Appendix 1: Animal EO Specs - Groups as of November 2009 – Separation Distances and Inferred Extent Distances

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
CADDISFLIES	1	1	Not applicable			
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, above) 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.		
PLANT CAVITY (PHYTOTELMATA) BREEDING ODONATES	1	1	Not applicable			
SEEPAGE-BREEDING ODONATES	1	1	Not applicable			
TERRESTRIAL SNAILS	1	1	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.
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).
MOLES	1	3	Not applicable			
NIGHT LIZARDS (XANTUSIIDS)	1	3	Not applicable		0.1	
POCKET GOPHERS	1	3	Not applicable			
RHYACOTRITONID (TORRENT) SALAMANDERS	1	3	Not applicable		0.1	
TERRESTRIAL PLETHODONTID SALAMANDERS	1	3	Not applicable		0.1	
THREADSNAKES AND BLINDSNAKES	1	3	Not applicable		0.1	
WORM LIZARDS (AMPHISBAENIANS)	1	3	Not applicable		0.1	
ANGUID LIZARDS	1	5	Not applicable		0.2	
ANOLES (POLYCHRID LIZARDS)	1	5	Not applicable		0.2	

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ANTELOPE SQUIRRELS	1	5	Not applicable		0.3	Based on a mean home range of 6.7 hectares (Allred and Beck 1963).
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.
BUFONID TOADS	1	5	Not applicable		0.5	
CHIPMUNKS	1	5	Not applicable		0.1	Based on a home range of about 1 hectare (see Separation Justification).
CROTAPHYTID LIZARDS	1	5	Not applicable		0.2	
DICAMPTODONTID (PACIFIC GIANT) SALAMANDERS	1	5	Not applicable		0.5	
FLYING SQUIRRELS	1	5	Not applicable		0.3	Based on a home range of 7 hectares.
GECKOS	1	5	Not applicable		0.2	
GROUND SQUIRRELS	1	5	Not applicable			
HOLOMELINA, 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 also mapping guidance.
HYLID FROGS (TREEFROGS)	1	5	Not applicable		0.5	Inferred extent distance pertains to distance from breeding sites.
IGUANAS	1	5	Not applicable		1	
JUMPING MICE	1	5	Not applicable		0.1	Based on a typical home range of about 0.3 hectares (see Separation Justification).
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). Note that some species have smaller known home ranges: e.g. 0.04 to 0.16 hectares in DIPODOMYS STEPHENSI (Bleich 1977), and 0.12 to 0.24 hectares in CHAETODIPUS BAILEYI and 0.1 to 0.2 hectares in C. PENICILLATUS (Reynolds and Haskell 1949).
LACERTID LIZARDS	1	5	Not applicable		0.2	
LEPTODACTYLID FROGS	1	5	Not applicable		0.5	
MEDIUM AND LARGE COLUBRID SNAKES	1	5	Not applicable		0.5	
NARROWMOUTH TOADS (MICROHYLIDS)	1	5	Not applicable		0.5	

	Separation Distance					
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PHRYNOSOMATID LIZARDS	1	5	Not applicable		0.2	
RANID FROGS	1	5	Not applicable			
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.
SALAMANDRIDS (NEWTS)	1	5	Not applicable		0.5	
SHREWS	1	5	Not applicable			
SKINKS	1	5	Not applicable		0.2	
SMALL COLUBRID SNAKES	1	5	Not applicable		0.2	
SPADEFOOTS	1	5	Not applicable		0.5	Inferred extent distance refers to distance from breeding sites and is likely a conservative value.
TAILED FROGS	1	5	Not applicable		0.5	
TEIID LIZARDS (WHIPTAILS AND OTHERS)	1	5	Not applicable		0.2	
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.
PROTEID SALAMANDERS (WATERDOGS)	1	10	Not applicable		0.1	
SIRENID SALAMANDERS (SIRENS)	1	10	Not applicable		0.3	
MAP TURTLES (GRAPTEMYS)	1	20	Not applicable		2	
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	

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	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
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, above) 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.		
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		
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.		
EREBIA 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.

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
LYCAENA (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 L. EPIXANTHE in New Jersey and nearly certain for L. DORCAS) that adults move along sunny stream banks, especially if the foodplant occurs in limited amounts 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.	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 L. EPIXANTHE and L. DORCAS, 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 may be inferred throughout it. In most cases foodplants are patchier than that.
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 GENUS 3 SPECIES 2 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. ACRAPEX RELICTA 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 form an observation.
CATOCALA 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	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.

Appendix 1: Animal EO Specs - Groups as of November 2009 – Separation Distances and Inferred Extent Distances

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
CRAMBIDIA. CISTHENE, 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.
EUPHYES, POANES, 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.
PAPAIPEMA 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 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 P. PTERISII, P. SP. 1, SPARTINIPHAGA CARTERAE 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.
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.
SMALL MURID RODENTS	2	5	Not applicable			
TREE SQUIRRELS	2	5	Not applicable		0.1	Based on a home range of 0.8 hectares (see Separation Justification).

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
ANISOTA, SPINGICAMPA, etc.	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 ANISOTA is about 100-200 hectares for A. STIGMA 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, A. SENATORIA 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 DRYOCAMPA RUBICUNDA 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 SPHIGICAMPA are available.
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 A. CLYTON or A. CELTIS 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.
CALLOPHRYS (MITOURA): 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 C. hesseli) where multiple foodplant patches occur use the suitable habitat distance across sections where the foodplant cedar is sparse but not	1	This very low figure reflects mainly the fact that some of the taxa, most notably C. HESSELI, often cannot be readily documented as occurring throughout the apparent contiguous habitat although some others such a C. G. GRYNEUS usually do occupy the full patch. For C. HESSELI and some other species male "lekking" areas can be very localized within the habitat. Probably females in fact do

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				absent unless it is present only as shaded understory plants or unless gaps exceed half the suitable habitat separation distance.		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..
CALLOPRHYS 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 NIPHON, AUGUSTINUS, POLIOS and HENRICI 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. C. IRUS and probably C. MOSSI 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,
CATOCALA MOTHS, ROSACEAE 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	With small habitats(<1000 hectares) the inferred extent is the entire habitat. However, in many regions occurrences normally extend for several to dozens of kilometers in at least one direction and adults can be collected throughout the habitat. A few occurrences are probably under 100 hectares, e.g. bog occurrences for C. GRACILIS in the Midwest. Occurrences of more than 5000 hectares are not at all unusual in some parts of the ranges of these species. Two kilometers is an arbitrary figure to be applied in extensive barrens etc. and is smaller than the radius of many known occurrences, especially for C. SORDIDA.
CATOCALA MOTHS, BLUEBERRY FEEDERS	2	10	Not applicable	Within a large barrens or other wooded natural situation, treat all collections or observations as a single metapopulation EO unless there really are gaps of at least half the suitable habitat distance with no blueberry patches. Ignore small, weak, isolated plants in deep shade but fruit production or even flowering are not important.	2	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.

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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 C. NEGLECTA, LADON LADON, C. LADON LUCIA, and in New Jersey also IDELLA, 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.
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 C. TRANQUEBARICA, SCUTELLARIS and less often FORMOSA.		
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).
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. 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.
DASYCHIRA	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 D. CINNAMOMEA 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. D. PINICOLA and D. OBLIQUATA in southern New Jersey

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						appear to be ubiquitous over more than 500,000 hectares of virtually contiguous Pinelands and some occurrences of D. MANTO 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.
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 species (e.g. KINGI, LIPAROPS STRGOSUM, probably CARYAEVORUM) appear to be more local than their

	Separation Distance					
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						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.
FRESHWATER MUSSELS	2	10	Not applicable			
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.
HEMILEUCA 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 (H. LUCINA and MAIA at least) commonly move more than a kilometer--in fact most H.LUCINA 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 suitable habitat pending more sampling. The resulting circle of about 400 hectares would define a small, but plausible occurrence area for forest or woodland Herminiinae. Also note that if the habitat is clearly only a feww hectares map it as such but an attemtp has been made to place species likely to actually occur in such tiny habitats in other Specs Groups.
JACKRABBITS AND HARES	2	10	Not applicable		0.6	Based on a modest home range size of 30 hectares (see

	Separation Distance					
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						Separation Justification).
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.
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 M. YUCCAE eastward) can be smaller.
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 DATANA). 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 DATANA and a few others do sometimes occur in small habitats, but in such cases these should be obvious based on the foodplant.

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
OENEIS BUTTERFLIES	2	10	Not applicable	These Specs are meant mainly for regions where OENEIS 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.
PARNASSIUS 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.
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 tthe 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 I 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 ERYNNIS JUVENALIS and E. HORATIUS, 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.

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
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.
SCHINIA 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.
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.
MAYFLIES	3	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 Enallagma laterale; Corbet (1999) for Nesciothemis nigeriensis and Calopteryx haemorrhoidalis; and Samways and Stetyler (1996) for Chorolestes tessalatus]. 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.
STONEFLIES	3	3	Not applicable			

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
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.
CATOCALA 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 habitat distance. Pine barren moth Specs may be substituted eastward when occurrences are in such habitats.	1	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 CATOCALA) chance of patches being vacant some years, uncertainty about recovery time after fires (presumed to be 1-3 seasons with partial burns; potentially one season to never after complete burns), somewhat sporadic occurrence of these species and often small habitat patches, a low inferred extent is suggested.
CATOCALA MOTHS, SMALLER 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 CONNUBIALIS and in some regions SP. 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.
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

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
						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: 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.
HESPERIINAE	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 ATRYTONE AROGOS AROGOS 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.

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
PIERIDAE, GENERAL	4	10	Not applicable	When dealing with multiple occurrences within the same large scale natural community such as COLIAS INTERIOR 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 ANTHOCARIS 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 Colias and presumably others concentrate in low, sheltered, sunny spots and appear more sedentary than they really are. Even the highly dispersive and somewhat migratory COLIAS EURYTHEME 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.
SPEYERIA 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.
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

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
						there actually is an occurrence.
CATOCALA MOTHS, LARGE MOBILE 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	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 1 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.
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.
HEMILEUCA 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 H. MAIA 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.

Appendix 1: Animal EO Specs - Groups as of November 2009 – Separation Distances and Inferred Extent Distances

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
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. C. PROMETHEA 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).
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 COMPSILURA CONCINNATA has radically altered the population biology of Saturniidae.
BONNETED BATS	5	5	Not applicable			
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.
CUCKOOS AND ANIS	5	5	Breeding			
CUCKOOS AND ANIS	5	5	Not applicable			
GULLS AND TERNS	5	5	Breeding			
GULLS AND TERNS	5	5	Migratory stopover			
GULLS AND TERNS	5	5	Nonbreeding			
HUMMINGBIRDS	5	5	Breeding		0.1	
HUMMINGBIRDS	5	5	Nonbreeding		0.1	
MARMOTS	5	5	Not applicable		0.1	Based on a home range of 1 hectare.
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).

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
PASSERINES	5	5	Breeding			
PASSERINES	5	5	Migratory stopover			
PASSERINES	5	5	Nonbreeding			
PASSERINES	5	5	Not applicable			
PHYLLOSTOMID BATS	5	5	Bachelor colony		10	IE distance is based on the foraging range of MACROTUS CALIFORNICUS (Brown, in Wilson and Ruff 1999). Mean flight distance of LEPTONYCTERIS CURASOAE to foraging area is farther (USFWS 1995).
PHYLLOSTOMID BATS	5	5	Maternity colony		10	Foraging range of MACROTUS CALIFORNICUS (Brown, in Wilson and Ruff 1999). Mean flight distance of LEPTONYCTERIS CURASOAE to foraging area is slightly farther, 14 kilometers (USFWS 1995).
PHYLLOSTOMID BATS	5	5	Nonbreeding			
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	
SHOREBIRDS	5	5	Breeding		1.5	Based on a smaller 'typical' home ranges (see Separation Justification).
SHOREBIRDS	5	5	Migratory stopover			
SHOREBIRDS	5	5	Nonbreeding			
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 DOVES	5	5	Breeding			
SMALL DOVES	5	5	Nonbreeding			
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).
SWIFTS	5	5	Breeding			
WOODPECKERS	5	5	Breeding		0.2	Based on a conservatively small home range of 3 hectares.

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
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 C. DORSALIS originally often extended for many kilometers. Now however, most potential suitable habitat is really unsuitable. For example nearly all (>>99%) seemingly suitable habitat for C. DORSALIS 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 C. SEVERA, 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 establish boundaries--ideally based on larvae as well as adults.
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 won't 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

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
						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 WADING BIRDS	5	10	Breeding		3	Based on foraging ranges from breeding rookeries.
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.
GREBES	5	10	Breeding		0.1	Based on conservative home ranges of Red-necked and Pied-billed Grebes.
GREBES	5	10	Nonbreeding			
GROUSE AND PTARMIGAN	5	15	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.

