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The Spatial Extent Contaminants and the Landscape Scale: An Analysis of the Wildlife, Conservation Biology, and Population Modeling Literature

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Appendix A: List of databases within which the literature search was conducted.

Database	Dates of Coverage	Size
AGRICOLA	1970 - current	> 3.6 million records
Agricultural and Environmental Biotechnology Abstracts	1993 - current	>29,100 records
Algology, Mycology & Protozoology Abstracts	1982 - current	>187,300 records
Animal Behavior Abstracts	1982 - current	>93,700 records
ASFA 3: Aquatic Pollution and Environmental Quality	1990 - current	>73,650 records
ASFA Aquaculture Abstracts	1984 - current	>56,620 records
ASFA Marine Biotechnology Abstracts	1989 - current	>16,000 records
ASFA Part 1: Biological Sciences and Living Resources	1978 - current	> 491,800 records
ASFA Part 2: Ocean Technology, Policy and Non-Living Resources	1978 - current	>216,530 records
Bioengineering Abstracts	1993 - current	>78,200 records
Biology Digest	1989 - current	>29,800 records
BIOSIS Previews database	1993 - current	>3,654,768 records
Conference Papers Index	1982 - current	>1,026,000 records
Current Contents	1989 - current	>6,455,303 records
Ecology Abstracts	1982 - current	>215,500 records
EIS: Digests of Environmental Impact Statements	1985 - current	>6,400 records
Environmental Engineering Abstracts	1990 - current	>86,000 records
GeoRef	1785 - present	>2,349,000 records
Health and Safety Science Abstracts	1981 - current	>122,900 records
Industrial and Applied Microbiology	1982 - current	>154,530 records
Melvyl Catalog database	All dates	>9 million records
Microbiology Abstracts Section B: Bacteriology	1982 - current	>243,840 records
NTIS	1964 - current	>2,112,300 records
Oceanic Abstracts	1981 - current	>220,971 records
Plant Science	1994 - current	>152,600 records
Pollution Abstracts	1981 - current	>173,350 records
Risk Abstracts	1990 - current	>9,300 records
Toxicology Abstracts	1981 - current	>137,000 records
Toxicology Abstracts	1981 - current	>137,000 records
TOXLINE	1994 - current	>460,500 records
Water Resources Abstracts	1967 - current	>344,825 records

Appendix B: List of literature search concepts used to capture critical patch data. A record needed to include one concept from each list. Linked words for a concept needed to be within 3-5 words of each other.

CONCEPT 1	CONCEPT 2
Critical patch size	Field observations
Critical patch arrangement	Field method
Patch size	Field data
Patch area	Survey method
Patch selection	Visual census
Patch isolation	Imaging method
Habitat patches	Plant monitoring
Habitat patchiness	Bottom travel survey
Habitat fragmentation	Vegetation mapping
Habitat destruction	Data collection
Habitat size (broad)	Aerial photography
Landscape patchiness	Radiotelemetry
Foraging niche	Identification method
Niche dimension	Photo identification
Extinction proneness	GIS
	Geographic Information Systems
	Sampling method
	Extinction risk assessment
	Biased random walk
	PASFRAN
	Patch Size Frequency Analysis
	Landsat Thematic Mapper
	Mark release capture
	Presence absence method
	Experiment

Appendix C: Tables of home range size requirements for all taxonomic groups.

Table C-1. Minimum home ranges for small mammals.

Common Species Name	Scientific Species Name	Minimum Home Range Size (m ²)	Habitat Type / Location ¹	Source ²
Grass field mouse	<i>Akodon azarae</i>	98	Cropfields, Argentina	Priotto and Steinmann 1999

Table C-1. Minimum home ranges for small mammals.

Common Species Name	Scientific Species Name	Minimum Home Range Size (m ²)	Habitat Type / Location ¹	Source ²
Formosan wood mouse	<i>Apodemus semotus</i>	954	Monocultural <i>Cryptomeria japonica</i> forest, Taiwan	Liang-Kong and Satoshi 1992
Wood mouse	<i>Apodemus sylvaticus</i>	1700	Lawn / shrubs, southern France	Benhamou 1990
Water vole	<i>Arvicola terrestris</i>	75	Riparian, United Kingdom	Rushton et al. 2000 (Strachan & Jefferies 1993)
Beaver	<i>Castor canadensis</i>	2500 ³	Bogs, Manitoba, Canada	Wheatley 1997
Beaver	<i>Castor canadensis</i>	4000	Southern Ontario, Canada	Wheatley 1997 (California and Gillespie 1977)
Bank vole	<i>Clenthionomys glareolus</i>	633 ⁴	Field, Finland	Jonsson et al. 2000
Northern bat	<i>Eptesicus nilssoni</i>	11600	Coniferous forest, clearcuts, and small abandoned fields, central Sweden	DeJong 1994
Serotine bat	<i>Eptesicus serotinus</i>	160000	Farmland, United Kingdom	Robinson and Stebbings 1997
Northern flying squirrel	<i>Glaucomys sabrinus</i>	23000	Coniferous forest, coastal range, Oregon	Witt 1992
Northern flying squirrel	<i>Glaucomys sabrinus</i>	31000	North Carolina	Witt 1992 (Weigl and Osgood 1974)
Northern flying squirrel	<i>Glaucomys sabrinus</i>	49000	Pennsylvania	Witt 1992 (Weigl and Osgood 1974)
Woodchuck	<i>Marmota monax</i>	19600 ⁴	Orchard, southcentral Connecticut	Swihart 1992 (Ouellet and Ferron 1986)
Woodchuck	<i>Marmota monax</i>	28000	Quebec, Canada	Swihart 1992
Gray-tailed vole	<i>Microtus canicaudus</i>	25		Wolff et al. 1996 (Wolff and Schaubert 1996)
Gray-tailed vole	<i>Microtus canicaudus</i>	135 ⁴	Open grassland, Oregon	Wolff et al. 1996
Prairie vole	<i>Microtus ochrogaster</i>	1100	Meadow, Kansas	Danielson and Swihart 1987
Prairie vole	<i>Microtus ochrogaster</i>	218 ³	Grassland, Kansas	Sera and Gaines 1994 (Swihart & Slade 1989)
Root vole	<i>Microtus oeconomus</i>	175	Farmland, Norway	Andreassen et al. 1998
Meadow vole	<i>Microtus pennsylvanicus</i>	86 ⁴	Field, Ohio	Collins and Barrett 1997
Meadow vole	<i>Microtus pennsylvanicus</i>	160		Harper et al. 1993 (Gaulin and FitzGerald 1988)
Meadow vole	<i>Microtus pennsylvanicus</i>	178.8	Field, Ohio	Harper et al. 1993
House mouse	<i>Mus musculus</i>	100	Highway island / old field, Alberta,	Zielinski 1992

Table C-1. Minimum home ranges for small mammals.

Common Species Name	Scientific Species Name	Minimum Home Range Size (m ²)	Habitat Type / Location ¹	Source ²
House mouse	<i>Mus musculus domesticus</i>	<50	Canada	Mikesic and Drickamer 1992
Bushy-tailed woodrat	<i>Neotoma cinerea</i>	31300	Old-field, Illinois	Topping and Millar 1996
Dusky-footed woodrat	<i>Neotoma fuscipes</i>	500	Outcrops surrounded by coniferous forest, Alberta, Canada	Topping and Millar 1996 (Kelly 1989)
Dusky-footed woodrat	<i>Neotoma fuscipes</i>	756	Sapling/poletimber shrubfields, northwestern California	Sakai and Noon 1997
Dusky-footed woodrat	<i>Neotoma fuscipes</i>	1100	Sapling/poletimber shrubfields, northwestern Californai	Sakai and Noon 1997
Desert woodrat	<i>Neotoma lepida intermedia</i>	371 ⁵	Coastal sage scrub, southern California	Bleich and Schwartz 1975
Southern grasshopper mice	<i>Onychomys torridus</i>	17000		Stapp 1999 (Frank and Heske, 1992)
Southern grasshopper mice	<i>Onychomys torridus</i>	24000		Stapp 1999 (Blair 1953)
Northern grasshopper mice	<i>Onychomys leucogaster</i>	12900 ⁴		Stapp 1999
Northern grasshopper mice	<i>Onychomys leucogaster</i>	21600 ⁵	Shortgrass steppe, Colorado	Stapp 1999
Southern grasshopper mouse	<i>Onychomys torridus torridus</i>	17500 ⁴	Desert scrub, Arizona	Frank and Heske 1992
White-footed mouse	<i>Peromyscus leucopus</i>	156	Oak-maple-hickory forest, Virginia	Wolff 1985
White-footed mouse	<i>Peromyscus leucopus</i>	500		Krohne and Hoch 1999 (Wolff 1985)
White-footed mouse	<i>Peromyscus leucopus</i>	517	Woodlots, Indiana	Krohne and Hoch 1999
White-footed mouse	<i>Peromyscus leucopus</i>	790		Wolff 1985 (Metzgar 1973b)
Cloudland deer mouse	<i>Peromyscus maniculatus</i>	156	Oak-maple-hickory forest, Virginia	Wolff 1985
Deer mouse	<i>Peromyscus maniculatus</i>	1600		Wolff 1985 (Taitt 1981)
Deer mouse	<i>Peromyscus maniculatus</i>	6300 ⁴		Ribble and Millar 1996
	<i>Peromyscus spp.</i>	790		Wolff 1985 (review)
Greater glider	<i>Petauroides volans</i>	12000		Lindenmayer and Lacy 1995 (Henry 1984)

