

## **Appendix II. Species Occurrence Area Justifications.**

The Species Occurrence Area (SOA) Justifications describe how SOAs are generated for each source feature species-feature label combination extracted from the Biotics database. The justifications also provide a review of the peer-reviewed scientific literature and/or information obtained through ENSP research that was used to support the occurrence area polygon size. The SOA justifications are sorted alphabetically by class. Use the bookmarks in this document to navigate to particular species-feature label combinations.

Terms used in the SOA justifications are defined below.

**SpcFLID** - A unique ID for each species/feature label combination.

**LUC** - Location Use Class. A label used for aerial and marine migrants that occupy disjunct locations by season (i.e. breeding or nonbreeding). Applies to migratory species only.

**Feature Label** - A label assigned to each occurrence that describes the occurrence type (i.e. nest, den, dead on road, etc.).

**Buffer Size** - The radius applied to the point, line, or polygon source feature extracted from the Biotics database to generate the Species Occurrence Area (SOA).

**Species Occurrence Area (SOA)** - A polygon specific to each species-feature label combination that is applied to all occurrences in the Biotics database and that is used to value habitat in the Landscape Project. The area of the polygon is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in New Jersey. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25m radius) is applied to take into account locational uncertainty.

**Point Rule** - The action applied to source feature points extracted from Biotics to generate the SOA.

**Line Rule** - The action applied to source feature lines extracted from Biotics to generate the SOA.

**Poly Rule** - The action applied to source feature polygons extracted from Biotics to generate the SOA.

**LP** - Yes/No as to whether source features with a given species/feature label combination are to be incorporated in the Landscape Project mapping.

## ***Amphibia***

### ***Blue-spotted Salamander***

#### ***Ambystoma laterale***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4748 N/A	On Road	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4749 N/A	Vernal Pool Breeding	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4750 N/A	Non-breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4751 N/A	Vernal Pool Non-breeding	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
8378 N/A	Occupied Habitat	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

Vernal habitats are utilized by a wide variety of amphibian species. A single vernal habitat and its surrounding upland component serve as critical habitat for a diversity of Ambystomid salamanders, including *A. laterale*. ENSP has determined that a buffer of 300 meters for both breeding (vernal habitat) and non-breeding (upland component) habitat provides protection for a high percentage of the species year-round range. The majority of Ambystomid salamanders breed in vernal pools in the spring for a limited number of weeks and then return to the uplands for the remainder of the year. Occurrences designated as non-breeding will mostly occur within 300 meters of a breeding habitat and therefore the occurrence area radii are the same for both feature labels.

#### **Literature:**

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**Bishop, S. C. 1941. The Salamanders of New York. Bulletin 324. Albany, NY: The New York State Museum.**

Dispersals recorded past 250 m away from suitable breeding habitats.

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**Brown, L.J. and R.R. Jung. 2005. An Introduction to Mid-Atlantic Seasonal Pools, EPA/903/B-05/001. U.S. Environmental Protection Agency, Mid-Atlantic Integrated Assessment, Ft. Meade, Maryland. Page 10.**

Seasonal pool terrestrial habitat buffer recommendation.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

Inferred minimum extent of habitat use for this species is 300 meters.

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**Regosin, J.V., B.S. Windmiller, R.N. Homan, and J.M. Reed. 2005. Variation in terrestrial habitat use among four pool-breeding amphibian species and its conservation implications. *Journal of Wildlife Management* 69:1481-1493.**

Dispersal of > 100 meters by 52% of a blue-spotted salamander population.

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**Semlitsch, R. D., and J. R. Bodie. 2003. Biological Criteria for Buffer Zones around Wetlands and Riparian Habitats for Amphibians and Reptiles. *Conservation Biology* 17(5): 1219-1228.**

Documents home ranges surrounding breeding sites up to 290 meters.

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**Williams, P.K. 1973. Seasonal movements and population dynamics of four sympatric mole salamanders, genus *Ambystoma*. Unpublished PhD. dissertation, Indiana University.**

Documents dispersal distances of various Ambystomid salamanders.

**Last researched by:** Zarate

**Date researched:** 1/1/2006

## ***Amphibia***

### ***Carpenter Frog***

#### ***Lithobates virgatipes***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5083	N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5084	N/A	Vernal Pool Non-breeding	Need Update	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5085	N/A	On Road	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5086	N/A	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5087	N/A	Occupied Habitat	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5088	N/A	Vernal Pool Breeding	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25 meter radius) is applied to take into account location uncertainty. These occurrence areas are used to value patches of habitat.

#### **Literature:**

N/A

N/A

**Last researched by:** Zarate

**Date researched:** 1/1/2007

## Amphibia

### Cope's Gray Treefrog

#### *Hyla chrysoscelis*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4919	N/A	Non-breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4920	N/A	Vernal Pool Breeding	300 Meter Buffer from Pool Edge	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4921	N/A	Vernal Pool Non-breeding	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4923	N/A	Occupied Habitat	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4924	N/A	Breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
7956	N/A	On Road	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

All grasslands, wetlands, and upland forests within 300 m of the pond edge are considered to be critical habitat for this species. Sightings of Cope's gray treefrogs made outside of the breeding period are also buffered by 300 m.

This species is typically associated with wetlands and ponded areas during the breeding season, but is capable of making long distance movements through upland habitats. Breeding habitats include borrow pits, ditches, vernal pools, detention basins, and other natural and human-made ponded areas (Zappalorti 2002). In their 2003 study, Johnson and Semlitsch suggest that a minimum core habitat of 60 m is need around breeding ponds to protect local populations of northern gray treefrogs. Movement distances of up to 200 m were observed in this study. One New Jersey study used radio-telemetry methodologies to determine daily movement distance of Cope's gray treefrogs. This study found that treefrogs were capable of moving long distances from breeding habitats, with one individual traveling a straight line distance of 401 m in a four-day period (Golden, unpublished data). Mean daily movement distances for Cope's gray treefrogs in this study were 32 m during the breeding season and 9 m outside of the breeding season. Regular movements of 100 m during the breeding season were observed in one study from Tennessee (Ritke et al. 1991).

#### Literature:

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**Johnson, JR and RD Semlitsch. 2003. Defining core habitat of local populations of gray treefrog (*Hyla versicolor*) based on choice of oviposition site. *Oecologia* 137:205-210.**

N/A

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**Ritke, ME, JG Babb, and MK Ritke. 1991. Breeding-site specificity in the gray treefrog (*Hyla chrysoscelis*). *Journal of Herpetology* 25:123-125.**

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**Zappalorti, RT. 2002. Ecology and breeding habits of Cope's gray treefrog (*Hyla chrysoscelis*) in the coastal Pine Barrens of southern New Jersey. Unpublished report to NJDEP, Division of Fish and Wildlife by Herpetological Associates.**

**Last researched by:** Golden

**Date researched:** 1/1/2007

## Amphibia

### Eastern Tiger Salamander

#### *Ambystoma tigrinum tigrinum*

SpC/LID	F LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4907	N/A	Non-breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4908	N/A	Vernal Pool Breeding	300 Meter Buffer from Pool Edge	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
4909	N/A	Vernal Pool Non-breeding	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4910	N/A	On Road	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
8380	N/A	Occupied Habitat	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

All emergent habitat types (forest, wetland forest, emergent wetland and adjacent barren land) within 300 m of a pond edge are designated as critical habitat. In the brief "non-breeding" period, those habitats within 300 m of a sighting are designated as critical habitat.

Large terrestrial areas adjacent to wetlands are used by adult pond-breeding salamanders and newly metamorphosed juveniles through the majority of the year. Semlitsch and Bodie (2003) identified a "core habitat" for amphibians of 290 m from the wetland edge. They based this figure on studies that found adult tiger salamanders move up to 300 m from breeding ponds (Semlitsch 1983, Madison and Farrand 1998). Salamanders tracked by radio-telemetry made all movements within 300 m of the breeding pond; the greatest movements were by those animals tracked the longest (Madison and Farrand 1998). They found salamanders moved in all directions within wooded areas, but avoided grassy fields, paved roads, and commercial areas. Habitat within 300 m of the pond is critical to survival: for a related species, marbled salamander (*A. opacum*), upland survival is much better in forested habitat than in old-field (Taylor et al. 2005). In NJ, many breeding ponds are located in abandoned sand/gravel pits where the 300 m area includes some barren land cover type.

Tiger salamanders found >300 m from a breeding pond in the non-breeding season (8/1-9/30) may represent movement between ponds, and the habitat should be considered a corridor for interaction of nearby populations.

#### Literature:

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**Madison, D.M., and L. Farrand. 1998. Habitat use during breeding and emigration in radio-implanted tiger salamanders, *Ambystoma tigrinum*.**

N/A

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**Semlitsch, R. D. 1983. Burrowing ability and behavior of salamanders of the genus Ambystoma. Canadian Journal of Zoology 61:616-620.**

N/A

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**Semlitsch, R. D., and J. R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibians and reptiles. Conservation Biology 17:1219-1228.**

N/A

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**Taylor, B. E., D. E. Scott, and J. W. Gibbons. 2005. Catastrophic reproductive failure, terrestrial survival, and persistence of the marbled salamander. Conservation Biology 20:792-801.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2007



## ***Amphibia***

### ***Fowler's Toad***

#### ***Anaxyrus fowleri***

SpC/LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5128	N/A	Vernal Pool Breeding	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5129	N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5130	N/A	Vernal Pool Non-breeding	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5131	N/A	Occupied Habitat	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5132	N/A	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
7960	N/A	On Road	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25 meter radius) is applied to take into account location uncertainty. These occurrence areas are used to value patches of habitat.

#### **Literature:**

N/A

N/A

**Last researched by:** Zarate

**Date researched:** 1/1/2007

## ***Amphibia***

### ***Jefferson Salamander***

#### ***Ambystoma jeffersonianum***

SpC/LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5077 N/A	Non-breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5078 N/A	Vernal Pool Breeding	300 Meter Buffer from Pool Edge	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5079 N/A	Vernal Pool Non-breeding	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5080 N/A	On Road	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
8381 N/A	Occupied Habitat	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

Vernal habitats are utilized by a wide variety of amphibian species. A single vernal habitat and its surrounding upland component serve as critical habitat for a diversity of Ambystomid salamanders, including *A. jeffersonianum*. ENSP has determined that a buffer of 300 meters for both breeding (vernal habitat) and non-breeding (upland component) habitat provides protection for a high percentage of the species year-round range. The majority of Ambystomid salamanders breed in vernal pools in the spring for a limited number of weeks and then return to the uplands for the remainder of the year. Occurrences designated as non-breeding will mostly occur within 300 meters of a breeding habitat and therefore the occurrence area radii are the same for both feature labels.

#### **Literature:**

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**Bishop, S. C. 1941. The Salamanders of New York. Bulletin 324. Albany, NY: The New York State Museum.**

Dispersals recorded as far as 1,610m away from suitable breeding habitats.

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**Brown, L.J. and R.R. Jung. 2005. An Introduction to Mid-Atlantic Seasonal Pools, EPA/903/B-05/001. U.S. Environmental Protection Agency, Mid-Atlantic Integrated Assessment, Ft. Meade, Maryland. Page 10.**

Seasonal pool terrestrial habitat buffer recommendation.

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**Faccio, S. D. 2003. Postbreeding emigration and habitat use by Jefferson and spotted salamanders in Vermont. Journal of Herpetology 37:479-489.**

Documents dispersal distances up to 355m in one movement and macro habitat preferences.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

Inferred minimum extent of habitat use for this species is 300 meters.

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**Semlitsch, R. D., and J. R. Bodie. 2003. Biological Criteria for Buffer Zones around Wetlands and Riparian Habitats for Amphibians and Reptiles. Conservation Biology 17(5): 1219-1228.**

Documents home ranges surrounding breeding sites up to 290 meters.

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**Williams, P.K. 1973. Seasonal movements and population dynamics of four sympatric mole salamanders, genus *Ambystoma*. Unpublished PhD. dissertation, Indiana University.**

Documents dispersal distances of various Ambystomid salamanders.

**Last researched by:** Zarate

**Date researched:** 1/1/2006

## ***Amphibia***

### ***Longtail Salamander***

#### ***Eurycea longicauda longicauda***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4911	N/A	Non-breeding Sighting	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4912	N/A	Vernal Pool Non-breeding	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4913	N/A	On Road	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4914	N/A	Occupied Habitat	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4915	N/A	Breeding Sighting	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4916	N/A	Vernal Pool Breeding	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

Very little primary literature exists on the life history of *Eurycea l. longicauda*. Much of the information we know about *E. longicauda* derives from the occurrence data in ENSP's Biotics Database. Ongoing research and personal observations have also contributed to the development of the current occurrence area.

#### **Literature:**

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**Anderson and Martino. 1966. The Life History of *Eurycea l. longicauda* Associated with Ponds. *The American Midland Naturalist* 75(2): 257-279.**

A unique association of *E. longicauda* with limestone sink ponds, also breeding areas for Ambystomid salamanders, exists in New Jersey.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

Inferred minimum extent of habitat use for this species is 100 meters.

**Last researched by:** Zarate

**Date researched:** 1/1/2006

## ***Amphibia***

### ***Marbled Salamander***

#### ***Ambystoma opacum***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5073 N/A	Vernal Pool Breeding	300 Meter Buffer from Pool Edge	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5074 N/A	Vernal Pool Non-breeding	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5075 N/A	Non-breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5076 N/A	On Road	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
8382 N/A	Occupied Habitat	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

Vernal habitats are utilized by a wide variety of amphibian species. A single vernal habitat and its surrounding upland component serve as critical habitat for a diversity of Ambystomid salamanders, including *A. opacum*. ENSP has determined that a buffer of 300 meters for both breeding (vernal habitat) and non-breeding (upland component) habitat provides protection for a high percentage of the species year-round range. The majority of Ambystomid salamanders breed in vernal pools in the spring for a limited number of weeks and then return to the uplands for the remainder of the year. Marbled salamanders, on the other hand, breed in the fall at vernal pools. Occurrences designated as non-breeding will mostly occur within 300 meters of a breeding habitat and therefore the occurrence area radii are the same for both feature labels.

#### **Literature:**

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**Brown, L.J. and R.R. Jung. 2005. An Introduction to Mid-Atlantic Seasonal Pools, EPA/903/B-05/001. U.S. Environmental Protection Agency, Mid-Atlantic Integrated Assessment, Ft. Meade, Maryland. Page 10.**

Seasonal pool terrestrial habitat buffer recommendation.

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**Gamble, L.R., McGarigal, K., Jenkins, C.L., and Timm, B.C. 2006. Limitations of regulated "buffer zones" for the conservation of marbled salamanders. Wetlands 26(2):298-306.**

Documents dispersals up to 1,230 meters by marbled salamanders.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

Inferred minimum extent of habitat use for this species is 300 meters.

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**Semlitsch, R. D., and J. R. Bodie. 2003. Biological Criteria for Buffer Zones around Wetlands and Riparian Habitats for Amphibians and Reptiles. Conservation Biology 17(5): 1219-1228.**

Documents home ranges surrounding breeding sites up to 290 meters.

---

**Williams, P.K. 1973. Seasonal movements and population dynamics of four sympatric mole salamanders, genus *Ambystoma*. Unpublished PhD. dissertation, Indiana University.**

Documents dispersal distances of various Ambystomid salamanders, including *A. opacum*, outwards to 450m.

**Last researched by:** Zarate

**Date researched:** 1/1/2006

## ***Amphibia***

### ***Northern Spring Salamander***

#### ***Gyrinophilus porphyriticus porphyriticus***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5081	N/A	Occupied Habitat	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5082	N/A	On Road	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25 meter radius) is applied to take into account location uncertainty. These occurrence areas are used to value patches of habitat.

#### **Literature:**

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N/A

N/A

**Last researched by:** Zarate

**Date researched:** 1/1/2007

## ***Amphibia***

### ***Pine Barrens Treefrog***

#### ***Hyla andersonii***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4925	N/A	Vernal Pool Breeding	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4926	N/A	Occupied Habitat	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4927	N/A	On Road	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4928	N/A	Vernal Pool Non-breeding	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4929	N/A	Non-breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4930	N/A	Breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

All wetlands, and upland forests within 300 m of the pond edge are considered to be critical habitat for this species. Sightings made outside of the breeding period are also buffered by 300 m.

Breeding habitats for this species are documented to consist of bogs, vernal pools, cedar swamps, and pitch pine lowlands (Means and Longden 1976). Common plant communities associated with breeding ponds contain red maple (*Acer rubrum*), pitch pine (*Pinus rigida*), leatherleaf (*Chamaedaphne calyculata*), fetterbush (*Eubotrys racemosa*), sheep laurel (*Kalmia angustifolia*), and highbush blueberry (*Vaccinium corymbosum*) (Laidig et al. 2001). Mean water depths of 13 Pine Barrens treefrog breeding ponds studied by Laidig et al. (2001) in the New Jersey Pinelands ranged from 30 to 65 cm. The maximum water depth of the same 13 ponds ranged from 55 to 124 cm. While research on the movements of Pine Barrens treefrogs is quite limited, one study found individuals of this species stayed within 72 m of the breeding pools during the breeding season (Freda and Gonzalez 1986). Dispersal distances were slightly higher outside of the breeding season (up to 102 m), but still less than the documented dispersal distances of related species (Johnson and Semlitsch 2003, Golden unpublished data). Because of the small sample size (n=8) of the Freda and Gonzalez study, a buffer distance for sightings on this species were adapted from data published on other treefrog specie

#### **Literature:**

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**Johnson, JR and RD Semlitsch. 2003. Defining core habitat of local populations of gray treefrog (*Hyla versicolor*) based on choice of oviposition site. *Oecologia* 137:205-210.**



N/A

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**Laidig, KJ, RA Zampella, JF Bunnell, CL Dow, and TM sulikowski. 2001. Characteristics of selected Pine Barrens treefrog pones in the New Jersey Pinelands. Unpublished reports by the New Jersey Pinelands Commission.**

N/A

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**Means, DB and CJ Longden. 1976. Aspects of the biology and zoogeography of the Pine Barrens treefrog (*Hyla andersonii*) in northern Florida. *Herpetologica* 32:117-130.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2007

## Aves

### *American Bittern*

### *Botaurus lentiginosus*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4729 Breeding	Nest	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4730 Breeding	Foraging	Need Update	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4731 Breeding	Breeding Sighting	Need Update	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4732 Breeding	Breeding Sighting-Confirmed	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4733 Breeding	Roosting Area	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4734 Non-Breeding	Non-breeding Sighting	Need Update	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

A study in Minnesota determined that the average home range of males and females differed considerably. Males averaged 415 ha while females averaged 337 ha (Brininger 1996). A second study, also conducted in Minnesota, found a significantly smaller average home range (males only) of 127 ha (n=20). However, the average core area (where the bittern was found more than 50% of the time) was only 25 ha (Azure 1998). These two studies led NatureServe to apply a minimum inferred extent of 0.5 km (NatureServe 2006). ENSP will use the NatureServe minimum inferred extent of 0.5 km until such time as that is changed or we have additional information, including New Jersey-specific data, to justify a change in this value.

#### Literature:

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**Azure. 1998. Aspects of American bittern ecology in northwestern Minnesota. MS thesis. University of North Dakota, Grand Forks, North Dakota. 139 pgs.**

In a Minnesota study where n=20, the average home range of males was 127 ha. The average size of the core use area (defined as the area of the home range where the bittern was located >50% of the time) was 25 ha.

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**Brininger. 1996. The ecology of the American bittern in northwest Minnesota. MS thesis/ St. Cloud State University, St. Cloud, MN, USA.**

In Minnesota, the average home range of males was 415 ha. The average female home range was 337 ha.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application).  
Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

The inferred minimum extent of habitat use (when actual extent is unknown) is 0.5 km. This is based on an average core home range of 25 ha (Azure 1998). Include only the nesting marsh within the boundaries of the inferred extent polygon.

**Last researched by:** Davis

**Date researched:** 7/1/2006

## Aves

### American Kestrel

#### *Falco sparverius*

SpC/LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5182	N/A	Breeding Sighting	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5184	N/A	Nest	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5185	N/A	Non-breeding Sighting	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

This species has small breeding territories but are area sensitive. The buffer was chosen based on breeding territory size and increased for the species' mobility and need for large patches. Until more is discovered about the mobility of the species, a 100 meter radius buffer will be used.

#### Literature:

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**Smallwood, J. A., and D. M. Bird. 2002. American Kestrel (*Falco sparverius*). In *The Birds of North America*, No. 602 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA***

Tend to occupy areas > 25 ha in size. Little information is available on breeding territory size, but estimates from breeding densities indicate territories may range from 0.5 - 1 ha.

Migratory stopover habitat consists of open patches. Wintering habitat is similar to breeding habitat but with more woody vegetation. Winter territories range from 1.4 - 3.5 km.

**Last researched by:** Petzinger

**Date researched:** 1/1/2006

## Aves

### American Oystercatcher

#### *Haematopus palliatus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5237	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5238	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5239	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5240	Breeding	Nesting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5241	Breeding	Nest	750 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

There is very little information available for home ranges and foraging commutes of American oystercatchers. Nol and Humphrey (1994) report that feeding areas may be further than 1600 m from nesting areas. Tom Virzi of Rutgers University (Virzi 2008) reports that he has observed foraging adults up to 1 km, and rarely up to 2 km, from their nesting sites. NatureServe recommends a buffer of 1.5 km when actual extent is unknown (NatureServe 2007). ENSP will use the NatureServe minimum inferred extent of 1.5 km until such time as that is changed or we have additional information, including New Jersey-specific data, to justify a change in this value.

#### Literature:

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: June 4, 2007 ).**

The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 1.5 km.

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**Nol, E. and R. C. Humphrey. 1994. American Oystercatcher (*Haematopus palliatus*). In *The Birds of North America*, No. 82 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.**

Feeding territories may be in excess of 1,600 m from breeding territories. Maximum distance observed traveling during breeding season in Massachusetts about 3 km.

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**Virzi, T. 2008. Effects of urbanization on the distribution and reproductive performance of the American oystercatcher (*Haematopus palliatus palliatus*) in coastal New Jersey.**

**Unpublished doctoral dissertation, Rutgers University, New Brunswick.**

**Last researched by:** Davis

**Date researched:** 1/1/2007

## Aves

### Bald Eagle

#### *Haliaeetus leucocephalus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4871	N/A	Roosting Area	Hand Digitized Polygon	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4872	N/A	Concentration Area	Hand Digitized Polygon	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4873	N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4874	N/A	Foraging	Bald Eagle Foraging Model	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4875	N/A	Nest	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4876	N/A	Breeding Sighting	Need Update	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
8358	N/A	Wintering	250 foot radius buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

All habitats (forest, field, wetlands) within 1 km of a nest are designated as critical habitat for bald eagles. Home range size for nesting bald eagles is variable depending on the habitat resources of the area such as food abundance, distance to adequate foraging habitat, etc (Stalmaster 1987, Therres, et al. 1993, Buehler 2000, Harmata and Montopoli 2001). Successful and continued occupancy of a nest site by eagles is also influenced by distance to human disturbance often associated with residential housing, roads, extractive industries (mining, timber) and others. The 1 km radius for nest site habitat protection equals approximately 3 km<sup>2</sup> of area. This is one-third larger than what may be the mean territory size (summarized in Buehler 2000), though local data are lacking.

Bald eagle foraging habitat is defined as the amount of habitat required to support a nesting pair of eagles throughout the year, as breeding bald eagles are year-round residents in NJ. Bald eagles hunt in open water for fish, waterfowl and other aquatic species, but usually do so from perches along the water's edge (Stalmaster 1987). The model calculates open water area by increasing the radius around each nest incrementally one cell (30 m) at a time until an area of 660 ha of foraging habitat has been identified. Foraging habitat is defined as all open water bodies greater than 8 ha. A 90 m buffer is applied to the identified waters to protect perching sites. All suitable habitat patches (i.e., forest and forested wetlands) that intersect with the foraging habitat and 90 m buffer are designated as critical for eagles.

Wintering sites were identified using specific Eagle Midwinter Survey data and biologist interpretation of essential habitat, as well as recorded sightings of eagles during the winter period of November 1-January 31. Patches of suitable habitat (forest, forested wetlands, and open waters) within 500 meters of each site are designated as critical habitat. This habitat designation was not applied in Landscape Version 1 or 2, but will be included in Landscape Version 3. The Wintering feature label was not used in Highlands's release of version 3.0.

From *Birds of North America* (Buehler 2000): Estimates of territory size (defended part of home range) vary widely based on nesting density, food supply, and method of measurement. Most reliable estimates based on radio-telemetry are limited. Stalmaster (1987) suggested 1–2 km<sup>2</sup> as typical territory size. Average territory radius (n = 10) was 590 m in Minnesota, as measured by presentation of decoy bird to elicit defensive reactions (Mahaffy and Frenzel 1987). Assuming circular territories, average territory size was about 1 km<sup>2</sup>. Minimum territory size was 4 km<sup>2</sup> for radio-tagged pair in Saskatchewan (Gerrard et al. 1992b). Spacing: About 1 nest/1.6 km of shoreline reported historically on Chesapeake Bay (Kirkwood 1895).

## Literature:

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**Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). In *The Birds of North America*, No. 506 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.**

N/A

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**Harmata, A. R., and G. J. Montopoli. 2001. Analysis of bald eagle spatial use of linear habitat. *J. Raptor Res.* 35(2):207-213.**

Primary foraging areas may need protection to maintain performance of eagles nesting along rivers.

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**Stalmaster, M. V. 1987. *The Bald Eagle*. Universe Books, New York. 227 p. Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). In *The Birds of North America*, No. 506 (A. Poole and F. Gill, eds.). The Birds of North America Inc., Philadelphia, PA.**

Home range sizes are variable (in Florida, 2–8 km<sup>2</sup>, larger in other areas, as small as 1 km<sup>2</sup> in some). Minimum territory size in Saskatchewan was 4 km<sup>2</sup> (Gerrard et al. 1992, in Buehler 2000). Wintering habitat is defined by food availability, presence of roost sites that provide protection from weather and absence of human disturbance (Buehler 2000).

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**Therres, G. D., M. A. Byrd, D. S. Bradshaw. 1993. *Transactions of the North American Wildlife and Natural Resources Conference*, 58:62-69.**

The effects of development activities on nesting bald eagles depend on the distance of the activities from the nest, the view the eagles have of the activities and the time of year the development occurs. Other factors that may contribute include the nesting history of the eagles, the birds' previous experience with humans, the availability of alternative nest sites and the amount of development in the area.

**Last researched by:** Clark

**Date researched:** 1/1/2006



## Aves

### Barn Owl

#### *Tyto alba*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5192 N/A	Breeding Sighting	1500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5193 N/A	Breeding Sighting-Confirmed	1500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5197 N/A	Non-breeding Sighting	1500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The breeding buffer was chosen based upon the average home range size of 717 ha in NJ (Marti et al. 2005). This species is highly mobile and essentially use the same wintering habitat as breeding habitat (Marti et al. 2005), so the nonbreeding buffer was chosen to be the same as the breeding buffer.

#### Literature:

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**Marti, C.D., A.F. Poole, and L.R. Bevier. 2005. Barn Owl (*Tyto alba*). In *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Laboratory of Ornithology; Retrieved from [http://bna.birds.cornell.edu/BNA/account/Barn\\_Owl/](http://bna.birds.cornell.edu/BNA/account/Barn_Owl/).**

Immatures disperse widely in all directions from the natal site at distances up to 1,900 km (Stewart 1952, Soucy 1980, Marti 1999). Dispersal distances for individuals banded as nestlings in Utah ranged from 1-1,267 km (mean = 102.9 km  $\pm$  162.03 SD); females banded as nestlings bred at distances on average of 61.4 km  $\pm$  52.04 from their natal site, significantly farther than males (mean = 35.7 km  $\pm$  36.61) (Marti 1999). One nestling banded in an Ohio nest was recovered 1,070 km to the northeast while its nest mate was found 800 km to the southeast (Dexter 1957). Dispersal of young in all compass directions also detected in Europe (Glutz von Blotzheim 1979, Bairlein 1985, Matics 2003). Time of fledging did not influence the direction of dispersal in Hungary and the sexes did not differ in direction of dispersal (Matics 2003). Direction of dispersal was strongly affected by major topographic features in Utah (Marti 1999).

#### Fidelity To Breeding Site And Winter Home Range

Typically nest at the same site as long as they live (Colvin et al. 1984, Marti 1999). Occasionally, change nest sites but do not move long distances to do so (Colvin et al. 1984, Marti 1999); those few breeders that changed nest sites from one year to the next in Utah moved on average 2.28 km  $\pm$  1.77 SD; no significant difference in distance between the sexes but females were >5 times as likely as males to make those moves (Marti 1999). Many pairs occupy the same area year-round in Utah and England and often roost in the nest site in winter (Bunn et al. 1982, Marti, pers. obs.).

#### Home Range

Highly variable, apparently in relation to prey density and habitat characteristics. Home ranges of radio-tagged individuals in New Jersey averaged 717 ha; maximum distance from roost to hunting areas was 5.6 km (Hegdal and Blaskiewicz 1984). Mean home range size in Virginia was 294 ha (Rosenburg 1986), 369 ha in Texas (Byrd 1982), and 308 ha in Scotland (Taylor 1994). In France, radio-tagged breeding males had home range size of >750 ha of which about 250 ha were used on any one night (Michelat and Giraudaux 1991).

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**Roulin, A. 2002. Offspring desertion by double-brooded female barn owls. *The Auk* 119(2): 515-519.**

I recorded 479 first clutches and 42 second clutches between 1991 and 2000 (Table 1). Thirty-nine females and 23 males were involved in two breeding attempts. That difference between the sexes is explained by the more frequent offspring desertion by females (18 out of 39 double-brooded individuals, 46%) than males (1 out of 23, 4%; chi-square test:  $\chi^2 = 11.2$ ,  $df = 1$ ,  $P = 0.001$ ). Among the 21 nondeserting females, 14 of them changed their nest box to lay the second clutch (Table 1). Therefore, 32 out of 39 (82%) double-brooded females used two nest boxes the same year. Among deserting females, the two nests were located at a distance of 4 km (median; range = 1.5-10 km), and among nondeserting females that changed their nest box the median distance was 0.5 km (range is 2 m to 2.5 km) (Mann-Whitney U-test,  $U = 8.5$ ,  $n_1 = 14$ ,  $n_2 = 17$ ,  $P < 0.001$ ). In the case where two nest boxes were fastened to the same barn, six double-brooded females used them both and four females used only one of the two boxes.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### Barred Owl

#### *Strix varia*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4740 N/A	Roosting Area	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4742 N/A	Breeding Sighting	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4744 N/A	Non-breeding Sighting	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4747 N/A	Nest	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Barred owl home ranges are highly variable geographically and are generally larger during the non-breeding season (Mazur and James 2000). Home range results identified within the literature (below) illustrate this variability. As year-round residents to NJ, the barred owls are protected during both the breeding and non-breeding seasons. As such, Elody and Sloan's, 1985, estimate of home range during the non-breeding season (282 ha) was incorporated into the ENSP's determination of an appropriate occurrence area depicting critical habitat. Using the home ranges 228.6 ha, 507.8 ha, and 282 ha (Nichols and Warner 1972, Fuller 1979, and Elody and Sloan 1985, respectively), the mean home range is 339.47 ha, equivalent to 1.04 km radius. Landscape species occurrence areas are not represented by proportional figures, therefore the ENSP has accepted a conservative estimate by rounding this range territory to a 1 km radius (314 ha).

#### Literature:

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**Elody, B.J. and N.F. Sloan. 1985. Movements and habitat use of barred owls in the Huron Mountains of Marquette County, Michigan, as determined by radiotelemetry. *Jack-pine Warbler* 63(1):3-8.**

Average home range size was 282 ha which decreased to 118 ha during the breeding season.

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**Fuller, M.R. 1979. Spatiotemporal ecology of four sympatric raptor species. Ph.D. Dissertation. University of Minnesota, St. Paul. 396 pp.**

Average cumulative home range, based on minimum area, was 507.8 ha.

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**Mazur, K. M., and P. C. James. 2000. Barred Owl (*Strix varia*). In *The Birds of North America*, No. 508 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

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**Nichols, T.H. and D.W. Warner. 1972. Barred owl habitat use as determined by radiotelemetry. *J. Wildlife Manage.* 36(2):213-224.**

Average home range was 228.6 ha, with a range of 86.1-369.0 ha.

**Last researched by:** Craddock

**Date researched:** 1/1/2006

## Aves

### *Black Rail*

### *Laterallus jamaicensis*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4997	Breeding	Nest	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4998	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4999	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5000	Breeding	Breeding Sighting-Confirmed	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5001	Breeding	Foraging	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5002	Breeding	Roosting Area	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Black rail research from different locales around the country report similar home ranges for clapper rails. In Arizona, the average home range was 0.4 ha + 0.2 ha, with a range of 0.1 ha - 1.8 ha (Flores 1991). In Florida, the male average home range was 1.3 ha and the female was 0.62 ha (Legare and Eddleman 2001). In the lower Colorado River, a telemetry study revealed the average home range as 0.43 ha, with a core use area of 0.10 ha (NatureServe 2006). The only report that deviates from this range (0.1-0.43) is from Maryland, where the home range is suspected to lie between 3-4 ha (NatureServe 2006). The minimum inferred extent set by NatureServe is 0.1 km. ENSP will use the NatureServe minimum inferred extent of 0.1 km until such time as that is changed or we have additional information, including New Jersey-specific data, to justify a change in this value.

#### Literature:

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**Flores. 1991. Ecology of black rail in southwest Arizona. Final Report, US Bureau of Reclamation, Yuma Project Office and Arizona Department of Game and Fish. Yuma, AZ.**

In Arizona, California black rails had an average home range of 0.4ha + 0.2 ha. Home ranges observed in the study ranged between 0.1-1.8 ha.

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**Legare. M.L., W.R. Eddleman. 2001. Home range size, nest site selection and nesting success of black rails in Florida. Journal of Field Ornithology 72 (1): 170-7.**

A telemetry study in Florida revealed that males kept an average home range of 1.3 ha, while the

females averaged 0.62 ha.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

Personal comments by R. Flores set an average home range of 0.43 ha, with a significant core size of 0.10 ha based on a telemetry study in the Lower Colorado River. Personal comments by J.G.

Weske estimate a 3-4 ha home range for bitterns in Maryland.

The inferred minimum extent of habitat use (when actual extent is unknown) is 0.1 km

**Last researched by:** Davis

**Date researched:** 7/1/2006

## Aves

### *Black Skimmer*

### *Rynchops niger*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4958	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4959	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4960	Breeding	Suspected Breeding Location	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
4961	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4962	Breeding	Foraging	9.6 km Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4963	Breeding	Nesting Colony	71.25 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes

#### Justification:

Black Skimmers nest in colonies and feed primarily in the salt marshes, estuaries, lagoons and tidal pools around their nest sites (Erwin 1977, Valiela 1984). There have not been exhaustive studies on the commuting distances for black skimmers, but at least two studies have been conducted. On Long Island, New York, black skimmers foraged < 8 km from the colony (Gochfeld and Burger 1994). In Georgia, they foraged approximately 5.2 km from the colony (Tomkins 1951).

Since there are so few studies focusing on black skimmers, commuting distances from related species are used to facilitate the establishment of a Landscape model. Least terns, who sometimes nest at the same sites as black skimmers, foraged an average of 3-12 km from nesting sites (Thompson, et al 1997). California gulls foraged an average of 17.4km with a maximum of 61 km (Baird 1977). Forster's terns had a reported feeding radius of 3.2 km from nesting colonies (VanRossem 1933).

#### Literature:

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**Baird, P.A. 1977. Feeding ecology of ring-billed and California gulls (*Larus delawarensis* and *L. californicus*). *Pacific Seabird Bulletin* 4:16-17.**

California gulls foraged an average of 17.4 kilometers from colony and maximum foraging distances ranged from 32 to 61 kilometers. Ring-billed gulls foraged an average of 11 km from

colony.

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**Erwin, M. 1977. Foraging and breeding adaptations to different food regimes in three seabirds: the Common Tern (*Sterna hirundo*), Royal Tern (*Sterna maxima*), and Black Skimmer (*Rynchops niger*). *Ecology* 58: 389-397.**

In Virginia, 88% of black skimmers fed in salt marsh tidal pools.

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**Gochfeld, M. and J. Burger. 1994. Black Skimmer (*Rynchops niger*). In *The Birds of North America*, No. 108 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists Union.**

On Long Island, New York, main feeding areas were located < 8 km from colony. Colony sites were often located near inlets. This may reflect access to feeding areas as well as suitable substrate.

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**Thompson, B.C., J.A. Jackson, J. Burger, L.A. Hill, E.M. Kirsch and J.L. Atwood. 1997. Least Tern (*Sterna antillarum*). In *The Birds of North America*, No. 290 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.**

Throughout their North American range, least terns foraged 3-12 kilometers from nesting colonies.

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**Tomkins, I.R. 1951. Method of feeding in the Black Skimmer, *Rynchops nigra*. *Auk* 68: 236-239.**

In Georgia, black skimmers fed approximately 5.2 km from a colony.

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**Valiela, I. 1984. *Marine ecological processes*. Springer-Verlag, New York.**

Black skimmers fed mainly in tidal waters of bays, estuaries, lagoons, rivers, and salt marsh pools, creeks, and ditches. These habitats concentrate small fish.

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**Van Rossem, A. J. 1933. Terns as destroyers of birds' eggs. *Condor* 35:49-51.**

Forster's terns had a reported feeding radius of 3.2 kilometers.

**Last researched by:** Davis

**Date researched:** 2/1/2007



## Aves

### *Black-billed Cuckoo*

#### *Coccyzus erythrophthalmus*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5211 Breeding	Breeding Sighting-Confirmed	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5213 Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5214 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

There is little information about territories of breeding individuals so the default occurrence area was chosen for breeding buffers. Black-billed cuckoos are not state listed during non-breeding, so it will not be included in the Landscape Project and the default buffer was chosen.

#### Literature:

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**Hughes, J. M. 2001. Black-billed Cuckoo (*Coccyzus erythrophthalmus*). In *The Birds of North America*, No. 587 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Breeding habitat includes groves of trees, forest edges, and thickets; frequently associated with water. In e. Canada and ne. U.S., usually found in edges and clearings of young deciduous and mixed deciduous-coniferous woods; abandoned farmland with trembling aspen, poplar, and birch. Will also use brushy hillsides and pastures, roadsides, and fencerows, orchards and berry patches, and hawthorn thickets. In wet areas, often among willows near edges of bogs and marshes, or on lake and river shores. Occasionally found in urban areas (parks, ravines, golf courses, residential gardens). In Pennsylvania, most frequently found in shrubbery around lakes and overgrown borders of pine and hemlock woodlands. In ne. Ohio, prefers aspen thickets near swamps.

Little information about territoriality. Probably territorial, as is Yellow-billed Cuckoo.

May be susceptible to habitat fragmentation and modification. In Saskatchewan, abundance correlated with grove size ( $p < 0.05$ ), and not found in aspen groves smaller than 1.2 ha. In central New Jersey, observed only on forest plots 7.5 and 24 ha in size; absent from plots ranging from 0.01 to 4 ha.

Migratory stopover habitat includes wooded areas and dense thickets during migration through Florida. In Texas, occurs in woodlands, particularly along streams and ponds, dense borders of meadows and margins of forests, also groves and thickets of coastal prairies. Also found near human habitation in orchards and gardens, but remains well hidden.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### *Blackburnian Warbler*

#### *Dendroica fusca*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5217 Breeding	Breeding Sighting	60 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5218 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5219 Breeding	Breeding Sighting-Confirmed	60 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Very little literature about territory size exists on blackburnian warblers, so the breeding occurrence area was chosen based upon the largest mean territory size of 1.1 ha reported. Blackburnian warblers are not state listed during non-breeding, so it will not be included in the Landscape Project and the default buffer was chosen.