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
CATOCALA MOTHS, RIPARIAN OR CANYON SPECIES	5	20	Not applicable		2	In many cases IE is moot as habitats are fairly small (dozens to a few hundred hectares) and so obviously occupied. When the habitat is under 1000 hectares assume full occupancy. However in extensive forests with widespread foodplant or along extensive forested riparian corridors occurrences can extend for several kilometers, probably more. Even the rarer more localized taxa like C. P. PRETIOSA (which has separate Specs) can have occurrences several kilometers in at least one direction. 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 C. C. CRATAEGI or C. BLANDULA utilizing naturalized apple trees. So some arbitrary limit is need and 2 kilometers seems reasonable. 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.
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.
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

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
						5000-10000 hectares. Some of these species while of very limited distribution elsewhere are fairly common in 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.
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.
BULLHEADS AND SMALL CATFISHES	10	10	Not applicable			

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
CHARACIDS	10	10	Not applicable			
CICHLIDS	10	10	Not applicable			
COLONIAL SEABIRDS	10	10	Nonbreeding			
COLONIAL WADING BIRDS	10	10	Nonbreeding			
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.		
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			
DIVING DUCKS AND SEA DUCKS	10	10	Breeding			
DIVING DUCKS AND SEA DUCKS	10	10	Migratory stopover			
DIVING DUCKS AND SEA DUCKS	10	10	Nonbreeding			
FRESHWATER SCULPINS	10	10	Not applicable			
GARS	10	10	Not applicable			
HAWKS AND FALCONS	10	10	Breeding		3	Foraging range variable; 3 kilometers is the mean diameter in several species.
HAWKS AND FALCONS	10	10	Nonbreeding			
KINGFISHERS	10	10	Breeding		0.8	Based on an average lakeside territory of Belted Kingfisher (Salyer and Lagler 1946).
LARGE DOVES	10	10	Breeding		0.4	Based on small home ranges of the relatively sedentary (in Texas) White-tipped Dove (Boydstun 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).
LARGE OWLS	10	10	Nonbreeding		1.5	Based on a conservatively small home range of just under 200 hectares (see Separation Justification in Breeding Class).
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			
MADTOMS	10	10	Not applicable			

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
NONANADROMOUS LAMPREYS	10	10	Not applicable			
NONANADROMOUS SMELTS	10	10	Not applicable			
PIKES AND PICKERELS	10	10	Not applicable			
RIVER-BREEDING ODONATES	10	10	Not applicable		0.5	The few studies determining areaof adult foraging habitat surrounding breeding sites have indicated a range of 30 meters to 300 meters [see Briggs (1993) for Enallagma laterale; Corbet (1999) for Nesciothemis nigeriensis and Calopteryx haemorrhoidalis; and Samways and Stetyler (1996) for Chorolestes tessalatus]. 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.
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			
SILVERSIDES (ATHERINIDS)	10	10	Not applicable			
SKUNKS	10	10	Not applicable		2.5	Based on a home range of 500 hectares (see Separation Justification).
SMALL CYPRINIDS	10	10	Not applicable			
SMALL SUCKERS	10	10	Not applicable			
STICKLEBACKS	10	10	Not applicable			
SUNFISHES (CENTRARCHIDS)	10	10	Not applicable			
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	10	10	Migratory stopover			
SWIFTS	10	10	Staging			

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
LANDSCAPE LEVEL SPHINX 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 MANDUCA BLACKBURNI 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.
MEDIUM CYPRINIDS	15	15	Not applicable			
MEDIUM SUCKERS	15	15	Not applicable			
DOLPHINS AND PORPOISES	20	20	Not applicable			
LARGE CYPRINIDS	20	20	Not applicable			
LARGE SUCKERS	20	20	Not applicable			
RORQUALS	30	30	Not applicable			
BEAKED WHALES	50	50	Not applicable			
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	
BLACK CORAL			Not applicable			
CAVEFISHES			Not applicable	Each separate hydrological system constitutes a distinct occurrence. Use a separation distance of 3 km if habitat continuity is uncertain.		
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		
HYDROCORAL			Not applicable			
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.		

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
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.		
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.		
MUD TURTLES (KINOSTERNON)			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 (STERNOTHERUS)			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	
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 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.		

Appendix 1: Animal EO Specs - Groups as of November 2009 – Separation Distances and Inferred Extent Distances

	Separation Distance					
Specifications Group Name	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
OCTOCORAL			Not applicable			
PSEUDEMYS 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	
STONY CORAL			Not applicable			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Hemipachnobia subporphyrea	Venus Flytrap Cutworm	1	2	Not applicable		1	Generally this distance is moot since most or all extant occurrences are small, but IE is the full extent of the flytrap occurrence up to 1 km from the collection site.
Polites mardon	Mardon Skipper	1	2	Not applicable		0.5	Two known occurrences where boundaries of the occurrences have been mapped and are surrounded by unoccupied habitat are a few hundred meters in diameter (Potter pers. comm., Fleckenstein pers. obs.). Therefore 500 meters measure should be used for the inferred extent. Given the small size of occurrences where surrounding unoccupied habitat seem equally suitable, mapped occurrences should be limited to areas surveyed with no interpolation of adjacent areas.
Anniella pulchra	California Legless Lizard	1	3	Not applicable		0.1	
Chamaeleo jacksonii	Jackson's Chameleon	1	3	Not applicable		0.1	
Dendrobates auratus	Poison Dart Frog	1	3	Not applicable			
Idia gopheri	Tortoise Commensal Noctuid Moth	1	3	Not applicable			No IE is given for the tortoise and for the moths the IE is obvious: the entire area occupied by the tortoise occurrence and no more.
Coenonympha nipisiquit	Maritime Ringlet	1	4	Not applicable			Consult local experts and get the actual not inferred boundaries.
Lycaena dospassosi	Salt Marsh Copper	1	4	Not applicable		0.5	This is a very localized species so do not infer occurrence more than this distance without more information. If both plants do not extend that far use a smaller distance.
Agkistrodon contortrix	Copperhead	1	5	Not applicable		1	Inferred extent distance pertains to hibernacula.
Agkistrodon piscivorus	Cottonmouth	1	5	Not applicable		0.5	
Aplodontia rufa	Mountain Beaver	1	5	Not applicable			Home ranges to small to create an inferred extent.
Charina bottae	Rubber Boa	1	5	Not applicable		0.5	
Charina trivirgata	Rosy Boa	1	5	Not applicable		0.5	
Crotalus adamanteus	Eastern Diamondback Rattlesnake	1	5	Not applicable		3	Suitable habitat within 3 km of a point location of this species is likely to be occupied.
Crotalus atrox	Western Diamondback Rattlesnake	1	5	Not applicable		3	Suitable habitat within 3 km of a point location or hibernaculum of this species is likely to be occupied.
Crotalus cerastes	Sidewinder	1	5	Not applicable		1	Suitable habitat within 1 km of a point location of this species is likely to be occupied.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Crotalus lepidus	Rock Rattlesnake	1	5	Not applicable		1	Based on movements of snakes of this size, suitable habitat within 1 km of a point location is likely to be occupied.
Crotalus mitchellii	Speckled Rattlesnake	1	5	Not applicable		2	Based on movements of snakes of this size, suitable habitat within 2 km of a point location is likely to be occupied.
Crotalus molossus	Blacktail Rattlesnake	1	5	Not applicable		2	Based on movements of snakes of this size, suitable habitat within 2 km of a point location is likely to be occupied.
Crotalus oreganus	Western Rattlesnake	1	5	Not applicable	A longer separation distance for suitable habitat can be used if site-specific data indicate that it is warranted.	1.5	Based on movements of this species and other snakes of this size, suitable habitat within 1.5 km of a point location (especially a hibernaculum), is likely to be occupied.
Crotalus pricei	Twin-spotted Rattlesnake	1	5	Not applicable		0.5	
Crotalus ruber	Red Diamond Rattlesnake	1	5	Not applicable		2	Based on movements of snakes of this size, suitable habitat within 2 km of a point location is likely to be occupied.
Crotalus scutulatus	Mojave Rattlesnake	1	5	Not applicable		2	Based on movements of snakes of this size, suitable habitat within 2 km of a point location is likely to be occupied.
Crotalus tigris	Tiger Rattlesnake	1	5	Not applicable		2	Based on movements of snakes of this size, suitable habitat within 2 km of a point location is likely to be occupied.
Crotalus viridis	Prairie Rattlesnake	1	5	Not applicable	A longer separation distance for suitable habitat can be used if site-specific data indicate that it is warranted.	1.5	Based on movements of this species and other snakes of this size, suitable habitat within 1.5 km of a point location (especially a hibernaculum), is likely to be occupied.
Crotalus willardi	Ridgenose Rattlesnake	1	5	Not applicable		0.5	
Cynomys gunnisoni	Gunnison's Prairie Dog	1	5	Not applicable		0.2	Based on a typical home range of 4 hectares for the closely-related C. PARVIDENS (Crocker-Bedford and Spillett 1977).
Cynomys leucurus	White-tailed Prairie Dog	1	5	Not applicable		0.2	Based on a typical home range of 4 hectares for the closely-related C. PARVIDENS (Crocker-Bedford and Spillett 1977).
Cynomys ludovicianus	Black-tailed Prairie Dog	1	5	Not applicable			Home ranges too small to justify an IE distance.
Cynomys parvidens	Utah Prairie Dog	1	5	Not applicable		0.2	Based on a typical home range of 4 hectares (Crocker-Bedford and Spillett 1977).
Dipsosaurus dorsalis	Desert Iguana	1	5	Not applicable		0.2	
Epicrates inornatus	Puerto Rico Boa	1	5	Not applicable		0.5	
Epicrates monensis	Mona Boa	1	5	Not applicable			
Gopherus agassizii	Desert Tortoise	1	5	Not applicable		1	

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Gopherus berlandieri	Texas Tortoise	1	5	Not applicable		1	
Gopherus polyphemus	Gopher Tortoise	1	5	Not applicable		1	
Leiocephalus carinatus	Northern Curly-tailed Lizard	1	5	Not applicable			
Leiocephalus eremitus	Navassa Curly-tailed Lizard	1	5	Not applicable			
Leiocephalus schreibersii	Schreiber's Curly-tailed Lizard	1	5	Not applicable			
Micruroides euryxanthus	Arizona Coral Snake	1	5	Not applicable		0.5	
Micrurus fulvius	Eastern Coral Snake	1	5	Not applicable		0.5	
Mustela erminea	Ermine	1	5	Not applicable		0.5	Based on a typical home range of 20 hectares (Nowak 1991).
Mustela nivalis	Least Weasel	1	5	Not applicable		0.35	Based on a home range of 10 hectares.
Rhinophrynus dorsalis	Mexican Burrowing Toad	1	5	Not applicable		0.5	
Sauromalus ater	Common Chuckwalla	1	5	Not applicable		0.2	
Sistrurus catenatus	Massasauga	1	5	Not applicable		2	
Sistrurus miliarius	Pygmy Rattlesnake	1	5	Not applicable		1	
Terrapene carolina	Eastern Box Turtle	1	5	Not applicable		0.5	
Terrapene ornata	Western Box Turtle	1	5	Not applicable		0.5	
Xenopus laevis	African Clawed Frog	1	5	Not applicable			
Crotalus horridus	Timber Rattlesnake	1	7	Not applicable	The following qualify as distinct occurrences: (1) occurrences based on hibernacula separated by more than 7 kilometers of suitable habitat from the nearest known hibernaculum (applies to northern populations that use communal hibernacula). A lesser distance can be used if radio telemetry data indicate than populations using different hibernacula less than 7 kilometers apart are separated by a distinct gap and are not likely to come into contact with one another; additionally, hibernacula more than 7 km apart are part of the same occurrence if the summer home ranges of populations from the two hibernacula are known to overlap); (2) occurrences separated by more than 7 kilometers of suitable habitat between observation sites for individuals of unknown hibernaculum origin or for populations in	3	Inferred extent distance refers to hibernacula. In Connecticut, most individuals stayed within 3 km of their hibernaculum, but some males traveled up to 3.6 km from their wintering site (Hammerson and Lemieux 2001).

