Lynx canadensis - Kerr, 1792
Canadian Lynx
Other Related Name(s): *Felis canadensis* ;*Felis lynx canadensis* ;*Felis lynx*
Related ITIS Name(s): *Lynx canadensis* Kerr, 1792 (TSN 180585)
Unique Identifier: ELEMENT_GLOBAL.2.102126
Element Code: AMAJH03010
Informal Taxonomy: Animals, Vertebrates - Mammals - Carnivores

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Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Mammalia	Carnivora	Felidae	Lynx

Genus Size: B - Very small genus (2-5 species)

Check this box to expand all report sections: ☐

Concept Reference

Concept Reference: Wilson, D. E., and D. M. Reeder (editors). 1993. Mammal Species of the World: a Taxonomic and Geographic Reference. Second Edition. Smithsonian Institution Press, Washington, DC. xviii + 1206 pp. Available online at: http://www.nmnh.si.edu/msw/.
Concept Reference Code: B93WIL01NAUS
Name Used in Concept Reference: *Lynx canadensis*
Taxonomic Comments: Placed in the genus *Felis* by some authors. Some authors regard *L. lynx*, *L. canadensis*, and *L. pardinus* as conspecific (see Tumlison 1987). Jones et al. (1992) treated *L. canadensis* and *L. lynx* as conspecific. Baker et al. (2003) amd Wozencraft (in Wilson and Reeder 1993, 2005) recognized *L. canadensis* (North America), *L. lynx* (Eurasia), and *L. pardinus* (Portugal, Spain) as separate species.

Conservation Status

NatureServe Status

Global Status: G5
Global Status Last Reviewed: 21Feb2000
Global Status Last Changed: 19Nov1996
Rounded Global Status: G5 - Secure
Reasons: Large range in northern North America; declines have occurred in some populations, but apparently still widespread and relatively abundant in most of historic range, though population data are lacking for many areas; habitat loss/fragmentation and susceptibility to overharvest are the major concerns.

In the contiguous U.S., overall numbers and range are substantially reduced from historical levels. At present, numbers have not recovered from overexploitation by both regulated and unregulated harvest that occurred in the 1970s and 1980s. Forest management practices that result in the loss of diverse age structure, fragmentation, roading, urbanization, agriculture, recreational developments, and unnatural fire frequencies have altered suitable habitat in many areas. As a result, many states may have insufficient habitat quality and/or quantity to sustain lynx or their prey. Human access into habitat has increased dramatically over the last few decades contributing to direct and indirect mortality and displacement from suitable habitat. Although legal take is highly restricted, existing regulatory

mechanisms may be inadequate to protect small, remnant populations or to conserve habitat. Competition with bobcats and coyotes may be a concern in some areas.

Nation: United States

National Status: N4?

Nation: Canada

National Status: N5 (11Jan2000)

U.S. & Canada State/Province Status	
United States	Alaska (S4), Colorado (S1), Idaho (S1), Indiana (SX), Maine (S2), Massachusetts (SX), Michigan (S1), Minnesota (SNR), Montana (S3), Nevada (SX), New Hampshire (S1), New York (SX), North Dakota (SU), Ohio (SX), Oregon (S1?), Pennsylvania (SX), Utah (S1), Vermont (S1?), Washington (S1), Wyoming (S1)
Canada	Alberta (S4), British Columbia (S4), Labrador (S4), Manitoba (S5), New Brunswick (S1), Newfoundland Island (S3S4), Northwest Territories (SNR), Nova Scotia (S1), Nunavut (SNR), Ontario (S5), Prince Edward Island (SX), Quebec (S5), Saskatchewan (S5), Yukon Territory (S5)

Other Statuses

Implied Status under the U.S. Endangered Species Act: PS:LT

U.S. Fish & Wildlife Service Lead Region: R6 - Rocky Mountain

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Not at Risk (01May2001)

IUCN Red List Category: LC - Least concern

Convention on International Trade in Endangered Species Protection Status (CITES): Appendix II

Comments on official statuses: USFWS (Federal Register, 26 August 1994) found that federal listing of the North American population may be warranted and initiated a formal status review. USFWS (Federal Register, 27 May 1997) determined that listing of the contiguous U.S. population is warranted but precluded by other higher priority actions. USFWS (Federal Register, 8 July 1998) proposed listing the U.S. lower 48 population segment as threatened. USFWS (Federal Register, 8 July 1999) extended for not more than six months a decision to list the contiguous United State population segment as a threatened species; this extension was made to allow time to resolve a dispute over the status of the U.S. lower 48 lynx population. USFWS (2000) determined threatened status for the contiguous U.S. distinct population segment of *L. canadensis*.

USFWS (2006) designated critical habitat for the contiguous U.S. distinct population segment. In total, approximately 1.841 square miles (4,768 square kilometers) fall within the boundaries of the critical habitat designation, in three units in the States of Minnesota, Montana and Washington (Federal Register, 9 November 2006).

NatureServe Global Conservation Status Factors

Range Extent: >2,500,000 square km (greater than 1,000,000 square miles)

Range Extent Comments: Throughout Alaska and Canada (except arctic islands) south through the Rocky Mountains, northern Great Lakes region, and northern New England. Also northern Eurasia if regarded as conspecific with LYNX LYNX (=FELIS LYNX). See U.S. Fish and Wildlife Service (1998) for information on distribution and relative abundance in the contiguous U.S. Considered historically resident in 16 states represented by five ecologically distinct regions: Cascade Range (Washington, Oregon), northern Rocky Mountains (northeastern Washington, southeastern Oregon, Idaho, Montana, western Wyoming, northern Utah), southern Rocky Mountains (southeastern Wyoming, Colorado), northern Great Lakes (Minnesota, Wisconsin, Michigan), and northern New England (Maine, New Hampshire, Vermont, New York, Pennsylvania, Massachusetts). Resident populations currently exist only in Maine, Montana, Washington, and possibly Minnesota; considered extant but no longer sustaining self-support populations in Wisconsin, Michigan, Oregon, Idaho, Wyoming, Utah, and Colorado; may be extirpated from New Hampshire, Vermont, New York, Pennsylvania, and Massachusetts (U.S. Fish and Wildlife Service 1998). See Stardom (1988 COSEWIC report) for information on distribution and relative abundance in Canada, where still widespread and relatively abundant in most of historic range. See USFWS (2000) for a state-by-state review of historical and current distribution.

Number of Occurrences: 81 to >300

Number of Occurrences Comments: Unknown, but numerous--Nearctic (or Holarctic) distribution.

Population Size: 10,000 to >1,000,000 individuals

Population Size Comments: Total population size is unknown, but it varies cyclically with availability of food; total probably is at least in the hundreds of thousands during population peaks, based on annual harvests in Canada that periodically exceed 50,000 (Nowak 1991). British Columbia population was estimated to vary between 200,000 and 250,000 (Goodchild and Munro 1980). See Stardom (1988 COSEWIC report) for information on status in Canada. In the contiguous U.S., total population size is unknown, but probably less than 2,000. Colorado: only 18 positive recordrds; none since 1973; proposing to reintroduce lynx (Colorado Division of Wildlife 1997). Idaho: less than 100 individuals (C. Harris, pers. comm., 1997). Maine: less than 200 individuals (C. McLaughlin, pers. comm., 1997). Oregon: perhaps fewer than 75 individuals (E. Gaines, pers. comm., 1997). Utah: very rare, few if any extant occurrences (G. Oliver, pers. comm., 1997). Montana: 740-1040 individuals (B. Giddings, pers. comm., 1998). Washington: 72-191 individuals (Washington Department of Wildlife 1993, Washington Department of Natural Resources 1996). Wyoming: less than 100 individuals (B. Oakleaf, pers. comm., 1998). Periodic increases in lynx numbers may be accentuated by dispersal of transient animals from Canadian populations (U.S. Fish and Wildlife Service 1998). It has been suggested that, because lynx occurrence throughout much of the continguous U.S. is on the southern periphery of the species' range, the presence of lynx is solely a consequence of dispersal from Canada and that most of the U.S. may never have supported self-sustaining, resident populations over time (U.S. Fish and Wildlife

Service 1998).

Overall Threat Impact Comments: In determining threatened status for the contiguous U.S. distinct population segment, USFWS (2000) cited the inadequacy of existing regulatory mechanisms. "Current U.S. Forest Service Land and Resource Management Plans include programs, practices, and activities within the authority and jurisdiction of federal land management agencies that may threaten lynx or lynx habitat. The lack of protection for lynx in these plans render[s] them inadequate to protect the species" (USFWS 2000). Past extensive logging that eliminated habitat for lynx and snowshoe hare was detrimental. Habitat has been lost due to suppression of forest fires and ecological succession to habitats that no longer support snowshoe hare and lynx. Fragmentation, due to forestry, agriculture, and roads, and the subsequent isolation of suitable habitat is a concern. Lack of immigration from Canadian lynx populations is an important factor in some regions. Past excessive trapping of lynx (as recently as the 1970s and 1980s) depressed populations and may have been detrimental to local lynx populations in Washington (see U.S. Forest Service et al. 1993) and elsewhere (U.S. Fish and Wildlife Service 1998). Road construction causes habitat fragmentation and allows increased human access into lynx habitat; this may increase lynx mortality by facilitating access to hunters and trappers (although there is no legal harvest except for two lynx per year in Montana); incidental harvest of lynx in the course of legal trapping/hunting for other species may be a problem in some areas. Increased winter recreation (snowmobiles, ski area development) may be causing displacement and/or incidental mortality of lynx. Habitat changes and increased access into lynx habitats has resulted in increased competition and displacement of lynx by bobcat and coyote in some areas.

Short-term Trend Comments: Regionally variable. Local densities fluctuate with hare densities in core of range in Alaska and Canada; this has not been demonstrated for populations on the southern periphery of the range in the contiguous U.S. Periodic increases in lynx numbers in the contiguous United States may be accentuated by dispersal of transient animals from Canadian populations. USFWS (2000) presented a state by state review of status in the contiguous U.S.

Other NatureServe Conservation Status Information

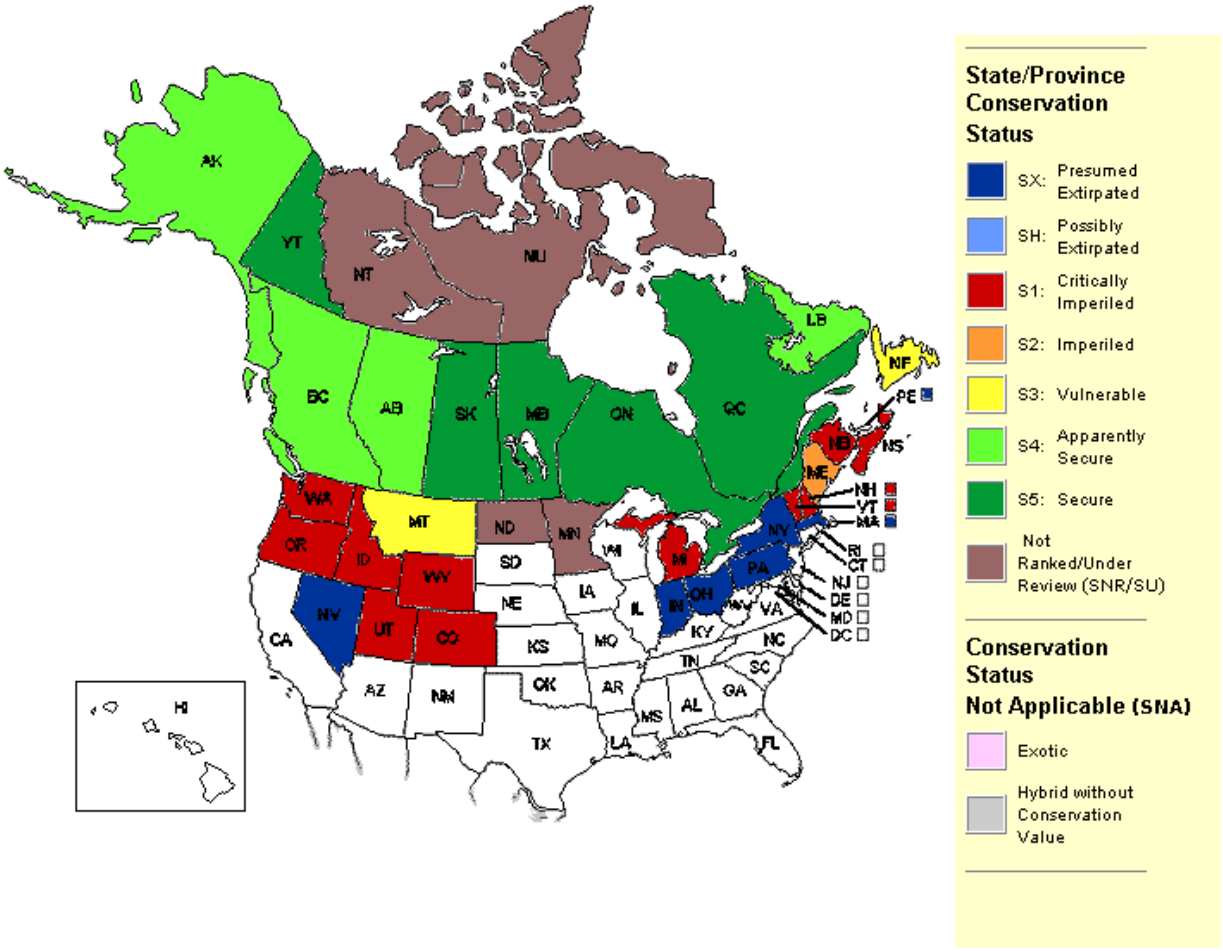
Inventory Needs: Continue monitoring of populations.

Protection Needs: Protect from overharvest.

Distribution

Global Range: (>2,500,000 square km (greater than 1,000,000 square miles)) Throughout Alaska and Canada (except arctic islands) south through the Rocky Mountains, northern Great Lakes region, and northern New England. Also northern Eurasia if regarded as conspecific with LYNX LYNX (=FELIS LYNX). See U.S. Fish and Wildlife Service (1998) for information on distribution and relative abundance in the contiguous U.S. Considered historically resident in 16 states represented by five ecologically distinct regions: Cascade Range (Washington, Oregon), northern Rocky Mountains (northeastern Washington, southeastern Oregon, Idaho, Montana, western Wyoming, northern Utah), southern Rocky Mountains (southeastern Wyoming, Colorado), northern Great Lakes (Minnesota, Wisconsin, Michigan), and northern New England (Maine, New Hampshire, Vermont, New York, Pennsylvania, Massachusetts). Resident populations currently exist only in Maine, Montana, Washington, and possibly Minnesota; considered extant but no longer sustaining self-support populations in Wisconsin, Michigan, Oregon, Idaho, Wyoming, Utah, and Colorado; may be extirpated from New Hampshire, Vermont, New York, Pennsylvania, and Massachusetts (U.S. Fish and Wildlife Service 1998). See Stardom (1988 COSEWIC report) for information on distribution and relative abundance in Canada, where still widespread and relatively abundant in most of historic range. See USFWS (2000) for a state-by-state review of historical and current distribution.

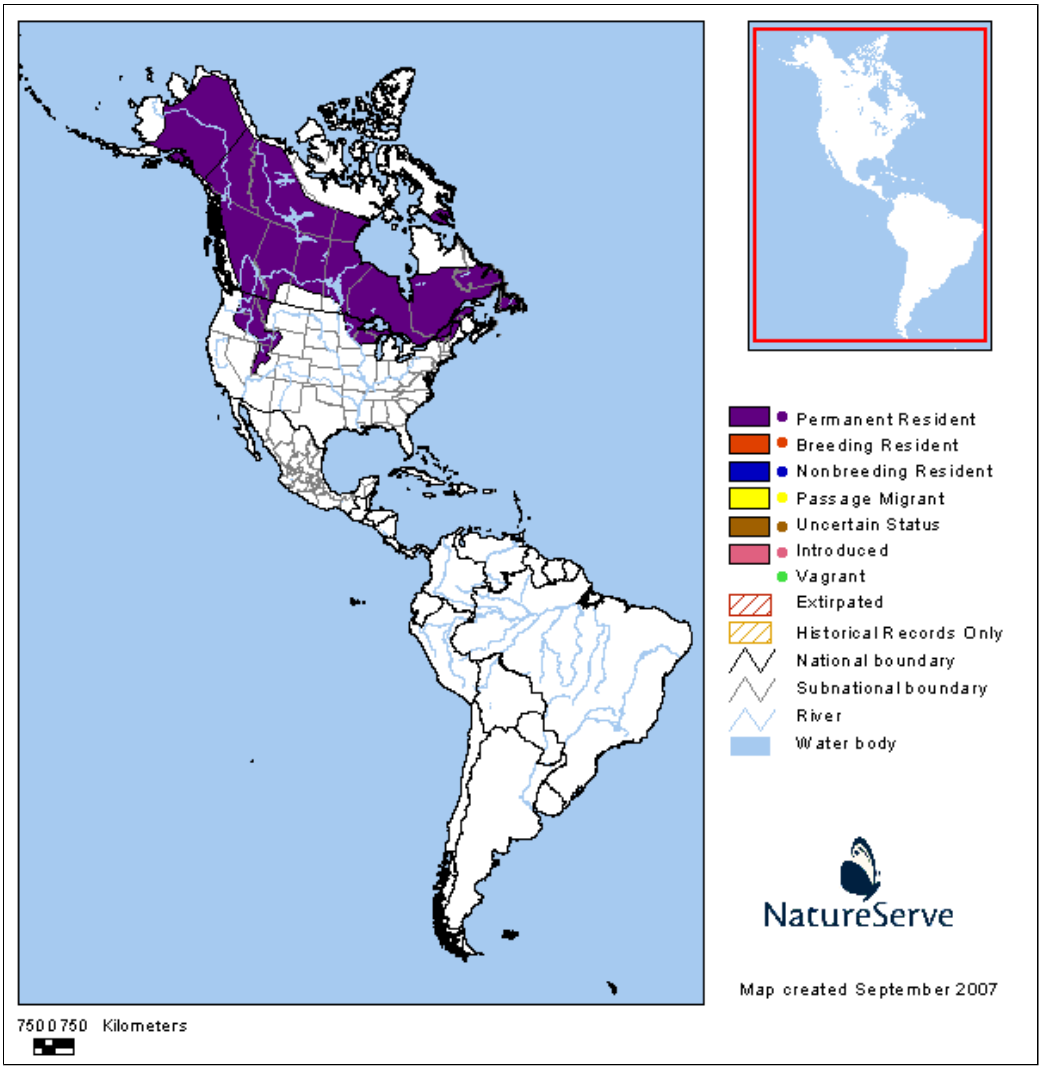
U.S. States and Canadian Provinces



Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	AK, CO, ID, IN, MA, ME, MI, MN, MT, ND, NH, NV, NY, OH, OR, PA, UT, VT, WA, WY
Canada	AB, BC, LB, MB, NB, NF, NS, NT, NU, ON, PE, QC, SK, YT

Range Map
Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: Sechrest, 2002

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
CO	Archuleta (08007), Chaffee (08015)*, Clear Creek (08019)*, Conejos (08021)*, Costilla (08023), Eagle (08037), Garfield (08045), Grand (08049)*, Gunnison (08051)*, Hinsdale (08053)*, Huerfano (08055), Jackson (08057)*, La Plata (08067)*, Lake (08065)*, Larimer (08069), Mineral (08079), Moffat (08081)*, Montezuma (08083), Ouray (08091)*, Park (08093)*, Pitkin (08097)*, Rio Blanco (08103)*, Routt (08107), San Juan (08111)*, Summit (08117)
ID	Adams (16003), Bannock (16005)*, Bear Lake (16007), Benewah (16009), Blaine (16013), Boise (16015), Bonner (16017), Bonneville (16019), Boundary (16021), Butte (16023)*, Camas (16025), Caribou (16029)*, Cassia (16031), Clark (16033), Clearwater (16035), Custer (16037), Elmore (16039), Franklin (16041), Fremont (16043), Idaho (16049), Jerome (16053)*, Kootenai (16055), Latah (16057), Lemhi (16059), Nez Perce (16069), Oneida (16071)*, Power (16077), Shoshone (16079), Teton (16081), Twin Falls (16083)*, Valley (16085)
MI	Keweenaw (26083)*, Mackinac (26097)*
MT	Beaverhead (30001), Broadwater (30007), Carbon (30009), Cascade (30013), Deer Lodge (30023), Flathead (30029), Gallatin (30031), Glacier (30035), Granite (30039), Jefferson (30043), Judith Basin (30045), Lake (30047), Lewis and Clark (30049), Lincoln (30053), Madison (30057)*, Meagher (30059), Mineral (30061), Missoula (30063), Park (30067), Pondera (30073), Powell (30077), Ravalli (30081), Sanders (30089), Silver Bow (30093), Stillwater (30095), Sweet Grass (30097), Teton (30099), Wheatland (30107)
ND	Foster (38031)*, Stutsman (38093)*
OR	Wallowa (41063)
PA	Tioga (42117)*
UT	Cache (49005), Daggett (49009)*, Emery (49015), Sanpete (49039), Sevier (49041), Summit (49043)*, Uintah (49047)*, Wasatch (49051)*

WA	Pend Oreille (53051)
WY	Albany (56001), Carbon (56007), Fremont (56013), Hot Springs (56017), Johnson (56019), Lincoln (56023), Park (56029), Sublette (56035), Teton (56039), Uinta (56041)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
02	Pine (02050205)+
04	Carp-Pine (04070002)+
09	Middle Sheyenne (09020203)+
10	Red Rock (10020001)+, Beaverhead (10020002)+, Big Hole (10020004)+, Jefferson (10020005)+, Boulder (10020006)+, Madison (10020007)+, Gallatin (10020008)+, Upper Missouri (10030101)+, Upper Missouri-Dearborn (10030102)+, Smith (10030103)+, Sun (10030104)+, Belt (10030105)+, Two Medicine (10030201)+, Cut Bank (10030202)+, Teton (10030205)+, Arrow (10040102)+, Judith (10040103)+, Upper Musselshell (10040201)+, Milk Headwaters (10050001)+, Yellowstone Headwaters (10070001)+, Upper Yellowstone (10070002)+, Shields (10070003)+, Stillwater (10070005)+, Clarks Fork Yellowstone (10070006)+, Upper Wind (10080001)+, Little Wind (10080002)+, Popo Agie (10080003)+, Upper Bighorn (10080007)+, North Fork Shoshone (10080012)+, South Fork Shoshone (10080013)+, Clear (10090206)+, James Headwaters (10160001)+, North Platte Headwaters (10180001)+, Upper North Platte (10180002)+, Medicine Bow (10180004)+, Upper Laramie (10180010)+, Horse (10180012)+, South Platte Headwaters (10190001)+, Upper South Platte (10190002)+, Clear (10190004)+, Cache La Poudre (10190007)+
11	Arkansas Headwaters (11020001)+, Huerfano (11020006)+
13	Alamosa-Trinchera (13010002)+, Conejos (13010005)+, Rio Chama (13020102)+
14	Colorado headwaters (14010001)+, Blue (14010002)+, Eagle (14010003)+, Roaring Fork (14010004)+, Colorado headwaters-Plateau (14010005)+, East-Taylor (14020001)+, Upper Gunnison (14020002)+, North Fork Gunnison (14020004)+, Uncompahange (14020006)+, Upper Dolores (14030002)+, Upper Green (14040101)+, New Fork (14040102)+, Upper Green-Flaming Gorge Reservoir (14040106)+, Blacks Fork (14040107)+, Upper Yampa (14050001)+, Little Snake (14050003)+, Upper White (14050005)+, Ashley-Brush (14060002)+, Strawberry (14060004)+, San Rafael (14060009)+, Fremont (14070003)+, Upper San Juan (14080101)+, Piedra (14080102)+, Animas (14080104)+, Middle San Juan (14080105)+, Mancos (14080107)+
16	Upper Bear (16010101)+, Central Bear (16010102)+, Bear Lake (16010201)+, Middle Bear (16010202)+, Lower Bear-Malad (16010204)+, Provo (16020203)+
17	Upper Kootenai (17010101)+, Fisher (17010102)+, Yaak (17010103)+, Lower Kootenai (17010104)+, Moyie (17010105)+, Upper Clark Fork (17010201)+, Flint-Rock (17010202)+, Blackfoot (17010203)+, Middle Clark Fork (17010204)+, Bitterroot (17010205)+, North Fork Flathead (17010206)+, Middle Fork Flathead (17010207)+, Flathead Lake (17010208)+, South Fork Flathead (17010209)+, Stillwater (17010210)+, Swan (17010211)+, Lower Flathead (17010212)+, Lower Clark Fork (17010213)+, Pend Oreille Lake (17010214)+, Priest (17010215)+, Pend Oreille (17010216)+, Upper Coeur D'alene (17010301)+, South Fork Coeur D'alene (17010302)+, Coeur D'alene Lake (17010303)+, St. Joe (17010304)+, Upper Spokane (17010305)+, Hangman (17010306)+, Snake headwaters (17040101)+, Gros Ventre (17040102)+, Greys-Hobock (17040103)+, Palisades (17040104)+, Salt (17040105)+, Upper Henrys (17040202)+, Lower Henrys (17040203)+, Teton (17040204)+, Willow (17040205)+, Blackfoot (17040207)+, Portneuf (17040208)+, Lake Walcott (17040209)+, Raft (17040210)+, Upper Snake-Rock (17040212)+, Beaver-Camas (17040214)+, Medicine Lodge (17040215)+, Little Lost (17040217)+, Big Lost (17040218)+, Big Wood (17040219)+, Little Wood (17040221)+, North and Middle Forks Boise (17050111)+, Boise-Mores (17050112)+, South Fork Boise (17050113)+, South Fork Payette (17050120)+, North Fork Payette (17050123)+, Lower Snake-Asotin (17060103)+, Palouse (17060108)+, Upper Salmon (17060201)+, Pahsimeroi (17060202)+, Middle Salmon-Panther (17060203)+, Lemhi (17060204)+, Upper Middle Fork Salmon (17060205)+, Lower Middle Fork Salmon (17060206)+, Middle Salmon-Chamberlain (17060207)+, South Fork Salmon (17060208)+, Lower Salmon (17060209)+, Little Salmon (17060210)+, Upper Selway (17060301)+, Lower Selway (17060302)+, Lochsa (17060303)+, Middle Fork Clearwater (17060304)+, South Fork Clearwater (17060305)+, Clearwater (17060306)+, Upper North Fork Clearwater (17060307)+, Lower North Fork Clearwater (17060308)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A medium-sized cat.
Reproduction Comments: Breeds in late winter-early spring in North America. Gestation lasts 62-74 days. Litter size averages 3-4; adult females produce one litter every 1-2 years. Young stay with mother until next mating season or longer. Some females give birth as yearlings, but their pregnancy rate is lower than that of older females (Brainerd 1985). Prey scarcity suppresses breeding and may result in mortality of nearly all young (Brand and Keith 1979).
Ecology Comments: Home range increases, and individuals may become nomadic, when prey is scarce (Ward and Krebs 1985, Saunders 1963, Mech 1980). Range of male (average often about 15-30 sq km, but up to hundreds of sq km in Alaska and Minnesota)

is larger than that of female. Spatial organization observed prior to low hare densities in Northwest Territories may be described as a land-tenure system, based on prior residency, and may have served to regulate density during peak prey levels (Poole 1995). Long distance dispersal movements of up to several hundred kilometers have been recorded.

Population density usually is less than 10 (locally up to 20) per 100 sq km, depending on prey availability. Mean densities range between 2 and 9 per 100 sq km (McCord and Cardoza 1982).

Usually solitary.
Non-Migrant: Y
Locally Migrant: N
Long Distance Migrant: N
Palustrine Habitat(s): FORESTED WETLAND
Terrestrial Habitat(s): Alpine, Forest - Conifer, Forest - Mixed, Tundra, Woodland - Conifer, Woodland - Mixed
Habitat Comments: Generally occurs in boreal and montane regions dominated by coniferous or mixed forest with thick undergrowth, but also sometimes enters open forest, rocky areas, and tundra to forage for abundant prey. When inactive or birthing, occupies den typically in hollow tree, under stump, or in thick brush. Den sites tend to be in mature or old growth stands with a high density of logs (Koehler 1990, Koehler and Brittell 1990).

U.S. Forest Service et al. (1993) listed three primary habitat components for lynx in the Pacific Northwest: (1) foraging habitat (15-35-year-old lodgepole pine) to support snowshoe hare and provide hunting cover, (2) denning sites (patches of >200-year-old spruce and fir, generally less than 5 acres, and (3) dispersal/travel cover (variable in vegetation composition and structure).

Major limiting factor is abundance of snowshoe hare, which in turn is limited by availability of winter habitat (in the Pacific Northwest, primarily early successional lodgepole pine with trees at least 6 feet tall) (U.S. Forest Service et al. 1993).
Adult Food Habits: Carnivore
Immature Food Habits: Carnivore
Food Comments: Eats primarily small mammals and birds, particularly LEPUS AMERICANUS. Occasionally feeds on squirrels, small mammals, beaver, deer, moose, muskrat, and birds; some taken as carrion. May cache food for later use.
Adult Phenology: Crepuscular, Nocturnal
Immature Phenology: Crepuscular, Nocturnal
Phenology Comments: Mainly nocturnal. Most active from 2 hours after sunset to one hour after sunrise (Banfield 1974).
Length: 107 centimeters
Weight: 18100 grams

Economic Attributes

Not yet assessed

Management Summary

Management Requirements: Trapping may be major source of mortality; such mortality is in addition to natural mortality during times of low hare abundance and low recruitment (Brittell et al. 1989). Refugia not subject to trapping may be important in maintaining populations during periods of low recruitment (Ward and Krebs 1985).

