards | 1 | 5 | Not applicable | | 0.2 | |
| Cuckoos and Anis | 5 | 5 | Breeding | | | |
| Cuckoos and Anis | 5 | 5 | Not applicable | | | |
| Cypress or Cedar Associated Geometridae | 2 | 10 | Not applicable | | 2 | Most suitable habitats are small (a few hundred hectares or less) and so Inferred extent is simply the entire swamp or other habitat. For extensive swamps these species are likely or virtually certain to occur throughout but in the absence of information this radius is arbitrarily suggested. Obviously this distance is to be used only over suitable or marginal habitat with no gaps more than 2 kilometers. |

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|--|---------------------------|------------------|--------------------|--------------------------------|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | | | Note also that cedar and cypress swamps are often riparian and therefore more or less linear so this figure would not really be a radius. As noted above some occurrences are actually known to extend more than twice this distance. |
| Dabbling Ducks | 10 | 10 | Breeding | | 1.6 | Diameter of average home range of Mallards (Gilmer et al. 1975). |
| Dabbling Ducks | 10 | 10 | Migratory stopover | | | |
| Dabbling Ducks | 10 | 10 | Nonbreeding | | | |
| Darters | 10 | 10 | Not applicable | | | |
| <i>Dasychira</i> | 2 | 10 | Not applicable | | 2 | For the forest and woodland species habitats are normally large (thousands of hectares or greater). These moths seldom are confined to small habitats and few occurrences are under 100 hectares and most are well over 1000. However at least <i>D. cinnamomea</i> apparently can persist in under 100 hectares, although it is possible such bog and fen "occurrences" are merely demes in metapopulations or that they extend substantially into adjacent forests. <i>D. pinicola</i> and <i>D. obliquata</i> in southern New Jersey appear to be ubiquitous over more than 500,000 hectares of virtually contiguous Pinelands and some occurrences of <i>D. manto</i> are probably larger than that. Obviously presence should be inferred only over contiguous or nearly contiguous high quality habitat, but for most species a 2 km radius defines a small to moderate habitat. |
| Default Noctuid Moths | 2 | 10 | Not applicable | | 1 | In practice for species in this group the inferred extent is usually all contiguous or nearly contiguous habitat which will usually be a few tens to hundreds of hectares. Occurrences are always based on populations which will at least over time occupy available habitat and generally will in any given year. However some arbitrary upper limit is needed with species that typically occupy large habitats. Therefore it is suggested that with really large habitats (usually forests, woodland, brushland) IE be capped at 1 km radius. The resulting 400 hectare area would be a fairly small occurrence for most forest or woodland species. Presence should be inferred only in suitable habitat within this radius. |
| Dicamptodontid (Pacific Giant) Salamanders | 1 | 5 | Not applicable | | 0.5 | |
| Diving Ducks and Sea Ducks | 10 | 10 | Breeding | | | |
| Diving Ducks and Sea Ducks | 10 | 10 | Migratory stopover | | | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---|---------------------------|------------------|--------------------|---|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Diving Ducks and Sea Ducks | 10 | 10 | Nonbreeding | | | |
| Dolphins and Porpoises | 20 | 20 | Not applicable | | | |
| <i>Erebia</i> Butterflies | 2 | 4 | Not applicable | For the most part, forests, but not open woodlands, should be considered barriers, and populations separated by as little as a kilometer of forest should be considered separate occurrences. For bog occurrences consider applying the suitable habitat | 0.5 | In many or most cases this distance is moot because habitats are only a few hectare to hundreds of hectares and inferred extent is the entire habitat. However where these butterflies are occurring in large landscape features this radius is suggested pending better information. A smaller than usual distance (for Lepidoptera) is chosen in consideration that these butterflies are often quite local, are weak fliers, and the observer and /or mapper may not have good idea of exactly what the habitat is. Obviously if observations indicate a larger extent, use it. |
| <i>Euphyes</i> , <i>Poanes</i> , Other Wetland Skippers | 2 | 5 | Not applicable | Within a wetland complex consider multiple colonies as one metapopulation by using the suitable habitat distance. | 1 | The inferred extent is nearly always at least the entire contiguous habitat/foodplant patch since these are usually only a few dozens of hectares at most. Colonies can persist at least decades in under a hectare of really good habitat. If the habitat is really several kilometers in extent it will usually be fully occupied (apparently nearly always so for the better known species) but cap inferred extent at this distance pending further observation. |
| Fishes with Anadromous Populations | | | Freshwater | For anadromous populations and migratory populations that have distinct and separate spawning and nonspawning areas, the area used by each population whose spawning area is separated by a gap of at least 10 stream-km from other spawning areas within a str | | |
| Flying Squirrels | 1 | 5 | Not applicable | | 0.3 | Based on a home range of 7 hectares. |
| Forest and Woodland Geometridae | 2 | 10 | Not applicable | | 2 | This figure is arbitrary but a circle of two kilometers radius would define a habitat clearly smaller than most, but well above the smallest ones. It is probably unrealistically low in extensively forested areas. This figure should not be used however if forests are reduced to small woodlots and the landscape is more than 50% agricultural or otherwise essentially devoid of native tree cover. In such cases the inferred extent is simply the woodlot in which the collection was made. In general with habitats under 1000 hectares assume full occupancy. |
| Forest and Woodland Hairstreaks | 2 | 10 | Not applicable | On islands it may be reasonable to consider all colonies as one metapopulation even if these distances are exceeded somewhat. | 1 | This applies only in extensive essentially contiguous habitats such as often in extensive eastern forest areas. If the habitat patch is smaller and there are no others within a kilometer the inferred extent is that patch. Note that many taxa feed on the dominant or co-dominant vegetation of the canopy or shrub layer and larvae and adults occur widely in such habitats. Many occupied habitats are several thousand hectares and 5-10 km or more in at least one dimension. Still since some of the |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---------------------------------------|---------------------------|------------------|--------------------|--|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | | | species (e.g., <i>kingi</i> , <i>liparops strgosum</i> , probably <i>caryaevorum</i>) appear to be more local than their foodplants these butterflies should not be inferred present over long distances. A circle of radius 1 km defines an area of about 400 hectares which is well within the range of occurrences where the habitats are large. |