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
					which communal denning does not occur; (3) occurrences separated by separated by more than 1 km of moderately unsuitable habitat (occasionally traverseable by low numbers of individuals).		
Amphiuma means	Two-toed Amphiuma	1	10	Not applicable		0.3	
Amphiuma pholeter	One-toed Amphiuma	1	10	Not applicable		0.2	
Amphiuma tridactylum	Three-toed Amphiuma	1	10	Not applicable		0.3	
Appalachia arcana	Michigan Bog Grasshopper	1	10	Not applicable			
Caiman crocodilus	Spectacled Caiman	1	10	Not applicable		3	
Heloderma suspectum	Gila Monster	1	10	Not applicable		2	
Neofiber alleni	Round-tailed Muskrat	1	10	Not applicable			
Trachemys gaigeae	Mexican Plateau Slider	1	10	Not applicable		1	
Crocodylus acutus	American Crocodile	1	30	Not applicable		5	
Macrochelys temminckii	Alligator Snapping Turtle	1	30	Not applicable		3.5	
Neonympha mitchellii mitchellii	Mitchell's Satyr	2	2	Not applicable			
Ptichodis bistrigata	Southern Ptichodis	2	2	Not applicable		0.5	This is arbitrary and reflects the fact that known occurrences seem to be small habitat patches and that there would be no basis for assessing the extent of an occurrence if the moth is collected in a large apparent habitat. Do not infer presence beyond the extent of habitat. In most cases apparent habitat is under 400 hectares and in such cases inferred extent would be the entire sandplain grassland, prairie remnant, savanna opening, or other grassy site where the collection was made.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Clemmys guttata	Spotted Turtle	2	3	Not applicable		0.5	
Abagrotis nefascia	A Noctuid Moth	2	4	Not applicable	When habitats are grassy openings within pine barrens or other woodlands or shrublands, generally all occurrences within the overall community complex should be treated as one occurrence, or at minimum the suitable habitat distance should be applied within the overall community. It would also be acceptable to use an appropriate Group Spec in many habitat types.	1	If the habitat is substantial use 1 km. If not then assume the entire habitat is occupied but no more.
Abagrotis nefascia benjamini	Coastal Heathland Cutworm	2	4	Not applicable	When habitats are grassy openings within pine barrens or other woodlands or shrublands, generally all occurrences within the overall community complex should be treated as one occurrence, by using the suitable habitat distance. It would also be acceptable to use an appropriate Group Spec in many habitat types.		
Phyciodes batesii batesii	Tawny Crescent	2	4	Not applicable			
Anisota senatoria	Orange-striped Oakworm Moth	2	5	Not applicable		1	In general at least occurrences will extend a few kilometers. However, one cannot assume occupancy over any substantial area based on just a single observation. It is not unusual for this species to be absent from seemingly suitable habitats. The smallest known occurrence (to Schweitzer anyway) is about 800 hectares near Albany, New York. Some forest fragments of comparable size in southern New Jersey, where this is an outbreak pest species in extensively forested regions, seem to consistently lack the species.
Atrytonopsis loammi	Loammi Skipper	2	5	Not applicable	Multiple colonies, whether persistent or transient, within a large savanna complex should be treated as a single metapopulation EO by using the suitable habitat distance even across stretches of savanna that are not optimum habitat.	1	In general an entire habitat patch would be assumed occupied if an EO is present at all. However this seems to be a localized species and it seems imprudent to assume occupancy over large areas based on limited observations. Therefore a conservative distance of 1 km is chosen until actual data are available. Also consider whether excessivley frequent fire could be making seemingly suitable habitat proximate to known sites function more as a sink than as habitat and do not infer occurrence into these

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
							areas. Specific guidance is unavailable but presumably for example this would apply to annually burned "habitat" at the very least.
Catocala coelebs	The Old Maid Underwing	2	5	Not applicable	Multiple occurrences within a large peatland or along the same river are generally considered a single occurrence. Use the suitable habitat distance.	1	In most cases inferred extent is simply all essentially contiguous boggy habitat and the adjacent woods, However since adults do move around to some extent it seems reasonable to include all MYRICA GALE patches within a km of a collection site as presumed habitat.
Catocala sp. 4 nr. louiseae	An Underwing Moth	2	5	Not applicable		1	With lack of any information, the minimum used for moderate to large moths is selected.
Cerma cora	Bird Dropping Moth	2	5	Not applicable	In New York and New England, the Specs for Pine Barrens Moths will often apply and if so should be used if the foodplants are well distributed within the community. Generally if the occurrence including the local foodplant is associated with a distinctive natural community or distinctive edaphic feature the suitable habitat distance should be applied within it. The suitable habitat distance may be violated within discrete isolated natural communities in which the foodplants are widespread over at least hundreds of hectares in order to prevent separating such metapopulations into multiple EOs.		Generally entire habitat up to 1000 hectares.
Cicindela lepida	Ghost Tiger Beetle	2	5	Not applicable	It would be acceptable to treat this as a beach and seashore species and apply those Specs when it occupies such habitats in New Jersey or perhaps in some Great Lakes areas		No inferred extent seems advisable at present other than the immediate occupied dune.
Cingilia catenaria	Chain Dotted Geometer	2	5	Not applicable			
Crambus daeckellus	Daecke's Pyralid Moth	2	5	Not applicable		0.5	Given the extreme rarity of this moth in recent decades it seems unwise to infer occupancy beyond the immediate habitat. However observations at Fort Dix suggest all patches within several square kilometers are occupied there.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Erynnis persius persius	Persius Dusky Wing	2	5	Not applicable	Generally consider all occurrences within a single barrens or savanna complex as one metapopulation even if some are slightly more than the suitable habitat distance apart unless the intervening habitat is largely developed. Such metapopulations are the conservation unit not the fragments. With populations associated with powerlines or other linear corridors generally treat the colonies as one occurrence by applying the suitable habitat distance unless the foodplant is completely absent for at least half that distance. If they are occurring together it would be reasonable to use distance and mapping conventions for either the Karner Blue or Frosted elfin for this duskywing also.	1	Use the 1 kilometer figure only if the habitat is unclear or if not associated with any sort of large scale barrens etc., and only if the general habitat wherein the capture was made extends that far. Within large barrens or savanna complexes habitat should change over time, or at least probably did in the past, and the species should be assumed to occupy or potentially occupy all suitable microhabitats within the community and all of these are part of the occurrence whether presently occupied or not.
Feniseca tarquinius	Harvester	2	5	Not applicable	Multiple colonies in a large wetland complex are one occurrence unless there are clearly permanent gaps of more than the suitable habitat distance.	1	Without information to suggest otherwise, it seems prudent not to infer occurrence beyond the boundaries of the immediate habitat which is often less than a hectare to dozens of hectares. If the butterflies or larvae are actually seen widely in a larger area, the inferred habitat then would be the enitre alder swamp, beech stand or other supporting community up to a mximum of 1 km.
Lytrosis permagnaria	A Geometrid Moth	2	5	Not applicable		1	
Monoleuca semifascia	A Slug Moth	2	5	Not applicable	Generally, and certainly in New Jersey, all collections in a given community are one occurrence even if separation distances are slightly violated. As far as known occurrences are large but perhaps sometimes less than 200 hectares.	0.5	Apparently south of the Mullica River in New Jersey and in Virginia occurrences occupy the entire associated community and they should be mapped as such up to 1000 hectares. Occurrences in NJ can be as small as about 400 hectares--perhaps smaller, down to apparently about 100 in Virginia. In New York and south of Virginia assume at least a half kilometer radius which is comparable to known small occurrences.
Ochotona collaris	Collared Pika	2	5	Not applicable			Home ranges too small to warrant an inferred extent.
Ochotona princeps	American Pika	2	5	Not applicable			Home ranges too small to warrant an inferred extent.
Ondatra zibethicus	Muskrat	2	5	Not applicable		0.08	Based on a home range of 0.5 hectares (Takos 1944). Along linear waterways, an inferred

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							extent of 0.2 kilometers may be used (Willner et al. 1980).
Orgyia detrita	A Tussock Moth	2	5	Not applicable		0.5	This is an unusually low IE for a forest moth. It reflects the fact the true habitat may not be at all apparent, especially northward. Also considered is the fact this species is rare, local and sporadic in southern New Jersey even though the kinds of habitats it occurs in seem to be rather ordinary. This species may in fact often fail to occupy some or most suitable habitat. At any rate it seems very unwarranted to infer large area of occupancy from a single collection.
Podiceps grisegena	Red-necked Grebe	2	5	Breeding			
Pygarctia abdominalis		2	5	Not applicable	Multiple collections from different habitat patches in the same general community or edaphic feature should be considered a single metapopulation occurrence by using the suitable habitat distance even if the foodplant is scarce in some parts of the community.	1	Too poorly known to justify a larger distance. In fact the few known occurrences seem to mostly be small but there are no real data. This distance should be re-evaluated when the foodplant and thus habitat becomes known. This species obviously originally did occur over large areas, but may not now, which in turn could explain why it is so rare and why it is extirpated in many areas.
Pygarctia spraguei	Sprague's Pygarctia	2	5	Not applicable	Multiple collections from different habitat patches in the same general community or edaphic feature should be considered a single metapopulation occurrence and the suitable habitat distance used within such savannas, prairies etc. even where the foodplant is currently sparse or nearly absent.	1	All EUPHORBIA patches with a kilometer are assumed to be habitat for an EO unless there is some known reason to exclude them (such as annual fires).
Pyrgus wyandot	Appalachian grizzled skipper	2	5	Not applicable		1	Use this distance only with suitable edaphic conditions and suitable habitat such as where the foodplant and habitat are frequent on a powerline (in which case it is linear and NOT a radius) or shale barrens and not with marginal forest habitats. It may be used for slightly discontinuous habitat patches. While some of this inferred habitat may now be vacant it almost certainly will not be if the species is allowed to recover in the area--thus it qualifies as recently occupied habitat likely to be re-occupied.

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Apodrepanulatrix liberaria	A Geometer Moth	2	6	Not applicable	Use appropriate group specs where appropriate for the habitat and apply the suitable habitat distance within obvious edaphic or vegetation features supporting multiple Ceanothus patches. For example in and east of New York pine barrens moth specs would be appropriate for the few remaining occurrences unless Ceanothus is truly absent over distances of half that for suitable habitat. If the habitat is not such a well defined community type apply the suitable habitat distance for marginal habitat where some foodplant occurs. 		
Erastria coloraria	Broad-lined Catopyrrha	2	6	Not applicable	These separation distances are suggested where no Group Spec seems appropriate. Use appropriate group specs where appropriate for the habitat and apply the suitable habitat distance within obvious edaphic or vegetation features supporting multiple Ceanothus patches. For example in and east of New York pine barrens moth specs would be appropriate for the few remaining occurrences unless Ceanothus is truly absent over distances of half that for suitable habitat. If the habitat is not such a well defined community type apply the suitable habitat distance for marginal habitat where some foodplant occurs.		
Acronicta lanceolaria	A Noctuid Moth	2	10	Not applicable		1	Use with caution. If the habitat is some sort of northern boggy shrubland infer only the immediate habitat up to 400 hectares. In more typical situations use of this radius would define a habitat well within a realistic size range but smaller than many or most. Since the adults can fly well and larvae feed on several to many of the common shrubs (such as scrub oaks, heaths, Rosaceae) there is no reason to suspect that colonies fail to occupy most available habitat when it is extensive, but since there is some doubt this small radius is suggested.

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Arawacus jada	Creamy Stripe-streak	2	10	Not applicable	One could and generallly should consider any occurrences in a single canyon or riparian area as one metapopulation occurrence by using the suitable habitat distance unless the foodplant is really absent for at least half that distance.	1	Apply only to appropriate habitat with foodplants and for this more or less fugitive species, patches may not always be occupied.
Bellura gortynoides		2	10	Not applicable		0.5	Since the species can be local and is probably excluded from some habitats by human disturbance or water level fluctuations, it is not prudent to assume a large IE. Inferred extent then is all available habitat contiguous or connected by water up to half kilometer of the observation. Schweitzer has more than once found colonies that failed to occupy all water lilly patches in a lake.
Callophrys irus	Frosted Elfin	2	10	Not applicable	When colonies occur on right of ways or in the cleared lands around airports use the suitable habitat distance for multiple colonies within the same artificial dry grassland or brushland system even if no concentrations of foodplants or adults are found, but use twice the unsuitable habitat distance accross exotic cool season grasses and weeds. However consider the possibility of connectivity along edges of woods, especially if the foodplant occurs on these edges. It is very unlikely an airport complex would ever be considered to have more than one occurrence, but a powerline could if there were truly large expanses of unsuitable habitat. Use the 2 kilometer distance across forests, wetlands and developed areas when colonies are not connected by roadsides or powerlines and are not part of a large barrens or savanna complex. A given natural community such as an oak savanna or pine barren should generally be considered to harbor only one metapopulation occurrence if multiple "colonies" occur. That is the suitable habitat distance should be used. It would be reasonable not to treat cut off remnants of the original community as separate (D or	2	Use this only with multiple habitat patches within a large natural community or on powerline corridors, along railroads, around airports etc. Inferred extent then is generally all accessible habitat within two kilometers. See separation barriers. Do not infer presence over more than a kilometer or two of closed canopy forest. Note in most cases this distance will be appropriate over some linear area but not as a radius.