#### Literature:

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**Morse, D. H. (2004). Blackburnian Warbler (*Dendroica fusca*). The Birds of North America Online. (A. Poole, Ed.) Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North American Online database:**

**[http://bna.birds.cornell.edu/BNA/account/Blackburnian\\_Warbler/](http://bna.birds.cornell.edu/BNA/account/Blackburnian_Warbler/).**

Breeding individuals occur in coniferous and mixed coniferous-deciduous forests, especially mature forest, but mainly inhabits deciduous forest at southern end of range. Elsewhere in range may inhabit primarily deciduous forests at low densities. In NY, found mostly in forest with hemlocks; even in forests with few hemlocks, almost invariably associated with these isolated trees. In New York State and other areas with deep coniferous forests and swamp woods at higher elevations, often prefers spruce draped with *Usnea* lichen. Along the Maine coast, inhabits red and white spruce forests, but not on small islands (< 1 ha), which generally have insufficient tall vegetation to support them. In Minnesota, found on islands of < 1 ha only if tall white pines or black spruces are available. Can nest on islands in New York lakes comparable in size to Maine islands, but characterized by coniferous vegetation averaging 4 m higher than in Maine. In Saskatchewan, common in white spruce forests, but absent in black spruce and jack pine. In Ontario, mostly in moist to dry hemlock forests, but also other types of conifer-dominated woodlands (white pine, cedar, spruce), and some hardwoods, especially those historically dominated by American chestnut; in southern regions of the province, has adapted to mature conifer plantations. In Quebec, most common in mixed forest with mature balsam fir stands; nesting and feeding individuals seek tall balsam spires, towering over rest of the canopy; highest relative abundance in sugar maple/yellow birch/balsam fir forests; Has disappeared from some hemlock forests of Highlands Plateau, North Carolina over the past 50 years.

Breeding territories all-purpose, and both males and females spend most of time on them. Territory size varies with habitat: smaller where favored conifers dense than in mixed coniferous-deciduous forests where primarily exploit conifers. Along Maine coast, territories between 0.4 and 0.6 ha in both red and white spruce. Territories averaged 1.1 ha in a largely deciduous forest with occasional, patchily distributed conifers, apparently in response to distribution of favored coniferous growth. Territories in fir-spruce forest in Ontario from 0.8-0.9 ha.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### *Black-crowned Night-heron*

#### *Nycticorax nycticorax*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4984	Breeding	Nesting Colony	71.25 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
4985	Non- Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
4986	Non- Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4987	Breeding	Foraging	6 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4988	Breeding	Roosting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4989	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### **Justification:**

Nesting area is defined by the area the herons actually use, as these birds do not defend a territory except immediately around their individual nests. The boundaries of the colony are defined as much by social attraction phenomenon and by habitat suitability. Consequently there is now immediately apparent justification for buffering the mapped extent of a nesting area. Where the mapped extent of a colony was available it was used. Where the mapped extent was not available the default seconds precision circle was used around the recorded nesting location point.

ENSP reviewed the literature regarding commuting distance for colonial nesting long-legged wading birds which fairly consistently indicates that the importance of suitable foraging habitat decreases with the distance from the nesting area (e.g. Dowd and Flake 1985, Custer et al. 2004, Kelly et al 1993, Thompson 1978). This is not surprising considering the energy demands of long commutes and the fact that, all other things being equal, if suitable foraging habitat is randomly distributed within the possible foraging range, simple geometry would argue that availability would increase with the square of the distance from the colony. Consequently, a particular type of wetland or riparian habitat is more critical if it is located close to a nesting area than a similar area located near the edge of the energetically feasible foraging range from the colony. It would therefore be unjustifiable to use the maximum foraging distance figures to define all potential foraging habitat as critical foraging habitat for a particular nesting colony. Conversely, using an average foraging

distance figure may under-include suitable habitat by omitting some foraging areas that are important because they provide particularly rich and easily exploited feeding habitat. Further, research (Custer et al. 2004) indicates that longer commuting distances are more frequent during high-demand and demographically critical nestling rearing period. Where the literature on commuting distance includes several studies, there can be wide variability in the mean commuting distances between different studies. When such was the case, we either averaged the reported mean commuting distances or used the information from the study with a large sample size or from an area most ecologically similar to New Jersey. We then doubled this figure.

Black-crowned night heron foraging flight distances in South China differed between high and low tides. At high tide, the average flight was 0.47 km, with a range of 0.03-1.10 km. At low tide, the average flight was 0.57 km, with a range of .03-1.38 km (Wong 1999). The Birds of North America, however, cites foraging flights of up to 24 km (Davis 1993). NatureServe sets a minimum inferred extent of 3 km for black-crowned night herons (NatureServe 2006). Since there is very little information available for this species, we apply a conservative 9.6 km radius occurrence area to nesting colony foraging areas.

## **Literature:**

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**Custer, C.M., S.A. Suarez, D.A. Olsen. 2004. Feeding habitat characteristics of the Great Blue Heron and Great Egret nesting along the Upper Mississippi River, 1995-1998. *Waterbirds* 27(4): 454-68.**

The majority of the herons in this study fed <5 km from the nesting site, and avoided areas > 10 km away. They flew farther to sites during the brood-rearing period than during incubation. Only 10% of the feeding flights ended at a location where another heron was present, indicating that they prefer to feed alone.

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**Davis, W.E.Jr. 1993. Black-crowned night heron (*Nycticorax nycticorax*) In *The Birds of North America* No. 74 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.**

Foraging commuting distance can be up to 24 km.

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**Dowd and Flake. 1985. Foraging habits and movements of nesting Great Blue Heron in prairie river ecosystem, South Dakota. *Journal of Field ornithology* 56: 377-87.**

A study in South Dakota found that the average distance that great blues flew from their colony to a foraging site was 3.1 km, and the maximum observed distance was 24.4 km. Eighty-five percent of the herons in the study fed within 4 km of the colony.

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**Kelly J. P., H. M. Pratt, P. L. Greene. 1993. The distribution, reproductive success, and habitat characteristics of heron and egret breeding colonies in the San Francisco Bay area. *Colonial Waterbirds*. 16:18-27.**

> 95% of great blue herons and >90% great egrets fed within 20 km of their colony.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

The inferred minimum extent of habitat use (when the actual extent is unknown) is 3 km. This is based on a low mean foraging range size.

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**Thompson. 1978. Feeding areas of Great Blue Herons and Great Egrets nesting in the floodplain of the upper Mississippi River. *Proc. Colonial Waterbird Group*. 2: 202-13.**

In central Minnesota the average distance that the herons flew from the colony to a foraging area was 6.5 km, and the maximum observed was 20.4 km. Fifty-three percent of the herons in the study fed within 4 km of the colony.

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**Wong. 1999. Foraging flights of nesting egrets and herons at Hong Kong Egretty, South China. *Waterbirds* 22(3): 424-434.**

In South China, foraging flight distances differed between high and low tides. At high tide, the average flight was 0.47 km, with a range of 0.03-1.10 km. At low tide, the average flight was 0.57 km, with a range of .03-1.38 km.

**Last researched by:** Davis

**Date researched:** 7/1/2006

## Aves

### ***Black-throated Blue Warbler***

#### ***Dendroica caerulescens***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5224 Breeding	Breeding Sighting	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5225 Breeding	Breeding Sighting-Confirmed	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5227 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

Breeding territories range from 1 - 4 ha and young can move 200-300 meters from the nest within 2 weeks of fledging. Based upon the upper limit territory size and to incorporate post-fledging habitat, an occurrence area of 250 meters was chosen. Black-throated blue warblers are not state listed during non-breeding, so it will not be included in the Landscape Project and the default buffer was chosen.

#### **Literature:**

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**Holmes, R.T., N. L. Rodenhouse and T. S. Sillett. (2005). Black-throated Blue Warbler (*Dendroica caerulescens*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North American Online database: [http://bna.birds.cornell.edu/BNA/account/Black-throated\\_Blue\\_Warbler/](http://bna.birds.cornell.edu/BNA/account/Black-throated_Blue_Warbler/)**

Breeds mainly in large, continuous tracts of undisturbed deciduous or mixed deciduous/coniferous forests usually dominated by maples, birches, beech, and other northern hardwoods, with varying amounts of eastern hemlock, spruce, and fir. It can sometimes also be found, especially during the fledgling period, in dense patches of regenerating aspen, spruce, or in red pine plantations with a dense, deciduous sapling understory. Forests most suitable as breeding habitat contain a relatively thick undergrowth of dense, usually deciduous or broad-leaved evergreen shrubs. The species occurs where there is thick undergrowth of mountain laurel, rhododendron, creeping yew, deciduous bushes, small saplings, or tiny conifers. Where shade-tolerant understory shrub species are typically rare, or have been removed by white-tailed deer, this species tends to respond positively to low-intensity harvest (e.g., selection cutting) of closed-canopy forest, which opens the forest canopy and promotes dense patches of seedlings and saplings. Selection of habitats with a dense shrub layer seems most closely related to nesting requirements and not to foraging needs or other factors. Does not usually occur commonly in young clear-cuts or second growth, but becomes frequent once canopy becomes well developed and gaps allow the development of shrubs, usually > 50 yr following clear-cutting. Appears to be about equally common in both managed and unmanaged northern hardwoods forests. Densities not significantly affected by selective logging activities as long as there is a dense or patchily dense shrub layer and relatively complete canopy cover.

Territory size ranges from about 1 to 4 ha, depending on habitat, being smallest where the shrub



layer is dense and heterogeneous. Young can move 200-300 meters from nest during the 1st 2 weeks after fledging.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### ***Black-throated Green Warbler***

#### ***Dendroica virens***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5229 Breeding	Breeding Sighting	50 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5230 Breeding	Breeding Sighting-Confirmed	50 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5233 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### **Justification:**

Little is known about the territory size of BTNW, but it does depend on the type of habitat. Because the favored spruce habitat is not common in New Jersey, the territory size will likely be larger than territories in favored habitat (0.25 ha). Thus, the upper range of listed territory sizes was chosen to create the breeding occurrence area. Non-breeding black-throated green warblers are listed as stable in New Jersey so no occurrence area was specified.

#### **Literature:**

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**Morse, D. H. and A. F. Poole (2005). Black-throated Green Warbler (*Dendroica virens*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Laboratory of Ornithology.**

Habitat consists of boreal coniferous forests and transition areas between coniferous and deciduous forests - prefers coniferous forests but can inhabit mixed and deciduous forests, often associated with hemlock forests.

Little data on territory size. Territory size depends on habitat - smaller territories occur in favored habitat of coniferous forest compared to less favored mixed forests. Smallest territory in favored habitat is 0.25 ha. Ontario territories ranged from 0.3 - 0.9 ha.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### **Blue-headed Vireo (Solitary Vireo)**

#### ***Vireo solitarius***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5617 Breeding	Breeding Sighting	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5618 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5620 Breeding	Breeding Sighting-Confirmed	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

The breeding occurrence area was chosen based upon a territory size of 3 ha. Non-breeding individuals are listed as stable in NJ so the default occurrence area was chosen and will not be included in the Landscape Project.

#### **Literature:**

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**James, R. D. 1998. Blue-headed Vireo (*Vireo solitarius*). In *The Birds of North America*, No. 379 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Typically breeds in evergreen forests with spruce, fir, hemlock, and pine, or conifers with associated deciduous growth that may be alder and willow shrubs as understory, or include poplar, birch, and/or maple trees in varying numbers. In highlands of e. U.S., usually above 300 m elevation in North and 600-1,000 m in South, extending as high as forest is available to >2,000 m in some areas. Here an even broader habitat tolerance is seen, from pure hardwood forest of beech, maple, oak, hickory, etc., on dry sites, through mixed mesophytic forest, pure pine or hemlock stands, to fir and spruce on mountaintops. Presence corresponds closely with areas where extensive forest predominates, but given that requirement, may be found almost anywhere with trees that are middle-aged to mature, with high percent canopy closure (usually >75%), and where there is some (but not dense) understory of shrubs and saplings, often near small openings or edges of wetlands and lakes.

After mating, most activity occurs within 100 m of nest (about 3-ha area). Unmated males can travel 0.5 km from territory.

Fledged young usually stay within 1 km of nest through late summer.

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**Klaus, N. A., D. A. Buehler, and A. M. Saxton. 2005. *Forest Management alternatives and songbird breeding habitat on the Chrokee National Forest, Tennessee.***

Assuming an average breeding density of 8.6 breeding pairs/40 ha (Hamel 1992), 3,596 pairs of blue-headed vireos could be supported under the expected harvest regime by 2053.

**Last researched by:** Petzinger

**Date researched:** 9/29/2008

## Aves

### Bobolink

#### *Dolichonyx oryzivorus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4757	Breeding	Breeding Sighting-Confirmed	200 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4759	Breeding	Breeding Sighting	200 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4761	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.45 – 2.5 ha (Dechant et al. 1999, Martin and Gavin 1995), but the closest study in NY had average territories of 0.5 ha (Dechant et al. 1999). The breeding occurrence area was chosen based upon the NY average of 0.5 ha and increased because the home range size encompasses several territories and the increase of home range due to movement of post-fledging chicks (Martin and Gavin 1995). Little is known about migratory stopover habitat use so the migrant occurrence area chosen is the default.

#### Literature:

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**Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, A. L. Zimmerman, and B. R. Euliss. 1999 (revised 2001). Effects of management practice on grassland birds: Bobolink. Northern Prairie Wildlife Research Center, Jamestown, ND. 24 pages.**

Territories did not vary much with location. Wisconsin mixed hayland floodplain territories ranged from 0.45 - 0.69 ha where dry pasture territories were 2.5 ha, New York hayfields contained territories of 0.5 ha, tame hayfields in Michigan had territories of 1.4 ha. Illinois minimum area for tallgrass prairie was 10-30 ha. Nebraska minimum area for wet meadows was 46 ha and perimeter-area ratio of 0.010.

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**Martin, S. G. and T. A. Gavin. 1995. Bobolink (*Dolichonyx oryzivorus*). In *The Birds of North America*, No. 176 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Territories vary according to the density of bobolinks and type of habitat. In Wisconsin territories ranged from 0.7 - 2 ha. Mean territory size in New York was 0.49 ha, Oregon was 0.74 - 1.45 ha. Courtship occurs within 40 m of nest. Gathering nesting materials occurs within 80 m of nest. Fledglings can move up to 70 m the first day out of nest. During breeding season, home ranges of males and females encompass area of several male territories (TAG), an area of use that becomes larger when nestlings fledge.

Mixed-sex and -age flocks begin forming in late June. In some locations flocks leave nesting hay fields and meadows by late July; in others, flocks remain until mid-Aug. Birds then seek shelter of freshwater marshes and coastal areas to complete Prebasic molt before migration. This species has

not been studied intensively outside the breeding season, habitat use during Aug-Sep is probably the least-known period of its annual cycle

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**Mitchell, L. R., C. R. Smith and R. A. Malecki, R. A. 2000. Ecology of grassland breeding birds in the northeastern US - a literature review with recommendations for management. USGS, BRD, NY Cooperative Fish and Wildlife Research Unit, DNR, Cornell University, Ithaca, NY 14853-3011. September 2000.**

Maine had 40% incidence at 500 ha, but not in optimal habitat for bobolink (see Vickery et al. below). New York's minimum area was 16 ha with a mean of 56.6 ha. Another study in NY had 96% incidence at 10-20 ha, 68% incidence at 5-10 ha, and 18% incidence at 3-6 ha. Illinois had 50% incidence at 50 ha and a minimum area of 10-30 ha.

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**Vickery, P. D., M. L. Hunter, Jr. and S. M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Conservation Biology 8(4): 1087-1097.**

Bobolinks have positive area effects but had low incidence because sites did not have enough graminoid cover to be a preferred site.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### *Broad-winged Hawk*

#### *Buteo platypterus*

SpC/LID	F LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5264	Breeding	Nest	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5265	Breeding	Breeding Sighting	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5267	Non-Breeding	Non-breeding Sighting	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### **Justification:**

This species has small breeding territories but are area sensitive. The buffer was chosen based on breeding territory size and increased for the species' mobility and need for large patches. Until more is discovered about the mobility of the species, a 100 meter radius buffer will be used.

#### **Literature:**

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**Goodrich, L. J., S. C. Crocoll, and S. E. Senner. 1996. Broad-winged Hawk (*Buteo platypterus*). In *The Birds of North America*, No. 218 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.**

N/A

**Last researched by:** Clark

**Date researched:** 2/1/2007

## Aves

### *Brown Thrasher*

### *Toxostoma rufum*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5275	N/A	Breeding Sighting	200 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5277	N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5278	N/A	Breeding Sighting-Confirmed	200 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.5 - 1.13 ha, but fledglings can move a median 200 meters (up to 800 meters) from the nest within a few weeks of fledgling. Therefore, the breeding occurrence area was chosen to incorporate a territory and the median post-fledging habitat. Non-breeding individuals are listed as stable in NJ so the default occurrence area was chosen and will not be included in the Landscape Project.

#### Literature:

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**Cavitt, J. F., and C. A. Haas. 2000. Brown Thrasher (*Toxostoma rufum*). In *The Birds of North America*, No. 557 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Breeds in dry, open country along coastal plain of Long I., NY, especially in thickets and scrubby fields; in w. New York, prefers brushy hillsides covered with hawthorn. In New Jersey pine barrens, breeds at high densities in regularly burned habitat dominated by pitch pine and scrub oaks and black jack oak but absent or rare in areas where fire suppression allows canopy oaks or white oaks. Not found breeding in New Jersey woodlots <0.8 ha in size and rare in woodlots of <4 ha. In Georgia, found in thickets and underbrush at edge of cotton fields in the Piedmont and Okefenokee Swamp. Only occasionally breeds in urban settings, including yards, gardens, and fencerows. Although uses a wide variety of habitats, reaches highest densities in shrub or midsuccessional stages of forests. Habitat suitability index model included 3 variables; suitability peaked when density of woody stems  $\geq 1.0$  m tall was 10,000-30,000/ha, percentage of canopy cover of trees was 10-30%, and percentage of ground surface covered by litter  $\geq 1$  cm deep was >80%. Breeding-territory size varied from 0.5 to >1.0 ha even within limited area, probably depending on habitat quality; in some cases, pairs nested within 15 m of each other. In IL, average breeding territory size varied from 0.65 to 1.13 ha over a 3-yr period. Most activities (including construction of up to 4 nests) of a pair seem to be confined to territories. In N. Dakota, young moved a median distance of only 200 m from nest in 6 wk. One fledgling moved 0.8 km within 12 d.

During migration, observed in hedgerows and railroad rights-of-way during fall migration in Illinois. Occasionally observed in chaparral in San Patricio Co., TX, during migration, but did not defend winter territories in this habitat. Found in mature deciduous forests, urban gardens, yards,



and parks, particularly those with fruit-bearing plants and feeders.

During the winter, abundant in riparian woodlands and absent from chaparral in San Patricio Co., TX. Foraged at sites with well-developed overstories and only rarely in open areas without canopy cover. Occurs in thickets and brushy woodland edges, often in yaupon holly thickets, in Texas in both winter and summer. Also frequents fencerows, gardens, yards, and cultivated areas. Occurs in riparian forest, oak woodland, and mesquite chaparral within Texas Coastal Bend. In Mississippi, found within vine-covered thickets, brier patches, and hedgerows. In Illinois, typically found in sheltered areas with heavy brush and often near feeders. Maintains winter territories in Texas by chasing and calling. Returns to same winter territory from one year to next.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### Canada Warbler

#### *Wilsonia canadensis*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5281 Breeding	Breeding Sighting	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5283 Breeding	Breeding Sighting-Confirmed	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5284 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

Little data are available on territory size. The mean of the territories provided was 0.66 ha, but it was noted that Canada warblers feed fledglings 60 - 90m away (Conway 1999) and 100 m buffer from wetland edge is adequate for a Canada warbler territory (Lambert and Faccio 2005), so the breeding occurrence area chosen was 100 meters. Non-breeding individuals are listed as stable in NJ so the default occurrence area was chosen and will not be included in the Landscape Project.

#### Literature:

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**Conway, C. J. 1999. Canada Warbler (*Wilsonia canadensis*). In *The Birds of North America*, No. 421 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Wide range of deciduous and coniferous forests. Most abundant in moist, mixed coniferous-deciduous forests with a well-developed understory. Often near open water. At lower elevations, often restricted to cool, wet, low-lying areas: cedar (*Cupressaceae*) woods, swampy forests, sphagnum (*Sphagnum* spp.) bogs, moist forest clearings and woodland edges, spruce (*Picea* spp.) tamarack (*Larix laricina*) bogs, aspen (*Populus* spp.) and moist spruce-birch (*Betula* spp.) forests, and alder (*Alnus rugosa*) and willow (*Salix* spp.) stands along stream banks. Less common in shrub wetlands.

In Ontario, average territory size 0.2 ha in Algonquin Provincial Park; one territory in Québec 0.4. Two paired males apparently defended areas of 0.8 and 1.2 ha in New York. Two pairs feeding newly fledged young just out of nest only 60-90 m apart. Three pairs nesting <30 m away from each other along stream in West Virginia and 5 nests found along 46 m of stream in Vermont (Cornell Nest Records Program [CNRP]). Size of singing area for 1 male in New York State was 0.24 ha, but he ranged over a 0.8 ha area (1.2 ha for another male) after nesting began.

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**Lambert, D. J. and S. D. Faccio. 2005. Canada warbler population status, habitat use, and stewardship guidelines for northeastern forests. Vermont Institute of Natural Science, Woodstock, VT.**

Inhabits lowland and upland habitats, including swamps, streamside thickets, brushy ravines, moist forests, and regenerating timber cuts with well-developed shrub layer and structurally complex

forest floor. They are area sensitive in "settled" areas but not in forest-dominated regions. In Rhode Island, the greatest incidence occurred in swamps > 6 ha and where forest covered 50% of landscape within 2km. "A 100-m distance from shoreline or wetland edge is adequate to encompass a typical Canada warbler territory."

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### Caspian Tern

#### *Hydroprogne caspia*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5292	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5293	Breeding	Foraging	6.5 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5294	Breeding	Nesting Colony	50 meter radii around nest/colony	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
5295	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5296	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5297	Breeding	Suspected Breeding Location	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No

#### Justification:

In New Jersey, Caspian terns nest primarily in the coastal salt marshes, building nests on wrack mats (Cuthbert and Wires 1999). They are primarily piscivores and rely on water bodies (bays, estuaries and ocean) as their foraging habitat (Cuthbert and Wires 1999). Distances commuted for foraging flights are not well understood, but there is some data to draw from and it is likely they participate in long foraging flights. In northern Lake Michigan, individuals (that were marked) were observed up to 50 km from their breeding colony (Cuthbert and Wires 1999). On the Pacific coast, adults were observed up to 62 km from their breeding colony (Gill 1976). Fifty (50%) of adults at a colony located on the Columbia River foraged within 8 km of their breeding site and 90% foraged within 21 km (Collis, et al 1999). Adults fitted with transmitters were documented foraging a minimum of 2.5 km offshore (Sirdevan and Quinn 1977). Another study on the Columbia River, in Oregon, found that radio tagged birds foraged, on average, between 14-29 km from the colony (Anderson et al. 2007). A third study on the Columbia River found that radio tagged terns foraged, a median of 7.7 km - 16.9km (depending on colony and timing of breeding cycle) (Lyons et al. 2005). NatureServe does not make any recommendations for inferred extents, but does recommend a 5km separation distance between breeding colonies. Since there are no New Jersey specific studies for this species (which breeds in small numbers in the state), we took into consideration studies for other locales and applied a 6.5 mile radius around the colony to protect likely foraging habitat.

## Literature:

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**Anderson, S.K., D.D. Roby, D.E. Lyons, K. Collis. 2007. Relationship of Caspian tern foraging ecology to nesting success in the Columbia River estuary, Oregon, USA. *Estuarine, Coastal and Shelf Science* 73: 447-456.**

This study reports the same results as the 2005 study (see Lyons, et al. below) but makes focuses on the idea that there are differences in commuting distances not just between discrete colonies but also among each colony on a yearly basis. For example, on East Sand Island, adults foraged during the chick rearing season an average of 20.2 km from the colony in 2000 (n=19) but only 13.9 km in 2001 (n= 33). They hypothesize that these differences were likely the result of site conditions (such a drought) and availability of prey items.

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**Collis, K., S. Adamany, D. D. Roby, D. P. Craig, and D. E. Lyons. 1999. Avian predation on juvenile salmonids on the lower Columbia River. 1998 draft annual report submitted to Bonneville Power Administration and U.S. Army Corps of Engineers. Second Version, October 1999.**

Fifty (50%) of adults at a colony located on the Columbia River foraged within 8 km of their breeding site and 90% foraged within 21 km, showing a great variety in the distances traveled by this species to forage.

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**Cuthbert, Francesca J. and Linda R. Wires. 1999. Caspian Tern (*Sterna caspia*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved 31 March 2011 from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/403doi:10.2173/bna.403>**

The BNA account gives information on all aspects of the natural life history of these species including locations of nesting and foraging habitat. The lead author also reported in a study she was involved with in Lake Michigan where marked birds were observed foraging up to 50 km from their breeding colony.

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**Gill Jr., R.E. 1976. Notes on the foraging of nesting Caspian Terns *Hydroprogne caspia* (Pallas). *California Fish and Game* 62: 155.**

The author observed Caspian terns on the Pacific coast foraging up to 62 km from their breeding colony.

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**Lyons D.E., D.D. Roby, K. Collis. 2005. Foraging Ecology of Caspian Terns in the Columbia River Estuary, USA. *Waterbirds* 28(3): 280-291.**

Two islands (Rice Island and East Sand Island) hosting Caspian tern colonies were studied to determine how foraging patterns affect nest success. The researchers found difference in foraging commute by colony and by timing during breeding cycle. Rice Island adults traveled a median of 12.3 km during early chick rearing and 16.9 km during late chick rearing while East Sand Island adults traveled 9.6 km during early chick rearing and 7.7 km during late chick rearing. This lead the authors to conclude that foraging distances are at least partially based on available habitat proximate to the colony.

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**NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 31, 2011 ).**

NatureServe recommends a 5 km separation distance from breeding occurrences. In its justification, it notes that this is certainly not large enough to compensate for the distances that foraging birds are likely to travel and that this number should be used for colony separations only. They chose this number to try and strike a balance between the high mobility of these birds and the practical considerations of conservation and management.

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**Sirdevan, J. E. and J. S. Quinn. 1997. Foraging patterns of Caspian Terns determined using radio-telemetry. *Waterbirds* 20: 429-435.**

This study took place in two Lake Ontario colonies, Hamilton Harbor and Gull Island, and showed that the birds exhibit a great variety and unpredictability in foraging patterns.

**Last researched by:** Davis

**Date researched:** 3/31/2011

## Aves

### Cattle Egret

#### *Bubulcus ibis*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5298	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5299	Breeding	Nesting Colony	90 meter radii around colony	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
5300	Breeding	Roosting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5301	Breeding	Foraging	7.0 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5302	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5303	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

Nesting area is defined by the area the birds actually use, as these birds do not defend a territory except immediately around their individual nests. The boundaries of the colony are defined as much by social attraction phenomenon and by habitat suitability. Consequently there is now immediately apparent justification for buffering the mapped extent of a nesting area. Where the mapped extent of a colony was available it was used.

ENSP reviewed the literature regarding commuting distance for colonial nesting long-legged wading birds which fairly consistently indicates that the importance of suitable foraging habitat decreases with the distance from the nesting area (e.g. Dowd and Flake 1985, Custer et al. 2004, Kelly et al 1993, Thompson 1978). This is not surprising considering the energy demands of long commutes and the fact that, all other things being equal, if suitable foraging habitat is randomly distributed within the possible foraging range, simple geometry would argue that availability would increase with the square of the distance from the colony. Consequently, a particular type of wetland or riparian habitat is more critical if it is located close to a nesting area than a similar area located near the edge of the energetically feasible foraging range from the colony. It would therefore be unjustifiable to use the maximum foraging distance figures to define all potential foraging habitat as critical foraging habitat for a particular nesting colony. Conversely, using an average foraging distance figure may under-include suitable habitat by omitting some foraging areas that are important because

they provide particularly rich and easily exploited feeding habitat. Further, research (Custer et al. 2004) indicates that longer commuting distances are more frequent during high-demand and demographically critical nestling rearing period. Where the literature on commuting distance includes several studies, there can be wide variability in the mean commuting distances between different studies. When such was the case, we either averaged the reported mean commuting distances or used the information from the study with a large sample size or from an area most ecologically similar to New Jersey. We then doubled this figure.

This species has a wider range of diet items than other herons and egrets nesting in New Jersey. Along with small fish, they will also eat grasshoppers, crickets, spiders, flies, frogs, noctuid moths and small mammals (Telfair 2006). Therefore when looking at the areas to be valued by this model, special attention should be paid to the marsh islands or inland areas that lie within the radius of the nesting colony, as well as the open water that other egret models value.

The worldwide range of this species is quite expansive, including parts of all continents except Antarctica (Telfair 2006). Due to this, there have been many studies conducted on this species and reported commuting distances are wide ranging. In North Carolina, cattle egrets traveled from 4-6 km to foraging sites from their nesting colonies (Custer and Osborn 1978). In Barbados, cattle egrets were observed foraging up to 5.7 km from breeding colonies (Krebs et al 1994). In southeastern Australia, 60% of cattle egrets fed within 6.5 km of the breeding colony (Richardson and Taylor 2003). In central Minnesota the average distance that the herons flew from the colony to a foraging area was 6.5 km (maximum distance 20.4 km) and 53% of the herons in the study fed within 4 km of the colony (Thompson 1978). In Texas, foraging flights ranged from 4-25 km, with 67% of those flights from 10-15 km (Mora and Miller 1998). In Baja, California, cattle egrets flew 2.5 - 35 km to foraging sites, most (80%) within 15 km of the breeding colony and 46% from 10-12.5 km (Mora 1997). In Alabama, cattle egrets traveled from 26-32 km from their breeding colonies to foraging sites (Bateman 1970). The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 3 km which is based on a low mean foraging range size for this group (NatureServe 2007).

## **Literature:**

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**Bateman, D.L. 1970. Movement-behavior in three species of colonial nesting wading birds: a radio-telemetric study. Ph.D. dissertation, Auburn University, Auburn, AL.**

In Alabama, cattle egrets traveled from 26-32 km from their breeding colonies to foraging sites.

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**Custer, C.M., S.A. Suarez, D.A. Olsen. 2004. Feeding habitat characteristics of the Great Blue Heron and Great Egret nesting along the Upper Mississippi River, 1995-1998. Waterbirds 27(4): 454-68.**

The majority of the herons in this study fed <5 km from the nesting site, and avoided areas > 10 km away. They flew farther to sites during the brood-rearing period than during incubation. Only 10% of the feeding flights ended at a location where another heron was present, indicating that they prefer to feed alone.

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**Custer, T.W., R. G. Osborn. 1978. Feeding habitat use by colonially-breeding herons, egrets, and ibises in North Carolina. Auk 95: 733-743.**

In North Carolina, cattle egrets traveled from 4-6 km to foraging sites from their nesting colonies.

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**Dowd and Flake. 1985. Foraging habits and movements of nesting Great Blue Heron in prairie river ecosystem, South Dakota. Journal of Field ornithology 56: 377-87.**

A study in South Dakota found that the average distance that great blues flew from their colony to a foraging site was 3.1 km, and the maximum observed distance was 24.4 km. Eighty-five percent of the herons in the study fed within 4 km of the colony.

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**Kelly J. P., H. M. Pratt, P. L. Greene. 1993. The distribution, reproductive success, and habitat characteristics of heron and egret breeding colonies in the San Francisco Bay area. Colonial Waterbirds. 16:18-27.**

> 95% of great blue herons and >90% great egrets fed within 20 km of their colony.

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**Krebs, E.A., D. Riven-Ramsey, W. Hunte 1994. The colonization of Barbados by Cattle Egrets (Bubulcus ibis) 1956-1990. Colon. Waterbirds 17: 86-90.**

In Barbados, cattle egrets were observed foraging up to 5.7 km from breeding colonies.

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**Mora, M.A. 1997. Feeding flights of Cattle Egrets nesting in an agricultural ecosystem. Southwest Naturalist 42: 52-58.**

In Baja, California, cattle egrets flew 2.5 - 35 km to foraging sites, most (80%) within 15 km of the breeding colony. Forty-six percent flew from 10-12.5 km.

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**Mora, M.A., J. M. Miller 1998. Foraging flights, reproductive success and organochlorine contaminants in Cattle Egrets nesting in a residential area in Bryan, Texas. Texas Journal of Science 50: 205-214.**

In Texas, foraging flights ranged from 4-25 km, with 67% of those flights falling from 10-15 km.

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**NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: August 2, 2007 ).**

The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 3 km. For the breeding season, this figure is based on a low mean foraging range size for this group.

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**Richardson, A.J., I. R. Taylor 2003. Are rice fields in southeastern Australia an adequate substitute for natural wetlands as foraging areas for egrets? Waterbirds 26: 353-363.**

In southeastern Australia, 60% of cattle egrets fed within 6.5 km of the breeding colony.

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**Telfair, R. C. II. 2006. Cattle Egret (Bubulcus ibis). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North American Online database: [http://bna.birds.cornell.edu/BNA/account/Cattle\\_Egret/](http://bna.birds.cornell.edu/BNA/account/Cattle_Egret/).**

This species is has a larger range of diet items than other herons and egrets nesting in New Jersey. Along with small fish, they will also eat grasshoppers, crickets, spiders, flies, frogs, noctuid moths, and some small mammals.

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**Thompson. 1978. Feeding areas of Great Blue Herons and Great Egrets nesting in the floodplain of the upper Mississippi River. Proc. Colonial Waterbird Group. 2: 202-13.**

In central Minnesota the average distance that the herons flew from the colony to a foraging area was 6.5 km, and the maximum observed was 20.4 km. Fifty-three percent of the herons in the study fed within 4 km of the colony.

**Last researched by:** Davis

**Date researched:** 1/1/2007

## Aves

### *Cerulean Warbler*

### *Dendroica cerulea*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5304 Breeding	Breeding Sighting-Confirmed	65 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5306 Breeding	Breeding Sighting	65 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5307 Non-Breeding	Non-breeding Sighting	65 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The breeding occurrence area distance was chosen based upon the upper confident limit of the mean territory size (1.04 ha  $\pm$  0.16 SE), which calculates to 1.35 ha. Little is known about non-breeding territories, but based on the area-sensitivity of the species, the breeding occurrence area distance was chosen.

#### Literature:

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**Hamel, P. B. 2000. Cerulean Warbler (*Dendroica cerulea*). In *The Birds of North America*, No. 511 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Routinely identified with predominantly forested landscapes, mature forest, large and tall trees of broad-leaved, deciduous species with an open understory; in wet bottomlands, or upland situations including mesic slopes, and mountains, from <30 to >1,000 m elevation. Expanding populations in northeastern North America now occupy landscapes formerly cleared for agriculture. Thus, species will occupy second-growth as well as mature forest. Minimum habitat requirements of this species along the Roanoke River in N. Carolina: (1) a closed canopy; (2) presence of scattered, very tall, old-growth canopy trees; (3) distinct zonation of canopy, subcanopy, shrub, and ground-cover layers. In Missouri breeding habitats, canopy cover averaged 85%, minimum value 65%.

Usually considered an area-sensitive species. Minimum forest-tract size varies, e.g. from 20-30 ha in Ohio to 700 ha in the Middle Atlantic states and 1,600 ha in Mississippi Alluvial Valley of Tennessee. Mueller et al. (1999) suggest tracts >8,000 ha may be required to support stable breeding populations in the Mississippi Alluvial Valley. In Ontario, however, found breeding in tracts as small as 10 ha (J. Jones pers. comm.). Species response to habitat fragmentation may reflect factors that covary with fragment size, such as intensity of Brown-headed Cowbird (*Molothrus ater*) parasitism and of predation, rather than particular behavioral aversion to small fragment size or to edges.

Mean breeding territory size of 1.04 ha  $\pm$  0.16 SE based on 18 Ontario territories that ranged in size from 0.38 to 2.4 ha. Maximum breeding densities on published Breeding Bird Censuses suggest that territories smaller than these are possible.

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**Rosenberg, K. V., R. W. Rohrbaugh, Jr., S. E. Barker, J. D. Lowe, R. S. Hames, and A. A. Dhondt. 1999. A land manager's guide to improving habitat for scarlet tanagers and other forest-interior birds. The Cornell Lab of Ornithology.**

Cerulean warblers share some habitat characteristics with Scarlet Tanagers. In the Piedmont Plains and Delaware Bay regions, they prefer areas at least 70% forested, deciduous or mixed, and the suitability increases with proximity of forest patches to larger, contiguous forest patches. In the Highlands, they prefer areas at least 50% forest, deciduous, and mixed and occasionally coniferous, and the suitability increases with proximity of forest patches to larger, contiguous forest patches.

**Last researched by:** Petzinger

**Date researched:** 7/1/2006

## Aves

### Cliff Swallow

#### *Petrochelidon pyrrhonota*

SpC/LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5322 Breeding	Breeding Sighting	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5324 Breeding	Breeding Sighting-Confirmed	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5326 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

This species is not territorial but highly mobile, particularly for foraging and fledgling dispersal (Brown and Brown 1995). In New Jersey, most large colonies occur on the undersides of bridges over the Delaware River. The breeding buffer was based on the foraging distance that most cliff swallows travel (Brown and Brown 2002). The non-breeding population is listed as stable in New Jersey, so the default buffer was chosen and will not be used in the Landscape Project

#### Literature:

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**Brown, Charles R. and Mary B. Brown. 1995. Cliff Swallow (*Petrochelidon pyrrhonota*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/149>.**

Most colony sites are located near open fields or pastures where the birds forage, and a water source is often nearby. Proximity to mud source (for nest-building) is often cited as a breeding-habitat requirement (Emlen 1941, 1952), although some colonies are located several kilometers from the nearest mud supply (Coffey 1980, CRB, MBB).

Juveniles travel up to 2-3 km from their natal colony to a creche site as soon as they fledge (CRB, MBB). Birds from different colonies may mix in the same creche, with membership changing daily as more young fledge and others become independent and leave. Birds often creche at the same physical location throughout a season or until all young from the local colonies have fledged. Wintering individuals can forage up to 20 km from roost site.

Some birds move relatively long distances between colonies within a season: up to 40 km in California and 64 km in Nebraska. Adults, like juveniles, spend up to a week or more in mid- to late summer visiting multiple colony sites near their breeding colony of that year. Birds probably use this time to assess suitability of sites (e.g., parasite load, food availability) and use that information in part to choose colonies the next spring (Brown and Brown in press). While selecting colonies in early spring, males and females generally ranged linear distances of 2-15 and 9-14 km, respectively, along a Nebraska river valley where colony sites were located (Brown and Brown in press). Once a bird selects a colony, most foraging is confined to areas within about a 1.5-km radius of the colony

site (Brown et al. 1992), although birds occasionally forage up to 6 km from their colony (Emlen 1952). Late in season, after young fledge, birds of all ages and sexes travel widely and visit colonies up to 60 km (and probably farther) from their natal or breeding colonies (CRB, MBB). Two radio-tagged postbreeding males confined their activities to a linear region of 15 and 19.5 km along a river valley for at least 6-8 d (Brown and Brown in press). Within-season homing is well developed over moderately long distances: adults in California were released at distances of 58, 68, 112, 136, and 184 km from their nesting sites, and birds from each distance returned to their colonies (Mayhew 1963).

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**Brown, Charles R. and Mary B. Brown. 2002. Does intercolony competition for food affect colony choice in cliff swallows? *The Condor*, 104(1):117-128.**

Past work has shown that virtually all foraging by colony residents occurs within a 1-km radius of a colony site (except in bad weather, when foraging ranges increase), regardless of colony size or habitat type.

Because previous observations had indicated that Cliff Swallows confine their foraging to within a 1-km radius of their colony site (Brown et al. 1992, Brown and Brown 1996), we designated the foraging range for each colony as a 785-ha circle of diameter 2 km centered at the colony site. The only occasions when the birds did not use this colony-centered foraging range was during cold or windy weather when individuals from many colonies would concentrate in hundreds or thousands over lakes or streams and forage on insects just above the water surface, or in canyons where the walls served as windbreaks to concentrate insects. On these occasions birds would travel 3 km or more from their colony sites and mix with birds from many colonies. Bad weather was infrequent enough during most years that we disregarded it in designating foraging ranges. Using topographic maps, we measured the linear distances between all colony sites. We defined any colony within 2 km of a given colony site as a neighboring colony with an overlapping foraging range. We scored sites only as overlapping or not, and did not quantify the degree of overlap. However, for a subset of colonies, we investigated whether the degree of overlap had any apparent effect; we did this by comparing colonies that had overlapping neighbors situated at different linear distances within 2 km.