| Forest or Woodland Nymphalidae | 5 | 20 | Not applicable | If an EO is on an island such as one of the Florida Keys it is reasonable to consider each island as a separate occurrence regardless of distance and even if some movement between islands occurs. Consult habitat and foodplant comments fields for species-specific information on what constitutes suitable habitat when mapping occurrences for individual species. For regularly recurring "populations" and probably in some other cases for several of these species the Specs for breeding Immigrant Lepidoptera may be substituted. | 2 | Use either 2 kilometers or the full extent of contiguous or nearly contiguous available habitat, whichever is less. These are not butterflies of small habitats. Obviously many occurrences are much greater than the roughly 1000 kilometers here defined and/or the potentially persistent occurrences is a cluster of numerous small habitats. Where these butterflies occupy vast expanses of habitat they are often landscape level species with undefinable occurrences. |
| Forest, Woodland, and Scrub Noctuidae | 4 | 20 | Not applicable | If the habitat is occurring patchily within an extensive overall wooded landscape consider all patches within half the suitable habitat separation distance of at least one other as one metapopulation occurrence. However apply the unsuitable habitat distance across cleared lands. | 2 | Inferred extent, for example based on one specimens in a light trap, is all suitable habitat within two kilometers of the collection point. If the habitat is more extensive than that there is almost no chance the resulting 1000 hectare circle will close to contain the entire occurrence. However when data are minimal conservative assumptions are warranted. |
| Freshwater Mussels | 2 | 10 | Not applicable | | | |
| Freshwater Sculpins | 10 | 10 | Not applicable | | | |
| Freshwater Snails | 2 | 2 | Not applicable | Freshwater cave species (mostly prosobranchs) may occur near entrances to very deep in cave systems with specimens occurring on the undersides of small stones in riffle areas (Hershler et al., 1990). For cave species, separation distance cannot often be | | |
| Gars | 10 | 10 | Not applicable | | | |
| Geckos | 1 | 5 | Not applicable | | 0.2 | |
| Grebes | 5 | 10 | Breeding | | 0.1 | Based on conservative home ranges of Red-necked and Pied-billed Grebes. |
| Grebes | 5 | 10 | Nonbreeding | | | |
| Ground Squirrels | 1 | 5 | Not applicable | | | |
| Grouse and Ptarmigan | 5 | 15 | Not applicable | | | |
| Gulls and Terns | 5 | 5 | Breeding | | | |
| Gulls and Terns | 5 | 5 | Migratory stopover | | | |
| Gulls and Terns | 5 | 5 | Nonbreeding | | | |
| Hawks and Falcons | 10 | 10 | Breeding | | 3 | Foraging range variable; 3 kilometers is the mean |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|--|---------------------------|------------------|--------------------|---|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | | | diameter in several species. |
| Hawks and Falcons | 10 | 10 | Nonbreeding | | | |
| Heathland Lepidoptera | 2 | 10 | Not applicable | Size of occurrences and intervening landscape may be appropriate considerations in assigning separation distances--at least with moths. With small discrete habitats Specs for bo Lepidoptera can be used instead. Almost certainly when occurrences are confi | 2 | In most cases habitats are small and inferred extent is simply the entire habitat up to 400 hectares. However in areas such as Nova Scotia, Massachusetts, Michigan and New Jersey heathland habitats (often actually pine barrens) can be thousands of hectares (more in New Jersey) so 2 kilometers seems a very conservative figure within large habitats. |
| <i>Hemileuca</i> in part: Oak Feeding Taxa | 4 | 20 | Not applicable | Do not use the unsuitable habitat distance within remnants of a degraded pine barren or other scrub community. Atr minimum consider twice that distance and the suitable habitat distance seems more appropriate if any scraps of the local foodplant/habitat | 2 | these moths occupy substantial habitats and while they are often patchily more or less abundant within them from year to year, patches are generally permanently occupied (by dormant pupae should local eradication of an egg or larval cohort occur). For <i>H. maia</i> two occurrences near Enfield Connecticut and in Chester County, Pennsylvania are known to be less 400 hectare (the area defined by radius 1 km) but the former was recently larger and probably is doomed and the latter may be part of a metapopulation. No case is known where a population fails to occupy at least 1000 hectares(roughly radius 1.8 km) if the habitat is that large. Do not infer presence in unsuitable habitat based on botanically derived community definitions or maps if the species is known to be more specific. For example pine barrens populations may not occupy the more shaded portions. For now it is assumed that more western taxa also occur fairly widely in extensive oak scrub or woodlands. |
| <i>Hemileuca</i> in part: Wetland Taxa | 2 | 10 | Not applicable | When connected by obvious linear dispersal corridors leading directly between habitats, such as shrubby riverbanks or powerlines, use 5 kilometers. This is based on the fact that buckmoth females (<i>H. lucina</i> and <i>maia</i> at least) commonly move more than a kilometer--in fact most <i>H. lucina</i> females from high density populations probably do. Movements up to at least 4 km have been actually documented (Schweitzer, unpublished) and may be common in some circumstances. | 0.5 | In virtually all circumstances the IE is the full extent of contiguous or nearly contiguous habitat in the area and usually this will be a few hectares to a few hundred hectares. However, if the habitat does extend for several kilometers it is suggested IE be arbitrarily capped at 0.5 radius pending additional field work. In part this reflects the fact that suitable habitat can be difficult to define unless one is experienced with the taxon in that region. Also habitats are not often more than 100 hectares. |
| Herminiinae and Other Small Deltoid Noctuids | 2 | 10 | Not applicable | | 1 | In some cases habitats for species likely to be tracked will be only a few hectares or hundreds of hectares and the inferred extent then is simply all available habitat up to 400 hectares. Woodland and forest species are usually contiguously (or possibly patchily) distributed over hundreds of hectares. However, this is not always so, or more likely there may be unapparent but important habitat features. It is suggested that with only one collection site IE be capped at 1 km across seemingly |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|------------------------------------|---------------------------|------------------|--------------------|--|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | | | suitable habitat pending more sampling. The resulting circle of about 400 hectares would define a small, but plausible occurrence area for forest or woodland <i>Herminiinae</i> . Also note that if the habitat is clearly only a few hectares map it as such but an attempt has been made to place species likely to actually occur in such tiny habitats in other Specifications Groups. |