For the Pacific Northwest, U.S. Forest Service et al. (1993) recommended the following actions within known lynx range: (1) minimizing road construction, closing unused roads, and maintaining roads to the minimum standard possible, (2) using prescribed fire to maintain forage for snowshoe hare in juxtaposition with hunting cover for lynx, (3) designating areas to be closed to kill trapping of any furbearer to avoid incidental lynx mortality to maintain population refugia for lynx in key areas, (4) planning for kill-trapping closure on a wider basis if data indicate a declining lynx population as a result of incidental trapping mortality, and (5) developing and implementing a credible survey and monitoring stretegy to determine the distribution of lynx throughout its potential range.
Management Research Needs: Develop accurate and reliable population size and trend indices.

Initiate intensive long-term studies of populations with known sex and age structure, reproductive activities, home ranges, habitat use, food habits, trends in prey species and interactions with other predators; such areas should then be tested with closely regulated harvest programs to determine optimal management strategies (McCord and Cardoza 1982).

Population/Occurrence Delineation

Use Class: Not applicable
Minimum Criteria for an Occurrence: Evidence of historical presence, or current and likely recurring presence, at a given location. Such evidence minimally includes collection or reliable observation and documentation of one or more individuals in appropriate habitat where the species is presumed to be established and breeding.

Separation Barriers: None.

Alternate Separation Procedure: Occurrences generally should be based on major occupied physiographic or ecogeographic units that are separated along areas of relatively low lynx density or use (e.g., major urban areas, very rugged alpine ridges, very wide bodies of water). These units may be based on available lynx sightings/records or on movements of radio-tagged individuals, or they may be based on the subjective determinations by biologists familiar with lynx and their habitats. Where occupied habitat is exceptionally extensive and continuous, that habitat may be subdivided into multiple contiguous occurrences as long as that does not reduce the occurrence rank (i.e., do not split up an A occurrence into multiple occurrences that would be ranked less than A).
Separation Justification: Lynx are highly mobile and, during prey scarcity, may disperse 100 km or more. Populations and metapopulations tend to encompass large areas. Hence, meaningful occurrences should represent large occupied landscape units, but these often will not be demographically isolated from other occurrences.

Inferred Minimum Extent of Habitat Use (when actual extent is unknown): 6 km
Inferred Minimum Extent Justification: Based on a home range of 30 square kilometers.
Date: 28Sep2004

Author: Hammerson, G., and S. Cannings

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank) Not yet assessed

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 17Feb2000
NatureServe Conservation Status Factors Author: Harris, C. E., E. W. West, F. Dirrigl, Jr., and G. Hammerson
Element Ecology & Life History Edition Date: 13Sep1995
Element Ecology & Life History Author(s): Hammerson, G.

Zoological data developed by NatureServe and its network of natural heritage programs (see **Local Programs**) and other contributors and cooperators (see **Sources**).

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IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. IUCN, Conservation International, and NatureServe, Washington, DC and Arlington, Virginia, USA.

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NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Haliaeetus leucocephalus - (Linnaeus, 1766)
Bald Eagle
Related ITIS Name(s): *Haliaeetus leucocephalus* (Linnaeus, 1766) (TSN 175420)
Unique Identifier: ELEMENT_GLOBAL.2.104470
Element Code: ABNKC10010
Informal Taxonomy: Animals, Vertebrates - Birds - Other Birds


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Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Accipitriformes	Accipitridae	Haliaeetus

Genus Size: C - Small genus (6-20 species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, D.C. [as modified by subsequent supplements and corrections published in *The Auk*]. Also available online: http://www.aou.org/.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: *Haliaeetus leucocephalus*
Taxonomic Comments: The two subspecies, *Haliaeetus leucocephalus leucocephalus* (southern U.S. and Baja California) and *H. l. alascanus* (northern U.S. and Canada) intergrade broadly in the central and northern U.S. Constitutes a superspecies with *H. albicilla* (AOU 1998).

Conservation Status

NatureServe Status

Global Status: G5
Global Status Last Reviewed: 11Mar2005
Global Status Last Changed: 11Mar2005
Rounded Global Status: G5 - Secure
Reasons: Widespread distribution in North America; large numbers of occurrences, many of high quality, particularly in Alaska and British Columbia, but suffered great decline in southern and eastern part of range earlier this century; still susceptible to a number of threats, particularly environmental contaminants and excessive disturbance by humans; recent rangewide improvement in numbers and the protection offered by governments prevent it from being ranked any higher.
Nation: United States
National Status: N5B,N5N
Nation: Canada
National Status: N5B,N5N (09Feb2012)

U.S. & Canada State/Province Status	
United States	Alabama (S3B), Alaska (S5), Arizona (S2S3B,S4N), Arkansas (S2B,S4N), California (S2), Colorado (S1B,S3N), Connecticut (S1B,S3N), Delaware (S2B,S3N), District of Columbia (S2N,SXB), Florida (S3), Georgia (S2), Idaho (S3B,S4N), Illinois (S2B,S3N), Indiana (S2), Iowa (S3B,S3N), Kansas (S2B,S4N), Kentucky (S2B,S2S3N), Louisiana (S2N,S3B), Maine (S4B,S4N), Maryland (S2S3B), Massachusetts (S2B,S3N), Michigan (S4), Minnesota (S3B,S3N), Mississippi (S2B,S2N), Missouri (S3), Montana (S3), Navajo Nation (S2S3N), Nebraska (S3), Nevada (S1B,S3N), New Hampshire (S2), New Jersey (S1B,S1N), New Mexico (S1B,S4N), New York (S2S3B,S2N), North Carolina (S3B,S3N), North Dakota (S1), Ohio (S2),

	Oklahoma (S1S3), Oregon (S4B,S4N), Pennsylvania (S2B), Rhode Island (S1B,S1N), South Carolina (S2), South Dakota (S1B,S2N), Tennessee (S3), Texas (S3B,S3N), Utah (S1B,S3N), Vermont (S1B,S2N), Virginia (S2S3B,S3N), Washington (S4B,S4N), West Virginia (S2B,S3N), Wisconsin (S4B,S4N), Wyoming (S3B,S5N)
Canada	Alberta (S4), British Columbia (S5B,S5N), Labrador (S4B), Manitoba (S4S5B), New Brunswick (S3B), Newfoundland Island (S4B), Northwest Territories (S4S5B), Nova Scotia (S4), Nunavut (SNRN), Ontario (S2N,S4B), Prince Edward Island (S4), Quebec (S3S4), Saskatchewan (S5B,S4M,S4N), Yukon Territory (S4B)

Other Statuses

U.S. Fish & Wildlife Service Lead Region: R3 - North Central
Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Not at Risk (01Apr1984)
IUCN Red List Category: LC - Least concern
Convention on International Trade in Endangered Species Protection Status (CITES): Appendix II

NatureServe Global Conservation Status Factors

Range Extent: >2,500,000 square km (greater than 1,000,000 square miles)
Range Extent Comments: Breeding range extends from central Alaska, northern Yukon, northwestern and southern Mackenzie, northern Saskatchewan, northern Manitoba, central Ontario, central Quebec, Labrador, and Newfoundland south locally to the Commander and Aleutian Islands, southern Alaska, Baja California (both coasts), Sonora (Brown et al. 1988), New Mexico, Arizona, Texas Gulf Coast, and Florida (including the Keys); breeding is very localized in the Great Basin and prairie and plains regions in interior North America, where the the breeding range recently has expanded to include Nebraska and Kansas. In Arizona, nesting occurs primarily along the Salt and Verde rivers in the central part of the state; only a few pairs nest in the western part of the state (http://www.swbemc.org/nest_sites.html). In Nevada, the few nesting pairs are primarily in the west-central part of the state, with another nesting area in extreme southern Elko County (GBBO 2010).

In the nonbreeding season, bald eagles occur generally throughout the breeding range except in the far north (AOU 1983, Sibley and Monroe 1990), most commonly from southern Alaska and southern Canada southward. The Chilkat Bald Eagle Preserve, Alaska, supports the largest wintering population anywhere (Ehrlich et al. 1992). Winter concentrations occur in British Columbia-northwestern Washington, along the Missouri and Mississippi rivers, and in northern Arkansas. One of the largest fall (mid-October to mid-December) migrant concentrations (200-300 birds at any one time, close to a thousand individuals through the season) occurs at Hauser Lake near Helena, Montana.

Number of Occurrences: > 300
Number of Occurrences Comments: The total number of occupied territories (not equivalent to breeding area occurrences) in British Columbia and Alaska is probably at least 7,000 (Gerrard 1983); there are about 1,000 on Vancouver Island alone (British Columbia CDC 1993). Kjos (1992) estimated there were 3,014 occupied bald eagle territories in the lower 48 states.

Population Size: 100,000 - 1,000,000 individuals
Population Size Comments: Gerrard (1983) estimated that Alaska and British Columbia had approximately 48,000 bald eagles. Blood and Anweiler (1991) gave North American estimates of 70,000, with 21,000 in British Columbia. Alaska population is about 30,000, and perhaps almost that many occur in western Canada. Estimated number of breeding pairs in Canada in the early 1990s was 15,000-20,000 (Kirk et al. 1995). The reported number of nesting territories in the lower 48 states in 1990 was 3,014 (Kjos 1990). Population estimates (number of occupied territories) based on the 1990 breeding season survey were as follows: northern states, 1,165; Chesapeake Bay, 235; Pacific states, 861; southeastern states, 722; southwestern states, 27; total, 3,010 (USFWS 1990). In 1992, there were 149 nesting pairs in New England. Rich et al. (2004) estimated the global population at 330,000.

The winter count for 1992-1993 was about 400 in Maine, 70 in Massachusetts, 61 in Connecticut, 23 in New Hampshire, 12 in Vermont, and a few in Rhode Island (End. Sp. Tech. Bull. 18(2):20). Winter count in late 1980s yielded about 11,250 bald eagles in the lower 48 states.

See Busch (1988) for information on status in the southwestern United States. About 100-150 bald eagles winter in Nevada; only a few pairs nest in the state (Nevada Department of Wildlife, GBBO 2010). See Brown et al. (1988) for status in Sonora, Mexico.

Overall Threat Impact: Medium
Overall Threat Impact Comments: Major threats include habitat loss, disturbance by humans, biocide contamination, decreasing food supply, and illegal shooting (Evans 1982, Green 1985, Herkert 1992). In 1992, many died in northern Utah after eating poisoned bait set out by ranchers. Breeding success still is being affected by environmental contaminants in the diet along Lake Superior in Wisconsin (Kozie and Anderson 1991). Bio-accumulated mercury from fish or exposure to other pesticides may interfere with reproduction or cause direct mortality (see GBBO 2010). Greatest potential threats in Florida include urban development and commercial timber harvest (Wood et al. 1989). The Chilkat Bald Eagle Preserve, Alaska, which supports the largest wintering population anywhere, was threatened by a proposed copper mine in the early 1990s (Ehrlich et al. 1992). See Witmer and O'Neil (1990) for information on estimating cumulative impacts of multiple hydroelectric development and logging activities in Washington. See Montopoli and Anderson (1991) for a model used to evaluate the cumulative effects of selected forms of human disturbance in the Greater Yellowstone ecosystem. As of the mid-1990s, the population in the southwestern United States continued to face threats and required intensive management to maintain current population levels (1994 End. Sp. Tech. Bull. 19(5):18).

Generally susceptible to human intrusion, but "show a high degree of adaptability and tolerance if the human activity is not directed

toward them" (Beebe 1974). However, chronic disturbance results in disuse of areas by eagles (Fraser 1985).

In Arizona, mortality from shooting, entanglement in monofilament, and heat stress continue to affect population expansion (J. T. Driscoll, in Corman and Wise-Gervais 2005).

Short-term Trend: Relatively stable to increase of 25%

Long-term Trend: Relatively stable to decline of 50%
Long-term Trend Comments: As of early 1990s, populations in many areas had rebounded from the low levels that occurred before DDT use was banned in the U.S. The population increase in recent years has been accomplished through protection and active management, as well as through enhanced reproduction after the DDT ban. Populations have been increasing in the contiguous 48 states: the number of nesting territories nearly tripled between 1980 and 1990 (Kjos 1992). In the lower 48 states, breeding population has doubled every 6-7 years since the late 1970s (USFWS, Federal Register, 12 July 1994, p. 35585). In Alaska and British Columbia numbers have been generally stable at about 48,000 (Gerrard 1983, Campbell et al. 1990). Populations are stable and "healthy" in Alaska and western Canada. As of the early 1980s, most Canadian populations were reasonably stable, and problem populations in southwestern Ontario and the maritime provinces were showing signs of recovery (Brownell and Oldham, 1984 COSEWIC report). Overall, populations have increased in Canada in recent decades (Kirk et al. 1995, Hunter and Baird 1995). A significant increase was recorded in migration counts in northeastern North America, 1972-1987 (Titus and Fuller 1990). The breeding population in the Chesapeake Bay region increased 12.6% per year from 1986 to 1990; the mean minimum survival rate of all eagles was 91%; however, eagle habitat there is being converted to human development at a rapid rate (Buehler et al. 1991). In California in the late 1980s, the winter population was stable, and the breeding population was increasing in numbers and range (California DF&G 1990). Bald eagle numbers in Arizona are now higher than ever recorded (due to intensive management), but nesting habitat is decreasing in the most productive areas, and some areas where eagles began to nest in the 1990s later were abandoned (J. T. Driscoll, in Corman and Wise-Gervais 2005).

Other NatureServe Conservation Status Information

Inventory Needs: Needs annual or biannual inventory until recovery goals are reached in the U.S. Then inventory could be reduced to longer (5-10 year) intervals at most locations.

Protection Needs: Acquisition of breeding territories is always a priority and is necessary for further improvement. Acquisition of other types of protection of winter foraging habitats and winter roosts advisable.

Distribution

Global Range: (>2,500,000 square km (greater than 1,000,000 square miles)) Breeding range extends from central Alaska, northern Yukon, northwestern and southern Mackenzie, northern Saskatchewan, northern Manitoba, central Ontario, central Quebec, Labrador, and Newfoundland south locally to the Commander and Aleutian Islands, southern Alaska, Baja California (both coasts), Sonora (Brown et al. 1988), New Mexico, Arizona, Texas Gulf Coast, and Florida (including the Keys); breeding is very localized in the Great Basin and prairie and plains regions in interior North America, where the the breeding range recently has expanded to include Nebraska and Kansas. In Arizona, nesting occurs primarily along the Salt and Verde rivers in the central part of the state; only a few pairs nest in the western part of the state (http://www.swbemc.org/nest_sites.html). In Nevada, the few nesting pairs are primarily in the west-central part of the state, with another nesting area in extreme southern Elko County (GBBO 2010).

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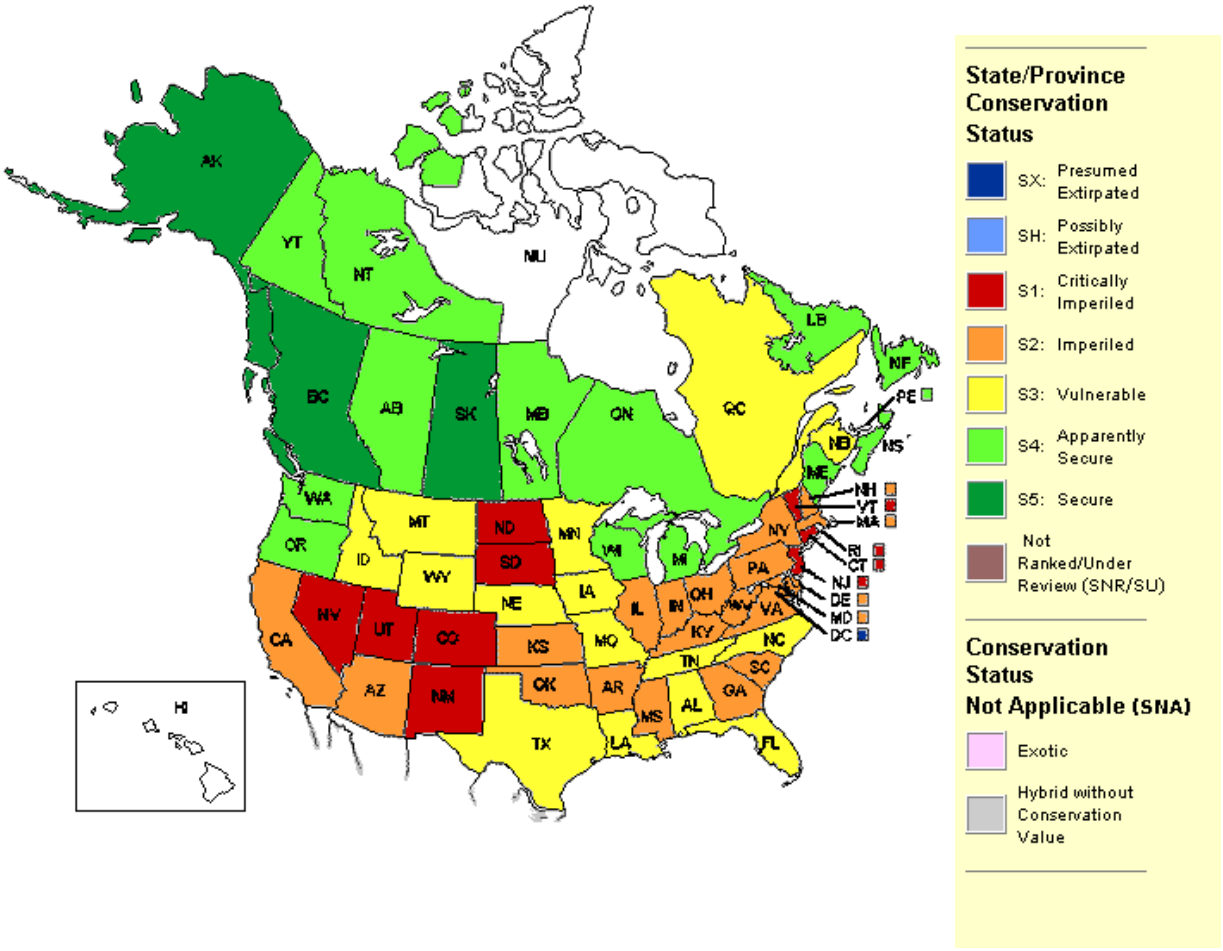
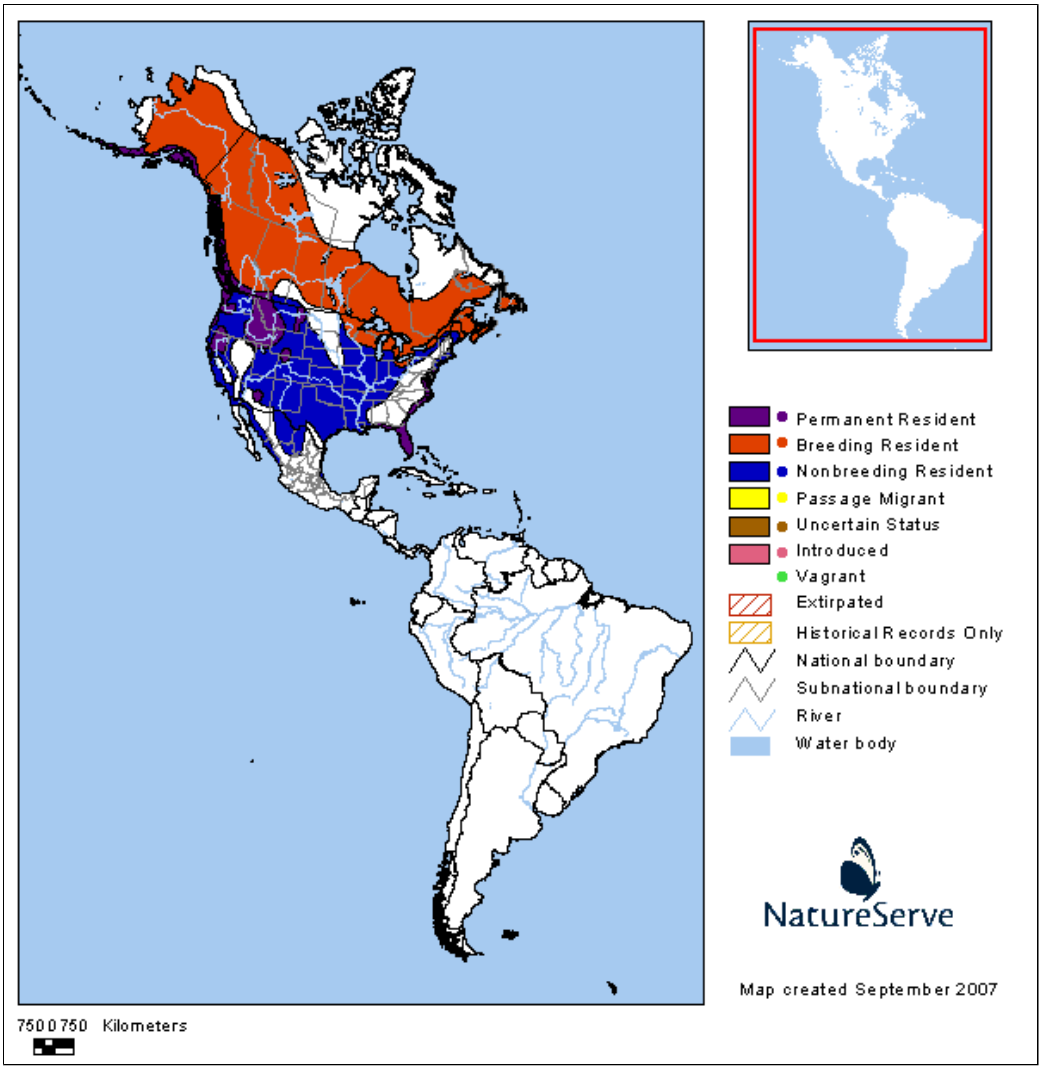
U.S. States and Canadian Provinces



NOTE: The maps for birds represent the breeding status by state and province. In some jurisdictions, the subnational statuses for common species have not been assessed and the status is shown as not-assessed (SNR). In some jurisdictions, the subnational status refers to the status as a non-breeder; these errors will be corrected in future versions of these maps. A species is not shown in a jurisdiction if it is not known to breed in the jurisdiction or if it occurs only accidentally or casually in the jurisdiction. Thus, the species may occur in a jurisdiction as a seasonal non-breeding resident or as a migratory transient but this will not be indicated on these maps. See other maps on this web site that depict the Western Hemisphere ranges of these species at all seasons of the year.
Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	AK, AL, AR, AZ, CA, CO, CT, DC, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NN, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY
Canada	AB, BC, LB, MB, NB, NF, NS, NT, NU, ON, PE, QC, SK, YT

Range Map
Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: NatureServe, 2002; WILDSPACETM 2002

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
AL	Autauga (01001), Baldwin (01003), Barbour (01005), Chambers (01017), Cherokee (01019), Chilton (01021), Choctaw (01023), Clarke (01025), Colbert (01033), Coosa (01037), Dallas (01047), Elmore (01051), Escambia (01053), Franklin (01059), Greene (01063), Hale (01065), Henry (01067), Houston (01069), Jackson (01071), Lauderdale (01077), Lawrence (01079), Limestone (01083), Lowndes (01085), Madison (01089), Marengo (01091), Marshall (01095), Mobile (01097), Montgomery (01101), Morgan (01103), Perry (01105), Pickens (01107), Russell (01113), Sumter (01119), Tallapoosa (01123), Tuscaloosa (01125), Wilcox (01131), Winston (01133)
AR	Arkansas (05001), Ashley (05003), Baxter (05005), Benton (05007), Cleburne (05023), Crawford (05033), Crittenden (05035), Cross (05037), Desha (05041), Drew (05043), Faulkner (05045), Franklin (05047), Fulton (05049), Garland (05051), Grant (05053), Greene (05055), Hempstead (05057)*, Jackson (05067), Jefferson (05069), Lafayette (05073), Lee (05077), Lincoln (05079), Little River (05081), Logan (05083), Madison (05087), Marion (05089), Mississippi (05093), Monroe (05095), Phillips (05107), Pike (05109), Poinsett (05111), Prairie (05117), Pulaski (05119), Scott (05127), Sebastian (05131), Van Buren (05141)
AZ	Apache (04001), Coconino (04005), Gila (04007), Graham (04009), La Paz (04012), Maricopa (04013), Mohave (04015), Pinal (04021), Yavapai (04025)
CA	Alameda (06001), Alpine (06003), Butte (06007), Calaveras (06009), Colusa (06011), Contra Costa (06013), Del Norte (06015)*, El Dorado (06017), Fresno (06019), Glenn (06021), Humboldt (06023), Inyo (06027), Kern (06029), Lake (06033), Lassen (06035), Los Angeles (06037), Madera (06039), Mendocino (06045), Merced (06047), Modoc (06049), Mono (06051), Monterey (06053), Napa (06055), Nevada (06057), Placer (06061), Plumas (06063), Riverside (06065), San Benito (06069), San Bernardino (06071), San Luis Obispo (06079), Santa Barbara (06083), Shasta (06089), Sierra (06091), Siskiyou (06093), Stanislaus (06099), Tehama (06103), Trinity (06105), Tuolumne (06109), Yuba (06115)
CO	Adams (08001), Alamosa (08003)*, Archuleta (08007), Baca (08009), Bent (08011), Boulder (08013),