We found only weak evidence that Cliff Swallow colony size at a site might have been influenced by competition for food from neighboring colonies. As predicted by the intercolony-competition hypothesis, in some years there was a pattern of the largest colonies occurring in areas with limited foraging-range overlap from other sites, and some of the smaller colonies were ones that overlapped with neighboring sites containing many nests. Furthermore, annual variability in colony size seemed to increase as a site shared its foraging range with more neighbors. However, the statistical patterns across all analyses were weak, the among-year analyses within sites showed almost no evidence that intercolony competition influenced settlement decisions, and there were many small to medium-sized colonies that shared their foraging range with other small to medium-sized colonies.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### Common Nighthawk

#### *Chordeiles minor*

SpCoF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5335	Breeding	Breeding Sighting-Confirmed	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5338	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5339	Breeding	Breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 4 - 34 ha depending on habitat. The breeding occurrence area was chosen based upon the upper limit of the breeding territories (28 ha) for nesting habitat. Common nighthawks migrate in flocks and are not territorial, but little information is available about stopover habitat use, so the default occurrence area was chosen for migrant nighthawks.

#### Literature:

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**Poulin, R. G., S. D. Grindal, and R. M. Brigham. 1996. Common Nighthawk (*Chordeiles minor*). In *The Birds of North America*, No. 213 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.**

Nesting habitat includes coastal sand dunes and beaches, logged or slashburned areas of forest sites, woodland clearings, prairies and plains, sagebrush and grassland habitat, farm fields, open forests, rock outcrops, and flat gravel rooftops of city buildings. Nests in open areas on the ground in Texas, extensively logged and burned areas in British Columbia, on bare sand and among small tufts of grass in Louisiana, in cultivated fields or atop fence posts throughout its range, and in open native grassland in s.-central Canada and n.-central U.S.. Prefers flat, gravel roofs in urban areas.

Generally selects large roofs with parapet, close to walls (<0.5 m), and not according to roof height. Aluminum roofs avoided, and flat roofs not used in the Okanagan Valley, BC, where natural sites are apparently preferred. Density of flat roofs is primary factor in selection of urban home ranges. Nesting areas chosen secondarily in association with large trees for roosting and vegetation for the production of flying insects for food. Average commuting distance from roost to feeding grounds is 2.7 km (SE ± 0.1, n = 284 trips). No evidence of roosting or nesting to minimize commuting distance to feeding areas.

Strongly territorial - males seldom cross territorial boundaries. Around Saskatoon, SK, greatest number of territories (n = 48) found within city limits, with greatest density downtown; 1 male/18.62 ha downtown, 1 male/33.6 ha in natural field.

Variable territory size in different habitats. In cities: in Saskatoon, SK, 10.53 ha; in Detroit, MI, 10.4 ha (range 4.14-22.8) for 13 territories defended by males. In natural habitat: 28.34 ha (field). Home range size not correlated with measured environmental factors. Generally the same as

territory. Average home range 10.5 ha (urban), 10.4 ha (Detroit, MI), 28.34 ha (field).

Few data on migratory stopover habitat; farmlands, river valleys, marshes, coastal dunes (e.g., s. New Jersey), open woodlands.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### Common Tern

#### *Sterna hirundo*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5340 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5341 Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5342 Breeding	Suspected Breeding Location	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5343 Breeding	Nesting Colony	50 meter radii around nest/colony	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
5344 Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5345 Breeding	Foraging	7.5 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

In New Jersey, common terns nest in the coastal landscape on wrack mats on marsh islands and in the dunes of barrier islands. They forage for small fish in the ocean or bay and their commuting distances are widely reported in the literature. The birds of North America notes that across the breeding range, most breeding birds feed within 20 km of colony-sites, often much less if numbers small and/or prey locally abundant. (Nisbet 2002). On the Atlantic Coast they usually foraged within 1 km of shore. (Duffy 1986). At Lake Ontario most terns flew either 0.9 km to a small pond (30% of trips) or 1-8 km to other foraging sites (Moore 1993). In another study the mean trip distance for foraging flights for common terns was 2.4-4.2 km, with a maximum distance of 20 km (n = 99 males, >1,000 trips) (Moore 2001). Individuals from Bird Island, Massachusetts were observed defending feeding territories up to 19 km away from nesting colonies. (Nisbet 1983). Another study at Bird Island found that some terns made triangular feeding flights of at least 60 km, including 15 km return flights with fish. (Heinemann 1992). Around Cape Cod, Massachusetts, terns fed in tidal inlets or between islands but were also observed feeding up to 20 km offshore. (Trull et al. 1999). The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 5 km (NatureServe 2007).

#### Literature:

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**Duffy, D.C. 1986. Foraging at patches: interactions between Common and Roseate Terns. *Ornis Scand.* 17: 47-52.**

On Atlantic Coast, the terns usually foraged within 1 km of shore.

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**Heinemann, D. 1992. Foraging ecology of Roseate Terns on Bird Island, Buzzards Bay, Massachusetts. U.S. Fish and Wildlife Service, Newton Corner, MA.**

Some birds nesting at Bird Island, Massachusetts made triangular feeding flights of at least 60 km, including 15 km return flights with fish.

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**Moore, D.J. 2001. The provisioning tactics of parent Common Terns (*Sterna hirundo*) in relation to brood energy requirement. Ph.D. dissertation, Simon Fraser Univ., Burnaby, British Columbia.**

The mean trip distance for foraging flights for common terns was 2.4-4.2 km, with a maximum distance of 20 km (n = 99 males, >1,000 trips).

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**Moore, D.J. 1993. Foraging ecology and parental care of Common Terns (*Sterna hirundo*) nesting in Windermere Basin, Lake Ontario. M.S. thesis, Brock Univ., St. Catharines, Ontario.**

At Lake Ontario most birds flew either 0.9 km to a small pond (30% of trips) or 1-8 km to other foraging sites.

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**NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: August 2, 2007 ).**

The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 5 km.

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**Nisbet, I. C. T. 2002. Common Tern (*Sterna hirundo*). In *The Birds of North America*, No. 618 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.**

Most breeding birds feed within 20 km of colony-sites, often much less if numbers small and/or prey locally abundant.

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**Nisbet, I.C.T. 1983. Territorial feeding by Common Terns. *Colonial Waterbirds* 6: 64-70.**

Some birds from Bird Island were observed defending feeding territories up to 19 km away from nesting colonies.

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**Trull, P., S. Hecker, M. J. Watson, I. C. T. Nisbet 1999. Staging of Roseate Terns *Sterna dougallii* in the post-breeding period around Cape Cod, Massachusetts, USA. *Atlantic Seabirds* 1: 145-158.**

Around Cape Cod, Massachusetts, many terns fed in tidal inlets or between islands. They were observed feeding up to 20 km offshore.

**Last researched by:** Davis

**Date researched:** 1/1/2007

## Aves

### Cooper's Hawk

#### *Accipiter cooperii*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4768 N/A	Nest	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4770 N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4773 N/A	Breeding Sighting	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The home ranges of Cooper's hawks' are highly variable, both geographically and seasonally. Only breeding records of Cooper's hawks are used in the Landscape Project to value habitat. Home range calculations reported in the literature for Cooper's hawks during the breeding season range from 65.5 ha to 784 ha. The average being 348 ha, or an area equivalent to having a 1.1 km radius. The ENSP uses a 1.0 km radius to represent the occurrence area boundary for all Cooper's hawk breeding records used in the Landscape Project. This represents a slightly conservative estimate of the breeding season home ranges of Cooper's hawks as reported in the literature.

#### Literature:

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##### **Craighead, F., and J. Craighead. 1956. Hawks, owls, and wildlife. Dover Publ. Inc., New York.**

Average home range during the breeding season for four pairs of Cooper's hawks was 1.43 sq miles, 1.55 sq miles, 0.37 sq miles, and 1.45 sq miles. Using the conversion of 1 square mile equals 640.0 acres and 1 acre equals 0.4046856 hectares, the average home ranges were 370 ha, 401 ha, 96 ha, and 376 ha.

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##### **Mannan, R. W. and C. W. Boal. 2000. Home range characteristics of male Cooper's hawks in an urban environment. Wilson Bull. 112(1):21-27.**

Average home range during breeding season was 65.5 ha, with a range of 13.3-130.6 ha.

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##### **Murphy, R.K., M.W. Gratson, and R.N. Rosenfield. 1988. Activity and habitat use by a breeding male Cooper's Hawk in a suburban area. J. Raptor Res. 22:97-100.**

Average home range during breeding season was 784 ha.

**Last researched by:** Schantz

**Date researched:** 1/1/2006

## Aves

### Eastern Meadowlark

#### *Sturnella magna*

SpC/LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5370 N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5374 N/A	Breeding Sighting-Confirmed	125 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5375 N/A	Breeding Sighting	125 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 1.2 - 6.1 ha (Hull 2000, Lanyon 1995) but commonly range from 2.8 - 3.2 ha (Lanyon 1995). The breeding occurrence area is based upon the upper limit of territory sizes. Because little is known about migratory stopover or wintering habitat use, the default occurrence area was chosen for the non-breeding individuals.

#### Literature:

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**Hull, S. D. 2000 (revised 2002). Effects of management practice on grassland birds: Eastern Meadowlark. Northern Prairie Wildlife Research Center, Jamestown, ND. 35 pages.**

Territories range from 1.2 - 4.8 ha and seem to prefer areas > 5 ha for breeding. Not affected by core area (or lack thereof). Had 50% incidence at 5 ha. Wisconsin territories ranged from 1.2 - 6 ha with an average of 2.3 ha. Oklahoma territories averaged 2 ha. In PA they were found in warm and cool-season grasses and fields > 1.4 ha. Not considered area sensitive by studies in New York and Missouri. 50% incidence at 5 ha. In Maine 40% incidence at 500 ha grassland barrens.

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**Lanyon, W. E. 1995. Eastern Meadowlark (*Sturnella magna*). In *The Birds of North America*, No. 160 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.**

Territories in Wisconsin varied from 1.2 to 6.1 ha but commonly 2.8 - 3.2 ha. In New York, 15 territories averaged 2.8 ha. Wintering habitat consists of open country, including cultivated fields and feedlots; also marshes. Northern limit of winter range correlated with temperature: absent from regions having mean minimum winter temperature below -12°C.

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**Mitchell, L. R., C. R. Smith and R. A. Malecki, R. A. 2000. Ecology of grassland breeding birds in the northeastern US - a literature review with recommendations for management. USGS, BRD, NY Cooperative Fish and Wildlife Research Unit, DNR, Cornell University, Ithaca, NY 14853-3011. September 2000.**

Meadowlarks tend to use areas > 20 ha.

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**Vickery, P. D., M. L. Hunter, Jr. and S. M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Conservation Biology 8(4): 1087-1097.**

Meadowlarks have positive area effects but had low incidence because sites did not have enough graminoid cover to be a preferred site.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### *Glossy Ibis*

#### *Plegadis falcinellus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5400	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5401	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5402	Breeding	Foraging	9.1 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5403	Breeding	Roosting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5404	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5405	Breeding	Nesting Colony	71.25 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes

#### **Justification:**

Nesting colony is defined by the area the birds actually use, as these birds do not defend a territory except immediately around their individual nests. The boundaries of the colony are defined as much by social attraction phenomenon and by habitat suitability. Consequently there is now immediately apparent justification for buffering the mapped extent of a nesting area. Where the mapped extent of a colony was available it was used. Where the mapped extent was not available the default seconds precision circle was used around the recorded nesting location point.

ENSP reviewed the literature regarding commuting distance for colonial nesting long-legged wading birds which fairly consistently indicates that the importance of suitable foraging habitat decreases with the distance from the nesting area (e.g. Dowd and Flake 1985, Custer et al. 2004, Kelly et al 1993, Thompson 1978). This is not surprising considering the energy demands of long commutes and the fact that, all other things being equal, if suitable foraging habitat is randomly distributed within the possible foraging range, simple geometry would argue that availability would increase with the square of the distance from the colony. Consequently, a particular type of wetland or riparian habitat is more critical if it is located close to a nesting area than a similar area located near the edge of the energetically feasible foraging range from the colony. It would therefore be unjustifiable to use the maximum foraging distance figures to define all potential foraging habitat as critical foraging habitat for a particular nesting colony. Conversely, using an average foraging

distance figure may under-include suitable habitat by omitting some foraging areas that are important because they provide particularly rich and easily exploited feeding habitat. Further, research (Custer et al. 2004) indicates that longer commuting distances are more frequent during high-demand and demographically critical nestling rearing period. Where the literature on commuting distance includes several studies, there can be wide variability in the mean commuting distances between different studies. When such was the case, we either averaged the reported mean commuting distances or used the information from the study with a large sample size or from an area most ecologically similar to New Jersey. We then doubled this figure.

Research in North Carolina found that 84% of breeding long-legged waterbirds flew to foraging areas, which is why habitat outside the vicinity of the colony must be valued as crucial to the success of the colony (Custer and Osborn 1978). This same study documented the mean distance flown to foraging habitat by glossy ibis was 7.3 km with a maximum distance flown as 12.4km. (Custer and Osborn 1978). In New Jersey, glossy ibis use the entire area of salt marsh pools rather than just the edge as other long legged species may be inclined to do (Wiese 1979). NatureServe recommends a minimum inferred extent of 3 km and justifies it by noting a low mean foraging range size for this group (NatureServe 2006). We apply a 14.6 km radius around a colony to protect foraging areas.

## **Literature:**

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**Custer, C.M., S.A. Suarez, D.A. Olsen. 2004. Feeding habitat characteristics of the Great Blue Heron and Great Egret nesting along the Upper Mississippi River, 1995-1998. *Waterbirds* 27(4): 454-68.**

The majority of the herons in this study fed <5 km from the nesting site, and avoided areas > 10 km away. They flew farther to sites during the brood-rearing period than during incubation. Only 10% of the feeding flights ended at a location where another heron was present, indicating that they prefer to feed alone.

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**Custer, T. W., R. G. Osborn. 1978. Feeding habitat use by colonially-breeding herons, egrets, and ibises in North Carolina. *Auk* 95: 733-743.**

In North Carolina, this small-scale study found that the mean distance to foraging habitat during breeding season was 7.3 km (n = 5). The longest observed flight was 12.4 km. In North Carolina, 84% of breeding individuals flew to tidal foraging habitat. They generally prefer brackish/marine habitats with relatively shallow water.

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**Dowd and Flake. 1985. Foraging habits and movements of nesting Great Blue Heron in prairie river ecosystem, South Dakota. *Journal of Field ornithology* 56: 377-87.**

A study in South Dakota found that the average distance that great blues flew from their colony to a foraging site was 3.1 km, and the maximum observed distance was 24.4 km. Eighty-five percent of the herons in the study fed within 4 km of the colony.

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**Kelly J. P., H. M. Pratt, P. L. Greene. 1993. The distribution, reproductive success, and habitat characteristics of heron and egret breeding colonies in the San Francisco Bay area. *Colonial Waterbirds*. 16:18-27.**

> 95% of great blue herons and >90% great egrets fed within 20 km of their colony.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: June 4, 2007 ).**

The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 3 km. For

the breeding season, this figure is based on a low mean foraging range size for this group.

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**Thompson. 1978. Feeding areas of Great Blue Herons and Great Egrets nesting in the floodplain of the upper Mississippi River. Proc. Colonial Waterbird Group. 2: 202-13.**

In central Minnesota the average distance that the herons flew from the colony to a foraging area was 6.5 km, and the maximum observed was 20.4 km. Fifty-three percent of the herons in the study fed within 4 km of the colony.

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**Wiese, J. H. 1979. A study of the reproductive biology of herons, egrets, and ibis nesting on Pea Patch Island, Delaware. Final report. Manomet Bird Observatory, Manomet, MA.**

In salt-marsh pools in New Jersey, ibises use the entire pool rather than just the edge.

**Last researched by:** Davis

**Date researched:** 1/1/2007

## Aves

### *Golden-winged Warbler*

### *Vermivora chrysoptera*

SpC/LID	F LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5408	Breeding	Breeding Sighting-Confirmed	800 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5409	Non-Breeding	Non-breeding Sighting	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5410	Breeding	Breeding Sighting	800 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

In New Jersey, territory sizes ranged from 0.17 to 7.84 hectares with the mean territory size of 1.66 ( $\pm 0.42$ ) hectares and males have been observed in areas > 800 meters from their nest and defended territory (DeFalco pers. obs.). Territories in New York ranged from 0.4 - 6 ha (Confer 1992). The breeding buffer was chosen based upon the mean territory size and mobility of the species. This species predominately uses scrub-shrub habitat but will use the forest edges up to 30 meters into the forest (Confer 1992).

#### Literature:

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**Confer, John L. 1992. Golden-winged Warbler. In *The Birds of North America*, No. 20 (A. Poole, P. Stettenheim, and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.**

Territories range from 0.4 -6 ha, depending on density of male, and can extend 5-30 m into forest. No information was provided on migratory stopover habitat.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007



## Aves

### Grasshopper Sparrow

#### *Ammodramus savannarum*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4776 Breeding	Breeding Sighting-Confirmed	90 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4778 Breeding	Breeding Sighting	90 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4779 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Mean breeding territories range from 0.19 to the highest upper confidence limit of 2.76 ha (Vickery 1996). The breeding occurrence area was chosen based upon the upper limit territory size. Little is known about the stopover habitat use, so the default occurrence area was chosen for the migrant individuals.

#### Literature:

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**Dechant, J. A., M. F. Dinkins, D. H. Johnson, L. D. Igl, C. M. Goldade, B. D. Parkin, and B. R. Euliss. 1998 (revised 2002). Effects of management practice on grassland birds: Grasshopper Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. 28 pages.**

Average territory size < 2 ha. Minimum area need to support breeding population may be > 30 ha. Illinois minimum area 10-30 ha, not found in areas <10 ha, Nebraska 8- 12 ha with perimeter-area ratio of 0.018.

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**Mitchell, L. R., C. R. Smith and R. A. Malecki, R. A. 2000. Ecology of grassland breeding birds in the northeastern US - a literature review with recommendations for management. USGS, BRD, NY Cooperative Fish and Wildlife Research Unit, DNR, Cornell University, Ithaca, NY 14853-3011. September 2000.**

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**Vickery, P. D. 1996. Grasshopper Sparrow (*Ammodramus savannarum*). In *The Birds of North America*, No. 239 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Minimum area requirements in Maine was 100 ha, Illinois 30 ha. Historically found in natural clearings a few ha in size. Pennsylvania territories average 0.8 ha, Connecticut  $0.66 \pm 0.39$  (SE) ha in 1986 (n = 11) and  $0.78 \pm 0.24$  (SE) ha in 1987, Wisconsin 0.85 ha, Michigan 1.4 ha, Florida  $1.8 \pm 0.96$  ha. Western PA territories  $0.19 \pm 0.13$  SD, W. Virginia 0.32 ha, s. California  $0.37 \pm 0.16$  SD. Territories shift during breeding season with arrival of late males. Males sing >50 m from nest.

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**Vickery, P. D., M. L. Hunter, Jr. and S. M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. *Conservation Biology* 8(4): 1087-1097.**

In Maine, Grasshopper sparrows reached 50% incidence at 100 ha, which may differ from other areas due to rarity of species in Maine.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### *Gray-cheeked Thrush*

#### *Catharus minimus*

SpC/LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5418	Non-Breeding	Non-breeding Sighting	25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Gray-cheeked thrushes do not breed in NJ, so no breeding buffer was chosen. Based upon the radio-telemetry study on spring migrants, a 25-meter occurrence area was chosen for non-breeding gray-cheeked thrushes.

#### Literature:

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**Lowther, P. E., C. C. Rimmer, B. Kessel, S. L. Johnson, and W. G. Ellison. 2001. Gray-cheeked Thrush (*Catharus minimus*). In *The Birds of North America*, No. 591 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.**

Little information about migratory stopover habitat. May be sighted in any treed or shrubby area, even in city parks and suburban gardens (Ouellet 1996: 1170). Favors well-wooded sites with thick understory or shrub layer, scarcer in more open woodlands, and infrequent in places with sparse or no canopy (WGE) - habitats structurally similar to those used on breeding grounds (above). Mist-net capture of migrant on 1 Jun 2000 in montane fir forest on Mt. Mansfield, VT, at 1,125 m elevation (CCR) suggests selection of breeding-like habitat. Reports from scrub and shrub habitats in Colombia and n. Venezuela seem referable to migrants (Paynter 1995). In an Illinois radio-tracking study, 8 spring migrants confined daytime activities to 0.04-0.20-ha areas

Breeding habitat consists of areas with closed canopy of medium-height shrubs combined with a dense woody undergrowth

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### Great Blue Heron

#### *Ardea herodias*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5419	Breeding	Roosting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5420	Breeding	Foraging	7.5 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5421	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5422	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5423	Breeding	Nesting Colony	71.25 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
5424	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

Nesting area is defined by the area the birds actually use, as these birds do not defend a territory except immediately around their individual nests. The boundaries of the colony are defined as much by social attraction phenomenon and by habitat suitability. Consequently there is now immediately apparent justification for buffering the mapped extent of a nesting area. Where the mapped extent of a colony was available it was used. Where the mapped extent was not available the default seconds precision circle was used around the recorded nesting location point.

ENSP reviewed the literature regarding commuting distance for colonial nesting long-legged wading birds which fairly consistently indicates that the importance of suitable foraging habitat decreases with the distance from the nesting area (e.g. Dowd and Flake 1985, Custer et al. 2004, Kelly et al 1993, Thompson 1978). This is not surprising considering the energy demands of long commutes and the fact that, all other things being equal, if suitable foraging habitat is randomly distributed within the possible foraging range, simple geometry would argue that availability would increase with the square of the distance from the colony. Consequently, a particular type of wetland or riparian habitat is more critical if it is located close to a nesting area than a similar area located near the edge of the energetically feasible foraging range from the colony. It would therefore be unjustifiable to use the maximum foraging distance figures to define all potential foraging habitat as critical foraging habitat for a particular nesting colony. Conversely, using an average foraging

distance figure may under-include suitable habitat by omitting some foraging areas that are important because they provide particularly rich and easily exploited feeding habitat. Further, research (Custer et al. 2004) indicates that longer commuting distances are more frequent during high-demand and demographically critical nestling rearing period. Where the literature on commuting distance includes several studies, there can be wide variability in the mean commuting distances between different studies. When such was the case, we either averaged the reported mean commuting distances or used the information from the study with a large sample size or from an area most ecologically similar to New Jersey. We then doubled this figure.

The average foraging flight for great blue herons has been firmly established in the literature. The average foraging flight has been observed at 2.3 km - 6.5 km (Butler 1991, Custer and Galli 2002, Dowd and Flake 1985, Parris 1979, Thompson 1978). The range of distance flown falls between <1 km- 27 km (Custer and Galli 2002, Thompson 1978). Although great blue herons have been recorded feeding as far away as 27 km, three studies found that the majority (at least 50%, and in one study 85%) of nesting herons fed within 4 or 5 km of the colony (Custer et al. 2004, Dowd and Flake 1985, Thompson 1978). Kelly, et al (1993) found that > 95% of great blue herons in their study fed within 20 km of the colony. The NatureServe minimum inferred extent is 3 km (NatureServe 2006). We apply a 12 km radius around a colony to protect foraging areas, which is likely to capture the majority of the foraging habitat for that colony.

## **Literature:**

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**Butler. 1991. Habitat selection and time of breeding in the Great Blue Heron. PhD dissertation. University of British Columbia, Vancouver.**

The average foraging commute in this study is btw. 2.3-6.5 km.

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**Custer, C.M., J. Galli. 2002. Feeding habitat selection by Great Blue Herons and Great Egrets nesting in east central Minnesota. *Waterbirds* 25(1): 115-24.**

In a study conducted in Minnesota great blue herons flew a median distance of 2.7 km (n=63) from their colony to a foraging area. The range of distances flown fell between <1 km - 27 km. Most wetlands that herons were located at were >350 ha.

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**Custer, C.M., S.A. Suarez, D.A. Olsen. 2004. Feeding habitat characteristics of the Great Blue Heron and Great Egret nesting along the Upper Mississippi River, 1995-1998. *Waterbirds* 27(4): 454-68.**

The majority of the herons in this study fed <5 km from the nesting site, and avoided areas > 10 km away. They flew farther to sites during the brood-rearing period than during incubation. Only 10% of the feeding flights ended at a location where another heron was present, indicating that they prefer to feed alone.

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**Dowd and Flake. 1985. Foraging habits and movements of nesting Great Blue Heron in prairie river ecosystem, South Dakota. *Journal of Field ornithology* 56: 377-87.**

A study in South Dakota found that the average distance that great blues flew from their colony to a foraging site was 3.1 km, and the maximum observed distance was 24.4 km. Eighty-five percent of the herons in the study fed within 4 km of the colony.

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**Kelly J. P., H. M. Pratt, P. L. Greene. 1993. The distribution, reproductive success, and habitat characteristics of heron and egret breeding colonies in the San Francisco Bay area. *Colonial Waterbirds*. 16:18-27.**

> 95% of great blue herons and >90% great egrets fed within 20 km of their colony.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

Inferred minimum extent of habitat use (when actual extent is unknown) is 3 km. This is based on a low mean foraging rate for this group.

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**Parris. 1979. Aspects of Great Blue Heron foraging ecology in southwest Lake Erie. MS Thesis. Ohio State University, Columbus, Ohio.**

The average foraging commute in this study is btw. 2.3-6.5 km.

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**Thompson. 1978. Feeding areas of Great Blue Herons and Great Egrets nesting in the floodplain of the upper Mississippi River. Proc. Colonial Waterbird Group. 2: 202-13.**

In central Minnesota the average distance that the herons flew from the colony to a foraging area was 6.5 km, and the maximum observed was 20.4 km. Fifty-three percent of the herons in the study fed within 4 km of the colony.

**Last researched by:** Davis

**Date researched:** 7/1/2006

## Aves

### *Gull-billed Tern*

#### *Gelochelidon nilotica*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5431 Breeding	Nesting Colony	71.25 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
5432 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5433 Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5434 Breeding	Suspected Breeding Location	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5435 Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5436 Breeding	Foraging	3 mile radii of open water/erme rgent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

Gull-billed terns are unique among the breeding terns in New Jersey in that their primary prey items are not small fish. Fish are part of their diet, but they are more likely to consume lizards, insects and chicks of other species (Parnell, et al. 1995). Therefore when looking at the areas to be valued by this model, special attention should be paid to the marsh islands that lie within the radius of the nesting colony, instead just the open water that other tern models value. No species specific information is available for the foraging commute of this species. NatureServe recommends a minimum inferred extent of 2 km, noting that this is a conservative estimate (NatureServe 2006). Considering the paucity of information available we chose to stay consistent with other *Sterna* species and we apply a 4.8 km buffer around the colony to protect foraging areas.

#### Literature:

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NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: June 4, 2007 ).

The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 2 km. The

authors note that this is a conservative estimate.

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**Parnell, J.F., R.M., Erwin, K.C. Molina. 1995. Gull-billed tern (*Sterna nilotica*). In *The Birds of North America*, No. 140 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia and The American Ornithologist's Union, Washington, D.C.**

Unlike other terns nesting in the coastal marshes of New Jersey this species does not feed primarily on fish but instead consumes lizards, insects, and sometimes chicks of other species.

**Last researched by:** Davis

**Date researched:** 1/1/2007



## Aves

### *Henslow's Sparrow*

#### *Ammodramus henslowii*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4978 Breeding	Breeding Sighting	75 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4980 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4982 Breeding	Breeding Sighting-Confirmed	75 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.18 - 1 ha but have an upper confidence limit of 0.83 ha (Herkert 2001, Herkert et al. 2002). The breeding occurrence area was chosen based on the upper limit territory size and increased to account for shifting territories during the breeding season (Herkert et al. 2002). Little is known about migratory stopover habitat use, so the default buffer was chosen.

#### Literature:

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**Herkert, J. R. 1998 (revised 2002). Effects of management practice on grassland birds: Henslow's Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. 17 pages.**

Individual territories range from 0.18 - 1 ha. In Kansas and New York, HESP are found in areas > 30 ha of grasslands. Illinois had 50% incidence in areas >55 ha. Another study in New York had HESP in areas > 8 ha. Largest patches occupied first, but patches < 50 ha can also be used for breeding. Isolated patches may also affect use of patch - used 16-ha patch that was within 1.6km of larger occupied patch, but absent from 28-ha isolated patch. Territory size in Michigan was 0.3 ha, 0.7 ha ± 0.26 SD (n = 4) in Wisconsin, 0.18 ha ± 0.05 SD (n = 22) in w PA. Territories shift during breeding season.

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**Herkert, J. R., P. D. Vickery, and D. E. Kroodsmas. 2002. Henslow's Sparrow (*Ammodramus henslowii*). In *The Birds of North America*, No. 672 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Average territory size was 0.3 ha in Michigan, 0.7 ha ± 0.26 SD (n = 4) in Wisconsin, and 0.18 ha ± 0.05 SD (n = 22) in w. Pennsylvania. Males tend to shift territories throughout the breeding season. In Robins' (1971a) study, 10 males had only 1 territory that appeared to remain stable throughout breeding season, 2 maintained 2 successive territories, 2 had 3 territories, and 4 had 4 territories. Approximately 50% of foraging trips by both sexes were beyond territorial borders defended by males. Males and females tended to forage in separate areas within or close to the home territory; mean distances of males flying from the nest to forage was 30.8 m ± 4.3 SD, of females 24.9 m ± 2.1 SD.

Migratory stopover habitat includes brushy places, along hedgerows, at edges of shrubby places as well as in grassy fields, prairies, and wet meadows.

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**Mitchell, L. R., C. R. Smith and R. A. Malecki, R. A. 2000. Ecology of grassland breeding birds in the northeastern US - a literature review with recommendations for management. USGS, BRD, NY Cooperative Fish and Wildlife Research Unit, DNR, Cornell University, Ithaca, NY 14853-3011. September 2000.**

There were 5 studies in New York: one had minimum area of 36 ha and mean of 66 ha, another minimum of 33.2 ha and mean 51.7 ha, another had habitat size ranging from 4.5 - 8.7 ha, another between 3 and 20 ha, and another stating that at low population numbers Henslows may require larger patches than actual minimum. In Illinois, habitat size ranged from 10-30 ha with 50% incidence at 55 ha. Missouri habitat size ranged from 10 - 100 ha.

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**Pruitt, L. 1996, Henslow's Sparrow Status Assessment. USFWS, Bloomington, IN.**

This species can possibly breed in New Jersey and was confirmed breeding in the 1980s. They do, however, migrate through New Jersey.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### Hooded Warbler

#### *Wilsonia citrina*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5449 Breeding	Breeding Sighting-Confirmed	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5450 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5451 Breeding	Breeding Sighting	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.5 - 0.75 ha in size and females may utilize areas 200 meters from their territories to care for post-fledging chicks (Evans Ogden and Stutchbury 1994). Based upon a median territory of 0.62 ha and adding the 200-meter post-fledging distance, a breeding occurrence area of 250 meters is recommended for this species. Non-breeding individuals are listed as stable in NJ so the default occurrence area was chosen and will not be included in the Landscape Project.

#### Literature:

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**Evans Ogden, L. J. and B. J. Stutchbury. 1994. Hooded Warbler (*Wilsonia citrina*). In *The Birds of North America, No. 110* (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.**

Breeding territories range from about 0.5-0.75 ha in size. Nearest neighbor distance in a high density population averages ( $\pm$  SE) 99-112 m. Males and females feed mainly on their territory, with males making forays off the territory for extra-pair mating attempts. Female not known to furtively leave their territories during their fertile period (D. Neudorf and BJS unpubl. data).

Females may take fledged broods some distance (200 m) from natal territory, while males generally feed their portion of brood on or near natal territory.

Inhabits a variety of forested habitats with an area > about 15 ha. Territories usually include small clearings where a shrub understory is available for nesting, and females often place nests in shrub at forest edge. Typically inhabit mature forests where trees are large enough to create significant tree fall gaps. Commonly invades selectively logged deciduous forests 1-5 yr after harvesting, and remains as long as there is suitable understory shrubs for nesting. In some cases, local populations have declined dramatically as shrub layer disappeared. Often associated with moist woodlands and ravines. Found breeding at elevations of 1,100 m, but more abundant at lower elevations.

Deciduous forests occupied usually dominated by maple, beech, or oak. A typical high-density population in nw. Pennsylvania occupies a selectively logged habitat with major overstory trees of beech, sugar maple, black cherry, and hemlock; principal understory trees and shrubs at this site include blackberry, cherry, prickly gooseberry, maple-leaf viburnum, and common spicebush. S.

Ontario population occupied a deciduous forest with a canopy height of 28 m, canopy cover of 88%, and shrub cover of 87%. This site consisted of several dominant species in shrub layer: maple-leaf viburnum, red and black raspberry, white ash, choke cherry, and red maple.

Stopover sites include "cheniers" (coastal woodlands) along sw. coast of Louisiana and wooded islands along the coasts of Alabama, Mississippi, and e. Louisiana. Cheniers support luxuriant vegetation dominated by hackberry and live oak. Favors holly forests in s. New Jersey.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### Horned Lark

#### *Eremophila alpestris*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5457	N/A	Breeding Sighting-Confirmed	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5458	N/A	Non-breeding Sighting	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5460	N/A	Breeding Sighting	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Territories range from 0.008 - 5.1 ha (Beason 1995, Dinkins et al. 2000) and there is no minimum patch size (Dinkins et al. 2000, Mitchell et al. 2000). The breeding occurrence area is based upon the upper limit of the largest mean territory size and increased to incorporate the mobility of the species. The migrant and wintering occurrence areas are based upon the wandering flocks formed while migrating and wintering.

#### Literature:

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**Beason, R. C. 1995. Horned Lark (*Eremophila alpestris*). In *The Birds of North America*, No. 195 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.**

Territories range from 0.6 - 3.1 ha in the midwest, 0.3 - 5.1 ha in Colorado. Territory size is related to density of males in a patch. Adults will fly 40 meters to discard fecal sacs and land 20 m from nest and walk in to feed young. Wintering birds are not territorial and form large flocks that are nomadic and wander over large areas for food.

Migratory stopover habitat is similar to breeding habitat but with increased use of beaches and sand dunes; also mowed areas such as airfields. North American flocks of migrants often intermix with resident conspecifics, and even form mixed-species flocks with other migrants such as longspurs and buntings. Wintering habitat is similar to habitats occupied during breeding and migration periods. In Oklahoma, for example, the shortest vegetation available, in Massachusetts, ocean beaches, sand dunes, airfields. Frequently concentrated along roadsides when ground is covered with deep snow.

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**Dinkins, M. F., A. L. Zimmerman, J. A. Dechant, B. D. Parkin, D. H. Johnson, L. D. Igl, C. M. Goldade, and B. R. Euliss. 2000 (revised 2002). Effects of management practices on grassland birds: Horned Lark. Northern Prairie Wildlife Research Center, Jamestown, ND. 34 pages.**

Colorado territories in lightly-grazed pastures ranged from 0.3 - 1.5 ha and average 0.7 ha; heavily grazed pastures had territories ranging from 1 - 1.7 ha and average 1.5 ha; mixed-grass pasture average 1.1 ha; idle mixed-grass averaged 1.6 ha. Midwestern cropland territories ranged from 0.6 - 3.1 ha and averaged 1.6 ha; hayland territories ranged 1 - 2.5 ha. One Illinois territory was 0.008 ha. Found on patches < 10 ha in Illinois.

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**Mitchell, L. R., C. R. Smith and R. A. Malecki, R. A. 2000. Ecology of grassland breeding birds in the northeastern US - a literature review with recommendations for management. USGS, BRD, NY Cooperative Fish and Wildlife Research Unit, DNR, Cornell University, Ithaca, NY 14853-3011. September 2000.**

Areas range from 1-10 ha.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### *Kentucky Warbler*

#### *Oporornis formosus*

SpC/LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5462	Breeding	Breeding Sighting	200 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5465	Breeding	Breeding Sighting-Confirmed	200 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5466	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

Breeding territories range from 1.21 to 3.75 ha with an average 2.21 ha, and adults tend to forage off territories. Furthermore, fledglings will travel up to 200 m from the nest a week after fledging. The breeding occurrence area was chosen to incorporate post-fledging habitat. There is little information about migrating individuals, so the default occurrence area will be used for migrating species.

#### **Literature:**

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**McDonald, M. V. 1998. Kentucky Warbler (*Oporornis formosus*). In *The Birds of North America*, No. 324 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Breeds in bottomland hardwoods and woods near streams with dense understory, often at low elevations. Rarely observed in agricultural habitats. Well-developed ground cover for ground nesting, and a thick understory, are essential. Studies of forest fragmentation in Missouri indicate that blocks of suitable habitat (at least 500 ha) are necessary for successful breeding. An analysis of floristic, structural, isolation, and area variables of forest fragments on coastal plain of Maryland found that forest area, independent of its covariates, strongly affected presence/absence of Kentucky Warbler.

Breeding-ground territories function as nesting and foraging areas that pairs (or unmated males) occupy nearly exclusively through breeding season, although after fledging young may wander into neighboring territories and parents follow, often unchallenged (perhaps undetected) by neighbors. Early in breeding season, adults of both sexes sometimes forage off their territories, and seek extra-pair copulations (MVM) as distantly as 500 m, but more often within 100 m of home. In Virginia, average territory size is 2.21 ha (range 1.21-3.75, n = 493). Young travel up to 200 m from nest within 1st week of fledging.

Little known about migratory habitat. May occur in suburban gardens and city parks.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### Least Bittern

#### *Ixobrychus exilis*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5473	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5474	Breeding	Roosting Area	175 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5475	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5476	Breeding	Foraging	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5477	Breeding	Breeding Sighting-Confirmed	175 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5478	Breeding	Nest	175 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Very little research has been conducted on this secretive marsh bird. One telemetry study in New York reported a mean home range for adults was 9.7 ha with a range of 1.8 ha - 35.7 ha. NatureServe does not suggest an inferred extent for this species. The New York Study appears to be the most relevant to New Jersey. A mean home range of 9.7 ha equates to a circle of radius 0.175km. We will use this value as an inferred extent until such time as we have additional information, including New Jersey-specific data, to justify a change in this value.

#### Literature:

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**Bogner, H.C., G.A. Baldassarre. 2002. Home range, movement and nesting of least bittern in western New York. Wilson Bulletin 114(3): 297-308.**

A telemetry study in New York tracked 33 adults and 12 chicks. The mean home range of the adults was 9.7 ha, with a range of 1.8-35.7 ha (which depended on whether the birds used one or two breeding sites per season). The mean movement of the chicks was 13.4 m between capture and 23 days post-hatch and 29.4 m between 24-27 post-hatch.

**Last researched by:** Davis

**Date researched:** 7/1/2006



## Aves

### Least Flycatcher

#### *Empidonax minimus*

SpC/LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5479	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5482	Breeding	Breeding Sighting	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5484	Breeding	Breeding Sighting-Confirmed	100 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.01 - 0.38 ha. Furthermore, fledglings will use areas within 100 meters of a nest in the first month of fledging. The breeding occurrence area was chosen to incorporate the territory size and the post-fledging habitat. Non-breeding individuals are listed as stable in NJ so the default occurrence area was chosen and will not be included in the Landscape Project.

#### Literature:

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**Briskie, J. V. 1994. Least Flycatcher (*Empidonax minimus*). In *The Birds of North America*, No. 99 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.**

Mean territory size in Ontario:  $0.13 \pm 0.10$  ha (range 0.03-0.38, n = 10); in New Hampshire:  $0.18 \pm 0.01$  ha (n = 59); in Michigan: 0.07 ha (range 0.01-0.20, n = 33). Area utilized by flycatchers for foraging, however, generally exceeds that defended by territorial male. Size of territory decreases after laying.

Despite defense of exclusive territories, most flycatcher territories distributed in dense aggregations or "colonies," leaving apparently adjacent suitable habitat unoccupied. Amount of forest occupied by aggregations averaged  $18.05 \pm 3.38$  ha (range 1.65-38.5) in Michigan. MacQueen (1950) observed that large open areas near territory aggregations sometimes used as neutral feeding grounds by all flycatchers nesting nearby and suggested such behavior may decrease intraspecific conflict and size of individual territories. Use of neutral feeding areas not reported by other workers and requires further study.

Territories of Least Flycatchers overlap extensively with those of other flycatcher species (e.g., Eastern Phoebe [*Sayornis phoebe*], Great Crested Flycatcher, and Eastern Wood-Pewee; Johnston 1971); however, flycatchers often exclude American Redstarts via interspecific aggression, leading to partial interspecific territoriality. Both Least Flycatchers and American Redstarts have converged on ecological niche of flycatching—both species overlap significantly in body size, bill morphology, foraging behavior, and patterns of habitat exploitation. Most important method of ecological segregation through horizontal spatial separation (i.e., decreased overlap of territories; Sherry 1979). Degree of interspecific territoriality varies with redstart age: adult redstarts overlap

territories less than second-year redstarts.