| Hesperinae | 4 | 10 | Not applicable | When multiple occupied habitats occur within a large community complex or remnants of one such as patchily within a barren, savanna, or prairie remnant use the suitable habitat distance. When occurrences in a region are all small (under 10 hectares) and are widely scattered and there is some actual evidence of persistent patch vacancy, a separation distance of one kilometer may be used instead of two. | 1 | In most cases the inferred extent is simply all contiguous or nearly contiguous habitat and usually this will be a few to a few hundred hectares which for almost all species is likely to be fully occupied even if at uneven densities. Use this distance only where the habitat is that extensive, but generally if the taxon is present any habitat patches within a kilometer will be occupied unless the species is excluded for example by extremely high fire frequencies or complete burns or lack of nectar. This figure is based in part on observations for <i>Atrytone arogos arogos</i> in New Jersey where it occurs in clusters of patches up to about a kilometer apart with within cluster patch occupancy nearly 100%, except approaching zero where fire intervals are about two years or less. This is one of the most imperiled skippers in North America and it is highly likely most other taxa are at least as effective colonizers. Another consideration in inferring any extent is that often the exact habitat is not clear and since it cannot be defined on the basis of any particular grass species there may be some doubt. One should not infer across any large distance based on one observation but if the habitat extends that far, a kilometer seems safe and most species can cover that distance in a few tens of seconds. |
| <i>Holomelina</i> , Localized Taxa | 1 | 5 | Not applicable | | 1 | In many cases the habitat patch will be small and discrete and such patch is the obvious inferred extent. Use this distance linearly on rights of way and as a radius where the exact habitat is unclear but apparently extensive. See mapping guidance documentation at: http://www.natureserve.org/prodServices/pdf/EO_Specs_Separation_Distance_and_Mapping_Guidelines_for_Animals.pdf . |
| Hummingbirds | 5 | 5 | Breeding | | 0.1 | |
| Hummingbirds | 5 | 5 | Nonbreeding | | 0.1 | |
| Hydrocoral | | | Not applicable | | | |
| Hylid Frogs (Treefrogs) | 1 | 5 | Not applicable | | 0.5 | Inferred extent distance pertains to distance from breeding sites. |
| Iguanas | 1 | 5 | Not applicable | | 1 | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|-------------------------------------|---------------------------|------------------|--------------------|--|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Jackrabbits and Hares | 2 | 10 | Not applicable | | 0.6 | Based on a modest home range size of 30 hectares (see Separation Justification section in group specifications record in Biotics). |
| Jumping Mice | 1 | 5 | Not applicable | | 0.1 | Based on a typical home range of about 0.3 hectares (see Separation Justification section in group specifications record in Biotics). |
| Kangaroo Rats and Allies | 1 | 5 | Not applicable | | 0.1 | Based on a home range of 0.33 hectares, the smaller end of the average scale for most heteromyids (see Separation Justification section in group specifications record in Biotics). Note that some species have smaller known home ranges: e.g., 0.04 to 0.16 hectares in <i>Dipodomys stephensi</i> (Bleich 1977), and 0.12 to 0.24 hectares in <i>Chaetodipus baileyi</i> and 0.1 to 0.2 hectares in <i>C. penicillatus</i> (Reynolds and Haskell 1949). |
| Killifishes (Cyprinodontids) | | | Not applicable | Each spring system that is undivided by a barrier constitutes a single distinct occurrence. Otherwise, use a separation distance of 10 km for any type of aquatic habitat. | | |
| Kingfishers | 10 | 10 | Breeding | | 0.8 | Based on an average lakeside territory of Belted Kingfisher (Salyer and Lagler 1946). |
| Lacertid Lizards | 1 | 5 | Not applicable | | 0.2 | |
| Landscape Level <i>Sphinx</i> Moths | 10 | 20 | Not applicable | Where EOs occupy islands in the ocean (e.g., off the coast of New England, USA; Hawaii) separate islands would generally be considered separate EOs if they are more than 1 kilometer from each other or from the mainland. | 5 | IE is really moot for such often low density landscape level moths that can easily move a kilometer in less than a minute. In the relatively few cases where edaphic or obvious habitat features clearly define the habitat one could reasonably consider any such patches within up to ten kilometers as part of the known EO but since this figure is probably impractical for an IE of all foodplant patches within two kilometers is arbitrarily suggested. Note USFWS designated critical habitat patches for <i>Manduca blackburni</i> up to 15,216 hectares and none under 100 hectares. Obviously functional occurrences for many continental species would be much larger. A conservative suggestion for inferred extent for a landscape level sphinx moth really would be all suitable habitat within a 5 km radius, but that may be impractical and many occurrences are much larger. |
| Large Catfishes | | | Not applicable | In general, each occupied river segment that is undivided by a barrier should be treated as a single distinct occurrence, regardless of the distance between observation/collection sites. A single occurrence may include multiple tributaries. | | |
| Large Cyprinids | 20 | 20 | Not applicable | | | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---------------------------|---------------------------|------------------|--------------------|---|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Large Doves | 10 | 10 | Breeding | | 0.4 | Based on small home ranges of the relatively sedentary (in Texas) White-tipped Dove (Boydston and de Young 1988); longer movements of other species may represent commuting trips that are not well-suited to the application of Inferred Extent. |
| Large Doves | 10 | 10 | Nonbreeding | | | |
| Large Owls | 10 | 10 | Breeding | | 1.5 | Based on a conservatively small home range of just under 200 hectares (see Separation Justification section in group specifications record in Biotics). |
| Large Owls | 10 | 10 | Nonbreeding | | 1.5 | Based on a conservatively small home range of just under 200 hectares (see Separation Justification section in group specifications record in Biotics in Breeding Class). |
| Large Saturniidae | 4 | 20 | Not applicable | Many of the species seem to occur mainly in unstable populations in successional or roadside areas in some parts of their range. <i>C. promethea</i> can be very unstable near the northern limits of its range (Tuskees et al., 1996; also personal observations of | 1 | Inferred is extent should really be all available habitat if the species is present at all. These moths can seldom maintain themselves in small areas and will utilize most patches to some extent in some years. One kilometer is merely a low, but practical suggested limit for use in extensive suitable habitat. A circle of this radius defines an area of about 400 hectares which does appear to approximate some of the smaller persistent occurrences for several species in southeastern Pennsylvania (Schweitzer). |