	Conejos (08021), Crowley (08025), Douglas (08035)*, Eagle (08037), El Paso (08041), Fremont (08043), Garfield (08045), Grand (08049), Gunnison (08051)*, Jackson (08057), Jefferson (08059), Kiowa (08061), La Plata (08067), Larimer (08069), Las Animas (08071), Logan (08075)*, Mesa (08077), Mineral (08079), Moffat (08081), Montezuma (08083), Montrose (08085), Morgan (08087)*, Otero (08089), Park (08093), Pitkin (08097), Prowers (08099), Pueblo (08101), Rio Blanco (08103), Rio Grande (08105)*, Routt (08107), Saguache (08109), Sedgwick (08115)*, Washington (08121)*, Weld (08123), Yuma (08125)
CT	Fairfield (09001), Hartford (09003), Litchfield (09005), Middlesex (09007), New Haven (09009), New London (09011), Tolland (09013)
DE	Kent (10001), New Castle (10003), Sussex (10005)
FL	Alachua (12001), Bay (12005), Bradford (12007), Brevard (12009), Broward (12011)*, Charlotte (12015), Citrus (12017), Clay (12019), Collier (12021), Columbia (12023), DeSoto (12027), Dixie (12029), Duval (12031), Flagler (12035), Franklin (12037), Gadsden (12039), Gilchrist (12041), Glades (12043), Gulf (12045), Hamilton (12047), Hardee (12049), Hendry (12051), Hernando (12053), Highlands (12055), Hillsborough (12057), Indian River (12061), Jackson (12063), Jefferson (12065), Lake (12069), Lee (12071), Leon (12073), Levy (12075), Liberty (12077), Manatee (12081), Marion (12083), Martin (12085), Miami-Dade (12086), Monroe (12087), Nassau (12089), Okaloosa (12091), Okeechobee (12093), Orange (12095), Osceola (12097), Palm Beach (12099), Pasco (12101), Pinellas (12103), Polk (12105), Putnam (12107), Santa Rosa (12113), Sarasota (12115), Seminole (12117), St. Johns (12109), St. Lucie (12111), Sumter (12119), Suwannee (12121), Taylor (12123), Union (12125), Volusia (12127), Wakulla (12129), Walton (12131), Washington (12133)
GA	Appling (13001)*, Baker (13007), Baldwin (13009), Berrien (13019), Bibb (13021), Brooks (13027), Bryan (13029), Bulloch (13031), Butts (13035), Camden (13039), Chatham (13051), Chattahoochee (13053), Cherokee (13057), Clay (13061), Coffee (13069), Colquitt (13071), Columbia (13073)*, Cook (13075), Crisp (13081), Dade (13083)*, Decatur (13087), Dodge (13091), Dougherty (13095), Early (13099), Fannin (13111), Glynn (13127), Greene (13133), Hancock (13141), Harris (13145), Hart (13147), Heard (13149), Henry (13151), Jefferson (13163), Lanier (13173)*, Lee (13177), Liberty (13179), Lincoln (13181), Long (13183), Lowndes (13185), Macon (13193), Mcduffie (13189), Mcintosh (13191), Meriwether (13199)*, Mitchell (13205), Monroe (13207), Morgan (13211), Murray (13213), Putnam (13237), Quitman (13239), Richmond (13245), Rockdale (13247)*, Seminole (13253), Stewart (13259), Sumter (13261), Talbot (13263), Thomas (13275), Troup (13285), Twiggs (13289), Union (13291), Walton (13297), Wilkes (13317), Wilkinson (13319), Worth (13321)
IA	Adair (19001), Allamakee (19005), Appanoose (19007), Benton (19011), Black Hawk (19013), Bremer (19017), Buchanan (19019), Buena Vista (19021), Butler (19023), Carroll (19027), Cass (19029), Cerro Gordo (19033), Cherokee (19035), Chickasaw (19037), Clay (19041), Clayton (19043), Clinton (19045), Dallas (19049), Decatur (19053), Delaware (19055), Des Moines (19057), Dubuque (19061), Fayette (19065), Floyd (19067), Fremont (19071), Guthrie (19077), Hamilton (19079), Harrison (19085), Henry (19087), Howard (19089), Humboldt (19091), Iowa (19095), Jackson (19097), Jefferson (19101), Johnson (19103), Jones (19105), Keokuk (19107), Lee (19111), Linn (19113), Louisa (19115)*, Lyon (19119), Mahaska (19123), Marion (19125), Mills (19129), Mitchell (19131), Monona (19133), Muscatine (19139), Page (19145), Palo Alto (19147), Sac (19161), Scott (19163), Van Buren (19177), Wapello (19179), Washington (19183), Wayne (19185), Winneshiek (19191), Woodbury (19193)
ID	Ada (16001), Adams (16003), Bannock (16005), Bear Lake (16007), Benewah (16009), Bingham (16011), Blaine (16013), Boise (16015), Bonner (16017), Bonneville (16019), Boundary (16021), Butte (16023), Camas (16025), Canyon (16027), Caribou (16029), Cassia (16031), Clark (16033), Clearwater (16035), Custer (16037), Elmore (16039), Franklin (16041), Fremont (16043), Gem (16045), Gooding (16047), Idaho (16049), Jefferson (16051), Jerome (16053), Kootenai (16055), Lemhi (16059), Lewis (16061), Madison (16065), Minidoka (16067), Nez Perce (16069), Owyhee (16073), Payette (16075), Power (16077), Shoshone (16079), Teton (16081), Twin Falls (16083), Valley (16085), Washington (16087)
IL	Adams (17001), Alexander (17003), Bond (17005), Brown (17009), Bureau (17011), Calhoun (17013), Carroll (17015), Cass (17017), Clark (17023), Clay (17025), Clinton (17027), Cook (17031), Crawford (17033), Cumberland (17035), De Witt (17039), Fayette (17051), Franklin (17055), Fulton (17057), Gallatin (17059), Greene (17061), Hancock (17067), Hardin (17069)*, Henderson (17071), Henry (17073), Jackson (17077), Jasper (17079), Jefferson (17081), Jersey (17083), Jo Daviess (17085), Johnson (17087), Kane (17089), Kendall (17093), Knox (17095), La Salle (17099), Lawrence (17101), Lee (17103), Livingston (17105), Macon (17115), Madison (17119), Marion (17121), Marshall (17123), Mason (17125), Massac (17127), Menard (17129), Mercer (17131), Monroe (17133), Montgomery (17135), Morgan (17137), Moultrie (17139), Ogle (17141), Peoria (17143), Perry (17145), Pike (17149), Pope (17151), Pulaski (17153), Putnam (17155), Randolph (17157), Richland (17159), Rock Island (17161), Saline (17165), Sangamon (17167), Schuyler (17169), Scott (17171), St. Clair (17163), Stephenson (17177), Tazewell (17179), Union (17181), Vermilion (17183), Wabash (17185), Washington (17189), Wayne (17191), White (17193), Whiteside (17195), Will (17197), Williamson (17199), Winnebago (17201), Woodford (17203)
IN	Adams (18001), Allen (18003), Bartholomew (18005), Brown (18013), Carroll (18015), Cass (18017), Clay (18021), Crawford (18025), Daviess (18027), Decatur (18031), Dubois (18037), Fountain (18045), Gibson (18051), Greene (18055), Hamilton (18057), Harrison (18061), Huntington (18069), Jackson (18071), Jefferson (18077), Jennings (18079), Johnson (18081), Knox (18083), La Porte (18091), Lawrence (18093), Marion (18097), Martin (18101), Miami (18103), Monroe (18105), Montgomery (18107), Morgan (18109), Newton (18111), Orange (18117), Owen (18119), Parke (18121), Perry (18123), Posey (18129), Putnam (18133), Ripley (18137), Scott (18143), Shelby (18145), Starke (18149), Sullivan (18153), Tippecanoe (18157), Union (18161), Vermillion (18165), Vigo (18167), Wabash (18169), Warren (18171), Warrick (18173), Washington (18175), White (18181)
KS	Barton (20009), Coffey (20031), Douglas (20045), Ellsworth (20053), Geary (20061), Greenwood (20073), Hodgeman (20083), Jackson (20085), Jefferson (20087), Johnson (20091), Leavenworth (20103), Marion (20115),

	Miami (20121), Neosho (20133), Norton (20137), Osage (20139), Osborne (20141), Pottawatomie (20149), Riley (20161), Sedgwick (20173), Seward (20175), Shawnee (20177), Stafford (20185), Trego (20195), Wabaunsee (20197), Wyandotte (20209)
KY	Allen (21003), Ballard (21007), Bath (21011), Boone (21015), Calloway (21035), Carlisle (21039), Clinton (21053), Daviess (21059), Franklin (21073), Fulton (21075)*, Grayson (21085), Henderson (21101), Henry (21103), Hickman (21105), Hopkins (21107), Jefferson (21111), Larue (21123), Laurel (21125), Lawrence (21127), Lewis (21135), Livingston (21139), Lyon (21143), Marshall (21157), Mason (21161), Meade (21163), Muhlenberg (21177), Nelson (21179), Todd (21219), Trigg (21221), Trimble (21223), Union (21225), Whitley (21235)
LA	Ascension (22005), Assumption (22007), Avoyelles (22009), Beauregard (22011), Bossier (22015), Caddo (22017), Calcasieu (22019), Claiborne (22027), Concordia (22029), De Soto (22031)*, East Baton Rouge (22033), East Carroll (22035), Franklin (22041), Iberia (22045), Iberville (22047), Jackson (22049), Jefferson (22051), La Salle (22059), Lafourche (22057), Livingston (22063), Madison (22065), Morehouse (22067), Natchitoches (22069), Orleans (22071), Ouachita (22073), Plaquemines (22075), Pointe Coupee (22077), Rapides (22079), Richland (22083), Sabine (22085), St. Bernard (22087), St. Charles (22089), St. James (22093), St. John the Baptist (22095), St. Landry (22097), St. Martin (22099), St. Mary (22101), St. Tammany (22103), Tangipahoa (22105), Tensas (22107), Terrebonne (22109), Union (22111), Vermilion (22113), West Baton Rouge (22121), West Feliciana (22125)
MA	Barnstable (25001)*, Berkshire (25003), Bristol (25005), Essex (25009), Franklin (25011), Hampden (25013), Hampshire (25015), Middlesex (25017), Plymouth (25023), Worcester (25027)
MD	Anne Arundel (24003), Baltimore (city) (24510), Baltimore County (24005), Calvert (24009), Caroline (24011), Carroll (24013)*, Cecil (24015), Charles (24017), Dorchester (24019), Frederick (24021), Garrett (24023), Harford (24025), Howard (24027), Kent (24029), Montgomery (24031), Prince Georges (24033), Queen Annes (24035), Somerset (24039), St. Marys (24037), Talbot (24041), Washington (24043), Wicomico (24045), Worcester (24047)
ME	Androscoggin (23001), Aroostook (23003), Cumberland (23005), Hancock (23009), Kennebec (23011), Knox (23013), Lincoln (23015), Oxford (23017), Penobscot (23019), Piscataquis (23021), Sagadahoc (23023), Somerset (23025), Waldo (23027), Washington (23029)
MI	Alcona (26001), Alger (26003), Allegan (26005), Alpena (26007), Antrim (26009), Arenac (26011), Baraga (26013), Barry (26015), Bay (26017), Benzie (26019), Calhoun (26025), Charlevoix (26029), Cheboygan (26031), Chippewa (26033), Clare (26035), Crawford (26039), Delta (26041), Dickinson (26043), Emmet (26047), Gladwin (26051), Gogebic (26053), Grand Traverse (26055), Gratiot (26057), Houghton (26061), Huron (26063), Ionia (26067), Iosco (26069), Iron (26071), Kalamazoo (26077), Kalkaska (26079), Keweenaw (26083), Lake (26085), Lapeer (26087), Leelanau (26089), Luce (26095), Mackinac (26097), Manistee (26101), Marquette (26103), Mason (26105), Mecosta (26107), Menominee (26109), Midland (26111), Missaukee (26113), Monroe (26115), Montcalm (26117), Montmorency (26119), Muskegon (26121), Newaygo (26123), Oceana (26127), Ogemaw (26129), Ontonagon (26131), Osceola (26133), Oscoda (26135), Otsego (26137), Ottawa (26139), Presque Isle (26141), Roscommon (26143), Saginaw (26145), Schoolcraft (26153), St. Clair (26147), Tuscola (26157), Wayne (26163), Wexford (26165)
MN	Aitkin (27001), Anoka (27003), Becker (27005), Beltrami (27007), Benton (27009), Big Stone (27011), Blue Earth (27013), Brown (27015), Carlton (27017), Carver (27019), Cass (27021), Chippewa (27023), Chisago (27025), Clay (27027), Clearwater (27029), Cook (27031), Crow Wing (27035), Dakota (27037), Douglas (27041), Faribault (27043), Fillmore (27045), Freeborn (27047), Goodhue (27049), Grant (27051), Hennepin (27053), Houston (27055), Hubbard (27057), Isanti (27059), Itasca (27061), Jackson (27063), Kanabec (27065), Kandiyohi (27067), Kittson (27069), Koochiching (27071), Lac Qui Parle (27073), Lake (27075), Lake of the Woods (27077), Le Sueur (27079), Lyon (27083), Mahnomen (27087), Marshall (27089), Mcleod (27085), Meeker (27093), Mille Lacs (27095), Morrison (27097), Nicollet (27103), Norman (27107), Olmsted (27109), Otter Tail (27111), Pennington (27113), Pine (27115), Polk (27119), Pope (27121), Ramsey (27123), Red Lake (27125), Redwood (27127), Renville (27129), Rice (27131), Roseau (27135), Scott (27139), Sherburne (27141), Sibley (27143), St. Louis (27137), Stearns (27145), Steele (27147), Stevens (27149), Swift (27151), Todd (27153), Traverse (27155), Wabasha (27157), Wadena (27159), Waseca (27161), Washington (27163), Watonwan (27165), Wilkin (27167), Winona (27169), Wright (27171), Yellow Medicine (27173)
MO	Adair (29001), Atchison (29005), Audrain (29007), Barry (29009), Benton (29015), Bollinger (29017), Boone (29019), Butler (29023), Callaway (29027), Camden (29029), Cape Girardeau (29031), Carroll (29033), Cedar (29039), Chariton (29041), Christian (29043), Clark (29045), Clinton (29049), Cole (29051), Cooper (29053), Crawford (29055), Dade (29057), Daviess (29061), Dent (29065), Douglas (29067), Dunklin (29069), Franklin (29071), Greene (29077), Grundy (29079), Henry (29083), Hickory (29085), Holt (29087), Howard (29089), Jackson (29095), Jasper (29097), Laclede (29105), Lewis (29111)*, Lincoln (29113), Linn (29115), Livingston (29117), Macon (29121), Madison (29123), Maries (29125), McDonald (29119), Miller (29131), Mississippi (29133), Moniteau (29135), Monroe (29137), Morgan (29141), New Madrid (29143), Oregon (29149), Osage (29151), Ozark (29153), Pemiscot (29155), Perry (29157), Pettis (29159), Phelps (29161), Pike (29163), Pulaski (29169), Ralls (29173), Randolph (29175), Ray (29177), Ripley (29181), Saline (29195), Scott (29201)*, Shelby (29205), St. Charles (29183), St. Clair (29185), St. Louis (29189), Ste. Genevieve (29186), Stoddard (29207), Stone (29209), Taney (29213), Texas (29215), Vernon (29217), Wayne (29223), Wright (29229)
MS	Adams (28001), Bolivar (28011), Clay (28025), George (28039), Greene (28041), Grenada (28043), Hancock (28045), Harrison (28047), Hinds (28049), Holmes (28051), Issaquena (28055), Itawamba (28057), Jackson (28059), Kemper (28069), Lafayette (28071), Lowndes (28087), Madison (28089), Monroe (28095), Noxubee (28103), Oktibbeha (28105), Panola (28107)*, Pearl River (28109), Rankin (28121), Sunflower (28133)*, Tate (28137), Tishomingo (28141), Tunica (28143), Warren (28149), Wilkinson (28157), Winston (28159),

	Yalobusha (28161), Yazoo (28163)
MT	Beaverhead (30001), Big Horn (30003), Blaine (30005), Broadwater (30007), Carbon (30009), Carter (30011), Cascade (30013), Chouteau (30015), Custer (30017), Dawson (30021), Deer Lodge (30023), Fallon (30025), Fergus (30027), Flathead (30029), Gallatin (30031), Glacier (30035), Granite (30039), Hill (30041), Jefferson (30043), Lake (30047), Lewis and Clark (30049), Lincoln (30053), Madison (30057), McCone (30055), Meagher (30059), Mineral (30061), Missoula (30063), Musselshell (30065), Park (30067), Phillips (30071), Pondera (30073), Powder River (30075), Powell (30077), Prairie (30079), Ravalli (30081), Richland (30083), Roosevelt (30085), Rosebud (30087), Sanders (30089), Silver Bow (30093), Stillwater (30095), Sweet Grass (30097), Teton (30099), Toole (30101), Treasure (30103), Valley (30105), Wheatland (30107), Wibaux (30109), Yellowstone (30111)
NC	Anson (37007), Beaufort (37013), Bertie (37015), Bladen (37017), Brunswick (37019), Burke (37023), Camden (37029)*, Carteret (37031)*, Catawba (37035), Chatham (37037), Cherokee (37039), Chowan (37041), Clay (37043), Columbus (37047), Craven (37049), Currituck (37053), Dare (37055), Davidson (37057), Durham (37063), Edgecombe (37065), Franklin (37069), Gaston (37071), Gates (37073), Graham (37075), Granville (37077), Guilford (37081), Halifax (37083), Harnett (37085)*, Haywood (37087), Hyde (37095), Johnston (37101), Jones (37103), Lee (37105)*, Lenoir (37107), Macon (37113), Martin (37117), Mecklenburg (37119), Montgomery (37123), Nash (37127), New Hanover (37129), Northampton (37131), Onslow (37133), Orange (37135), Pamlico (37137), Pasquotank (37139), Pender (37141), Perquimans (37143), Pitt (37147), Rowan (37159), Stanly (37167), Surry (37171), Swain (37173), Tyrrell (37177), Vance (37181), Wake (37183), Warren (37185), Washington (37187), Wayne (37191)*, Yadkin (37197)
ND	Billings (38007), Bottineau (38009), Burleigh (38015), Dunn (38025)*, Grand Forks (38035), McKenzie (38053), McLean (38055), Mercer (38057), Morton (38059), Oliver (38065), Pembina (38067), Richland (38077), Slope (38087)*, Walsh (38099)
NE	Antelope (31003), Blaine (31009), Boyd (31015), Brown (31017), Buffalo (31019), Cass (31025), Cedar (31027), Cherry (31031), Colfax (31037), Cuming (31039), Custer (31041), Dakota (31043), Dawson (31047), Dixon (31051), Dodge (31053), Douglas (31055), Fillmore (31059), Frontier (31063), Gage (31067), Garden (31069), Grant (31075), Greeley (31077), Hall (31079), Harlan (31083), Hitchcock (31087), Holt (31089), Hooker (31091), Keith (31101), Keya Paha (31103), Knox (31107), Lancaster (31109), Lincoln (31111), Loup (31115), Madison (31119), Merrick (31121), Morrill (31123), Nance (31125), Nemaha (31127), Otoe (31131), Pawnee (31133), Phelps (31137), Pierce (31139), Platte (31141), Polk (31143), Richardson (31147), Rock (31149), Sarpy (31153), Saunders (31155), Scotts Bluff (31157), Sheridan (31161), Sherman (31163), Thurston (31173), Valley (31175), Webster (31181)
NH	Belknap (33001), Carroll (33003), Cheshire (33005), Coos (33007), Grafton (33009), Hillsborough (33011), Merrimack (33013), Rockingham (33015), Strafford (33017), Sullivan (33019)
NJ	Atlantic (34001), Bergen (34003), Burlington (34005), Camden (34007), Cape May (34009), Cumberland (34011), Gloucester (34015), Hunterdon (34019), Mercer (34021), Middlesex (34023), Monmouth (34025), Morris (34027), Ocean (34029), Passaic (34031), Salem (34033), Somerset (34035), Sussex (34037), Warren (34041)
NM	Bernalillo (35001), Catron (35003), Colfax (35007), Mckinley (35031), San Juan (35045), Sandoval (35043), Sierra (35051)
NV	Churchill (32001), Elko (32007), Lyon (32019), Mineral (32021)
NY	Albany (36001), Allegany (36003), Broome (36007), Cattaraugus (36009), Cayuga (36011), Chautauqua (36013), Chemung (36015), Chenango (36017), Clinton (36019), Columbia (36021), Delaware (36025), Dutchess (36027), Erie (36029), Essex (36031), Franklin (36033), Fulton (36035), Genesee (36037), Greene (36039), Hamilton (36041), Jefferson (36045), Livingston (36051), Monroe (36055), Onondaga (36067), Ontario (36069), Orange (36071)*, Orleans (36073), Oswego (36075), Otsego (36077), Putnam (36079), Rensselaer (36083), Rockland (36087), Saratoga (36091), Schoharie (36095), Seneca (36099), St. Lawrence (36089), Steuben (36101), Sullivan (36105), Tioga (36107), Tompkins (36109), Ulster (36111), Warren (36113)*, Washington (36115), Wayne (36117), Westchester (36119), Wyoming (36121), Yates (36123)
OH	Coshocton (39031), Delaware (39041), Erie (39043), Geauga (39055), Guernsey (39059), Harrison (39067), Henry (39069), Huron (39077), Knox (39083), Lorain (39093), Lucas (39095), Mahoning (39099), Marion (39101), Mercer (39107), Noble (39121), Ottawa (39123), Portage (39133), Ross (39141), Sandusky (39143), Seneca (39147), Summit (39153), Trumbull (39155), Wayne (39169), Wood (39173), Wyandot (39175)
OK	Adair (40001), Alfalfa (40003)*, Bryan (40013), Caddo (40015), Canadian (40017), Carter (40019), Cherokee (40021), Choctaw (40023), Cimarron (40025), Cleveland (40027), Cotton (40033), Custer (40039), Delaware (40041), Garvin (40049), Grady (40051), Grant (40053)*, Haskell (40061), Hughes (40063), Kay (40071), Kingfisher (40073), LeFlore (40079), Logan (40083), Love (40085), McClain (40087), McIntosh (40091), Muskogee (40101), Noble (40103), Oklahoma (40109), Osage (40113), Pittsburg (40121), Sequoyah (40135), Stephens (40137), Texas (40139)*, Tulsa (40143), Wagoner (40145), Washita (40149)
OR	Baker (41001), Benton (41003), Clackamas (41005), Clatsop (41007), Columbia (41009), Coos (41011), Crook (41013), Curry (41015), Deschutes (41017), Douglas (41019), Grant (41023), Harney (41025), Hood River (41027), Jackson (41029), Jefferson (41031), Josephine (41033), Klamath (41035), Lake (41037), Lane (41039), Lincoln (41041), Linn (41043), Malheur (41045), Marion (41047), Multnomah (41051), Polk (41053), Tillamook (41057), Umatilla (41059), Union (41061), Wallowa (41063), Wasco (41065), Washington (41067), Wheeler (41069), Yamhill (41071)
PA	Adams (42001), Armstrong (42005), Beaver (42007), Bedford (42009), Berks (42011), Bradford (42015), Bucks (42017), Butler (42019), Cameron (42023), Carbon (42025), Centre (42027), Chester (42029), Clarion (42031), Clearfield (42033), Clinton (42035), Columbia (42037), Crawford (42039), Cumberland (42041), Dauphin (42043), Delaware (42045), Elk (42047), Erie (42049), Fayette (42051), Forest (42053), Fulton (42057), Huntingdon (42061), Jefferson (42065), Juniata (42067), Lancaster (42071), Lawrence (42073), Luzerne (42079),

	Lycoming (42081), McKean (42083), Mercer (42085), Mifflin (42087), Monroe (42089), Montgomery (42091), Montour (42093), Northampton (42095), Northumberland (42097), Perry (42099), Philadelphia (42101), Pike (42103), Sullivan (42113), Tioga (42117), Venango (42121), Warren (42123), Wayne (42127), Westmoreland (42129), Wyoming (42131), York (42133)
RI	Providence (44007)
SC	Abbeville (45001), Aiken (45003), Allendale (45005), Anderson (45007), Barnwell (45011), Beaufort (45013), Berkeley (45015), Calhoun (45017), Charleston (45019), Chester (45023), Clarendon (45027), Colleton (45029), Dillon (45033), Dorchester (45035), Edgefield (45037), Fairfield (45039), Florence (45041), Georgetown (45043), Greenwood (45047), Hampton (45049), Horry (45051), Jasper (45053), Kershaw (45055), Lancaster (45057), Lexington (45063), Marion (45067), Marlboro (45069), McCormick (45065), Newberry (45071), Orangeburg (45075), Richland (45079), Saluda (45081), Sumter (45085), York (45091)
SD	Aurora (46003), Bennett (46007), Bon Homme (46009), Brown (46013), Brule (46015), Buffalo (46017), Butte (46019), Campbell (46021), Charles Mix (46023), Clay (46027), Corson (46031), Custer (46033), Day (46037), Dewey (46041), Douglas (46043), Fall River (46047), Grant (46051), Gregory (46053), Harding (46063), Hughes (46065), Hutchinson (46067), Lawrence (46081), Lyman (46085), Marshall (46091), Meade (46093), Mellette (46095), Minnehaha (46099), Moody (46101), Pennington (46103), Perkins (46105), Roberts (46109), Sanborn (46111), Spink (46115), Stanley (46117), Union (46127), Walworth (46129), Yankton (46135), Ziebach (46137)
TN	Benton (47005), Blount (47009), Cheatham (47021)*, Clay (47027), Cocke (47029), Coffee (47031), Davidson (47037), DeKalb (47041), Decatur (47039), Dickson (47043), Franklin (47051), Grainger (47057), Hamblen (47063), Hamilton (47065), Hancock (47067), Hardin (47071), Hawkins (47073), Henry (47079), Houston (47083), Humphreys (47085)*, Jackson (47087), Jefferson (47089), Knox (47093), Lake (47095), Lauderdale (47097), Loudon (47105), Marion (47115), Meigs (47121), Monroe (47123), Obion (47131), Overton (47133), Perry (47135), Pickett (47137), Polk (47139), Rhea (47143), Roane (47145), Sevier (47155), Shelby (47157), Stewart (47161), Sullivan (47163), Sumner (47165), Union (47173), Washington (47179), Wilson (47189)
TX	Anderson (48001), Angelina (48005), Austin (48015), Bastrop (48021), Bell (48027), Bowie (48037), Brazoria (48039), Burnet (48053), Calhoun (48057), Cass (48067), Chambers (48071), Colorado (48089), Cooke (48097), Fannin (48147), Fayette (48149), Fort Bend (48157), Freestone (48161), Goliad (48175), Grayson (48181), Grimes (48185), Harris (48201), Henderson (48213), Hopkins (48223), Houston (48225), Jackson (48239), Kaufman (48257), Lavaca (48285), Leon (48289), Liberty (48291), Limestone (48293), Madison (48313), Matagorda (48321), Montgomery (48339), Nacogdoches (48347), Navarro (48349), Newton (48351), Panola (48365), Polk (48373), Refugio (48391), Robertson (48395), Rusk (48401), Sabine (48403), San Augustine (48405), San Jacinto (48407), San Saba (48411), Shelby (48419), Smith (48423), Trinity (48455), Tyler (48457), Victoria (48469), Walker (48471), Wharton (48481), Wood (48499)
UT	Beaver (49001), Box Elder (49003), Cache (49005), Carbon (49007), Daggett (49009), Davis (49011), Duchesne (49013), Emery (49015), Garfield (49017), Grand (49019), Iron (49021), Juab (49023), Millard (49027), Morgan (49029), Piute (49031), Rich (49033), Salt Lake (49035), San Juan (49037), Sanpete (49039), Sevier (49041), Summit (49043), Tooele (49045), Uintah (49047), Utah (49049), Wasatch (49051), Washington (49053), Wayne (49055), Weber (49057)
VA	Accomack (51001), Albemarle (51003), Amherst (51009), Bath (51017), Brunswick (51025), Campbell (51031), Caroline (51033), Charles City (51036), Chesterfield (51041), Culpeper (51047), Essex (51057), Fairfax (51059), Fauquier (51061), Gloucester (51073), Goochland (51075), Halifax (51083), Hampton (City) (51650), Hanover (51085), Henrico (51087), Hopewell (City) (51670), Isle of Wight (51093), James City (51095), King George (51099), King William (51101), King and Queen (51097), Lancaster (51103), Mathews (51115), Mecklenburg (51117), Middlesex (51119), New Kent (51127), Newport News (City) (51700), Northampton (51131), Northumberland (51133), Portsmouth (City) (51740), Powhatan (51145), Prince Edward (51147), Prince George (51149), Prince William (51153), Pulaski (51155), Richmond (51159), Richmond (City) (51760), Rockbridge (51163), Southampton (51175), Stafford (51179), Suffolk (City) (51800), Surry (51181), Sussex (51183), Virginia Beach (City) (51810), Westmoreland (51193), York (51199)
VT	Addison (50001), Caledonia (50005), Chittenden (50007), Essex (50009), Grand Isle (50013), Rutland (50021), Windham (50025), Windsor (50027)
WA	Asotin (53003), Cowlitz (53015), Wahkiakum (53069)
WI	Adams (55001), Ashland (55003), Barron (55005), Bayfield (55007), Brown (55009), Buffalo (55011), Burnett (55013), Calumet (55015), Chippewa (55017), Clark (55019), Columbia (55021), Crawford (55023), Dane (55025), Dodge (55027), Door (55029), Douglas (55031), Dunn (55033), Eau Claire (55035), Florence (55037), Forest (55041), Grant (55043), Green (55045), Green Lake (55047), Iowa (55049), Iron (55051), Jackson (55053), Jefferson (55055), Juneau (55057), Kewaunee (55061), La Crosse (55063), Lafayette (55065), Langlade (55067), Lincoln (55069), Manitowoc (55071), Marathon (55073), Marinette (55075), Marquette (55077), Menominee (55078), Monroe (55081), Oconto (55083), Oneida (55085), Outagamie (55087), Ozaukee (55089), Pepin (55091), Pierce (55093), Polk (55095), Portage (55097), Price (55099), Richland (55103), Rusk (55107), Sauk (55111), Sawyer (55113), Shawano (55115), Sheboygan (55117), St. Croix (55109), Taylor (55119), Trempealeau (55121), Vernon (55123), Vilas (55125), Washburn (55129), Waukesha (55133), Waupaca (55135), Waushara (55137), Winnebago (55139), Wood (55141)
WV	Grant (54023), Hampshire (54027), Hancock (54029), Hardy (54031), Jefferson (54037), Mineral (54057), Morgan (54065), Pendleton (54071), Taylor (54091), Wood (54107)*
WY	Big Horn (56003), Carbon (56007), Lincoln (56023), Park (56029), Sheridan (56033), Sublette (56035), Sweetwater (56037), Teton (56039)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
01	Allagash (01010002)+, Fish (01010003)+, Aroostook (01010004)+, West Branch Penobscot (01020001)+, East Branch Penobscot (01020002)+, Mattawamkeag (01020003)+, Piscataquis (01020004)+, Lower Penobscot (01020005)+, Upper Kennebec (01030001)+, Dead (01030002)+, Lower Kennebec (01030003)+, Upper Androscoggin (01040001)+, Lower Androscoggin (01040002)+, St. Croix (01050001)+, Maine Coastal (01050002)+, St. George-Sheepscot (01050003)+, Passamaquoddy Bay-Bay of Fundy (01050004)+, Presumpscot (01060001)+, Saco (01060002)+, Piscataqua-Salmon Falls (01060003)+, Pemigewasset (01070001)+, Merrimack (01070002)+, Contoocook (01070003)+, Nashua (01070004)+, Merrimack (01070006)+, Upper Connecticut (01080101)+, Waits (01080103)+, Upper Connecticut-Mascoma (01080104)+, Black-Ottauquechee (01080106)+, West (01080107)+, Middle Connecticut (01080201)+, Deerfield (01080203)+, Chicopee (01080204)+, Lower Connecticut (01080205)+, Westfield (01080206)+, Farmington (01080207)+, Cape Cod (01090002)+, Narragansett (01090004)+, Quinebaug (01100001)+, Thames (01100003)+, Quinnipiac (01100004)+, Housatonic (01100005)+, Saugatuck (01100006)+
02	Upper Hudson (02020001)+, Sacandaga (02020002)+, Hudson-Hoosic (02020003)+, Mohawk (02020004)+, Schoharie (02020005)+, Middle Hudson (02020006)+, Rondout (02020007)+, Hudson-Wappinger (02020008)+, Lower Hudson (02030101)+, Hackensack-Passaic (02030103)+, Sandy Hook-Staten Island (02030104)+, Raritan (02030105)+, Upper Delaware (02040101)+, East Branch Delaware (02040102)+, Lackawaxen (02040103)+, Middle Delaware-Mongaup-Brodhead (02040104)+, Middle Delaware-Musconetcong (02040105)+, Lehigh (02040106)+, Crosswicks-Neshaminy (02040201)+, Lower Delaware (02040202)+, Schuylkill (02040203)+, Delaware Bay (02040204)+, Brandywine-Christina (02040205)+, Cohansey-Maurice (02040206)+, Broadkill-Smyrna (02040207)+, Mullica-Toms (02040301)+, Great Egg Harbor (02040302)+, Chincoteague (02040303)+, Eastern Lower Delmarva (02040304)+, Upper Susquehanna (02050101)+, Chenango (02050102)+, Owego-Wappasening (02050103)+, Tioga (02050104)+, Chemung (02050105)+, Upper Susquehanna-Tunkhannock (02050106)+, Upper Susquehanna-Lackawanna (02050107)+, Upper West Branch Susquehanna (02050201)+, Sinnemahoning (02050202)+, Middle West Branch Susquehanna (02050203)+, Bald Eagle (02050204)+, Pine (02050205)+, Lower West Branch Susquehanna (02050206)+, Lower Susquehanna-Penns (02050301)+, Raystown (02050303)+, Lower Juniata (02050304)+, Lower Susquehanna-Swatara (02050305)+, Lower Susquehanna (02050306)+, Upper Chesapeake Bay (02060001)+, Chester-Sassafras (02060002)+, Gunpowder-Patapsco (02060003)+, Severn (02060004)+, Choptank (02060005)+, Patuxent (02060006)+, South Branch Potomac (02070001)+, North Branch Potomac (02070002)+, Cacapon-Town (02070003)+, Conococheague-Opequon (02070004)+, Shenandoah (02070007)+, Middle Potomac-Catoctin (02070008)+, Middle Potomac-Anacostia-Occoquan (02070010)+, Lower Potomac (02070011)+, Great Wicomico-Piankatank (02080102)+, Rapidan-Upper Rappahannock (02080103)+, Lower Rappahannock (02080104)+, Mattaponi (02080105)+, Pamunkey (02080106)+, York (02080107)+, Lynnhaven-Poquoson (02080108)+, Western Lower Delmarva (02080109)+, Eastern Lower Delmarva (02080110)+, Pokomoke-Western Lower Delmarva (02080111)+, Upper James (02080201)+, Maury (02080202)+, Middle James-Buffalo (02080203)+, Rivanna (02080204)+, Middle James-Willis (02080205)+, Lower James (02080206)+, Appomattox (02080207)+, Hampton Roads (02080208)+
03	Middle Roanoke (03010102)+, Lower Dan (03010104)+, Roanoke Rapids (03010106)+, Lower Roanoke (03010107)+, Nottoway (03010201)+, Blackwater (03010202)+, Ghowan (03010203)+, Meheriin (03010204)+, Albemarle (03010205)+, Upper Tar (03020101)+, Fishing (03020102)+, Lower Tar (03020103)+, Pamlico (03020104)+, Pamlico Sound (03020105)+, Upper Neuse (03020201)+, Middle Neuse (03020202)+, Contentnea (03020203)+, Lower Neuse (03020204)+, White Oak River (03020301)+, New River (03020302)+, Haw (03030002)+, Deep (03030003)+, Upper Cape Fear (03030004)+, Lower Cape Fear (03030005)+, Upper Yadkin (03040101)+, Lower Yadkin (03040103)+, Upper Pee Dee (03040104)+, Lower Pee Dee (03040201)+, Lynches (03040202)+, Little Pee Dee (03040204)+, Black (03040205)+, Waccamaw (03040206)+, Carolina Coastal-Sampit (03040207)+, Coastal Carolina (03040208)+, Upper Catawba (03050101)+, Lower Catawba (03050103)+, Wateree (03050104)+, Lower Broad (03050106)+, Saluda (03050109)+, Congaree (03050110)+, Lake Marion (03050111)+, Santee (03050112)+, Cooper (03050201)+, South Carolina Coastal (03050202)+, North Fork Edisto (03050203)+, Edisto (03050205)+, Four Hole Swamp (03050206)+, Salkehatchie (03050207)+, Broad-St. Helena (03050208)+, Bulls Bay (03050209)+, St. Helena Island (03050210)+, Seneca (03060101)+, Upper Savannah (03060103)+, Broad (03060104)+, Little (03060105)+, Middle Savannah (03060106)+, Brier (03060108)+, Lower Savannah (03060109)+, Calibogue Sound-Wright River (03060110)+, Upper Ogeechee (03060201)+, Lower Ogeechee (03060202)+, Canoochee (03060203)+, Ogeechee Coastal (03060204)+, Upper Oconee (03070101)+, Lower Oconee (03070102)+, Upper Ocmulgee (03070103)+, Little Ocmulgee (03070105)+, Altamaha (03070106)+, Satilla (03070201)+, Cumberland-St. Simons (03070203)+, St. Marys (03070204)+, Upper St. Johns (03080101)+, Oklawaha (03080102)+, Lower St. Johns (03080103)+, Daytona - St. Augustine (03080201)+, Cape Canaveral (03080202)+, Vero Beach (03080203)+, Kissimmee (03090101)+, Northern Okeechobee Inflow (03090102)+, Western Okeechobee Inflow (03090103)+, Lake Okeechobee (03090201)+, Everglades (03090202)+, Florida Bay-Florida Keys (03090203)+, Big Cypress Swamp (03090204)+, Caloosahatchee (03090205)+, Florida Southeast Coast (03090206)+, Peace (03100101)+,