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					occasionally D-ranked) occurrences and recommended they not be if they are within the suitable habitat distance even if the habitat is no longer suitable. This species is not prone to existing as isolated colonies.		
Catocala crataegi ssp. 1	Southern Hawthorn Underwing	2	10	Not applicable		2	Apply this distance within nearly contiguous bottomland forest only. In most cases available habitat will be obviously smaller and in such cases IE is simply all such habitat subject to the separation distances but arbitrarily capped at 2 kilometers pending better data. For now the typical size of occurrences is not apparent and it seems unwarranted to assume they are large.
Catocala minuta	Little Underwing	2	10	Not applicable		1	
Catocala pretiosa pretiosa	Precious Underwing	2	10	Not applicable		3	In cases of really large swamp complexes, or proximate clusters of such swamps, where the species is present all suitable connected habitat up to 3 kilometers is assumed occupied. In the few such cases that have been looked at (e.g. around Atlantic City Airport and the Batsto-Mullica River area) this has been shown to be true and at least one occurrence extends for more than five kilometers. Do not infer presence over such distances if the habitat is marginal, that is drier woods.
Cicindela sexguttata	Six-spotted Tiger Beetle	2	10	Not applicable	Where forest is reduced to small fragments (<100 hectares) a shorter separation distance may be used, especially if some of the remnants actually lack colonies.	2	This is not a localized species and there is virtually no chance suitable habitat within 2 kilometers of an observation would fail to support at least continued recurrence.

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Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Cicindela wickhami	Sonoran Tiger Beetle	2	10	Not applicable			
Dasypus novemcinctus	Nine-banded Armadillo	2	10	Not applicable		0.27	Based on an average home range size of 5.7 hectares (radius of 135 meters) (Layne and Glover 1977).
Hemileuca chinatiensis	Chinati Sheepmoth	2	10	Not applicable		1	Apparently can be either very local or more widespread in its environment, so while some occurrences probably are larger do not infer more than all suitable habitat within 1 kilometer without multiple observations. If the field observer's reports indicate the population is highly localized within known boundaries then do not infer much wider occurrence.
Hemileuca griffini	Griffin's Sheepmoth	2	10	Not applicable		1	Given that this species is said to be very localized, it should not be assumed to occupy large areas. So the inferred extent is all available habitat up to 1 kilometer. Most habitats are apparently much smaller.
Hemileuca lucina	New England Buckmoth	2	10	Not applicable	Colonies within a wetland complex separated from the nearest other colony by distances up to 10 kilometers are part of the same metapopulation regardless of intervening communities.	0.5	Habitats are generally only a few to a few dozen hectares. Not all SPIRAEA patches are necessarily occupied, although in many cases it is obvious why not (shade, dry soil, too tall and dense). It is quite likely that including all habitat up to 500 meters from an observation will contain it. In many cases it will be apparent that the occurrences should not be extended that far.
Hyalophora columbia columbia	Columbia Silkmoth	2	10	Not applicable	When multiple larch stands occur within the same wetland complex they would generally be considered as one occurrence since scattered individual larches will generally be found between such patches and can support larvae. So apply suitable habitat distance in such situations. However within such a wetland complex more than one occurrence can be recognized if larches occur a densities of less than one tree per hectare for twice the unsuitable habitat distance.	2	This figure is generally moot as most occurrences especially eastward and in the United States are associated with small habitats of only a few hundred hectares or less and thus the inferred extent is all available habitat. However in large boreal swamp or bog situations or in other places with extensive larch swamps populations presumably occupy large areas but some arbitrary cap is needed. Still a radius of 2 kilometers seems very small for a large saturniid moth unless this one somehow can maintain consistently higher than typical density.
Lambdina canitiaria	A Looper Moth	2	10	Not applicable		1	This species is too poorly understood to justify much extrapolation of habitat. A circle of 1 kilometers radius would approximate some of the smaller habitats known where congeners occur in isolated colonies.

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Lapara phaeobrachycerous	Gulf Pine Sphinx	2	10	Not applicable		2	If habitat is contiguous adults surely often move several kilometers or more in a life time. All insect EOs are based on populations and not individuals. However caution is needed in inferring just what is suitable habitat until the ecology of this species is somewhat understood. This arbitrary figure is chosen because it would define an area comparable to some of the smller ones known for the closely related L. CONIFERARUM.
Narraga georgiana		2	10	Not applicable			
Neonympha mitchellii francisci	Mitchell's Satyr	2	10	Not applicable			
Pieris virginiensis	West Virginia White	2	10	Not applicable	Where forest is intact but lacks the foodplant use a distance of twice the unsuitable habitat distance. Also far more so than with most Lepidoptera it would be reasonable to invoke barriers to justify treatment of occurrences 1 to 2 km apart as separate.	1	Apply this only in extensive contiguous suitable forest with the foodplant which is not fragmented by unshaded paved roads, powerlines, rivers, unshaded streams, etc. Some occurrences are much larger, but many are not.
Satyrium edwardsii	Edwards' Hairstreak	2	10	Not applicable		1	In almost all cases (but not all) occurrences are a kilometer or more in one dimension. While exceptions may rarely occur (e.g. maybe at the Maine occurrence) it seems prudent to assume oak scrub habitat less than a kilometer from a collection site is occupied except that inferred extent should not extend across any gap in the habitat of more than 500 meters. Even in southern New Jersey one occurrence extends over probably 10 km of powerline and adjacent scrub and another occupies cloe to 100 hectares with adults seen over several kilometers and in the Albany Pine Bush 500-1000 hectares of scrub oak seems to be occupied. A much larger extent than one kilometer is probably justified on ridge systems in eastern Massachusetts southwest into eastern Pennsyvania, but for now no such figure is suggested.
Semiothisa fraserata	Fraser Fir Geometrid Moth	2	10	Not applicable		2	This applies only over tracts with fraser fir or other foodplant more or less throughout. Where the occurrence is in planted firs do not infer extent beyond that plantation.
Tolype notialis		2	10	Not applicable		2	Refers only to suitable habitat.

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Zanclognatha sp. 1		2	10	Not applicable		1	Since occurrences are usually several hundred hectares or larger (at least in New Jersey) inferred extent should be all contiguous or nearly contiguous habitat and marginal habitat within 1 km of a collection site. This would define an area comparable to the apparent extent of some smaller occurrences. A larger figure seems inappropriate given that details of habitat needs are unknown, and especially outside of new jersey this could cause the habitat to be severely over-stated. One well studied New Jersey occurrence is over five kilometers long and moths have turned up at all sample sites.
Lapara coniferarum	Southern Pine Sphinx	2	20	Not applicable		2	A few known northern occurrences are as small as about 1000 to 1500 hectares but most are vastly larger. There is no good reason to assume that a poorly documented occurrence is among the smallest known if the habitat is large. However some arbitrary cap is needed. Therefore inferred extent is all terrain with substantial hard pines within 2 kilometers. Usually where this species is actually tracked in the northern edge of the range the habitat and thus inferred extent and boundaries will be obvious--that is an entire pine barrens community. Two kilometers radius would produce an area sufficient to encompass many of these northern occurrences.
Paonias astylus	Huckleberry Sphinx	2	20	Not applicable	A distance of one rather than two kilometers may be used between habitats that are both smaller than 50 hectares, such as bogs in generally non-acid soil landscapes, assuming populations actually occur in such places.	1	Very few occurrences are likely to be under 400 hectares, so this is merely assuming a much smaller than average EO exists.
Spartiniphaga carterae	A Noctuid Moth	2	20	Not applicable			
Novumbra hubbsi	Olympic Mudminnow	3	3	Not applicable			
Umbra limi	Central Mudminnow	3	3	Not applicable			
Umbra pygmaea	Eastern Mudminnow	3	3	Not applicable			
Problema bulenta	Rare Skipper	3	5	Not applicable		2	Probably few EOs are really less than two kilometers long, but for now the fact there are known areas of apparently unoccupied habitat suggests more than normal caution about

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							assuming habitat is fully occupied.
Lithophane lemmeri	Lemmer's Noctuid Moth	3	10	Not applicable	Multiple patches of white cedar in the same swamp or along the same river or patches of red cedar on the same ridge or other comparable situations should be treated as single metapopulation occurrences. In New Jersey Pinelands at least white cedar is rarely absent in palustrine forests and where there are concentrations nearby both adults and larvae are found in such mixed stands. Therefore use the suitable habitat distances in such places unless cedars are virtually absent over twice the unsuitable habitat distance. Probably this would be appropriate in upland habitats but these may be more discrete.	2	This figure probably will not often work in uplands where the IE will generally simply be the contiguous or closely proximate red cedar stand. However in extensive lowland swamp forest such as along New Jersey Pinelands rivers and streams the IE is all suitable is all contiguous white cedar and mixed swamp forest containing some cedar in the swamp complex up to 2 km, and at least one EO is known to be substantially larger and others probably are.
Aphelocoma californica	Western Scrub-Jay	3.5	3.5	Not applicable		0.2	Based on a home range of 3 hectares (Verbeek 1973).
Aphelocoma coerulescens	Florida Scrub-jay	3.5	3.5	Not applicable		0.35	Based on a mean/median home range of 9 hectares (Woolfenden and Fitzpatrick 1984).
Aphelocoma insularis	Island Scrub-jay	3.5	3.5	Not applicable		0.2	Based on a home range for Western Scrub-Jay of 3 hectares (Verbeek 1973).
Euchlaena milnei	A Geometrid Moth	4	4	Not applicable		1	
Plebejus melissa samuelis	Karner Blue	4	8	Not applicable	When multiple colonies occur in the same large sandy pine barren or oak savanna landscape separation distances may be violated, especially for practical reasons. However it is suggested separation distances should generally not exceed 8 km. Conceptually at least some of the intervening habitat can be considered to be potentially restorable and probably some was recently suitable and occupied. Populations within such xeric communities were obviously not persistently isolated, even if they are now, and sometimes a realistic conservation and management goal will be to reconnect them. It also seems pointless to consider small isolated demes as separate low quality (D-ranked)occurrences as opposed to assuming	1	This is usually moot since usually extent will be known and need not be inferred. The inferred extent is the actual habitat patch which is usually less than 100 hectares and rarely 1 km in any direction, or in some cases would be used to infer presence in proximate patches if a metapopulation is actually known to occupy the area. If the actual occupied habitat patch is more than 1 km across, then the entire extent is still inferred habitat. Patches are either unoccupied or vacant, not partially occupied, over any reasonable time scale

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					a core-satellite model even if this means violating standard separation distances. See Recovery Plan especially Appendix G, regarding such issues. However there is no actual evidence of adults moving more than 6.6 km and movements more than 1500 meters appear to be rare.		
Agrotis buchholzi	Buchholz's Dart Moth	4	10	Not applicable		1	This is exceeding conservative and would result in defining the second smallest occurrence known. In reality this species will occupy the entire habitat.
Atrytone arogos	Arogos Skipper	4	10	Not applicable		2	Inferred extent is all suitable habitat within 2 kilometers of the the observation point. Observations in southern New Jersey show that if a habitat complex is occupied at all, any patches within one or two kilometers are also occupied except where extreme fire frequencies preclude survival and even in these areas transient colonizations quickly appear in excessively burned areas up to about this distance from a stable source. New Jersey habitats are clusters of discrete patches of a few tens of hectares each or less. It is extremely likely that IE should be longer (perhaps 10km) in some prairie regions with substantial populations in seemingly more contiguous habitat and conservative fire regimens.
Callosamia securifera	Sweetbay Silkmoth	4	10	Not applicable		1	This is one of few Lepidoptera that does seem to often occur in an area without occupying all contiguous suitable habitat. It is possible though occupancy is higher over several years than at any particular time. With small occurrences (under about 500 hectares) inferred extent is simply the available habitat. With extensive swamplands it doe not seem warranted to assume full occupancy, but certainly the population will occupy a substantial area or