Fledglings generally recaptured within 100 m of nest site until 10-14 d after leaving nest; thereafter gradually dispersing so that by 20-24 d post-fledging they are about 500 m from nest, and by 30-34 d > 800 m from nest.

No published studies of habitat use during migration. Ely (1970) noted migrating Least Flycatchers in w.-central Kansas generally confined to wooded habitats along water courses, gullies and windbreaks, although occasionally found in tall weed growth and isolated trees.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### Least Tern

#### *Sternula antillarum*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4952	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4953	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
4954	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4955	Breeding	Suspected Breeding Location	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4956	Breeding	Foraging	3 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4957	Breeding	Nesting Colony	71.25 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes

#### Justification:

Least terns nest primarily on Atlantic coast beaches in New Jersey, with the exception of a few inland nesting sites in areas such as abandoned sand mines and airports. In coastal colonies in Georgia, least terns foraged up to 4.9 km from colony locations (Tomkins 1959). In California, least terns in coastal colonies preferred foraging in the ocean as opposed to other non-ocean foraging options. In that study, 90-95% of the terns foraged within 1.6 km of the shoreline, and were never observed at distances of greater than 3.2 km (Atwood 1983). At interior sites, Schweitzer found that least terns would forage up to 12 km from nesting sites (Schweitzer 1994). The majority of observed least terns along the Missouri River foraged within 100-200m from nesting sites and the maximum sighting was 4.5 km away (Hill 1993). In some locations, least terns will nest on rooftops. At a rooftop nesting site in Mississippi, terns foraged up to 4.5 km away (Jackson 1994). NatureServe (2006) does not make any recommendations for inferred minimum extents.

#### Literature:

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Atwood, J.L., D. E. Minsky 1983. Least Tern foraging ecology at three major California breeding colonies. *West. Birds* 14: 57-71.

Approximately 75% of surveyed least terns in coastal California colonies foraged in the ocean as opposed to other bodies of water. Approximately 90-95% of the birds feed within 1.6 km of the shoreline in water less than 18.2 meters in depth. They were rarely observed foraging between 1.6 - 3.2 km offshore and were never observed at greater distances than 3.2 km miles.

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**Hill, L.A. 1993b. Design of constructed islands for nesting interior Least Terns. Pp. 109-118 in Proceedings of the Missouri River and its tributaries: Piping Plover and Least Tern Symposium (K. F. Higgins and M. R. Brashier, eds.). South Dakota State Univ., Brookings, SD.**

Least terns in interior areas forage primarily in 100-300 m from riverine nesting sites. However, they may forage in areas up to 4.5 km away.

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**J. A. Jackson 1994. Terns on tar beach. Natural History 103(7): 46-53.**

Least terns foraged 4.5 km from rooftop nest sites in Mississippi.

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**Schweitzer, S.H. 1994. Abundance and conservation of endangered interior Least Terns nesting on salt flat habitat. Ph.D. diss., Oklahoma State Univ., Stillwater.**

In response to localized abundance of suitable fish, terns foraged up to 12 km from inland salt flat colonies.

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**Tomkins, I.R. 1959. Life history notes on the Least Tern. Wilson Bulletin 71: 313-322.**

Nesting least terns foraged up to 4.9 km away when carrying food to a colony in Georgia.

**Last researched by:** Davis

**Date researched:** 2/1/2007

## Aves

### Little Blue Heron

#### *Egretta caerulea*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5485	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5486	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5487	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5488	Breeding	Nesting Colony	71.25 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
5489	Breeding	Roosting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5490	Breeding	Foraging	8.1 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

Nesting area is defined by the area the birds actually use, as these birds do not defend a territory except immediately around their individual nests. The boundaries of the colony are defined as much by social attraction phenomenon and by habitat suitability. Consequently there is now immediately apparent justification for buffering the mapped extent of a nesting area. Where the mapped extent of a colony was available it was used. Where the mapped extent was not available the default seconds precision circle was used around the recorded nesting location point.

ENSP reviewed the literature regarding commuting distance for colonial nesting long-legged wading birds which fairly consistently indicates that the importance of suitable foraging habitat decreases with the distance from the nesting area (e.g. Dowd and Flake 1985, Custer et al. 2004, Kelly et al 1993, Thompson 1978). This is not surprising considering the energy demands of long commutes and the fact that, all other things being equal, if suitable foraging habitat is randomly distributed within the possible foraging range, simple geometry would argue that availability would increase with the square of the distance from the colony. Consequently, a particular type of wetland or riparian habitat is more critical if it is located close to a nesting area than a similar area located near the edge of the energetically feasible foraging range from the colony. It would therefore be unjustifiable to use the maximum foraging distance figures to define all potential foraging habitat as critical foraging habitat for a particular nesting colony. Conversely, using an average foraging

distance figure may under-include suitable habitat by omitting some foraging areas that are important because they provide particularly rich and easily exploited feeding habitat. Further, research (Custer et al. 2004) indicates that longer commuting distances are more frequent during high-demand and demographically critical nestling rearing period. Where the literature on commuting distance includes several studies, there can be wide variability in the mean commuting distances between different studies. When such was the case, we either averaged the reported mean commuting distances or used the information from the study with a large sample size or from an area most ecologically similar to New Jersey. We then doubled this figure.

Research in North Carolina found that 84% of breeding long-legged waterbirds flew to foraging areas, which is why habitat outside the vicinity of the colony must be valued as crucial to the success of the colony (Custer and Osborn 1978). Foraging commuting distances for little blue herons are highly variable, likely due to factors such as prey availability and water depth and fluctuation (Rodgers and Smith 1995). This variability can be observed in the following studies. In Florida, the average commuting distance was found to be 10.2 km (Bancroft et al. 1990). In North Carolina, the average distance was 2.9 km (Custer and Osborn 1978). NatureServe recommends a minimum inferred extent of 3 km and justifies it by noting a low mean foraging range size for this group (NatureServe 2006). We apply a 13.1 km radius around a colony to protect foraging areas.

## **Literature:**

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**Bancroft, G. T., S. D. Jewell, A. M. Strong. 1990. Foraging and nesting ecology of herons in the lower everglades relative to water conditions. Final report to South Fla. Water Manage. Dist., West Palm Beach, FL.**

In Florida, the average commuting distance of little blue herons to foraging sites from a marsh island colony was 10.2 km.

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**Custer, C.M., S.A. Suarez, D.A. Olsen. 2004. Feeding habitat characteristics of the Great Blue Heron and Great Egret nesting along the Upper Mississippi River, 1995-1998. Waterbirds 27(4): 454-68.**

The majority of the herons in this study fed <5 km from the nesting site, and avoided areas > 10 km away. They flew farther to sites during the brood-rearing period than during incubation. Only 10% of the feeding flights ended at a location where another heron was present, indicating that they prefer to feed alone.

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**Custer, T. W., R. G. Osborn. 1978. Feeding habitat use by colonially-breeding herons, egrets, and ibises in North Carolina. Auk 95: 733-743**

In North Carolina, little blue herons commuted an average of 2.9 km from a coastal colony to foraging sites.

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**Dowd and Flake. 1985. Foraging habits and movements of nesting Great Blue Heron in prairie river ecosystem, South Dakota. Journal of Field ornithology 56: 377-87.**

A study in South Dakota found that the average distance that great blues flew from their colony to a foraging site was 3.1 km, and the maximum observed distance was 24.4 km. Eighty-five percent of the herons in the study fed within 4 km of the colony.

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**Kelly J. P., H. M. Pratt, P. L. Greene. 1993. The distribution, reproductive success, and habitat characteristics of heron and egret breeding colonies in the San Francisco Bay area. Colonial Waterbirds. 16:18-27.**

> 95% of great blue herons and >90% great egrets fed within 20 km of their colony.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: June 4, 2007 ).**

The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 3 km. For the breeding season, this figure is based on a low mean foraging range size for this group.

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**Rodgers, J. A., Jr., and H. T. Smith. 1995. Little Blue Heron (*Egretta caerulea*). In *The Birds of North America*, No. 145 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.**

Choice of foraging sites and length of time a particular area is used are highly variable, depending on prey available, water depth, and water-level fluctuation. Flight distance to foraging sites varies among studies, probably reflecting food availability.

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**Thompson. 1978. Feeding areas of Great Blue Herons and Great Egrets nesting in the floodplain of the upper Mississippi River. *Proc. Colonial Waterbird Group*. 2: 202-213.**

In central Minnesota the average distance that the herons flew from the colony to a foraging area was 6.5 km, and the maximum observed was 20.4 km. Fifty-three percent of the herons in the study fed within 4 km of the colony.

**Last researched by:** Davis

**Date researched:** 1/1/2007

## Aves

### Loggerhead Shrike

#### *Lanius ludovicianus migrans*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4795	Non-Breeding	Non-breeding Sighting	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Little is known about the occurrence of this species in New Jersey, but it is unlikely that this species breeds in New Jersey (Pruitt 2000). Elsewhere, territories ranged from 2.7 to 34 ha (Dechant et al. 1998, Yosef 1996). The occurrence area was chosen based upon the upper range of territory size.

#### Literature:

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**Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, A. L. Zimmerman, and B. R. Euliss. 1998 (revised 2002). Effects of management practices on grassland birds: Loggerhead Shrike. Northern Prairie Wildlife Research Center, Jamestown, ND. 19 pages.**

Territories 6-9 ha averaging 2.7 ha in Alberta to 25 ha in Idaho. Alberta ROW territories were 8.5 ha. Average Missouri territories were 4.6 ha.

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**Pruitt, L. 2000. Loggerhead Shrike Status Assessment. USFWS, Bloomington, IN.**

This species has not been documented breeding in New Jersey since the early 1900s. It is a partial migrant only in northern part of range and migration may depend on severity of winter and food availability in breeding habitat during wintertime. Stopover sites are different in spring than fall and individuals may migrate between wintering sites.

Winter habitat is not different from breeding habitat. May move from pastures to more shrub-forest habitat in winter, particularly when snow-covered. Could also use more cropland in winter

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**Yosef, R. 1996. Loggerhead Shrike (*Lanius ludovicianus*). In *The Birds of North America*, No. 231 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.**

Breeding territories averaged 13.4 ha in Alberta, 34 ha in California, 4.6 ha in Missouri, 7.5 ha in New York, 8.35 ha in Florida, and 8.9 ha and 25 ha in Idaho. No information on minimum patch size was provided. Breeding territories maintained year-round in Florida and S. Carolina, but not in California.

No information provided on migratory habitat - assume similar to breeding habitat. Winter habitat also similar to breeding habitat but hay fields and idle pastures used in addition to scrub-shrub and



open forest habitat

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### Long-eared Owl

#### *Asio otus*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4787 Non-Breeding	Non-breeding Sighting	400 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4790 Breeding	Breeding Sighting	400 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4792 Breeding	Nest	400 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4793 Non-Breeding	Roosting Area	400 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

No information was found regarding home range/territory sizes for long-eared owls in the northeast. Reported home ranges for this species are highly variable and range from 0.7 - 20.25 km<sup>2</sup> (Kirschbaum and Ivory 1999). Craighead and Craighead (1956) reported home ranges for long-eared owls in Wyoming ranging from 34 - 106 ha with an average of 51 ha. Knight and Erickson (1977) estimated breeding densities along the Columbia River to be approximately 1 pair/12 linear km. Along the Snake River in Idaho an average of 0.28 - 0.42 nesting pairs per square km was estimated, as compared to areas in southern Idaho where from 0.64 - 1.55 pairs per square kilometer were found (Marks 1986). Due to the paucity of information on home range for long-eared owls, especially in the northeast, a conservative home range estimate of 50 ha has been adopted based on the available literature.

#### Literature:

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**Craighead, J.J., and F.C. Craighead, Jr. 1956. Hawks, owls and wildlife. Stackpole Books, Harrisburg, PA. 443pp.**

Home ranges in Wyoming ranged from 34 - 106 ha with an average of 51 ha.

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**Kirschbaum, K., and A. Ivory. 1999. Asio Otus (On-line) Animal Diversity Web. Accessed April 4, 2007 at [http://animaldiversity.ummz.umich.edu/site/accounts/information/Asio\\_otus.html](http://animaldiversity.ummz.umich.edu/site/accounts/information/Asio_otus.html) .**

Reported that home ranges were highly variable and ranged from 0.7 - 20.25 square kilometers.

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**Knight, R.L., and A.W. Erickson. 1977. Ecological notes on long-eared and great horned owls along the Columbia River. Murrelet 58: 2-6.**

Reported 1 pair per 12 linear kilometers of riparian habitat in Washington.

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**Marks, J. S., D. L. Evans, and D. W. Holt. 1994. Long-eared Owl (*Asio otus*). In *The Birds of***

**North America, No. 133 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.**

Two breeding pairs were tracked for 8-9 nights and were found to use a core area within 1 km of the nest with occasional forays up to 3 km from the nest.

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**Marks, J.S. 1986. Nest site characteristics and reproductive success of long-eared owls (*Asio otus*) in southwestern Idaho. *Wilson Bull.* 98: 547-60.**

Reported home ranges in Idaho along the Snake River ranging from 238 to 357 ha. Elsewhere in southeastern Idaho home ranges varied from 65 to 155 ha.

**Last researched by:** Valent

**Date researched:** 4/1/2007

## Aves

### ***Migratory Raptor Concentration Site***

#### ***Migratory raptor concentration site***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7887	Non-Breeding	Non-breeding Concentration	Hand Digitized Polygon	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### **Justification:**

Mapped polygons represent all non-urban habitat (2012 NJDEP LU/LC) in the lower 10 kilometers of the Cape May peninsula.

#### **Literature:**

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**McCann, J. M., S. E. Mabey, L. J. Niles, C. Bartlett, and P. Kerlinger. 1993. A regional study of coastal migratory stopover habitat for Neotropical migrant songbirds: Land management implications. Trans. N. Amer. Wildlife and Natural Resources Conf. 58:398-407.**

N/A

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**Niles, L.J., J. Burger, and K. E. Clark. 1996. The influence of weather, geography, and habitat on migrating raptors on Cape May peninsula. Condor 98:382-394.**

N/A

**Last researched by:** Clark

**Date researched:** 8/13/2015

## Aves

### ***Migratory Shorebird Concentration Site***

#### ***Migratory shorebird concentration site***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7701	Non-Breeding	Non-breeding Concentration-Major	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5756	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### **Justification:**

During northbound spring migration (late-April to early June), shorebirds gather in large numbers to forage on horseshoe crab eggs and roost on Delaware Bay and Atlantic Coast beaches and marshes (Clark et al. 1993, Burger et al. 1997, Niles et al. 2008). During fall migration, large numbers of shorebirds concentrate on Atlantic Coast beaches and mudflat sites to build weight for southward migration (Niles et al. 2011), or remain for longer durations (2 - 6 months) to molt flight feathers (ENSP unpub. Data) and/or overwinter. Polygons delineate the extent of coastal areas where ENSP has documented shorebirds congregating to forage, roost and rest. These areas were digitized over current aerial photography using the presence of important features such as mudflats and beaches to guide delineation. Areas delineated as polygons did not receive a buffer (that would value adjacent suitable habitats).

Shorebird concentration areas support several species of migrating shorebirds, including state endangered and special concern species as well as several considered conservation priority species in the US Shorebird Conservation Plan, (2001): Red Knot, Sanderling, American Oystercatcher, Whimbrel, Semipalmated Sandpiper, Piping Plover, Spotted Sandpiper, and 26 declining shorebirds: American Avocet, American Golden Plover, Baird's sandpiper, Black-bellied Plover, Buff-breasted Sandpiper, Cerlew Sandpiper, Dunlin, Greater Yellowlegs, Hudsonian Godwit, Killdeer, Least Sandpiper, Lesser Yellowlegs, Long-billed Dowitcher, Marbled Godwit, Pectoral Sandpiper, Purple Sandpiper, Ruddy Turnstone, Semipalmated Plover, Short-billed Dowitcher, Solitary Sandpiper, Spotted Sandpiper, Stilt Sandpiper, Western Sandpiper, White-rumped Sandpiper, Willet, Wilson's Snipe; (ENSP and NJ Audubon Society Unpubl. Data, US Shorebird Conservation Plan, 2001).

#### **Literature:**

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**Burger, J., L. Niles, and K. E. Clark. 1997. Importance of beach, mudflat, and marsh habitats to migrant shorebirds on Delaware Bay. *Biological Conservation* 79:283-292.**

N/A

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**Clark, K. E., L. J. Niles, and J. Burger. 1993. Abundance and distribution of migratory shorebirds in Delaware Bay, NJ. *Condor* 95:694-705.**

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**Niles, L. J., H. P. Sitters, A. D. Dey, P. W. Atkinson, A. J. Baker, K. A. Bennett, R. Carmona, K. E. Clark, N. A. Clark, C. Espoz, P. M. Gonzalez, B. A. Harrington, D. E. Hernandez, K. S. Kalasz, R. G. Lathrop, R. N. Matus, C. D. T. Minton, R. I. G. Morrison, M. K. Peck, W. Pitts, R. A. Robinson, and I. L. Serrano. 2008. Status of the Red Knot (*Calidris canutus rufa*) in**

the Western Hemisphere. *Studies in Avian Biology*, No. 36. Cooper Ornithological Society.

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**Niles, L. J., J. Burger, R. R. Porter, A. D. Dey, C. D. T. Minton, P. M. Gonzalez, A. J. Baker, J. W. Fox and C. Gordon. 2010. First results using light level geolocators to track Red Knots in the Western Hemisphere show rapid and long intercontinental flights and new details of migration pathways. *Wader Study Group Bull.* 117(2):123-130.**

**Last researched by:** Clark

**Date researched:** 2/1/2007

## Aves

### Nashville Warbler

#### *Oreothlypis ruficapilla*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6539 Breeding	Breeding Sighting	90 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
6541 Breeding	Breeding Sighting-Confirmed	90 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
6542 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Little information is known about breeding territories of Nashville warblers, so the breeding occurrence area was chosen based on the upper limit breeding density calculated to a territory size of 2.5 ha (Williams 1996). The nonbreeding population is listed as stable in NJ, so no occurrence area was chosen and will not be included in the Landscape Project.

#### Literature:

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**Williams, J. M. 1996. Nashville Warbler (*Vermivora ruficapilla*). In *The Birds of North America*, No. 205 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.**

Breeding territory in East: 5-15 pairs/40.5 ha in Vermont. In subalpine area in White Mtns. of New Hampshire, territory size 1.1 ha, with 9 pairs ( $\pm 3$  SE)/km<sup>2</sup>; in nearby area of virgin spruce grove, density increased to 24 pairs/km<sup>2</sup>. During spruce-budworm outbreak in Maine and New Hampshire, territorial density >0.5 territories/ha.

Prefers second growth, open deciduous, or mixed-species forests, with high level of light penetration; preferably with shrubby undergrowth. Never found in unbroken forest. In New York, nests in mixed forests, edges, and fields. In the East, sometimes inhabits mountains slopes, including fairly steep ones, as high as 1,400 m, but not above timberline. Nests farther south are found in drier, more open, cut-over areas and in second-growth forests, especially with aspen, birch, and alder (*Alnus*).

During migration, frequents deciduous trees or shrubs in open mixed forests at mid-canopy level, bushy edges of woodlands along streams, roads, and paths, or edges of fields, meadows, and ponds, swamps, or marshes. Often seen in mixed-species flocks in both spring and fall migration.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### Northern Goshawk

#### *Accipiter gentilis*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4797 N/A	Nest	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4798 N/A	Breeding Sighting	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4800 N/A	Non-breeding Sighting	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Northern goshawks' home range sizes vary both seasonally and by sex. Males generally have larger territories than females, although there are exceptions, and both sexes have larger territories during the non-breeding season than during the breeding season (Squires and Reynolds 1997). Breeding habitats are more selective, the hawks preferring large, contiguous tracts of mature forests and forested wetlands (Squires and Reynolds 1997, Bosakowski and Speiser 1994), while non-breeding habitats may also include young forests, scrub-shrub habitats and ecotones between forest and open fields and agricultural lands (Squires and Reynolds 1997, Bosakowski and Speiser 1994). Results from research on home ranges sizes vary greatly and no home range size determination has been developed for eastern populations. However, due to the similarity in habitat preferences and behavior of northern goshawks and red-shouldered hawks in NJ and NY (Bosakowski and Speiser 1994), the same occurrence area will be used as a conservative estimate of northern goshawk critical habitat until new research suggests differently.

#### Literature:

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**Bosakowski, Thomas and Robert Speiser. 1994. Macrohabitat Selection by Nesting Northern Goshawks: Implications for Managing Eastern Forests. *Studies in Avian Biology*. 16:46-49.**

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**Squires, J. R., and R. T. Reynolds. 1997. Northern Goshawk (*Accipiter gentilis*). In *The Birds of North America*, No. 298 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.**

Home range studies varied in methodology and focused on western populations of northern goshawks: Arizona males' ranges varied from 1,758 ha + 500 (std. dev.) (range 896 - 2,528 ha). New Mexico males' ranges varied from 2,106 ha + 635 (std. dev.) (range 1,698 - 2,837 ha); New Mexico females' ranges varied from 569 ha + 473 (std. dev.) (range 95 - 1,292 ha). California males' ranges varied from 1,340 ha + 810 (std. dev.) (2 males, one with 1,790 ha range and 3,010 ha range). Northern California males' ranges varied from 2,425 ha (1,083 ha - 3,902 ha); Northern California females' ranges varied from 3,774 ha (2,007 - 6908 ha).

**Last researched by:** Schantz

**Date researched:** 1/1/2006



# Aves

## Northern Harrier

### *Circus cyaneus*

SpC/LID	F LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4805	N/A	Non-breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4806	N/A	Breeding Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4808	N/A	Nest	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from about 1 ha to over 1,500 ha (Dechant et al. 1998, MacWhirter and Bildstein 1996). The breeding occurrence area was chosen based upon evidence of large territories, the distance traveled for foraging, and the mobility of the species (Dechant et al. 1998). The non-breeding occurrence area was chosen based upon evidence of smaller territories (MacWhirter and Bildstein 1996) than breeding territories and the mobility of the species. No minimum patch size was chosen due to evidence that harriers will use smaller patches (Dechant et al. 1998).

#### Literature:

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**Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 1998 (revised 2002). Effects of management practices on grassland birds: Northern Harrier. Northern Prairie Wildlife Research Center, Jamestown, ND. 15 pages.**

In North Dakota, uncommon in areas < 100 ha. In Illinois, nested in grasslands 8-120 ha in size. May respond to total amount of grassland in area instead of patch size - small fragments may be used if located near larger patches. Missouri nesting density: 121 ha per pair. Male home ranges averaged 890 ha. In Manitoba males defended 27.7 ha centered on nest. In Minnesota traveled over 259 ha to hunt. Idaho territories averaged 1570 ha for males and 113 ha for females.

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**MacWhirter, R. B., and K. L. Bildstein. 1996. Northern Harrier (*Circus cyaneus*). In *The Birds of North America*, No. 210 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.**

Not very territorial except of the nest. In New Brunswick male breeding territories were 100 ha, female territories 10 ha. In Idaho, male territories were 0.8 ha. Nonbreeding territories were 65 ha in SE US, California ranged from 3.9 - 125 ha and a mean of 33.6 ha.

**Last researched by:** Petzinger

**Date researched:** 1/1/2006

# Aves

## Northern Parula

### *Parula americana*

SpCFLID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5511	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5513	Breeding	Breeding Sighting	50 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5516	Breeding	Breeding Sighting-Confirmed	50 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.08 - 0.65 ha. The breeding occurrence area was chosen based upon the upper limit territory size. Non-breeding individuals are listed as stable in NJ so no occurrence area was chosen.

#### Literature:

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**Moldenhauer, R. R., and D. J. Regelski. 1996. Northern Parula (*Parula americana*). In *The Birds of North America*, No. 215 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.**

Primarily a riparian species; usually associated with mature forest with epiphytic growth. Prefers tall, mature coniferous forests with spruce, hemlock, and fir in moist bog and swamp habitat where beard moss is abundant. In hardwood stands of sugar maple, red maple, paper birch, and yellow birch in Nova Scotia, most abundant in 40-yr-old stands of trees, less numerous in younger and older-aged. Density positively correlated with tree density, basal area, percent canopy cover, and canopy height. In n.-central Minnesota, inhabits primarily mature undisturbed mixed forest of predominately deciduous trees with moderate ground and shrub cover and >75% canopy cover. Numbers positively correlated with the presence of sycamore in s. Illinois. In Middle Atlantic states, forest area was a significant predictor of this species' relative abundance; in a forest area of >3,000 ha, maximum probability of occurrence, with probability of occurrence dropping to 50% for forest areas of 520 ha. Rarely encountered in forests of <100 ha.

In Nova Scotia, mean territory size 0.32 ha (n = 26, range 0.08-0.65). Potential competitors affect territory size and density; mean territory size 0.4 ha (0.30-0.51) for birds inhabiting the mainland spruce forests of Maine, but species occupies offshore islands only 0.16 ha in size.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### Osprey

#### *Pandion haliaetus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4815	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4811	Breeding	Nest	300 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
4812	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
8493	Breeding	Foraging	2.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

All wetland habitats within 300 meters of a nest are designated as critical habitat. Home range size is much larger than 300 meters and determined by availability of food (fish); only the nest area itself is defended. In NJ colonies, some nests are as close as 120 meters, but most are more than 500 meters apart (KEC). While ospreys generally tolerate and nest in proximity to people, human activity of certain types and at certain times of the season will disrupt nesting and can cause injury or mortality to young.

Foraging habitat is defined as open waters within 2 km of nests. A USFWS osprey habitat model for the eastern U.S. represented foraging habitat as waters (riverine, lake and shallow coastal waters) within 2 km radius of nests, based on numerous literature sources. Ospreys may forage as far as 20 km from nests, but most foraging occurs closer to the nest as long as foraging conditions there are adequate.

#### Literature:

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**Poole, A. F. 1989. Ospreys: a natural and unnatural history. Cambridge Univ. Press. Cambridge, U.K.**

Nests in MA were spaced 140 m apart in a salt marsh area with artificial nest structures, farther in upland situations (Table 8.6 in Poole 1989).

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**Poole, A. F., R. Bierregaard, and M. S. Martell. 2002. Osprey (*Pandion haliaetus*). In *The Birds of North America*, No. 683 (A. Poole and F. Gill, eds.). The Birds of North America Inc., Philadelphia, PA.**

The nest area is determined by food availability, nest structure availability, and type of nest structure (artificial nest-pole, tree, channel marker, cell tower) and height.

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**U.S. Fish and Wildlife Service. 2000. Osprey Habitat Model. USFWS Region 5,  
[www.fws.gov/r5gomp/gom/habitatstudy/metadata/osprey\\_model.htm](http://www.fws.gov/r5gomp/gom/habitatstudy/metadata/osprey_model.htm).**

N/A

**Last researched by:** Clark

**Date researched:** 3/3/2011

## Aves

### *Peregrine Falcon*

### *Falco peregrinus*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4860 N/A	Urban Nest	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4861 N/A	Nest	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4863 N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4865 N/A	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

All emergent wetland habitats within 1 km of a nest are designated as critical habitat. Home range size is much larger than 1 km, as peregrines forage on birds found in open habitats within 5 km of the nest. Prey species are mainly passerines, shorebirds and doves found in open habitats, usually within 1-5 km of the nest. Typical hunting habitats are emergent marsh, scrub-shrub, beach, dunes and intertidal flats. In urban areas, any of those habitat types are used, in addition to the urban setting itself, where peregrines hunt rock pigeons (*Columba livia*). In urban areas, *Columba* species may comprise 31% of the peregrine diet, and resident bird species (including *Columba* species) more than 90% (by occurrence; Nadeski 2001). In contrast, Steidl et al. (1997) found that nearly 70% of the diet of NJ coastal peregrines consisted of migratory birds, predominantly shorebirds. These diet figures point to the habitat differences between coastal/marsh nesting peregrines and urban-nesting peregrines.

#### Literature:

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Nadeski, C. A. 2001. Analysis of prey of the peregrine falcon (*Falco peregrinus*) for the Port of New York/New Jersey. Unpublished report to U.S. Fish and Wildlife Service. May 2001.

N/A

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Steidl, R. J., C. R. Griffin, T. P. Augspurger, D. W. Sparks, L. J. Niles. 1997. Prey of peregrine falcons from the New Jersey coast and associated contaminant levels. *Northeast Wildlife* 52:11-19.

N/A

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White, C. M., N. J. Clum, T. J. Cade, and W. G. Hunt. (2002). Peregrine Falcon (*Falco peregrinus*). *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Laboratory of Ornithology; Retrieved from *The Birds of North American Online* database: [http://bna.birds.cornell.edu/BNA/account/Peregrine\\_Falcon/](http://bna.birds.cornell.edu/BNA/account/Peregrine_Falcon/).

N/A

**Last researched by:** Clark

**Date researched:** 2/1/2007

## Aves

### *Pied-billed Grebe*

#### *Podilymbus podiceps*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4819 Breeding	Breeding Sighting-Confirmed	110 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4820 Breeding	Foraging	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4821 Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4822 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4823 Breeding	Nest	110 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The average home range in one study was found to be 1.3 ha, although another study reports a home range as large as 35 ha (Glover 1953, Muller 1995). A similar species, the red-necked grebe, had a home range of 114 meters (Palmer 1962). Pied-billed grebes will defend a circular area with a radius of 46 m from the nest, but sometimes the radius will be smaller than this (Johnsgard 1987). NatureServe reports a minimum inferred extent of 0.11 km (NatureServe 2006). We are accepting the NatureServe minimum inferred extent of 0.11 km until such time as that is changed or we have additional information, including New Jersey-specific data, to justify a change in this value.

#### Literature:

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#### **Glover. 1953. Nesting ecology of the pied-billed grebe in northwestern Iowa. *Wilson Bulletin* 65: 32-39.**

The average home range of pied-billed grebes in Iowa was 1.3 ha (n=44), which is roughly a circle with a diameter of 130 m.

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#### **Johnsgard. 1987. *Diving birds of North America*. University of Nebraska Press. Lincoln xii. 292 pp.**

An area of a radius of 46 m around the nest is defended by pied-billed grebes, though it is sometimes smaller than this.

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#### **Muller. 1995. Pied-billed grebes nesting on Green Lake, Seattle Washington. *Washington Birds* 4:35-59.**

Some pied-billed grebes had a home range as large as 35 ha.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

Inferred minimum extent is 0.11 km.

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**Palmer. 1962. Handbook of North American birds. Vol 1. Loons through flamingoes. R.S. (ed.). Yale University Press, New Haven. 567 pgs.**

Red-necked grebes had a home range of approximately 114 meters.

**Last researched by:** Davis

**Date researched:** 7/1/2006



## Aves

### Piping Plover

#### *Charadrius melodus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4941	Breeding	Nest	750 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4942	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4943	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4944	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4945	Breeding	Nesting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

Piping plovers nest singly or in loose colonies on the Atlantic coast beaches in New Jersey. They maintain a breeding territory that consists of a section of shoreline (for feeding) and a portion of beach (for nesting) (Whyte 1985). Males defend territories (pre-nest) of up to 10,000m<sup>2</sup> (Cairns 1982). Home range during incubation is generally confined to the vicinity of the nest. Distances to nearest nest highly variable: averages include 50 m apart in Nova Scotia (Cairns 1977) to a range of 500m - 5000m in New York (Elias-Gerken 1994). In New Jersey, piping plover territories appear to be at least partially based on the amount of habitat available. Pairs with fewer conspecifics on the site tend to maintain larger territories, and pairs that are spaced at a higher density tend to have smaller territories (C. Kisiel, personal communication, February 23, 2007).

Piping plover chicks are precocial and therefore highly mobile (Cairns 1982). In NJ, broods have been documented traveling maximum distances of up to three-quarters of a mile (1207 meters) (T. Pover, personal communication, February 13, 2007). Chick mobility varies in other states: in Maryland and Virginia distances varied from 32m - 600+ meters (both studies n=59 broods) (Patterson 1988, Cross 1989). At another Maryland study, brood distances averaged 143m (n=87 broods), but three weeks post hatch increased to an average of 237m (n=80 broods). In North Carolina, the average was 274.23m (n=14 broods) (Coutu, et al 1990). In Massachusetts, 50% the focal chicks moved >200m in the first 5 days post hatch (50% moved <100m) (n=10 chicks) (Strauss 1990).

In nesting areas outside NJ, territory size also varied by point in the nesting cycle and among sites: an average of 4,000 m<sup>2</sup> in Nova Scotia (Cairns 1982) to 27,022 - 30,547 m<sup>2</sup> in Saskatchewan (Whyte 1985). Natureserve recommends a buffer of 1.5 km when actual extent is unknown.

#### Literature:

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A. J. Whyte. 1985. Breeding ecology of the Piping Plover (*Charadrius melodus*) in central

**Saskatchewan. M.S. thesis, Univ. Saskatchewan, Saskatoon.**

Birds primarily fed within 15 m of the shoreline on Big Quill Lake, Saskatchewan but also sometimes fed near nest. Pairs maintained a 27,022 - 30,547 m<sup>2</sup> territory.

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**Coutu, S.D., J.D. Fraser, J.L. McConnaughey, and J.P. Loegering. 1990. Piping plover distribution and reproductive success on Cape Hatteras National Seashore. Unpublished report to the National Park Service. 67pp.**

Observations of 11 broods averaged 2121m from their nests; 3 broods moved 400-725 m from their nest sites.

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**Cross, R.R. 1989. Monitoring, management and research of the piping plover at Chincoteague National Wildlife Refuge. Unpublished report. Virginia Department of Game and Inland Fisheries Virginia. 80pp.**

At 3 sites, observers recorded broods at a mean distance from their nests of 153 m +/-97m (44 observations, 14 broods), 32m +/- 7m (8 observations, 3 broods), and 492m +/-281m (12 observations, 4 broods).

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**Elias S.P., J. D. Fraser, P. A. Buckley. 2000. Piping Plover brood foraging ecology on New York barrier islands. J. Wildl. Manage. 64: 346-354.**

On ocean beaches wrack line is preferred foraging habitat for chicks followed by vegetated dunes.

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**Elias-Gerken, S.P. 1994. Piping plover habitat suitability on central Long island, New York barrier islands. M.S.Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 48pp.**

In New York in 1992, she observed 2.1 pairs/km on Westhampton Island, 1.8 pairs/km on Jones Island and 0.2 km/pair on Fire Island.

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**Haig, Susan M., and Elliott-Smith, E. (2004). Piping Plover. The Birds of North America Online. (A. Poole, Ed.) Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North American Online database: [http://bna.birds.cornell.edu/BNA/account/Piping\\_Plover/](http://bna.birds.cornell.edu/BNA/account/Piping_Plover/).**

While percentage of feeding near the shoreline varies by sex, age, and stage of breeding, birds feed chiefly within 5 m of the water's edge; only at sunset do parents and broods return to feed on higher ground. In Manitoba, individual breeders seen throughout the breeding season at sites that ranged from 3-102 km apart.

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**J. Whyte. 1985. Breeding ecology of the Piping Plover (*Charadrius melodus*) in central Saskatchewan. M.S. thesis, Univ. Saskatchewan, Saskatoon.**

Describes piping plover nesting habitat requirements.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

The inferred minimum extent habitat use (when actual extent is unknown) is 1.5 km (diameter).

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**Patterson, M.E. 1988. piping plover breeding biology and reproductive success on Assateague Island. M.S. thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 131 pp.**

Eighteen of 38 broods moved to feeding areas 100+m from nest, 5 broods moved 600+m. The distances were measured parallel to the wrack line.

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**Strauss,E. 1990. Reproductive success, life history patterns and behavioral variation in a population of piping plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts. 143pp.**

Ten chicks moved more than 200m during the first 5 days post-hatch while 19 chicks moved less than 200m during the same interval.

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**W. E. Cairns. 1977. Breeding biology and behavior of the piping plover *Charadrius melodus* in southern Nova Scotia. M.S. Thesis. Dalhousie University, Halifax, Nova Scotia. 115pp.**

Pairs nested, on average, 50m apart at this Nova Scotia study site. The shortest observed distance between two nests was 3 m.

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**W. E. Cairns. 1982. Biology and behavior of breeding Piping Plovers. *Wilson Bull.*94: 531-545.**

Males run distances of up to 100m during parallel run displays in pre-nesting territory disputes. Pairs maintained an average of a 4,000m<sup>2</sup> territory.

**Last researched by:** Davis

**Date researched:** 2/1/2007

# Aves

## Red Knot

### *Calidris canutus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4996	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

During northbound spring migration (late-April to early June), shorebirds gather in large numbers to forage on horseshoe crab eggs and roost on Delaware Bay and Atlantic Coast beaches and marshes (Clark et al. 1993, Burger et al. 1997, Niles et al. 2008). During fall migration, large numbers of shorebirds concentrate on Atlantic Coast beaches and mudflat sites to build weight for southward migration (Niles et al. 2011), or remain for longer durations (2 - 6 months) to molt flight feathers (ENSP unpub. Data) and/or overwinter. Polygons delineate the extent of coastal areas where ENSP has documented shorebirds congregating to forage, roost and rest. Species occurrence areas for red knot were either recorded as a point location to identify where an individual or flock occurred or were digitized as polygons to reflect the area where flocks have been repeatedly observed. Current aerial photography was used in delineating the SOA using the presence of important features such as mudflats and beaches to guide delineation. Areas delineated as polygons did not receive a buffer whereas those areas delineated as points received the standard or default buffer or 71.25 m.

#### Literature:

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**Burger, J., L. Niles, and K. E. Clark. 1997. Importance of beach, mudflat, and marsh habitats to migrant shorebirds on Delaware Bay. *Biological Conservation* 79:283-292.**

N/A

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**Clark, K. E., L. J. Niles, and J. Burger. 1993. Abundance and distribution of migratory shorebirds in Delaware Bay, NJ. *Condor* 95:694-705.**

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**Niles, L. J., H. P. Sitters, A. D. Dey, P. W. Atkinson, A. J. Baker, K. A. Bennett, R. Carmona, K. E. Clark, N. A. Clark, C. Espoz, P. M. Gonzalez, B. A. Harrington, D. E. Hernandez, K. S. Kalasz, R. G. Lathrop, R. N. Matus, C. D. T. Minton, R. I. G. Morrison, M. K. Peck, W. Pitts, R. A. Robinson, and I. L. Serrano. 2008. Status of the Red Knot (*Calidris canutus rufa*) in the Western Hemisphere. *Studies in Avian Biology*, No. 36. Cooper Ornithological Society.**

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**Niles, L. J., J. Burger, R. R. Porter, A. D. Dey, C. D. T. Minton, P. M. Gonzalez, A. J. Baker, J. W. Fox and C. Gordon. 2010. First results using light level geolocators to track Red Knots in the Western Hemisphere show rapid and long intercontinental flights and new details of migration pathways. *Wader Study Group Bull.* 117(2):123-130.**

**Last researched by:** Dey

**Date researched:** 2/9/2012

## Aves

### *Red-headed Woodpecker*

### *Melanerpes erythrocephalus*

SpC/LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4824	N/A	Non-breeding Sighting	75 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4827	N/A	Breeding Sighting-Confirmed	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4828	N/A	Breeding Sighting	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 3.1 - 8.5 ha while wintering territories range from 0.05 - 1 ha (Smith et al. 2000). The breeding occurrence area was chosen based upon the upper limit breeding territory size of 7 ha. The non-breeding occurrence area was based upon the upper limit wintering territory size of 0.6 ha and increased because this species will travel beyond its territory to forage (Smith et al. 2000).

#### Literature:

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**Smith, K. G., J. H. Withgott, and P. G. Rodewald. 2000. Red-headed Woodpecker (*Melanerpes erythrocephalus*). In *The Birds of North America*, No. 518 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.**

Little is known about breeding territories. In Florida, size of summer territories (3.1-8.5 ha) larger than in winter, with overlap between adjacent territories, although overlap areas not used as much as exclusive portion

Little information on habitat use in migration. Forages on living oak, maple (*Acer*), and hickory (*Carya*) trees and dead trees during spring in Illinois. Uses shelterbelts in spring migration on Great Plains. Forms loose flocks in fall in Florida that seek mast or fruit-bearing trees in orchards, oak hammocks, and urban areas where mature oaks or fruit trees are plentiful. Some suggest that species use forest edges more in fall.