	Myakka (03100102)+, Charlotte Harbor (03100103)+, Sarasota Bay (03100201)+, Manatee (03100202)+, Little Manatee (03100203)+, Alafia (03100204)+, Hillsborough (03100205)+, Tampa Bay (03100206)+, Crystal-Pithlachascotee (03100207)+, Withlacoochee (03100208)+, Waccasassa (03110101)+, Econfina-Steinhatchee (03110102)+, Aucilla (03110103)+, Upper Suwannee (03110201)+, Alapaha (03110202)+, withlacoochee (03110203)+, Little (03110204)+, Lower Suwannee (03110205)+, Santa Fe (03110206)+, Apalachee Bay-St. Marks (03120001)+, Upper Ochlockonee (03120002)+, Lower Ochlockonee (03120003)+, Middle Chattahoochee-Lake Harding (03130002)+, Middle Chattahoochee-Walter F. George Reservoir (03130003)+, Lower Chattahoochee (03130004)+, Upper Flint (03130005)+, Middle Flint (03130006)+, Kinchafoonee-Muckalee (03130007)+, Lower Flint (03130008)+, Spring (03130010)+, Apalachicola (03130011)+, Chipola (03130012)+, New (03130013)+, Apalachicola Bay (03130014)+, St. Andrew-St. Joseph Bays (03140101)+, Choctawhatchee Bay (03140102)+, Blackwater (03140104)+, Pensacola Bay (03140105)+, Lower Choctawhatchee (03140203)+, Lower Conecuh (03140304)+, Coosawattee (03150102)+, Etowah (03150104)+, Upper Coosa (03150105)+, Lower Coosa (03150107)+, Middle Tallapoosa (03150109)+, Lower Tallapoosa (03150110)+, Upper Alabama (03150201)+, Cahaba (03150202)+, Middle Alabama (03150203)+, Upper Tombigbee (03160101)+, Tibbee (03160104)+, Luxapallila (03160105)+, Middle Tombigbee-Lubbub (03160106)+, Sipsey (03160107)+, Noxubee (03160108)+, Sipsey Fork (03160110)+, Lower Black Warrior (03160113)+, Middle Tombigbee-Chickasaw (03160201)+, Mobile - Tensaw (03160204)+, Lower Chickasawhay (03170003)+, Pascagoula (03170006)+, Escatawpa (03170008)+, Mississippi Coastal (03170009)+, Middle Pearl-Strong (03180002)+, Lower Pearl. Mississippi (03180004)+
04	Baptism-Brule (04010101)+, Beaver-Lester (04010102)+, St. Louis (04010201)+, Cloquet (04010202)+, Beartrap-Nemadji (04010301)+, Bad-Montreal (04010302)+, Black-Presque Isle (04020101)+, Ontonagon (04020102)+, Keweenaw Peninsula (04020103)+, Sturgeon (04020104)+, Dead-Kelsey (04020105)+, Betsy-Chocolay (04020201)+, Tahquamenon (04020202)+, Waiska (04020203)+, Lake Superior (04020300)+, Manitowoc-Sheboygan (04030101)+, Door-Kewaunee (04030102)+, Duck-Pensaukee (04030103)+, Oconto (04030104)+, Peshtigo (04030105)+, Brule (04030106)+, Michigamme (04030107)+, Menominee (04030108)+, Cedar-Ford (04030109)+, Escanaba (04030110)+, Tacoosh-Whitefish (04030111)+, Fishdam-Sturgeon (04030112)+, Upper Fox (04030201)+, Wolf (04030202)+, Lake Winnebago (04030203)+, Lower Fox (04030204)+, Milwaukee (04040003)+, Black-Macatawa (04050002)+, Kalamazoo (04050003)+, Upper Grand (04050004)+, Maple (04050005)+, Lower Grand (04050006)+, Thornapple (04050007)+, Pere Marquette-White (04060101)+, Muskegon (04060102)+, Manistee (04060103)+, Betsie-Platte (04060104)+, Boardman-Charlevoix (04060105)+, Manistique (04060106)+, Brevoort-Millecoquins (04060107)+, St. Marys (04070001)+, Carp-Pine (04070002)+, Lone Lake-Ocqueoc (04070003)+, Cheboygan (04070004)+, Black (04070005)+, Thunder Bay (04070006)+, Au Sable (04070007)+, Au Gres-Rifle (04080101)+, Kawkawlin-Pine (04080102)+, Pigeon-Wiscoggin (04080103)+, Tittabawassee (04080201)+, Pine (04080202)+, Shiawassee (04080203)+, Flint (04080204)+, Cass (04080205)+, Saginaw (04080206)+, St. Clair (04090001)+, Huron (04090005)+, Ottawa-Stony (04100001)+, Raisin (04100002)+, St. Joseph (04100003)+, Lower Maumee (04100009)+, Cedar-Portage (04100010)+, Sandusky (04100011)+, Huron-Vermilion (04100012)+, Black-Rocky (04110001)+, Cuyahoga (04110002)+, Grand (04110004)+, Chautauqua-Conneaut (04120101)+, Cattaraugus (04120102)+, Niagara (04120104)+, Lake Erie (04120200)+, Oak Orchard-Twelvemile (04130001)+, Upper Genesee (04130002)+, Lower Genesee (04130003)+, Irondequoit-Ninemile (04140101)+, Salmon-Sandy (04140102)+, Seneca (04140201)+, Oswego (04140203)+, Chaumont-Perch (04150102)+, Upper St. Lawrence (04150301)+, Oswegatchie (04150302)+, Indian (04150303)+, Grass (04150304)+, Raquette (04150305)+, St. Regis (04150306)+, Chateaugay-English (04150308)+, Mettawee River (04150401)+, Otter Creek (04150402)+, Winooski River (04150403)+, Ausable River (04150404)+, Saranac River (04150406)+, Lake Champlain (04150408)+
05	Upper Allegheny (05010001)+, Conewango (05010002)+, Middle Allegheny-Tionesta (05010003)+, French (05010004)+, Clarion (05010005)+, Middle Allegheny-Redbank (05010006)+, Conemaugh (05010007)+, Kiskiminetas (05010008)+, Tygart Valley (05020001)+, Cheat (05020004)+, Upper Ohio (05030101)+, Shenango (05030102)+, Mahoning (05030103)+, Connoquenessing (05030105)+, Upper Ohio-Shade (05030202)+, Tuscarawas (05040001)+, Walhonding (05040003)+, Muskingum (05040004)+, Wills (05040005)+, Upper New (05050001)+, Upper Scioto (05060001)+, Lower Scioto (05060002)+, Paint (05060003)+, Big Sandy (05070204)+, Whitewater (05080003)+, Ohio Brush-Whiteoak (05090201)+, Middle Ohio-Laughery (05090203)+, Licking (05100101)+, Lower Kentucky (05100205)+, Barren (05110002)+, Middle Green (05110003)+, Rough (05110004)+, Pond (05110006)+, Upper Wabash (05120101)+, Salamonie (05120102)+, Mississinewa (05120103)+, Eel (05120104)+, Middle Wabash-Deer (05120105)+, Tippecanoe (05120106)+, Wildcat (05120107)+, Middle Wabash-Little Vermilion (05120108)+, Vermilion (05120109)+, Sugar (05120110)+, Middle Wabash-Busseron (05120111)+, Embarras (05120112)+, Lower Wabash (05120113)+, Little Wabash (05120114)+, Skillet (05120115)+, Upper White (05120201)+, Lower White (05120202)+, Eel (05120203)+, Driftwood (05120204)+, Flatrock-Haw (05120205)+, Upper East Fork White (05120206)+, Muscatatuck (05120207)+, Lower East Fork White (05120208)+, Patoka (05120209)+, Upper Cumberland (05130101)+, Obey (05130105)+, Upper Cumberland-Cordell Hull (05130106)+, Caney (05130108)+, Lower Cumberland-Old Hickory Lake (05130201)+, Lower Cumberland-Sycamore (05130202)+, Stones (05130203)+, Harpeth (05130204)+, Lower Cumberland (05130205)+, Red (05130206)+, Silver-Little Kentucky (05140101)+, Salt (05140102)+, Rolling Fork (05140103)+, Blue-Sinking (05140104)+, Lower Ohio-Little Pigeon (05140201)+, Highland-Pigeon (05140202)+, Lower Ohio-Bay (05140203)+, Saline (05140204)+, Tradewater (05140205)+, Lower Ohio (05140206)+
06	South Fork Holston (06010102)+, Watauga (06010103)+, Holston (06010104)+, Pigeon (06010106)+, Lower French Broad (06010107)+, Watts Bar Lake (06010201)+, Upper Little Tennessee (06010202)+, Tuckasegee (06010203)+, Lower Little Tennessee (06010204)+, Upper Clinch (06010205)+, Middle

	Tennessee-Chickamauga (06020001)+, Hiwassee (06020002)+, Ocoee (06020003)+, Sequatchie (06020004)+, Guntersville Lake (06030001)+, Wheeler Lake (06030002)+, Upper Elk (06030003)+, Pickwick Lake (06030005)+, Bear (06030006)+, Lower Tennessee-Beech (06040001)+, Upper Duck (06040002)+, Lower Duck (06040003)+, Buffalo (06040004)+, Kentucky Lake (06040005)+, Lower Tennessee (06040006)+
07	Mississippi Headwaters (07010101)+, Leech Lake (07010102)+, Prairie-Willow (07010103)+, Elk-Nokasippi (07010104)+, Pine (07010105)+, Crow Wing (07010106)+, Redeye (07010107)+, Long Prairie (07010108)+, Platte-Spunk (07010201)+, Sauk (07010202)+, Clearwater-Elk (07010203)+, Crow (07010204)+, South Fork Crow (07010205)+, Twin Cities (07010206)+, Rum (07010207)+, Upper Minnesota (07020001)+, Pomme De Terre (07020002)+, Lac Qui Parle (07020003)+, Hawk-Yellow Medicine (07020004)+, Chippewa (07020005)+, Middle Minnesota (07020007)+, Cottonwood (07020008)+, Blue Earth (07020009)+, Watonwan (07020010)+, Le Sueur (07020011)+, Lower Minnesota (07020012)+, Upper St. Croix (07030001)+, Namekagon (07030002)+, Kettle (07030003)+, Snake (07030004)+, Lower St. Croix (07030005)+, Rush-Vermillion (07040001)+, Cannon (07040002)+, Buffalo-Whitewater (07040003)+, Zumbro (07040004)+, Trempealeau (07040005)+, La Crosse-Pine (07040006)+, Black (07040007)+, Root (07040008)+, Upper Chippewa (07050001)+, Flambeau (07050002)+, South Fork Flambeau (07050003)+, Jump (07050004)+, Lower Chippewa (07050005)+, Eau Claire (07050006)+, Red Cedar (07050007)+, Coon-Yellow (07060001)+, Upper Iowa (07060002)+, Grant-Little Maquoketa (07060003)+, Turkey (07060004)+, Apple-Plum (07060005)+, Maquoketa (07060006)+, Upper Wisconsin (07070001)+, Lake Dubay (07070002)+, Castle Rock (07070003)+, Baraboo (07070004)+, Lower Wisconsin (07070005)+, Kickapoo (07070006)+, Copperas-Duck (07080101)+, Upper Wapsipinicon (07080102)+, Lower Wapsipinicon (07080103)+, Flint-Henderson (07080104)+, South Skunk (07080105)+, Skunk (07080107)+, Upper Cedar (07080201)+, Shell Rock (07080202)+, Winnebago (07080203)+, West Fork Cedar (07080204)+, Middle Cedar (07080205)+, Lower Cedar (07080206)+, Middle Iowa (07080208)+, Lower Iowa (07080209)+, Upper Rock (07090001)+, Crawfish (07090002)+, Pecatonica (07090003)+, Sugar (07090004)+, Lower Rock (07090005)+, Des Moines Headwaters (07100001)+, Upper Des Moines (07100002)+, East Fork Des Moines (07100003)+, Middle Des Moines (07100004)+, Boone (07100005)+, North Raccoon (07100006)+, South Raccoon (07100007)+, Lake Red Rock (07100008)+, Lower Des Moines (07100009)+, Bear-Wyaconda (07110001)+, The Sny (07110004)+, North Fork Salt (07110005)+, South Fork Salt (07110006)+, Salt (07110007)+, Cuivre (07110008)+, Peruque-Piasa (07110009)+, Kankakee (07120001)+, Iroquois (07120002)+, Chicago (07120003)+, Upper Illinois (07120005)+, Upper Fox (07120006)+, Lower Fox (07120007)+, Lower Illinois-Senachwine Lake (07130001)+, Vermilion (07130002)+, Lower Illinois-Lake Chautauqua (07130003)+, Mackinaw (07130004)+, Spoon (07130005)+, Upper Sangamon (07130006)+, South Fork Sangamon (07130007)+, Lower Sangamon (07130008)+, Salt (07130009)+, La Moine (07130010)+, Lower Illinois (07130011)+, Cahokia-Joachim (07140101)+, Meramec (07140102)+, Upper Mississippi-Cape Girardeau (07140105)+, Big Muddy (07140106)+, Whitewater (07140107)+, Cache (07140108)+, Upper Kaskaskia (07140201)+, Middle Kaskaskia (07140202)+, Shoal (07140203)+, Lower Kaskaskia (07140204)+
08	Lower Mississippi-Memphis (08010100)+, Bayou De Chien-Mayfield (08010201)+, Obion (08010202)+, South Fork Obion (08010203)+, Horn Lake-Nonconnah (08010211)+, Lower Mississippi-Helena (08020100)+, New Madrid-St. Johns (08020201)+, Upper St. Francis (08020202)+, Lower St. Francis (08020203)+, Little River Ditches (08020204)+, L'anguille (08020205)+, Cache (08020302)+, Lower White (08020303)+, Lower Arkansas (08020401)+, Bayou Meto (08020402)+, Lower Mississippi-Greenville (08030100)+, Little Tallahatchie (08030201)+, Yocona (08030203)+, Coldwater (08030204)+, Yalobusha (08030205)+, Upper Yazoo (08030206)+, Big Sunflower (08030207)+, Lower Yazoo (08030208)+, Deer-Steele (08030209)+, Ouachita Headwaters (08040101)+, Little Missouri (08040103)+, Lower Ouachita-Bayou De Loutre (08040202)+, Upper Saline (08040203)+, Lower Saline (08040204)+, Bayou Bartholomew (08040205)+, Bayou D'arbonne (08040206)+, Lower Red (08040301)+, Castor (08040302)+, Little (08040304)+, Bayou Cocodrie (08040306)+, Boeuf (08050001)+, Bayou Macon (08050002)+, Tensas (08050003)+, Lower Mississippi-Natchez (08060100)+, Lower Big Black (08060202)+, Coles Creek (08060204)+, Homochitto (08060205)+, Buffalo (08060206)+, Lower Mississippi-Baton Rouge (08070100)+, Bayou Sara-Thompson (08070201)+, Amite (08070202)+, Tickfaw (08070203)+, Lake Maurepas (08070204)+, Tangipahoa (08070205)+, Lower Grand (08070300)+, Atchafalaya (08080101)+, Bayou Teche (08080102)+, Vermilion (08080103)+, Mermentau (08080202)+, Upper Calcasieu (08080203)+, Whisky Chitto (08080204)+, Lower Calcasieu (08080206)+, Liberty Bayou-Tchefuncta (08090201)+, Eastern Louisiana Coastal (08090203)+, East Central Louisiana Coastal (08090301)+, West Central Louisiana Coastal (08090302)+
09	Willow (09010004)+, Bois De Sioux (09020101)+, Mustinka (09020102)+, Otter Tail (09020103)+, Upper Red (09020104)+, Buffalo (09020106)+, Elm-Marsh (09020107)+, Eastern Wild Rice (09020108)+, Sandhill-Wilson (09020301)+, Red Lakes (09020302)+, Red Lake (09020303)+, Thief (09020304)+, Clearwater (09020305)+, Grand Marais-Red (09020306)+, Lower Red (09020311)+, Two Rivers (09020312)+, Roseau (09020314)+, Rainy Headwaters (09030001)+, Vermilion (09030002)+, Rainy Lake (09030003)+, Little Fork (09030005)+, Big Fork (09030006)+, Rapid (09030007)+, Lower Rainy (09030008)+, Lake of the Woods (09030009)+, St. Marys (09040001)+, Belly (09040002)+
10	Red Rock (10020001)+, Beaverhead (10020002)+, Ruby (10020003)+, Big Hole (10020004)+, Jefferson (10020005)+, Boulder (10020006)+, Madison (10020007)+, Gallatin (10020008)+, Upper Missouri (10030101)+, Upper Missouri-Dearborn (10030102)+, Smith (10030103)+, Sun (10030104)+, Belt (10030105)+, Two Medicine (10030201)+, Marias (10030203)+, Teton (10030205)+, Bullwhacker-Dog (10040101)+, Judith (10040103)+, Fort Peck Reservoir (10040104)+, Upper Musselshell (10040201)+, Middle Musselshell (10040202)+, Lower Milk (10050012)+, Porcupine (10050016)+, Prarie Elk-Wolf (10060001)+, Yellowstone Headwaters (10070001)+, Upper Yellowstone (10070002)+,

	Shields (10070003)+, Upper Yellowstone-Lake Basin (10070004)+, Stillwater (10070005)+, Clarks Fork Yellowstone (10070006)+, Upper Yellowstone-Pompeys Pillar (10070007)+, Upper Bighorn (10080007)+, Big Horn Lake (10080010)+, Lower Bighorn (10080015)+, Upper Tongue (10090101)+, Lower Tongue (10090102)+, Middle Powder (10090207)+, Little Powder (10090208)+, Lower Powder (10090209)+, Mizpah (10090210)+, Lower Yellowstone-Sunday (10100001)+, Big Porcupine (10100002)+, Rosebud (10100003)+, Lower Yellowstone (10100004)+, O'fallon (10100005)+, Upper Little Missouri (10110201)+, Boxelder (10110202)+, Middle Little Missouri (10110203)+, Lower Little Missouri (10110205)+, Angostura Reservoir (10120106)+, Beaver (10120107)+, Middle Cheyenne-Spring (10120109)+, Rapid (10120110)+, Middle Cheyenne-Elk (10120111)+, Lower Cheyenne (10120112)+, Cherry (10120113)+, Lower Belle Fourche (10120202)+, Redwater (10120203)+, Painted Woods-Square Butte (10130101)+, Upper Lake Oahe (10130102)+, Lower Lake Oahe (10130105)+, West Missouri Coteau (10130106)+, Knife (10130201)+, South Fork Grand (10130302)+, Grand (10130303)+, Upper Moreau (10130305)+, Lower Moreau (10130306)+, Fort Randall Reservoir (10140101)+, Medicine (10140104)+, Little White (10140203)+, Lower White (10140204)+, Middle Niobrara (10150004)+, Snake (10150005)+, Keya Paha (10150006)+, Lower Niobrara (10150007)+, Upper James (10160003)+, Middle James (10160006)+, Lower James (10160011)+, Lewis and Clark Lake (10170101)+, Middle Big Sioux Coteau (10170201)+, Lower Big Sioux (10170203)+, Rock (10170204)+, Upper North Platte (10180002)+, Middle North Platte-Scotts Bluff (10180009)+, Upper Laramie (10180010)+, Lower North Platte (10180014)+, South Platte Headwaters (10190001)+, Upper South Platte (10190002)+, Middle South Platte-Cherry Creek (10190003)+, St. Vrain (10190005)+, Cache La Poudre (10190007)+, Middle South Platte-Sterling (10190012)+, Lower South Platte (10190018)+, Middle Platte-Buffalo (10200101)+, Middle Platte-Prairie (10200103)+, Lower Platte-Shell (10200201)+, Lower Platte (10200202)+, Salt (10200203)+, Upper Middle Loup (10210001)+, Lower Middle Loup (10210003)+, South Loup (10210004)+, Mud (10210005)+, Upper North Loup (10210006)+, Lower North Loup (10210007)+, Calamus (10210008)+, Loup (10210009)+, Upper Elkhorn (10220001)+, North Fork Elkhorn (10220002)+, Lower Elkhorn (10220003)+, Blackbird-Soldier (10230001)+, Little Sioux (10230003)+, Maple (10230005)+, Big Papillion-Mosquito (10230006)+, Boyer (10230007)+, Keg-Weeping Water (10240001)+, West Nishnabotna (10240002)+, East Nishnabotna (10240003)+, Tarkio-Wolf (10240005)+, Big Nemaha (10240008)+, Platte (10240012)+, South Fork Republican (10250003)+, Upper Republican (10250004)+, Red Willow (10250007)+, Medicine (10250008)+, Prairie Dog (10250015)+, Middle Republican (10250016)+, Lower Republican (10250017)+, Upper Smoky Hill (10260003)+, Middle Smoky Hill (10260006)+, Lower North Fork Solomon (10260012)+, Middle Kansas (10270102)+, Delaware (10270103)+, Lower Kansas (10270104)+, Middle Big Blue (10270202)+, Turkey (10270204)+, Lower Big Blue (10270205)+, Upper Grand (10280101)+, Thompson (10280102)+, Lower Grand (10280103)+, Upper Chariton (10280201)+, Lower Chariton (10280202)+, Little Chariton (10280203)+, Upper Marais Des Cygnes (10290101)+, Lower Marais Des Cygnes (10290102)+, Harry S. Missouri (10290105)+, Sac (10290106)+, Pomme De Terre (10290107)+, South Grand (10290108)+, Lake of the Ozarks (10290109)+, Niangua (10290110)+, Lower Osage (10290111)+, Upper Gasconade (10290201)+, Big Piney (10290202)+, Lower Gasconade (10290203)+, Lower Missouri-Crooked (10300101)+, Lower Missouri-Moreau (10300102)+, Lamine (10300103)+, Lower Missouri (10300200)+
11	Beaver Reservoir (11010001)+, James (11010002)+, Bull Shoals Lake (11010003)+, Middle White (11010004)+, North Fork White (11010006)+, Upper Black (11010007)+, Current (11010008)+, Spring (11010010)+, Eleven Point (11010011)+, Strawberry (11010012)+, Upper White-Village (11010013)+, Little Red (11010014)+, Upper Arkansas (11020002)+, Fountain (11020003)+, Upper Arkansas-Lake Meredith (11020005)+, Horse (11020008)+, Upper Arkansas-John Martin (11020009)+, Purgatoire (11020010)+, Two Butte (11020013)+, Pawnee (11030005)+, Cow (11030011)+, Middle Arkansas-Slate (11030013)+, North Fork Ninnescah (11030014)+, Upper Cimarron (11040002)+, Bear (11040005)+, Upper Cimarron-Liberal (11040006)+, Lower Cimarron-Skeleton (11050002)+, Kaw Lake (11060001)+, Lower Salt Fork Arkansas (11060004)+, Black Bear-Red Rock (11060006)+, Fall (11070102)+, Caney (11070106)+, Bird (11070107)+, Upper Cottonwood (11070202)+, Upper Neosho (11070204)+, Middle Neosho (11070205)+, Lake O' the Cherokees (11070206)+, Spring (11070207)+, Elk (11070208)+, Lower Neosho (11070209)+, Cimarron (11080002)+, Mora (11080004)+, Lower Canadian-Walnut (11090202)+, Little (11090203)+, Lower Canadian (11090204)+, Upper Beaver (11100101)+, Middle Beaver (11100102)+, Coldwater (11100103)+, Middle North Canadian (11100301)+, Lower North Canadian (11100302)+, Polecat-Snake (11110101)+, Dirty-Greenleaf (11110102)+, Illinois (11110103)+, Robert S. Kerr Reservoir (11110104)+, Poteau (11110105)+, Frog-Mulberry (11110201)+, Dardanelle Reservoir (11110202)+, Lake Conway-Point Remove (11110203)+, Lower Arkansas-Maumelle (11110207)+, Farmers-Mud (11130201)+, Northern Beaver (11130208)+, Washita headwaters (11130301)+, Upper Washita (11130302)+, Middle Washita (11130303)+, Bois D'arc-Island (11140101)+, Kiamichi (11140105)+, Pecan-Waterhole (11140106)+, Lower Little (11140109)+, Mckinney-Posten Bayous (11140201)+, Loggy Bayou (11140203)+, Red Chute (11140204)+, Bodcau Bayou (11140205)+, Lower Red-Lake Iatt (11140207)+, Black Lake Bayou (11140209)+, Lower Sulphur (11140302)+, Cross Bayou (11140304)+
12	Middle Sabine (12010002)+, Lake Fork (12010003)+, Toledo Bend Reservoir (12010004)+, Lower Sabine (12010005)+, Upper Neches (12020001)+, Middle Neches (12020002)+, Lower Neches (12020003)+, Upper Angelina (12020004)+, Lower Angelina (12020005)+, Elm Fork Trinity (12030103)+, Upper Trinity (12030105)+, Cedar (12030107)+, Richland (12030108)+, Chambers (12030109)+, Lower Trinity-Tehuacana (12030201)+, Lower Trinity-Kickapoo (12030202)+, Lower Trinity (12030203)+, West Fork San Jacinto (12040101)+, Spring (12040102)+, Buffalo-San Jacinto (12040104)+, East Galveston Bay (12040202)+, North Galveston Bay (12040203)+, Austin-Oyster (12040205)+, Navasota (12070103)+, Lower Brazos (12070104)+, Lampasas (12070203)+, San Saba (12090109)+, Buchanan-Lyndon B (12090201)+, Lower Colorado-Cummins (12090301)+, Lower Colorado (12090302)+, San Bernard (12090401)+, East Matagorda Bay (12090402)+, Lavaca (12100101)+, Navidad (12100102)+, Lower