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							possibly a cluster of several smaller ones. However with well known extensive occurrences like Okefenokee Swamp the inferred extent is all available habitat where sweetbay grows.
Caripeta aretaria	A Moth	4	10	Not applicable		2	Occurrences in Pennsylvania are mostly 200 to 300 hectares, which would be about the smallest for the genus. Still most habitats seem to be large to vast, especially in the coastal plain. However for now the species is too poorly known to justify large extrapolations.
Caripeta sp. 1	The South Jersey Caripeta	4	10	Not applicable		2	This is arbitrary but approaches the size of some of the smallest known occurrences for the closely related C. ARETARIA. The smallest habitat actually documented would be the Long Island Dwarf Pine Plains where the occurrence might be on less than 1000 hectares.
Chelydra serpentina	Snapping Turtle	4	10	Not applicable		1	
Cicindela unipunctata	One-spotted Tiger Beetle	4	10	Not applicable		1	This is arbitrary but C. UNIPUNCTATA is not a localized species and where habitat is extensive assuming a one kilometer radius is rather conservative for a tiger beetle. Do not assume occurrence outside the wooded habitat though, except for adjacent shale barrens etc.
Danaus eresimus	Soldier	4	10	Not applicable	Appropriate group specs may be substituted in some situations.	2	
Danaus gilippus	Queen	4	10	Not applicable		2	

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Epiglaea apiata	Pointed Sallow	4	10	Not applicable	Group Specs (pine barrens moths, bog-fen moths etc.) may be substituted if appropriate for the local habitat. Since adults are evidently fairly dispersive (based on out of habitat singletons) the suitable habitat distance should be used within edaphic situations where habitat occurs patchily separated by forest or woodland or brushland especially in and north of the Poconos. This would be especially true in fire prone areas because local populations would probably be eradicated in any but the lightest fire occurring during the adult flight season in early fall through very late the following spring (September to June in Massachusetts), but at the same time fires create at least temporary habitat. Long term persistence would likely require a metapopulation in fire prone habitats. However truly isolated populations can persist indefinitely in small bogs within otherwise unsuitable regions, e.g. in northwest New Jersey and the Ohio occurrences. When the intervening terrain is woods with Vaccinium angustifolium in the understory but sufficiently wooded that moths are not found regularly in it, a separation distance of twice the unsuitable habitat distance is suggested between occurrences. The suitable habitat distance may be violated within large sand plains (such as in Carroll County, New Hampshire) or other obvious acidic edaphic features in which the moth is known to be abundant and widespread.	2	Inferred extent is almost always the entire habitat which will usually be obvious and fairly small. Certainly in the cases of bog occurrences any other bogs within 2 kilometers of a collection site can be presumed occupied. However in the few really extensive barrens occurrences and possibly northward in boggy boreal forest occurrences are more than 5 kilometers in one or more directions, but pending better information a 2 kilometer cap is recommended.
Hesperia meskei pinocayo	Rockland Grass Skipper-Keys Race	4	10	Not applicable	Genrally all populations on the same island would be considered a single metaopulation occurrence. 		
Mestra amymone	Common Mestra	4	10	Not applicable			
Tetracha affinis	Upland Big-headed Tiger Beetle	4	10	Not applicable			
Tetracha carolina	Pan-American Big-headed Tiger Beetle	4	10	Not applicable			

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Tetracha virginica	Virginia Big-headed Tiger Beetle	4	10	Not applicable			
Isoparce cupressi	Cypress Sphinx	4	20	Not applicable	When the foodplant is spotty along a river or in a swamp forest use the suitable habitat distance where these trees are sparse and also within the overall community even if gaps with no cypress up to twice the unsuitable habitat distance apparently occur.	5	While this species can persist in surprisingly small swamps, e.g. at its Maryland sites, all evidence suggests it is nearly as widespread as the foodplant trees farther south. The species can occur where cypress grows on wet land or in nearly permanent water. Thus in huge cypress dominated wetland complexes where cypress occurs without major breaks for many kilometers, this is a reasonable, and probably overly conservative, assumption. As with nearly all Lepidoptera this one will occupy most or all available contiguous habitat if it is established at all. With habitats smaller than 1000 hectares always assume full occupancy.
Samia cynthia	Ailanthus Silkmoth	4	20	Not applicable		1	Impossible to assess now. While 20 km would certainly have been reasonable in 1970, a much smaller distance is needed now in the USA.
Zale perculta	Okefenokee Zale Moth	4	20	Not applicable		2	In most cases the inferred extent would be the entire swamp forest or the portion of it supporting the foodplant if that is much smaller. Habitats are probably normally several kilometers in one or more dimensions. In large habitats such as Okefenokee where the foodplant is widespread including all habitat with the foodplant within a radius of 2 kilometers is probably too conservative, but this SPEC may very well be moot outside of Okefenokee Swamp.
Aramus guarauna	Limpkin	5	5	Breeding		0.75	Based on a typical male home range of about 750 meters length.
Asio flammeus	Short-eared Owl	5	5	Breeding		0.9	Based on an average breeding home range of 65 hectares.
Asio otus	Long-eared Owl	5	5	Breeding		0.8	The diameter of an average home range (Craighead and Craighead 1956).
Athene cunicularia	Burrowing Owl	5	5	Breeding			
Bassariscus astutus	Ringtail	5	5	Not applicable		0.6	Based on a conservatively small average home range of about 30 hectares.
Butorides virescens	Green Heron	5	5	Breeding			
Butorides virescens	Green Heron	5	5	Nonbreeding			

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Ceratomia catalpae	Catalpa Sphinx	5	5	Not applicable		1	This figure is arbitrary but should prove workable. EOs will usually be fairly large over time if the foodplant is widely planted or native. Habitat patches eastward often consist of one or a few yard catalpas. Such patches seldom can perpetuate an occurrence on their own since parasites or other factors frequently eradicate the species in them. Obviously then a persistent EO will be several patches. Where this species occur any catalpa tree in any setting is virtually certain to have larvae sometimes.
Chordeiles acutipennis	Lesser Nighthawk	5	5	Breeding			Inferred extent probably not appropriate in a aerial-feeding species such as this that wanders widely in search of food.
Chordeiles minor	Common Nighthawk	5	5	Breeding			Inferred extent probably not appropriate in this aerial-feeding species.
Euderma maculatum	Spotted Bat	5	5	Breeding			Not appropriate, since this species can commute several kilometers to a feeding area.
Euderma maculatum	Spotted Bat	5	5	Nonbreeding			
Euptilotis neoxenus	Eared Quetzal	5	5	Breeding		1	Based on a conservatively small home range of about 80 hectares (Hall 1996, Elegant Trogon).
Geococcyx californianus	Greater Roadrunner	5	5	Not applicable		0.8	Average diameter of territories in California (Bryant 1916), Arizona (Calder 1967), and west Texas (Hughes 1996).
Ixobrychus exilis	Least Bittern	5	5	Breeding			
Mormoops megalophylla	Ghost-faced Bat	5	5	Nonbreeding			IE not appropriate for a species that commutes long distances to foraging areas.
Mormoops megalophylla	Ghost-faced Bat	5	5	Maternity colony			IE not appropriate for a species that commutes long distances to foraging areas.
Mormoops megalophylla	Ghost-faced Bat	5	5	Bachelor colony			IE not appropriate for a species that commutes long distances to foraging areas.
Nyctinomops femorosaccus	Pocketed Free-tailed Bat	5	5	Maternity colony			IE not appropriate for this species, in which foraging areas are usually quite separate from roosts.
Nyctinomops macrotis	Big Free-tailed Bat	5	5	Maternity colony			IE not appropriate for this species, in which foraging areas are usually quite separate from roosts.
Ortalis vetula	Plain Chachalaca	5	5	Not applicable		0.13	Based on a moderate-sized home range of 5 hectares (Balda 1989).
Pelamis platurus	Yellowbelly Sea Snake	5	5	Not applicable			
Podiceps auritus	Horned Grebe	5	5	Breeding			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Tadarida brasiliensis	Brazilian Free-tailed Bat	5	5	Nonbreeding			Inferrred Extent not appropriate for a species that commutes long distances to foraging areas.
Tadarida brasiliensis	Brazilian Free-tailed Bat	5	5	Maternity colony			Inferrred Extent not appropriate for a species that commutes long distances to foraging areas.
Tadarida brasiliensis	Brazilian Free-tailed Bat	5	5	Bachelor colony			Inferrred Extent not appropriate for a species that commutes long distances to foraging areas.
Trogon elegans	Elegant Trogon	5	5	Breeding		1.4	Based on a male home range of 150 hectares (Hall 1996).
Picoides borealis	Red-cockaded Woodpecker	5	8	Not applicable		0.9	Based on a mean home range size of 70 hectares (Hooper et al. 1982).
Brachylagus idahoensis	Pygmy Rabbit	5	10	Not applicable		0.1	Based on an average male home range of 0.7 hectares (Gahr 1993).
Brachyramphus marmoratus	Marbled Murrelet	5	10	Breeding	For conservation management purposes, A-ranked occurrences may be separated at distances of less than 5 kilometers of unoccupied, unsuitable habitat.		Little information on terrestrial home ranges.
Catocala jair	Jair Underwing	5	10	Not applicable		2	In most places outside of New Jersey suitable scrub is fragmented and occurrences are in a few thousand hectares or less. In such cases the inferred extent is simply all available habitat up to 1000 hectares. In New Jersey it does seem very clear most of the West Plains is occupied but otherwise the species seems rare and sporadic and it does not seem to extend much beyond the West Plains into nearly identical but slightly taller scrub. On the other hand there is little evidence of occurrences occupying less than 1000 hectares anywhere and most are larger. In New York the species is widespread through the Dwarf Pine Plains and it seems to occur throughout the few remaining large habitats in peninsular Florida (e.g. Archbald and Withlacoochee). Given unpredictable occupancy of scrub in New Jersey at least it seems that when information is lacking the inferred extent should be kept consistent with some of the smaller known occurrences. Pending better information the small IE seems prudent for Texas etc. also.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Cautethia grotei	Grote's Sphinx	5	10	Not applicable	Smaller distance can and should be used if there is some evidence of effective barriers. There is no real basis for the arbitrary 10 kilometer distance and little chance suitable habitat proximate to occupied habitat would actully prove unoccupied with suitable field effort, but pending such effort treat observations more than 10 kilometers apart as separate EOs.	3	Given suitable habitat this is an extremely conservative distance representing much less than the distance an individual could travel in an hour.
Darapsa versicolor	Hydrangea Sphinx	5	10	Not applicable	When multiple occupied or presumed occupied foodplant (DECODON, CEPHALANTHUS) patches occur in a wetland or along a river or ditch system consider all as one metapopulation occurrence if there are no gaps of more than twice the unsuitable habitat distance. Likewise consider all occurrences within a large swamp complex as a single metapopulation subject to the suitable habitat distance. Appropriate Group Specs for mobile sphinx moths can be substituted for these recommendations.	2	Inferred extent is all suitable habitat/foodplant within 1 km radius of the observation. Such a distance is extremely conservative for a moth that could easily cover such a distance in less than one minute and typically occurs sparsely over a large area (many square km).
Euproserpinus phaeton	A Sphinx Moth	5	10	Not applicable	If multiple patches occur in the same natural community or same sand system and they are all within 10 kilometers of at least one other, treat as one metapopulation occurrence.	3	See E. WIESTI.
Euproserpinus wiesti	Wiest's Sphinx Moth	5	10	Not applicable	If multiple patches occur in the same natural community or same sand system and they are all within 10 kilometers of at least one other, treat as one metapopulation occurrence.	3	Inferred extent is all suitable habitat within 3 kilometers of the observation. Adults are known to move up to five kilometers at least. This figure is arbitrary but well within that range. See mobility. In many cases the habitat will be small enough that the inferred extent will be all contiguous or nearly contiguous habitat.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Hesperia attalus	Dotted Skipper	5	10	Not applicable		5	Some habitat complexes are large with adults scattered over 5000 hectares or more and at least in New Jersey none are suspected of being much under 500 hectares. This is clearly a mobile species and no instances are known where habitat patches within two or three kilometers of major occupied ones are permanently vacant. Assuming that any habitat within 5 kilometers of a known occupied habitat would be occupied during some or all years is a very conservative assumption for this species. This inferred extent is for typical habitat matrices with patches of xeric grassland and separate or concurrent nectar resources in forested or woodland settings. In the case of contiguous open xeric grassland the entire habitat should generally be assumed occupied up to at least 5000 hectares. Almost always a cursory check of flowers in late morning can verify that adults are dispersed fairly widely.
Histrionicus histrionicus	Harlequin Duck	5	10	Migratory stopover			
Madoryx pseudothyreus	False-windowed Sphinx	5	10	Not applicable	In the case of well defined mangroves assume the species is present throughout subject to the Inferred Extent limits and lump any such patches that are less than five kilometers apart. In other settings the habitat is poorly understood and these distances while arbitrary seem reasonable for a medium sized sphinx moth in consideration of their flight capability.	2	In more or less contiguous mangrove habitat it would be unreasonable to assume proximate or contiguous patches within such a small radius would not be occupied if the species is present at all-- given the flight capabilities of sphinx moths. Some adults undoubtedly cover larger distances in a night in the absence of sharp habitat boundaries. Furthermore for insects an occurrence is based on populations of many individuals. Use this IE only if the habitat is reasonably clear.
Papilio joanae	Joan's Swallowtail	5	10	Not applicable	If in the opinion of an expert who has spent a lot of field time in the area or on the basis of actual data it appears that no movement occurs between forest patches separated by open or developed landscapes then smaller distances down to the minimum of I kilometer may be used.	10	Use this figure for contiguous expanses of forest with no distances of five kilometers or more between patches of foodplants.
Pecari tajacu	Collared Peccary	5	10	Not applicable		1.1	Based on a moderate home range of 1 square kilometers.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Pelecanus erythrorhynchos	American White Pelican	5	10	Breeding	Colonies closer than separation distance given may be considered separate occurrences if long-term research indicates little population mixing.		Not appropriate in this wide-ranging bird that can commute great distances to feed.
Pelecanus erythrorhynchos	American White Pelican	5	10	Nonbreeding			
Podiceps auritus	Horned Grebe	5	10	Nonbreeding			
Podiceps grisegena	Red-necked Grebe	5	10	Nonbreeding			
Proserpinus clarkiae	A Sphinx Moth	5	10	Not applicable	See EUPROSERPINUS WIESTI	3	Based on E. WIESTI.
Proserpinus flavofasciata	Yellow-banded Day Sphinx	5	10	Not applicable	If multiple patches occur in the same natural community or same edaphic system and they are all within 10 kilometers of at least one other, treat as one metapopulation occurrence.	3	See E.WIESTI
Proserpinus gaurae	Proud Sphinx	5	10	Not applicable	If multiple habitat patches are contained within an overall large xeric community type all patches within the commuiinty should be treated as a single EO by using the suitable habitat distance within that community.	3	Inferred extent is all suitable habitat within 3 kilometers of the observation. This is based on the closely related EUPROSERPINUS WIESTI.
Proserpinus juanita	A Sphinx Moth	5	10	Not applicable	If multiple habitat patches are contained within an overall large xeric community type all patches within the commuiinty should be treated as a single EO.	3	See E. WIESTI
Proserpinus terlooii	Terloo's Sphinx	5	10	Breeding		3	Inferred extent is all suitable habitat within 3 kilometers of the observation and is based on the related EUPROSERPINUS WIESTI.. See that species.
Proserpinus vega	Vega Sphinx	5	10	Not applicable		3	Inferred extent is all suitable habitat within 3 kilometers of the observation. This is based on the closely related EUPROSERPINUS WIESTI.
Tympanuchus cupido	Greater Prairie-chicken	5	10	Not applicable		1.8	Based on a median female home range in late spring of 266 hectares (Schroeder 1991).
Alligator mississippiensis	American Alligator	5	15	Not applicable		5	
Castor canadensis	American Beaver	5	15	Not applicable		1.8	Based on a home range of a colony of 125 hectares (see Separation Justification).
Centrocercus urophasianus	Greater Sage-grouse	5	15	Not applicable		2	Measured from a lek; based on a minimum average distance from nests to leks of 1.1 kilometers (Connelly et al. 2000).
Mustela vison	American Mink	5	15	Not applicable		1	Diameter of a small home range for a male (Svendsen, in Wilson and Ruff 1999).
Urocyon cinereoargenteus	Gray Fox	5	15	Not applicable		1.1	Based on a small 'average' home range size of 100 hectares (see Separation Justification).