| Large Suckers | 20 | 20 | Not applicable | | | |
| Leptodactylid Frogs | 1 | 5 | Not applicable | | 0.5 | |
| Livebearers (Poeciliids) | | | Not applicable | Each spring system that is undivided by a barrier constitutes a single distinct occurrence. Otherwise, use a separation distance of 10 km for any type of aquatic habitat. | | |
| Loons | 10 | 10 | Breeding | | 1 | Home range sizes generally not available. This distance based conservatively on a breeding territory size of 80 hectares; i.e., does not include foraging lakes or salt water separate from nesting lake. |
| Loons | 10 | 10 | Nonbreeding | | | |
| <i>Lycaena</i> (Coppers) | 2 | 4 | Not applicable | For most species suitable habitats are not often large so the four kilometer figure would seldom apply. Apply the 4 km distance in extensive wetland complexes, considering all colonies as part of a single metapopulation occurrence. The four kilometer limit should probably apply in a few other situations where a large geologic feature or community complex contains multiple habitat patches, especially if the foodplant occurs at least occasionally between the main colony sites. It is also very likely (observed occasionally for <i>L. epixanthe</i> in New Jersey and nearly certain for <i>L. dorcias</i>) that adults move along sunny stream banks, especially if the foodplant occurs in limited amounts | 0.5 | Inferred extent is very rarely applicable since most colonies are tiny and the sites obviously fully occupied and only the patch where the observation was made is assumed occupied. However when habitat complexes are truly large, e.g., some northern peatlands with metapopulations of <i>L. epixanthe</i> and <i>L. dorcias</i> , it would be unreasonable not to assume very nearby patches are occupied and in such cases usually either all or none of them are. Still apparently more so than most butterflies coppers do sometimes fail to occupy or persist in seemingly suitable proximate habitats, and colonies can be very localized. If the actual foodplant patch itself extends continuously for more than .5 kilometer presence |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|----------------------------------|---------------------------|------------------|--------------------|--|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | along them. Thus in most cases the 4 km distance is probably appropriate when wetlands or riparian habitats are connected by streams in fairly open landscapes. | | may be inferred throughout it. In most cases foodplants are patchier than that. |
| Lycaenidae in part: Most Blues | 2 | 10 | Not applicable | When multiple colonies occur in the same edaphic feature or community, e.g., in a canyon, along a stream, or in large pine barrens or oak savannas, all such colonies separated from the nearest neighbor by less than 10 kilometers should be treated as a single metapopulation occurrence. Often the overall community or feature can be used to define boundaries. | 1 | Usually the inferred extent will simply be all contiguous or closely proximate habitat and most patches are a few hundred hectares or much less. However, when the habitat is extensive it should generally be considered occupied--as with most Lepidoptera. Still since these butterflies can be local and what the observer thinks is suitable may in fact not all be, a maximum radius of km is suggested when dealing with limited information. This radius is applied only to suitable habitat. |
| Madtoms | 10 | 10 | Not applicable | | | |
| Map Turtles (<i>Graptemys</i>) | 1 | 20 | Not applicable | | 2 | |
| Marmots | 5 | 5 | Not applicable | | 0.1 | Based on a home range of 1 hectare. |
| Mayflies | 3 | 3 | Not applicable | | | |
| Medium and Large Colubrid Snakes | 1 | 5 | Not applicable | | 0.5 | |
| Medium Cyprinids | 15 | 15 | Not applicable | | | |
| Medium Suckers | 15 | 15 | Not applicable | | | |
| Megathymidae | 2 | 10 | Not applicable | Generally use the suitable habitat distance within a canyon or other feature unless the foodplant is really absent in which case substitute twice the unsuitable habitat distance. | 1 | If the habitat is smaller then assume it is fully occupied but given the lack of good data it seems inappropriate to infer extent more than a kilometer from an observation point regardless of habitat size. Since a circle of radius 1 km is about 400 hectares this IE would approximate a fairly small occurrence. Occurrences may not be as large as the extent of the foodplants. Megathymid populations may also be limited by edaphic, microclimate, size and condition of the foodplants factors among other factors. Habitats are usually hundreds or thousands of hectares, but (at least for <i>M. yuccae</i> eastward) can be smaller. |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|--|---------------------------|------------------|--------------------|--|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Migratory Butterflies and Skippers | 2 | 2 | Not applicable | Since EOs for these species are totally arbitrary and rather irrelevant to their conservation, one could really use any convenient method for defining them. Two kilometers seems like a convenient distance. However since decisions about separation should have few consequences, really any convenient separation distance is justified. Maximum individual movement distances for most or all of these species substantially exceed 1000 km, although some like the common buckeye sometimes form sedentary colonies for the summer. | | |
| Moles | 1 | 3 | Not applicable | | | |
| Mud Turtles (<i>Kinosternon</i>) | | | Not applicable | Separation distance along riverine corridors or continuous aquatic/wetlands habitats: 10 km. Separation distance for upland habitat: 3 km. Use intermediate values for intermediate circumstances. | 1 | |
| Musk Turtles (<i>Sternotherus</i>) | | | Not applicable | Separation distance along riverine corridors: 10 stream km. Separation distance for other freshwater aquatic and wetland habitats: 5 km. Separation distance for upland habitat: 1 km. Use intermediate values for intermediate circumstances. | 0.2 | |
| Narrowmouth Toads (<i>Microhylids</i>) | 1 | 5 | Not applicable | | 0.5 | |
| Night Lizards (<i>Xantusiids</i>) | 1 | 3 | Not applicable | | 0.1 | |
| Nightjars | 5 | 5 | Breeding | | 0.2 | No information on breeding home range. Based conservatively on male Buff-collared Nightjar territories and reported Whip-poor-will densities (see Separation Justification section in group specifications record in Biotics). |
| Nonanadromous Lampreys | 10 | 10 | Not applicable | | | |
| Nonanadromous Salmonids | | | Not applicable | Separation distance is 10 stream-km for both suitable and unsuitable habitat. However, if it is known that the same population occupies sites separated by more than 10 km (e.g., this may be common for migratory populations), those sites should be included within the same occurrence. In lakes, occurrences include all suitable habitat that is presumed to be occupied (based on expert judgment), even if documented collection/observation points are more than 10 km apart. Separate sub-occurrences or source features may usefully document locations of critical spawning areas within a lake. | | |