	Guadalupe (12100204)+, Lower San Antonio (12100303)+, West Matagorda Bay (12100402)+, East San Antonio Bay (12100403)+
13	Rio Grande headwaters (13010001)+, Alamosa-Trinchera (13010002)+, San Luis (13010003)+, Saguache (13010004)+, Conejos (13010005)+, Rio Grande-Albuquerque (13020203)+, Caballo (13030101)+
14	Colorado headwaters (14010001)+, Eagle (14010003)+, Roaring Fork (14010004)+, Colorado headwaters-Plateau (14010005)+, East-Taylor (14020001)+, Westwater Canyon (14030001)+, Upper Dolores (14030002)+, San Miguel (14030003)+, Upper Colorado-Kane Springs (14030005)+, Upper Green (14040101)+, Upper Green-Slate (14040103)+, Big Sandy (14040104)+, Upper Green-Flaming Gorge Reservoir (14040106)+, Upper Yampa (14050001)+, Upper White (14050005)+, Piceance-Yellow (14050006)+, Lower White (14050007)+, Lower Green-Diamond (14060001)+, Ashley-Brush (14060002)+, Duchesne (14060003)+, Strawberry (14060004)+, Lower Green-Desolation Canyon (14060005)+, Willow (14060006)+, Price (14060007)+, Lower Green (14060008)+, San Rafael (14060009)+, Upper Lake Powell (14070001)+, Muddy (14070002)+, Fremont (14070003)+, Dirty Devil (14070004)+, Escalante (14070005)+, Upper San Juan (14080101)+, Piedra (14080102)+, Animas (14080104)+, Middle San Juan (14080105)+, Chaco (14080106)+, Mcelmo (14080202)+, Chinle (14080204)+, Lower San Juan (14080205)+
15	Lower Colorado-Marble Canyon (15010001)+, Upper Virgin (15010008)+, Little Colorado headwaters (15020001)+, Upper Puerco (15020006)+, Canyon Diablo (15020015)+, Lower Little Colorado (15020016)+, Havasu-Mohave Lakes (15030101)+, Big Sandy (15030201)+, Burro (15030202)+, Bill Williams (15030204)+, San Francisco (15040004)+, Upper Gila-San Carlos Reservoir (15040005)+, San Carlos (15040007)+, Middle Gila (15050100)+, Black (15060101)+, Upper Salt (15060103)+, Tonto (15060105)+, Lower Salt (15060106)+, Upper Verde (15060202)+, Lower Verde (15060203)+, Agua Fria (15070102)+
16	Upper Bear (16010101)+, Central Bear (16010102)+, Bear Lake (16010201)+, Middle Bear (16010202)+, Little Bear-Logan (16010203)+, Lower Bear-Malad (16010204)+, Upper Weber (16020101)+, Lower Weber (16020102)+, Utah Lake (16020201)+, Spanish Fork (16020202)+, Provo (16020203)+, Jordan (16020204)+, Pine Valley (16020302)+, Rush-Tooele Valleys (16020304)+, Skull Valley (16020305)+, Southern Great Salt Lake Desert (16020306)+, Northern Great Salt Lake Desert (16020308)+, Curlew Valley (16020309)+, Great Salt Lake (16020310)+, Upper Sevier (16030001)+, East Fork Sevier (16030002)+, Middle Sevier (16030003)+, San Pitch (16030004)+, Lower Sevier (16030005)+, Escalante Desert (16030006)+, Beaver Bottoms-Upper Beaver (16030007)+, Lower Beaver (16030008)+, Sevier Lake (16030009)+, Lake Tahoe (16050101)+, Truckee (16050102)+, Upper Carson (16050201)+, Middle Carson (16050202)+, Carson Desert (16050203)+, West Walker (16050302)+, Walker (16050303)+, Walker Lake (16050304)+, Spring-Steptoe Valleys (16060008)+
17	Upper Kootenai (17010101)+, Fisher (17010102)+, Yaak (17010103)+, Lower Kootenai (17010104)+, Moyie (17010105)+, Upper Clark Fork (17010201)+, Flint-Rock (17010202)+, Blackfoot (17010203)+, Middle Clark Fork (17010204)+, Bitterroot (17010205)+, North Fork Flathead (17010206)+, Middle Fork Flathead (17010207)+, Flathead Lake (17010208)+, South Fork Flathead (17010209)+, Stillwater (17010210)+, Swan (17010211)+, Lower Flathead (17010212)+, Lower Clark Fork (17010213)+, Pend Oreille Lake (17010214)+, Priest (17010215)+, Pend Oreille (17010216)+, Coeur D'alene Lake (17010303)+, St. Joe (17010304)+, Upper Spokane (17010305)+, Snake headwaters (17040101)+, Gros Ventre (17040102)+, Greys-Hobock (17040103)+, Palisades (17040104)+, Salt (17040105)+, Idaho Falls (17040201)+, Upper Henrys (17040202)+, Lower Henrys (17040203)+, Teton (17040204)+, Willow (17040205)+, American Falls (17040206)+, Blackfoot (17040207)+, Portneuf (17040208)+, Lake Walcott (17040209)+, Raft (17040210)+, Upper Snake-Rock (17040212)+, Salmon Falls (17040213)+, Beaver-Camas (17040214)+, Medicine Lodge (17040215)+, Little Lost (17040217)+, Big Wood (17040219)+, Little Wood (17040221)+, C. J. Idaho (17050101)+, Bruneau (17050102)+, Middle Snake-Succor (17050103)+, Upper Owyhee (17050104)+, South Fork Owyhee (17050105)+, Middle Owyhee (17050107)+, North and Middle Forks Boise (17050111)+, Boise-Mores (17050112)+, South Fork Boise (17050113)+, Lower Boise (17050114)+, Middle Snake-Payette (17050115)+, Upper Malheur (17050116)+, South Fork Payette (17050120)+, Payette (17050122)+, North Fork Payette (17050123)+, Weiser (17050124)+, Brownlee Reservoir (17050201)+, Burnt (17050202)+, Powder (17050203)+, Hells Canyon (17060101)+, Lower Snake-Asotin (17060103)+, Upper Grande Ronde (17060104)+, Wallowa (17060105)+, Lower Grande Ronde (17060106)+, Upper Salmon (17060201)+, Pahsimeroi (17060202)+, Middle Salmon-Panther (17060203)+, Lemhi (17060204)+, Middle Salmon-Chamberlain (17060207)+, South Fork Salmon (17060208)+, Lower Salmon (17060209)+, Lower Selway (17060302)+, Middle Fork Clearwater (17060304)+, South Fork Clearwater (17060305)+, Clearwater (17060306)+, Lower North Fork Clearwater (17060308)+, Middle Columbia-Lake Wallula (17070101)+, Umatilla (17070103)+, Middle Columbia-Hood (17070105)+, Upper John Day (17070201)+, North Fork John Day (17070202)+, Middle Fork John Day (17070203)+, Upper Deschutes (17070301)+, Little Deschutes (17070302)+, Beaver-South Fork (17070303)+, Upper Crooked (17070304)+, Lower Crooked (17070305)+, Lower Deschutes (17070306)+, Trout (17070307)+, Lower Columbia-Sandy (17080001)+, Lower Columbia-Clatskanie (17080003)+, Lower Columbia (17080006)+, Middle Fork Willamette (17090001)+, Coast Fork Willamette (17090002)+, Upper Willamette (17090003)+, Mckenzie (17090004)+, North Santiam (17090005)+, South Santiam (17090006)+, Middle Willamette (17090007)+, Yamhill (17090008)+, Molalla-Pudding (17090009)+, Tualatin (17090010)+, Clackamas (17090011)+, Lower Willamette (17090012)+, Necanicum (17100201)+, Nehalem (17100202)+, Wilson-Trusk-Nestuccu (17100203)+, Siletz-Yaquina (17100204)+, Alsea (17100205)+, Siuslaw (17100206)+, Siltcoos (17100207)+, North Umpqua (17100301)+, South Umpqua (17100302)+, Umpqua (17100303)+, Coos (17100304)+, Coquille (17100305)+, Sixes (17100306)+, Upper Rogue (17100307)+, Middle Rogue (17100308)+, Applegate (17100309)+, Lower Rogue (17100310)+, Illinois (17100311)+, Harney-Malheur Lakes (17120001)+, Silvies (17120002)+, Donner Und

	Blitzen (17120003)+, Silver (17120004)+, Summer Lake (17120005)+, Lake Abert (17120006)+, Warner Lakes (17120007)+
18	Smith (18010101)+, Mad-Redwood (18010102)+, Upper Eel (18010103)+, Big-Navarro-Garcia (18010108)+, Williamson (18010201)+, Sprague (18010202)+, Upper Klamath Lake (18010203)+, Lost (18010204)+, Butte (18010205)+, Upper Klamath (18010206)+, Shasta (18010207)+, Lower Klamath (18010209)+, Trinity (18010211)+, South Fork Trinity (18010212)+, Goose Lake (18020001)+, Upper Pit (18020002)+, Lower Pit (18020003)+, Mccloud (18020004)+, Sacramento headwaters (18020005)+, Upper Stony (18020115)+, Upper Cache (18020116)+, North Fork Feather (18020121)+, East Branch North Fork Feather (18020122)+, Middle Fork Feather (18020123)+, Upper Yuba (18020125)+, North Fork American (18020128)+, South Fork American (18020129)+, Cottonwood Creek (18020152)+, Battle Creek (18020153)+, Clear Creek-Sacramento River (18020154)+, Paynes Creek-Sacramento River (18020155)+, Big Chico Creek-Sacramento River (18020157)+, Butte Creek (18020158)+, Upper Putah (18020162)+, Middle Kern-Upper Tehachapi- (18030003)+, Middle San Joaquin-Lower (18040001)+, Middle San Joaquin-Lower (18040002)+, Upper San Joaquin (18040006)+, Upper Chowchilla-Upper Fresno (18040007)+, Upper Merced (18040008)+, Upper Tuolumne (18040009)+, Upper Stanislaus (18040010)+, Upper Calaveras (18040011)+, Upper Cosumnes (18040013)+, San Pablo Bay (18050002)+, San Francisco Bay (18050004)+, Pajaro (18060002)+, Salinas (18060005)+, Santa Ynez (18060010)+, San Pedro Channel Islands (18070107)+, San Jacinto (18070202)+, Santa Ana (18070203)+, Santa Margarita (18070302)+, Madeline Plains (18080002)+, Honey-Eagle Lakes (18080003)+, Crowley Lake (18090102)+, Mojave (18090208)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: Bald eagle. Mature adults have a white head and tail.
General Description: Adults have a white head, white tail, and a large bright yellow bill; elsewhere the plumage is dark. Immatures are dark with variable amounts of light splotching on the body, underwing coverts, flight feathers, and tail base; averages 79-94 cm long, 178-229 cm wingspan (NGS 1983).
Diagnostic Characteristics: Adults differ from other eagles in having both a white head and white tail (head of white-tailed eagle may look white at a distance). Bald eagle has a proportionately larger head and bill than does the golden eagle, in the immatures of which the white is confined to the base of the primaries and the base of the tail. Bald eagle lacks the long wedge-shaped tail of Steller's sea-eagle. Bald eagle's neck is shorter and tail is longer than in white-tailed eagle.
Reproduction Comments: Clutch size is 1-3 (usually 2). Incubation lasts about 5 weeks, by both sexes. Second hatched young often dies. Young first fly at 10-12.5 weeks, cared for by adults and may remain around nest for several weeks after fledging. Generally first breeds at about 5-6 years. Adults may not lay every year.
Ecology Comments: Commonly roosts communally, especially in winter. See Curnutt (1992) for information on the dynamics of a year-round communal roost in southern Florida.

In Montana, the introduction of shrimp (MYSIS RELICTA) had a cascading effect through the food chain, ultimately causing displacement of bald eagles (Spencer et al. 1991).
Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: Y
Mobility and Migration Comments: Most eagles that breed in Canada and the northern U.S. move south for winter. Migrates widely over most of North America (AOU 1983); moves generally E-SE across Canada and the Great Lakes region to the northeast coast of the U.S. In the northern Chesapeake Bay region, radio-tagged northern migrants arrived in late fall (mean date 21 December) and departed in early spring (mean date 27 March); radio-tagged southern migrants arrived throughout April-August and departed June-October (Buehler et al. 1991). See Palmer (1988) for fairly detailed review of seasonal movements in various regions.

Defended territories are relatively small; fourteen in Alaska varied from 11-45 hectares and averaged 23 ha (Hensel and Troyer 1964), and territory radius around active nests averaged 0.6 km in Minnesota (Mahaffy and Frenzel 1987). Feeding home ranges surrounding active nests are undoubtedly much larger, depending on proximity to food sources and abundance of food. Minimum home range of breeding birds in Saskatchewan was 7 square kilometers (Gerrard et al. 1992); on the Columbia River, Oregon, breeding home ranges averaged 21.6 square kilometers (Garrett et al. 1993).

Winter home ranges can be very large, especially for nonbreeding birds. An immature wintered in Arizona over an area of >40,000 square kilometers and spent the summer in the Northwest Territories over a summer range of >55,000 square kilometers (Grubb et al. 1994). Maximum distance between feeding area and night roost site was less than 16 km in winter in Missouri (Griffin et al. 1982). In north-central Arizona, February-April home range of immatures averaged 400 square kilometers; birds moved frequently and roosted singly or in small groups (Grubb et al. 1989).
Marine Habitat(s): Near shore
Estuarine Habitat(s): Bay/sound, Lagoon, River mouth/tidal river, Tidal flat/shore
Riverine Habitat(s): BIG RIVER, MEDIUM RIVER
Lacustrine Habitat(s): Deep water, Shallow water
Palustrine Habitat(s): FORESTED WETLAND, Riparian
Terrestrial Habitat(s): Cliff, Forest - Conifer, Forest - Hardwood, Forest - Mixed, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed
Habitat Comments: Breeding habitat most commonly includes areas close to (within 4 km) coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, or seabirds (Andrew and Mosher 1982, Green 1985, Campbell et al. 1990). For example, in Saskatchewan lakes, bald eagle density was positively correlated with abundance of large fishes (Dzus and Gerrard 1993).

Nests usually are in tall trees or on pinnacles or cliffs near water. Tree species used for nesting vary regionally and may include pine, spruce, fir, cottonwood, poplar, willow, sycamore, oak, beech, or others. Ground nesting has been reported on the Aleutian Islands in Alaska, in Canada's Northwest Territories, and in Ohio, Michigan, and Texas. The same nest may be used year after year, or a pair may use alternate nest sites in successive years. See Livingston et al. (1990) for a model of nesting habitat in Maine. See Wood et al. (1989) for characteristics of nesting habitat in Florida (most nests were in live pine trees). In Oregon, most nests were within 1.6 km of water, usually in the largest tree in a stand (Anthony and Isaacs 1989). In Colorado and Wyoming, forest stands containing nest trees varied from old-growth ponderosa pine to narrow strips of riparian vegetation surrounded by rangeland (Kralovec et al. 1992). In Arizona, recent nests were on cliffs or pinnacles, or in large cottonwoods, willows, sycamores, or ponderosa pines, usually within 1 km of a riparian corridor (J. T. Driscoll, in Corman and Wise-Gervais 2005).

In winter, bald eagles may associate with waterfowl concentrations or congregate in areas with abundant dead fish (Griffin et al. 1982) or other food resources. Wintering areas are commonly associated with open water though in some regions (e.g., Great Basin) some bald eagles use habitats with little or no open water (e.g., montane areas) if upland food resources (e.g. rabbit or deer carrion, livestock afterbirths) are readily available (GBBO 2010). Wintering eagles tend to avoid areas with high levels of nearby human activity (boat traffic, pedestrians) and development (buildings) (Buehler et al. 1991). Bald eagles preferentially roost in conifers or other sheltered sites in winter in some areas; typically they select the larger, more accessible trees (Buehler et al. 1991, 1992). Perching in deciduous and coniferous trees is equally common in other areas (e.g., Bowerman et al. 1993). Communal roost sites used by two or more eagles are common, and some may be used by 100 or more eagles during periods of high use. Winter roost sites vary in their proximity to food resources (up to 33 km) and may be determined to some extent by a preference for a warmer microclimate at these sites. Available data indicate that energy conservation may or may not be an important factor in roost-site selection (Buehler et al. 1991). Communal night roosts often are in trees that are used in successive years.
Adult Food Habits: Carnivore, Piscivore
Immature Food Habits: Carnivore, Piscivore
Food Comments: Feeds opportunistically on fishes, injured waterfowl and seabirds, various mammals, and carrion (Terres 1980). See Haywood and Ohmart (1986), Kralovec et al. (1992), Brown (1993), and Grubb (1995) for diet of inland breeding populations in Arizona, Colorado, and Wyoming. Hunts live prey, scavenges, and pirates food from other birds (e.g., osprey) and, in Alaska, sea otter (Watt et al. 1995, Condor 97:588-590). See Palmer (1988) for further information on hunting methods. In the Columbia River estuary, tidal flats and water less than 4 m deep were important foraging habitats (Watson et al. 1991). See Caton et al. (1992) for information on foraging perches used in Montana. Sheep carcasses were significant food sources in winter in Oregon (Marr et al. 1995, Wilson Bulletin 107:251-257).
Adult Phenology: Crepuscular, Diurnal
Immature Phenology: Crepuscular, Diurnal
Phenology Comments: In the Columbia River estuary, foraging activity was most common at low tide and first daylight (Watson et al. 1991). In Arizona, foraging activity during the breeding season peaked at 0800-1000 and 1600-1900 MST (Grubb 1995).
Length: 94 centimeters
Weight: 5244 grams

Economic Attributes

Economic Comments: Eagle feathers are used for religious and cultural purposes by Native Americans, and the Department of the Interior is responsible for facilitating the distribution of eagle carcasses for these purposes (executive directive, 29 April 1994).

Management Summary

Stewardship Overview: Conservation strategies in the Great Basin region include the following (GBBO 2010): protection and appropriate management of open water and lowland riparian habitat; in areas near known nest sites, several large trees (especially known nest trees) in proximity to large water bodies with large fish should be left intact; tree removal should be restricted or closely supervised in known winter roost areas; restrict human disturbances and pesticide use near nest sites; manage recreational use of lakes and reservoirs to prevent undue disturbance of nest sites and actively used foraging areas; monitor and, if necessary, manage human disturbance in proximity to winter roost sites. These may be applicable throughout most of the species' range.
Management Requirements: Recovery has been assisted by intensive management that included systematic monitoring, enhanced protection, captive breeding, relocation of wild birds, and publicity (Matthews and Moseley 1990).

Knight and Knight (1984) recommended a 450 m buffer between a human in a canoe and a feeding eagle. For northern Chesapeake Bay, Buehler et al. (1991) recommended a 1360-m-wide shoreline management zone that extends 1400 m inland to encompass nonbreeding roost sites and provide a buffer from human disturbance. Another study recommended a 250-m buffer between a human on land and an eagle in a shoreline tree. A 500-m buffer around the nest may be adequate (see Fraser et al. 1985). In Michigan, 75% of all alert and flight responses to human activity occurred when activity was within 500 m and 200 m, respectively; vehicles and pedestrians elicited the highest response frequencies. Anthony and Isaacs (1989) made recommendations for Oregon: size of areas for nest-site management should be 50-250 ha, with size and shape depending on surrounding vegetation, topography, and eagle behavior; human activities within 800 m of nests should be restricted from 1 January to 31 August; clearcut logging, road building, hiking trails, and boat launch facilities should not be allowed within 400 m of nests. In Arizona, pedestrians were the most disturbing human activity; eagles were more often flushed from perches than from nests and were most easily disturbed when foraging; eagle response to disturbance frequencies were 64% at distances less than 216 m, 45% at 216-583 m, and 24% at distances greater than 583 m (Grubb and King 1991). Along northern Chesapeake Bay, flush distances because of approaching boats averaged 204 m in winter, 176 m in summer (Buehler et al. 1991, which see for further information on the effects of human activity).

In the Columbia River estuary, management of eagle foraging habitats should emphasize protection and enhancement of tidal flats (Watson et al. 1991).

See Busch (1988) for a discussion of management activities in the southwestern U.S., Lefranc and Glinski (1988) for management recommendations.

Supplemental feeding can be used in efforts to replace diminished supplies of natural foods, provide food free of environmental contaminants, provide essential nutrients, enhance survival of subadults, manipulate distribution of populations, increase nesting

success, support released captive-bred birds, and/or afford opportunities for public viewing and education; potential disadvantages of supplemental feeding include prohibitive costs, the loss of natural and cautious behavior, dependence on these food supplies which may alter migration patterns, and increased potential for disease transmission (Knight and Anderson 1990).

See Grubb (1980) for information on construction and use of an artificial nest structure.
Monitoring Requirements: See Fraser et al. (1983) for information on scheduling reproductive surveys. See Britten et al. (1995) for information on satellite telemetry.

Population/Occurrence Delineation

Use Class: Breeding
Subtype(s): Foraging area, Nest site
Minimum Criteria for an Occurrence: Evidence of historical breeding, or current and likely recurring breeding, at a given location, minimally a reliable observation of one or more breeding pairs in appropriate habitat. Be cautious about creating EOs for observations that may represent single breeding events outside the normal breeding distribution. Occurrence includes not only the nest sites, but also the surrounding areas used for feeding during the nesting season.
Mapping Guidance: If feeding grounds are separated from nest site(s) by unsuitable habitat, they should be mapped as a separate polygon within the same occurrence.
Separation Barriers: None.
Alternate Separation Procedure: Each nesting territory or nest is regarded as a separate occurrence.
Separation Justification: Thousands of raptor breeding occurrences, as circumscribed by heritage programs and conservation data centers, have been based on individual nests or territories. Accordingly, we have adopted this procedure as the standard for these species. Although in general we regard metapopulations and groups of ecogeographically associated territories as the most meaningful entities for conservation purposes on a range-wide scale, we believe that the costs of changing established occurrence delineation procedures for raptors outweigh the benefits. Also, given the mobility of these birds, any designation of a specific separation distance would not identify metapopulations in the usual sense of that concept.
Inferred Minimum Extent of Habitat Use (when actual extent is unknown): 2 km
Inferred Minimum Extent Justification: No information found on actual feeding home ranges, but this distance is presented as a minimum.
Date: 21Dec2005
Author: Hammerson, G., and S. Cannings

Use Class: Nonbreeding
Subtype(s): Feeding area, Roosting area
Minimum Criteria for an Occurrence: Evidence of historic, and/or present recurring feeding or roosting concentrations in the non-breeding season; minimally a reliable observation of 10 birds in appropriate habitat. Be cautious about creating EOs for observations that may represent single or very infrequent events.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 10 km
Separation Distance for Suitable Habitat: 10 km
Separation Justification: Separation distance arbitrary. Wintering birds exhibit large movements from day to day and week to week, but feeding concentration areas are largely defined by the distribution of the high quality food resource (e.g. salmon) rather than the movements of the eagles.
Date: 19Sep2001
Author: Cannings, S.

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Not yet assessed

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 19Aug2011
NatureServe Conservation Status Factors Author: Cannings, S.C., E. West, and G. Hammerson
Element Ecology & Life History Edition Date: 19Aug2011
Element Ecology & Life History Author(s): Hammerson, G.

Zoological data developed by NatureServe and its network of natural heritage programs (see **Local Programs**) and other contributors and cooperators (see **Sources**).

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Note: All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of **February 2012**.
Note: This report was printed on **May 1, 2012**

Citation for data on website including State Distribution, Watershed, and Reptile Range maps:
NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 1, 2012).

Citation for Bird Range Maps of North America:
Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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"Data provided by NatureServe in collaboration with Robert Ridgely, James Zook, The Nature Conservancy - Migratory Bird Program, Conservation International - CABS, World Wildlife Fund - US, and Environment Canada - WILDSPACE."

Citation for Mammal Range Maps of North America:
Patterson, B.D., G. Ceballos, W. Sechrest, M.F. Tognelli, T. Brooks, L. Luna, P. Ortega, I. Salazar, and B.E. Young. 2003. Digital Distribution Maps of the Mammals of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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"Data provided by NatureServe in collaboration with Bruce Patterson, Wes Sechrest, Marcelo Tognelli, Gerardo Ceballos, The Nature Conservancy-Migratory Bird Program, Conservation International-CABS, World Wildlife Fund-US, and Environment Canada-WILDSPACE."

Citation for Amphibian Range Maps of the Western Hemisphere:
IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. IUCN, Conservation International, and NatureServe, Washington, DC and Arlington, Virginia, USA.

Acknowledgement Statement for Amphibian Range Maps of the Western Hemisphere:
"Data developed as part of the Global Amphibian Assessment and provided by IUCN-World Conservation Union, Conservation International and NatureServe."

NOTE: Full metadata for the Bird Range Maps of North America is available at:

http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

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NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Glyptemys insculpta - (Le Conte, 1830)
Wood Turtle
Other Related Name(s): *Clemmys insculpta* (Le Conte, 1830)
Related ITIS Name(s): *Glyptemys insculpta* (LeConte, 1830) (TSN 668669)
Unique Identifier: ELEMENT_GLOBAL.2.100280
Element Code: ARAAD02020
Informal Taxonomy: Animals, Vertebrates - Turtles


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View image report from CalPhoto

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Chelonia	Cryptodeira	Emydidae	Glyptemys

Genus Size: B - Very small genus (2-5 species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: King, F. W., and R. L. Burke, editors. 1989. Crocodilian, tuatara, and turtle species of the world: a taxonomic and geographic reference. Association of Systematics Collections, Washington, D.C. 216 pp.
Concept Reference Code: B89KIN01NAUS
Name Used in Concept Reference: *Clemmys insculpta*
Taxonomic Comments: Molecular data and morphological evidence indicate that the genus *Clemmys* (sensu McDowell 1964) is paraphyletic (see Bickham et al. 1996, Holman and Fritz 2001, Feldman and Parham 2002). Based on morphological data, Holman and Fritz (2001) split *Clemmys* as follows: *Clemmys guttata* was retained as the only member of the genus; *Clemmys insculpta* and *C. muhlenbergii* were placed in the genus *Glyptemys* (as first reviser, Holman and Fritz gave *Glyptemys* Agassiz, 1857, precedence over the simultaneously published genus *Calemys* Agassiz, 1857); and *Clemmys marmorata* was transferred to the monotypic genus *Actinemys*.

Genetic data support the basic features of this arrangement. An analysis of emydid relationships based on molecular data (Feldman and Parham 2002) identified four well-supported clades: *Terrapene*; *Clemmys guttata*; *C. insculpta* and *C. muhlenbergii*; and *Clemmys marmorata*, *Emys orbicularis*, and *Emydoidea blandingii*. Feldman and Parham retained *Clemmys guttata* as the only member of that genus; regarded *Clemmys marmorata*, *Emys orbicularis*, and *Emydoidea blandingii* as congeneric (in the genus *Emys*, which has priority); and placed *C. insculpta* and *C. muhlenbergii* in the genus *Calemys*. However, Feldman and Parham were unaware that Holman and Fritz (2001) had given *Glyptemys* precedence over *Calemys*, so the correct generic name for these turtles under the arrangement of Feldman and Parham is *Glyptemys*. In contrast to Holman and Fritz (2001), Feldman and Parham (2002) argued that placing *Clemmys marmorata* in the monotypic genus *Actinemys* would unnecessarily obscure its phylogenetic relationships, and they recommended that *marmorata* be included in the genus *Emys*.

See also McDowell (1964), Merkle (1975), Lovich et al. (1991), and Bickham et al. (1996) for information on relationships among turtles of the genus *Clemmys* (sensu lato).