Winter habitat in north, found in mature stands of forest, particularly oak forests; oak-hickory, maple, ash (*Fraxinus*), or beech woodlands; and old oak woodlots containing overmature trees with many cavities and dead. In south, pine and pine-oak areas. Favors areas with numerous standing snags (dri-ki) resulting from flooding or girdling by beavers, beaver ponds, marshes, and swamps. Also favored elm trees that had succumbed to fungal Dutch elm disease. Presence of mast as a winter food has long been recognized as single most important factor determining winter distribution in northern part of range, leading to the rule, "No mast, no redheads". A positive relationship existed between numbers and acorn abundance in most counties studied in Missouri and large acorn-bearing oaks in Illinois, suggesting that species may respond to acorn abundance on a local scale, but this relationship remains unstudied.

Winter territories can be small; e.g.,  $0.05 \text{ ha} \pm 0.03 \text{ SD}$  ( $n = 8$ ) for adults and  $0.03 \text{ ha} \pm 0.03$  ( $n = 6$ ) for juveniles, but more typically  $0.17 \text{ ha} \pm 0.04 \text{ SE}$  ( $n = 20$ ) to  $0.38 \text{ ha} \pm 0.04$  ( $n = 18$ ), to  $0.5\text{-}0.6 \text{ ha}$  to as large as  $1 \text{ ha}$  ). Acorns often gathered from beyond territory, and several individuals may be seen gathering acorns at same source, such that individuals defend their storage sites, not source of acorns.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### *Red-shouldered Hawk*

#### *Buteo lineatus*

SpC/LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4830 N/A	Nest	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4831 N/A	Breeding Sighting	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4836 N/A	Non-breeding Sighting	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

According to the scientific literature home range sizes for eastern populations of red-shouldered hawks' are highly variable, both seasonally and by sex. Males generally have larger territories than females and both sexes have larger territories during the non-breeding season than during the breeding season (Crocoll 1994). Crocoll, 1994, reported that the average breeding season home range of eastern populations varied from 108.9 ha to 339 ha. The mean breeding season home range being 224 ha, an area equivalent to a circle having a 0.71 km radius. ENSP selected a slightly larger occurrence area boundary for red-shouldered hawks to account for the larger territory size used by the birds during the non-breeding season.

#### Literature:

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**Crocoll, S.T. Red-shouldered hawk. The Birds of North America, No. 107, 1994. The Academy of Natural Sciences, Philadelphia.**

Home range of red-shouldered hawk varies from 108.9 ha to 339 ha in eastern populations during the breeding season, with a computed average of 224 ha.

**Last researched by:** Schantz

**Date researched:** 1/1/2006



## Aves

### Roseate Tern

#### *Sterna dougallii dougallii*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4877	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4878	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4879	Breeding	Foraging	3 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4880	Breeding	Nesting Colony	50 meter radii around nest/colony	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
4881	Breeding	Suspected Breeding Location	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4882	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No

#### Justification:

Where the literature on commuting distance includes several studies, there can be wide variability in the mean commuting distances between different studies. When such was the case, we either averaged the reported mean commuting distances or used the information from the study with a large sample size or from an area most ecologically similar to New Jersey. We then doubled this figure.

The Birds of North America reports that there is inadequate data concerning commuting distances for roseate terns (Gochfeld et al. 1998). The information that is available varies widely. In Massachusetts, many roseate terns were observed to forage within 300 m of the colony (Gochfeld et al. 1998). In Puerto Rico, most terns fed within 2 km of the colony and often within 200 m (Shealer and Burger 1995). Other reports indicate that terns feed at maximum distances of 16- 30 km from nesting colonies (Gochfeld et al. 1998, Heinemann 1992, Nisbet and Spendalov 1999). NatureServe recommends a minimum inferred extent of 2 km, noting that this is a conservative estimate (NatureServe 2006). We apply a 4.8 km buffer around the colony to protect foraging areas.

#### Literature:

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**Gochfeld, M., J. Burger, and I. C. T. Nisbet. 1998. Roseate Tern (*Sterna dougallii*). In *The Birds of North America*, No. 370 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

BNA reports that inadequate information exists for commuting distances of roseate terns. They report that roseate terns may forage up to 30 km from breeding colonies. In Massachusetts, many terns foraged within 300m of the colony.

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**Heinemann, D. 1992. Foraging ecology of roseate terns breeding on Bird Island, Buzzards Bay, Massachusetts. Report to USFWS, Newton Corner, MA. 54 pp.**

In Massachusetts, researchers observed foraging flights up to 16km.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: June 12, 2007 )**

The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 2 km. The authors note that this is a conservative estimate.

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**Nisbet, I.C.T., Spendalov, J.A. 1999. Contribution to research to management and recovery of the Roseate Tern: review of a twelve-year project. *Waterbirds* 22(2): 239-252.**

During this twelve year study, authors report foraging commutes up to 25 km away.

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**Shealer D.A., J. Burger 1995. Comparative foraging success between adult and one-year-old Roseate and Sandwich Terns. *Colonial Waterbirds* 18: 93-99.**

At Culebra and other Puerto Rican islands, roseate terns fed primarily within 2 km of colony, and often within 200 m.

**Last researched by:** Davis

**Date researched:** 1/1/2007

## Aves

### *Saltmarsh Sparrow*

#### *Ammodramus caudacutus*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5579 N/A	Urban Nest	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5580 N/A	Breeding Sighting	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5585 N/A	Non-breeding Sighting	125 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5586 N/A	Nest	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Saltmarsh sharp-tailed sparrows are not territorial and have overlapping home ranges that range from 1.2 - 5.7 ha for males and 0.4 - 3.1 ha for females. However, females may travel >250 meters from the nest to forage. Based upon the distance traveled to find food for young, a breeding occurrence area of 250 meters is recommended for this species. Based upon the non-territorial behavior and the upper limit of the area needed to forage (5 ha), an occurrence area of 125 meters was chosen for migrant and wintering individuals.

#### Literature:

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**Greenlaw, J. S. and J. D. Rising. 1994. Sharp-tailed Sparrow (*Ammodramus caudacutus*). In *The Birds of North America*, No. 112 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.**

Along the Atlantic Coast south of New Brunswick, breeds in salt marshes where smooth cordgrass, saltmeadow grass, and blackgrass are bordered by cattail, reed (*Phragmites* sp.), and marsh elder. Forages on ground in dense grasses of marshes or wet meadows (e.g., cordgrass, blackgrass, and saltmeadow grass in salt marshes), ditch margins, edges of shallow pools and mud pannes, patches of wrack, and bay intertidal. Breeding females often forage close to nest but may fly long distances from nest. Females may search for food > 250 m from nest (mean = 60.7 ± 3.3 [SE], n = 201). Breeding males are non-territorial and have large, overlapping home ranges. In New Jersey, male home ranges estimated between 1.2 and 1.6 ha; in coastal New York, mean size 4.3 ha (3.0-5.7 ha). Females occupy breeding home ranges smaller than those of males; e.g., a mean of 1.1 ha (0.4-3.1 ha) in New York and an estimated average female home range size as 0.4 ha in New Jersey.

Migrants along the Atlantic coast are restricted to coastal marshes, with a few subcoastal and inland records from freshwater marshes. Most of the Atlantic Coast population winters in coastal cordgrass marshes, occasionally in cattail; birds often leave tidal marshes only when forced out by high tides, when they may become concentrated along shoreline. Winter foraging is also on the ground in dense grass in marshes, at edges of ponds or pools, and sometimes on floating vegetation. In fall, favors

areas of tall, seed-bearing cordgrass along channels and bay margins. Along mid-Atlantic Coast congregate in loose feeding groups in tall, seed-bearing cordgrass; groups usually consist of 10-40 individuals, but larger (> 100 birds) and smaller groups (even solitary individuals) commonly occur. Wintering birds along se. Atlantic Coast also form loose feeding groups.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### Sanderling

#### *Calidris alba*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5587	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25 meter radius) is applied to take into account location uncertainty. These occurrence areas are used to value patches of habitat.

#### Literature:

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N/A

N/A

**Last researched by:** Dey

**Date researched:** 3/2/2011

## Aves

### Savannah Sparrow

#### *Passerculus sandwichensis*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4839 N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4840 N/A	Breeding Sighting-Confirmed	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4843 N/A	Breeding Sighting	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.05 - 1.25 ha (Swanson 1998, Wheelwright and Rising 1993). The breeding occurrence area was selected based upon the upper limit of the territory range and increased to accommodate shifting territories for second nesting attempts and nomadic behavior of juveniles (Wheelwright and Rising 1993). No minimum patch size was selected based upon evidence that the species can occupy areas < 2 ha (Swanson 1998). Non-breeding savannah sparrows are not listed in New Jersey so no non-breeding occurrence area was assigned.

#### Literature:

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**Mitchell, L. R., C. R. Smith and R. A. Malecki, R. A. 2000. Ecology of grassland breeding birds in the northeastern US - a literature review with recommendations for management. USGS, BRD, NY Cooperative Fish and Wildlife Research Unit, DNR, Cornell University, Ithaca, NY 14853-3011. September 2000.**

Maine had 50% incidence at 10 ha and that 5-10 ha is minimum size for birds to breed (see Vickery et al. 1994 below). New York had minimum area of 11.7 ha and mean patch size of 53.6 ha. Another study in New York had 97% incidence in areas 20 ha and larger, 88% incidence in 10-20 ha patches, 63% incidence in 5-10 ha patches, and 28% incidence in 3-5 ha patches. Missouri had minimum areas of 1-10 ha, and Illinois 10-30 ha.

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**Swanson, D. A. 1998 (revised 2002). Effects of management practice on grassland birds: Savannah Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. 30 pages.**

Territories range from 0.05 - 1.25 ha and they may occupy areas < 5 ha in size. In Illinois, none occurred in areas < 10 ha and 50% incidence at 40 ha.

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**Vickery, P. D., M. L. Hunter, Jr. and S. M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Conservation Biology 8(4): 1087-1097.**

In Maine, 50% incidence for SAVS was reached at 10 ha.

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**Wheelwright, N. T. and J. D. Rising. 1993. Savannah Sparrow (*Passerculus sandwichensis*).**

**In The Birds of North America, No. 45 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.**

Breeding territories vary in size between regions, habitats, seasons, and years. Mean size or range: Michigan, 0.11 ha, Wisconsin, 0.53 - 0.86 ha, coastal Nova Scotia, 0.17 ha, Kent Is., NB, 0.05 - 0.30 ha (NTW); Sable Is., NS 0.38 - 0.53 ha in densely vegetated habitat, 1.09 - 1.25 ha in sparse habitat. Territory diameter 60 m in Quebec. Territories tend to expand during the breeding season and females will reneest 0.5 - 31 meters from original nest (19m upper conf. limit), 26.7 m in Michigan, range from 7 - 42 m in Nova Scotia. Females are also territorial and are aggressive up to 20 m from nest. Parents will drop fecal sacs 10 - 50 m away from nest. Juveniles form loose flocks after a month post-fledging and wander 500 - 1000 meters daily while foraging.

Stopover habitat includes open fields, roadsides, dune vegetation, coastal marshes, edges of sewage ponds and other ponds in open country; rarely found in open woodlands. Winter habitat includes cultivated fields, pastures, golf courses, roadsides, dumps, dune grass, and salt marshes. *P. s. rostratus* and apparently other salt marsh populations, though generally wintering in salt marshes, can be found in a variety of open habitats, including sparsely vegetated habitats on xeric islands.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### Sedge Wren

#### *Cistothorus platensis*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4970	N/A	Breeding Sighting	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4973	N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4976	N/A	Nest	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.12 to 3.4 ha and average 3.4 ha in Illinois (Dechant et al. 1998, Herkert et al. 2001). The breeding occurrence area was chosen based upon the average territory size in Illinois and increased to account for shifting territories (Herkert et al 2001). Little is known about the non-breeding territories, so the default occurrence area was chosen for migrant and wintering individuals.

#### Literature:

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**Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, B. D. Parkin, and B. R. Euliss. 1998 (revised 2002). Effects of management practice on grassland birds: Sedge Wren. Northern Prairie Wildlife Research Center, Jamestown, ND. 17 pages.**

In Illinois, area was not important in predictive occurrence and were present in areas < 10 ha. Minnesota territories average 0.2 ha, Illinois territories were 3.4 ha.

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**Herkert, J. R., D. E. Kroodsma, and J. P. Gibbs. 2001. Sedge Wren (*Cistothorus platensis*). In *The Birds of North America*, No. 582 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.**

Territory boundaries are fluid throughout nesting season, and males may shift activity and defend new areas as season progresses. Territory size for 12 males in Minnesota averaged 1,780 m<sup>2</sup> (range 1,274-3,559) (0.178 ha).

Migratory stopover habitats closely resemble preferred breeding habitats, but also occasionally found in other habitats including mesic grasslands; salt marshes; and alfalfa, clover, and rye fields

**Last researched by:** Petzinger

**Date researched:** 2/1/2007



## Aves

### *Semipalmated Sandpiper*

#### *Calidris pusilla*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6703	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25 meter radius) is applied to take into account location uncertainty. These occurrence areas are used to value patches of habitat.

#### **Literature:**

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N/A

N/A

**Last researched by:** Dey

**Date researched:** 3/2/2011

## Aves

### **Sharp-shinned Hawk**

#### ***Accipiter striatus***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5602 N/A	Nest	800 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5607 N/A	Breeding Sighting	800 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5609 N/A	Non-breeding Sighting	800 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### **Justification:**

There are few studies available (summarized in Birds of North America). Two studies tracked four individuals, resulting in home ranges of 90-140 ha for females and 120-270 ha for males. Those areas convert to radii ranging 0.28-0.44 km (females) and 0.38-0.85 km (males). Another study tracked a pair in Utah that ranged in an area with a 0.80 km radius.

Wintering sharp-shinneds had slightly larger ranges in a NC study. Three tracked males had a mean range of 2.5 km<sup>2</sup> (mean of 250 ha, radius=0.79 km), while three tracked females had a mean range of 2.8 km<sup>2</sup> (mean of 280 ha, radius=0.88 km).

#### **Literature:**

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**Bildstein, K. L., and K. Meyer. 2000. Sharp-shinned Hawk (*Accipiter striatus*). In *The Birds of North America*, No. 482 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

N/A

**Last researched by:** Clark

**Date researched:** 2/1/2007

## Aves

### Short-eared Owl

#### *Asio flammeus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4964	N/A	Nest	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4966	N/A	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4968	N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25 meter radius) is applied to take into account location uncertainty. These occurrence areas are used to value patches of habitat.

#### Literature:

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N/A

N/A

**Last researched by:** Clark

**Date researched:** 2/1/2007

## Aves

### *Snowy Egret* *Egretta thula*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5610 Breeding	Nesting Colony	71.25 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
5611 Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5612 Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
5613 Breeding	Roosting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5614 Breeding	Foraging	9.8 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5615 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

Nesting area is defined by the area the birds actually use, as these birds do not defend a territory except immediately around their individual nests. The boundaries of the colony are defined as much by social attraction phenomenon and by habitat suitability. Consequently there is now immediately apparent justification for buffering the mapped extent of a nesting area. Where the mapped extent of a colony was available it was used. Where the mapped extent was not available the default seconds precision circle was used around the recorded nesting location point.

ENSP reviewed the literature regarding commuting distance for colonial nesting long-legged wading birds which fairly consistently indicates that the importance of suitable foraging habitat decreases with the distance from the nesting area (e.g. Dowd and Flake 1985, Custer et al. 2004, Kelly et al 1993, Thompson 1978). This is not surprising considering the energy demands of long commutes and the fact that, all other things being equal, if suitable foraging habitat is randomly distributed within the possible foraging range, simple geometry would argue that availability would increase with the square of the distance from the colony. Consequently, a particular type of wetland or riparian habitat is more critical if it is located close to a nesting area than a similar area located near the edge of the energetically feasible foraging range from the colony. It would therefore be unjustifiable to use the maximum foraging distance figures to define all potential foraging habitat as critical foraging habitat for a particular nesting colony. Conversely, using an average foraging

distance figure may under-include suitable habitat by omitting some foraging areas that are important because they provide particularly rich and easily exploited feeding habitat. Further, research (Custer et al. 2004) indicates that longer commuting distances are more frequent during high-demand and demographically critical nestling rearing period. Where the literature on commuting distance includes several studies, there can be wide variability in the mean commuting distances between different studies. When such was the case, we either averaged the reported mean commuting distances or used the information from the study with a large sample size or from an area most ecologically similar to New Jersey. We then doubled this figure.

Research in North Carolina found that 84% of breeding long-legged waterbirds flew to foraging areas, which is why habitat outside the vicinity of the colony must be valued as crucial to the success of the colony (Custer and Osborn 1978). A study in Florida at Lake Okeechobee found snowy egrets flew an average of 2.8 km from colonies to foraging areas and the maximum flight recorded was 5 kilometers (Smith 1995). Another study in Florida, in Everglades National Park, found that over the course of 2 field seasons, snowy egrets flew an average of 13km, with a maximum recorded distance of 31.5 km (Strong 1997). NatureServe recommends a minimum inferred extent of 3 km and justifies it by noting a low mean foraging range size for this group (NatureServe 2006). We apply a 15.8 km radius around a colony to protect foraging areas.

$(\{13\text{km} + 2.8\text{ km}\}/2 = 7.9\text{km} * 2 = 15.8\text{km})$

## Literature:

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**Custer, C.M., S.A. Suarez, D.A. Olsen. 2004. Feeding habitat characteristics of the Great Blue Heron and Great Egret nesting along the Upper Mississippi River, 1995-1998. *Waterbirds* 27(4): 454-68.**

The majority of the herons in this study fed <5 km from the nesting site, and avoided areas > 10 km away. They flew farther to sites during the brood-rearing period than during incubation. Only 10% of the feeding flights ended at a location where another heron was present, indicating that they prefer to feed alone.

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**Custer, T., R. Osborn. 1978. Feeding habitat use by colonially-breeding herons, egrets, and ibises in North Carolina. *Auk* 95: 733-743.**

In North Carolina, 84% of breeding individuals flew to tidal foraging habitat. They generally prefer brackish/marine habitats with relatively shallow water.

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**Dowd and Flake. 1985. Foraging habits and movements of nesting Great Blue Heron in prairie river ecosystem, South Dakota. *Journal of Field ornithology* 56: 377-387.**

A study in South Dakota found that the average distance that great blues flew from their colony to a foraging site was 3.1 km, and the maximum observed distance was 24.4 km. Eighty-five percent of the herons in the study fed within 4 km of the colony.

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**Kelly J. P., H. M. Pratt, P. L. Greene. 1993. The distribution, reproductive success, and habitat characteristics of heron and egret breeding colonies in the San Francisco Bay area. *Colonial Waterbirds*. 16: 18-27.**

> 95% of great blue herons and >90% great egrets fed within 20 km of their colony.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: June 4, 2007 ).**

The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 3 km. For

the breeding season, this figure is based on a low mean foraging range size for this group.

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**Smith, J. P. 1995. Foraging flights and habitat use of nesting wading birds (Ciconiiformes) at Lake Okeechobee, Florida. Colonial Waterbirds 18 (2): 139-158.**

Snowy egrets at Lake Okeechobee, FL flew an average of 2.8 km from colonies to foraging areas in vicinity of Lake Okeechobee, FL. The maximum flight recorded was 5 kilometers. High water increased foraging flight distances for individuals.

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**Strong, A.M. 1997. Hydrological constraints of the Tricolored Heron and Snowy Egret resource use. Condor 99(4): 894-905.**

A study in Everglades National Park, FL found that 95% of all the foraging locations (for both species) were located within 22 km of a nesting colony (mean flight distance + 2 SD). In 1987, mean distance flown to foraging location was 12.9 km + 4.8 km (n=68) and in 1988 it was 13.1 km + 6.3 km (n=156). The maximum distance traveled by a Snowy egret was 31.5 km.

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**Thompson. 1978. Feeding areas of Great Blue Herons and Great Egrets nesting in the floodplain of the upper Mississippi River. Proc. Colonial Waterbird Group. 2: 202-13.**

In central Minnesota the average distance that the herons flew from the colony to a foraging area was 6.5 km, and the maximum observed was 20.4 km. Fifty-three percent of the herons in the study fed within 4 km of the colony.

**Last researched by:** Davis

**Date researched:** 1/1/2007

## Aves

### Tricolored Heron

#### *Egretta tricolor*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5627	Breeding	Nesting Colony	90 meter radii around colony	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes
5628	Breeding	Foraging	9.0 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5629	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5630	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5631	Breeding	Roosting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
5632	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No

#### Justification:

Nesting area is defined by the area the birds actually use, as these birds do not defend a territory except immediately around their individual nests. The boundaries of the colony are defined as much by social attraction phenomenon and by habitat suitability. Consequently there is now immediately apparent justification for buffering the mapped extent of a nesting area. Where the mapped extent of a colony was available it was used. Where the mapped extent was not available the default seconds precision circle was used around the recorded nesting location point.

ENSP reviewed the literature regarding commuting distance for colonial nesting long-legged wading birds which fairly consistently indicates that the importance of suitable foraging habitat decreases with the distance from the nesting area (e.g. Dowd and Flake 1985, Custer et al. 2004, Kelly et al 1993, Thompson 1978). This is not surprising considering the energy demands of long commutes and the fact that, all other things being equal, if suitable foraging habitat is randomly distributed within the possible foraging range, simple geometry would argue that availability would increase with the square of the distance from the colony. Consequently, a particular type of wetland or riparian habitat is more critical if it is located close to a nesting area than a similar area located near the edge of the energetically feasible foraging range from the colony. It would therefore be unjustifiable to use the maximum foraging distance figures to define all potential foraging habitat as critical foraging habitat for a particular nesting colony. Conversely, using an average foraging

distance figure may under-include suitable habitat by omitting some foraging areas that are important because they provide particularly rich and easily exploited feeding habitat. Further, research (Custer et al. 2004) indicates that longer commuting distances are more frequent during high-demand and demographically critical nestling rearing period. Where the literature on commuting distance includes several studies, there can be wide variability in the mean commuting distances between different studies. When such was the case, we either averaged the reported mean commuting distances or used the information from the study with a large sample size or from an area most ecologically similar to New Jersey. We then doubled this figure.

Research in North Carolina found that 84% of breeding long-legged waterbirds flew to foraging areas, which is why habitat outside the vicinity of the colony must be valued as crucial to the success of the colony (Custer and Osborn 1978). In the Florida Everglades tricolored herons traveled an average of 5.6 km to forage, with a maximum reported distance of 25km (Bancroft, et al 1988). A different study in the Everglades found that over the course of three years tricolored herons traveled an average distance of 8.9 km, with a yearly average ranging from 5.4 km to 12.8 km. The range was hypothesized to be a result of varying water level fluctuations. The maximum distance traveled in this study was 27 km and 95% of the birds traveled within 22 km of their colony (Strong 1997). NatureServe recommends a minimum inferred extent of 3 km and justifies it by noting a low mean foraging range size for this group (NatureServe 2006). We apply a 14.5 km radius around a colony to protect foraging areas.

## **Literature:**

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**Bancroft, G.T., S. D. Jewell, A. M. Strong. 1988. Foraging habitat of Egretta herons relative to stage in the nest cycle and water conditions. Third Annual Report. South Florida Water Management District, West Palm Beach, FL.**

In the Florida Everglades foraging habitat was constrained to a mean foraging radius of 5.6 km  $\pm$  6.0 km SD (n=265). The maximum foraging commute recorded was 25 km.

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**Custer, C.M., S.A. Suarez, D.A. Olsen. 2004. Feeding habitat characteristics of the Great Blue Heron and Great Egret nesting along the Upper Mississippi River, 1995-1998. Waterbirds 27(4): 454-68.**

The majority of the herons in this study fed <5 km from the nesting site, and avoided areas > 10 km away. They flew farther to sites during the brood-rearing period than during incubation. Only 10% of the feeding flights ended at a location where another heron was present, indicating that they prefer to feed alone.

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**Dowd and Flake. 1985. Foraging habits and movements of nesting Great Blue Heron in prairie river ecosystem, South Dakota. Journal of Field ornithology 56: 377-87.**

A study in South Dakota found that the average distance that great blues flew from their colony to a foraging site was 3.1 km, and the maximum observed distance was 24.4 km. Eighty-five percent of the herons in the study fed within 4 km of the colony.

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**Kelly J. P., H. M. Pratt, P. L. Greene. 1993. The distribution, reproductive success, and habitat characteristics of heron and egret breeding colonies in the San Francisco Bay area. Colonial Waterbirds. 16: 18-27.**

> 95% of great blue herons and >90% great egrets fed within 20 km of their colony.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: June 4, 2007 ).**



The breeding inferred minimum extent of habitat use (when actual extent is unknown) is 3 km. For the breeding season, this figure is based on a low mean foraging range size for this group.

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**Strong, A.M. 1997. Hydrological constraints of the Tricolored Heron and Snowy Egret resource use. *The Condor* 99(4): 894-905.**

A study in Everglades National Park, FL found that 95% of all the foraging locations (for both species) were located within 22 km of a nesting colony (mean flight distance + 2 SD). In 1987, mean distance flown to foraging location was 12.8km + 5.8 km (n=39), in 1988 it was 8.6 km + 4.3 km (n=91) and in 1989 it was 5.4 km + 3.9 km (n=135). The fluctuation in distance traveled may be due to the way yearly fluctuations in water level influence availability of foraging habitat. The maximum distance traveled by a tricolored heron was 27 km.

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**Thompson. 1978. Feeding areas of Great Blue Herons and Great Egrets nesting in the floodplain of the upper Mississippi River. *Proc. Colonial Waterbird Group*. 2: 202-213.**

In central Minnesota the average distance that the herons flew from the colony to a foraging area was 6.5 km, and the maximum observed was 20.4 km. Fifty-three percent of the herons in the study fed within 4 km of the colony.

**Last researched by:** Davis

**Date researched:** 1/1/2007

## Aves

### *Upland Sandpiper*

### *Bartramia longicauda*

SpC/LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4948 Breeding	Breeding Sighting	1 km Buffer, min. patch 25 ha	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4949 Breeding	Breeding Sighting-Confirmed	1 km Buffer, min. patch 25 ha	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4950 Non-Breeding	Non-breeding Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Upland sandpipers are area-sensitive grassland birds and sensitive to habitat fragmentation. Breeding territory sizes differ between males and females and average 8 ha for males and 85.6 ha for females (Dechant et al. 1999, Houston and Bowen 2001). This species requires large areas of a mosaic of grassland and open habitats for breeding and rearing young. Minimum patch sizes varied greatly from 26 to 50 ha (Mitchell et al. 2000, Vickery et al. 1994). The minimum patch size of 26 ha reported was located closest to New Jersey than others reported. The breeding occurrence area chosen was based on the female territory size of 85.6 ha and increased because females will travel an average 869 m (and up to 3,275 m) from the nest as well as to incorporate post-fledging habitat (Houston and Bowen 2001). However, due to the area sensitivity of the species, only patches 25 ha and greater should be valued for breeding individuals of this species.

Little is known about the stopover habitat use of migratory upland sandpipers. Therefore, the migrant occurrence area was chosen based upon evidence that upland sandpipers travel a far distance to forage (Houston and Bowen 2001)

#### Literature:

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**Dechant, J. A., M. F. Dinkins, D. H. Johnson, L. D. Igl, C. M. Goldade, B. D. Parkin, and B. R. Euliss. 1999 (revised 2002). Effects of management practice on grassland birds: Upland Sandpiper. Northern Prairie Wildlife Research Center, Jamestown, ND. 34 pages.**

In Wisconsin territory size was 8 - 12 ha. Illinois had minimum area requirements of 30 ha, southwest Missouri 75 ha, Nebraska had 50% incidence at 50 - 61 ha, and Maine had 50% incidence at 200 ha (see Vickery et al. below).

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**Houston, C. S. and D. E. Bowen, Jr. 2001. Upland Sandpiper (*Bartramia longicauda*). In *The Birds of North America*, No. 580 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.**

Nests in loose colonies with little or no evidence of territoriality. Nesting territories were usually grouped. Courtship flight displays 200 - 400 m in diameter. North Dakota had an annual nesting density of 9.8 – 21.8 nests per 100 ha with a mean of 12.4 nests per 100 ha (1 nest per 8 ha).

Minnesota had fledglings move 300 m and 500 m from the nest. Illinois also had recent fledglings fly 170 - 410 m from the nest. Migratory stopover habitat in Texas includes plowed fields, rarely bottomlands. Females have large home ranges (85.6 ha) and can move an average 869 m from the nest. Males have smaller home ranges (8.5 ha).

Stopped at dry salt-hay marshes in New Jersey in summer and autumn, and in harvested corn (*Zea mays*) and agave (*Agave* sp.) fields and flooded acacia (*Acacia* sp.) and sorghum (*Sorghum vulgare*) near Guadalajara, Mexico (O. Reyna pers. comm.). Along Manu River in sw. Peru, from 21 Aug through 5 Nov, used beach habitats overgrown with *Tessaria* and weeds.

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**Mitchell, L. R., C. R. Smith and R. A. Malecki, R. A. 2000. Ecology of grassland breeding birds in the northeastern US - a literature review with recommendations for management. USGS, BRD, NY Cooperative Fish and Wildlife Research Unit, DNR, Cornell University, Ithaca, NY 14853-3011. September 2000.**

A study in the northeastern United States showed minimum habitat requirement to be at least 100 ha but found 50% incidence at 30 - 40 ha. Two other studies in New York show minimum habitat requirements to be 26 ha and 46 ha. In St Lawrence River, habitat size ranged from 160 - 496 ha with a mean of 375 ha. In the Midwest, 50% incidence was found between 30 and 100 ha.

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**Vickery, P. D., M. L. Hunter, Jr. and S. M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Conservation Biology 8(4): 1087-1097.**

In Maine: Upland sandpipers have the greatest area requirements of all 10 species in study. They were rare on sites less than 50 ha and increased steadily with area. Reached 50% incidence at 200 ha. Territories are > 8 ha.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### Veery

#### *Catharus fuscescens*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5634 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
5637 Breeding	Breeding Sighting-Confirmed	85 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5638 Breeding	Breeding Sighting	85 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The breeding occurrence area was chosen based upon the upper limit of the mean territory size mentioned below (Bevier et al.), which came to 2.21 ha. The nonbreeding population is listed as stable in NJ, so the default occurrence area was chosen and will not be included in the Landscape Project.

#### Literature:

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**Bevier, L., A. F. Poole, and W. Moskoff. (2004). Veery (*Catharus fuscescens*). The Birds of North America Online. (A. Poole, Ed.) Ithaca: Cornell Laboratory of Ornithology; Retrieved from The Birds of North American Online database: <http://bna.birds.cornell.edu/BNA/account/Veery/>.**

Prefers disturbed forest, probably because of denser understory not found in undisturbed forests. In northern hardwood forests, Veery bred in 77% of disturbed and successional habitats available but in only 18% of mature undisturbed habitats available. In mature woodlands, moisture regime is chief factor in habitat selection, more than twice as important as herb cover. Shrub cover is chief vegetative consideration in habitat selection - probably because shrubs provide safe nest sites.

In Middle Atlantic states requires forests of 20 ha for 50% probability of occurrence. In Illinois, of 22 forest patches in which known to breed, only 2 smaller than 100 ha.; average forest size of breeding area 309 ha. In red maple swamps of s. Rhode Island, while occurring in swamps as small as 1 ha, regional forest abundance may be more critical determinant of presence and abundance than swamp size.

Territories range from 0.10 ha to a few hectares. In Ontario (n = 61), average size of territory 0.25 ha; in s. Quebec (sugar maple/hemlock stand), 0.5 ha (A. Cyr unpubl.). In Hudson Valley, occasionally build nests within 15-20 m of each other within large, overlapping territories.

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**Rosenberg, K., R. Hames, R. Rohrbaugh, S. Barker Swarthout, J. Lowe, and A. Dhondt. 2003. A land manager's guide to improving habitat for forest thrushes. The Cornell Lab of Ornithology.**

Veeries are area sensitive and intolerant of forest fragmentation even though they use disturbed habitats. Habitat with highest suitability consists of wet areas in 400 ha deciduous or mixed forests with 70% canopy closure. They also use coniferous and hemlock forests. The amount of area needed is related to the amount of fragmentation in the area. They can tolerate smaller fragments of 1 - 8 ha.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### Vesper Sparrow

#### *Pooecetes gramineus*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4852 N/A	Breeding Sighting-Confirmed	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4853 N/A	Non-breeding Sighting	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4854 N/A	Breeding Sighting	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Vesper breeding territories range from 0.29 - 8.19 ha in patches 5+ ha in size (Dechant et al. 2000, Jones and Cornerly 2002). The breeding occurrence area was selected based upon the Michigan upper limit territory size. The non-breeding occurrence area was chosen based upon the average winter home range size (Jones and Cornely 2002).

#### Literature:

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**Dechant, J. A., M. F. Dinkins, D. H. Johnson, L. D. Igl, C. M. Goldade, B. D. Parkin, and B. R. Euliss. 2000 (revised 2002). Effects of management practice on grassland birds: Vesper Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. 41 pages.**

Montana territories ranged from 0.29 - 3 ha and an average of 1.65 ha. Corn and soybean fields in Iowa had territories ranging from 1.6 - 8 ha and an average of 3 ha. Another Iowa study had territories ranging from 1.8 - 3.2 ha and averaging 2.3 ha. Michigan territories in a 5.6-ha field averaged 0.48 - 0.72 ha. Illinois tallgrass prairies contained vespers in small sites < 10 ha but not large sites (650 ha). Maine found vesper abundance to be positively correlated with area and 50% incidence at 20 ha.

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**Jones, S. L. and J. E. Cornely. 2002. Vesper Sparrow (*Pooecetes gramineus*). In *The Birds of North America*, No. 624 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.**

In Ohio, used open areas from 5 – 15 ha. Breeding territory size ranges from 0.29 – 8.19 ha. In Michigan, territories averaged 2.59 ha, but open field territories averaged 1.53 ha ± 0.33 SD and 1.03 ha ± 0.77 SD in fields with standing dead trees.

Stopover habitat consists of pastures and weeds bordering cultivated fields and roadsides, hedgerows, and barren to overgrown fields. Throughout much of range, commonly found near grassy or weedy ditches and fencerows, since fields are still barren upon arrival in early spring.

Wintering habitat in e. U.S. consists of patches of cleared and natural openings in forest land. On wintering range, home range of 142 m (n = 37) average for 3 yr; annual variation in size positively

correlated to previous summer's rainfall (Gordon 2000).

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**Mitchell, L. R., C. R. Smith and R. A. Malecki, R. A. 2000. Ecology of grassland breeding birds in the northeastern US - a literature review with recommendations for management. USGS, BRD, NY Cooperative Fish and Wildlife Research Unit, DNR, Cornell University, Ithaca, NY 14853-3011. September 2000.**

Maine had 38 pairs in a 210-ha patch and 50% incidence at 20 ha (see Vickery et al. 1994 below). Missouri had a range of patch size from 10 - 100 ha. Illinois had minimum patch size of 10 ha. No information on territory size was provided.

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**Vickery, P. D., M. L. Hunter, Jr. and S. M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Conservation Biology 8(4): 1087-1097.**

In Maine, 50% incidence for vespers were reached at 20 ha.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### *Whimbrel*

### *Numenius phaeopus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5645	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### Justification:

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25 meter radius) is applied to take into account location uncertainty. These occurrence areas are used to value patches of habitat.

#### Literature:

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N/A

N/A

**Last researched by:** Dey

**Date researched:** 3/2/2011



## Aves

### *Whip-poor-will*

#### *Caprimulgus vociferus*

SpCFLID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5646	Breeding	Breeding Sighting	175 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5649	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5651	Breeding	Breeding Sighting-Confirmed	175 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 2.8 - 11.1 ha with an average 5.1 ha. The breeding occurrence area was chosen based upon the upper limit of the breeding territories (10 ha). The nonbreeding population is unknown in NJ, so the default buffer was chosen and will not be used in the Landscape Project.

#### Literature:

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**Cink, C. L. 2002. Whip-poor-will (*Caprimulgus vociferus*). In *The Birds of North America*, No. 620 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Breeds in dry deciduous or mixed forests with little or no underbrush throughout most of its range. Degree of openness in forest understory appears to be more important than forest composition. In New York State, widespread in northern hardwood forests of Hudson Valley and low-elevation forests surrounding the Adirondacks, mainly white pine and oak-northern hardwoods or aspen-gray birch-paper birch forests. Absent, however, from large, heavily forested areas of the Adirondacks and Catskills above 305 m. Prefers dry woodland such as pitch pine-scrub oak barrens on Long I. and deciduous woods inland. Prefers drier oak-hickory forests to beech-maple woods in upstate New York, yet numerous individuals found in wet woods at edge of Black Creek marshes in St. Lawrence Co., NY. In W. Virginia, occurs in oak "hickory" white pine, or hardwood-hemlock forest and sparingly in northern hardwoods (red maple, American beech, and yellow birch) forest, but not in pure red spruce. Appears to be missing from many areas of dense uninterrupted forest. Common in open and partially open pitch pine-scrub oak habitat on Cape Cod, but dramatically fewer singing in black oak-scarlet oak-pitch pine habitat along glacial moraines with closed canopy; decreased light here may influence foraging success. In the Sand Ridge State Forest of Illinois, species most common in mixed pine-oak habitats, followed by oak-dominated deciduous stands, and least abundant in jack pine plantations. In Kentucky, breeders found in a variety of semiopen habitats, including rural farmland, power-line and roadway corridors, clearcut and selectively logged forest, old fields, and reclaimed surface mines.

Shade, proximity to open areas for foraging, and fairly sparse ground cover are key elements of habitat. Although many authors suggest this preference, few data on stage of succession preferred, except that early is preferred to late. Species absent from areas where forest canopy is extensive and

closed. No data on forest structure and size. Minimum forest plot size needed to sustain a pair is unknown, but small isolated woodlots in agricultural n.-central Maryland provide poor Whip-poor-will habitat; species does not use this habitat. This suggests not only size of forest habitat used but distance from larger forest tracts may be important.

Little information is known about migratory habitat. In U.S., many occur in same types of open forests they breed in.

Whip-poor-wills travel large distances while foraging. In Kansas, size of territories varied from 2.8 to 11.1 ha (n = 3). In another study, most (52% of 26 birds) averaged 5.1 ha

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### Winter Wren

#### *Troglodytes hiemalis*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5669 N/A	Breeding Sighting	110 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5671 N/A	Breeding Sighting-Confirmed	110 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5673 N/A	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

The breeding buffer was chosen based on the upper confidence limit of the mean habitat size for second nesting attempts ( $3.3 \text{ ha} \pm 1.2 \text{ SD}$ ,  $n = 22$ ) (Hejl et al. 2002), which calculates to 3.8 ha. Non-breeding wrens are listed as stable in New Jersey, so the default buffer was chosen and will not be used in the Landscape Project..

#### Literature:

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**Hejl, S. J., J. A. Holmes, and D. E. Kroodsma. 2002. Winter Wren (*Troglodytes troglodytes*). In *The Birds of North America*, No. 632 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.**

Winter Wrens use all types of forest near water, especially old-growth structures (snags, downed logs, and large trees) for nesting, foraging, and roosting. Clearcutting and some types of partial logging reduce habitat suitability for the Winter Wren

Shape, size, density, and distribution of territories is influenced by habitat and topography. Territories appear to be preferentially established along streams or other water sources, especially in drier habitats, resulting in patchy distribution

Territory size varies both within and between habitats. In n. Idaho, breeding-territory size overall ranged from 0.8 to 6 ha; 0.8-4.0 ha (mean  $1.9 \text{ ha} \pm 0.9 \text{ SD}$ ;  $n = 17$ ) within old-growth cedar-hemlock forests and 1.0 to 3.3 in fragmented old growth (mean  $2.1 \text{ ha} \pm 0.8 \text{ SD}$ ;  $n = 11$ ) interspersed with 4- to 11-yr-old clearcuts. Averaged  $2.0 \text{ ha} \pm 0.9 \text{ SD}$  ( $n = 28$ ) for first nesting attempts and  $3.3 \text{ ha} \pm 1.2 \text{ SD}$  ( $n = 22$ ) for second attempts. Family groups used these areas after nesting. In se. Alaska, territory size ranged from 0.7 to 4.8 ha, averaged  $2.2 \text{ ha} \pm 0.3 \text{ SD}$ , and differed significantly among 3 sites ( $n = 15$ ). In coastal western hemlock in British Columbia, breeding-territory sizes ranged from 0.48 to 2.21 ha and averaged  $1.38 \text{ ha} \pm 0.51 \text{ SD}$  ( $n = 14$ ) in 1979 and  $1.23 \text{ ha} \pm 0.50 \text{ SD}$  ( $n = 12$ ) in 1980. In a separate study in similar habitat of British Columbia, average size of territories over 3 yr ranged from 0.68 to 1.46 ha.