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Vulpes macrotis	Kit Fox	5	15	Not applicable		1.8	Based on a small home range of 260 hectares (Morrell 1972).
Vulpes velox	Swift Fox	5	15	Not applicable		3	Based conservatively on a home range of 700 hectares.
Vulpes vulpes	Red Fox	5	15	Not applicable		3	Based on a home range of 700 hectares.
Catocala marmorata	Marbled Underwing	5	20	Not applicable		2	This moth if present presumably will occupy a large area or a collection of smaller proximate ones. In many cases the apparent breeding habitat will be small and in such cases IE is simply all suitable habitat in the area. Still until this moth is better known it seems best to be conservative about IE. Most likely many occurrences are rather linear and well over 2 km long.
Catocala meskei	Meske's Underwing	5	20	Not applicable		2	This figure is arbitrary and seems small but takes into account that this species is somewhat rare and local eastward at least and also the difficulty of assessing habitat in urban contexts. In more western riparian contexts it should be relatively easy to determine the species' local distribution. However if data are lacking it would be reasonable to use the suitable habitat distance and not the inferred extent in riparian corridors with no major gaps in trees.
Cicindela punctulata	Punctured Tiger Beetle	5	20	Not applicable	This is a very adaptable and generally common tiger beetle and its habitat is probably the most variable of any North American species (see literature such as Knisely and Schultz, 1997 or Leonard and Bell, 1999). It is reasonable to substitute Specs for one of the Cicindelid Specs Group (such as riparian species) if they apply locally, for example in drier western parts of the range. The separation distances are based on considerations of eastern conditions such as Virginia, southern New Jersey and forest lands around Boston where edaphic conditions are highly suitable. It might well be reasonable to use a smaller unsuitable habitat distance in heavily urbanized areas which lack substantial parks etc. especially if all local habitats are small (<50 hectares) or where	2	This is a mobile species. If an observation really does represent an occurrence there is virtually no chance suitable habitat within such a short distance would fail to support at least regular recurrence given that adults will use driveways, sidewalks, croplands, and almost any open situation when dispersing.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
					the species cannot cope with the predominant edaphic conditions.		
Eudocima materna	A Noctuid Moth	5	25	Not applicable			
Sphinx gordius	Gordian Sphinx	5	25	Not applicable	Where this species is localized such as in Pennsylvania, North Carolina, and Wisconsin occurrences will be usually discrete communities with obvious boundaries. In central Wisconsin such habitats will be entire barrens of thousands of hectares. On off shore islands such as Block Island, most of the island is the EO, and only the most developed parts and active pastures are probably unsuitable. Islands of this size should not be treated as having more than one occurrence. In New Jersey there is little likelihood that EOs would need to be mapped and there is really only one major occurrence anyway-- but of more than 200,000 hectares. If subdivision is necessary use vegetation maps and attempt to find discontinuities of several km. Most more open variants of pitch pine lowlands, oak scrub, shrub swamps, bogs and of course dwarf pine areas are all very highly suitable and as far as known all are occupied north of the Mullica River. More mature pine-oak forest there is marginal habitat and can be arbitrarily treated as unsuitable in New Jersey if this would aid in defining useful occurrences, even though adults occur in such habitat if good habitat is nearby.	3	Inferred extent is usually simply the contiguous or nearly contiguous habitat of several hundred to several thousand hectares. However to be prudent (and probably overly cautious) do not infer more than 3 kilometers should any new occurrences in really large habitats be found. No cases are suspected where this species consistently fails to occupy all of the habitat where it occurs. If the habitat really is large it will be occupied. A circle of 3 km would define a moderate sized occurs of 2500 hectares. One known occurrence is only a few hundred hectares but most are several thousand and several are over ten thousand. It is also worth noting that pine barrens under about 500 hectares will generally lack this moth. With a moth that can easily move a kilometer in under two minutes, it does not seem reasonable with extensive habitats to assume the occurrence is among the smallest known smallest known--which would be the outcome if one used 1 km for IE. Three km is obviously low in some situations for such a species but should be practical and is probably large enough to encompass most occurrences at least outside of New Jersey and Wisconsin. Note though IE applies only across suitable habitat. If there are closed canopy forests or other unsuitable situations do not infer occupancy of them.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Vulpes lagopus	Arctic Fox	5	30	Not applicable	Where an occurrence is at least twice the size of a minimum A-ranked occurrence, it may be divided into two or more A-ranked occurrences along divisions that are narrower (or absent) than the separation distances given. The dividing lines should be made as much as possible along lines of limited fox use.	5	Based on a home range of 18.5 square kilometers.
Histrionicus histrionicus	Harlequin Duck	7	10	Breeding	EOs may be separated at less than 7 kilometers over major ridge divides; minimum two kilometer separation between streams. This is based on lack of detected movements between streams over major divides.	1	Conservative measure of stream length; based on movements of breeding females in Oregon (Bruner 1997) and pairs in Montana (Kuchel 1977).
Cicindela arenicola	St. Anthony Dune Tiger Beetle	8	20	Not applicable			
Cicindela theatina	Colorado Tiger Beetle	8	20	Not applicable			Moot. Colonies occupy discrete microhabitat patches, the entire dune system is the habitat for the metapopulation.
Neonympha areolatus	Georgia Satyr	10	4	Not applicable			
Amia calva	Bowfin	10	10	Not applicable			
Aphredoderus sayanus	Pirate Perch	10	10	Not applicable			
Botaurus lentiginosus	American Bittern	10	10	Breeding		0.5	Based on an average core home range of 25 hectares (Azure 1998). Include only the nesting marsh within the boundaries of the Inferred Extent polygon.
Botaurus lentiginosus	American Bittern	10	10	Nonbreeding		0.5	Based on an average core home range in summer of 25 hectares (Azure 1998)
Brachyramphus brevirostris	Kittlitz's Murrelet	10	10	Breeding			Nests may be up to 75 km inland (Piatt et al. 1999), and thus considerably isolated from foraging waters.
Brachyramphus brevirostris	Kittlitz's Murrelet	10	10	Nonbreeding			
Brachyramphus marmoratus	Marbled Murrelet	10	10	Nonbreeding			
Callorhinus ursinus	Northern Fur Seal	10	10	Breeding		10	A conservative estimate.
Cathartes aura	Turkey Vulture	10	10	Breeding		4	Roughly based on an average breeding home range of 6900 hectares (Kirk and Mossman 1998).
Cathartes aura	Turkey Vulture	10	10	Nonbreeding			
Cathartes aura	Turkey Vulture	10	10	Migratory stopover			
Chologaster cornuta	Swampfish	10	10	Not applicable			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Coragyps atratus	Black Vulture	10	10	Breeding		14	
Coragyps atratus	Black Vulture	10	10	Nonbreeding			
Cryptobranchus alleganiensis	Hellbender	10	10	Not applicable		0.2	
Didelphis virginiana	Virginia Opossum	10	10	Not applicable		0.5	Based on a home range of 20 hectares.
Dorosoma petenense	Threadfin Shad	10	10	Not applicable			
Erethizon dorsatum	North American Porcupine	10	10	Not applicable		1.5	Centered on winter den (Woods 1973).
Eumetopias jubatus	Steller Sea Lion	10	10	Breeding		30	See Separation Justification.
Eumetopias jubatus	Steller Sea Lion	10	10	Nonbreeding		30	See Separation Justification. Use this IE cautiously, since many marine environments may not be used for foraging.
Grus americana	Whooping Crane	10	10	Nonbreeding			
Grus americana	Whooping Crane	10	10	Migratory stopover			
Grus canadensis	Sandhill Crane	10	10	Nonbreeding			
Grus canadensis	Sandhill Crane	10	10	Migratory stopover			
Haliaeetus leucocephalus	Bald Eagle	10	10	Nonbreeding			
Hiodon tergisus	Mooneye	10	10	Not applicable			
Histrionicus histrionicus	Harlequin Duck	10	10	Staging			
Hysterocarpus traski	Tule Perch	10	10	Not applicable			
Lota lota	Burbot	10	10	Not applicable			
Morone mississippiensis	Yellow Bass	10	10	Not applicable			
Mustela nigripes	Black-footed Ferret	10	10	Not applicable		1	Inferred extent probably will not be used in this species, since the boundaries of occurrences will be relatively precisely known. In the event that boundaries are not known, inferred extent could coincide with outside perimeter of occupied prairie dog town.
Patagioenas fasciata	Band-tailed Pigeon	10	10	Breeding		3.5	Based on a conservatively very small home range of 1000 hectares.
Patagioenas fasciata	Band-tailed Pigeon	10	10	Nonbreeding		3.5	Based on a conservatively very small home range of 1000 hectares.
Patagioenas flavirostris	Red-billed Pigeon	10	10	Breeding			
Patagioenas leucocephala	White-crowned Pigeon	10	10	Not applicable			Not appropriate in this species, which may commute long distances to foraging areas.
Perca flavescens	Yellow Perch	10	10	Not applicable			
Percopsis omiscomaycus	Trout-perch	10	10	Not applicable			
Percopsis transmontana	Sand Roller	10	10	Not applicable			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Rhynchopsitta pachyrhyncha	Thick-billed Parrot	10	10	Not applicable			Inferred Extent may not be appropriate for a species that commutes long distances to feeding grounds.
Sander canadensis	Sauger	10	10	Not applicable			