Table C-1. Minimum home ranges for small mammals.

Common Species Name	Scientific Species Name	Minimum Home Range Size (m ²)	Habitat Type / Location ¹	Source ²
Yellow-bellied glider	<i>Petaurus australis</i>	300000		Stapp 1999 (Goldingay and Kavanagh 1993)
Squirrel glider	<i>Petaurus norfolcensis</i>	25000		Stapp 1999 (Quin 1995)
Plains harvest mouse	<i>Reithrodontomys montanus</i>	400		Spencer and Cameron 1988 (Goertz 1963)
Plains harvest mouse	<i>Reithrodontomys montanus</i>	2300		Spencer and Cameron 1988 (Waggoner 1975)
Salt marsh harvest mouse	<i>Reithrodontomys raviventris halicoetes</i>	182	Pickleweed, California	Bias and Morrison 1999
Eastern mole	<i>Scalopus aquaticus</i>	1500		Lovallo and Anderson 1996
Gray squirrel	<i>Sciurus carolinensis</i>	5000		Nupp and Swihart 2000
Fox squirrel	<i>Sciurus niger</i>	2600 ⁵	Agriculture/forest, Illinois	Sheperd and Swihart 1995
Fox squirrel	<i>Sciurus niger</i>	4000		Nupp and Swihart 2000
Fox squirrel	<i>Sciurus niger</i>	8000		Sheperd and Swihart 1995 (review)
Swamp rabbit	<i>Sylvilagus aquaticus</i>	7000		Zollner et al. 2000 (Kjolhaug and Woolf 1988)
Swamp rabbit	<i>Sylvilagus aquaticus</i>	10000	Bottomland hardwoods, Arizona	Zollner et al. 2000
Cottontail rabbit	<i>Sylvilagus floridanus</i>	810	Missouri	Trent and Rongstad 1974 (Schwartz 1941)
Cottontail rabbit	<i>Sylvilagus floridanus</i>	1215 ³	Michigan	Trent and Rongstad 1974 (Allen 1939)
Cottontail rabbit	<i>Sylvilagus floridanus</i>	1620	Woodlot, Wisconsin	Trent and Rongstad 1974
Cottontail rabbit	<i>Sylvilagus floridanus</i>	2025	Connecticut	Trent and Rongstad 1974 (Dalke 1942)
Cottontail rabbit	<i>Sylvilagus floridanus</i>	2025	Kansas	Trent and Rongstad 1974 (Janes 1959)
Cottontail rabbit	<i>Sylvilagus floridanus</i>	2430	Kentucky	Trent and Rongstad 1974 (Bruna 1952)
Eastern cottontail	<i>Sylvilagus floridanus</i>	8000		Mankin and Warner 1999 (review)
Eastern cottontail	<i>Sylvilagus floridanus</i>	10000 ³	Row crops, Illinois	Mankin and Warner 1999
Cottontail rabbit	<i>Sylvilagus floridanus</i>	50625 ³	Michigan	Trent and Rongstad 1974

Table C-1. Minimum home ranges for small mammals.

Common Species Name	Scientific Species Name	Minimum Home Range Size (m ²)	Habitat Type / Location ¹	Source ²
Cottontail rabbit	<i>Sylvilagus floridanus</i>	60750 ³	Michigan	(Haugen 1942a) Trent and Rongstad 1974
Southern bog lemming	<i>Synaptomys cooperi</i>	900	Meadow, Kansas	(Haugen 1942a) Danielson and Swihart 1987
Eastern chipmunk	<i>Tamias striatus</i>	4000		Nupp and Swihart 2000
Rats		5,000	Temperate deciduous forest, eastern Tennessee	Garten 1995
Mice		5000	Temperate deciduous forest, eastern Tennessee	Garten 1995

1. All locations are in the United States unless otherwise noted.

2. Citations in parenthesis denote the source which the authors referenced.

3. Homeranges varied by season and/or habitat.

4. Male homeranges were larger.

5. Female homeranges were larger.

Table C-2. Minimum home ranges for large herbivorous mammals.

Common species name	Scientific species name	Minimum home range size (ha)	Habitat type / location ¹	Source ²
Roe deer	<i>Capreolus capreolus</i>	~11		McLoughlin and Ferguson 2000 (Lovari & San Jose 1997) Relyea 2000
Desert mule deer	<i>Odocoileus hemionus crooki</i>	488 ⁴	Grassland, desert scrub, pinyon pine/juniper, Texas	
White-tailed deer	<i>Odocoileus virginianus</i>	2.3	Flatwoods and swamps, northern Florida	Labisky and Fritzen 1998
White-tailed deer	<i>Odocoileus virginianus</i>	10	Deciduous woodland, fields, and wetlands, southern Connecticut	Bertrand et al. 1996
White-tailed deer	<i>Odocoileus virginianus</i>	50	Forest, California	Holzenbein and Marchinton 1992
White-tailed deer	<i>Odocoileus virginianus</i>	68	Forest, California	Holzenbein and Marchinton 1992
White-tailed deer	<i>Odocoileus virginianus</i>	170	Forests, grassland, and agriculture, Nebraska	Vercauteren and Hygnstrom 1998
White-tailed deer	<i>Odocoileus virginianus</i>	~60	Forest, California	McShea and Schwede 1993
White-tailed deer	<i>Odocoileus virginianus</i>	50	Temperate deciduous forest, eastern Tennessee	Garten 1995 (Marchinton & Hirth, 1984)
White-tailed deer	<i>Odocoileus virginianus</i>	730	Northern white-cedar stands, Upper Peninsula, Michigan	Van Deelen et al. 1998
White-tailed deer	<i>Odocoileus virginianus zimmerman</i>	82 ³	Hardwood forest and tallgrass prairie, Oklahoma	Leslie et al. 1996

1. All locations are in the United States unless otherwise noted.

2. Citations in parenthesis denote the source which the authors referenced.

3. Homeranges varied by season and/or habitat.

4. Male homeranges were larger.

Table C-3. Minimum home ranges for large omnivorous and carnivorous mammals.