| Nonanadromous Smelts | 10 | 10 | Not applicable | | | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---------------------------|---------------------------|------------------|--------------------|---|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Nonanadromous Sturgeons | | | Not applicable | Generally each river or lake should be treated as a different occurrence, unless information on movements indicates otherwise, in which case an occurrence may encompass multiple lakes or rivers. For the largest bodies of water, use a separation distance of 200 km (measured in aquatic habitat, not over land) for both suitable and unsuitable habitat, but be careful not to separate a population's spawning and nonspawning habitats as different occurrences (i.e., do not use the 200-km separation distance without accounting for seasonal migrations, if any). Also, a smaller separation distance can be used if adequate study (radiotelemetry or recapture data) indicates that occupied locations separated by less than 200 km are not part of a single population. | | |
| Notodontidae | 2 | 10 | Not applicable | When multiple habitat patches occur in a large community complex such as a barrens or savanna or in a landscape feature like a ridgeline or canyon, regard all as one metapopulation. | 2 | Most Notodontidae are widespread woodland or forest moths and typically they are not localized within such places unless the foodplant is. For species where there is some understanding of what actually is suitable habitat, few if any, observations suggest consistent partial occupancy but as noted some do require certain vegetation features (often sparsely wooded to open scrub of some sort) in addition to foodplant. Notodontids seem to reliably occupy all available habitat where they are present at all, although they may of course be temporarily absent from patches within larger habitats (especially <i>datana</i>). This radius is certainly unrealistically low for most species in large expanses of habitat but some limit is needed. If the habitat does not appear to be a large scale forest or woodland type, do not use this radius. For example some <i>datana</i> and a few others do sometimes occur in small habitats, but in such cases these should be obvious based on the foodplant. |
| Octocoral | | | Not applicable | | | |
| <i>Oeneis</i> Butterflies | 2 | 10 | Not applicable | These Specs are meant mainly for regions where <i>Oeneis</i> occur, or recently did occur, widely for example in the Rockies, northern prairies, and arctic and subarctic. Some of these species also occur in small apparently relict colonies southward which proba | 1 | With small habitats (up to 400 hectares) simply map the entire habitat as an occurrence. However larger apparent habitats are more problematic. While extensive tundra habitats will probably be well occupied and the occurrence may well extend several to tens of kilometers for some species. However in practice there may be difficulty in assessing just what is really suitable habitat. Therefore it is suggested that when observations are limited, occurrence not be inferred to be more than all apparently suitable habitat within a kilometer even though this may seem excessively conservative in some situations. |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|-------------------------------------|---------------------------|------------------|--------------------|--|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| <i>Papaipema</i> and Related Borers | 2 | 5 | Not applicable | In general when multiple colonies occur in a distinct natural community occurrence, such as a prairie remnant or wetland complex, they should usually be regarded as one metapopulation occurrence and so the suitable habitat distance should be used within the | 1 | Use this radius only with virtually contiguous habitats with the foodplants widespread. Some known occurrences for <i>P. pterisii</i> , <i>P. sp. 1</i> , <i>Spartiniphaga carterae</i> are several square kilometers. In by far most cases the inferred extent is the entire contiguous habitat which will usually be a few hundred hectares or less and if the habitat is under 400 hectares assume full occupancy (at least over time if not every year). Note also for riparian habitats this distance is not really a radius but more of a linear distance. |
| <i>Parnassius</i> Butterflies | 2 | 10 | Not applicable | Populations confined to high altitude peaks will probably be isolated and should be treated as separate occurrences regardless of distance. Such high altitude populations are not as vagile as lower ones even of the same species and are often darker in color as noted by several authors such as Layberry et al. (1998). European butterfly collectors named many of these mountain top populations as subspecies and apparently collected a few of them to extinction. | 1 | In general the inferred extent should be all available habitat up to about 400 hectares. However with really extensive suitable looking habitat it seems unwarranted to infer extensive occupancy based on minimal information unless the taxon is well known locally to normally occupy larger areas. |
| Passerines | 5 | 5 | Breeding | | | |
| Passerines | 5 | 5 | Migratory stopover | | | |
| Passerines | 5 | 5 | Nonbreeding | | | |
| Passerines | 5 | 5 | Not applicable | | | |
| Phrynosomatid Lizards | 1 | 5 | Not applicable | | 0.2 | |
| Phyllopodous Brachiopods | 1 | 1 | Not applicable | Freshwater cave (troglobitic) species may occur from near entrances to very deep in cave systems. For cave species, each cave where an observation or collection was recorded (see Minimum EO Criteria in group EO specifications record in Biotics) constitutes an element occurrence regardless of separation distance unless caves are part of a single hydrological system (see below). Occurrences are additionally separated by underground physical barriers to movement. Multiple caves within a single hydrological cave system are considered to be a single element occurrence when they are less than one kilometer apart. Multiple caves within a single hydrological cave system are considered separate element occurrences when hydrological connections have not been determined or when separated by a distance of at least one kilometer. | | |
| Phyllostomid Bats | 5 | 5 | Bachelor colony | | 10 | IE distance is based on the foraging range of <i>Macrotus californicus</i> (Brown, in Wilson and Ruff 1999). Mean flight distance of <i>Leptonycteris curasoae</i> to foraging area is farther (USFWS 1995). |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---------------------------|---------------------------|------------------|--------------------|---|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Phyllostomid Bats | 5 | 5 | Maternity colony | | 10 | Foraging range of <i>Macrotus californicus</i> (Brown, in Wilson and Ruff 1999). Mean flight distance of <i>Leptonycteris curasoae</i> to foraging area is slightly farther, 14 kilometers (USFWS 1995). |
| Phyllostomid Bats | 5 | 5 | Nonbreeding | | | |