Trachemys stejnegeri	Antillean Slider (Jicotea)	10	10	Not applicable		1	
Zalophus californianus	California Sea Lion	10	10	Breeding		10	A conservative estimate.
Zalophus californianus	California Sea Lion	10	10	Nonbreeding		10	A conservative estimate. Use IE cautiously here, since all marine habitats may not be used by foraging sea lions.
Accipiter gentilis	Northern Goshawk	15	15	Breeding	Where an occurrence is at least twice the size of a minimum A-ranked occurrence, it may be divided into two or more A-ranked occurrences along divisions that are narrower than the separation distances given. The dividing lines should be made as much as possible along lines of limited goshawk use; for example, along rugged, alpine ridges or bodies of water 0.5-10 kilometers wide.	2.5	Based on a modest home range of 500 hectares.
Corvus corax	Common Raven	15	15	Breeding		1.3	Territories where food resources are plentiful are relatively small; in coastal California the median is 5.1 square kilometers (n = 5; Linz et al. 1992), which gives a circle with a radius of 1.3 kilometers.
Corvus cryptoleucus	Chihuahuan Raven	15	15	Breeding		1.3	No information on home range requirements; data for Common Raven used.
Falco mexicanus	Prairie Falcon	15	15	Nonbreeding			
Falco peregrinus	Peregrine Falcon	15	15	Nonbreeding			
Falco rusticolus	Gyrfalcon	15	15	Nonbreeding			
Grus americana	Whooping Crane	15	15	Breeding		2	Based on a small home range of 3 square kilometers (Kuyt 1993).
Grus canadensis	Sandhill Crane	15	15	Breeding		2.4	Based on an average home range of an adult pair of 447 hectares (Nesbitt and Williams 1990).
Halichoerus grypus	Gray Seal	15	15	Breeding			
Halichoerus grypus	Gray Seal	15	15	Nonbreeding			
Histrionicus histrionicus	Harlequin Duck	15	15	Nonbreeding			
Meleagris gallopavo	Wild Turkey	15	15	Not applicable		3.3	Based on a spring female home range of 865 hectares (Bidwell et al. 1989).
Mirounga angustirostris	Northern Elephant Seal	15	15	Breeding	Occurrences can be separated at smaller separation distances if research reveals little genetic mixing between the two breeding		Not applicable.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
					populations.		
Mirounga angustirostris	Northern Elephant Seal	15	15	Nonbreeding			Not applicable.
Phoca vitulina	Harbor Seal	15	15	Breeding			
Procyon lotor	Northern Raccoon	15	15	Not applicable		1	Based on a conservatively small average male home range size of just under 100 hectares.
Stercorarius longicaudus	Long-tailed Jaeger	15	15	Breeding		0.9	Hunting populations in arctic North America space nests at least 0.9 kilometres apart (Wiley and Lee 1999).
Stercorarius parasiticus	Parasitic Jaeger	15	15	Breeding		0.9	Hunting populations in arctic North America space nests at least 0.9 kilometres apart (Wiley and Lee 1999).
Stercorarius parasiticus	Parasitic Jaeger	15	15	Migratory stopover			
Stercorarius pomarinus	Pomarine Jaeger	15	15	Breeding		0.9	Hunting populations of Parasitic Jaeger in arctic North America space nests at least 0.9 kilometres apart (Wiley and Lee 1999).
Strix occidentalis	Spotted Owl	15	15	Not applicable		2.7	Based on a small home range of 570 hectares for S. O. CAURINA (Thomas et al. 1990). Median home ranges for S. O. CAURINA vary from 571 hectares in California to 4019 hectares on the Olympic Peninsula of Washington State (Thomas et al. 1990). Mean home ranges for S. O. LUCIDA ranged from 242 hectares to 1180 hectares (Ganey and Balda 1989, USFWS 1993).
Aquila chrysaetos	Golden Eagle	20	20	Breeding	Where an occurrence is at least twice the size of a minimum A-ranked occurrence, it may be divided into two or more A-ranked occurrences along divisions that are narrower (or absent) than the separation distances given. The dividing lines should be made as much as possible along lines of limited eagle use; for example, along major urban areas or very wide bodies of water.	6	Based on a conservatively small home range of 30 square kilometers (see Separation Justification).
Aquila chrysaetos	Golden Eagle	20	20	Nonbreeding		6	Based on a conservatively small home range of 30 square kilometers (see Separation Justification in Breeding Location Use Class).
Caracara cheriway	Crested Caracara	20	20	Not applicable		6	Based on average home range width in Florida (Morrison 1996).
Delphinapterus leucas	Beluga	20	20	Nonbreeding			Not applicable.
Delphinapterus leucas	Beluga	20	20	Estuarine			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Falco mexicanus	Prairie Falcon	20	20	Breeding	Where an occurrence is at least twice the size of a minimum A-ranked occurrence, it may be divided into two or more A-ranked occurrences along divisions that are narrower (or absent) than the separation distances given. The dividing lines should be made as much as possible along lines of limited falcon use; for example, along major urban areas or very wide bodies of water.	8.7	Based on a relatively small home range of 59 square kilometers (Steenhof 1998).
Falco peregrinus	Peregrine Falcon	20	20	Breeding		8	Average foraging distance from nest (Brown and Amadon 1968).
Falco rusticolus	Gyrfalcon	20	20	Breeding		12	Radius of small foraging range.
Haliaeetus leucocephalus	Bald Eagle	20	20	Breeding	Where an occurrence is at least twice the size of a minimum A-ranked occurrence, it may be divided into two or more A-ranked occurrences along divisions that are narrower (or absent) than the separation distances given. The dividing lines should be made as much as possible along lines of limited eagle use; for example, along major urban areas, very high alpine ridges or very wide bodies of water.	2	No information found on actual feeding home ranges, but this distance is presented as a minimum.
Megaptera novaeangliae	Humpback Whale	20	20	Nonbreeding			
Monachus schauinslandi	Hawaiian Monk Seal	20	20	Breeding			
Monodon monoceros	Narwhal	20	20	Nonbreeding			
Monodon monoceros	Narwhal	20	20	Nursery area			
Pandion haliaetus	Osprey	20	20	Breeding		5	A conservative foraging range. See Separation Justification.
Stercorarius longicaudus	Long-tailed Jaeger	20	20	Migratory stopover			
Stercorarius pomarinus	Pomarine Jaeger	20	20	Migratory stopover			
Orcinus orca	Killer Whale	25	25	Not applicable			
Kogia breviceps	Pygmy Sperm Whale	30	30	Not applicable			
Kogia simus	Dwarf Sperm Whale	30	30	Not applicable			
Phoca largha	Spotted Seal	30	30	Breeding			
Phoca largha	Spotted Seal	30	30	Nonbreeding			
Sander vitreus	Walleye	30	30	Not applicable			
Cystophora cristata	Hooded Seal	50	50	Breeding			
Cystophora cristata	Hooded Seal	50	50	Nonbreeding			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Delphinapterus leucas	Beluga	50	50	Breeding			
Enhydra lutris	Sea Otter	50	50	Not applicable	Where an occurrence is at least twice the size of a minimum A-ranked occurrence, it may be divided into two or more A-ranked occurrences along divisions that are narrower (or absent) than the separation distances given. The dividing lines should be made as much as possible through regions of limited Sea Otter use.	16	Based on annual movements of females (Riedman and Estes 1990).
Erignathus barbatus	Bearded Seal	50	50	Not applicable			
Histriophoca fasciata	Ribbon Seal	50	50	Breeding			
Megaptera novaeangliae	Humpback Whale	50	50	Breeding			Not applicable.
Megaptera novaeangliae	Humpback Whale	50	50	Calving area			
Odobenus rosmarus	Walrus	50	50	Not applicable			
Pagophilus groenlandicus	Harp Seal	50	50	Breeding			
Pagophilus groenlandicus	Harp Seal	50	50	Nonbreeding			
Pusa hispida	Ringed Seal	50	50	Breeding			
Pusa hispida	Ringed Seal	50	50	Nonbreeding			
Trichechus manatus	West Indian Manatee	50	50	Not applicable	Major (A-ranked) occurrences can be separated along major watershed divides, including coastal areas adjacent to each watershed.	15	
Eubalaena glacialis	Right Whale	60	150	Nonbreeding			
Eubalaena glacialis	Right Whale	60	150	Migratory corridor			
Eubalaena glacialis	Right Whale	60	150	Calving area			
Eubalaena glacialis	Right Whale	60	150	Nursery area			Not applicable.
Physeter macrocephalus	Sperm Whale	100	100	Breeding			
Physeter macrocephalus	Sperm Whale	100	100	Nonbreeding			
Balaena mysticetus	Bowhead	150	150	Nonbreeding			
Acrocephalus familiaris	Millerbird			Not applicable	Each occupied island comprises one distinct occurrence.		
Aegolius acadicus pop. 1	Northern Saw-whet Owl - Southern Appalachians			Not applicable			
Agrotis carolina	A Moth			Not applicable			
Alces alces	Moose			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.	3.6	Based on a seasonal home range of 1000 hectares.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Anguilla rostrata	American Eel			Not applicable	Occupied locations in the same tributary are part of the same occurrence regardless of how far apart they are. Occupied locations in different tributaries are part of the same occurrence if they are within 5 stream-km of each other, regardless of the quaility of the habitat; otherwise they are treated as different occurrences.		
Antilocapra americana	Pronghorn			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.	8	Most herds have ranges with a diameter of 8 kilometers or more (Yoakum 1978).
Apyrrothrix araxes	Dull Firetip			Not applicable			
Atrytone arogos arogos	(Eastern) Arogos Skipper			Not applicable			
Bos bison	American Bison			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.		
Bufo boreas pop. 1	Western Toad - Southern Rocky Mountains			Not applicable	Occurrences are separated by 8 km within a common 1st, 2nd or 3rd order drainage, and by 5 km between drainages.	1	
Callophrys mossii	Moss' Elfin			Not applicable			
Canis latrans	Coyote			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low coyote density (e.g., major urban areas, very rugged alpine ridges, very wide bodies of water). These units may be based on available coyote sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with coyotes and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).	3.6	Based on a conservative home range of 10 square kilometers (see Separation Justification).