Common species name	Scientific species name	Minimum home range size (ha)	Habitat type / location ¹	Source ²
Coyote	<i>Canis latrans</i>	1.6	Coastal douglas fir, British Columbia, Canada	Nupp and Swihart 2000
Coyote	<i>Canis latrans</i>	250	Southern Texas	Mills and Knowlton 1991 (Andelt 1985, Windberg and Knowlton 1988)
Coyote	<i>Canis latrans</i>	450	Texas	Gompper and Gittleman 1991 (Andelt 1985)
Coyote	<i>Canis latrans</i>	560	Agriculture, champlain valley, Vermont	Person and Hirth 1991
Coyote	<i>Canis latrans</i>	650	Agricultural, Georgia	Holzman et al. 1992
Coyote	<i>Canis latrans</i>	670		Laundre and Keller 1984 (Bowen 1978)
Coyote	<i>Canis latrans</i>	920		Laundre and Keller 1984 (Andelt 1976, Althoff 1978)
Coyote	<i>Canis latrans</i>	1070		Laundre and Keller 1984 (Laundre and Keller 1981)
Coyote	<i>Canis latrans</i>	1150	Sagebrush, greasewood, and sagebrush-grassland complex, northern Utah and southeastern Idaho	Mills and Knowlton 1991
Coyote	<i>Canis latrans</i>	1200	Shortgrass prairie and pinon pine, Colorado	Kitchen et al. 1999
Coyote	<i>Canis latrans</i>	2470		Laundre and Keller 1984 (Smith et al. 1981)
Coyote	<i>Canis latrans</i>	3800		Laundre and Keller 1984 (Hibler 1976)
Armadillo	<i>Chaetophractus vellerosus</i>	5.7	Sand dunes, Argentina	Gregor 1980
Nine-banded armadillo	<i>Dasypus novemcinctus</i>	5.7	Florida	Layne and Glover 1977
Common opossum	<i>Didelphis marsupialis</i>	0.2	Grassland and scattered forest, Venezuela	Sunquist 1987 (August 1984)
Virginia opossum	<i>Didelphis virginiana</i>	4.7		Sunquist 1987 (Lay 1942)
Cat	<i>Felis catus</i>	42	Grassland, south island, New Zealand	Norbury et al. 1998
Feral cat	<i>Felis catus</i>	75	Grassland, south island, New Zealand	Moller and Alterio 1999
Cat	<i>Felis catus</i>	80		Norbury et al. 1998 (review)

Table C-3. Minimum home ranges for large omnivorous and carnivorous mammals.

Common species name	Scientific species name	Minimum home range size (ha)	Habitat type / location ¹	Source ²
Cougar	<i>Felis concolor</i>	620 ⁴	Forest, eastern slope Rocky Mountains, southwest Alberta, Canada	Ross and Jalkotzy 1992
Cougar	<i>Felis concolor</i>	13400	Chapparal, coastal scrub, oak woodlands, and annual grasslands, southern California	Beier 1995
Florida panther	<i>Felis concolor coryi</i>	5300	Forest, freshwater marsh, agriculture, urban areas, southwestern Florida	Maehr 1991
Bobcat	<i>Felis rufus</i>	600	Boreal coniferous-hardwood forest, northcentral Minnesota	Fuller et al. 1985
Bobcat	<i>Felis rufus</i>	900	Idaho	Litvaitis 1986 (Bailey 1974)
Bobcat	<i>Felis rufus</i>	1820	Hardwood/coniferous forest, Maine	Litvaitis 1986
Bobcat	<i>Felis rufus</i>	~130		Gompper and Gittleman 1991
Bobcat	<i>Felis rufus</i>	~575 ⁴		Gompper and Gittleman 1991
Bobcat	<i>Felis rufus</i>	<400	Alabama	Litvaitis 1986 (Miller 1980)
Bobcat	<i>Lynx rufus</i>	110 ⁴	Southern United States	Conner et al. 1999 (Miller and Speake 1979)
Bobcat	<i>Lynx rufus</i>	214 ⁴	Pine and hardwood stands, Mississippi	Conner et al. 1999
Bobcat	<i>Lynx rufus</i>	1980 ⁴	Coniferous-hardwood and pine savanna forest, Wisconsin	Lovallo and Anderson 1996
Bobcat	<i>Lynx rufus</i>	2080 ⁴	Coniferous-hardwood and pine savanna forest, Wisconsin	Lovallo and Anderson 1996
Bobcat	<i>Lynx rufus baileyi</i>	200		Lawhead 1984 (review)
Bobcat	<i>Lynx rufus baileyi</i>	420	Desert scrub, chapparal, desert grassland, riparian, Arizona	Lawhead 1984
American marten	<i>Martes americana</i>	75	Boreal forest, United States and Canada	Schneider and Yodzis 1994
Striped skunk	<i>Mephitis mephitis</i>	70	Agriculture, southern Alberta, Canada	Rosatte and Gunson 1984
Striped skunk	<i>Mephitis mephitis</i>	110	Cropland, with grassland and wetlands, North Dakota	Greenwood et al. 1997
Striped skunk	<i>Mephitis mephitis</i>	240	East-central North Dakota	Greenwood et al. 1997 (Greenwood et al. 1985)
Striped skunk	<i>Mephitis mephitis</i>	371	Agriculture, with wetlands and forest, southcentral Saskatchewan, Canada	Lariviere and Messier 1998
Striped skunk	<i>Mephitis mephitis</i>	426	Agriculture, with wetlands and forest,	Lariviere and Messier 1998

Table C-3. Minimum home ranges for large omnivorous and carnivorous mammals.

Common species name	Scientific species name	Minimum home range size (ha)	Habitat type / location ¹	Source ²
Ferret	<i>Mustela furo</i>	9	southcentral Saskatchewan, Canada	Norbury et al. 1998 (Blandford 1987, Brzezinski et al. 1992)
Ferret	<i>Mustela furo</i>	16	Grassland, south island, New Zealand	Norbury et al. 1998
Ferret	<i>Mustela furo</i>	73	Grassland, south island, New Zealand	Moller and Alterio 1999
Stoat	<i>Mustela erminea</i>	32 ⁴	Grassland, south island, New Zealand	Moller and Alterio 1999
North American badgers	<i>Mustela sp.</i>	282 ⁴	Sagebrush-grassland, Wyoming	Minta 1992 (Minta 1990)
Raccoon	<i>Procyon lotor</i>	15 ⁴	Mesquite-buchgrass and live oak-mixed-grass communities, Texas	Minta 1992
Raccoon	<i>Procyon lotor L.</i>	92 ³	Forest, Germany	Hohmann 2000
Raccoon	<i>Procyon lotor L.</i>	150 ³	Forest, Germany	Hohmann 2000
Wild boar	<i>Sus scrofa</i>	200		Howells and Edwards-Jones 1997 (Spitz 1992)
Badger	<i>Taxidea taxus</i>	~200 ⁴	Sagebrush, Wyoming	Rosatte and Gunson 1984
Mountain brushtail possum	<i>Trichosurus caninus</i>	2	Montane ash forest, Victoria, Canada	Lindenmayer and Lacy 1995 (Lindenmayer et al., unpublished data, Warneke and Seebeck, unpublished data)
Northern brush-tailed possum	<i>Trichosurus vulpecula arnhemensis</i>	1		Short and Turner 1994 (Kerle 1984)
Gray fox	<i>Urocyon cinereoargenteus</i>	384	Coniferous woodland and suburban, New Mexico	Harrison 1997
Black bear	<i>Ursus americanus</i>	~1220		Gompper and Gittleman 1991
Brown bear	<i>Ursus arctos</i>	~3100 ⁴	North America	McLoughlin and Ferguson 2000 (McLoughlin et al. 1999)
Swift fox	<i>Vulpes velox</i>	530	Shortgrass prairie and pinon pine, Colorado	Kitchen et al. 1999
Red fox	<i>Vulpes vulpes</i>	10 ³		Lucherini and Lovari 1996 (MacDonald 1987, Voigt 1987)
Red fox	<i>Vulpes vulpes</i>	~50 ⁴	Coastal ecotone, pinewood, rural ecotone, central Italy	Lucherini and Lovari 1996

1. All locations are in the United States unless otherwise noted.

Table C-3. Minimum home ranges for large omnivorous and carnivorous mammals.

Common species name	Scientific species name	Minimum home range size (ha)	Habitat type / location ¹	Source ²
2. Citations in parenthesis denote the source which the authors referenced.				
3. Homeranges varied by season and/or habitat.				
4. Male homeranges were larger.				

Table C-4. Minimum home ranges for herptiles.

Common species name	Scientific species name	Minimum home range size (m ²)	Habitat type / location ¹	Source ²
Snapping turtle	<i>Chelydra serpentina</i>	30,000	Temperate deciduous forest, eastern Tennessee	Garten 1995 (Obbard & Brooks, 1981)
Bog turtle	<i>Clemmys muhlenbergii</i>	100 ³	Wet meadows, Virginia	Carter et al. 1999
Bog turtle	<i>Clemmys muhlenbergii</i>	200 ³	Wet meadows, Virginia	Carter et al. 1999
Bog turtle	<i>Clemmys muhlenbergii</i>	660	Maryland	Carter et al. 1999 (Chase et al. 1989)
Broad-headed snakes	<i>Hoplocephalus bungaroides</i>	300	Open woodland forest, near Sydney, Australia	Webb and Shine 1997
Grand skink	<i>Oligosoma grande</i>	2.5	Rocky outcrops in grassland, south island, New Zealand	Eifler and Eifler 1999

1. All locations are in the United States unless otherwise noted.
 2. Citations in parenthesis denote the source which the authors referenced.
 3. Female home ranges were larger.