| Pieridae, General | 4 | 10 | Not applicable | When dealing with multiple occurrences within the same large scale natural community such as <i>Colias interior</i> in openings in a large barrens complex, consider the occurrence a metapopulation and apply the suitable habitat distance. Also both distances may be lowered in very cold environments where sustained flight is almost always impossible except in highly sheltered warm microclimates. However do this very conservatively for suitable habitat distance since. | 1 | In practice most occurrences will occupy a few hundred hectares or less and in such cases the inferred extent is simply all available habitat. Exceptions are most likely to occur among woodland species such as <i>anthocaris</i> for which foodplants are scattered more sparsely or patchily over large areas forcing at least females to move around a lot to find them. Use the 1 kilometer figure only with extensive habitat or proximate patches along a feature such as a ridgeline. As with most butterflies populations will usually occupy most of the potential habitat at least during good weather or favorable years. Beware though that in cold conditions at least <i>Colias</i> and presumably others concentrate in low, sheltered, sunny spots and appear more sedentary than they really are. Even the highly dispersive and somewhat migratory <i>Colias eurytheme</i> becomes intensely localized and sedentary in southern New Jersey from about mid November through February when sun angle is too low for the butterflies to reach optimum flight temperature even on warm days. Arctic and alpine species are also most active and dispersive on warm sunny days. It is unlikely that 1 kilometer will prove realistic except in arctic and alpine situations, for now there are insufficient observations to justify a larger figure. |
| Pikes and Pickerels | 10 | 10 | Not applicable | | | |
| Pine Barrens Moths | 5 | 20 | Not applicable | If the pine barren community is, or recently (within last 100 years) was, large and more or less contiguous it should be regarded as a single occurrence for any of these species that occur. This is generally the case even if there has been habitat fragme | 2 | Outside of New Jersey few pine barrens exceed 5,000 hectares in size and most are under 1000 hectares which seems to be near the minimum size on which many of these moths are likely to still occur (Schweitzer, personal observations; Givnish et al., 1988; Schweitzer and Rawinski, 1987; Cryan, ca. 1985; Schweitzer, 1996). Such occurrences are usually isolated by tens of kilometers or more from one another making boundaries and inferred extent (the entire habitat) isobvious. In larger pine barrens the 2 kilometer radius is unjustifiably small but here suggested as practical. No examples are known where species in this group have been shown or even suspected to occupy much less than all available habitat and most have at least one known occurrence of at least 5000-10000 hectares. Some of these species while of very limited distribution elsewhere are fairly common in |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|--|---------------------------|------------------|--------------------|---|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | | | the core of the New Jersey Pine Barrens and are almost continuously distributed over tens of thousands of hectares and/or have linear distributions of ten kilometers or more within large habitats. While it is generally unreasonable to assume species in this group occupy much less than all available habitat contiguous to an observation point, some practical upper limit is needed especially in New Jersey. Therefore it is recommended that IE not be extended more than 2 kilometers radius in extensive contiguous suitable habitat, pending further sampling which is nearly certain to show a larger extent. A circle of radius 2 km would define a habitat comparable to some of the smaller occurrences known for most of these species. A circle of one kilometer radius would define a habitat of only 400 hectares and most of these species are likely to be absent from such small remnants (although some, it is unpredictable which, will likely occur) and so it makes no sense to define an Inferred extent smaller than known small occurrences. At least outside of southern New Jersey, in no case should Inferred Extent around individual collection points ever be used to justify recognition of more than one occurrence for these moths in large pine barrens areas. |
| Plant Cavity (Phytotelmata) Breeding Odonates | 1 | 1 | Not applicable | | | |
| Pocket Gophers | 1 | 3 | Not applicable | | | |
| Pond-Breeding Odonates | 3 | 3 | Not applicable | | 0.5 | The few studies determining area of adult foraging habitat surrounding breeding sites have indicated a range of 30 meters to 300 meters [see Briggs (1993) for <i>Enallagma laterale</i> ; Corbet (1999) for <i>Nesciothemis nigeriensis</i> and <i>Calopteryx haemorrhoidalis</i> ; and Samways and Stetyler (1996) for <i>Chorolestes tessalatus</i>]. As a result, an element occurrence should include the breeding site and surrounding pond or upland habitat extending 500 m in a radius from the breeding site. |
| Proteid Salamanders (Waterdogs) | 1 | 10 | Not applicable | | 0.1 | |
| <i>Pseudemys</i> Turtles (Cooters) | | | Not applicable | Separation distance along riverine corridors: 20 stream km. Separation distance for upland habitat: 1 km. Separation distance for other situations (e.g., mixture of upland and aquatic/wetland habitat): 5 km. | 1 | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|--------------------------------------|---------------------------|------------------|--------------------|--|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Pyrginae | 2 | 10 | Not applicable | When dealing with multiple patches of habitat within an obvious feature like a pine barrens, airport approach zone or powerline, consider all as one metapopulation subject to the suitable habitat distance. On most right of ways or if the species is occurring patchily along a riparian corridor, apply the suitable habitat distance unless the foodplant really is completely absent for at least half that distance. | 1 | In most cases with taxa likely to be actually tracked and mapped occurrences will be in habitats or remnants of habitats of only dozens to perhaps 100 hectares or occupying discrete patches within larger communities or landscape features and the inferred extent is all available habitat even if this exceeds 1 kilometer. However in cases where the habitat appears extensive or is unclear and information on the occurrence is limited, assume only all suitable habitat within 1 kilometer radius. Note however if the foodplant is spotty or highly localized never infer an extent greater than that occupied by this plant. In general these skipper will largely occupy suitable habitat where they are present at all, but often one will not really know what suitable habitat really is locally. In extreme cases such as <i>Erynnis juvenalis</i> and <i>E. horatius</i> , occurrences in the core of their ranges may well be hundreds of thousands of hectares in heavily oak forested regions, such as obviously so for the former in southern New Jersey. |
| Quail | 5 | 5 | Breeding | | 0.3 | Based on a home range of 6 hectares. |
| Quail | 5 | 5 | Nonbreeding | | 0.3 | Based on a relatively small home range of 6 hectares. |
| Quail | 5 | 5 | Not applicable | | | |