Conservative estimates of fall-territory size ranged from 0.42 to 1.31 ha and winter territory size

ranged from 0.14 to 1.45 ha. In Idaho, territories shifted between broods (SJH and JAH). In British Columbia, territory shifts occurred at beginning of winter, at junction with breeding season, and breeding/fall juncture.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

# Aves

## Wood Thrush

### *Hylocichla mustelina*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5675	Breeding	Breeding Sighting-Confirmed	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5677	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5679	Breeding	Breeding Sighting	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The breeding occurrence area was chosen based upon the median distance traveled from the nest by post-fledging young and parents to incorporate post-fledging habitat (Roth et al 1996). The non-breeding population is listed as stable in New Jersey, so the default buffer was chosen and will not be used in the Landscape Project

#### Literature:

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**Rosenberg, K., R. Hames, R. Rohrbaugh, S. Barker Swarthout, J. Lowe, and A. Dhondt. 2003. A land manager's guide to improving habitat for forest thrushes. The Cornell Lab of Ornithology.**

Breeds in interior and edges of deciduous and mixed forests in cool, moist sites near water. Requires moderate to dense understory with a lot of shade, moist soil, and decaying leaf litter. High suitability is in forest patches at least 81 ha (200 acres) with suitability declining in patches less than 40.5 ha (100 acres). Can breed in smaller patches but have lower reproductive success. Must factor in forest size, amount of core area, amount of edge, and vegetation structure.

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**Roth, R. R., M. S. Johnson, and T. J. Underwood. 1996. Wood Thrush (*Hylocichla mustelina*). In *The Birds of North America*, No. 246 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.**

Breeds in interior and edges of deciduous and mixed forests, especially well-developed, upland, mesic ones. Key elements of oft-used sites: trees >16 m in height, high variety of deciduous tree species, moderate subcanopy and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter. Waning of these features associated with range and altitudinal limits - 750 to 1,050 m in Vermont and 1,325 m in the Smoky Mtns. More likely to occur in larger-area forests but may nest in 1-ha fragments and semi-wooded residential areas and parks. Breeding territories range from 0.08–2.8 ha but tend to use areas outside territories. Most nesting material gathered <35 m from nest, but females may cross territories to reach mud source. Fledglings and parents tend to be 200-400 meters away from nest within weeks of fledging.

Fall migratory habitat includes second-growth and forest-edge habitats with fruit. No data for spring

transients to suggest deviation from breeding season habitats.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008

## Aves

### *Worm-eating Warbler*

#### *Helmitheros vermivorum*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5682 Breeding	Breeding Sighting-Confirmed	175 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5683 Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5686 Breeding	Breeding Sighting	175 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.6 - 5 ha with an upper confidence limit of 1.8 ha (Hanners and Patton 1998). The breeding occurrence area was chosen to incorporate territories of second nesting attempts and post-fledging habitat (Hanners and Patton 1998). The non-breeding population is listed as stable in New Jersey, so the default buffer was chosen and will not be used in the Landscape Project.

#### Literature:

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**Hanners, L. A. and S. R. Patton. 1998. Worm-eating Warbler (*Helmitheros vermivorus*). In *The Birds of North America*, No. 623 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Occurs regularly where large tracts of mature deciduous or mixed deciduous-coniferous forest overlap with hillsides and smaller patches of shrubs such as mountain laurel and rhododendron. Suggested minimum area requirements range from 21 to 340 ha. Plant composition of the forest community appears less important to this species than forest age and size, presence of hillsides, and occurrence of dense patches of shrub cover. Species occurs in variety of forest communities, including eastern hemlock, beech-maple, and oak-hickory associations, and may be found through a continuum of moist to dry environments

Mean territory size in Connecticut: 1.72 ha  $\pm$  0.78 SD (range 0.60-4.95, n = 94 territories), derived from mapping repeated observations of singing males, fights, and nest sites. No known relationship between territory size and territory quality.

Second or third nesting attempts are within 10 - 100m of first nest. Individuals may be successful at sites as small as 19 ha, but little is known about return rates of adults to these sites in subsequent years. The species is considered area sensitive and nests in highest densities in forests of at least several hundred hectares. Within first week of fledging, begin following parents widely within territory and sometimes beyond territory boundaries. Unknown when they become totally independent.

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**Rosenberg, K. V., R. W. Rohrbaugh, Jr., S. E. Barker, J. D. Lowe, R. S. Hames, and A. A.**

**Dhondt. 1999. A land manager's guide to improving habitat for scarlet tanagers and other forest-interior birds. The Cornell Lab of Ornithology.**

Worm-eating warblers share some habitat characteristics with Scarlet Tanagers. In the Piedmont Plains and Delaware Bay regions, they prefer areas at least 70% forested, deciduous or mixed, and the suitability increases with proximity of forest patches to larger, contiguous forest patches. In the Highlands, they prefer areas at least 50% forest, deciduous, and mixed and occasionally coniferous, and the suitability increases with proximity of forest patches to larger, contiguous forest patches.

**Last researched by:** Petzinger

**Date researched:** 9/30/2008



## Aves

### *Yellow-breasted Chat*

#### *Icteria virens*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5694	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5695	Breeding	Breeding Sighting-Confirmed	75 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5697	Breeding	Breeding Sighting	75 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Breeding territories range from 0.4 - 2.4 ha (Eckerle and Thompson 2001). The breeding occurrence area was based on the upper territory limit of 1.75 ha. The nonbreeding population is listed as stable in NJ, so the default buffer was chosen and will not be used in the Landscape Project.

#### Literature:

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**Eckerle, K. P., and C. F. Thompson. 2001. Yellow-breasted Chat (*Icteria virens*). In *The Birds of North America*, No. 575 (A. Poole and F. Gill, eds.). *The Birds of North America, Inc., Philadelphia, PA.***

Breeding habitat consists of low, dense deciduous and coniferous vegetation, including early second-growth forest and shrub in abandoned agricultural fields, clear-cuts, power-line corridors, fencerows, forest edges and openings, and near streams, pond edges, and swamps > 0.5 ha. Tolerates areas of open grass if dense shrubs are nearby. Classified as an open-canopy obligatory species (i.e., preferred open overstory and brushy understory), with population density directly related to shrub density to a height of 4.5 m. Can also be found in areas with dense overstory vegetation and an open subcanopy layer in e. Tennessee, where it is rare. Readily colonizes clear-cut areas and power-line corridors. Population density positively correlated with blackberry density and patchiness in power-line corridors. In W. Virginia, occurs in forest edges and openings, and occupies openings in any forest type, including spruce forest with heavy understory growths of blackberries. Appears early in succession when woody plants begin to invade and reaches peak densities in dense shrub thickets. In se. Missouri, numbers highest in clear-cut areas compared with areas subjected to other harvesting techniques. In Delta National Forest in Mississippi, breeding densities highest 4-5 yr after clear-cutting in habitats where residual stems were left, compared with mature forest or habitats where all residual stems were sheared. In e. Texas, presence was positively associated with increasing density of shrub stems, foliage density at 0-3 m, percentage of pine saplings, and number of shrub species; presence negatively correlated with vegetation height, percentage of canopy closure, foliage density at 12-15 m, and density of pole-sized trees. Species present in 3- to 12-yr-old mixed-oak stands in Virginia also described high densities in a heavily wooded, partly swampy floodplain forest with closing canopy. In N. Carolina prefers dense thickets in upland and floodplain habitats.

In a low-density population in s. Indiana, the yearly mean territory size ranged 1.1-1.6 ha, n = 4 yr; grand mean 1.2 ha  $\pm$  0.51 SD; range 0.4-2.4, n = 28. In a high-density population (territory size ranged from 0.5 to 1.0 ha in Virginia, however, territorial intrusions and male-male interactions were the rule, as territorial intruders were frequently captured in mist-nets well within boundaries of neighboring territories. In s. Illinois, 4 territories were 0.35-1.75 ha (mean 0.82).

Migratory habitat tends to be the same low, dense vegetation used on breeding grounds, although spring migrants occasionally found in suburban habitat.

**Last researched by:** Petzinger

**Date researched:** 2/1/2007

## Aves

### *Yellow-crowned Night-heron*

#### *Nyctanassa violacea*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4990	Non-Breeding	Non-breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4991	Breeding	Roosting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4992	Breeding	Foraging	1.7 mile radii of open water/emergent wetland	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4993	Non-Breeding	Non-breeding Concentration	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	No
4994	Breeding	Breeding Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
4995	Breeding	Nesting Colony	71.25 Meter Buffer	2 copies needed - both get rule #1, but different buffer sizes	Convert to a point and buffer	2 copies needed - one gets rule #3, the other #1	Yes

#### **Justification:**

Nesting area is defined by the area the birds actually use, as these birds do not defend a territory except immediately around their individual nests. The boundaries of the colony are defined as much by social attraction phenomenon and by habitat suitability. Consequently there is now immediately apparent justification for buffering the mapped extent of a nesting area. Where the mapped extent of a colony was available it was used. Where the mapped extent was not available the default seconds precision circle was used around the recorded nesting location point.

ENSP reviewed the literature regarding commuting distance for colonial nesting long-legged wading birds which fairly consistently indicates that the importance of suitable foraging habitat decreases with the distance from the nesting area (e.g. Dowd and Flake 1985, Custer et al. 2004, Kelly et al 1993, Thompson 1978). This is not surprising considering the energy demands of long commutes and the fact that, all other things being equal, if suitable foraging habitat is randomly distributed within the possible foraging range, simple geometry would argue that availability would increase with the square of the distance from the colony. Consequently, a particular type of wetland or riparian habitat is more critical if it is located close to a nesting area than a similar area located near the edge of the energetically feasible foraging range from the colony. It would therefore be unjustifiable to use the maximum foraging distance figures to define all potential foraging habitat as critical foraging habitat for a particular nesting colony. Conversely, using an average foraging

distance figure may under-include suitable habitat by omitting some foraging areas that are important because they provide particularly rich and easily exploited feeding habitat.

Further, research (Custer et al. 2004) indicates that longer commuting distances are more frequent during high-demand and demographically critical nestling rearing period. Where the literature on commuting distance includes several studies, there can be wide variability in the mean commuting distances between different studies. When such was the case, we either averaged the reported mean commuting distances or used the information from the study with a large sample size or from an area most ecologically similar to New Jersey. We then doubled this figure.

A study conducted in North Carolina determined that the average foraging commute was 1.4 km (Custer and Osborn 1978). Research from the Chesapeake Bay found a smaller average foraging commute at <0.5 km. NatureServe recommends a minimum inferred extent of 3 km and justifies it by noting a low mean foraging range size (NatureServe 2006). We apply a 2.7 km radius around a colony to protect foraging areas.

## **Literature:**

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**Bentley. 1994. Use of a landscape-level approach to determine the habitat requirements of the yellow-crowned night-heron in the lower Chesapeake Bay. Masters Thesis, College of William and Mary, Williamsburg, Virginia.**

Average distance between nest and foraging area was <0.5 km.

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**Custer and Osborn. 1978. Feeding habitat use by colonially breeding herons, egrets and ibises in North Carolina. Auk 95: 733-743.**

Average distance between nests and foraging areas was 1.4 km.

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**Custer, C.M., S.A. Suarez, D.A. Olsen. 2004. Feeding habitat characteristics of the Great Blue Heron and Great Egret nesting along the Upper Mississippi River, 1995-1998. Waterbirds 27(4): 454-468.**

The majority of the herons in this study fed <5 km from the nesting site, and avoided areas > 10 km away. They flew farther to sites during the brood-rearing period than during incubation. Only 10% of the feeding flights ended at a location where another heron was present, indicating that they prefer to feed alone.

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**Dowd and Flake. 1985. Foraging habits and movements of nesting Great Blue Heron in prairie river ecosystem, South Dakota. Journal of Field ornithology 56: 377-387.**

A study in South Dakota found that the average distance that great blues flew from their colony to a foraging site was 3.1 km, and the maximum observed distance was 24.4 km. Eighty-five percent of the herons in the study fed within 4 km of the colony.

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**Kelly J. P., H. M. Pratt, P. L. Greene. 1993. The distribution, reproductive success, and habitat characteristics of heron and egret breeding colonies in the San Francisco Bay area. Colonial Waterbirds. 16: 18-27.**

> 95% of great blue herons and >90% great egrets fed within 20 km of their colony.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

The inferred minimum extent habitat use (when actual extent is unknown) is 3 km. This is based on

a low mean foraging range size.

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**Thompson. 1978. Feeding areas of Great Blue Herons and Great Egrets nesting in the floodplain of the upper Mississippi River. Proc. Colonial Waterbird Group. 2: 202-213.**

In central Minnesota the average distance that the herons flew from the colony to a foraging area was 6.5 km, and the maximum observed was 20.4 km. Fifty-three percent of the herons in the study fed within 4 km of the colony.

**Last researched by:** Davis

**Date researched:** 7/1/2006

## ***Bivalvia***

### ***Brook Floater***

#### ***Alasmidonta varicosa***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5008	N/A	Fresh Shell Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5009	N/A	Fresh Dead Individual	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5010	N/A	Glochidia Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5011	N/A	Live Individual Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5012	N/A	Relict Shell	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No

#### **Justification:**

Although adult freshwater mussels are mostly sedentary, their larvae (glochidia) with few exceptions are obligate parasites on specific fish hosts. Without the host fish, mussel species are unable to complete their reproductive cycle and therefore face extinction (Bogan 1993). Movement of host fishes bearing glochidia is by far the main mechanism of freshwater mussel dispersal (Watters 1992). Given the potential distance of transport by host fishes, D. Strayer (pers. comm.) as reported by Cordeiro, J. (2004) on the NatureServe web site, suggests a separation distance of at least 10 km when reporting freshwater mussel occurrences. Cordeiro (2004) recommends a separation distance in flowing water of 2 kilometers between sightings in unsuitable habitat and 10 km in suitable habitat. Populations/occurrences as defined by NatureServe are based on some evidence of historic or current presence, including live specimens or recently dead shells (including soft tissue still attached and/or nacre still glossy without signs of external weathering or staining) at any given location with potentially recurring existence. Given that separation distance based on potential host fish dispersal is somewhat arbitrary, the application of a 50 m radius buffer which is then buffered upstream and downstream by .75 m is conservative. Also, our recommendations do not take into account distances necessary to protect populations from water quality threats such as heavy metals, pesticides, sewage treatment plant effluents, and other point and nonpoint contaminant sources.

#### **Literature:**

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**Bogan, A. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. Amer. Zool. 33:599-609.**

N/A

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**Cordeiro, J. (2004). NatureServe Web Site. Population/occurrence delineation for freshwater mussels.**

N/A

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**Watters, G.T. 1992. Unionids, fishes, and the species-area curve. Journal of Biogeography 19:481-490.**

N/A

**Last researched by:** Bowers-Altman

**Date researched:** 1/1/2007

## ***Bivalvia***

### ***Creeper***

#### ***Strophitus undulatus***

SpC/LID	F LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5169	N/A	Glochidia Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5170	N/A	Relict Shell	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5171	N/A	Live Individual Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5172	N/A	Fresh Shell Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5173	N/A	Fresh Dead Individual	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes

#### **Justification:**

Although adult freshwater mussels are mostly sedentary, their larvae (glochidia) with few exceptions are obligate parasites on specific fish hosts. Without the host fish, mussel species are unable to complete their reproductive cycle and therefore face extinction (Bogan 1993). Movement of host fishes bearing glochidia is by far the main mechanism of freshwater mussel dispersal (Watters 1992). Given the potential distance of transport by host fishes, D. Strayer (pers. comm.) as reported by Cordeiro, J. (2004) on the NatureServe web site, suggests a separation distance of at least 10 km when reporting freshwater mussel occurrences. Cordeiro (2004) recommends a separation distance in flowing water of 2 kilometers between sightings in unsuitable habitat and 10 km in suitable habitat. Populations/occurrences as defined by NatureServe are based on some evidence of historic or current presence, including live specimens or recently dead shells (including soft tissue still attached and/or nacre still glossy without signs of external weathering or staining) at any given location with potentially recurring existence. Given that separation distance based on potential host fish dispersal is somewhat arbitrary, the application of a 50 m radius buffer which is then buffered upstream and downstream by .75 m is conservative. Also, our recommendations do not take into account distances necessary to protect populations from water quality threats such as heavy metals, pesticides, sewage treatment plant effluents, and other point and nonpoint contaminant sources.

#### **Literature:**

---

**Bogan, A. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. Amer. Zool. 33:599-609.**

N/A

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**Cordeiro, J. (2004). NatureServe Web Site. Population/occurrence delineation for freshwater mussels.**

N/A

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**Watters, G.T. 1992. Unionids, fishes, and the species-area curve. Journal of Biogeography 19:481-490.**



N/A

**Last researched by:** Bowers-Altman

**Date researched:** 1/1/2007

## ***Bivalvia***

### ***Dwarf Wedgemussel***

#### ***Alasmidonta heterodon***

SpC/LID	F LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5003	N/A	Fresh Shell Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5004	N/A	Fresh Dead Individual	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5005	N/A	Live Individual Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5006	N/A	Relict Shell	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5007	N/A	Glochidia Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No

#### **Justification:**

Although adult freshwater mussels are mostly sedentary, their larvae (glochidia) with few exceptions are obligate parasites on specific fish hosts. Without the host fish, mussel species are unable to complete their reproductive cycle and therefore face extinction (Bogan 1993). Movement of host fishes bearing glochidia is by far the main mechanism of freshwater mussel dispersal (Watters 1992). Given the potential distance of transport by host fishes, D. Strayer (pers. comm.) as reported by Cordeiro, J. (2004) on the NatureServe web site, suggests a separation distance of at least 10 km when reporting freshwater mussel occurrences. Cordeiro (2004) recommends a separation distance in flowing water of 2 kilometers between sightings in unsuitable habitat and 10 km in suitable habitat. Populations/occurrences as defined by NatureServe are based on some evidence of historic or current presence, including live specimens or recently dead shells (including soft tissue still attached and/or nacre still glossy without signs of external weathering or staining) at any given location with potentially recurring existence. Given that separation distance based on potential host fish dispersal is somewhat arbitrary, the application of a 50 m radius buffer which is then buffered upstream and downstream by .75 m is conservative. Also, our recommendations do not take into account distances necessary to protect populations from water quality threats such as heavy metals, pesticides, sewage treatment plant effluents, and other point and nonpoint contaminant sources.

#### **Literature:**

---

**Bogan, A. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. Amer. Zool. 33:599-609.**

N/A

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**Cordeiro, J. (2004). NatureServe Web Site. Population/occurrence delineation for freshwater mussels.**

N/A

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**Watters, G.T. 1992. Unionids, fishes, and the species-area curve. Journal of Biogeography 19:481-490.**

N/A

**Last researched by:** Bowers-Altman

**Date researched:** 1/1/2007

## ***Bivalvia***

### ***Eastern Lampmussel***

#### ***Lampsilis radiata***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5018	N/A	Fresh Shell Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5019	N/A	Fresh Dead Individual	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5020	N/A	Glochidia Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5021	N/A	Relict Shell	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5022	N/A	Live Individual Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes

#### **Justification:**

Although adult freshwater mussels are mostly sedentary, their larvae (glochidia) with few exceptions are obligate parasites on specific fish hosts. Without the host fish, mussel species are unable to complete their reproductive cycle and therefore face extinction (Bogan 1993). Movement of host fishes bearing glochidia is by far the main mechanism of freshwater mussel dispersal (Watters 1992). Given the potential distance of transport by host fishes, D. Strayer (pers. comm.) as reported by Cordeiro, J. (2004) on the NatureServe web site, suggests a separation distance of at least 10 km when reporting freshwater mussel occurrences. Cordeiro (2004) recommends a separation distance in flowing water of 2 kilometers between sightings in unsuitable habitat and 10 km in suitable habitat. Populations/occurrences as defined by NatureServe are based on some evidence of historic or current presence, including live specimens or recently dead shells (including soft tissue still attached and/or nacre still glossy without signs of external weathering or staining) at any given location with potentially recurring existence. Given that separation distance based on potential host fish dispersal is somewhat arbitrary, the application of a 50 m radius buffer which is then buffered upstream and downstream by .75 m is conservative. Also, our recommendations do not take into account distances necessary to protect populations from water quality threats such as heavy metals, pesticides, sewage treatment plant effluents, and other point and nonpoint contaminant sources.

#### **Literature:**

---

**Bogan, A. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. Amer. Zool. 33:599-609.**

N/A

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**Cordeiro, J. (2004). NatureServe Web Site. Population/occurrence delineation for freshwater mussels.**

N/A

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**Watters, G.T. 1992. Unionids, fishes, and the species-area curve. Journal of Biogeography 19:481-490.**

N/A

**Last researched by:** Bowers-Altman

**Date researched:** 1/1/2007

## ***Bivalvia***

### ***Eastern Pondmussel***

#### ***Ligumia nasuta***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5038	N/A	Relict Shell	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5039	N/A	Live Individual Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5040	N/A	Fresh Dead Individual	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5041	N/A	Glochidia Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5042	N/A	Fresh Shell Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes

#### **Justification:**

Although adult freshwater mussels are mostly sedentary, their larvae (glochidia) with few exceptions are obligate parasites on specific fish hosts. Without the host fish, mussel species are unable to complete their reproductive cycle and therefore face extinction (Bogan 1993). Movement of host fishes bearing glochidia is by far the main mechanism of freshwater mussel dispersal (Watters 1992). Given the potential distance of transport by host fishes, D. Strayer (pers. comm.) as reported by Cordeiro, J. (2004) on the NatureServe web site, suggests a separation distance of at least 10 km when reporting freshwater mussel occurrences. Cordeiro (2004) recommends a separation distance in flowing water of 2 kilometers between sightings in unsuitable habitat and 10 km in suitable habitat. Populations/occurrences as defined by NatureServe are based on some evidence of historic or current presence, including live specimens or recently dead shells (including soft tissue still attached and/or nacre still glossy without signs of external weathering or staining) at any given location with potentially recurring existence. Given that separation distance based on potential host fish dispersal is somewhat arbitrary, the application of a 50 m radius buffer which is then buffered upstream and downstream by .75 m is conservative. Also, our recommendations do not take into account distances necessary to protect populations from water quality threats such as heavy metals, pesticides, sewage treatment plant effluents, and other point and nonpoint contaminant sources.

#### **Literature:**

---

**Bogan, A. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. Amer. Zool. 33:599-609.**

N/A

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**Cordeiro, J. (2004). NatureServe Web Site. Population/occurrence delineation for freshwater mussels.**

N/A

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**Watters, G.T. 1992. Unionids, fishes, and the species-area curve. Journal of Biogeography 19:481-490.**

N/A

**Last researched by:** Bowers-Altman

**Date researched:** 1/1/2007

## ***Bivalvia***

### ***Green Floater***

#### ***Lasmigona subviridis***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5013	N/A	Glochidia Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5014	N/A	Relict Shell	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5015	N/A	Live Individual Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5016	N/A	Fresh Dead Individual	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5017	N/A	Fresh Shell Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes

#### **Justification:**

Although adult freshwater mussels are mostly sedentary, their larvae (glochidia) with few exceptions are obligate parasites on specific fish hosts. Without the host fish, mussel species are unable to complete their reproductive cycle and therefore face extinction (Bogan 1993). Movement of host fishes bearing glochidia is by far the main mechanism of freshwater mussel dispersal (Watters 1992). Given the potential distance of transport by host fishes, D. Strayer (pers. comm.) as reported by Cordeiro, J. (2004) on the NatureServe web site, suggests a separation distance of at least 10 km when reporting freshwater mussel occurrences. Cordeiro (2004) recommends a separation distance in flowing water of 2 kilometers between sightings in unsuitable habitat and 10 km in suitable habitat. Populations/occurrences as defined by NatureServe are based on some evidence of historic or current presence, including live specimens or recently dead shells (including soft tissue still attached and/or nacre still glossy without signs of external weathering or staining) at any given location with potentially recurring existence. Given that separation distance based on potential host fish dispersal is somewhat arbitrary, the application of a 50 m radius buffer which is then buffered upstream and downstream by .75 m is conservative. Also, our recommendations do not take into account distances necessary to protect populations from water quality threats such as heavy metals, pesticides, sewage treatment plant effluents, and other point and nonpoint contaminant sources.

#### **Literature:**

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**Bogan, A. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. Amer. Zool. 33:599-609.**

N/A

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**Cordeiro, J. (2004). NatureServe Web Site. Population/occurrence delineation for freshwater mussels.**

N/A

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**Watters, G.T. 1992. Unionids, fishes, and the species-area curve. Journal of Biogeography 19:481-490.**



N/A

**Last researched by:** Bowers-Altman

**Date researched:** 1/1/2007

## ***Bivalvia***

### ***Tidewater Mucket***

#### ***Leptodea ochracea***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5023	N/A	Relict Shell	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5024	N/A	Fresh Dead Individual	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5025	N/A	Glochidia Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5026	N/A	Live Individual Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5027	N/A	Fresh Shell Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes

#### **Justification:**

Although adult freshwater mussels are mostly sedentary, their larvae (glochidia) with few exceptions are obligate parasites on specific fish hosts. Without the host fish, mussel species are unable to complete their reproductive cycle and therefore face extinction (Bogan 1993). Movement of host fishes bearing glochidia is by far the main mechanism of freshwater mussel dispersal (Watters 1992). Given the potential distance of transport by host fishes, D. Strayer (pers. comm.) as reported by Cordeiro, J. (2004) on the NatureServe web site, suggests a separation distance of at least 10 km when reporting freshwater mussel occurrences. Cordeiro (2004) recommends a separation distance in flowing water of 2 kilometers between sightings in unsuitable habitat and 10 km in suitable habitat. Populations/occurrences as defined by NatureServe are based on some evidence of historic or current presence, including live specimens or recently dead shells (including soft tissue still attached and/or nacre still glossy without signs of external weathering or staining) at any given location with potentially recurring existence. Given that separation distance based on potential host fish dispersal is somewhat arbitrary, the application of a 50 m radius buffer which is then buffered upstream and downstream by .75 m is conservative. Also, our recommendations do not take into account distances necessary to protect populations from water quality threats such as heavy metals, pesticides, sewage treatment plant effluents, and other point and nonpoint contaminant sources.

#### **Literature:**

---

**Bogan, A. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. Amer. Zool. 33:599-609.**

N/A

---

**Cordeiro, J. (2004). NatureServe Web Site. Population/occurrence delineation for freshwater mussels.**

N/A

---

**Watters, G.T. 1992. Unionids, fishes, and the species-area curve. Journal of Biogeography 19:481-490.**

N/A

**Last researched by:** Bowers-Altman

**Date researched:** 1/1/2007

## ***Bivalvia***

### ***Triangle Floater***

#### ***Alasmidonta undulata***

SpC/LID	F LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5033	N/A	Relict Shell	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5034	N/A	Fresh Shell Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5035	N/A	Glochidia Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5036	N/A	Live Individual Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5037	N/A	Fresh Dead Individual	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes

#### **Justification:**

Although adult freshwater mussels are mostly sedentary, their larvae (glochidia) with few exceptions are obligate parasites on specific fish hosts. Without the host fish, mussel species are unable to complete their reproductive cycle and therefore face extinction (Bogan 1993). Movement of host fishes bearing glochidia is by far the main mechanism of freshwater mussel dispersal (Watters 1992). Given the potential distance of transport by host fishes, D. Strayer (pers. comm.) as reported by Cordeiro, J. (2004) on the NatureServe web site, suggests a separation distance of at least 10 km when reporting freshwater mussel occurrences. Cordeiro (2004) recommends a separation distance in flowing water of 2 kilometers between sightings in unsuitable habitat and 10 km in suitable habitat. Populations/occurrences as defined by NatureServe are based on some evidence of historic or current presence, including live specimens or recently dead shells (including soft tissue still attached and/or nacre still glossy without signs of external weathering or staining) at any given location with potentially recurring existence. Given that separation distance based on potential host fish dispersal is somewhat arbitrary, the application of a 50 m radius buffer which is then buffered upstream and downstream by .75 m is conservative. Also, our recommendations do not take into account distances necessary to protect populations from water quality threats such as heavy metals, pesticides, sewage treatment plant effluents, and other point and nonpoint contaminant sources.

#### **Literature:**

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**Bogan, A. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. Amer. Zool. 33:599-609.**

N/A

---

**Cordeiro, J. (2004). NatureServe Web Site. Population/occurrence delineation for freshwater mussels.**

N/A

---

**Watters, G.T. 1992. Unionids, fishes, and the species-area curve. Journal of Biogeography 19:481-490.**

N/A

**Last researched by:** Bowers-Altman

**Date researched:** 1/1/2007

## ***Bivalvia***

### ***Yellow Lampmussel***

#### ***Lampsilis cariosa***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5028	N/A	Fresh Shell Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5029	N/A	Live Individual Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5030	N/A	Glochidia Sighting	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No
5031	N/A	Fresh Dead Individual	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
5032	N/A	Relict Shell	50 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	No

#### **Justification:**

Although adult freshwater mussels are mostly sedentary, their larvae (glochidia) with few exceptions are obligate parasites on specific fish hosts. Without the host fish, mussel species are unable to complete their reproductive cycle and therefore face extinction (Bogan 1993). Movement of host fishes bearing glochidia is by far the main mechanism of freshwater mussel dispersal (Watters 1992). Given the potential distance of transport by host fishes, D. Strayer (pers. comm.) as reported by Cordeiro, J. (2004) on the NatureServe web site, suggests a separation distance of at least 10 km when reporting freshwater mussel occurrences. Cordeiro (2004) recommends a separation distance in flowing water of 2 kilometers between sightings in unsuitable habitat and 10 km in suitable habitat. Populations/occurrences as defined by NatureServe are based on some evidence of historic or current presence, including live specimens or recently dead shells (including soft tissue still attached and/or nacre still glossy without signs of external weathering or staining) at any given location with potentially recurring existence. Given that separation distance based on potential host fish dispersal is somewhat arbitrary, the application of a 50 m radius buffer which is then buffered upstream and downstream by .75 m is conservative. Also, our recommendations do not take into account distances necessary to protect populations from water quality threats such as heavy metals, pesticides, sewage treatment plant effluents, and other point and nonpoint contaminant sources.

#### **Literature:**

---

**Bogan, A. 1993. Freshwater bivalve extinctions (Mollusca: Unionoida): a search for causes. Amer. Zool. 33:599-609.**

N/A

---

**Cordeiro, J. (2004). NatureServe Web Site. Population/occurrence delineation for freshwater mussels.**

N/A

---

**Watters, G.T. 1992. Unionids, fishes, and the species-area curve. Journal of Biogeography 19:481-490.**

N/A

**Last researched by:** Bowers-Altman

**Date researched:** 1/1/2007

## ***Insecta***

### ***Allegheny River Cruiser*** ***Macromia alleghaniensis***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5841	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5842	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5843	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5844	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5845	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5846	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006



## ***Insecta***

### ***Arogos Skipper***

#### ***Atrytone arogos arogos***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4735 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
4736 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
4737 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
4738 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
4739 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning *Arogos Skipper*'s spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, BE and L Niles. 2003. *Endangered and Threatened Wildlife of New Jersey*. Rutgers's University Press. New Brunswick, NJ.**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

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**Glassberg, J. 1999. *Butterflies Through Binoculars, the East*. Oxford University Press. New York, NY.**

N/A

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**Gochfeld, M and J Burger. 1997. Butterflies of New Jersey: a guide to their status, distribution, conservation, and appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

---

**NatureServe. 2009. Arogos Skipper. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

A good short distance and occasional long distance colonizer. Evidence that of this skipper can easily disperse several kilometers is overwhelming, and there is strong implication of larger movements at least in and near New Jersey.

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**Opler, PA and V Malikul. 1998. A guide to eastern butterflies. Houghton Mifflin. New York, NY.**

N/A

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**Scott, J. 1986. The butterflies of North America: a natural history and field guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Arrowhead Spiketail***

### ***Cordulegaster obliqua***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5871	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5872	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5873	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5874	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5875	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5876	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Banner Clubtail***

#### ***Gomphus apomyius***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5895	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5896	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5897	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5898	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5899	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5900	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Bronze Copper***

#### ***Lycaena hyllus***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5053	N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5054	N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5055	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5056	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5057	N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Bronze Copper's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, BE and L Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ.**

N/A

---

**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

---

**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

---

**Gochfeld, M and J Burger. 1997. Butterflies of New Jersey: a guide to their status, distribution, conservation, and appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

---

**NatureServe. 2009. Bronze Copper. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: .5 km.

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**Opler, PA and V Malikul. 1998. A guide to eastern butterflies. Houghton Mifflin. New York, NY.**

N/A

---

**Scott, J. 1986. The butterflies of North America: a natural history and field guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Brook Snaketail***

#### ***Ophiogomphus aspersus***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5949	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5950	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5951	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5952	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5953	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5954	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Brush-tipped Emerald*** ***Somatochlora walshii***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5955	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5956	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5957	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5958	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5959	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5960	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006



## ***Insecta***

### ***Checkered White***

#### ***Pontia protodice***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5058 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5059 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5060 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5061 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5062 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Checkered White's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

---

**Beans, BE and L Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ.**

N/A

---

**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

---

**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

---

**Gochfeld, M and J Burger. 1997. Butterflies of New Jersey: a guide to their status, distribution, conservation, and appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

---

**NatureServe. 2009. Checkered White. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 1 km.

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**Opler, PA and V Malikul. 1998. A guide to eastern butterflies. Houghton Mifflin. New York, NY.**

N/A

---

**Scott, J. 1986. The butterflies of North America: a natural history and field guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Cobra Clubtail***

### ***Gomphus vastus***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5967	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5968	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5969	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5970	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5971	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5972	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

---

N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Coppery Emerald***

#### ***Somatochlora georgiana***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5991	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5992	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5993	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5994	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5995	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5996	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Crimson-ringed Whiteface***

#### ***Leucorrhinia glacialis***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5997 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5998 N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5999 N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6000 N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6001 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6002 N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Dotted Skipper***

#### ***Hesperia attalus slossonae***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5134 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5135 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5136 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5137 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5138 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Dotted Skipper's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, BE and L Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ.**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

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**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

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**Gochfeld, M and J Burger. 1997. Butterflies of New Jersey: a guide to their status, distribution, conservation, and appreciation. Rutgers's University Press. New Brunswick, NJ.**

N/A

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**NatureServe. 2009. Dotted Skipper. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 5 km.

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**Opler, PA and V. Malikul. 1998. A guide to eastern butterflies. Houghton Mifflin. New York, NY.**

N/A

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**Scott, J. 1986. The butterflies of North America: a natural history and field guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Forcipate Emerald***

#### ***Somatochlora forcipata***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6491	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6492	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6493	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6494	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6495	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6496	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006



## ***Insecta***

### ***Frosted Elfin***

#### ***Callophrys irus***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5063	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5064	N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5065	N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5066	N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5067	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Frosted Elfin's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, BE and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ.**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

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**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

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**Gochfeld, M. and J. Burger. 1997. Butterflies of New Jersey: a guide to their status, distribution, conservation, and appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

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**NatureServe. 2009. Frosted Elfin. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 2km. Small Baptisia or lupine patches within 2 or 3 km from substantial colonies are almost never unoccupied.

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**Opler, PA and V. Malikul. 1998. A guide to eastern butterflies. Houghton Mifflin. New York, NY.**

N/A

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**Scott, J. 1986. The butterflies of North America: a natural history and field guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Georgia Satyr***

#### ***Neonympha areolatus septentrionalis***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5139 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5140 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5141 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5142 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5143 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Georgia Satyr's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, BE and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ.**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

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**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

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**Gochfeld, M and J Burger. 1997. Butterflies of New Jersey: a guide to their status, distribution, conservation, and appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

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**NatureServe. 2009. Helicta Satyr. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

N/A

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**Opler, PA and V Malikul. 1998. A guide to eastern butterflies. Houghton Mifflin. New York, NY.**

N/A

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**Scott, J. 1986. The butterflies of North America: a natural history and field guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Golden-winged Skimmer***

#### ***Libellula auripennis***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5764 N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5765 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5766 N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5767 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5768 N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5769 N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Gray Petaltail***

#### ***Tachopteryx thoreyi***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6093	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6094	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6095	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6096	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6097	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6098	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Green-faced Clubtail***

#### ***Gomphus viridifrons***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6105	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6106	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6107	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6108	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6109	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6110	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006



## ***Insecta***

### ***Harpoon Clubtail***

#### ***Gomphus descriptus***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6123	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6124	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6125	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6126	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6127	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6128	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Harris Checkerspot***

#### ***Chlosyne harrisii***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5144 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5145 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5146 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5147 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5148 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Harris' Checkerspot's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

---

**Beans, B.E. and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

---

**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

---

**Gochfeld, M. and J. Burger. 1997. Butterflies of New Jersey. A Guide to Their Status, Distribution, Conservation, and Appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

---

**NatureServe. 2009. Harris' Checkerspot. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 2 km

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**Opler, P.A. and V. Malikul. 1998. A Guide to Eastern Butterflies. Houghton Mifflin Company. New York, NY**

N/A

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**Scott, J.A. 1986. The Butterflies of North America, a Natural History and Field Guide. Stanford University Press. Standford, CA.**

N/A

**Last researched by:** Somes

**Date researched:** 3/30/2010

## ***Insecta***

### ***Hessel's Hairstreak***

#### ***Callophrys hesseli***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5149 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5150 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5151 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5152 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5153 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Hessel's Hairstreak's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

---

**Beans, B.E. and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

---

**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY**

N/A

---

**Gochfeld, M. and J. Burger. 1997. Butterflies of New Jersey. A Guide to Their Status, Distribution, Conservation, and Appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

---

**NatureServe. 2009. Hessel's Hairstreak. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 1 km.

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**Opler, P.A. and V. Malikul. 1998. A Guide to Eastern Butterflies. Houghton Mifflin Company. New York, NY**

N/A

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**Scott, J.A. 1986. The Butterflies of North America, a Natural History and Field Guide. Stanford University Press. Standford, CA.**

N/A

**Last researched by:** Somes

**Date researched:** 3/3/2010

## ***Insecta***

### ***Hoary Elfin***

#### ***Callophrys polios***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5154 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5155 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5156 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5157 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5158 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Hoary Elfin's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, BE and L Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ.**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

---

**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

---

**Gochfeld, M and J Burger. 1997. Butterflies of New Jersey: a guide to their status, distribution, conservation, and appreciation. Rutgers's University Press. New Brunswick, NJ.**

N/A

---

**NatureServe. 2009. Hoary Elfin. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 2 km.

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**Opler, PA and V Malikul. 1998. A guide to eastern butterflies. Houghton Mifflin. New York, NY.**

N/A

---

**Scott, J. 1986. The butterflies of North America: a natural history and field guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Hudsonian Whiteface***

#### ***Leucorrhinia hudsonica***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6129	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6130	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6131	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6132	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6133	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6134	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006



## ***Insecta***

### ***Kennedy's Emerald***

#### ***Somatochlora kennedyi***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6497 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6498 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6499 N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6500 N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6501 N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6502 N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Leonard's Skipper***

#### ***Hesperia leonardus***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6551 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6552 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6553 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6554 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6555 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Leonard's Skipper's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, B.E. and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ.**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

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**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

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**Gochfeld, M. and J. Burger. 1997. Butterflies of New Jersey. A Guide to Their Status, Distribution, Conservation, and Appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

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**NatureServe. 2009. Leonard's Skipper. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 1 km.

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**Opler, P.A. and V. Malikul. 1998. A Guide to Eastern Butterflies. Houghton Mifflin Company. New York, NY.**

N/A

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**Scott, J.A. 1986. The Butterflies of North America, a Natural History and Field Guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Somes

**Date researched:** 3/30/2010

## ***Insecta***

### ***Maine Snaketail***

#### ***Ophiogomphus mainensis***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6153	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6154	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6155	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6156	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6157	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6158	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Midland Clubtail***

#### ***Gomphus fraternus***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6503	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6504	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6505	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6506	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6507	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6508	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Mitchell's Satyr***

#### ***Neonympha mitchellii mitchellii***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5043 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5044 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5045 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5046 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5047 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Mitchell's Satyr's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Barton, B.J. and C.E. Bach. 2005. Habitat Use by the Federally Endangered Mitchell's Satyr Butterfly (*Neonympha mitchellii mitchellii*) in a Michigan Prairie Fen. *Am. Midl. Nat.* 153:41-51.**

The longest distances flown by males and females were 511.8 m and 344.8 m, respectively.