Table C-5. Minimum home ranges for birds.

Common species name	Scientific species name	Minimum home range size (ha)	Habitat type / location ¹	Source ²
Boreal owls	<i>Aegolius funereus</i>	2048	Coniferous forest, Idaho	Hayward et al. 1993
Boreal owls	<i>Aegolius funereus</i>	3750	Coniferous forest, Idaho	Hayward et al. 1993
Killdeer	<i>Charadrius vociferus</i>	1	Desert scrub/wetlands, northern California	Plissner 2000
Whistling duck	<i>Dendrocygna arborea</i>	2	Ground-scrub / mixed-broadleaf coppice vegetation, Bahamas	Staus 1998
Whistling duck	<i>Dendrocygna arborea</i>	23	Ground-scrub / mixed-broadleaf	Staus 1998

Table C-5. Minimum home ranges for birds.

Common species name	Scientific species name	Minimum home range size (ha)	Habitat type / location ¹	Source ²
Prairie falcon	<i>Falco mexicanus</i>	74700	coppice vegetation, Bahamas	Squires et al. 1993
Crested ibis	<i>Nipponia nippon</i>	Several	Sagebrush prairie, Wyoming	Li and Li 1998
Red-cockaded woodpecker	<i>Picoides borealis</i>	24.82	China	Doster and James 1998
Red-cockaded woodpecker	<i>Picoides borealis</i>	32	Shortleaf pine forest, west-central Arkansas	Doster and James 1998 (review)
Scarlet tanager	<i>Piranga olivacea</i>	6.13	Hardwood forest, western New York	Roberts & Norment 1999
Tawny owl	<i>Strix aluco</i>	1.5	oak/ash woodland fragments in a fen matrix, United Kingdom	Redpath 1995
Tawny owl	<i>Strix aluco</i>	12		Redpath 1995 (Southern 1970, Hirons 1985)
Northern spotted owl	<i>Strix occidentalis</i>	571		Hayward et al. 1993 (Thomas et al. 1990)
Northern spotted owl	<i>Strix occidentalis</i>	1200		Akcakaya and Raphael 1998 (Thomas et al. 1990)
Northern spotted owl	<i>Strix occidentalis caurina</i>	422	Old growth forest, northern California	Zabel et al.1995
Northern spotted owl	<i>Strix occidentalis caurina</i>	591	Northern California	Zabel et al.1995
Northern spotted owl	<i>Strix occidentalis caurina</i>	817		Zabel et al.1995

1. All locations are in the United States unless otherwise noted.

2. Citations in parenthesis denote the source which the authors referenced.

Appendix D: Tables of critical patch size requirements for all taxonomic groups.**Table D-1. Critical patch sizes for small mammals.**

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source ³
Atherton antechinus	<i>Antechinus godmani</i>	590	Rainforest, Queensland, Australia	Laurance 1994
Brown antechinus	<i>Antechinus stuartii</i>	101		Matthews et al. 1999
Brown antechinus	<i>Antechinus stuartii</i>	8 ⁴	Eucalyptus forest, Victoria, Australia	Bennett 1990
Masked titi monkey	<i>Callicebus personatus</i>	>= 20,000	Atlantic rainforest, Brazil	Chiarello 2000
Geoffroy's marmoset	<i>Callithrix geoffroyi</i>	>= 20,000	Atlantic rainforest, Brazil	Chiarello 2000
Brown capuchin monkey	<i>Cebus apella</i>	>= 20,000	Atlantic rainforest, Brazil	Chiarello 2000
Pigmy possum	<i>Cercartetus nanus</i>	~80000	Island, Tasmania	Burkey 1995 (Diamond 1984)
Bank vole	<i>Clethrionomys glareolus</i>	0.6	Deciduous woodlots, Netherlands	Vanapeldoorn et al. 1992
Lumholtz's tree kangaroo	<i>Dendrolagus lumholtzi</i>	12	Primary rainforest, northeastern Australia	Pahl et al. 1988
Southern flying squirrel	<i>Glaucomys volans</i>	4.6	Hardwood forest, Indiana	Nupp & Swihart 2000
Southern flying squirrel	<i>Glaucomys volans</i>	28	Forest fragments, Illinois	Rosenblatt et al. 1999
Southern brown bandicoot	<i>Isoodon obesulus</i>	8	Eucalyptus forest, Victoria, Australia	Bennett 1990
Dobson's shrew tenrec	<i>Microgale dobsoni</i>	30	Evergreen rainforest, Madagascar	Goodman & Rakotondravony 2000
	<i>Microgale gymnorhyncha</i>	136	Evergreen rainforest, Madagascar	Goodman & Rakotondravony 2000
Pygmy shrew tenrec	<i>Microgale parvula</i>	136	Evergreen rainforest, Madagascar	Goodman & Rakotondravony 2000
Long-tailed tenrec	<i>Microgale pusilla</i>	136	Evergreen rainforest, Madagascar	Goodman & Rakotondravony 2000
Rice tenrec	<i>Oryzorictes hova</i>	30	Evergreen rainforest, Madagascar	Goodman & Rakotondravony 2000
Long-nosed bandicoot	<i>Perameles nasuta</i>	3	Eucalyptus forest, Victoria, Australia	Bennett 1990
Potoroo	<i>Potorous apicalis</i>	~5000	Island, Tasmania	Burkey 1995 (Diamond 1984)
Long-nosed potoroo	<i>Potorous tridactylus</i>	3	Eucalyptus forest, Victoria, Australia	Bennett 1990
Spiny rat	<i>Proechimys semispinosus</i>	2.1	Forested island, Panama	Adler & Seamon 1991
Ringtail possum	<i>Pseudocheirus peregrinus</i>	~80000	Island, Tasmania	Burkey 1995 (Diamond 1984)
Bush rat	<i>Rattus fuscipes</i>	8 ⁴	Eucalyptus forest, Victoria, Australia	Bennett 1990

Table D-1. Critical patch sizes for small mammals.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source ³
Swamp rat	<i>Rattus lutreolus</i>	3	Eucalyptus forest, Victoria, Australia	Bennett 1990
Central American squirrel monkey	<i>Saimiri oerstedii</i>	15 ⁵	Pacific wet lowlands, Costa Rica and Panama	Boinski et al. 1998 (Boinski and Sirot 1997)
Guianan Squirrel	<i>Sciurus aestuans</i>	>= 1,500	Atlantic rainforest, Brazil	Chiarello 2000
Gray squirrel	<i>Sciurus carolinensis</i>	4.9	Hardwood forest, Indiana	Nupp & Swihart 2000
Fox squirrel	<i>Sciurus niger</i>	2.3	Forest fragments, Illinois	Rosenblatt et al. 1999
Fox squirrel	<i>Sciurus niger</i>	10000	Hardwood forest, Indiana	Nupp & Swihart 2000
Red squirrel	<i>Sciurus vulgaris</i>	0.88	Coniferous woodlots, Netherlands	Verboom & Apeldoorn 1990
Greater hedgehog tenrec	<i>Setifer setosus</i>	30	Evergreen rainforest, Madagascar	Goodman & Rakotondravony 2000
House shrew	<i>Suncus murinus</i>	30	Evergreen rainforest, Madagascar	Goodman & Rakotondravony 2000
New England cottontail	<i>Sylvilagus transitionalis</i>	0.2		Litvaitis & Villafuerte 1996 (Litvaitis 1993, Brown and Litvaitis 1995)
New England cottontails	<i>Sylvilagus transitionalis</i>	5	Northern hardwoods and white pine	Barbour & Litvaitis 1993
Short-beaked echidna	<i>Tachyglossus aculeatus</i>	~80000	Island, Tasmania	Burkey 1995 (Diamond 1984)
Eastern chipmunk	<i>Tamias striatus</i>	44.7	Forest fragments, Illinois	Rosenblatt et al. 1999
Red squirrel	<i>Tamiasciurus hudsonicus</i>	4	Hardwood forest, Indiana	Nupp & Swihart 2000
Tasmanian pademelon	<i>Thylogale billardierii</i>	~800	Island, Tasmania	Burkey 1995 (Diamond 1984)
Gray fox	<i>Urocyon cinereoargenteus</i>	24	Forest fragments, Illinois	Rosenblatt et al. 1999
Red fox	<i>Vulpes vulpes</i>	24	Forest fragments, Illinois	Rosenblatt et al. 1999

1. Refers to minimum patch size in which members of the species were found, unless otherwise noted. Measurements given in hectares, or percentage of landscape that was available habitat.