Conservation Status

NatureServe Status

Global Status: G3
Global Status Last Reviewed: 11Nov2010
Global Status Last Changed: 11Nov2010
Rounded Global Status: G3 - Vulnerable

Reasons: Occurs in the northeastern United States and portions of adjacent southern Canada; apparently declining throughout most of the range; still extant in all 21 states and Canadian provinces from which recorded but rated as apparently secure in only 2 states; late maturity and very low annual juvenile recruitment make the species vulnerable to declines and limit recovery potential; threatened by over-collection (commonly illegal) and habitat loss and fragmentation; better information is needed on population trends and their relationship to specific threats.
Nation: United States
National Status: N3 (11Nov2010)
Nation: Canada
National Status: N3 (28Dec2011)

U.S. & Canada State/Province Status	
United States	Connecticut (S3), District of Columbia (SH), Iowa (S1), Maine (S4), Maryland (S4), Massachusetts (S3), Michigan (S2S3), Minnesota (S2), New Hampshire (S3), New Jersey (S2), New York (S3), Ohio (S1), Pennsylvania (S3S4), Rhode Island (S2), Vermont (S3), Virginia (S2), West Virginia (S2), Wisconsin (S2)
Canada	New Brunswick (S3), Nova Scotia (S3), Ontario (S2), Quebec (S2)

Other Statuses

Canadian Species at Risk Act (SARA) Schedule 1/Annexe 1 Status: T (23Feb2010)
Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Threatened (30Nov2007)
IUCN Red List Category: VU - Vulnerable
Convention on International Trade in Endangered Species Protection Status (CITES): Appendix II

NatureServe Global Conservation Status Factors

Range Extent: 200,000-2,500,000 square km (about 80,000-1,000,000 square miles)
Range Extent Comments: Eastern North America, from Cape Breton Island, Nova Scotia, New Brunswick, and Quebec south to northern Virginia and Eastern Panhandle of West Virginia, west through the Great Lakes region (including southern Ontario) to eastern Minnesota, northeastern Iowa, and western Pennsylvania (Bleakney 1963, Gilhen and Grantmyer 1973, Green and Pauley 1987, Quinn and Tate 1991, Conant and Collins 1991, Harding 1997). Not known from Illinois or Indiana; occurrence in extreme northeastern Ohio was questioned as a possible native population (Conant 1975, Thompson 1953). See 1994 Herpetol. Rev. 25:144-146 for a discussion of occurrence on the coastal plain of Maryland.

Number of Occurrences: 81 - 300
Number of Occurrences Comments: The number of occurrences has not been determined using standardized occurrence specifications, but probably there are at least a few hundred distinct occurrences.

Population Size: 10,000 - 100,000 individuals
Population Size Comments: Total adult population size is unknown but likely exceeds 10,000.

In the Great Lakes region, this species is generally uncommon to rare; locally common where habitat is intact and human disturbance is minimal (Harding 1997). It is rare in Minnesota and uncommon even in suitable habitat; populations are not large (Oldfield and Moriarty 1994). It is widespread but apparently rare in Maine (Hunter et al. 1992).

Environmental Specificity: Narrow. Specialist or community with key requirements common.

Overall Threat Impact: Very high - high
Overall Threat Impact Comments: The species has been seriously impacted by illegal collection. Entire populations along some streams have been eliminated. As a result, the distribution is now more discontinuous than it once was, and gene flow has certainly been reduced in some areas. Collection for pet trade (now illegal in most of the range) is the major threat to the survival of wood turtles. In the north, where development pressure is not great, collection may be the only serious threat. Collectors can easily clean out an entire population along many miles of stream in only one or two seasons of collecting, by timing collection to coincide with the turtles' emergence from hibernation. Although the level of illegal collecting is undocumented, experts in most states surveyed mentioned collecting as a major threat in their state. Most states and provinces in the range now have laws prohibiting mass collection and commercial use. Nevertheless, it is not illegal to sell wood turtles in the rest of the United States, or to export them. They commonly show up in pet stores on the west coast, and they are also shipped to Japan and Europe. Hundreds to thousands of wood turtles arrive in Florida for world-wide distribution each spring (Harding, pers. comm.). Levell (2000) discussed commercial exploitation for the live animal trade. The wood turtle was recently listed in Appendix II of the CITES treaty, which will mean that permits will be required for export of the species (Brautigam, A., 1992, in litt. to J. Harding). The summary prepared for this listing (Inclusion of Clemmys insculpta in Appendix II United States of America Doc. 8.46: No. 51) indicated that "reviewers concur that protective legislation at state and provincial levels in the United States and Canada appears to have done little to curb collection of this species." One reviewer for the CITES listing indicated that specimen price lists only reveal a small fraction of the numbers actually sold, and that sale prices in Europe were reported to exceed US $100 (J. Harding). Another reviewer had been offered $35 per animal and had found selling prices of US $35-200 (R. Brooks). In this same document, reviewer J. Kaufmann reported that Canadian collectors had collected (illegally) several hundred specimens from one stream in Pennsylvania over a couple days time. Clearly, the selling price and apparent ease of collection will continue to put pressure on this species until sales are effectively regulated. The Chelonian Advisory Group of the American

Association of Zoological Parks and Aquariums has adopted a resolution calling for a cessation of collection of CLEMMYS spp. from wild populations, and limitation of purchase to specimens proven to be captive-bred.

In contrast to the vulnerability to direct human exploitation, wood turtles are fairly tolerant of moderate habitat alterations. For instance, though wood turtles are generally associated with wooded streams, they generally feed along the margins of woods, or in openings, where preferred berries grow. Thus, some clearcutting adjacent to streams may not be harmful (Harding 1990). They are also tolerant of moderate development/disturbance, such as shoreline hunting cabins used only a few times a year, timber harvest, light grazing, and low-intensity agriculture (Harding 1997). On the other hand, intense use, such as high-use canoe put-ins and campgrounds generally result in absence of the turtles along such stretches of stream (Harding, pers. comm.). In Connecticut, two formerly stable wood turtle populations declined drastically after a protected drinking water supply area was opened to recreational use (Garber and Burger 1995). Presumably most of the turtles that disappeared were taken by people. In Quebec, "agricultural development may have resulted in reduced predation but also in reduced growth and recruitment, as well as increased adult mortality" (Saumure and Bider 1998).

Habitat destruction and fragmentation due to intense development and accompanying stream alterations are serious problems in the southeastern portion of the wood turtle's range, especially northern Virginia (Mitchell 1994), northwestern New Jersey, southeastern New York and eastern Pennsylvania. Similar problems exist in the Great Lakes region (Harding 1997). "Certain fisheries management practices, such as sand bank stabilization and the digging of sand traps in streams, can eliminate nesting sites and reduce preferred turtle habitat" (Harding 1997). With increasing development, adult mortality due to road traffic also increases (Harding 1997).

Another detrimental aspect of development and intense recreational use is increased egg predation by predators that coexist well with humans. For example, egg predators such as skunks and raccoons commonly increase in abundance with surrounding development and degradation of natural habitat. Although this turtle is apparently adapted to high egg mortality, predation rates elevated above "natural" rates may reduce reproductive success below critical replacement rates. Raccoons may also increase adult mortality. Farrell and Graham found 16.8% of wood turtles captured over a 4-year study to be injured, primarily by raccoons. Harding (1985) provided further information on predation and injuries.

Wood turtles are also intolerant of all types of water pollution. Wood turtles showed declines in some areas in the 1950s and 1960s, probably in response to increasing insecticide use.

Intrinsic Vulnerability: Highly to moderately vulnerable.
Intrinsic Vulnerability Comments: Population biology (late maturity, very low annual juvenile recruitment) limits recovery potential, and heightens vulnerability to over-collection. Low mobility (relative to birds, e.g.), and tendency to home, reduce probability of recolonization of decimated populations. These characteristics necessitate early response to indications of decline.

Short-term Trend: Decline of 30-70%
Short-term Trend Comments: Robust data on trend are not available for most occurrences, but available evidence indicates that this species is declining in many parts of its range, and trend is unknown but likely declining in most other areas. The species is not known to be stable or increasing in any substantial portion of the range. Decline in population size over the past three generations (which likely exceeds 50 years) probably has been substantial.

In the Great Lakes region, many local populations recently have been greatly reduced or extirpated by human activities (Harding 1997).

In southern Quebec, a local population in an agricultural area along the Sutton River declined by 50% over 7 seven years (Daigle and Jutras 2005).

Long-term Trend: Decline of 30-70%
Long-term Trend Comments: Long-term decline is primarily in abundance and condition of occurrences.

Other NatureServe Conservation Status Information

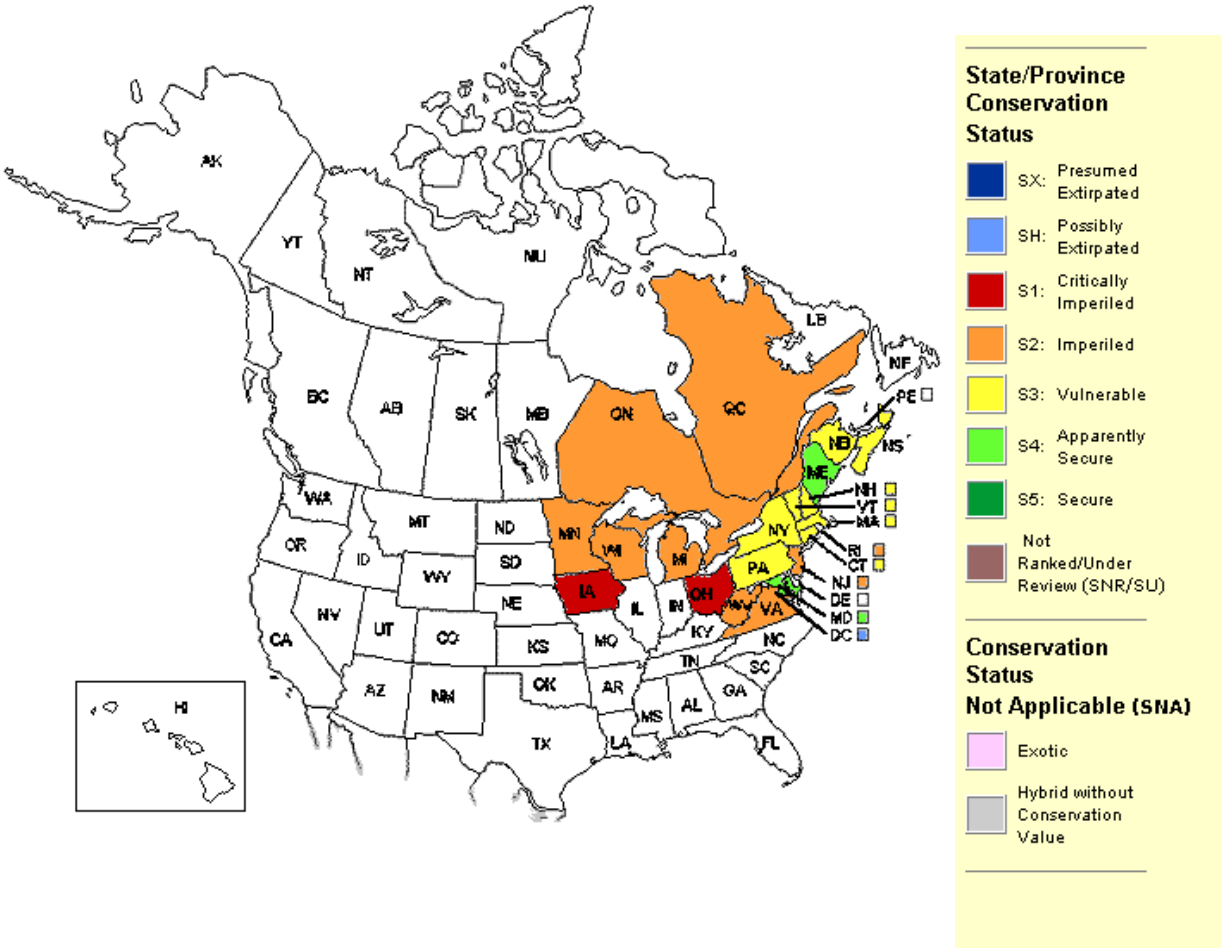
Inventory Needs: Range-wide surveys to assess status and document impact of commercial collection, especially in Pennsylvania and New York, in the heart of range, and Maine, where wood turtles have no state protection. Ongoing or planned inventories in West Virginia, Minnesota, Maryland, and Vermont.

Protection Needs: Species was given CITES Appendix II protection in 1992, which means that permits will now be required for exports. State laws to protect from commercial collection needed in all states and provinces in range. Regulation of commercial sale also needed throughout USA. Also, habitat preservation, education, and moderation of recreational stream use.

Distribution

Global Range: (200,000-2,500,000 square km (about 80,000-1,000,000 square miles)) Eastern North America, from Cape Breton Island, Nova Scotia, New Brunswick, and Quebec south to northern Virginia and Eastern Panhandle of West Virginia, west through the Great Lakes region (including southern Ontario) to eastern Minnesota, northeastern Iowa, and western Pennsylvania (Bleakney 1963, Gilhen and Grantmyer 1973, Green and Pauley 1987, Quinn and Tate 1991, Conant and Collins 1991, Harding 1997). Not known from Illinois or Indiana; occurrence in extreme northeastern Ohio was questioned as a possible native population (Conant 1975, Thompson 1953). See 1994 Herpetol. Rev. 25:144-146 for a discussion of occurrence on the coastal plain of Maryland.

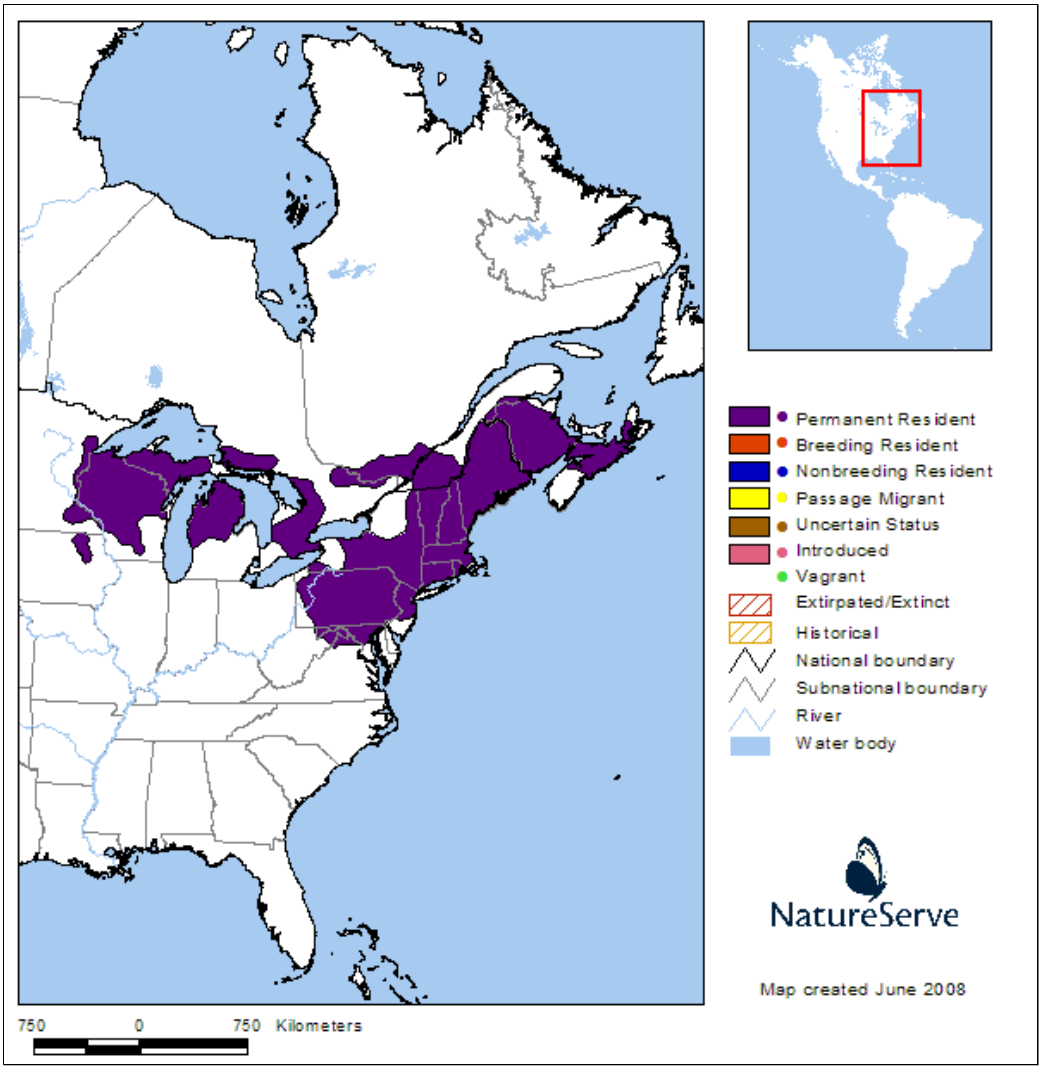
U.S. States and Canadian Provinces



Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	CT, DC, IA, MA, MD, ME, MI, MN, NH, NJ, NY, OH, PA, RI, VA, VT, WI, WV
Canada	NB, NS, ON, QC

Range Map
Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: NatureServe 2008

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
CT	Fairfield (09001), Hartford (09003), Litchfield (09005), Middlesex (09007), New Haven (09009), New London (09011), Tolland (09013), Windham (09015)
IA	Benton (19011), Black Hawk (19013), Bremer (19017), Butler (19023), Chickasaw (19037), Dallas (19049), Delaware (19055), Floyd (19067), Franklin (19069), Iowa (19095), Keokuk (19107), Mitchell (19131), Washington (19183)
MA	Berkshire (25003), Bristol (25005), Essex (25009), Franklin (25011), Hampden (25013), Hampshire (25015), Middlesex (25017), Norfolk (25021), Plymouth (25023), Suffolk (25025)*, Worcester (25027)
MD	Allegany (24001), Frederick (24021), Montgomery (24031), Washington (24043)
ME	Androscoggin (23001), Aroostook (23003), Cumberland (23005), Franklin (23007), Hancock (23009), Kennebec (23011), Lincoln (23015), Oxford (23017), Penobscot (23019), Piscataquis (23021), Somerset (23025), Waldo (23027), Washington (23029), York (23031)
MI	Alcona (26001), Allegan (26005)*, Alpena (26007), Arenac (26011), Baraga (26013), Benzie (26019), Cheboygan (26031), Chippewa (26033), Clare (26035), Crawford (26039), Delta (26041), Dickinson (26043), Gladwin (26051), Gogebic (26053), Grand Traverse (26055), Houghton (26061), Ingham (26065)*, Iosco (26069), Iron (26071), Isabella (26073), Kalkaska (26079), Kent (26081), Lake (26085), Manistee (26101), Marquette (26103), Mason (26105), Mecosta (26107), Menominee (26109), Midland (26111), Missaukee (26113), Montcalm (26117), Montmorency (26119), Muskegon (26121), Newaygo (26123), Oceana (26127), Ogemaw (26129), Ontonagon (26131), Osceola (26133), Oscoda (26135), Otsego (26137), Presque Isle (26141), Roscommon (26143), Saginaw (26145)*, Schoolcraft (26153), Wexford (26165)
MN	Carlton (27017), Chisago (27025), Dakota (27037), Dodge (27039), Goodhue (27049), Houston (27055), Isanti (27059), Lake (27075), Mille Lacs (27095), Mower (27099), Olmsted (27109), Pine (27115), Rice (27131), St. Louis (27137), Steele (27147), Wabasha (27157)

NH	Belknap (33001), Carroll (33003), Cheshire (33005), Coos (33007), Grafton (33009), Hillsborough (33011), Merrimack (33013), Rockingham (33015), Strafford (33017), Sullivan (33019)
NJ	Atlantic (34001)*, Bergen (34003), Burlington (34005), Camden (34007)*, Essex (34013), Gloucester (34015)*, Hudson (34017)*, Hunterdon (34019), Mercer (34021), Middlesex (34023), Monmouth (34025), Morris (34027), Ocean (34029), Passaic (34031), Somerset (34035), Sussex (34037), Union (34039), Warren (34041)
OH	Cuyahoga (39035)*
PA	Armstrong (42005), Berks (42011), Blair (42013), Bucks (42017), Butler (42019), Cameron (42023), Carbon (42025), Chester (42029), Columbia (42037), Cumberland (42041), Franklin (42055), Fulton (42057)*, Indiana (42063), Juniata (42067), Lebanon (42075), Lehigh (42077), Mifflin (42087), Monroe (42089), Montgomery (42091), Montour (42093), Northampton (42095), Perry (42099), Philadelphia (42101)*, Pike (42103), Schuylkill (42107), Snyder (42109), Venango (42121), Warren (42123)
RI	Kent (44003), Providence (44007), Washington (44009)
VA	Alexandria (City) (51510)*, Arlington (51013)*, Clarke (51043), Fairfax (51059), Frederick (51069), Loudoun (51107), Page (51139), Rockingham (51165), Shenandoah (51171), Warren (51187)
VT	Addison (50001), Bennington (50003), Chittenden (50007), Essex (50009), Orange (50017), Rutland (50021), Washington (50023)
WI	Adams (55001)*, Ashland (55003), Barron (55005), Bayfield (55007), Brown (55009), Buffalo (55011), Burnett (55013), Chippewa (55017), Clark (55019), Columbia (55021), Crawford (55023), Douglas (55031), Dunn (55033), Eau Claire (55035), Florence (55037), Forest (55041), Grant (55043)*, Iowa (55049)*, Iron (55051)*, Jackson (55053), Juneau (55057), La Crosse (55063), Langlade (55067), Lincoln (55069), Marathon (55073), Marinette (55075), Menominee (55078), Monroe (55081), Oconto (55083), Oneida (55085), Outagamie (55087), Pepin (55091), Pierce (55093), Polk (55095), Portage (55097), Price (55099), Richland (55103), Rusk (55107), Sauk (55111)*, Sawyer (55113), Shawano (55115), St. Croix (55109), Taylor (55119), Trempealeau (55121), Vernon (55123), Vilas (55125), Washburn (55129), Waupaca (55135), Winnebago (55139)*, Wood (55141)
WV	Berkeley (54003), Grant (54023), Hampshire (54027), Hardy (54031), Jefferson (54037)*, Mineral (54057), Morgan (54065), Pendleton (54071)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
01	Upper St. John (01010001)+, Allagash (01010002)+, Fish (01010003)+, Aroostook (01010004)+, West Branch Penobscot (01020001)+, East Branch Penobscot (01020002)+, Mattawamkeag (01020003)+, Piscataquis (01020004)+, Lower Penobscot (01020005)+, Upper Kennebec (01030001)+, Dead (01030002)+, Lower Kennebec (01030003)+, Upper Androscoggin (01040001)+, Lower Androscoggin (01040002)+, St. Croix (01050001)+, Maine Coastal (01050002)+, St. George-Sheepscot (01050003)+, Presumpscot (01060001)+, Saco (01060002)+, Piscataqua-Salmon Falls (01060003)+, Pemigewasset (01070001)+, Merrimack (01070002)+, Contoocook (01070003)+, Nashua (01070004)+, Concord (01070005)+, Merrimack (01070006)+, Upper Connecticut (01080101)+, Waits (01080103)+, Upper Connecticut-Mascoma (01080104)+, White (01080105)+, Black-Ottauquechee (01080106)+, West (01080107)+, Middle Connecticut (01080201)+, Miller (01080202)+, Deerfield (01080203)+, Chicopee (01080204)+, Lower Connecticut (01080205)+, Westfield (01080206)+, Farmington (01080207)+, Charles (01090001)+, Blackstone (01090003)+, Narragansett (01090004)+, Pawcatuck-Wood (01090005)+, Quinebaug (01100001)+, Shetucket (01100002)+, Thames (01100003)+, Quinnipiac (01100004)+, Housatonic (01100005)+, Saugatuck (01100006)+
02	Hudson-Hoosic (02020003)+, Rondout (02020007)+, Lower Hudson (02030101)+, Hackensack-Passaic (02030103)+, Sandy Hook-Staten Island (02030104)+, Raritan (02030105)+, Middle Delaware-Mongaup-Brodhead (02040104)+, Middle Delaware-Musconetcong (02040105)+, Lehigh (02040106)+, Crosswicks-Neshaminy (02040201)+, Lower Delaware (02040202)+, Schuylkill (02040203)+, Brandywine-Christina (02040205)+, Mullica-Toms (02040301)+, Great Egg Harbor (02040302)+, Upper Susquehanna-Lackawanna (02050107)+, Sinnemahoning (02050202)+, Lower West Branch Susquehanna (02050206)+, Lower Susquehanna-Penns (02050301)+, Upper Juniata (02050302)+, Lower Juniata (02050304)+, Lower Susquehanna-Swatara (02050305)+, Lower Susquehanna (02050306)+, South Branch Potomac (02070001)+, North Branch Potomac (02070002)+, Cacapon-Town (02070003)+, Conococheague-Opequon (02070004)+, North Fork Shenandoah (02070006)+, Shenandoah (02070007)+, Middle Potomac-Catoctin (02070008)+, Middle Potomac-Anacostia-Occoquan (02070010)+
04	Beaver-Lester (04010102)+, St. Louis (04010201)+, Cloquet (04010202)+, Beartrap-Nemadji (04010301)+, Bad-Montreal (04010302)+, Black-Presque Isle (04020101)+, Ontonagon (04020102)+, Keweenaw Peninsula (04020103)+, Sturgeon (04020104)+, Dead-Kelsey (04020105)+, Betsy-Chocolay (04020201)+, Duck-Pensaukee (04030103)+, Oconto (04030104)+, Peshtigo (04030105)+, Brule (04030106)+, Menominee (04030108)+, Cedar-Ford (04030109)+, Escanaba (04030110)+, Fishdam-Sturgeon (04030112)+, Upper Fox (04030201)+, Wolf (04030202)+, Lake Winnebago (04030203)+, Lower Fox (04030204)+, Kalamazoo (04050003)+, Upper Grand (04050004)+, Lower Grand (04050006)+, Pere Marquette-White (04060101)+, Muskegon (04060102)+, Manistee (04060103)+, Betsie-Platte (04060104)+, Boardman-Charlevoix (04060105)+, Manistique (04060106)+, Lone Lake-Ocqueoc (04070003)+, Cheboygan (04070004)+, Black (04070005)+, Thunder Bay (04070006)+, Au Sable (04070007)+, Au Gres-Rifle (04080101)+, Tittabawassee (04080201)+, Pine (04080202)+, Shiawassee (04080203)+, Huron (04090005)+, Black-Rocky (04110001)+, Otter Creek (04150402)+, Winooski River (04150403)+, Lake Champlain (04150408)+

05	Conewango (05010002)+, Middle Allegheny-Tionesta (05010003)+, French (05010004)+, Middle Allegheny-Redbank (05010006)+, Conemaugh (05010007)+, Lower Allegheny (05010009)+
07	Rum (07010207)+, Upper St. Croix (07030001)+, Namekagon (07030002)+, Kettle (07030003)+, Lower St. Croix (07030005)+, Rush-Vermillion (07040001)+, Cannon (07040002)+, Buffalo-Whitewater (07040003)+, Zumbro (07040004)+, Trempealeau (07040005)+, La Crosse-Pine (07040006)+, Black (07040007)+, Root (07040008)+, Upper Chippewa (07050001)+, Flambeau (07050002)+, South Fork Flambeau (07050003)+, Jump (07050004)+, Lower Chippewa (07050005)+, Eau Claire (07050006)+, Red Cedar (07050007)+, Coon-Yellow (07060001)+, Grant-Little Maquoketa (07060003)+, Turkey (07060004)+, Maquoketa (07060006)+, Upper Wisconsin (07070001)+, Lake Dubay (07070002)+, Castle Rock (07070003)+, Baraboo (07070004)+, Lower Wisconsin (07070005)+, Kickapoo (07070006)+, Upper Cedar (07080201)+, Shell Rock (07080202)+, West Fork Cedar (07080204)+, Middle Cedar (07080205)+, Middle Iowa (07080208)+, Lower Iowa (07080209)+, South Raccoon (07100007)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: a medium-sized aquatic turtle
General Description: A medium-sized turtle with a low, broad, gray to brown, usually keeled carapace that is intricately sculptured with concentric growth layers; plastron is yellow, each scute having an irregular dark lateral blotch; adults have orange on neck and limbs and usually are 14-20 cm in carapace length, rarely to 23 cm (Smith and Brodie 1982, Conant and Collins 1991). Hatchlings average 26.6-34 mm carapace length (CL) (Harding and Bloomer 1979, Lovich et al. 1990) and have a tail that may be as long as the carapace.
Diagnostic Characteristics: Differs from box turtles and Blanding's turtle in lacking a hinged plastron. Differs from diamondback terrapin in habitat and having orange neck and leg skin in adults and a plain colored (vs. patterned) head in young.
Reproduction Comments: Copulates in spring or fall (e.g., Niederberger and Seidel 1999, Ernst 2001); mostly in spring in the north; usually late March-April and October-November in New Jersey (Farrell and Graham 1991); more often in fall than in spring in Virginia and central Pennsylvania (Kaufmann 1992).

Depending on local climate, eggs can be laid anytime from mid-May to early July. In New Jersey, Virginia, and Pennsylvania (Ernst 2001), a single clutch generally is laid in June. Clutch size usually is 4-18 (often 7-14). Clutch size averaged 11 in Wisconsin (Ross et al. 1991), about 9 in Ontario (Brooks et al. 1992).

In New Jersey, clutch size was 5-11 (mean 8.5) (Farrell and Graham, 1991). Harding and Bloomer reported that clutches averaged 10 eggs in Michigan, and clutches of 13-14 eggs were "not uncommon." Eggs hatch after 70-80 days, August-October (after about 70 days, generally in late August, in New Jersey). Sex is genetically determined, and sex ratios are approximately 1:1 at birth (Ewert and Nelson 1991).