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**Beans, B.E. and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ.**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

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**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

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**Gochfeld, M. and J. Burger. 1997. Butterflies of New Jersey. A Guide to Their Status, Distribution, Conservation, and Appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

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**NatureServe. 2009. Mitchell's Satyr. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 1 km.

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**Opler, P.A. and V. Malikul. 1998. A Guide to Eastern Butterflies. Houghton Mifflin Company. New York, NY.**

N/A

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**Scott, J.A. 1986. The Butterflies of North America, a Natural History and Field Guide. Stanford University Press. Stanford, CA.**

N/A

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**Szymanski, J., Shuey, J.A., and K. Oberhauser. 2004. Population Structure of the Endangered Mitchell's Satyr, *Neonympha mitchellii mitchellii* (French): Implications for Conservation. *Am. Midl. Nat.* 152:304-322.**

Maximum range estimates were 290 m and 420 m at the two sites.

**Last researched by:** Somes

**Date researched:** 3/30/2010

## ***Insecta***

### ***New England Bluet***

#### ***Enallagma laterale***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6201	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6202	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6203	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6204	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6205	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6206	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006



## ***Insecta***

### ***Northeastern Beach Tiger Beetle***

#### ***Cicindela dorsalis dorsalis***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7843 N/A	Larvae Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
7844 N/A	Breeding/Courtship	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
7845 N/A	Occupied Habitat	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. For many species that value habitat patches in the Landscape Project maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In these cases, a default occurrence area (71.25 meter radius) is applied to take into account location uncertainty. These occurrence areas are used to value patches of habitat.

#### **Literature:**

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N/A

N/A

**Last researched by:** Somes

**Date researched:** 1/1/2007

## ***Insecta***

### ***Northern Metalmark***

#### ***Calephelis borealis***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5159 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5160 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5161 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5162 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5163 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Northern Metalmark's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, B.E. and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers's University Press. New Brunswick, NJ.**

N/A

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**Bisignano, M. 2006. Northern Metalmark (*Calephelis borealis*) Habitat Restoration on Private Lands: 2005 Survey Results and Habitat Management Recommendations. Report to The New Jersey Chapter of the Nature Conservancy.**

The maximum distance that adult metalmarks disperse is approximately 2,200 meters (~1.4 miles).

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

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**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

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**Gochfeld, M. and J. Burger. 1997. Butterflies of New Jersey: a guide to their status, distribution, conservation, and appreciation. Rutgers's University Press. New Brunswick, NJ.**

N/A

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**NatureServe. 2009. Northern Metalmark. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: .5 km.

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**Opler, P.A. and V. Malikul. 1998. A guide to eastern butterflies. Houghton Mifflin. New York, NY.**

N/A

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**Scott, J. 1986. The butterflies of North America: a natural history and field guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Pine Barrens Bluet***

#### ***Enallagma recurvatum***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6219	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6220	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6221	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6222	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6223	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6224	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Rapids Clubtail***

#### ***Gomphus quadricolor***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6231	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6232	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6233	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6234	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6235	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6236	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Robust Baskettail***

#### ***Epitheca spinosa***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6255	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6256	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6257	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6258	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6259	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6260	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Sable Clubtail***

#### ***Gomphus rogersi***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6279	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6280	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6281	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6282	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6283	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6284	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Scarlet Bluet***

#### ***Enallagma pictum***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6285	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6286	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6287	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6288	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6289	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6290	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006



## ***Insecta***

### ***Septima's Clubtail***

#### ***Gomphus septima***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6303	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6304	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6305	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6306	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6307	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6308	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Silver-bordered Fritillary*** ***Boloria selene myrina***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5068 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5069 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5070 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5071 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5072 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ. Natureserve recommends a buffer of 2km when actual extent is unknown (Natureserve 2010).

Due to the absence of literature concerning Silver-bordered Fritillary's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, B.E. and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers University Press. New Brunswick, NJ.**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

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**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY.**

N/A

---

**Gochfeld, M. and J. Burger. 1997. Butterflies of New Jersey. A Guide to Their Status, Distribution, Conservation, and Appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

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**NatureServe. 2009. Silver-bordered Fritillary. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 2km.

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**Opler, P.A. and V. Malikul. 1998. A Guide to Eastern Butterflies. Houghton Mifflin Company. New York, NY.**

N/A

---

**Scott, J.A. 1986. The Butterflies of North America, a Natural History and Field Guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Somes

**Date researched:** 3/30/2010

## ***Insecta***

### ***Ski-tailed Emerald***

#### ***Somatochlora elongata***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6309	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6310	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6311	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6312	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6313	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6314	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Spatterdock Darner***

#### ***Rhionaeschna mutata***

SpCFLID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6333	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6334	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6335	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6336	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6337	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6338	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Subarctic Darner***

#### ***Aeshna subarctica***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6509	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6510	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6511	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6512	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6513	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6514	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Superb Jewelwing***

#### ***Calopteryx amata***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6369	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6370	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6371	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6372	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6373	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6374	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Tiger Spiketail***

#### ***Cordulegaster erronea***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6381	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6382	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6383	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6384	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6385	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6386	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006



## ***Insecta***

### ***Two-spotted Skipper***

#### ***Euphyes bimacula***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5167 N/A	Casual Flyby	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5168 N/A	Pupae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5164 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5165 N/A	Nectaring	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
5166 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

The species occurrence area is generally based on the average home range/territory size, or other appropriate life-history parameter as reported in peer-reviewed scientific literature or from other information obtained through ENSP research. When searching the scientific literature to gather information to support the occurrence area polygon size, efforts were made to select research that was conducted in habitat types similar to those found in NJ.

Due to the absence of literature concerning Two-spotted Skipper's spatial requirements, a 500-meter radius was formulated based upon the information available and the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program. Given the distances that these species are known to disperse, 500 meters is a highly conservative measure and based on minimum distance that these species are known to disperse with ease.

#### **Literature:**

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**Beans, B.E. and L. Niles. 2003. Endangered and Threatened Wildlife of New Jersey. Rutgers's University Press. New Brunswick, NJ.**

N/A

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**ENSP Biologist Expert Opinion: R. Somes and D. Golden**

N/A

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**Glassberg, J. 1999. Butterflies Through Binoculars, the East. Oxford University Press. New York, NY**

N/A

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**Gochfeld, M. and J. Burger. 1997. Butterflies of New Jersey: a guide to their status, distribution, conservation, and appreciation. Rutgers University Press. New Brunswick, NJ.**

N/A

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**NatureServe. 2009. Two-spotted Skipper. In: NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: March 17, 2010 ).**

Inferred Minimum Extent of habitat use: 1 km.

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**Opler, P.A. and V. Malikul. 1998. A guide to eastern butterflies. Houghton Mifflin. New York, NY.**

N/A

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**Scott, J. 1986. The butterflies of North America: a natural history and field guide. Stanford University Press. Stanford, CA.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Williamson's Emerald***

#### ***Somatochlora williamsoni***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6417 N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6418 N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6419 N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6420 N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6421 N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6422 N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## ***Insecta***

### ***Zebra Clubtail***

#### ***Stylurus scudderi***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6423	N/A	Breeding/Courtship	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6424	N/A	Exuviae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6425	N/A	Territorial Display	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6426	N/A	Foraging	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6427	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
6428	N/A	Larvae Sighting	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes

#### **Justification:**

For many species that value habitat patches in the Landscape Project Maps, insufficient information exists in the scientific literature to support the designation of an occurrence area. In the Landscape Project, an occurrence area equates to the area a species needs to fulfill its life history requirements (breeding, resting, feeding). Due to the absence of literature concerning Odonate species' spatial requirements, a 500 meter radius was formulated based upon the expert opinion of the biologist responsible for reviewing these species within the NJ Endangered and Nongame Species Program.

#### **Literature:**

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N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2006

## **Mammalia**

### **Allegheny Woodrat**

#### ***Neotoma magister***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4725	N/A	Capture Location	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4726	N/A	Live Individual Sighting	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4727	N/A	On Road	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes
4728	N/A	Physical evidence	150 Meter Buffer	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### **Justification:**

The preferred habitat of the Allegheny woodrat in NJ is rocky areas within deciduous forests. Woodrats make their dens, or middens, within the crevices and spaces between boulders at the base of cliffs or in rock outcrops. They forage in vegetated areas adjacent to their dens. The Indiana DNR (2007) states that Allegheny woodrats rarely travel more than 100 meters from their den sites. The PA Game Commission (2006) recommends that a 150 meter primary buffer be protected from the edge of the surface rock zone where the dens are located. The most comprehensive research to determine home range for Allegheny woodrats was conducted by Castleberry (2000) in the central Appalachians. Thirty-four woodrats were tracked using radio telemetry and the mean topographic home range was 4.4 ha. The maximum distance traveled from the den while foraging averaged 151 m.

#### **Literature:**

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**Butchkoski, C. 2006. Allegheny woodrat research/management. Annual Job Report. Project Code No. 06718, Job Code No. 71801. 27 pp.**

Recommends a 150 meter primary buffer extending out from the edge of the surface rock zone.

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**Castleberry, S.B. 2000. Conservation and management of the Allegheny woodrat in the central Appalachians, Dissertation, West Virginia University, [On-line Abstract].**

**Available:**<https://kitkat.wvu.edu/etd/documentdata.eTD?documentid=1503>

Thirty-four woodrats were radio tracked during 1998-99 and the mean home range was 4.4 ha.

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**Indiana Department of Natural Resources. 2007. The Allegheny woodrat (On-line). Accessed April 4, 2007 at: <http://www.in.gov/dnr/fishwild/publications/liferies/wdrat.htm>**

States that Allegheny woodrats rarely travel farther than 100 meters from their dens.

**Last researched by:** Valent

**Date researched:** 4/1/2007

## **Mammalia**

### **Bobcat**

#### ***Lynx rufus***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4752	N/A	Capture Location	2.82 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4753	N/A	Live Individual Sighting	2.82 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4754	N/A	On Road	2.82 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4755	N/A	Physical evidence	2.82 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
8359	N/A	Telemetry: Home Range	Kernel Home Range	Apply a buffer	Convert to a point and buffer	Stays as is	Yes

#### **Justification:**

Bobcat home range sizes are highly variable, both geographically and intrasexually in the same geographic area particularly if suitable habitat components have a patchy distribution (Lovallo 1999). The home range size of males is generally larger than that of females. In New Jersey's Highlands region, the annual home range of an adult male in 2002 was 121 km<sup>2</sup> with a core of 19 km<sup>2</sup>. The annual home range (kernel home range) of an adult male in the Ridge and Valley physiographic province of northwest NJ in 2004 was 50.3 km<sup>2</sup> with a core of 9.6 km<sup>2</sup>. The annual home range of an adult female in 2003 in the Highlands region was 90 km<sup>2</sup> with a core of 11.7 km<sup>2</sup>. The annual home range of an adult female in 2005 in the Ridge and Valley physiographic province was 22.6 km<sup>2</sup> with a core of 2.8 km<sup>2</sup>. We apply a 25 km<sup>2</sup> buffer (2.82 km radius) around bobcat sightings, which is larger than the core area we estimated for a male and female bobcat in the state, and midway between the male and female home range sizes Lovallo (2000) estimated in north central Pennsylvania. It is a conservative estimate based on sizes reported for bobcats in the northeastern United States (Lovallo 2000).

#### **Literature:**

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**Conner, M., B. Plowman, B.D. Leopold, C. Lovell. 1999. Influence of time-in-residence on home range and habitat use of bobcats. *Journal of Wildlife Management* 63(1):261-269.**

In east central Mississippi the male home range was 15.34 + 2.12 km<sup>2</sup> and 15.67 + 2.61 km<sup>2</sup> in consecutive years. The female annual home range was 7.81 + .91 km<sup>2</sup> and 6.40 + .57 km<sup>2</sup> in consecutive years

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**Litvaitis, J.A., J.A. Sherburne, J.A. Bissonette. 1986. Bobcat habitat use and home range size in relation to prey density. *Journal of Wildlife Management* 50(1):110-117.**

In Maine the average home range size of males was 95.7 km<sup>2</sup> and that of females was 31.2 km<sup>2</sup>.

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**Lovallo, J.M. 1999. Multivariate models of bobcat habitat selection for Pennsylvania Landscape. Ph.D. dissertation. The Pennsylvania State University, University Park. 146pp.**

Attributes the highly variable home range estimates of both males and females to the patchy distribution of suitable habitat components.

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**Lovallo, M.J. 2000. Bobcat home range size and intraspecific social relationships. Pennsylvania Game Commission Bureau of Wildlife Management Research Division Project Annual Job Report: Bobcat Research/Management 06630.**

Median female home range was 16 km<sup>2</sup> (MCP) and median male home range was 42 km<sup>2</sup> (MCP). Lovallo (2000) also summarizes other home range sizes in the northeastern U.S. as being 36-326 km<sup>2</sup> for males in New York State, 71-112 km<sup>2</sup> for males in Massachusetts, and 28-33 km<sup>2</sup> for females in Maine.

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**Lovallo, M.J., E.M. Anderson. 1996. Bobcat (*Lynx rufus*) home range size and habitat use in northwest Wisconsin. American Midland Naturalist 135(2): 241-252.**

In northwestern Wisconsin the annual male home ranges were 60.4 km<sup>2</sup> + 23.4 km<sup>2</sup> and the female home ranges were 28.5 km<sup>2</sup> + 3.7 km<sup>2</sup>.

**Last researched by:** Valent

**Date researched:** 9/19/2008



## **Mammalia**

### **Fin Whale**

#### ***Balaenoptera physalus***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7730 N/A	Stranding	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
7731 N/A	Foraging Area	25 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
7733 N/A	Live Individual Sighting	25 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

The baleen whales which occur off the NJ coast are, for the most part, migrating between summer feeding grounds in the north and winter breeding and/or calving grounds in the south. Foraging has been documented for humpback whales off the NJ coast and may also be engaged in by fin whales, but the bulk of foraging behavior occurs farther north and perhaps offshore (foraging in NJ waters may be opportunistic). Northern Right Whales, whose preferred diet consists of calanoid copepods, are not thought to feed in NJ waters. Movements are patterned and consistent, but movements of individuals in a given year may vary according to their energetic and reproductive condition, climatic factors, etc. Thus, due to the migratory behavior of these species in NJ waters, as well as the tremendous distance which they are capable of traveling within relatively short spans of time (Mate 1999; NMFS 1991; Watkins 1996), formulating a Species Occurrence Area (SOA) based upon a home range is both impractical and inappropriate for an area which primarily functions as a migratory corridor. However, in order to provide a basis by which these species may best be represented within the current SOA framework, the documented average daily distance traveled will be used to determine the SOA radius. Due to the paucity of data regarding migratory movements of baleen whales between summering and wintering grounds in the northwest Atlantic, an extremely conservative SOA radius of 25 km was chosen.

#### **Literature:**

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**Mate, Bruce R., and B.A. Lagerquist. 1999. Movements of North Pacific blue whales during the feeding season off southern California and their southern fall migration. *Marine Mammal Science* 15(4): 1246-1257.**

The satellite-acquired locations of 10 blue whales tagged with Argos radio tags indicated an overall average speed of individual whales ranging from 58 to 172km/day. Migratory individuals covered greater average distance as opposed to clustered or foraging movements.

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**Merrick, Richard L., P.J. Clapham, T. Cole, P. Gerrior, and R.M. Pace III. 2001. Identification of Seasonal Area Management Zones for North Atlantic Right Whale Conservation. *Northeast Fisheries Science Center Reference Document* 01-14.**

Within the northern right whale's summer foraging habitat, the size of an area necessary to contain a right whale's movement over a 1-2 week period was calculated to be a 15 nautical mile (27.78) radius.

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**National Marine Fisheries Service. 1991. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105 pp.**

Estimated migration speeds of humpback whales migrating between summering and wintering areas were: 78 days (2.38 km/hr) for a 4,500 km distance between Hawaii and Alaska; and 3.29 km/hr and 2.28 km/hr for two individuals migrating between the Greater Antilles and Massachusetts Bay.

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**Watkins, William A., J. Sigurjonsson, D. Wartzok, R.R. Maiefski, P.W. Howey, and M.A. Daher. 1996. Fin whale tracked by satellite off Iceland. *Marine Mammal Science* 12(4): 564-569.**

The average daily distance of a fin whale tagged with a satellite transmitter was 36 km (range 1.9 km - 156.6 km, median 23 km) over a period of 45 days.

**Last researched by:** Davenport

**Date researched:** 1/1/2007

## **Mammalia**

### **Humpback Whale**

#### ***Megaptera novaeangliae***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7738	Non-Breeding	Foraging Area	25 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
7739	Non-Breeding	Stranding	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
7741	Non-Breeding	Live Individual Sighting	25 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

The baleen whales which occur off the NJ coast are, for the most part, migrating between summer feeding grounds in the north and winter breeding and/or calving grounds in the south. Foraging has been documented for humpback whales off the NJ coast and may also be engaged in by fin whales, but the bulk of foraging behavior occurs farther north and perhaps offshore (foraging in NJ waters may be opportunistic). Northern Right Whales, whose preferred diet consists of calanoid copepods, are not thought to feed in NJ waters. Movements are patterned and consistent, but movements of individuals in a given year may vary according to their energetic and reproductive condition, climatic factors, etc. Thus, due to the migratory behavior of these species in NJ waters, as well as the tremendous distance which they are capable of traveling within relatively short spans of time (Mate 1999; NMFS 1991; Watkins 1996), formulating a Species Occurrence Area (SOA) based upon a home range is both impractical and inappropriate for an area which primarily functions as a migratory corridor. However, in order to provide a basis by which these species may best be represented within the current SOA framework, the documented average daily distance traveled will be used to determine the SOA radius. Due to the paucity of data regarding migratory movements of baleen whales between summering and wintering grounds in the northwest Atlantic, an extremely conservative SOA radius of 25 km was chosen.

#### **Literature:**

---

**Mate, Bruce R., and B.A. Lagerquist. 1999. Movements of North Pacific blue whales during the feeding season off southern California and their southern fall migration. *Marine Mammal Science* 15(4): 1246-1257.**

The satellite-acquired locations of 10 blue whales tagged with Argos radio tags indicated an overall average speed of individual whales ranging from 58 to 172km/day. Migratory individuals covered greater average distance as opposed to clustered or foraging movements.

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**Merrick, Richard L., P.J. Clapham, T. Cole, P. Gerrior, and R.M. Pace III. 2001. Identification of Seasonal Area Management Zones for North Atlantic Right Whale Conservation. Northeast Fisheries Science Center Reference Document 01-14.**

Within the northern right whale's summer foraging habitat, the size of an area necessary to contain a right whale's movement over a 1-2 week period was calculated to be a 15 nautical mile (27.78) radius.

---

**National Marine Fisheries Service. 1991. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105 pp.**

Estimated migration speeds of humpback whales migrating between summering and wintering areas were: 78 days (2.38 km/hr) for a 4,500 km distance between Hawaii and Alaska; and 3.29 km/hr and 2.28 km/hr for two individuals migrating between the Greater Antilles and Massachusetts Bay.

---

**Watkins, William A., J. Sigurjonsson, D. Wartzok, R.R. Maiefski, P.W. Howey, and M.A. Daher. 1996. Fin whale tracked by satellite off Iceland. *Marine Mammal Science* 12(4): 564-569.**

The average daily distance of a fin whale tagged with a satellite transmitter was 36 km (range 1.9 km - 156.6 km, median 23 km) over a period of 45 days.

**Last researched by:** Davenport

**Date researched:** 1/1/2007

## **Mammalia**

### **Indiana Bat**

#### ***Myotis sodalis***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4781	Undetermined	Hibernaculum	4.0 Kilometer Buffer	Apply a buffer	Apply a buffer	Convert to a point and buffer	Yes
4782	Undetermined	Inactive Season Sighting	2.0 Kilometer Buffer	Apply a buffer	Apply a buffer	Convert to a point and buffer	Yes
4783	Undetermined	Maternity Colony	2.0 Kilometer Buffer	Apply a buffer	Apply a buffer	Convert to a point and buffer	Yes
4786	Undetermined	Active Season Sighting	2.0 Kilometer Buffer	Apply a buffer	Apply a buffer	Convert to a point and buffer	Yes
8509	Undetermined	Roost Site	2.0 Kilometer Buffer	Apply a buffer	Apply a buffer	Convert to a point and buffer	Yes

#### **Justification:**

Fall roosting and foraging distance from hibernacula ranged from 2.4km-6.8km with an average distance of 4.33km. A 4km radius buffer was therefore selected to protect foraging and roosting habitat surrounding hibernacula. Summer roosting and foraging distances ranged from 0.679km-5km to create an average radius buffer of 2km.

#### **Literature:**

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**Callahan, E.V., R.D. Drobney, and R.L. Clawson. 1997. Selection of summer roosting sites by Indiana bats (*Myotis sodalis*) in Missouri. *J. Mamm.* 78:818-825.**

The furthest distance documented between roosts occupied by bats within a single maternity colony was 5 km.

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**Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1991a. Summer roost selection and roosting behavior of *Myotis sodalis* (Indiana bat) in Illinois. Unpublished report, Illinois Natural History Survey, Champaign, Illinois.**

Radiotelemetry showed that during the maternity period, home range of Indiana bats is generally no larger than 2 km in breadth.

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**Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1991b. Summary of *Myotis sodalis* summer habitat studies in Illinois: with recommendations for impact assessment. Special Report. Illinois Natural History Survey, Illinois Dept. of Conservation. Champaign, Illinois. 28 pp.**

Stream, associated with floodplain forests, and impounded bodies of water are preferred foraging habitats for pregnant and lactating Indiana bats, some of which may fly up to 2.5 km from upland

roosts. Mean distance moved by reproductively active females between foraging and roosting habitat was 1.04 km. Maximum distance moved by reproductively active females between foraging and roosting habitat was 2.40 km.

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**Kiser, J.D. and C.L. Elliott. 1996. Foraging habitat, food habits, and roost tree characteristics of the Indiana bat (*Myotis sodalis*) during autumn in Johnson County, Kentucky. Final report, Kentucky Dept. of Fish and Wildl. Resources, Frankfort, Kentucky. 65 pp.**

In Kentucky, Kiser and Elliott found male Indiana bats roosting primarily in dead trees on upper slopes and ridgetops within 2.4 km of their hibernaculum. In the fall, male Indiana bats tend to roost and forage in upland and ridgetop forests, but may also forage in valley and riparian forest; movements of 2.5-6.8 km have been reported in Kentucky and Missouri.

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**Menzel, J.M., W.M. Ford, M.A. Menzel, T.C. Carter, J.E. Gardner, J.D. Garner, J.E. Hofmann. 2005. Summer habitat use and home-range analysis of the endangered Indiana bat. *Journal of Wildlife Management* 69(1):430-436.**

Home ranges were determined from radio telemetry of 7 female and 4 male Indiana bats in Illinois. No significant differences were found in home-range size between male and female bats or between study years. The mean home-range size for the Indiana bats tracked was 144.7 ha, which calculates to a radius of 0.679 km.

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**Stihler, C. West Virginia Division of Natural Resources, pers observ. October 1996. Reference excerpted from USFWS Indiana Bat Revised Recovery Plan, March 1999.**

During September in West Virginia, male Indiana bats roosted within 5.6km [of hibernacula] in trees near ridgetops, and often switched roost trees from day to day.

**Last researched by:** Craddock

**Date researched:** 6/1/2006

## **Mammalia**

### **North Atlantic Right Whale**

#### ***Eubalaena glacialis***

SpCoF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7742	Non-Breeding	Live Individual Sighting	25 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
7743	Non-Breeding	Foraging Area	25 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
7745	Non-Breeding	Stranding	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### **Justification:**

The baleen whales which occur off the NJ coast are, for the most part, migrating between summer feeding grounds in the north and winter breeding and/or calving grounds in the south. Foraging has been documented for humpback whales off the NJ coast and may also be engaged in by fin whales, but the bulk of foraging behavior occurs farther north and perhaps offshore (foraging in NJ waters may be opportunistic). Northern Right Whales, whose preferred diet consists of calanoid copepods, are not thought to feed in NJ waters. Movements are patterned and consistent, but movements of individuals in a given year may vary according to their energetic and reproductive condition, climatic factors, etc. Thus, due to the migratory behavior of these species in NJ waters, as well as the tremendous distance which they are capable of traveling within relatively short spans of time (Mate 1999; NMFS 1991; Watkins 1996), formulating a Species Occurrence Area (SOA) based upon a home range is both impractical and inappropriate for an area which primarily functions as a migratory corridor. However, in order to provide a basis by which these species may best be represented within the current SOA framework, the documented average daily distance traveled will be used to determine the SOA radius. Due to the paucity of data regarding migratory movements of baleen whales between summering and wintering grounds in the northwest Atlantic, an extremely conservative SOA radius of 25 km was chosen.

#### **Literature:**

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**Mate, Bruce R., and B.A. Lagerquist. 1999. Movements of North Pacific blue whales during the feeding season off southern California and their southern fall migration. *Marine Mammal Science* 15(4): 1246-1257.**

The satellite-acquired locations of 10 blue whales tagged with Argos radio tags indicated an overall average speed of individual whales ranging from 58 to 172km/day. Migratory individuals covered greater average distance as opposed to clustered or foraging movements.

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**Merrick, Richard L., P.J. Clapham, T. Cole, P. Gerrior, and R.M. Pace III. 2001. Identification of Seasonal Area Management Zones for North Atlantic Right Whale Conservation. *Northeast Fisheries Science Center Reference Document 01-14.***

Within the northern right whale's summer foraging habitat, the size of an area necessary to contain a right whale's movement over a 1-2 week period was calculated to be a 15 nautical mile (27.78) radius.

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**National Marine Fisheries Service. 1991. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105 pp.**

Estimated migration speeds of humpback whales migrating between summering and wintering areas were: 78 days (2.38 km/hr) for a 4,500 km distance between Hawaii and Alaska; and 3.29 km/hr and 2.28 km/hr for two individuals migrating between the Greater Antilles and Massachusetts Bay.

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**Watkins, William A., J. Sigurjonsson, D. Wartzok, R.R. Maiefski, P.W. Howey, and M.A. Daher. 1996. Fin whale tracked by satellite off Iceland. *Marine Mammal Science* 12(4): 564-569.**

The average daily distance of a fin whale tagged with a satellite transmitter was 36 km (range 1.9 km - 156.6 km, median 23 km) over a period of 45 days.

**Last researched by:** Davenport

**Date researched:** 1/1/2007



## **Mammalia**

### **Northern Myotis**

#### ***Myotis septentrionalis***

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7597	Undetermined	Maternity Colony	2.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
7598	Undetermined	Hibernaculum	4.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
7601	Undetermined	Inactive Season Sighting	2.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
7602	Undetermined	Active Season Sighting	2.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
8508	Undetermined	Roost Site	2.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### **Justification:**

Northern long-eared bats use a wide variety of forested habitats in summer, including woodlands of variable tree densities and canopy closures as well as forest edges, riparian zones, and interspersed areas of wetlands, fields, and linear wooded corridors. They roost in live or dead trees >3 inches dbh that have sloughing bark, cracks, crevices, or cavities. Northern long-eared bats have also been found roosting in buildings, barns, bridges, and bat houses. The species' summer home range is typically within a 3 mile (4.8 km) radius of a capture location or positive acoustic identification, or within 1.5 miles (2.4 km) of a roost (USFWS 2014). For radio-tracked northern long-eared bats (n>300), the distance between foraging areas and roost trees ranged from 0.07 km (0.04 mi) to 4.8 km (3.0 mi), with a mean distance of around 1.7 km (1.1 mi). Roost switching typically occurs every two days or so (Carter and Feldhamer 2005; Foster and Kurta 1999; Sasse and Pekins 1996; Timpone et al. 2010).

Migratory distances of 5-168 miles have been documented among northern long-eared bats, and 40-50 miles is typical (USFWS 2014). Spring staging and fall swarming areas consist of wooded habitats within 5 miles (8 km) of a hibernaculum (USFWS 2014). Due to a paucity of published information on spring staging/fall swarming and foraging ranges surrounding hibernacula, we refer to the information available on the closely related Indiana bat (*Myotis sodalis*), which shares a similar life history with the northern long-eared bat, and therefore apply the same 4.0 km hibernaculum buffer at this time.

#### **Literature:**

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**Carter, T. C. and G. A. Feldhamer. 2005. Roost tree use by maternity colonies of Indiana bats and northern long-eared bats in southern Illinois. *Forest Ecology and Management*. 219: 259-268.**

N/A

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**Foster, R.W., and A. Kurta. 1999. Roosting ecology of the northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). *Journal of Mammalogy* 80: 659-672.**

N/A

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**Jackson, J. L. 2004. Effects of Wildlife Stand Improvements and Prescribed Burning on Bat and Insect Communities: Buffalo Ranger District, Ozark-St. Francis National Forest, Arkansas. M.S. Thesis. Arkansas State University. 162 pp.**

Thirty northern long-eared bats were tracked to 259 roosts; the maximum distance traveled within a summer home range was 1.7 miles.

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**Kiser, J.D. and C.L. Elliott. 1996. Foraging habitat, food habits, and roost tree characteristics of the Indiana bat (*Myotis sodalis*) during autumn in Johnson County, Kentucky. Final report, Kentucky Dept. of Fish and Wildl. Resources, Frankfort, Kentucky. 65 pp.**

In Kentucky, Kiser and Elliott found male Indiana bats roosting primarily in dead trees on upper slopes and ridgetops within 2.4 km of their hibernaculum. In the fall, male Indiana bats tend to roost and forage in upland and ridgetop forests, but may also forage in valley and riparian forest; movements of 2.5-6.8 km have been reported in Kentucky and Missouri.

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**Sasse, D.B., and P.J. Pekins. 1996. Summer roosting ecology of northern long-eared bats (*Myotis septentrionalis*) in the White Mountain National Forest. Pp. 91-101 in *Proceedings of the bats and forests symposium* (R.M.R. Barclay and R.M. Brigham, eds.). British Columbia Ministry of Forests, Victoria, British Columbia, Canada.**

In New Hampshire, the mean distance between foraging areas and roost trees was 602 m (0.37 miles) (p. 95). Canopy closure at roost trees was greater than 75 percent.

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**Stihler, C. West Virginia Division of Natural Resources, pers observ. October 1996. Reference excerpted from USFWS Indiana Bat Revised Recovery Plan, March 1999.**

During September in West Virginia, male Indiana bats roosted within 5.6km [of hibernacula] in trees near ridgetops, and often switched roost trees from day to day.

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**Timpone, J.C., J.G. Boyles, K.L. Murray, D.P. Aubrey, and L.W. Robbins. 2010. Overlap in roosting habits of Indiana bats (*Myotis sodalis*) and Northern bats (*Myotis septentrionalis*). *American Midland Naturalist*. 163: 115-123.**

In Missouri, 13 northern long-eared bats were tracked to 39 roosts, which were an average 1.7 km (1.1 mi) from the point of capture (range 0.07-4.8 km (0.04-3.0 mi)). The mean distance traveled between roost trees was 0.67 km (0.42 mi) (range 0.05-3.9 km [0.03-2.4 mi]). Canopy coverage at roosts averaged 56 percent.

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**US Fish and Wildlife Service. 2014. Northern long-eared bat interim conference and planning guidance, USFWS Regions 2, 3, 4, 5, & 6. 67 pp.**

N/A

**Last researched by:** Hall

**Date researched:** 6/12/2015

## ***Osteichthyes***

### ***Atlantic Sturgeon***

#### ***Acipenser oxyrinchus***

SpCFLID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
6433	N/A	Nursery Area - Young-of-year Sighting	5 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
6434	N/A	Migration Corridor - Adult Sighting	30 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
6435	N/A	Summering Area - Adult Sighting	30 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
6436	N/A	Spawning Area - Adult Sighting	30 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
6437	N/A	Migration Corridor - Juvenile Sighting	10 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
6438	N/A	Nursery Area - Larvae Sighting	5 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
6440	N/A	Spawning Area - Egg Sighting	71.25 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
6441	N/A	Summering Area - Juvenile Sighting	10 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes

#### **Justification:**

Little is known about the movement patterns of Atlantic sturgeon in the Delaware River estuary and along the coast. The Atlantic sturgeon is an anadromous fish species, migrating from open ocean to fresh or brackish water to spawn. Young may spend up to four years in their natal river before migrating to sea. Recent sonic tagging studies suggest that a reproducing population still exists in the Delaware River, with spawning occurring much farther upriver than during the height of late 1800's fishery. Though an exact spawning area has not been determined, at least one Atlantic sturgeon was tracked migrating in the Bordentown area during the spawning season. Following presumed spawning, tracking data indicate that the lower, poly-mesohaline portions of Delaware Bay serve as habitat for adults. In addition, the lower Delaware River is thought to serve as an important summer feeding ground for immature sturgeon.

Coastal movement of Atlantic sturgeon remains unclear. According to Fox et al. (2009), the higher salinity regions at the mouth of the Delaware Estuary serve as critical habitat for Atlantic sturgeon from multiple river systems. Despite mixing in coastal waters, tagging records indicate that Atlantic sturgeon return to their natal rivers to spawn. Sturgeon tagged in the lower Delaware River have been recaptured in coastal waters from North Carolina to Maine. Since data are limited, the SOA for coastal/ocean adults is an extremely conservative estimate of habitat usage and how far Atlantic sturgeon are capable of migrating. For example, ocean migrations of up to 1,450 kilometers have been recorded, though it would impractical to apply such a distance here. Since the Atlantic sturgeon is a newly listed species (Federal and State Endangered as of April 6, 2012), and information in Biotics is lacking, SOA's will be refined as location and movement data are acquired. The SOA distances for early life stages and juvenile/adult movement within the river system are based upon SOA distances chosen for shortnose sturgeon.

## Literature:

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**Atlantic Sturgeon Status Review Team. 2007. Status Review of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). Report to National Marine Fisheries Service, Northeast Regional Office. February 23, 2007.**

Delaware River movement, spawning area.

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**Bain, M.B. 1997. Atlantic and shortnose sturgeons in the Hudson River: common and divergent life history attributes. Environmental Biology of Fishes 48:347-358.**

N/A

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**Delaware Division of Fish and Wildlife. 2009. Delaware River Atlantic Sturgeon Research Fact Sheet, DNREC website.**

N/A

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**Dovel and Berggren 1983. Atlantic sturgeon of the Hudson estuary, New York, New York. Fish and Game Journal 30:140-172.**

Migration distance.

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**Fisher, M.T., Jacobini, J. and C.A. Shirey. A telemetry study of late stage juvenile Atlantic sturgeon, *Acipenser oxyrinchus*: seasonal movements and habitat use in the Delaware estuary in 2007 and 2008 with comparisons to a similar telemetry study in 1997 and 1998 (Abstract only). Presented at 1st Symposium on Atlantic Sturgeon, Seaboard Fisheries Institute, Feb. 23-25, 2009, Newark, DE.**

General movement.

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**Fox, D., Brown. L.B., and P.C. Simpson. Life after the party: Atlantic sturgeon in the Delaware River (Abstract only). Presented at 1st Symposium on Atlantic Sturgeon, Seaboard Fisheries Institute, Feb. 23-25, 2009, Newark, DE.**

General movement.

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**Gilbert, C.R. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (mid-Atlantic bight) - Atlantic and shortnose sturgeons. U.S. Fish Wildl. Serv. Biol. Rep. 82(11.122). U.S. Army Corps of Engineers TR EL-82-4. 28 pp.**

Eggs demersal adhesive, nothing known about larvae.

**Last researched by:** Bowers-Altman

**Date researched:** 6/11/2012

## ***Osteichthyes***

### ***Shortnose Sturgeon***

#### ***Acipenser brevirostrum***

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4931 Freshwater	Summering Area - Juvenile Sighting	10 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
4932 Freshwater	Overwintering Area - Juvenile Sighting	10 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
4933 Freshwater	Migration Corridor - Juvenile Sighting	10 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
4934 Freshwater	Nursery Area - Young-of-year Sighting	5 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
4935 Freshwater	Migration Corridor - Adult Sighting	30 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
4936 Freshwater	Spawning Area - Adult Sighting	30 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
4937 Freshwater	Summering Area - Adult Sighting	30 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
4938 Freshwater	Nursery Area - Larvae Sighting	5 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
4939 Freshwater	Spawning Area - Egg Sighting	300 Meter Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes
4940 Freshwater	Overwintering Area - Adult Sighting	10 km Buffer	Apply a buffer	Apply a buffer	Apply a buffer	Yes

#### **Justification:**

Within the Delaware River, shortnose sturgeon have a complex life cycle wherein they may, depending on life stage, migrate between overwintering areas within the upper tidal portion of the river near Trenton, spawning areas upstream within the nontidal portion, and additional areas for foraging and migration as far south as Philadelphia and northern reaches of the Delaware Bay. Shortnose sturgeon have limited movements and a restricted home range within their river and estuary (Kynard 1997), thus only the Delaware River, Hudson River and Delaware Bay proper and no tributaries, are to be included within the species occurrence area.

#### **Literature:**

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**Kynard, Boyd. 1997. Life history, latitudinal patterns, and status of the shortnose sturgeon, *Acipenser brevirostrum*. *Environmental Biology of Fishes*. 48: 319-334.**

Young-of-year are non-migratory for about 1 year (residency period within the nursery area). Juveniles show similar spatio-temporal patterns of habitat use as adults (similarity of home ranges). Spawning adults typically travel 200 km or more upstream.

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**O'Herron, J.C., K.W. Able, and R.W. Hastings. 1993. Movements of shortnose sturgeon (*Acipenser brevirostrum*) in the Delaware River. *Estuaries*. 16 (2): 235-240.**

Typical overwintering movements were localized between 0.6 - 9.6 km (mean = 4.6 km).  
Spawning to post-spawning movement = 10 - 30 km.

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**Seibel, D. 1993. Habitat selection, movements, and response to illumination of shortnose sturgeon in the Connecticut River. Masters Thesis, University of Massachusetts, Amherst, Massachusetts.**

**As cited within: National Marine Fisheries Service. 1998. Recovery Plan for the Shortnose Sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 104 pages. p. 28.**

In the Connecticut River, adult and juvenile summer home ranges are about 10 km. Winter range is usually less than 2 km.

**Last researched by:** Davenport

**Date researched:** 2/1/2007

## Reptilia

### Atlantic Green Turtle

#### *Chelonia mydas*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7718	Undetermined	Marine Telemetry: Partial Activity Range	9.6 km Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes
7719	Undetermined	Dead Individual Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
7721	Undetermined	Occupied Habitat	9.6 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
8492	Undetermined	Nesting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

The Atlantic green, Atlantic loggerhead, and Atlantic ridley sea turtles both forage and migrate through NJ waters. While movement specific to migration is largely confined off-shore, foraging may occur both off-shore and within the neritic zone. The bulk of the scientific literature which pertains to determining a home range size, is based upon lower latitude habitats, relatively young individuals, and is predominantly focused on the Atlantic green turtle. Using the mean of the home range estimates from the studies detailed below and creating an average based upon those figures, produces a 9.6 km radius as the basis for a species occurrence area for these three species.

#### Literature:

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**Blumenthal, J.M., J.L. Soloman, C.D. Bell, T.J. Austin, G. Ebanks-Petrie, M.S. Coyne, A.C. Broderick, and B.J. Godley. 2006. Satellite tracking highlights the need for international cooperation in marine turtle management. *Endangered Species Research*. 7: 1-11.**

Migrations of mature marine turtles typically span hundreds or thousands of kilometers.

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**Godley, B.J., E.H.S.M. Lima, S. Akesson, A.C. Broderick, F. Glen, M.H. Godfrey, P. Luschi, and G.C. Hays. 2003. Movement patterns of green turtles in Brazilian coastal waters described by satellite tracking and flipper tagging. *Marine Ecology Progress Series*. 253: 279-288.**

The home range for some turtles feeding on macroalgae may encompass an area which spans 90 km of coastline.

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**Kinzel, M.R. Green Sea Turtle Migration in the Gulf of Mexico. In: *Marine Geography - GIS for the Oceans and Seas*. Breman, J. (Editor). ESRI Press.2002.**

Home range for one individual was 2,745.63 sq km, while another was reported as being 336.317 sq km.