2. All locations are in the United States unless otherwise noted.

3. Citations in parenthesis denote the source which the authors referenced.

4. Size threshold below which species is not present in all patches.

5. Area in which long-term monitoring of isolated populations go extinct if also have 15 member or less, and less than 30 ha of available habitat.

Table D-2. Critical patch sizes for herptiles.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source
Blanchard's cricket frog	<i>Acris crepitans</i>	285	Lake Erie Islands, Great Lakes	Hager 1998
Jefferson salamander	<i>Ambystoma jeffersonianum</i>	619	Lake Erie Islands, Great Lakes	Hager 1998
Blue-spotted salamander	<i>Ambystoma laterale</i>	0.8	Georgian Bay Islands, Great Lakes	Hager 1998
Blue-spotted salamander	<i>Ambystoma laterale</i>	312	Lake Erie Islands, Great Lakes	Hager 1998
Yellow spotted salamander	<i>Ambystoma maculatum</i>	22	Georgian Bay Islands, Great Lakes	Hager 1998
Yellow spotted salamander	<i>Ambystoma maculatum</i>	312	Lake Erie Islands, Great Lakes	Hager 1998
Marbled salamander	<i>Ambystoma opacum</i>	619	Lake Erie Islands, Great Lakes	Hager 1998
Smallmouth salamander	<i>Ambystoma texanum</i>	285	Lake Erie Islands, Great Lakes	Hager 1998
American toad	<i>Bufo americanus</i>	12	Lake Erie Islands, Great Lakes	Hager 1998
American toad	<i>Bufo americanus</i>	2.9	St. Lawrence Islands, Great Lakes	Hager 1998
Woodhouse's toad	<i>Bufo woodhousei</i>	3	Lake Erie Islands, Great Lakes	Hager 1998
Common snapping turtle	<i>Chelydra serpentina</i>	79	Georgian Bay Islands, Great Lakes	Hager 1998
Common snapping turtle	<i>Chelydra serpentina</i>	23	Lake Erie Islands, Great Lakes	Hager 1998
Midland painted turtle	<i>Chrysemys picta marginata</i>	10.1	Georgian Bay Islands, Great Lakes	Hager 1998
Midland painted turtle	<i>Chrysemys picta marginata</i>	117	Lake Erie Islands, Great Lakes	Hager 1998
Midland painted turtle	<i>Chrysemys picta marginata</i>	2.9	St. Lawrence Islands, Great Lakes	Hager 1998
Spotted turtle	<i>Clemmys guttata</i>	250	Georgian Bay Islands, Great Lakes	Hager 1998
Racer	<i>Coluber constrictor</i>	117	Lake Erie Islands, Great Lakes	Hager 1998
Western whip snake	<i>Coluber viridiflavus</i>	3 ³	Forest, Italy	Luiselli & Capizzi 1997
Timber rattlesnake	<i>Crotalus horridus</i>	3	Lake Erie Islands, Great Lakes	Hager 1998
Northern ringneck snake	<i>Diadophis punctatus</i>	208	Georgian Bay Islands, Great Lakes	Hager 1998
Northern ringneck	<i>Diadophis punctatus</i>	312	Lake Erie Islands, Great Lakes	Hager 1998

Table D-2. Critical patch sizes for herptiles.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source
snake				
Northern ringneck	<i>Diadophis punctatus</i>	374	St. Lawrence Islands, Great Lakes	Hager 1998
snake				
Rat snake	<i>Elaphe obsoleta</i>	619	Lake Erie Islands, Great Lakes	Hager 1998
Rat snake	<i>Elaphe obsoleta</i>	374	St. Lawrence Islands, Great Lakes	Hager 1998
Eastern fox snake	<i>Elaphe vulpina</i>	10.1	Georgian Bay Islands, Great Lakes	Hager 1998
Eastern fox snake	<i>Elaphe vulpina</i>	3	Lake Erie Islands, Great Lakes	Hager 1998
Blanding's turtle	<i>Emydoidea blandingii</i>	250	Georgian Bay Islands, Great Lakes	Hager 1998
Blanding's turtle	<i>Emydoidea blandingii</i>	7	Lake Erie Islands, Great Lakes	Hager 1998
Five-lined skink	<i>Eumeces fasciatus</i>	10.1	Georgian Bay Islands, Great Lakes	Hager 1998
Map turtle	<i>Graptemys geographica</i>	1.2	Georgian Bay Islands, Great Lakes	Hager 1998
Map turtle	<i>Graptemys geographica</i>	3	Lake Erie Islands, Great Lakes	Hager 1998
Four-toed salamander	<i>Hemidactylium scutatum</i>	79	Georgian Bay Islands, Great Lakes	Hager 1998
Four-toed salamander	<i>Hemidactylium scutatum</i>	374	St. Lawrence Islands, Great Lakes	Hager 1998
Eastern hognose snake	<i>Heterodon platirhinos</i>	208	Georgian Bay Islands, Great Lakes	Hager 1998
Eastern hognose snake	<i>Heterodon platirhinos</i>	619	Lake Erie Islands, Great Lakes	Hager 1998
Tetraploid gray treefrog	<i>Hyla versicolor</i>	79	Georgian Bay Islands, Great Lakes	Hager 1998
Tetraploid gray treefrog	<i>Hyla versicolor</i>	4261	Lake Erie Islands, Great Lakes	Hager 1998
Tetraploid gray treefrog	<i>Hyla versicolor</i>	3	St. Lawrence Islands, Great Lakes	Hager 1998
Tetraploid gray treefrog	<i>Hyla versicolor</i>	235	St. Lawrence Islands, Great Lakes	Hager 1998
Eastern milk snake	<i>Lampropeltis triangulum</i>	79	Georgian Bay Islands, Great Lakes	Hager 1998
Mudpuppy	<i>Necturus maculosus</i>	250	Georgian Bay Islands, Great Lakes	Hager 1998
Mudpuppy	<i>Necturus maculosus</i>	285	Lake Erie Islands, Great Lakes	Hager 1998
Eastern red-spotted	<i>Notophthalmus</i>	115	Georgian Bay Islands, Great Lakes	Hager 1998
newt	<i>viridescens</i>			
Eastern red-spotted	<i>Notophthalmus</i>	285	Lake Erie Islands, Great Lakes	Hager 1998
newt	<i>viridescens</i>			
Velvet gecko	<i>Oedura reticulata</i>	0.3 ⁵	Eucalyptus forest, western Australia	Sarre et al. 1994
Eastern smooth green	<i>Opheodrys vernalis</i>	250	Georgian Bay Islands, Great Lakes	Hager 1998
snake				
Redback salamander	<i>Plethodon cinereus</i>	20	Lake Erie Islands, Great Lakes	Hager 1998
Redback salamander	<i>Plethodon cinereus</i>	9.4	St. Lawrence Islands, Great Lakes	Hager 1998
Spring peeper	<i>Pseudacris crucifer</i>	23	Lake Erie Islands, Great Lakes	Hager 1998