In New Jersey, wood turtles grow to 165 mm (6.5 inches) in 7 or 8 years. In Michigan, growth rates are slower, and it may take as many as 12 years to attain a 169 mm CL (Harding, 1990). Growth rates for males and females are constant until secondary sexual differences begin to appear, when males begin to grow faster, and ultimately become larger than females (Lovich et al. 1990). Harding (1990) found that average CL of females was 182 mm (n = 105), and average CL of males was 200 mm (n = 86). After and early growth spurt, growth of both sexes slows considerably, until by 20 years of age, growth rates are so slow that annual growth rings on the shell no longer yield accurate age data (Harding 1990).

In Pennsylvania, secondary sexual characteristics began to appear at 5-9 years of age, at a size of 160 to 180 mm (Lovich et al. 1990). However, there is usually a delay of several years between sexual differentiation and sexual maturity. Maturity is apparently not attained until 12 to 15 years of age (Lovich et al. 1990, Farrell and Graham 1991, Harding 1990). In a long term study in Michigan, Harding reported that the smallest female found laying eggs was 158 mm carapace length and had twelve growth rings, indicating she was at least 12 years old. In New Jersey, attained maturity in 14th year (Farrell and Graham 1991). In Wisconsin, the youngest gravid female was 14 years old; the smallest male observed copulating was 20 years old (Ross et al. 1991). In Ontario age at maturity was 17-18 years (Brooks et al. 1992).

Nesting success generally is very low, with egg predators taking a heavy toll. One report conservatively estimated egg and hatchling mortality at 98% (Harding 1990). An Ontario population incurred a high rate of predation on nests and adults (Brooks et al. 1992). Reproductive success depends on a high rate of adult survival, long-lived adults that reproduce many times during their lifetime, and the occasional good season when a nest survives (Harding, pers. comm. 1992).

Adults may live for many years, with maximum ages of 32 years (wild caught) and 58 years (captive) reported by Harding and Bloomer (1979). In Pennsylvania, several known-age turtles marked as juveniles were found to live at least 30 to 42 years (Ernst, 1992, personal communication). Given the difficulty of aging turtles over 20 years, the wild caught age is likely conservative.
Ecology Comments: Solitary late spring-summer; may aggregate in or near hibernation sites. Not territorial (Kaufmann 1992, which see for a detailed study of social behavior in central Pennsylvania).

New Jersey populations averaged 12.5 adults/ha, but the turtles were usually concentrated around basking areas or favorite food patches, rather than spread evenly across an area. In New Jersey, population density over several years averaged 10.7/ha of suitable habitat (Farrell and Graham 1991). In Michigan, the populations seem to be more scattered, and density is likely considerably lower. In southern Quebec, density was estimated at 1.2 turtles per 100 m of river (Daigle 1997). In West Virginia, estimated density was 19.1 individuals per hectare of total habitat (287-337 individuals along a 1.7 km length of river) (Niederberger and Seidel 1999). In Pennsylvania, density for 240 ha of available habitat was 0.66 turtles/ha, whereas density for available riparian habitat where most turtles occurred was 4.42 turtles/ha (Ernst 2001).

The combination of late maturity, low reproductive success, and long-lived adults results in a population structure skewed heavily toward adults. Harding's study populations consisted of 80 to 85% adults. Farrell and Graham (1991) reported 3% juveniles (1 to 8 years), 53%

subadults (9 to 13 years), and 34% adults (over 13 years) in one New Jersey population; almost half of the population comprised individuals over 14 cm in plastron length These characteristics combine to delay the detection of population declines, and to reduce the ability of small, declining populations to recover. A population studied in West Virginia included 46% juveniles (Niederberger and Seidel 1999).
Non-Migrant: N
Locally Migrant: Y
Long Distance Migrant: N
Mobility and Migration Comments: In Virginia, a male moved 1 km in one day from his hibernaculum to his normal home range (Ernst and McBreen 1991, Mitchell 1991). In New Hampshire, Tuttle (1996) recorded movements of over 900 m in one day.

After eggs are laid, adults in eastern populations often disperse to more upland areas for summer range, where they tend to remain within a fairly defined, though variably sized, area (referred to as "home range" below).

The home range is often elongate because of the tendency to follow streams (Strang 1983). Virtually all turtle locations are within 150-300 m of streams used by the turtles (Harding and Bloomer 1979, Arvisais et al. 2002). Based on the 95% convex polygon method, the largest home ranges have been documented in Quebec and Ontario (averaging about 24-28 ha; largest single-season home range = 132 ha) (Quinn and Tate 1991, Arvisais et al. 2002). Maps in Quinn and Tate (1991) depicted home ranges of up to about 1.9 km in longest dimension; one female moved 3.6 km in a fairly straight line from her apparent nesting site to her late summer range. Home range size documented by others is an order of magnitude smaller (average less than 7 ha) (Strang 1983, Kaufmann 1995, Ross et al. 1991, Tuttle 1996, Tuttle and Carroll 1997, Ernst 2001; see also Arvisais et al. 2002).

Wood turtles have a reputation of intelligence and agility. They are excellent climbers and easily escape from boxes and enclosures. They are quick to learn mazes, daily routines, and are known to be good at homing (Tinklepaugh 1932, Clement 1958). Caroll and Ehrenfeld (1978) reported that wood turtles could often return to the exact spot of capture when released up to 2 kilometers away. Homing ability fell off sharply beyond the 2 km distance, and learning, age, and sex were not found to influence homing ability.
Riverine Habitat(s): CREEK, Low gradient, MEDIUM RIVER, Moderate gradient
Palustrine Habitat(s): FORESTED WETLAND, HERBACEOUS WETLAND, Riparian
Terrestrial Habitat(s): Forest - Hardwood, Grassland/herbaceous, Sand/dune
Habitat Comments: Wood turtles live along permanent streams during much of each year but in summer may roam widely overland and can be found in a variety of terrestrial habitats adjacent to streams, including deciduous woods, cultivated fields, and woodland bogs, marshy pastures. Use of woodland bogs and marshy fields is most common in the northern part of the range.

Wood turtles are often associated with the margins of woods. For example, in Wisconsin, wood turtles used wet mesic forest in riverbottom and riparian shrub/forest ecotones; most captures were in ecotones between alder thickets and grassy openings (Ross et al. 1991). In western Maine, within activity areas, wood turtles selected nonforested locations close to water with low canopy cover; within a watershed, they selected activity areas close to streams with moderate forest cover and little open water; overall they appeared to select forest edges to balance thermoregulatory and feeding needs (Compton et al. 2002).

Most activity is terrestrial June-August in Pennsylvania, May-October in New Jersey (Farrell and Graham 1991), but turtles commonly enter streams at night (Kaufmann 1992). Individuals occur mainly in streams in spring and fall. Some agricultural operations may be locally beneficial by providing a mixture of different food and cover types near wooded streams (Kaufmann 1992). Western populations are closely associated with water year-round, and eastern populations tend to be more terrestrial in the summer. According to Harding and Bloomer, Michigan wood turtles were never found more than 152 m (500 ft) from water, and had leeches (evidence of aquatic habits) at all times of the year. New Jersey wood turtles were found farther from water and were free of leeches during summer months. Hatchlings and small juveniles are much more closely associated with water than are adults. In Minnesota, Buech et al. (1990, 1991) found that nesting habitat and stream substrate are the most important habitat determinants. Wood turtles were never found in water where the bottom substrate was mucky. Harding (1990) reported that in Michigan these turtles are not found in clay-bottomed streams. However, Carl Ernst (1992, pers. comm.) reported that in Virginia and Pennsylvania the turtles can be found in streams with clay substrate. Harding (1990) also reported that wood turtles are usually found where openings in the streamside canopy allow growth of herbaceous plants. These openings provide both food and basking sites. As with other turtles, nesting wood turtles require loose substrate on fully exposed (unshaded) sites, such as sandy banks or sand-gravel bars in streams. When natural openings are unavailable they may use such man-made disturbances as road grades, railroad grades, sand pits, or plowed fields.

Overwintering occurs in bottoms or banks of streams where water flows all winter, including pools underneath a layer of ice; underwater muskrat burrows, beaver lodges, or over-bank root systems also may be used as winter hibernation (brumation) sites (Ernst 1986).

Reproductive activity (courtship, copulation) is aquatic (Ernst 1986). Eggs are laid in open sunny areas in fairly moist but well-drained, sandy or gravelly soil, commonly in clearings created by humans. Sites are usually near a stream, but females often appear along roads at this time of year, presumably looking for nesting sites in the soft shoulder material. This habit is a significant source of adult mortality. The female digs a hole in the dirt or sand with her hind feet, deposits the eggs and then carefully fills in the soil and tamps it flat (Pallas 1960).

Other turtles often share nest sites with this species. McBreen (1989) reported that Chelydra serpentia, Chrysemys picta, Terrapene carolina, Pseudemys rubrinventris used the same nest sites as wood turtles in Virginia. In Michigan wood turtles shared nesting areas with Chrysemys picta and Chelydra serpentina. In New Jersey, Clemmys muhlenbergi, C. guttata, Chrysemys picta, Chelydra serpentina, and Terrapene carolina commonly share nesting areas with wood turtles (Harding and Bloomer 1979).
Adult Food Habits: Carnivore, Frugivore, Invertivore, Piscivore
Immature Food Habits: Carnivore, Frugivore, Invertivore, Piscivore
Food Comments: Opportunistic omnivore. Pope (1967) indicated a strong preference for vegetable matter, including fruits, berries, tender leaves, and mushrooms. Harding and Bloomer (1979) listed insects, earthworms, mollusks, tadpoles, dead fish, and newborn mice as foods, with invertebrates and plant matter predominant. Favorite leaves include sandbar willow and strawberries (Harding 1990). Strang (1983) tallied food choices of wood turtles in their natural habitat in Pennsylvania and found that they ate fungi and green leaves most frequently (accounting for a total of 68% of all feeding observations), and fruits/flowers and insects about equally (totalling

32% of observations). In Pennsylvania, Ernst (2001) reported a diet of earthworms, leeches, caterpillars, fish (likely carrion), and Rana clamitans tadpoles and adults.

Feeds in water and on land (Ernst 2001). In some areas, reported to stamp the front feet or hit the plastron on the ground, which brings earthworms to the surface where they can be captured and eaten.
Adult Phenology: Diurnal, Hibernates/aestivates
Immature Phenology: Diurnal, Hibernates/aestivates
Phenology Comments: Most active diurnally, March or April through October or November (Farrell and Graham 1991, Ernst 2001). Some aquatic movements may occur in winter, especially in the southern part of the range. Activity peaks in morning in summer, in afternoon in spring and fall. Mating and egg layinh sometimes continue after dark. Does not estivate (Ernst 1986, Farrell and Graham 1991).

Males tend to be active and easy to find earlier in the spring than are females, whereas females are easier to find during the egg-laying season.
Length: 23 centimeters

Economic Attributes

Economic Comments: Very popular in the pet trade (Mitchell 1991).

Management Summary

Restoration Potential: It is possible to breed wood turtles in captivity as long as natural conditions, including winter hibernation, are approximated. However, Harding (1990), after more than 20 years studying wood turtles, strongly discouraged captive breeding for this species. He stated his arguments this way: "...release of hatchlings is poor compensation for removal of adults from a population, due to high natural mortality of the former. Based on Michigan data, the release of between 50 and 100 hatchlings would be required to balance the removal of one adult from the population. Head-starting of juveniles is an unproven technique; the recapture rate of head-started juveniles (1 year olds) in this study was less than 5%." Recovery of the species to historical levels is highly unlikely, because much habitat has been permanently lost to development. However, if commercial collection were stopped, in much of its range the wood turtle would require little active protection or management to remain secure.

Low recruitment rate may make recovery a slow process.
Preserve Selection & Design Considerations: Overall, land preservation is currently less important than regulatory protection from commercial collection for the pet trade. In the extreme southeastern portion of its range, land protection is of primary importance. In areas where human use conflicts with wood turtle needs, habitat protection should proceed. Preserve design should include protection of wooded stream corridors, nesting, feeding, basking, and overwintering sites, and an upland buffer would be necessary to include in preserve design. The size of the upland buffer would need to be determined from studies of local populations, since wood turtles vary considerably in home range size. Alternatively, a preserve could be fenced to prevent turtles from leaving the protected area, if adequate food, basking, nesting and hibernating sites were available within the preserve. Control of excessive nest predation should also be considered in preserve design. Finally, roads should not be placed close to and parallel to the stream, as adult mortality along roads is significant.

Garber (unpublished) suggested that populations with a minimum of 50 breeding adult females in a population might be viable.
Management Requirements: Because of low natural reproductive success, it is essential to respond to declining populations early. Habitat management could benefit this species in the portions of its range where human use and development are intense. Wood turtles are fairly tolerant of a variety of adjacent land uses. Any management compatible with maintenance of water quality, nesting and hibernating habitat, a reasonable food supply, and natural mortality levels, will be compatible with wood turtles.

Habitat improvement is probably best aimed at nesting, basking, and hibernating sites. Creation of openings in the woods along streams, where herbaceous vegetation and berries can thrive may be a necessary management activity in some areas. Maintenance of natural stream dynamics that create sand bars and islands, natural banks, and open sand shores, and restriction of intense human impact along rivers (restriction of designated campgrounds and access points), are probably the most critical foci of management. Some trout management practices, especially sand traps that remove sand and produce a gravelly stream bed, are counterproductive for wood turtles, which prefer sandy substrate.

Education is also an important management tool, especially on rivers that get heavy canoe use. Canoeists should be informed that this species is protected and should not be collected or used as a target for shooting.

In some areas, predator control would be of benefit. Management of habitat characteristics of adjacent uplands should be aimed at achieving a mixture of vegetation including forest-edge habitat without encouraging raccoon and skunk populations.

See Brewster and Brewster (1991) for information on the movements of captive-bred juveniles introduced into a wood turtle population in Wisconsin.
Monitoring Requirements: It is essential to conduct monitoring censuses at the proper time of the year. A good idea of population size can be obtained by walking or floating a stream when the turtles first emerge from hibernation. Three years of census are recommended to get an accurate estimate of population size (Harding, pers. comm.). Ideally, sites should be revisited during the nesting season to check nesting sites for signs of reproduction. Counting the number of nesting females is another method of estimating population size, since sex ratios are generally 1:1. However, this method will not account for juveniles. To get a clear picture of a particular population's dynamics, individual turtles should be captured, marked, aged, and sized. This is not practical for most range-wide surveys, but would be useful for representative, or critical populations. The overall status of the species is only poorly known at present (see above). A rangewide, concerted effort of thorough and repeated censuses over the next 3-5 years would help pinpoint the areas most needing attention, allow an accurate assessment of status, and greatly aid in documenting the impact of commercial collectors.
Management Research Needs: The biology of wood turtles is fairly well studied. The main research needed presently is an assessment of the rangewide status (see monitoring needs, above). Population monitoring and management would be enhanced by population studies, including viability analyses, on a few important populations from across the range. This would give a more complete

picture of the status of the species. These studies would also help to identify the population parameters that best indicate population health, so these could be used to improve the value of monitoring efforts.

Research is needed to determine levels of predation that can be tolerated by wood turtles without causing population declines. Then, the impact of various human use patterns on predation level should be investigated so that predator controls can be instigated where needed.

Also needed is a better idea of the amount of feeding and summer habitat wood turtles use or require in different regions, so that management can be aimed at adequate habitat.
Biological Research Needs: Population viability analyses across range; levels of predation that can be tolerated; impact of human use on predation level; amount of feeding and summer habitat required in different regions and habitats.

Population/Occurrence Delineation

Use Class: Not applicable

Subtype(s): Hibernaculum, Nesting Area.
Minimum Criteria for an Occurrence: Occurrences are based on evidence of historical presence, or current and likely recurring presence, at a given location. Such evidence minimally includes collection or reliable observation and documentation of one or more individuals (including eggs) in or near appropriate habitat where the species is presumed to be established and breeding.
Separation Barriers: Busy highway or highway with obstructions such that turtles rarely if ever cross successfully; untraversable topography (e.g., cliff); urbanized area lacking aquatic or wetland habitat; large impoundment or lake.
Alternate Separation Procedure: Separation distance across continuous upland habitat: 1 km. Separation distance for locations along riverine corridors: 5 km. Separation distance for intermediate (e.g., mixed upland-riverine wetland) situations: 3 km.

A riverine corridor is measured along the river, not as a straight line distance. It includes areas that have stream-influenced conditions (geomorphology, vegetation, hydrology). Upland habitat lacks hydric soils and stream-influenced conditions.
Separation Justification: Available data (see Migration/Mobility comments) indiate that home ranges tend be be elongate (usually less than 2 km long) and follow streams, extending out from streams up to 300 m. These data suggest a separation distance of the nominal minimum of 1 km for expanses of upland habitat and at least 5 km for riverine corridors. The latter distance is roughly 2.5 times the maximum known home range length (Quinn and Tate 1991) and more than four times the maximum recorded home range length in most other studies, which, due to small sample sizes and minimal radio-tracking effort, likely underestimated movements.
Inferred Minimum Extent of Habitat Use (when actual extent is unknown): .5 km
Date: 12Feb2003
Author: Hammerson, G.

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Not yet assessed

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 11Nov2010
NatureServe Conservation Status Factors Author: Hammerson, G., and J. Soule
Management Information Edition Date: 19Dec1994
Management Information Edition Author: JUDITH SOULE, MICHIGAN NATURAL FEATURES INVENTORY. PARTIALLY REVISED AND EDITED BY G. HAMMERSON.
Management Information Acknowledgments: Al Breisch, Andy Cutko, Rick Dutko, Bonita Eliason, Charles Fitchel, Jim Harding, Judith Harding, Dawn McKay, Joanne Michaud, Brian McDonald, Paul Novak, Chris Pague, Kathy Schneider, Clark Shiffer, Tim Vogt provided information on wood turtles in their states. Dr. Jim Harding of Michigan State University, and Dr. Carl Ernst of George Mason University reviewed the first draft and provided many helpful comments and unpublished information.
Element Ecology & Life History Edition Date: 12Feb2003
Element Ecology & Life History Author(s): SOULE, J., AND G. HAMMERSON

Zoological data developed by NatureServe and its network of natural heritage programs (see **Local Programs**) and other contributors and cooperators (see **Sources**).

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Note: All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of **February 2012**.
Note: This report was printed on **May 1, 2012**

Citation for data on website including State Distribution, Watershed, and Reptile Range maps:
NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 1, 2012).

Citation for Bird Range Maps of North America:
Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

Acknowledgement Statement for Bird Range Maps of North America:
"Data provided by NatureServe in collaboration with Robert Ridgely, James Zook, The Nature Conservancy - Migratory Bird Program, Conservation International - CABS, World Wildlife Fund - US, and Environment Canada - WILDSPACE."

Citation for Mammal Range Maps of North America:
Patterson, B.D., G. Ceballos, W. Sechrest, M.F. Tognelli, T. Brooks, L. Luna, P. Ortega, I. Salazar, and B.E. Young. 2003. Digital Distribution Maps of the Mammals of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

Acknowledgement Statement for Mammal Range Maps of North America:
"Data provided by NatureServe in collaboration with Bruce Patterson, Wes Sechrest, Marcelo Tognelli, Gerardo Ceballos, The Nature Conservancy-Migratory Bird Program, Conservation International-CABS, World Wildlife Fund-US, and Environment Canada-WILDSPACE."

Citation for Amphibian Range Maps of the Western Hemisphere:
IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. IUCN, Conservation International, and NatureServe, Washington, DC and Arlington, Virginia, USA.

Acknowledgement Statement for Amphibian Range Maps of the Western Hemisphere:
"Data developed as part of the Global Amphibian Assessment and provided by IUCN-World Conservation Union, Conservation International and NatureServe."

NOTE: Full metadata for the Bird Range Maps of North America is available at:
http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

Full metadata for the Mammal Range Maps of North America is available at:
http://www.natureserve.org/library/mammalsDistributionmetadatav1.pdf.

contacted for a site-specific review of the project area (see **Visit Local Programs**).

Feedback Request: NatureServe encourages users to let us know of any errors or significant omissions that you find in the data through (see **Contact Us**). Your comments will be very valuable in improving the overall quality of our databases for the benefit of all users.

NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Phenacomys ungava - Merriam, 1889
Eastern Heather Vole
Related ITIS Name(s): *Phenacomys ungava* Merriam, 1889 (TSN 552492)
Unique Identifier: ELEMENT_GLOBAL.2.103453
Element Code: AMAFF10050
Informal Taxonomy: Animals, Vertebrates - Mammals - Rodents

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Mammalia	Rodentia	Cricetidae	Phenacomys

Genus Size: B - Very small genus (2-5 species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: Wilson, D. E., and D. M. Reeder (editors). 1993. Mammal Species of the World: a Taxonomic and Geographic Reference. Second Edition. Smithsonian Institution Press, Washington, DC. xviii + 1206 pp. Available online at: http://www.nmnh.si.edu/msw/.
Concept Reference Code: B93WIL01NAUS
Name Used in Concept Reference: *Phenacomys ungava*
Taxonomic Comments: There is uncertainty about the taxonomic status of *Phenacomys ungava*. In recent decades, most authors have regarded *ungava*as a subspecies of *P. intermedius*. Musser and Carleton (in Wilson and Reeder 1993, 2005) noted the present validity of earlier statements that the relationship between *intermedius* and *ungava* needs further detailed study; nevertheless, they listed P. *ungava* as a separate species. Jones et al. (1997), Baker et al. (2003), and George (in Wilson and Ruff 1999) also recognized *ungava* as a distinct species.

Conservation Status

NatureServe Status

Global Status: G5
Global Status Last Reviewed: 15Jun2000
Global Status Last Changed: 15Jun2000
Rounded Global Status: G5 - Secure
Reasons: Wide distribution in North America; many protected occurrences; no known large-scale threats.
Nation: United States
National Status: NNR
Nation: Canada
National Status: N5 (01Jan2012)

U.S. & Canada State/Province Status	
United States	Minnesota (S3)
Canada	Labrador (SNR), Manitoba (S5), Northwest Territories (S5), Nunavut (SNR), Ontario (S4), Quebec (S4), Saskatchewan (S5), Yukon Territory (S4S5)

Other Statuses

IUCN Red List Category: LC - Least concern

NatureServe Global Conservation Status Factors

Range Extent: >2,500,000 square km (greater than 1,000,000 square miles)
Range Extent Comments: Labrador west to southern Yukon Territory, south to southern Alberta (Wilson and Reeder 1993), southcentral Saskatchewan, southeastern Manitoba, northeastern Minnesota (Jannett and Oehlenschlager 1997), southern Ontario, and southern Quebec (McAllister and Hoffmann 1988). For recent records from Minnesota, see Etnier (1989).

Number of Occurrences: 81 to >300
Number of Occurrences Comments: At least hundreds of known locations.

Population Size: 10,000 to >1,000,000 individuals

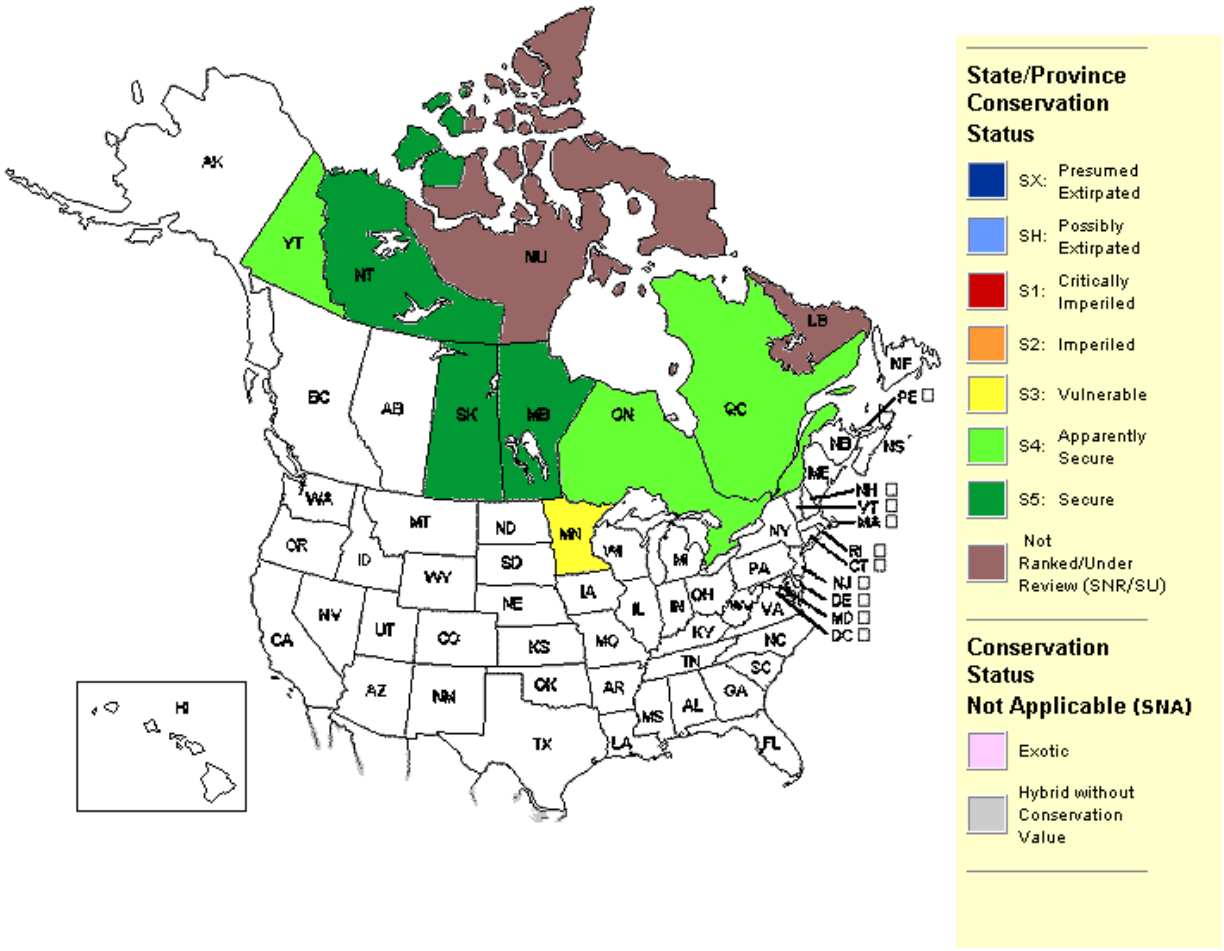
Short-term Trend: Unknown
Short-term Trend Comments: Unknown

Other NatureServe Conservation Status Information

Distribution

Global Range: (>2,500,000 square km (greater than 1,000,000 square miles)) Labrador west to southern Yukon Territory, south to southern Alberta (Wilson and Reeder 1993), southcentral Saskatchewan, southeastern Manitoba, northeastern Minnesota (Jannett and Oehlenschlager 1997), southern Ontario, and southern Quebec (McAllister and Hoffmann 1988). For recent records from Minnesota, see Etnier (1989).

U.S. States and Canadian Provinces

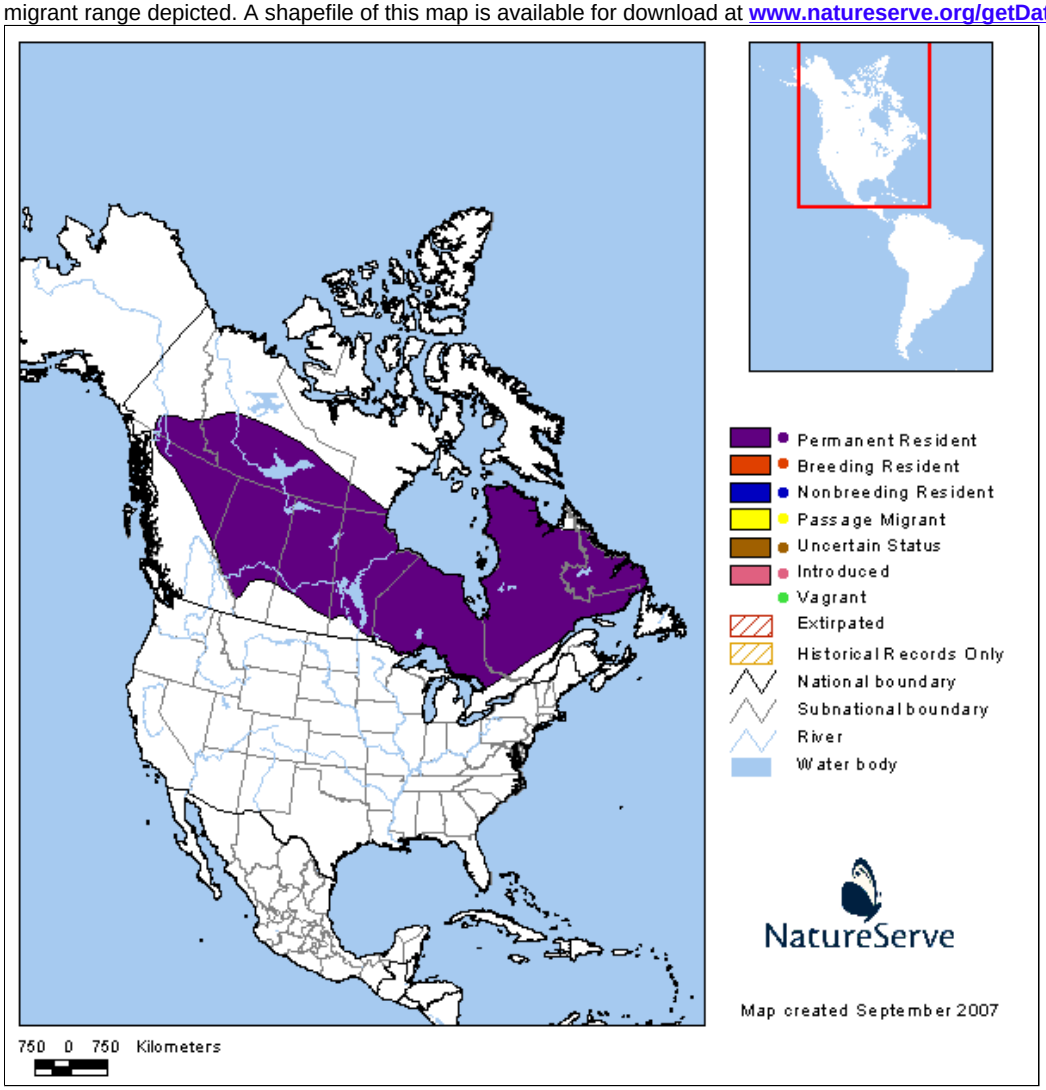


Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	MN
Canada	LB, MB, NT, NU, ON, QC, SK, YT

Range Map

Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at [www.natureserve.org/getData/animalData.jsp.](www.natureserve.org/getData/animalData.jsp)



Range Map Compilers: Sechrest, 2002

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
MN	Cook (27031), Lake (27075), St. Louis (27137)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
04	Baptism-Brule (04010101)+, Beaver-Lester (04010102)+, St. Louis (04010201)+, Cloquet (04010202)+, Lake Superior (04020300)+
09	Rainy Headwaters (09030001)+

\+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A small, relatively short-tailed vole.