| Rails | 5 | 5 | Breeding | | 0.1 | |
| Rails | 5 | 5 | Nonbreeding | | 0.1 | |
| Rapid Frogs | 1 | 5 | Not applicable | | | |
| Rhyacotritonid (Torrent) Salamanders | 1 | 3 | Not applicable | | 0.1 | |
| Riodinidae: North American Species | 1 | 5 | Not applicable | | 0.5 | Since these butterflies are so localized it seems prudent not to infer presence over large areas without actually checking. However if habitat is contiguous or nearly so it does seem unlikely that most species would fail to occupy it especially in situations like ridges, river or stream corridors, canyon bottoms etc. So .5 kilometer is an arbitrary compromise. Occupancy is not inferred beyond actual potential habitat and if this is smaller than about 200 hectares assume full occupancy. If larger, more observation is needed. |
| River-breeding Damselfly Odonates | 5 | 5 | Not applicable | None. | 0.5 | The few studies determining area of adult foraging habitat surrounding breeding sites have indicated a range of 30 meters to 300 meters [see Briggs (1993) for <i>Enallagma laterale</i> ; Corbet (1999) for <i>Nesciothemis nigeriensis</i> and <i>Calopteryx haemorrhoidalis</i> ; and Samways and Stetyler (1996) for <i>Chorolestes tessalatus</i>]. As a result, an element occurrence should include the breeding site and surrounding pond or upland habitat extending 500 m in a |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---|---------------------------|------------------|--------------------|---|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | | | radius from the breeding site. |
| River-breeding Dragonfly Odonates | 10 | 10 | Not applicable | None. | 0.5 | The few studies determining area of adult foraging habitat surrounding breeding sites have indicated a range of 30 meters to 300 meters [see Briggs (1993) for <i>Enallagma laterale</i> ; Corbet (1999) for <i>Nesciothemis nigeriensis</i> and <i>Calopteryx haemorrhoidalis</i> ; and Samways and Stetyler (1996) for <i>Chorolestes tessalatus</i>]. As a result, an element occurrence should include the breeding site and surrounding pond or upland habitat extending 500 m in a radius from the breeding site. |
| Rorquals | 30 | 30 | Not applicable | | | |
| Salamandrids (Newts) | 1 | 5 | Not applicable | | 0.5 | |
| Sand Prairie, Savanna, and Barrens Openings Moths | 2 | 10 | Not applicable | | 1 | While most occurrences are much smaller or consist of a cluster of smaller occurrences it is safe to infer at least this distance if the habitat actually is that large. Individuals can easily move a kilometer in under half an hour and as with most Lepidoptera suitable contiguous habitat is normally fully occupied at least some of the time. So inferred extent is all proximate habitat up to one kilometer from the collection site and if habitat is more extensive a very little effort will almost certainly show a larger occurrence. If three or more collections sites a kilometer apart have been verified within an extensive community all habitat patches should also be assumed occupied. |
| Saturniinae and Most Hemileucinae | 4 | 20 | Not applicable | When a cluster of occupied habitats occurs in the same geographic feature such as a desert mountain range, or a canyon treat them as a single metapopulation occurrence unless there are gaps of more than twice the unsuitable habitat distance. In general, do not treat recently fragmented patches of the same habitat (e.g., chaparral or thorn scrub) as separate occurrences if gaps are within the suitable habitat distance. One reason is that such scraps probably need to be considered together in any conservation efforts and are unlikely to persist on their own. Island occurrences can be considered as separate EOs if at least one km off shore. | 1 | With small habitats the inferred extent is all available habitat. With extensive more or less contiguous habitats an arbitrary cap of 1kilometers is recommended. This is a highly conservative recommendation and few occurrences would fit within a circle of 1 km radius. Additional sampling then should show the habitat to be fully occupied regardless of its size. These moths normally occur in large to enormous habitats and are seldom consistently absent from any substantial portions of such habitats where they are present at all and often rather uniformly common. As Tuskes et al. (1996) put it their populations are normally widespread and dense. Exceptions seem most likely in parts of New England and elsewhere where <i>Compsilura concinnata</i> has radically altered the population biology of Saturniidae. |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|---|---------------------------|------------------|------------------------|---|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Satyrinae, Most Species | 2 | 5 | Not applicable | If the species occurs in habitat patches within a discrete and distinctive natural community such as a savanna or wetland or riparian complex consider all such colonies as one metapopulation occurrence by using the suitable habitat distance. | 1 | In most cases inferred extent is simply all suitable contiguous habitat, but when habitat is extensive it should be capped at 1 kilometer radius pending further information. |
| <i>Schinia</i> and Other Flower Feeding Noctuidae | 2 | 10 | Not applicable | | 1 | In general habitats are only a few hectares to hundreds of hectares and so IE is simply all available habitat up to 400 hectares. However some arbitrary cap is needed where habitat is extensive or foodplant patches are widely distributed within a large community. |
| Sea Turtles (Cheloniidae and Dermochelyidae) | 10 | 10 | Adult foraging area | | | |
| Sea Turtles (Cheloniidae and Dermochelyidae) | 10 | 10 | Hibernaculum | | | |
| Sea Turtles (Cheloniidae and Dermochelyidae) | 10 | 10 | Juvenile foraging area | | | |
| Sea Turtles (Cheloniidae and Dermochelyidae) | 10 | 10 | Nesting area | | | |
| Seepage-Breeding Odonates | 1 | 1 | Not applicable | | | |
| Shorebirds | 5 | 5 | Breeding | | 1.5 | Based on a smaller 'typical' home ranges (see Separation Justification section in group specifications record in Biotics). |
| Shorebirds | 5 | 5 | Migratory stopover | | | |
| Shorebirds | 5 | 5 | Nonbreeding | | | |
| Shrews | 1 | 5 | Not applicable | | | |
| Silversides (Atherinids) | 10 | 10 | Not applicable | | | |
| Sirenid Salamanders (Sirens) | 1 | 10 | Not applicable | | 0.3 | |
| Skinks | 1 | 5 | Not applicable | | 0.2 | |
| Skunks | 10 | 10 | Not applicable | | 2.5 | Based on a home range of 500 hectares (see Separation Justification section in group specifications record in Biotics). |
| Small and Medium Bats | 5 | 5 | Bachelor colony | | | |
| Small and Medium Bats | 5 | 5 | Hibernaculum | | | |
| Small and Medium Bats | 5 | 5 | Maternity colony | | | |
| Small and Medium Bats | 5 | 5 | Nonbreeding | | | |
| Small Colubrid Snakes | 1 | 5 | Not applicable | | 0.2 | |
| Small Cyprinids | 10 | 10 | Not applicable | | | |
| Small Doves | 5 | 5 | Breeding | | | |
| Small Doves | 5 | 5 | Nonbreeding | | | |