Table D-2. Critical patch sizes for herptiles.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source
Midland chorus frog	<i>Pseudacris triseriata</i>	79	Georgian Bay Islands, Great Lakes	Hager 1998
Midland chorus frog	<i>Pseudacris triseriata</i>	1143	Lake Erie Islands, Great Lakes	Hager 1998
Bullfrog	<i>Rana catesbeinana</i>	3	Lake Erie Islands, Great Lakes	Hager 1998
Bullfrog	<i>Rana catesbeinana</i>	3	St. Lawrence Islands, Great Lakes	Hager 1998
Green frog	<i>Rana clamitans</i>	23	Lake Erie Islands, Great Lakes	Hager 1998
Pickerel frog	<i>Rana palustris</i>	208	Georgian Bay Islands, Great Lakes	Hager 1998
Northern leopard frog	<i>Rana pipiens</i>	1.7	Georgian Bay Islands, Great Lakes	Hager 1998
Northern leopard frog	<i>Rana pipiens</i>	32	Lake Erie Islands, Great Lakes	Hager 1998
Wood frog	<i>Rana sylvatica</i>	115	Georgian Bay Islands, Great Lakes	Hager 1998
Wood frog	<i>Rana sylvatica</i>	374	St. Lawrence Islands, Great Lakes	Hager 1998
Queen snake	<i>Regina septemvittata</i>	117	Lake Erie Islands, Great Lakes	Hager 1998
Eastern massasauga	<i>Sistrurus catenatus</i>	250	Georgian Bay Islands, Great Lakes	Hager 1998
Stinkpot	<i>Sternotherus odoratus</i>	250	Georgian Bay Islands, Great Lakes	Hager 1998
Northern brown snake	<i>Storeria dekayi</i>	79	Georgian Bay Islands, Great Lakes	Hager 1998
Northern brown snake	<i>Storeria dekayi</i>	3	Lake Erie Islands, Great Lakes	Hager 1998
Northern brown snake	<i>Storeria dekayi</i>	4.1	St. Lawrence Islands, Great Lakes	Hager 1998
Redbelly snake	<i>Storeria occipitomaculata</i>	10.1	Georgian Bay Islands, Great Lakes	Hager 1998
Redbelly snake	<i>Storeria occipitomaculata</i>	235	St. Lawrence Islands, Great Lakes	Hager 1998
Eastern box turtle	<i>Terrapene carolina</i>	4261	Lake Erie Islands, Great Lakes	Hager 1998
Eastern garter snake	<i>Thamnophis sirtalis</i>	10.1	Georgian Bay Islands, Great Lakes	Hager 1998
Eastern garter snake	<i>Thamnophis sirtalis</i>	3	Lake Erie Islands, Great Lakes	Hager 1998
Eastern ribbon snake	<i>Thamnophis sauritus</i>	100	Georgian Bay Islands, Great Lakes	Hager 1998

1. Refers to the smallest island upon which the species was found, unless otherwise noted. Measurements given in hectares.

2. All locations are in the United States unless otherwise noted.

3. Citations in parenthesis denote the source which the authors referenced.

4. Size threshold below which species is not present in all patches.

5. Refers to minimum patch size in which members of the species were found.

Table D-3. Critical patch sizes for large mammals.

Common Species Name	Scientific Species Name	Critical Patch Size (km ²) ¹	Habitat Type / Location ²	Source ³
Cheetah	<i>Acinonyx jubatus</i>	3328		Smallwood 1999
Arctic fox	<i>Alopex lagopus</i>	1890		Smallwood 1999

Table D-3. Critical patch sizes for large mammals.

Common Species Name	Scientific Species Name	Critical Patch Size (km ²) ¹	Habitat Type / Location ²	Source ³
Coyote	<i>Canis latrans</i>	140		Smallwood 1999
Wolf	<i>Canis lupus</i>	1100		Smallwood 1999
Coyote	<i>Canus latrans</i>	65	Forest fragments, Illinois	Rosenblatt et al. 1999
Coyote	<i>Canus latrans</i>	25%	Chapparel in an urban matrix, southern California	Soule 1988
Bearded saki	<i>Chiropotes satanas</i>	>5,000 ⁴	Terra firma forest, south eastern Amazonia, Brazil	Ferrari et al. 1999
Spotted hyena	<i>Crocuta crocuta</i>	250		Smallwood 1999
Dhole	<i>Cuon alpinus</i>	412		Smallwood 1999
Red-humped agouti	<i>Dasyprocta leporina</i>	>= 20,000	Atlantic rainforest, Brazil	Chiarello 2000
Lumholtz's Tree-kangaroo	<i>Dendrolagus lumholtzi</i>	20	Rainforest, tropical Queensland, Australia	Laurance and Laurance 1999 (Pahl et al. 1988; Laurance 1990)
Culpeo	<i>Dusicyon culpaeus</i>	178		Smallwood 1999
Florida panther	<i>Felis concolor</i>	1350		Smallwood 1999
Lynx	<i>Felis lynx</i>	331		Smallwood 1999
Wolverine	<i>Gulo gulo</i>	1300		Smallwood 1999
Leadbeater's possum	<i>Gymnobelideus leadbeateri</i>	6		Smallwood 1999
Lemuroid ringtail possum	<i>Hemibelideus lemuroides</i>	600	Rainforest, tropical Queensland, Australia	Laurance and Laurance 1999 (Laurance 1990)
African hunting dog	<i>Lycaon pictus</i>	3325		Smallwood 1999
Lion-tailed macaque	<i>Macaca silenus</i>	24	Rainforest, southern India	Umapathy & Kumar 2000
Red-Necked Wallaby	<i>Macropus rufogriseus</i>	~900	Island, Tasmania	Burkey 1995 (Diamond 1984)
American marten	<i>Martes americana</i>	1.5	Mature forest, Maine	Chapin et al. 1998
American marten	<i>Martes americana</i>	14		Smallwood 1999
Marten	<i>Martes martes</i>	47.5		Smallwood 1999
Eurasian badger	<i>Meles meles</i>	7.3		Smallwood 1999
Sloth bear	<i>Melursus ursinus</i>	412.4		Smallwood 1999
Striped skunk	<i>Mephitis mephitis</i>	65	Forest fragments, Illinois	Rosenblatt et al. 1999
Striped skunk	<i>Mephitis mephitis</i>	15.36		Smallwood 1999
Least weasel	<i>Mustela nivalis</i>	32		Smallwood 1999
Mink	<i>Mustela vison</i>	32.6		Smallwood 1999
Bighorn sheep	<i>Ovis canadensis</i>	3200	Prairie-badlands	Zeigenfuss et al. 2000

Table D-3. Critical patch sizes for large mammals.

Common Species Name	Scientific Species Name	Critical Patch Size (km ²) ¹	Habitat Type / Location ²	Source ³
Bighorn sheep	<i>Ovis canadensis</i>	8500	Rocky Mountains	Zeigenfuss et al. 2000
Bighorn sheep	<i>Ovis canadensis</i>	38100	Desert	Zeigenfuss et al. 2000
Bighorn sheep	<i>Ovis canadensis</i>	1700		Zeigenfuss et al. 2000
Lion	<i>Panthera leo</i>	1412		Smallwood 1999
Leopard	<i>Panthera pardus</i>	412		Smallwood 1999
Siberian tiger	<i>Panthera tigris</i>	848		Smallwood 1999
Herbert River ringtail	<i>Pseudochirulus herbertensis</i>	20	Rainforest, tropical Queensland, Australia	Laurance and Laurance 1999 (Laurance 1990)
Badger	<i>Taxidea taxus</i>	70		Smallwood 1999
Mountain brushtail possum	<i>Trichosurus caninus</i>	6		Smallwood 1999
Gray fox	<i>Urocyon cinereoargenteus</i>	41		Smallwood 1999
Black bear	<i>Ursus americanus</i>	192		Smallwood 1999
Brown bear	<i>Ursus arctos</i>	701		Smallwood 1999
Polar bear	<i>Ursus maritimus</i>	7217		Smallwood 1999
Red fox	<i>Vulpes vulpes</i>	89		Smallwood 1999

1. Refers to minimum patch size in which members of the species were found, unless otherwise noted. Measurements given in hectares, or percentage of landscape that was available habitat.

2. All locations are in the United States unless otherwise noted.

3. Citations in parenthesis denote the source which the authors referenced.

4. Area required to sustain healthy populations of greater than 500 individuals, although long-term viability of populations this size is still considered debatable (Ferrari et al. 1999).