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Canis lupus	Gray Wolf			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low wolf density or use (e.g., major urban areas, very rugged alpine ridges, very wide bodies of water, very sparsely used habitats). These units may be based on available wolf sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with wolves and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).	16	This distance is appropriate for much of the southern portion of the wolf's range; based on a home range of 200 square kilometers. In Alaska and northern Canada, distances of 28 to 36 kilometers (representing home ranges of 600 to 1000 square kilometers) are more appropriate.
Canis rufus	Red Wolf			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low wolf density or use (e.g., major urban areas, very wide bodies of water, very sparsely used habitats) These units may be based on available wolf sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with wolves and their habitats.	11	Based on a home range of 100 square kilometers (see Separation Justification).
Catocala crataegi	Hawthorn Underwing			Not applicable			
Catocala herodias	Herodias Underwing			Not applicable			
Catocala neogama	The Bride Underwing			Not applicable			
Catocala piatrix	The Penitent Underwing			Not applicable			
Catocala pretiosa	Precious Underwing			Not applicable			
Cervus canadensis	Elk			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.		

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Chrysemys picta	Northern Painted Turtle			Not applicable	Separation distance across more or less continuously joined suitable aquatic or wetland habitat: 10 km. Separation distance for upland habitat: 3 km. Separation distance for intermediate situations: 5 km.	1	
Cicindela californica	California Tiger Beetle			Not applicable			
Cicindela denikei	Laurentian Tiger Beetle			Not applicable			
Cicindela depressula	Dispirited Tiger Beetle			Not applicable			
Cicindela hirticollis	Hairy-necked Tiger Beetle			Not applicable			
Cicindela limbalis	Common Claybank Tiger Beetle			Not applicable			
Cicindela limbata albissima	Coral Pink Dunes Tiger Beetle			Not applicable			
Cicindela ohlone	Ohlone Tiger Beetle			Not applicable			Not applicable
Cicindela oregona	Western Tiger Beetle			Not applicable			
Cicindela patruela consentanea	New Jersey Pine Barrens Tiger Beetle			Not applicable			
Cicindela tranquebarica	Oblique-lined Tiger Beetle			Not applicable			
Copablepharon fuscum	Sand-verbena Moth			Not applicable			
Cyclophora culicaria	A Geometrid Moth			Not applicable			
Danaus plexippus	Monarch			Not applicable			
Deirochelys reticularia	Chicken Turtle			Not applicable	Separation distance across continuous or mostly continuous suitable aquatic/wetland habitat: 3 km. Separation distance across continuous upland habitat: 1 km. Separation distance for intermediate situations: 2 km.	0.5	
Drasteria graphica	Graphic Moth			Not applicable			
Emys blandingii	Blanding's Turtle			Not applicable	Separation distances are as follows: continuous riverine-riparian corridors, 10 km; mosaics of aquatic-wetland and undeveloped upland habitat, 10 km; continuous, undeveloped upland habitat lacking aquatic or wetland habitat, 5 km; upland habitat with significant but not intense development (e.g., scattered buildings in otherwise "natural" habitat), 2 km. Other separation distances may be used when adequate site-specific data indicate	1	

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
					that these separation distances are inappropriate for a particular population. Any such deviations should be explained in the element occurrence record.		
Emys marmorata	Western Pond Turtle			Not applicable	Separation distance across continuous upland habitat: 1 km. Separation distance for locations along riverine corridors or more or less continuous aquatic/wetland habitat: 10 km. Separation distance for intermediate situations: 5 km.	1	
Erynnis persius	Persius Duskywing			Not applicable			
Eschrichtius robustus	Gray Whale			Breeding	Occurrences generally should be based on major occupied hydrographic or ecogeographic units that are separated along areas of relatively low whale density or use. To the extent possible, these units should be based on available observational records or on movements of radio-tagged individuals, but occurrence boundaries also may be determined by expert professional consensus.		
Eschrichtius robustus	Gray Whale			Nonbreeding	Occurrences generally should be based on major occupied hydrographic or ecogeographic units that are separated along areas of relatively low whale density or use. To the extent possible, these units should be based on available observational records or on movements of radio-tagged individuals, but occurrence boundaries also may be determined by expert professional consensus.		
Eschrichtius robustus	Gray Whale			Migratory corridor	Each migratory concentration corridor that is separated from other corridors by a gap of at least 50 km (measured perpendicular or parallel to the migration direction) should be treated as a separate occurrence.		
Euphilotes pallescens arenamontana	Sand Mountain Blue			Not applicable			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Euproserpinus euterpe	Kern Primrose Sphinx Moth			Breeding	All habitat patches within the single known remaining location are considered to represent one EO.		The entire habitat at the known site is the inferred extent regardless of where adults or larvae can be found in a particular year.
Glaucopsyche lygdamus xerces	Xerces Blue			Not applicable			
Glyptemys insculpta	Wood Turtle			Not applicable	Separation distance across continuous upland habitat: 1 km. Separation distance for locations along riverine corridors: 5 km. Separation distance for intermediate (e.g., mixed upland-riverine wetland) situations: 3 km. A riverine corridor is measured along the river, not as a straight line distance. It includes areas that have stream-influenced conditions (geomorphology, vegetation, hydrology). Upland habitat lacks hydric soils and stream-influenced conditions.	0.5	
Glyptemys muhlenbergii	Bog Turtle			Not applicable	Separation distance across continuous or mostly continuous suitable wetlands: 3 km. Separation distance for continuous upland habitat: 1.5 km. Separation distance for intermediate or mosaic upland-wetland habitat: 2 km. Palustrine wetland systems are considered suitable wetlands. 	0.2	
Gulo gulo	Wolverine			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low wolverine density or use. These units may be based on available sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with wolverines and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A). The dividing lines should be made as much as possible along lines of limited wolverine use; for example, along very rugged alpine ridges or	25	Based on a home range of about 500 square kilometers (see Separation Justification).

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
					very wide bodies of water.		
Gymnogyps californianus	California Condor			Not applicable	Each of the reintroduction areas should be treated as a single, separate occurrence.	20	A conservative figure (see Separation Justification).
Hemileuca maia	The Buckmoth			Not applicable			
Herpailurus yaguarondi	Jaguarundi			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low jaguarundi density or use. These units may be based on available sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with jaguarundis and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A). The dividing lines should be made as much as possible along lines of limited jaguarundi use (for example, along very wide bodies of water).	5	Set conservatively low; based on a female home range of 20 square kilometers (Konecny 1989).
Hesperia attalus attalus	Dotted Skipper			Not applicable			
Hesperia attalus nigrescens				Not applicable			
Hesperia attalus slossonae	Seminole Skipper			Not applicable			
Hyalophora columbia	Columbia Silkmoth, includes Glover's Silkmoth			Not applicable			
Hypomecis longipectinaria	A Moth			Not applicable			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Leopardus pardalis	Ocelot			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low ocelot density or use. These units may be based on available ocelot sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with ocelots and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).	2.5	Based conservatively on a male home range of 5 square kilometers.
Lithophane thujae	Northern White Cedar Lithophane			Not applicable			
Lontra canadensis	Northern River Otter			Not applicable	Occurrences generally should be based on major occupied hydrographic or ecogeographic units that are separated along areas of relatively low otter density or use. These units may be based on available sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with otters and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A). The dividing lines should be made as much as possible along lines of limited otter use.	12	An arbitrarily small distance, representing a small home range (See Separation Justification).
Loxia curvirostra pop. 1	Red Crossbill - Southern Appalachians			Not applicable			
Lycaena epixanthe	Bog Copper			Not applicable			
Lycia rachelae	Twilight Moth			Not applicable			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Lynx canadensis	Canada Lynx			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low lynx density or use (e.g., major urban areas, very rugged alpine ridges, very wide bodies of water). These units may be based on available lynx sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with lynx and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).	6	Based on a home range of 30 square kilometers.
Lynx rufus	Bobcat			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low bobcat density or use (e.g., major urban areas, very rugged alpine ridges, very wide bodies of water, sparsely used habitats). These units may be based on available bobcat sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with bobcats and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).	2.5	Based on a home range of 5 square kilometers. In the northwest, this distance may be increased to 7 kilometers, based on larger home ranges there (Bailey 1974).
Malaclemys terrapin	Diamondback Terrapin			Not applicable	Separation distance for suitable habitat: 10 km. Separation distance for unsuitable habitat: 1 km. However, for convenience, nesting populations on separate islands or mainland areas can be treated as distinct occurrences, regardless of	1	

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
					their proximity to other islands or to mainland.		
Metarranthis amyrisaria				Not applicable			
Metarranthis apiciaria	A Metarranthis Moth			Not applicable			
Metarranthis pilosaria	Coastal Bog Metarranthis			Not applicable			
Morone chrysops	White Bass			Not applicable	Use a separation distance of 10 km 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 10-km separation distance without evaluating seasonal changes in habitat use).		
Nasua narica	White-nosed Coati			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low coati density or use. These units may be based on available sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with coatis and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A). The dividing lines should be made as much as possible along lines of limited coati use.	0.94	Based on a small home range in Arizona of 70 hectares (Kaufmann et al. 1976).
Neonympha helicta	Helicta Satyr			Not applicable			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Neonympha mitchellii	Mitchell's Satyr			Not applicable	Separation distance is moot for subspecies MITCHELLII, including probably Virginia occurrences. See subspecies SPECs.	0.2	For now it seems very prudent to be conservative and not assume any newly found occurrences are large even for subspecies FRANCISCI until they are better studied. Unlike most butterflies it is definitely not clear that this species can be expected to fully occupy what seems to be suitable habitat, and there have been claims that it does not. In fact adults may be very reluctant to move away from trees or tall thickets as are those on N. A. SEPTENTRIONALIS. In most cases initial inferred extent will be the immediate sedge meadow at the point of observation which will usually be only a few hectares.
Odocoileus hemionus	Mule Deer			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.	2.5	Based on a home range of 500 hectares (McCullough, in Wilson and Ruff 1999).
Odocoileus virginianus	White-tailed Deer			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.	1	Based on a 'typical' home range of 90-100 hectares.
Oeneis jutta	Jutta Arctic			Not applicable			
Oeneis melissa semidea	White Mountain Butterfly			Not applicable			
Oreamnos americanus	Mountain Goat			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.	3	Based on a home range of about 7 square kilometers.
Ovibos moschatus	Muskox			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.		
Ovis canadensis	Bighorn Sheep			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.		

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Ovis dalli	Dall's Sheep			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.		
Panthera onca	Jaguar			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low jaguar density or use. These units may be based on available sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with jaguars and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).	5.6	Based on a small home range of 25 square kilometers (see Kitchener 1991).
Phaeognathus hubrichti	Red Hills Salamander			Not applicable	Separation distance for unsuitable habitat: 1 km Separation distance for apparently suitable habitat (e.g., at least some slopes 15 degrees, siltstone outcroppings, mesic deciduous forest): 2.5 km Separation distance for apparently suitable but unsurveyed habitat: 5 km	0.2	
Phalaropus fulicarius	Red Phalarope			Not applicable			
Poanes viator	Broad-winged Skipper			Not applicable			
Polyodon spathula	Paddlefish			Not applicable	Generally each major occupied river should be treated as a single occurrence, unless there is a barrier across which movement appears to be absent or negligible. If available, information on the movements or recapture locations of tagged individuals should be used to determine the boundaries of an occurrence. In the absence of adequate data, the best professional judgment of regional fish biologists may be used to delineate occurrences.		

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Ptychocheilus lucius	Colorado Pikeminnow			Not applicable	For extant occurrences, use radiotelemetry data and recaptures of tagged individuals to determine the extent of occurrences.		
Puma concolor	Puma			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low puma density or use. These units may be based on available sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with pumas and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).	7	Based arbitrarily on a relatively small home range of 40 square kilometers.
Rangifer tarandus	Caribou			Not applicable	Occurrence separations should be based on populations that exhibit specific migration patterns, or on appropriate resource agency management units, rather than on specific prescribed distances.		Not applicable; most herd boundaries are well enough known to be mapped without using an Inferred Extent feature.
Salvelinus namaycush	Lake Trout			Not applicable	In most cases, except the largest lakes, each occupied lake represents a single, separate occurrence, unless movement between lakes is known, in which case an occurrence may encompass multiple lakes. The entire lake should be mapped as the occurrence, unless there is information indicating that certain areas are not used. In the largest lakes, use a separation distance of 200 km.		
Satan eurystomus	Widemouth Blindcat			Not applicable	Each separate hydrological system is treated as a distinct occurrence. Because all collections are from one system (San Antonio Pool of the Edwards Aquifer) they are treated as a single occurrence.		
Speyeria idalia idalia	Regal Fritillary			Not applicable			
Spilosoma dubia				Not applicable			
Synanthedon castaneae	Chestnut Clearwing Moth			Not applicable			
Syngrapha microgamma				Not applicable			

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
Trachemys scripta	Slider			Not applicable	Separation distance along riverine corridors: 20 stream km. Separation distance for mixture or mosaic of upland and aquatic/wetland habitat: 10 km. Separation distance for upland habitat: 3 km.	1	
Trogloglanis pattersoni	Toothless Blindcat			Not applicable	Each separate hydrological system is treated as a distinct occurrence. Because all collections are from one system (San Antonio Pool of the Edwards Aquifer) they are treated as a single occurrence.		
Urocyon littoralis	Island Gray Fox			Not applicable	Each island is considered a separate single occurrence.	0.6	Based on a 30-hectare home range.
Ursus americanus	American Black Bear			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low bear density or use (e.g., major urban areas, very rugged alpine ridges, very wide bodies of water). These units may be based on available bear sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with bears and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).	3.5	Home ranges vary considerably in size. This distance based on a conservatively small male home range of 1000 hectares (see Separation Justification).
Ursus arctos	Brown Bear			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated by areas of relatively low bear density or use (e.g., major urban areas, very rugged alpine ridges, very wide bodies of water) These units may be based on available bear sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with bears and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may	10	Set conservatively low, based on an individual home range of 8000 hectares. Extent of viable populations will be much, much larger. In the northern interior of North America, inferred extents of 23 kilometers (home range of 40,000 hectares) can be used.

		Separation Distance					
Scientific Name	**Common Name**	**Unsuitable Habitat**	**Suitable Habitat**	**Location Use Class**	**Alternate Separation Procedure**	**IE**	**Inferred Extent Notes**
					be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).		
Ursus maritimus	Polar Bear			Not applicable	Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low bear density or use. These units may be based on available sightings/records or on movements of radio-tagged individuals (e.g., Bethke et al. (1996) used satellite radio-collar locations to identify three discrete polar bear subpopulations in the western Canadian Arctic), or they may be based on the subjective determinations by biologists familiar with polar bears and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A). The dividing lines should be made as much as possible along lines of limited polar bear use.		Use of inferred extent probably not appropriate for this wide-ranging species.
Vaga blackburni	Hawaiian Blue			Not applicable			
Vanessa tameamea	Kamehameha			Not applicable			
Xestia elimata	Southern Variable Dart Moth			Not applicable			
Xyrauchen texanus	Razorback Sucker			Not applicable	Occurrences are based on population-specific radio-tracking and recapture data.		