| Small Murid Rodents | 2 | 5 | Not applicable | | | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|--------------------------------------|---------------------------|------------------|--------------------|--|-------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Small or Localized Nymphalids | 2 | 10 | Not applicable | Multiple colonies within an overall community matrix such as openings within pine barrens or savannas, or foodplant patches within a wetland complex, prairie remnant, canyon or along a stream should generally be treated as one metapopulation occurrence by using the suitable habitat distance, especially if the foodplant occurs to some degree between the colonies. | 2 | In the overwhelming majority of situations with most taxa likely to be tracked and mapped the inferred extent is simply the entire contiguous or nearly contiguous suitable habitat, which will usually be a few hundred hectares or less or a fairly obvious collection of patches within a well defined community. However in situations with extensive contiguous habitat or closely proximate patches (e.g., along a ridgetop or along a river) it is unreasonable to assume it is consistently unoccupied, but occupancy should not be inferred over more than 2 kilometers without additional data. |
| Small Owls | 5 | 5 | Breeding | | 0.6 | Conservatively based on a home range of 27 hectares; for example, a breeding male Northern Saw-whet Owl spent most of its active time in a 27-hectare core area (Cannings 1987). |
| Small Owls | 5 | 5 | Nonbreeding | | 0.6 | Conservatively based on an average home range of 27 hectares for a Ferruginous Pygmy-Owl family (Proudfoot and Johnson 2000). A breeding male Northern Saw-whet Owl spent most of its active time in a core area of only 27 hectares (Cannings 1987). |
| Small Suckers | 10 | 10 | Not applicable | | | |
| Softshell Turtles | 1 | 20 | Not applicable | In some areas, individual annual home ranges may be longer than the separation distance, so it is important to evaluate movement patterns and seasonal changes in distribution before applying the standard separation distance for suitable habitat. | 3 | |
| Spadefoots | 1 | 5 | Not applicable | | 0.5 | Inferred extent distance refers to distance from breeding sites and is likely a conservative value. |
| <i>Speyeria</i> Butterflies, Generic | 4 | 10 | Not applicable | In arid regions consider whether hot arid terrain might actually be a barrier and not merely unsuitable. If this appears to be the case a separation distance as small as 2 km might be appropriate. | 2 | Use with caution and some knowledge of the adult and breeding habitat. For a flying animal easily capable of covering 1-6 kilometers in a day that lives around one-two months and with occurrences being populations of generally hundreds of adults, it would be unreasonable to assume truly suitable habitat without large gaps would remain regularly unoccupied even if parts of it were vacant in a given year (such as in some cases after fall or spring fires). Apply the 2 km radius only for extensive suitable habitat. If the habitat does not extend that far do not infer presence. For habitats less than 400 hectares assume full occupancy. If the nature or extent of the local habitat is unclear, select a smaller inferred extent. Persistent greater fritillary occurrences usually occupy more than 50 hectares and often several hundred. |
| Sticklebacks | 10 | 10 | Not applicable | | | |
| Stoneflies | 3 | 3 | Not applicable | | | |
| Stony Coral | | | Not applicable | | | |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|--------------------------------------|---------------------------|------------------|--------------------|---|-------------------------|--|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| Strymon and Related Hairstreaks | 4 | 10 | Not applicable | On relatively small islands including some or even most of the Florida Keys it is reasonable to consider all "colonies" as a single metapopulation occurrence. | 2 | If the species is present in an area assume at minimum any suitable habitat within two kilometers of an observation is part of the occurrence--that is supports at least regular recurrence, provided there is sufficient reason to believe there actually is an occurrence. |
| Sunfishes (Centrarchids) | 10 | 10 | Not applicable | | | |
| Swallowtails (Most Papilionidae). | 5 | 20 | Not applicable | In very many cases, especially in the drier parts of western North America, populations will be confined to clearly definable, discrete landscape features such as riparian areas, canyons, ridgelines or even irrigated settled areas. In most such cases it is very reasonable simply to treat each canyon , ridge, etc., occurrence as a separate EO by using suitable habitat distances within them. If the landscape features are separated by hot arid terrain consider whether such terrain is a barrier rather than merely unsuitable and if that seems to be the case separations distances as small as 1 km may sometimes be appropriate. Although some species do move between islands, in general it is reasonable to treat populations on islands as separate EOs. In order to define practical EOs, for riparian species the unsuitable habitat distance might be applied over marginally suitable habitat. | 2 | This applies only in suitable habitat and if larval foodplants are widely distributed. Do not use to extend occurrences beyond breeding habitat. However, given suitable habitat and dozens to thousands of highly mobile adults it would be unreasonable to assume absence from suitable habitat with established populations as close as 2 kilometers and at least marginal habitat in intervening area. |
| Swans and Geese | 10 | 10 | Breeding | | 3 | Based on the conservative, smaller mean home range for Snow Geese of 6.6 square kilometers (Hughes et al. 1994). |
| Swans and Geese | 10 | 10 | Nonbreeding | | | |
| Swifts | 5 | 5 | Breeding | | | |
| Swifts | 10 | 10 | Migratory stopover | | | |
| Swifts | 10 | 10 | Staging | | | |
| Tailed Frogs | 1 | 5 | Not applicable | | 0.5 | |
| Teiid Lizards (Whiptails and Others) | 1 | 5 | Not applicable | | 0.2 | |
| Terrestrial Plethodontid Salamanders | 1 | 3 | Not applicable | | 0.1 | |
| Terrestrial Snails | 1 | 1 | Not applicable | | | |
| Threadsnakes and Blindsnakes | 1 | 3 | Not applicable | | 0.1 | |
| Tidal Marsh Lepidoptera | 3 | 10 | Not applicable | | 2 | If habitat is extensive this is a very conservative figure since many occurrences for these species are several to many square kilometers or they may be nearly continuous along many kilometers of marsh or its edge. If the habitat is well defined and less than 2 kilometers radius or length, inferred extent is simply the entire suitable habitat. |
| Tree Squirrels | 2 | 5 | Not applicable | | 0.1 | Based on a home range of 0.8 hectares (see Separation Justification section in group specifications record in |

| Specifications Group Name | Separation Distances (km) | | Location Use Class | Alternate Separation Procedure | IE Buffer Distance (km) | Inferred Extent Notes |
|-------------------------------|------------------------------|---------------------|--------------------|--------------------------------|-------------------------------|---|
| | Unsuitable Habitat | Suitable Habitat | | | | |
| | | | | | | Biotics). |
| Woodpeckers | 5 | 5 | Breeding | | 0.2 | Based on a conservatively small home range of 3 hectares. |
| Worm Lizards (Amphisbaenians) | 1 | 3 | Not applicable | | 0.1 | |