Table D-4. Critical patch sizes for birds.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source ³
Marsh warbler	<i>Acrocephalus palustris</i>	10 ⁴	Wetlands, northern Italy	Celada & Bogliani 1993
Long-tailed tit	<i>Aegithalos caudatus</i>	3		Nour et al. 1997
Long-tailed tit	<i>Aegithalos caudatus</i>	5	Urban woodland, Japan	Natuhara & Imai 1999
Long-tailed tit	<i>Aegithalos caudatus</i>	10%	Boreal forest	Jansson 1998 (Jansson & Angelstam 1997)
Henslow's sparrow	<i>Ammodramus henslowii</i>	100	Grassland, Illinois	Herkert 1994
Henslow's sparrow	<i>Ammodramus henslowii</i>	30 ⁵	Grassland, New York	Herkert 1994 (Smith & Smith 1990)
Henslow's sparrow	<i>Ammodramus henslowii</i>	10 ⁵	Prairie, Missouri	Herkert 1994 (Samson 1980)
Henslow's sparrow	<i>Ammodramus henslowii</i>	20 ⁵		Herkert 1994
Grasshopper sparrow	<i>Ammodramus savannarum</i>	40 ⁴	Meadows, Nebraska	Helzer & Jelinski 1999
Grasshopper sparrow	<i>Ammodramus savannarum</i>	10	Grassland-barrens, Maine	Vickery et al. 1994
Short-eared owls	<i>Asio flammeus</i>	50 ⁶	Coniferous forest, Scotland	Shaw 1995
Bamboo partridge	<i>Bambusicola thoracica</i>	5	Urban woodland, Japan	Natuhara & Imai 1999
Upland sandpiper	<i>Bartramia longicauda</i>	7	Grassland-barrens, Maine	Vickery et al. 1994
Hazel grouse	<i>Bonasa bonasia</i>	~0.5 ⁶	Spruce forest, Finland	Saari et al. 1998
Upland sandpiper	<i>Bratamia longicauda</i>	200 ⁴	Meadows, Nebraska	Helzer & Jelinski 1999
Upland Sandpiper	<i>Bratamia longicauda</i>	77	Tallgrass prairie, SW Missouri	Winter and Faaborg 1999
Rough-legged hawk	<i>Buteo lagopus</i>	5-7% ⁷	Grasslands in an urban matrix, Colorado	Berry et al. 1998
Ferruginous hawk	<i>Buteo regalis</i>	5-7% ⁷	Grasslands in an urban matrix, Colorado	Berry et al. 1998
Ferruginous hawk	<i>Buteo regalis</i>	50%	Prairie, southeastern Alberta, Canada	Schmutz 1984
California quail	<i>Callipepla californica</i>	1.25	Chapparel in an urban matrix, southern California	Soule 1988
California quail	<i>Callipepla californica</i>	30%	Chapparel in an urban matrix, southern California	Soule 1988
Magellanic Woodpecker	<i>Campephilus magellanicus</i>	0.5	Rainforest, Chile	Willson et al. 1994
Eurasian siskin	<i>Carduelis spinus</i>	1.1	Boreal forest, Sweden	Edenius & Sjoberg 1997
Veery	<i>Catharus fuscens</i>	93 ⁸	Deciduous forest, Ontario, Canada	Burke & Nol 2000
Short-toed treecreeper	<i>Certhia brachydactyla</i>	4		Nour et al. 1997

Table D-4. Critical patch sizes for birds.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source ³
Common treecreeper	<i>Certhia familiaris</i>	24	Forest, north Finland	Kuitunen & Helle 1988 (P. Helle, unpubl.)
Common treecreeper	<i>Certhia familiaris</i>	2	Forest, south Finland	Kuitunen & Helle 1988 (Haila et al. 1987)
Common treecreeper	<i>Certhia familiaris</i>	1.5	Forest, central Sweden	Kuitunen & Helle 1988 (P. Angelstam, unpubl.)
Common treecreeper	<i>Certhia familiaris</i>	0.7	Forest, England	Kuitunen & Helle 1988 (Ford 1987)
Common treecreeper	<i>Certhia familiaris</i>	11	Forested island, Finland	Kuitunen & Helle 1988 (Haila et al. 1983)
Common treecreeper	<i>Certhia familiaris</i>	3.2	Forested island, Finland	Kuitunen & Helle 1988 (Ahlen & Nilsson 1982)
Common treecreeper	<i>Certhia familiaris</i>	3.2	Forested island, Finland	Kuitunen & Helle 1988 (T. Reed, unpubl.)
Bush warbler	<i>Cettia diphone</i>	20	Urban woodland, Japan	Natuhara & Imai 1999
Wrentit	<i>Chamaea fasciata</i>	1.8 ⁴	Chapparel in an urban matrix, southern California	Soule 1988
Marsh harrier	<i>Circus aeruginosus</i>	5	Wetlands, northern Italy	Celada & Bogliani 1993
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	7.5	Tropical deciduous forest, upper Florida keys	Sinclair et al. 1995
Mangrove cuckoo	<i>Coccyzus minor</i>	1.3	Tropical deciduous forest, upper Florida keys	Sinclair et al. 1995
Northern flicker	<i>Colaptes auratus</i>	3.5	Tropical deciduous forest, upper Florida keys	Sinclair et al. 1995
Northern flicker	<i>Colaptes auratus</i>	1.34	Cottonwood-willow forest, southeastern Wyoming	Gutzwiller & Anderson 1987
Chilean pigeon	<i>Columba araucana</i>	0.5	Rainforest, Chile	Willson et al. 1994
Carrion crow	<i>Corvus corone</i>	20 ⁴	Urban woodland, Japan	Natuhara & Imai 1999
Jungle crow	<i>Corvus macrorhynchos</i>	2	Urban woodland, Japan	Natuhara & Imai 1999
Spruce grouse	<i>Dendragapus canadensis</i>	4	Black spruce stands, Maine	Whitcomb et al. 1996
Kirtland's warbler	<i>Dendrioca kirtlandii</i>	40	Coniferous forest, Michigan	Nelson and Buech 1996 (Nelson 1992)
Japanese pygmy	<i>Dendrocopos kizuki</i>	20	Urban woodland, Japan	Natuhara & Imai 1999

Table D-4. Critical patch sizes for birds.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source ³
woodpeker				
Middle spotted woodpecker	<i>Dendrocopos medius</i>	6%	Forest, Sweden	Tjernberg 1993 (Pettersson 1985)
Lesser spotted woodpecker	<i>Dendrocopos minor</i>	10%	Deciduous forest	Tjernberg 1993 (Wiktander et al. 1992)
Chestnut-sided warbler	<i>Dendroica pensylvanica</i>	~35%	Forest patches	Villard et al. 1999
Black-throated green warbler	<i>Dendroica virens</i>	60%	Forest patches	Villard et al. 1999
Bobolink	<i>Dolichonyx oryzivorus</i>	0.2	Grassland-barrens, Maine	Vickery et al. 1994
Black woodpecker	<i>Dryocopus martius</i>	4500	Forest, Sweden	Tjernberg 1993
Pied imperial-pigeon	<i>Ducula bicolor</i>	1	Monsoonal rainforest, northern Australia	Price et al. 1999
Siberian meadow bunting	<i>Emberiza cioides</i>	5	Urban woodland, Japan	Natuhara & Imai 1999
Eastern yellow robin	<i>Eopsaltria australis</i>	20	Forest	Zanette et al. 2000 (Barrett 1995)
Common koel	<i>Eudynamys scolopacea</i>	1.5	Monsoonal rainforest, northern Australia	Price et al. 1999
Ochre-flanked Tapaculo	<i>Eugralla paradoxa</i>	0.5	Rainforest, Chile	Willson et al. 1994
Prairie falcon	<i>Falco mexicanus</i>	5-7% ⁷	Grasslands in an urban matrix, Colorado	Berry et al. 1998
American kestrel	<i>Falco sparverius</i>	1.99	Cottonwood-willow forest, southeastern Wyoming	Gutzwiller & Anderson 1987
Greater roadrunner	<i>Geococcyx californianus</i>	1.25	Chapparel in an urban matrix, southern California	Soule 1988
Greater roadrunner	<i>Geococcyx californianus</i>	50%	Chapparel in an urban matrix, southern California	Soule 1988
Bald eagle	<i>Haliaeetus leucocephalus</i>	5-7% ⁷	Grasslands in an urban matrix, Colorado	Berry et al. 1998
Worm-eating warbler	<i>Helmitheros vermivorus</i>	300 ⁵	Deciduous forest, central Missouri	Wenny et al. 1993 (Hayden et al. 1985)
Wood thrush	<i>Hylocichla mustelina</i>	225 ⁸	Deciduous forest, Ontario, Canada	Burke & Nol 2000
Wood thrush	<i>Hylocichla mustelina</i>	1		Hoover et al. 1995 (Robbins et al.