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**Makowski, C., J.A. Seminoff, and M. Salmon. 2006. Home range and habitat use of juvenile Atlantic green turtles (*Chelonia mydas*) on shallow reef habitats in Palm Beach, Florida, USA. *Marine Biology*. 148: 1167-1179.**

Home range areas measured with 100% minimum convex polygon and 95% fixed kernel estimators varied from 0.69 to 5.05 sq km (mean = 2.38 sq km) and 0.73 to 4.89 sq km (mean = 2.09 sq km), respectively. Averaging the mean results of both methods produces a home range size of 2.24 sq km.

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**Mendonca, M.T. 1983. Movements and feeding ecology of immature green turtles (*Chelonia mydas*) in a Florida lagoon. *Copeia*. 1013-1023.**

Average home range = 2.88 sq km.

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**Renaud, M.L., J.A. Carpenter. 1994. Movements and submergence patterns of loggerhead turtles (*Caretta caretta*) in the Gulf of Mexico determined through satellite telemetry. *Bulletin of Marine Science*. 55: 1-15.**

Average home range = 0.77 sq km.

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**Schmid, J.R. A.B. Bolten, K.A. Bjorndal, W.J. Lindberg, H.F. Percival, and P.D. Zwick. 2003. Home range and habitat use by Kemp's ridley turtles in west-central Florida. *Journal of Wildlife Management*. 67: 196-206.**

Radio and sonic telemetry were utilized on subadult Kemp's ridley turtles to investigate home-range size and habitat use in the coastal waters of west-central Florida from 1994 to 1996. Nine turtles were tracked for up to 70 days after release and were found to occupy 5-30 sq km foraging ranges.

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**Seminoff, J.A., A. Resendiz, W.J. Nichols. 2002. Home range of green turtles, *Chelonia mydas*, at a coastal foraging area in the Gulf of California, Mexico. *Marine Ecology progress Series*. 242: 253-265.**

Average home range = 16.62 sq km.

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**Whiting, S.D. and J.D. Miller. 1998. Short term foraging ranges of adult green turtles (*Chelonia mydas*). *Journal of Herpetology*. 32(3): 330-337.**

Adult green turtles may forage over larger areas than juveniles.

Mean foraging range = 315 ha (range = 84 - 850 ha).

Mean distance traveled per day = 3.0 km (range = 0.9 - 4.9 km).

**Last researched by:** Davenport

**Date researched:** 1/1/2007



## Reptilia

### Atlantic Leatherback

#### *Dermochelys coriacea*

SpC/LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7714 Undetermined	Dead Individual Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
7715 Undetermined	Marine Telemetry: Partial Activity Range	25 km Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes
7717 Undetermined	Occupied Habitat	25 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Leatherback turtles have the largest range of any living reptile and have been documented to travel thousands of miles within a given year (Eckert 2006). Although no nesting behavior, nor any other terrestrial activity, occurs within NJ, Atlantic leatherbacks both forage in and migrate through NJ off-shore and coastal waters. Due to the great distance which they are capable of traveling within relatively short spans of time, formulating a Species Occurrence Area (SOA) based upon a home range is difficult for a species whose home range includes an entire ocean basin. However, in order to provide a basis by which this species may best be represented within the current SOA framework, the documented average daily distance traveled will be used to determine the SOA radius. Due to the paucity of data regarding movements of leatherback turtles in the northwest Atlantic, an extremely conservative SOA radius of 25 km was chosen, based upon the lower end of the range of distance covered per day, based upon Eckert (2006).

#### Literature:

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**Blumenthal, J.M., J.L. Soloman, C.D. Bell, T.J. Austin, G. Ebanks-Petrie, M.S. Coyne, A.C. Broderick, and B.J. Godley. 2006. Satellite tracking highlights the need for international cooperation in marine turtle management. *Endangered Species Research*. 7: 1-11.**

Migrations of mature marine turtles typically span hundreds or thousands of kilometers.

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**Eckert, S.A. 2006. High-use oceanic areas for Atlantic leatherback sea turtles (*Dermochelys coriacea*) as identified using satellite telemetered location and dive information. *Marine Biology*. 149: 1257-1267.**

Nine adult females were tagged with satellite transmitters while they nested on the Caribbean Island of Trinidad. Study animals ranged as far as the Flemish Cap, the Bay of Biscay, and off the coast of northwestern Africa. Dividing each study animal's minimum distance traveled by the number of days in which it was tracked, produces a range of 23.69-43.08 km traveled per day and a mean of 34.75 km/day.

**Last researched by:** Davenport

**Date researched:** 1/1/2007

## Reptilia

### Atlantic Loggerhead

#### *Caretta caretta*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7706	Undetermined	Dead Individual Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
7707	Undetermined	Marine Telemetry: Partial Activity Range	9.6 km Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes
7708	Undetermined	Nesting Area	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
7709	Undetermined	Occupied Habitat	9.6 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The Atlantic green, Atlantic loggerhead, and Atlantic ridley sea turtles both forage and migrate through NJ waters. While movement specific to migration is largely confined off-shore, foraging may occur both off-shore and within the neritic zone. The bulk of the scientific literature which pertains to determining a home range size, is based upon lower latitude habitats, relatively young individuals, and is predominantly focused on the Atlantic green turtle. Using the mean of the home range estimates from the studies detailed below and creating an average based upon those figures, produces a 9.6 km radius as the basis for a species occurrence area for these three species.

#### Literature:

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**Blumenthal, J.M., J.L. Soloman, C.D. Bell, T.J. Austin, G. Ebanks-Petrie, M.S. Coyne, A.C. Broderick, and B.J. Godley. 2006. Satellite tracking highlights the need for international cooperation in marine turtle management. *Endangered Species Research*. 7: 1-11.**

Migrations of mature marine turtles typically span hundreds or thousands of kilometers.

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**Godley, B.J., E.H.S.M. Lima, S. Akesson, A.C. Broderick, F. Glen, M.H. Godfrey, P. Luschi, and G.C. Hays. 2003. Movement patterns of green turtles in Brazilian coastal waters described by satellite tracking and flipper tagging. *Marine Ecology Progress Series*. 253: 279-288.**

The home range for some turtles feeding on macroalgae may encompass an area which spans 90 km of coastline.

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**Kinzel, M.R. Green Sea Turtle Migration in the Gulf of Mexico. In: *Marine Geography - GIS for the Oceans and Seas*. Breman, J. (Editor). ESRI Press.2002.**

Home range for one individual was 2,745.63 sq km, while another was reported as being 336.317 sq km.

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**Makowski, C., J.A. Seminoff, and M. Salmon. 2006. Home range and habitat use of juvenile Atlantic green turtles (*Chelonia mydas*) on shallow reef habitats in Palm Beach, Florida, USA. *Marine Biology*. 148: 1167-1179.**

Home range areas measured with 100% minimum convex polygon and 95% fixed kernel estimators varied from 0.69 to 5.05 sq km (mean = 2.38 sq km) and 0.73 to 4.89 sq km (mean = 2.09 sq km), respectively. Averaging the mean results of both methods produces a home range size of 2.24 sq km.

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**Mendonca, M.T. 1983. Movements and feeding ecology of immature green turtles (*Chelonia mydas*) in a Florida lagoon. *Copeia*. 1013-1023.**

Average home range = 2.88 sq km.

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**Renaud, M.L., J.A. Carpenter. 1994. Movements and submergence patterns of loggerhead turtles (*Caretta caretta*) in the Gulf of Mexico determined through satellite telemetry. *Bulletin of Marine Science*. 55: 1-15.**

Average home range = 0.77 sq km.

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**Schmid, J.R. A.B. Bolten, K.A. Bjorndal, W.J. Lindberg, H.F. Percival, and P.D. Zwick. 2003. Home range and habitat use by Kemp's ridley turtles in west-central Florida. *Journal of Wildlife Management*. 67: 196-206.**

Radio and sonic telemetry were utilized on subadult Kemp's ridley turtles to investigate home-range size and habitat use in the coastal waters of west-central Florida from 1994 to 1996. Nine turtles were tracked for up to 70 days after release and were found to occupy 5-30 sq km foraging ranges.

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**Seminoff, J.A., A. Resendiz, W.J. Nichols. 2002. Home range of green turtles, *Chelonia mydas*, at a coastal foraging area in the Gulf of California, Mexico. *Marine Ecology progress Series*. 242: 253-265.**

Average home range = 16.62 sq km.

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**Whiting, S.D. and J.D. Miller. 1998. Short term foraging ranges of adult green turtles (*Chelonia mydas*). *Journal of Herpetology*. 32(3): 330-337.**

Adult green turtles may forage over larger areas than juveniles.

Mean foraging range = 315 ha (range = 84 - 850 ha).

Mean distance traveled per day = 3.0 km (range = 0.9 - 4.9 km).

**Last researched by:** Davenport

**Date researched:** 1/1/2007

## Reptilia

### Atlantic Ridley

#### *Lepidochelys kempii*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
7710	Undetermined	Dead Individual Sighting	71.25 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No
7711	Undetermined	Marine Telemetry: Partial Activity Range	9.6 km Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes
7713	Undetermined	Occupied Habitat	9.6 km Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The Atlantic green, Atlantic loggerhead, and Atlantic ridley sea turtles both forage and migrate through NJ waters. While movement specific to migration is largely confined off-shore, foraging may occur both off-shore and within the neritic zone. The bulk of the scientific literature which pertains to determining a home range size, is based upon lower latitude habitats, relatively young individuals, and is predominantly focused on the Atlantic green turtle. Using the mean of the home range estimates from the studies detailed below and creating an average based upon those figures, produces a 9.6 km radius as the basis for a species occurrence area for these three species.

#### Literature:

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**Blumenthal, J.M., J.L. Soloman, C.D. Bell, T.J. Austin, G. Ebanks-Petrie, M.S. Coyne, A.C. Broderick, and B.J. Godley. 2006. Satellite tracking highlights the need for international cooperation in marine turtle management. *Endangered Species Research*. 7: 1-11.**

Migrations of mature marine turtles typically span hundreds or thousands of kilometers.

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**Godley, B.J., E.H.S.M. Lima, S. Akesson, A.C. Broderick, F. Glen, M.H. Godfrey, P. Luschi, and G.C. Hays. 2003. Movement patterns of green turtles in Brazilian coastal waters described by satellite tracking and flipper tagging. *Marine Ecology Progress Series*. 253: 279-288.**

The home range for some turtles feeding on macroalgae may encompass an area which spans 90 km of coastline.

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**Kinzel, M.R. Green Sea Turtle Migration in the Gulf of Mexico. In: *Marine Geography - GIS for the Oceans and Seas*. Breman, J. (Editor). ESRI Press.2002.**

Home range for one individual was 2,745.63 sq km, while another was reported as being 336.317 sq km.

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**Makowski, C., J.A. Seminoff, and M. Salmon. 2006. Home range and habitat use of juvenile Atlantic green turtles (*Chelonia mydas*) on shallow reef habitats in Palm Beach, Florida, USA. *Marine Biology*. 148: 1167-1179.**

Home range areas measured with 100% minimum convex polygon and 95% fixed kernel estimators varied from 0.69 to 5.05 sq km (mean = 2.38 sq km) and 0.73 to 4.89 sq km (mean = 2.09 sq km), respectively. Averaging the mean results of both methods produces a home range size of 2.24 sq km.

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**Mendonca, M.T. 1983. Movements and feeding ecology of immature green turtles (*Chelonia mydas*) in a Florida lagoon. *Copeia*. 1013-1023.**

Average home range = 2.88 sq km.

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**Renaud, M.L., J.A. Carpenter. 1994. Movements and submergence patterns of loggerhead turtles (*Caretta caretta*) in the Gulf of Mexico determined through satellite telemetry. *Bulletin of Marine Science*. 55: 1-15.**

Average home range = 0.77 sq km.

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**Schmid, J.R. A.B. Bolten, K.A. Bjorndal, W.J. Lindberg, H.F. Percival, and P.D. Zwick. 2003. Home range and habitat use by Kemp's ridley turtles in west-central Florida. *Journal of Wildlife Management*. 67: 196-206.**

Radio and sonic telemetry were utilized on subadult Kemp's ridley turtles to investigate home-range size and habitat use in the coastal waters of west-central Florida from 1994 to 1996. Nine turtles were tracked for up to 70 days after release and were found to occupy 5-30 sq km foraging ranges.

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**Seminoff, J.A., A. Resendiz, W.J. Nichols. 2002. Home range of green turtles, *Chelonia mydas*, at a coastal foraging area in the Gulf of California, Mexico. *Marine Ecology progress Series*. 242: 253-265.**

Average home range = 16.62 sq km.

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**Whiting, S.D. and J.D. Miller. 1998. Short term foraging ranges of adult green turtles (*Chelonia mydas*). *Journal of Herpetology*. 32(3): 330-337.**

Adult green turtles may forage over larger areas than juveniles.

Mean foraging range = 315 ha (range = 84 - 850 ha).

Mean distance traveled per day = 3.0 km (range = 0.9 - 4.9 km).

**Last researched by:** Davenport

**Date researched:** 1/1/2007

## Reptilia

### Bog Turtle

#### *Glyptemys muhlenbergii*

SpC/LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4762 N/A	Hibernaculum	200 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4763 N/A	Occupied Habitat	Bog Turtle Model + Hand Digitized Polygon	Apply a buffer	Convert to a point and buffer	Apply a buffer	Yes
4764 N/A	On Road	200 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4765 N/A	Suitable Habitat	200 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	No

#### Justification:

*Glyptemys muhlenbergii* is a habitat specialist that occupies wetlands that meet certain characteristics of vegetation, soils, and, most importantly, hydrology. The life history of *G. muhlenbergii* is somewhat unique in that it spends the majority of the year within the wetland complex and often does not venture for great periods of time into the adjacent uplands and therefore the identification of wetlands occupied by the bog turtle is critical to the recovery of this species. A percentage of wetlands with bog turtles are of a small enough size that they are not currently identified as Wetlands in the 2007 Land Use/Land Cover data layer so therefore polygons are hand digitized to reduce the chance of not capturing core habitat.

An additional 200 meters is generated around the Bog Turtle Colony polygons to account for turtle movements not identified during fieldwork as well as habitat that is valuable to the colony, but was not identified by the biologists. This new polygon is the Species Occurrence Area (SOA).

#### Literature:

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**Chase et al. 1989. Habitat Characteristics, Population Size, and Home Range of the Bog Turtle, *Clemmys muhlenbergii*, in Maryland. *Journal of Herpetology* 23(4): 356-362.**

Discusses bog turtle habitat use as mostly isolated to specific wetland types.

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**Morrow et al. 2001. Home Range and Movements of the Bog Turtle in Maryland. *Journal of Herpetology* 35(1): 68-73.**

Discusses use of wetlands as primary habitat for bog turtles throughout duration of study.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

Inferred minimum extent of habitat use for this species is 200 meters.

**Last researched by:** Zarate

**Date researched:** 1/1/2006

## Reptilia

### Corn Snake

#### *Elaphe guttata guttata*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4883	N/A	Occurrence by Den	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4884	N/A	Telemetry: Partial Activity Range	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4885	N/A	Occupied Habitat	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4886	N/A	Nesting Area	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4887	N/A	On Road	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4888	N/A	Telemetry: Home Range	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4889	N/A	Gestation Site	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4890	N/A	Hibernaculum	250 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

All grasslands, and forests within 250 m of a documented corn snake sighting are considered to be critical habitat for this species. Dead-on-road sightings are still used to value corn snake habitat despite the fact that the observed and reported individual is no longer living. The explanation for this is based on the fact that habitat for this species still remains within 250 meters of the DOR snake. Furthermore, even though the individual that was killed along the road is no longer alive to make use of this habitat, it is assumed that other snakes of this species live in the area and will make use of the habitat.

Corn snakes prefer upland habitats with sandy soils and pine-dominated forests (Beans and Niles 2003). Corn snakes are a fossorial species and activity range estimates for this species in the New Jersey pinelands range from 11.3 - 24.8 acres (Zappalorti et al. 1983; Zappalorti and Rocco 1990). For the purposes of creating a reasonable buffer that could be applied to corn snake sightings and to approximate habitat needs for this species, these activity range estimates were converted into estimates of square footage and assumed to be circular in configuration. Buffer distances (radii of the circular activity ranges) were then calculated and ranged from 396 to 587 feet (120 - 179 m). However, because activity ranges for this species are often oblong (Zappalorti, RT and R Gianluca) rather than circular, a buffer distance of 250 m is applied to all corn



snake sightings in order to capture the entire activity range for this species.

## **Literature:**

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**Beans, BE and L Niles. 2003. Endangered and Threatened Wildlife of New Jersey. New Brunswick, NJ: Rutger's University Press.**

N/A

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**New Jersey. Unpublished report to NJDEP, Division of Fish and Wildlife by Herpetological Associates.**

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**Zappalorti O Heck. 1988. A captive breeding program of the corn snake (*Elaphe guttata*) with notes on a sampling program of released hatchlings in the New Jersey Pine Barrens. In. Proceedings of the 12th International Herpetological Symposium on Captive Propagation and Husbandry.**

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**Zappalorti, RT and R Gianluca. 1990. Endangered and threatened snake studies and habitat evaluations of the route of the proposed mule road extension, Berkely Township, Ocean County, New Jersey.**

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**Zappalorti, RT. 1993. Life history, ecology and management of the northern pine snake (*Pituophis melanoleucus melanoleucus*). Unpublished report to NJDEP, Division of Fish and Wildlife by Herpetological Associates.**

**Last researched by:** Golden

**Date researched:** 1/1/2007

## Reptilia

### Eastern Box Turtle

#### *Terrapene carolina carolina*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5094	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5095	N/A	Vernal Pool Non-breeding	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5096	N/A	Hibernaculum	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5097	N/A	Nesting Area	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5098	N/A	On Road	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The eastern box turtle, *Terrapene carolina*, is the most terrestrial of New Jersey's turtles. Although the box turtle's home range is usually no greater than 15 hectares, individuals routinely move between populations, especially juveniles. When displaced from their home range, *T. carolina* is known to have some homing ability outwards to 1.5 kilometers and individuals placed outside of this distance will take up occupancy at the release point with mixed success.

As a special concern species, much of the state data collected on *T. carolina* is in the form of Herp Atlas reports which are mapped on 1/6 USGS Quadrangles

#### Literature:

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**Dodd, C. K., Jr. 2001. North American box turtles: a natural history. University of Oklahoma Press, Norman. 231 pp.**

Comprehensive text on box turtle life history.

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**Dolbeer, R. A. 1969. Population density and home range size of the eastern box turtle (*Terrapene c. carolina*) in eastern Tennessee. ASB Bulletin 16:49.**

Provides home range estimates for a population of box turtles and general habitat requirements.

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**Ernst, C. H., R. W. Barbour, and J. E. Lovich. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, D.C. xxxviii + 578 pp.**

Literature-based life history of the box turtle.

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**NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.**

Inferred minimum extent of habitat use for this species is 500 meters.

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**Stickel, L. F. 1989. Home range behavior among box turtles (TERRAPENE C. CAROLINA) of a bottomland forest in Maryland. J. Herpetol. 23:40-44.**

Describes habitat use by box turtles and home range sizes. Movements to nesting areas, which are critical to the viability of a population are often not calculated in an individual's home range.

**Last researched by:** Zarate

**Date researched:** 1/1/2006

## Reptilia

### Eastern Kingsnake

#### *Lampropeltis getula getula*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5104	N/A	Telemetry: Partial Activity Range	Need Update	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5105	N/A	Hibernaculum	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5106	N/A	Telemetry: Home Range	Need Update	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5107	N/A	On Road	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5108	N/A	Occupied Habitat	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5109	N/A	Gestation Site	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5110	N/A	Occurrence by Den	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5111	N/A	Nesting Area	300 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Currently under review.

#### Literature:

N/A

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2007

## Reptilia

### Northern Copperhead Snake

#### *Agkistrodon contortrix mokasen*

SpcF LUC LID	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5112 N/A	On Road	716 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5113 N/A	Gestation Site	995 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5114 N/A	Telemetry: Home Range	716 Meter Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes
5115 N/A	Occurrence by Den	995 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5117 N/A	Occupied Habitat	716 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5118 N/A	Hibernaculum	995 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5119 N/A	Telemetry: Partial Activity Range	716 Meter Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes

#### Justification:

Literature documenting the home range size of northern copperheads (*Agkistrodon contortrix mokasen*) is scant as most literature focuses on habitat types used by this species rather than dispersal distances and home range. One article by Fitch, 1960, documents the home range of *Agkistrodon contortrix* at 9.9 ha (.099 square km), but the difference in habitat types between the study location and NJ is unclear. Additionally, the research predates the use of radio-telemetry in snake research and therefore, it is possible the observations documented by Fitch, 1960, represent dens and nearby basking/transient areas rather than foraging grounds. More recently, Smith et al. (2009) reported the activity range of male copperheads in Connecticut ranging from 6.09 to 44.49 ha with a mean of 17.49 plus or minus 2.68 ha, although a 1000 ac (~ 404 ha) study site containing two hibernacula was used almost in its entirety by the local copperhead populations (Charles F. Smith, pers. comm., 2009) and these figures may include sub-adult males with smaller dispersal distances. Additionally, the furthest distance a male moved from the hibernacula was 769.5 plus or minus 73.6 m. Philip Dunning (2009, unpub. data) found males in Pennsylvania 965.5 to 1,223 m from the hibernacula, although these were not necessarily the furthest distances moved as these snakes were not tracked through an entire active season. Similarities between the northern copperhead and the timber rattlesnake behavior including males typically traveling greater distances than nongravid females, the importance of gestation areas, basking sites and hibernacula due to the snakes' affinity to these locations, and the need to provide a natural buffer to the identified occupied habitat to minimize the effects of "edge" habitat (i.e., light pollution, noise pollution, increased scavenger population) and permit larger males (and possibly nongravid females) to disperse further in search of mates, foraging opportunities and basking sites warrant a similar approach to identifying critical habitat for northern copperheads. There is currently no published literature recommending the total hibernacula buffer required to adequately protect critical habitat for northern

copperhead populations. As such, the ENSP has determined that a 995m radius buffer around dens is required to do so. Using the larger annual home range data of eight adult males tracked by Smith in 2002 and 2003 to develop potential dispersal distances and the known dispersal distances of three males and one subadult male tracked by Dunning in 2006 and 2009, the average dispersal distance was 822.67m. The kernel home range excludes outliers and therefore in an effort to capture 95% of each den's population, we have added two standard errors (172m).

"Occurrence by Den" is related to early transient/basking areas, which also may be used as gestation sites. These areas are critical sites near dens (thus the same model applies) that are important to the snakes upon spring emergence and fall ingress. These areas provide both important early and late season basking sites before the snakes move onto their foraging grounds or shed sites and prior to denning. "Gestation Site" is often near the den but the average distance is unclear. These sites are critical to the survival of the northern copperhead populations and are used for many generations. Young snakes follow scent trails, left by adult females, back to the safety of their dens in the late fall. Due to the females' condition and newborns' inexperience, they are highly vulnerable to predation at these sites. Therefore, the same model has been applied to known gestation sites in an effort to: 1) protect the site and travel corridors to/ from the den and 2) to capture the den with the model.

"Occupied Habitat" and "On Road" refers to random sightings of northern copperheads whereby it is impossible to determine the snake's den location or critical habitat range. NJ has used all of the home range data reported by Smith (2007) including two field seasons of data on five adult males and one field season of data on three adult males having a mean home range equivalent to 656 meter (.66 km) radius buffer (topography not considered). The kernel home range excludes outliers and therefore in an effort to capture 82% of the population potentially using the habitat, we have added 1.5 standard errors (60 m); providing a 716 meter radius buffer around all random observations and telemetry study locations.

"Telemetry Home Range" and "Telemetry Partial Activity Range" refers to observation locations collected through radio-telemetry studies; "home range" referring to snakes whereby a full season of data was collected, "partial activity range" referring to snakes whereby only part of the snake's active season was recorded. These locations will be entered as a continuous line of movement that will be given the same buffer as randomly observed points in an effort to capture the home range territory of the snakes. The snakes' home range shift annually, but always retains a core. By buffering the line of activity, the ENSP is attempting to capture all of the habitat used by an individual snake and allow for directional shifting of snakes tracked through radio-telemetry,

## Literature:

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### **Dunning, Philip. 2006 and 2009 (unpublished data).**

Maximum single migratory distance from den\*: Pennsylvania male, 1,226 m (1.23 km);

Pennsylvania nongravid female\*\*, 869 m (3.7 km)

Recorded single migratory distance from den\*: adult male, 1,223.1 m (1.221 km); adult male, 1,226.5 m (1.227 km); adult male, 965.6 m (0.966 km); sub-adult male\*\*\*, 1,158.7 m (1.159 km)

\*Note: These snakes were not followed through a complete active season and therefore, their migratory distances from the den(s) may not represent the snakes' furthest distance traveled.

\*\*Only one nongravid female's distance was reported.

\*\*\*Suspected sub-adult male due to size, but range is indicative of a mature male.

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**Fitch H. S. 1960. Autecology of the copperhead. Univ. of Kansas Publications Museum of Natural History. 13:85-288 In: Roth, Eric. 2005 Spatial Ecology of a Cottonmouth (Agkistrodon piscivorus) Population in East Texas. Journal of Herpetology. June 2005, 39 (2): 308-312.**

N/A

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**Smith, Charles F. 2007. Sexual dimorphism, and the spatial and reproductive ecology of the copperhead snake, *Agkistrodon contortrix*. Ph.D.; University of Connecticut. Pp. 201; AAT 3265803.**

The following are the home ranges (ha) using the Animal Movement Ext., Kernal Home Range (95%) per Smith (2007) of eight [suspected] adult males\* during their 2002 and 2003 active seasons: Snake 263: 34.93 ha (2002); 32.38 ha (2003). Snake 4GH: 11.16 ha (2003). Snake 96C: 35.51 ha (2002), 51.4 ha (2003). Snake KLC: 31.31 ha (2003). Snake 06A: 55.35 ha (2002), 68.99 ha (2003). Snake 104: 32.39 ha (2002), 25.5 ha (2003). Snake 71C: 2002: 28.36 ha. Snake 825: 31.39 ha(2002), 20.33 ha (2003).

\*Suspected adult males due to reported home range.

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**Smith, Charles F., Gordon W. Schuett, Ryan L. Earley, and Kurt Schwenk. 2009. The spatial and reproductive ecology of the copperhead (*Agkistrodon contortrix*) at the northeastern extreme of its range. In press: 2010, Herpetological Monographs.**

Mean size home ranges: Connecticut males\*, 17.49 plus or minus 2.68 ha; Connecticut nongravid females, 5.02 plus or minus 1.15 ha

Mean maximum migratory distance from den: Connecticut males\*, 769.5 plus or minus 73.6 m; Connecticut nongravid females, 363.1 plus or minus 63.8 m

\*Note: These figures may include sub-adult male snakes with smaller home ranges and dispersal distances.

**Last researched by:** Schantz

**Date researched:** 3/30/2010

## Reptilia

### Northern Pine Snake

#### *Pituophis melanoleucus melanoleucus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4899	N/A	Gestation Site	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4900	N/A	Telemetry: Home Range	500 Meter Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes
4901	N/A	Hibernaculum	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4902	N/A	On Road	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4903	N/A	Nesting Area	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4904	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4905	N/A	Telemetry: Partial Activity Range	500 Meter Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes
4906	N/A	Occurrence by Den	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

All grasslands, and forests within 500 m of a documented northern pine snake sighting are considered to be critical habitat for this species. Dead-on-road sightings are still used to value pine snake habitat despite the fact that the observed and reported individual is no longer living. The explanation for this is based on the fact that habitat for this species still remains within 500 meters of the DOR snake. Furthermore, even though the individual that was killed along the road is no longer alive to make use of this habitat, it is assumed that other snakes of this species live in the area and will make use of the habitat.

This species is typically associated with dry upland habitats and can make long distance movements through both upland (Burger and Zappalorti 1988; Zappalorti 1993) and, in some cases, extensive wetland habitats (Bien, personal communication). While home range estimates vary extensively from study to study, one radio-telemetry study of this species conducted in the New Jersey Pinelands found that pine snakes had an activity range of 5.9 to 116 acres (Zappalorti et al. 1983). For the purposes of creating a reasonable buffer that could be applied to pine snake sightings to approximate habitat needs, these activity range estimates were converted into estimates of square footage (area calculation) and assumed to be circular in configuration. Buffer distances (radii of the circular activity ranges) were then calculated and ranged from 286 to 1268 feet (87-386 m). However, because activity ranges for this species are typically oblong (Zappalorti and Rocco 1990) rather than circular a buffer distance of 500 m is applied to all pine snake sightings in order to capture



the entire activity range for this species.

## Literature:

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**Burger, J and RT Zappalorti. 1988. Habitat use in free-ranging pine snakes (*Pituophis melanoleucus melanoleucus*) in the New Jersey Pine Barrens. *Herpetologica* 44(1): 48-55.**

N/A

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**New Jersey. Unpublished report to NJDEP, Division of Fish and Wildlife by Herpetological Associates.**

N/A

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**Zappalorti, RT and R Gianluca. 1990. Endangered and threatened snake studies and habitat evaluations of the route of the proposed mule road extension, Berkely Township, Ocean County, New Jersey.**

N/A

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**Zappalorti, RT, EW Johnson, and Z Leszczynski. 1983. The ecology of the northern pine snake (*Pituophis melanoleucus melanoleucus*) in southern New Jersey, with special notes on habitat and nesting behavior. *Bulletin, Chicago Herpetological Society* 18:57-72.**

N/A

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**Zappalorti, RT. 1993. Life history, ecology and management of the northern pine snake (*Pituophis melanoleucus melanoleucus*). Unpublished report to NJDEP, Division of Fish and Wildlife by Herpetological Associates.**

N/A

**Last researched by:** Golden

**Date researched:** 1/1/2007

## Reptilia

### Spotted Turtle

#### *Clemmys guttata*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
5089	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5090	N/A	Hibernaculum	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5091	N/A	Nesting Area	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5092	N/A	On Road	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
5093	N/A	Vernal Pool	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

The spotted turtle, *Clemmys guttata*, frequents a variety of wetland habitat types throughout its range, although terrestrial habitat use is documented. The type of wetland that the species uses may shift seasonally causing the animal to travel regularly across fields, through forests, or employ wetlands as a corridor between preferred habitats. In some cases, females will move large distances from wetlands to find suitable nesting areas.

#### Literature:

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NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life (web application). Version 4.7. NatureServe, Arlington, VA. Available at: <http://www.natureserve.org/explorer>.

Inferred minimum extent of habitat use for this species is 500 meters.

Last researched by: Zarate

Date researched: 1/1/2006

## Reptilia

### Timber Rattlesnake

#### *Crotalus horridus horridus*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4844	N/A	Telemetry: Home Range	1.0 Kilometer Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes
4845	N/A	Gestation Site	4.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4846	N/A	Occurrence by Den	4.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4847	N/A	Hibernaculum	4.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4849	N/A	Telemetry: Partial Activity Range	1.0 Kilometer Buffer	Apply a buffer	Apply a buffer	Stays as is	Yes
4850	N/A	On Road	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4851	N/A	Occupied Habitat	1.0 Kilometer Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

Timber rattlesnakes' home ranges vary according to sex and age class. Reproductively mature males typically travel greater distances than females and young males in search of mates and/or food resources. ENSP research has shown that sub-adult males often venture farther than non-gravid females, while juveniles and yearlings [males] may maintain a smaller activity range. Non-gravid females typically maintain a larger activity range than gravid females, and gravid females may venture out to forage early in the season, but return to their gestation site/ birthing rookery by early July which is typically within 500 meters (.3 miles) of her den. Rattlesnake researchers agree that the majority of a den's population will use the habitat within a 1.5 mile (2.4 km) radius of the den with some of the larger males venturing beyond this distance in search of mates. However, telemetry research has shown that males (and less typically, non-gravid females) will travel greater distances in search of food, basking areas, and mates (Brown 1993, Martin 1993, ENSP research 2006). Therefore, the ENSP has determined that a larger occurrence area (4 km radius around a den) is required to adequately protect critical habitat for timber rattlesnake populations.

"Occurrence by Den" is related to early transient/ basking areas, which also may be used as gestation sites. These are critical sites near dens (thus the same model applies) that are important to the snakes upon spring emergence. These areas provide both important early and late season basking sites before the snakes move onto their foraging grounds or shed sites and prior to denning. "Gestation Site" is often near the den but can be up to 500 meters (.3 miles) from the den. These sites are critical to the survival of timber rattlesnake populations in the northern region and are used for many generations. Young snakes follow scent trails, left

by adult females, back to the safety of their dens in the late fall. Due to the females' condition and newborns' inexperience, they are highly vulnerable to predation at these sites. Therefore, the same model has been applied to known gestation sites in an effort to: 1) protect the site and travel corridors to/ from the den, and; 2) to capture the den within the model.

"Occupied Habitat" and "On Road" refers to random sightings of rattlesnakes whereby it is impossible to determine the snake's den location or critical habitat range. ENSP's research has shown adult males to have a mean home range of 263 ha (651 ac); equivalent to .88 kilometer radius buffer (topography not considered). The kernel home range excludes outliers and therefore in an effort to capture these critical locations, we have added a 1.5 standard error (.12 km), capturing 82% of the population. As such, these sites have been given a 1 kilometer radius buffer in an effort to capture the snakes' approximate home range, valuing all suitable habitat intersected by this buffer as potential critical habitat.

"Telemetry Home Range" and "Telemetry Partial Activity Range" refers to observation locations collected through radio-telemetry studies; "home range" referring to snakes whereby a full season of data was collected, "partial activity range" referring to snakes whereby only part of the snake's active season was recorded. These locations will be entered as a continuous line of movement that will be given the same buffer as randomly observed points in an effort to capture the home range territory of the snakes. The snakes' home range shifts annually, but always retains a core. By buffering the line of activity, ENSP is attempting to capture all of the habitat used by an individual snake.

## Literature:

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**Brown, William S. 1993. Timber Rattlesnake: Habitat. In Biology, Status, and Management of the Timber Rattlesnake (Crotalus Horridus): A Guide for Conservation (Joseph T. Collins ed.). Museum of Natural History - Dyche Hall, The University of Kansas, Lawrence, Kansas. Pp. 10-15.**

Transient habitat is also used by females during their reproductive years for gestating and birthing.

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**Brown, William S. 1993. Timber Rattlesnake: Land Protection. In Biology, Status, and Management of the Timber Rattlesnake (Crotalus Horridus): A Guide for Conservation (Joseph T. Collins ed.). Museum of Natural History - Dyche Hall, The University of Kansas, Lawrence, Kansas. Pp. 39-40.**

-Home ranges average 160 - 500 ac (65 - 202 ha) for males; 40 - 100 ac (16 - 40 ha) for nongravid females.

-A 1.5 mile (2.4 km) radius centered around den would encompass most of the habitat used by snakes from that den. An additional buffer of 1 mile (for a total of 2.5 mile radius, 4.0 km radius) is recommended to protect large males and some nongravid females that venture further and to buffer the habitat used by the greater portion of the individual den population from human activity.

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**Brown, William S. 1993. Timber Rattlesnake: Ecology. In Biology, Status, and Management of the Timber Rattlesnake (Crotalus Horridus): A Guide for Conservation (Joseph T. Collins ed.). Museum of Natural History - Dyche Hall, The University of Kansas, Lawrence, Kansas. Pp. 15-24.**

Mean size home ranges:

-New Jersey males: 207 ha

-New Jersey nongravid females: 42 ha

-New Jersey gravid females: 22 ha

Mean maximum migratory distance from den:

-New Jersey males: 4.07 km (2.5 mi)

-New Jersey nongravid females: 2.05 km (1.3 mi)  
Maximum single migratory distance from den:  
-New Jersey males: 7.2 km (4.5 mi)  
-New Jersey nongravid females: 3.7 km (2.3 mi)

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**Martin, W.H. 1993. Reproduction of the Timber Rattlesnake (*Crotalus Horridus*) in the Appalachian Mountains. *Journal of Herpetology* 27(2):133-143.**

Females spent most of their gestation period...usually located within 500 m (.3 miles) of their overwintering dens.

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**Schantz, Kris. 2006. Expert opinion. Endangered and Nongame Species Program Timber Rattlesnake Telemetry Research 1999-2000, 2003-2005.**

Mean size home ranges (using Kernel home range at 95% confidence interval): New Jersey males: 263 ha (651 ac), roughly equivalent to .88 km radius - 1SE (68% of pop/data): 0.88 km + 0.08 km = 0.96 km radius; 1SE (82% of pop/data): 0.88 km + (1.5 x 0.08 km) = 1.0 km radius; 2SE: (95% of pop/data): 0.88 km + (2 x 0.08 km) = 1.04 km radius

Maximum single migratory distance from den: New Jersey males': 3.6 km (2.2 mi)

**Last researched by:** Schantz

**Date researched:** 10/1/2008

## Reptilia

### Wood Turtle

#### *Glyptemys insculpta*

SpcF LID	LUC	Feature Label	Buffer Size	Point Rule	Line Rule	Poly Rule	LP
4866	N/A	Nesting Area	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4867	N/A	Hibernaculum	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4868	N/A	On Road	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4869	N/A	Vernal Pool	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes
4870	N/A	Occupied Habitat	500 Meter Buffer	Apply a buffer	Convert to a point and buffer	Convert to a point and buffer	Yes

#### Justification:

A radius of one mile as the starting point for wood turtle habitat mapping was chosen based upon ecological studies that demonstrated wood turtle movements of 800m (Harding and Bloomer), 1km (Mitchell 1991), and 1.9km and 3.6km (Quinn and Tate 1991) along riparian corridors. Carroll and Ehrenfeld (1978) demonstrated that wood turtles displaced up to 2km were well within their home range. In addition to linear movements following watercourses, it is well documented that wood turtles travel beyond the riparian zone during the summer months. The 322m buffer represents a mean distance wood turtles traveled from their hibernation/breeding streams according to various natural history studies (Burt and Collins n.d.; Ernst 1986; Harding and Bloomer 1979; Strang 1983; Kaufmann 1992, 1995; Brewster and Brewster 1991; Farrell and Graham 1991; Quinn and Tate 1991), as well as ongoing research (R.L. Burke, Hofstra University; J.L. Behler, Wildlife Conservation Society).

#### Literature:

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**Brewster, K. N., and C. M. Brewster. 1991. Movement and microhabitat use by juvenile wood turtles introduced into a riparian habitat. *J. Herpetol.* 25:379-382.**

N/A

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**Burt, C.J. and D.E. Collins. Population parameters and summer home range-habitat relationships of the wood turtle (*Clemmys insculpta*). Unpub. Manuscript. 26pp.**

N/A

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**Carroll, T. E. and D. W. Ehrenfeld. 1978. Intermediate-range homing in the wood turtle, *Clemmys insculpta*. *Copeia* 1978(1): 117-126.**

N/A

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**Ernst, C.H. 1986. Environmental temperatures and activities in the wood turtle, *Clemmys insculpta*. J. of Herp. 20(2):222-229.**

N/A

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**Farrell, R. F. and T. E. Graham. 1991. Ecological notes on the turtle *Clemmys insculpta* in northwestern New Jersey. J. Herp. 25(1): 1-9.**

N/A

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**Harding, J. H. and T. J. Bloomer. 1979. The wood turtle, *Clemmys insculpta*...a natural history. HERP Bull. N.Y. Herp. Soc. 15(1): 9-26.**

N/A

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**Kaufmann, J. H. 1992. Habitat use by wood turtles in central Pennsylvania. J. Herpetol. 26:315-321.**

N/A

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**Kaufmann, J. H. 1995. Home ranges and movements of wood turtles, *Clemmys insculpta*, in central Pennsylvania. Copeia 1995:22-27.**

N/A

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**Mitchell, J. C. 1991. Amphibians and reptiles. Pages 411-76 in K. Terwilliger (coordinator). Virginia's Endangered Species: Proceedings of a Symposium. McDonald and Woodward Publishing Company, Blacksburg, Virginia.**

N/A

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**Quinn, N. W. S., and D. P. Tate. 1991. Seasonal movements and habitat of wood turtles (*Clemmys insculpta*) in Algonquin Park, Canada. J. Herpetol. 25:217-220.**

N/A

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**Strang, C. A. 1983. Spatial and temporal activity patterns in two terrestrial turtles. J. Herpetol. 17:43-47.**

N/A

**Last researched by:** Zarate

**Date researched:** 1/1/2007