Table D-4. Critical patch sizes for birds.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source ³
				1989a)
Yellow-breasted Chats	<i>Icteria virens</i>	2.4	Oak-hickory forests, Missouri	Burhans and Thompson 1999
Savi's warbler	<i>Locustella luscinioides</i>	0.5	Wetlands, northern Italy	Celada & Bogliani 1993
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	1.99	Cottonwood-willow forest, southeastern Wyoming	Gutzwiller & Anderson 1987
Black-and-white warbler	<i>Mniotilta varia</i>	~7%		Villard et al. 1999
Kentucky warbler	<i>Oporornis formosus</i>	300 ⁵	Deciduous forest, central Missouri	Wenny et al. 1993 (Hayden et al. 1985)
Black-capped chickadee	<i>Parus atricapillus</i>	6.82	Cottonwood-willow forest, southeastern Wyoming	Gutzwiller & Anderson 1987
Blue tit	<i>Parus caeruleus</i>	0.5		Nour et al. 1997
Great tit	<i>Parus major</i>	0.5	Oak forests, northern Belgium	Nour et al. 1997
Great tit	<i>Parus major</i>	20 ⁴	Urban woodland, Japan	Natuhara & Imai 1999
Willow tit	<i>Parus montanus</i>	3		Nour et al. 1997
Plains-wanderer	<i>Pedionomus torquatus</i>	450 ⁹	Riverine Plain, Victoria and south Australia	Baker-Gabb et al. 1990
Common pheasant	<i>Phasianus colchicus</i>	20	Urban woodland, Japan	Natuhara & Imai 1999
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	93 ⁸	Deciduous forest, Ontario, Canada	Burke & Nol 2000
Downy woodpecker	<i>Picoides pubescens</i>	2.9	Cottonwood-willow forest, southeastern Wyoming	Gutzwiller & Anderson 1987
Hairy woodpecker	<i>Picoides villosus</i>	55-60%	Forest patches in agricultural matrix, near Ottawa, Canada	Villard et al. 1999
Hairy woodpecker	<i>Picoides villosus</i>	0.32	Cottonwood-willow forest, southeastern Wyoming	Gutzwiller & Anderson 1987
Japanese green woodpecker	<i>Picus awokera</i>	20	Urban woodland, Japan	Natuhara & Imai 1999
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>	1.25	Chapparel in an urban matrix, southern California	Soule 1988
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>	5.61 ⁴	Chapparel in an urban matrix, southern California	Soule 1988
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>	30%	Chapparel in an urban matrix, southern California	Soule 1988

Table D-4. Critical patch sizes for birds.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source ³
Scarlet tanager	<i>Piranga olivacea</i>	10	Hardwood forest, western New York	Roberts & Normant 1999
Huet-Heut	<i>Pterotochus tarnii</i>	0.5	Rainforest, Chile	Willson et al. 1994
Common grackle	<i>Quiscalus quiscula</i>	1.34	Cottonwood-willow forest, southeastern Wyoming	Gutzwiller & Anderson 1987
Water rail	<i>Rallus aquaticus</i>	0.5	Wetlands, northern Italy	Celada & Bogliani 1993
Clapper rail	<i>Rallus longirostris</i>	1.8	Marsh, Colorado	Anderson & Ohmart 1985
Goldcrest	<i>Regulus regulus</i>	3		Nour et al. 1997
Goldcrest	<i>Regulus regulus</i>	1.1	Boreal forest, Sweden	Edenius & Sjoberg 1997
Andean Tapaculo	<i>Scytalopus magellanicus</i>	0.5	Rainforest, Chile	Willson et al. 1994
Ovenbird	<i>Seiurus aurocapillus</i>	7.6 ¹⁰	Hardwood forest, New Brunswick, Canada	Sabine et al. 1996
Ovenbird	<i>Seiurus aurocapillus</i>	500 ⁸	Deciduous forest, Ontario, Canada	Burke & Nol 2000
Ovenbird	<i>Seiurus aurocapillus</i>	300 ⁵	Deciduous forest, central Missouri	Wenny et al. 1993 (Hayden et al. 1985)
Ovenbird	<i>Seiurus aurocapillus</i>	NA	Upland, mature oak and hickory deciduous forest, Central Missouri	Gibbs and Faaborg 1990
Oven bird	<i>Seiurus autocapillus</i>	10%		Villard et al. 1999; 30 (review)
Nuthatch	<i>Sitta europaea</i>	6 ⁴	Deciduous woodlots, Netherlands	Opdam & Schotman 1987
Nuthatch	<i>Sitta europaea</i>	NA	Old deciduous forest	Matthysen 1999 (Opdam et al. 1985; van Dorp and Opdam 1987; van Noorden et al. 1988; Enoksson et al. 1995)
Dickcissel	<i>Spiza americana</i>	90 ⁴	Meadows, Nebraska	Helzer & Jelinski 1999
Tawny owl	<i>Strix aluco</i>	4 ⁴	Oak/ash wood fragments in a fen matrix, United Kingdom	Redpath 1995
Eastern meadowlark	<i>Sturnella magna</i>	0.8	Grassland-barrens, Maine	Vickery et al. 1994
Western meadowlark	<i>Sturnella neglecta</i>	25 ⁴	Meadows, Nebraska	Helzer & Jelinski 1999
European starling	<i>Sturnus vulgaris</i>	0.84	Cottonwood-willow forest, southeastern Wyoming	Gutzwiller & Anderson 1987
Des Murs's Wiretail	<i>Sylviorthorhynchus desmursii</i>	0.5	Rainforest, Chile	Willson et al. 1994
Little grebe	<i>Tachybaptus ruficollis</i>	0.5	Wetlands, northern Italy	Celada & Bogliani 1993
Tree swallow	<i>Tachycineta bicolor</i>	15.05	Cottonwood-willow forest, southeastern	Gutzwiller & Anderson 1987

Table D-4. Critical patch sizes for birds.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source ³
Chilean swallow	<i>Tachycineta leucopyga</i>	0.5	Wyoming	Willson et al. 1994
Capercaillie	<i>Tetrao urogallus</i>	30%	Rainforest, Chile	Redpath 1995 (review)
Capercaillie	<i>Tetrao urogallus</i>	1000 ⁵	Mature coniferous forest, Europe and Asia	Marshall & Edwards-Jones 1998 (primary data, Mueller 1981, and Gjerde and Wegge 1989)
Capercaillie	<i>Tetrao urogallus</i> L.	48	Old boreal forest	Rolstad and Wegge 1987
California thrasher	<i>Toxostoma redivivum</i>	1.25	Chapparel in an urban matrix, southern California	Soule 1988
California thrasher	<i>Toxostoma redivivum</i>	5.61 ⁴	Chapparel in an urban matrix, southern California	Soule 1988
California thrasher	<i>Toxostoma redivivum</i>	50%	Chapparel in an urban matrix, southern California	Soule 1988
Greater Prairie-Chicken	<i>Tympanuchus cupido</i>	77	Tallgrass prairie, SW Missouri	Winter and Faaborg 1999
Greater prairie-chickens	<i>Tympanuchus cupido pinnatus</i>	1800 ⁵	Agriculture and grazing, Wisconsin	Niemuth 2000
Greater prairie-chickens	<i>Tympanuchus cupido pinnatus</i>	260-2024		Niemuth 2000 (review)
Black-whiskered vireo	<i>Vireo altiloquus</i>	0.2	Tropical deciduous forest, upper Florida keys	Sinclair et al. 1995
White-eyed vireo	<i>Vireo griseus</i>	2.3	Tropical deciduous forest, upper Florida keys	Sinclair et al. 1995
White-throated sparrow	<i>Zonotrichia albicollis</i>	~30%	Forest patches in agricultural matrix, near Ottawa, Canada	Villard et al. 1999
Japanese white-eye	<i>Zosterops japonica</i>	20 ⁴	Urban woodland, Japan	Natuhara & Imai 1999

1. Refers to minimum patch size in which members of the species were found, unless otherwise noted. Measurements given in hectares, or percentage of landscape that was available habitat.

2. All locations are in the United States unless otherwise noted.

3. Citations in parenthesis denote the sources which the authors referenced.

4. Size threshold below which species is not present in all patches. Smallest occupied patch was 0.3 ha.

5. Appropriate minimum area in which a stable population can be maintained.

6. Smallest patch on which species was found to breed.

7. Threshold amount of urbanization above which species is not found.

Table D-4. Critical patch sizes for birds.

Common Species Name	Scientific Species Name	Critical Patch Size (ha) ¹	Habitat Type / Location ²	Source ³
8. Patches smaller than these were found to be population sinks.				
9. Area required for population of 50 to be independently viable and persist in the short-term.				
10. Males only.				