Economic Attributes Not yet assessed

Not yet assessed

Management Summary Not yet assessed

Population/Occurrence Delineation

Group Name: SMALL MURID RODENTS

Use Class: Not applicable
Minimum Criteria for an Occurrence: Evidence of historical presence, or current and likely recurring presence, at a given location. Such evidence minimally includes collection or reliable observation and documentation of one or more individuals in appropriate habitat where the species is presumed to be established and breeding.
Mapping Guidance: Separate sites separated by less than 1000 meters should be mapped as separate polygons.
Separation Barriers: Barriers include: wide highways with heavy traffic (subjective determination) and highways with continuous solid barriers that prevent rodent passage; major water bodies, arbitrarily set at those greater than 50 meters across in ice-free areas and those greater than 200 meters wide if frozen regularly.
Separation Distance for Unsuitable Habitat: 2 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: Home ranges may be quite small, but at least some species exhibit good dispersal ability that may take them several kilometers from their natal area (Maier 2002). *Peromyscus* that have been displaced up to 3 km may return home within a few days (see Maier 2002). Displaced *Neotoma fuscipes* dispersed up to at least 1.6 km from their release point in five nights (Smith 1965). A male *Dicrostonyx richardsoni* moved more than 3 kilometers per day several times (Engstrom, in Wilson and Ruff 1999). Some species can traverse significant distances of unsuitable habitat. For example, *Peromyscus leucopus* may move between wooded areas separated by a deforested agricultural gap of up to at least 2 km (Krohne and Hoch 1999). In New Brunswick, a tagged subadult male *Peromyscus maniculatus* was captured at locations 1.77 km apart after a period of 2 weeks in September, suggesting that dispersal may extend at least this far (Bowman et al. 1999). In Kansas, individual *Peromyscus maniculatus* were captured at trap sites up to 1.32 km apart (Rehmeier et al. 2004). Dispersal can play a key role in the population dynamics of murid rodents.

Patterns of genetic (DNA) variation indicate that gene flow can be low among subpopulations of *Neotoma magister* and that effective dispersal is limited among subpopulations separated by as little as 3 km (Castleberry et al. 2002).

Separation distance for suitable habitat is a compromise between the typical small home range sizes of these mammals and their sometimes considerable dispersal ability and the likely low probability that two occupied locations separated by less than several kilometers of suitable habitat would represent independent populations.

Roads, especially divided highways, are major barriers to dispersal in small mammals (Oxley et al. 1974, Wilkins 1982, Garland and Bradley 1984).
Date: 08Mar2005
Author: Hammerson, G., and S. Cannings
Notes: Group contains most members of the family Muridae: mice, voles, lemmings, woodrats, etc.

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank) Not yet assessed

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 12Nov1996
NatureServe Conservation Status Factors Author: Reichel, J. D., and G. Hammerson

Zoological data developed by NatureServe and its network of natural heritage programs (see Local Programs) and other contributors and cooperators (see Sources).

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Note: All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of **February 2012**.
Note: This report was printed on **May 1, 2012**

information contained herein. Since the data in the central databases are continually being updated, it is advisable to refresh data retrieved at least once a year after its receipt. The data provided is for planning, assessment, and informational purposes. Site specific projects or activities should be reviewed for potential environmental impacts with appropriate regulatory agencies. If ground-disturbing activities are proposed on a site, the appropriate state natural heritage program(s) or conservation data center can be contacted for a site-specific review of the project area (see **Visit Local Programs**).

Feedback Request: NatureServe encourages users to let us know of any errors or significant omissions that you find in the data through (see **Contact Us**). Your comments will be very valuable in improving the overall quality of our databases for the benefit of all users.


NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Coturnicops noveboracensis - (Gmelin, 1789)
Yellow Rail
Related ITIS Name(s): *Coturnicops noveboracensis* (Gmelin, 1789) (TSN 176259)
Unique Identifier: ELEMENT_GLOBAL.2.100233
Element Code: ABNME01010
Informal Taxonomy: Animals, Vertebrates - Birds - Other Birds


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Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Gruiformes	Rallidae	Coturnicops

Genus Size: B - Very small genus (2-5 species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, D.C. [as modified by subsequent supplements and corrections published in *The Auk*]. Also available online: http://www.aou.org/.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: *Coturnicops noveboracensis*
Taxonomic Comments: May constitute a superspecies with *C. exquisitus* (AOU 1998).

Conservation Status

NatureServe Status

Global Status: G4
Global Status Last Reviewed: 25Nov1996
Global Status Last Changed: 25Nov1996
Rounded Global Status: G4 - Apparently Secure
Reasons: Widespread distribution centered in south-central and southeastern Canada; apparently rather rare in most areas, though this is partly because of difficulty in detection; known to be fairly common in some areas; evidently declining in some areas where habitat destruction is ongoing, but there are some significant areas of protected habitat.
Nation: United States
National Status: N3B,N4N
Nation: Canada
National Status: N4B (13Feb2012)

U.S. & Canada State/Province Status	
United States	Alabama (S2N), Arkansas (SNA), California (S1S2), District of Columbia (SHN), Florida (SNA), Georgia (S3?), Illinois (SXB,S2N), Indiana (SNA), Iowa (SNA), Kansas (SNA), Kentucky (SNA), Louisiana (S3S4N), Massachusetts (S1N), Michigan (S1S2), Minnesota (S3B), Mississippi (S2N), Missouri (SU), Montana (S3B), Nebraska (SNRN), New Jersey (SNRN), New York (SNRN), North Carolina (S2N), North Dakota (S2), Ohio (SX), Oregon (S1B), South Dakota (SUB), Texas (S3N), Virginia (SNRN), Wisconsin (S1B), Wyoming (SNA)
Canada	Alberta (S2), British Columbia (S2B), Manitoba (S3S4B), New Brunswick (S1?B), Northwest Territories (S2B), Ontario (S4B), Quebec (S2S3B), Saskatchewan (S3B,S2M)

Other Statuses

Canadian Species at Risk Act (SARA) Schedule 1/Annexe 1 Status: SC (05Jun2003)
Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Special Concern (27Nov2009)
IUCN Red List Category: LC - Least concern

NatureServe Global Conservation Status Factors

Range Extent: 20,000-2,500,000 square km (about 8000-1,000,000 square miles)
Range Extent Comments: BREEDING: locally from northwestern Alberta to central Saskatchewan, Manitoba, northern New York (Gibbs, pers. comm.), Maine, and New Brunswick, south to southern Alberta, northeastern Montana, North Dakota, Michigan, southern Wisconsin, northern Minnesota, southern Ontario, and New England; formerly south to southern Ohio and northern Illinois (Bookhout 1995). Nested formerly in eastern California, where current nesting is a possibility. Recently rediscovered nesting in southern Oregon (Stern et al. 1993). Formerly occurred in State of Mexico, Rio Lerma Valley (subspecies GOLDMANI) where last reported in 1964 (Bookhout 1995). NON-BREEDING: mostly on Coastal Plain in southeastern U.S. from Texas to North Carolina; scattered records in California from Humboldt to Riverside Counties (Bookhout 1995).

Number of Occurrences: 81 to >300
Number of Occurrences Comments: Difficult to estimate due to rail's secretive nature, but a total of more than 150 EOs were reported from the five states and provinces that provided this information in a 1993 survey. It is likely that there are many more EOs in territories that did not respond (e.g., Manitoba and Saskatchewan). Species is likely highly under-detected. Many new records in Minnesota as a result of intensive county inventories suggest that the scant records prior to these inventories were due to lack of detection.

Population Size: 2500 - 10,000 individuals
Population Size Comments: Probably more abundant than present records indicate.

Overall Threat Impact Comments: The major threats are nesting habitat destruction due to coastal development, natural succession, and wetland destruction. The breeding grounds are used for hay and pastures. Light agricultural use is beneficial, whereas intensive grazing removes needed cover. Hunting is a threat of unknown dimensions, especially in the mid-Atlantic coastal zone (Gibbs, pers. comm.). In Minnesota, habitat is threatened by agriculture and gamebird management activities (Coffin and Pfannmuller 1988). The timing of flooding for waterfowl management differs from the natural flooding cycle of the migratory habitat of the rails (Rundle and Fredrickson 1981). Johnson and Dinsmore (1986) reported that waterfowl management can be compatible with breeding rails. In Mississippi, urbanization, development of the coastal zone, and stream alteration projects have lowered the water table and destroyed marshes.
In Illinois, a public viewing area used once a week by humans 229 m from a rookery did not cause any overt responses from nesting birds (DeMauro 1993). See Vos (1984) for information on response to human disturbance in Colorado. Predators may include the red fox (VULPES VULPES), mink (MUSTELA spp), raccoon (PROCYON LOTOR), snakes, turtles, crows (CORVUS spp), gulls (LARUS spp), hawks, owls, eagles, rats, opossum (DIDELPHIS VIRGINIANA), striped skunk (MEPHITIS MEPHITIS), river otter (LUTRA CANADENSIS), coyote (CANIS LATRANS) and bobcat (LYNX RUFUS).

Short-term Trend: Decline of 10-30%
Short-term Trend Comments: Information on population trends and historic data is scant due to difficulty of detecting birds. Becoming rare in some parts of its range, but is still common in others. Declining in North Dakota and Mississippi.

Other NatureServe Conservation Status Information

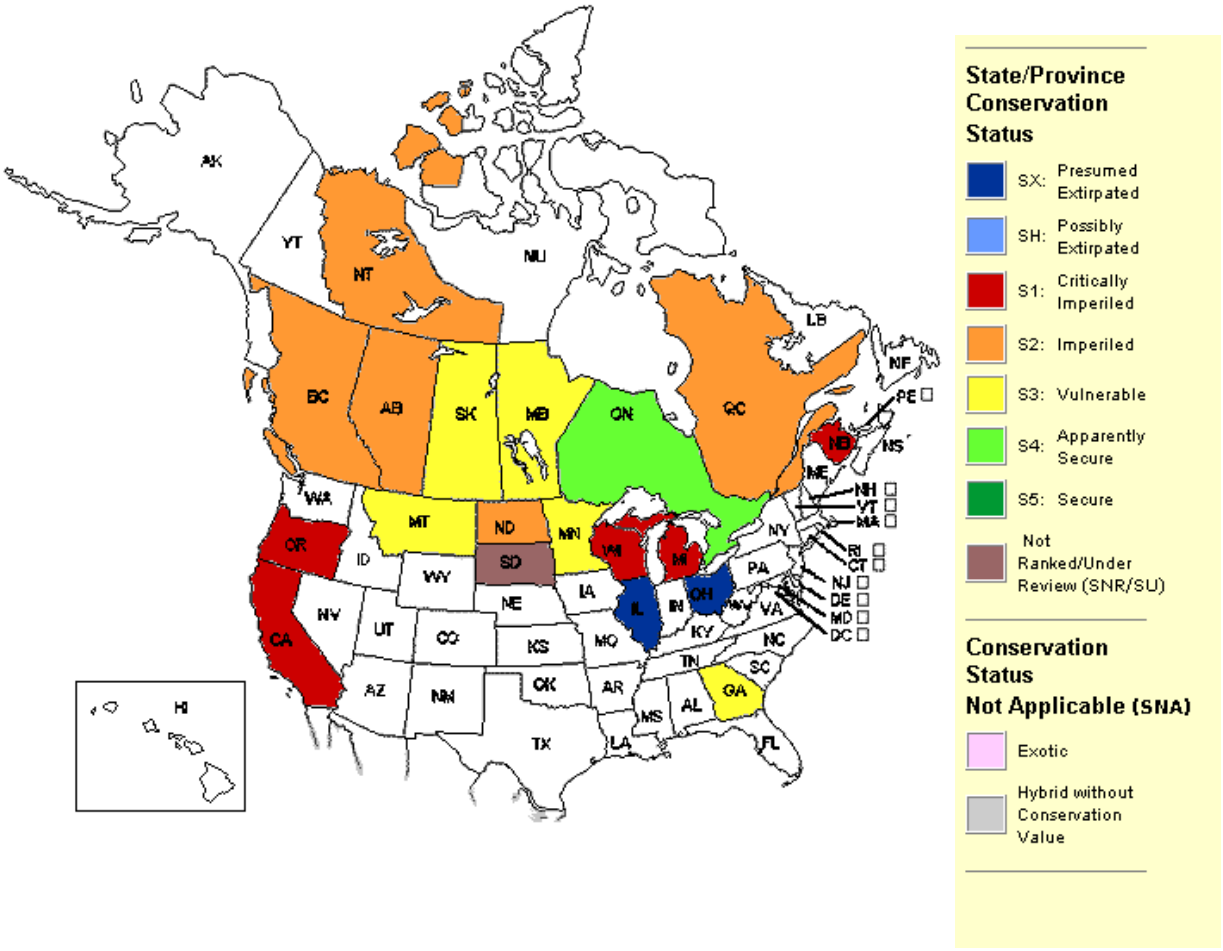
Inventory Needs: Determine current distribution, abundance, and population trend, especially in prairie states and coastal areas.

Protection Needs: Protect remaining habitat, especially coastal marshes and prairie pothole marshes. Discourage stream alteration projects that lower the water table in wetland rail habitat. Eddleman et al. (1988) made the following protection recommendations for North American rallids: enforce the 1985 Farm Act to protect wetlands from agricultural damage; accelerate U.S. Fish and Wildlife Service acquisition of wetlands with high elevational diversity and high percentage of emergent vegetation; resume congressional funding of the Accelerated Research Program for Migratory and Upland Game Birds that funds research on habitat management; institute a U.S. Fish and Wildlife Service hunting stamp for hunting rails and migratory game birds other than waterfowl to facilitate data collection and promote habitat protection.

Distribution

Global Range: (20,000-2,500,000 square km (about 8000-1,000,000 square miles)) BREEDING: locally from northwestern Alberta to central Saskatchewan, Manitoba, northern New York (Gibbs, pers. comm.), Maine, and New Brunswick, south to southern Alberta, northeastern Montana, North Dakota, Michigan, southern Wisconsin, northern Minnesota, southern Ontario, and New England; formerly south to southern Ohio and northern Illinois (Bookhout 1995). Nested formerly in eastern California, where current nesting is a possibility. Recently rediscovered nesting in southern Oregon (Stern et al. 1993). Formerly occurred in State of Mexico, Rio Lerma Valley (subspecies GOLDMANI) where last reported in 1964 (Bookhout 1995). NON-BREEDING: mostly on Coastal Plain in southeastern U.S. from Texas to North Carolina; scattered records in California from Humboldt to Riverside Counties (Bookhout 1995).

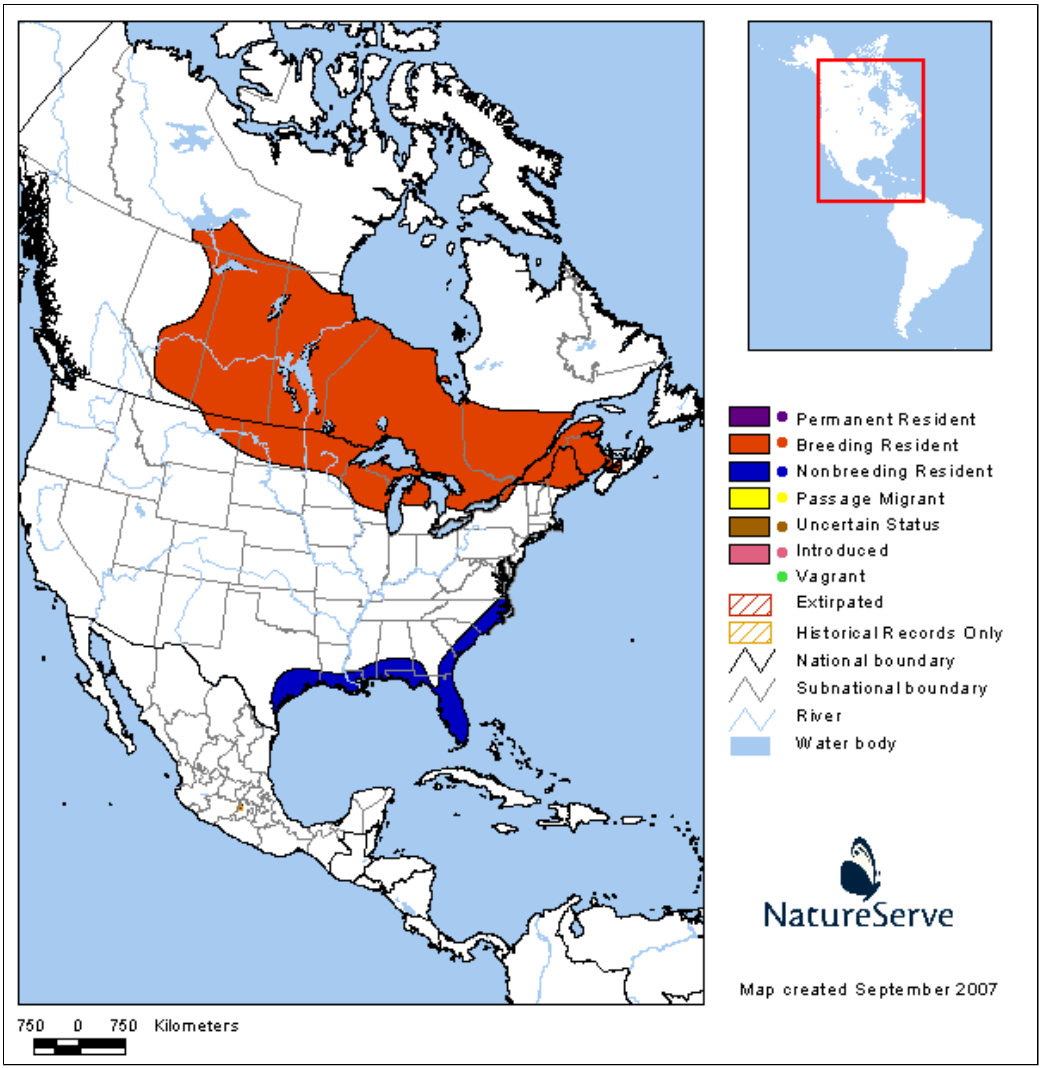
U.S. States and Canadian Provinces



NOTE: The maps for birds represent the breeding status by state and province. In some jurisdictions, the subnational statuses for common species have not been assessed and the status is shown as not-assessed (SNR). In some jurisdictions, the subnational status refers to the status as a non-breeder; these errors will be corrected in future versions of these maps. A species is not shown in a jurisdiction if it is not known to breed in the jurisdiction or if it occurs only accidentally or casually in the jurisdiction. Thus, the species may occur in a jurisdiction as a seasonal non-breeding resident or as a migratory transient but this will not be indicated on these maps. See other maps on this web site that depict the Western Hemisphere ranges of these species at all seasons of the year.
Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	AL, AR, CA, DC, FL, GA, IA, IL, IN, KS, KY, LA, MA, MI, MN, MO, MS, MT, NC, ND, NE, NJ, NY, OH, OR, SD, TX, VA, WI, WY
Canada	AB, BC, MB, NB, NT, ON, QC, SK

Range Map
Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: WILDSPACETM 2002

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
CA	Merced (06047)*
MI	Chippewa (26033), Luce (26095)*, Mackinac (26097), Roscommon (26143), Schoolcraft (26153)*
MN	Aitkin (27001), Becker (27005), Beltrami (27007), Benton (27009)*, Cass (27021), Clay (27027), Clearwater (27029), Cook (27031), Crow Wing (27035), Itasca (27061), Kanabec (27065), Kittson (27069), Lake of the Woods (27077), Mahnomen (27087), Marshall (27089), Mille Lacs (27095), Morrison (27097), Norman (27107), Otter Tail (27111), Pennington (27113), Pine (27115), Polk (27119), Roseau (27135), Sherburne (27141)*, St. Louis (27137), Stearns (27145)*, Todd (27153), Wadena (27159), Wilkin (27167)
MS	Forrest (28035)*, Harrison (28047), Jackson (28059), Lamar (28073)*, Pearl River (28109)*, Stone (28131)*
MT	Roosevelt (30085)*, Sheridan (30091)
NC	Carteret (37031), Currituck (37053), Dare (37055), Hyde (37095)
ND	Benson (38005), Burke (38013), Divide (38023), Grand Forks (38035), McHenry (38049), Mountrail (38061), Sheridan (38083), Stutsman (38093)
OR	Klamath (41035), Lake (41037)
SD	Faulk (46049)
WI	Ashland (55003), Barron (55005), Bayfield (55007), Burnett (55013), Calumet (55015), Chippewa (55017), Door (55029), Douglas (55031), Forest (55041), Langlade (55067), Marinette (55075), Marquette (55077), Monroe (55081), Oconto (55083), Oneida (55085), Sawyer (55113), Vilas (55125)
WY	Teton (56039)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)

Watershed Region	Watershed Name (Watershed Code)
03	Albemarle (03010205)+, Pamlico Sound (03020105)+, White Oak River (03020301)+, Pascagoula (03170006)+, Black (03170007)+, Mississippi Coastal (03170009)+, Lower Pearl. Mississippi (03180004)+
04	Baptism-Brule (04010101)+, St. Louis (04010201)+, Beartrap-Nemadji (04010301)+, Bad-Montreal (04010302)+, Betsy-Chocolay (04020201)+, Manitowoc-Sheboygan (04030101)+, Door-Kewaunee (04030102)+, Oconto (04030104)+, Peshtigo (04030105)+, Upper Fox (04030201)+, Wolf (04030202)+, Muskegon (04060102)+, Manistique (04060106)+, St. Marys (04070001)+, Carp-Pine (04070002)+
07	Mississippi Headwaters (07010101)+, Leech Lake (07010102)+, Prairie-Willow (07010103)+, Elk-Nokasippi (07010104)+, Pine (07010105)+, Crow Wing (07010106)+, Redeye (07010107)+, Long Prairie (07010108)+, Platte-Spunk (07010201)+, Clearwater-Elk (07010203)+, Rum (07010207)+, Upper St. Croix (07030001)+, Snake (07030004)+, Lower St. Croix (07030005)+, Upper Chippewa (07050001)+, Flambeau (07050002)+, Lower Chippewa (07050005)+, Red Cedar (07050007)+, Upper Wisconsin (07070001)+, Castle Rock (07070003)+
09	Lower Souris (09010003)+, Upper Red (09020104)+, Buffalo (09020106)+, Eastern Wild Rice (09020108)+, Devils Lake (09020201)+, Upper Sheyenne (09020202)+, Sandhill-Wilson (09020301)+, Red Lake (09020303)+, Thief (09020304)+, Clearwater (09020305)+, Grand Marais-Red (09020306)+, Turtle (09020307)+, Snake (09020309)+, Lower Red (09020311)+, Two Rivers (09020312)+, Roseau (09020314)+, Big Fork (09030006)+, Rapid (09030007)+, Lake of the Woods (09030009)+
10	Big Muddy (10060006)+, Brush Lake closed basin (10060007)+, Lake Sakakawea (10110101)+, Apple (10130103)+, Snake (10160008)+
17	Greys-Hobock (17040103)+, Little Deschutes (17070302)+, Summer Lake (17120005)+
18	Williamson (18010201)+, Sprague (18010202)+, Upper Klamath Lake (18010203)+, Middle San Joaquin-Lower (18040001)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A small marsh bird (rail).
General Description: A small buffy rail with very secretive habits (Peterson 1980). White wing patch noticeable in flight. Has a very short greenish bill and a striped, checkered back with buff and black (Peterson 1980). The male's bill turns black after the breeding season. Weight 50-55 g; 15 to 19 cm (6 to 7.5 inches) long; wingspan 25 to 33 cm (10 to 13 inches) (Evers 1990). Males are generally larger than females.

Both the male and female are capable of calling. The calls consist of a long, continued series of pairs and triplets of "ticks" (Savaloja 1981). The female has a variety of calls used when protecting young. A "rowr" is used when the nest is disturbed, a whining may be used to attract young, and moans may be given when brooding (Savaloja 1981). Males call during northward migration and females do not. During the pre-incubation period the males will give their calls nightly for hours, stopping for only a few minutes each hour. Calling continues (at lower levels) during and after incubation but generally ends in mid-August.

The chicks have a pink bill and are black in color. The bill fades and eventually becomes black in its juvenile stage. Juveniles are darker than adults and have white barred breast areas and distinctive spots on the head. Young chicks and juveniles give various sounds described as "wees" and "peeps" (Savaloja 1981).
Diagnostic Characteristics: Small size; striped yellow and black above with small white crossbars; in flight shows a large white patch on trailing edges of wings; bill short and thick. Call is a four- or five-note tik-tik, tik-tik-tik, in alternate twos and threes (National Geographic Society 1999).
Reproduction Comments: Sexual activity usually takes place in the late morning hours. Lay six to ten eggs per clutch (Savaloja 1981, Brewer et al. 1991) with eight being the average. In Minnesota and North Dakota eggs are laid in late May and early June (Savaloja 1981). Incubation begins after the last egg is laid and lasts 13 to 20 days (Harrison 1979, Savaloja 1981). Female incubates and does not leave the nest at night during this time. Within one day of hatching the young leave the nest and are cared for by female. The young can feed on their own at 11 days (Stenzel 1983). Fledge at five weeks (Stahlhelm 1974). Renesting may occur if initial nests are destroyed or unsuccessful.
Ecology Comments: Male territories are an average of 7.8 ha (19 acres), and are established within one week of their arrival (Bookhout and Stenzel 1987). Territories may encompass multiple female activity areas. The activity areas used by females average 1.2 ha (3 acres) during pre-incubation, decreasing to 0.3 ha (0.7 acres) during incubation (Bookhout and Stenzel 1987). Adult birds are flightless for several weeks during molting (mid- to late August) (Savaloja 1981).
Non-Migrant: N
Locally Migrant: N
Long Distance Migrant: Y
Mobility and Migration Comments: Generally arrives on northern nesting range in March-April (Terres 1980).
Estuarine Habitat(s): Herbaceous wetland
Palustrine Habitat(s): Bog/fen, HERBACEOUS WETLAND, Riparian
Terrestrial Habitat(s): Cropland/hedgerow, Grassland/herbaceous
Habitat Comments: BREEDING: Emergent wetlands, grass or sedge marshes and wet meadows in freshwater situations. Some breeding territories in these wet meadows contain firm footing and only a few remnant pools of water (Berkey 1991). These areas can range from damp to 38 cm (15 inches) of water but the average depth used for nesting is 8 to 15 cm (3 to 6 inches) (Savaloja 1981).

Choose shallow water habitats over deep marsh zones. The vegetation ranges in height from about 5 to over 60 cm (2 to over 24 inches). This variation depends on the area and the time of year. In Minnesota, nest in large marshes composed of mixed sedge and bulrush, with cattails in deeper areas (Hanowski and Niemi 1990). The largest populations in North Dakota are in fens (bogs) with thick, soft mats of dead vegetation (Berkey 1991). In Manitoba, the birds are found in small boggy areas (Savaloja 1981). In the Great Lakes Region, nearly exclusively associated with CAREX spp. (Evers 1990). In Michigan, nest sites predominantly among the sedge CAREX LASIOCARPA (Bart et al. 1984, Bookhout and Stenzel 1987, Brewer et al. 1991). In Maine, found in damp, low-lying areas with water depths of 5 to 10 cm (2 to 4 inches) in otherwise dried-out portions of floodplains with a senescent mat composed of previous year's sedge growth (Gibbs et al. 1991). Habitats in Maine contained low densities of sedge, rush, and grass stems compared to other areas. Birds will use freshly burned area for territories only if burned after they have arrived to the breeding area (Savaloja 1981). NON-BREEDING: grain fields in winter and when migrating. Winters in both freshwater and brackish marshes, as well as in dense, deep grass. During fall migration, will use many open habitats, from rice paddies to dry hayfields. Winters are spent in a variety of areas, including salt-marshes, grain fields, damp grassy meadows, and freshwater marshes. In the south, the bird winters in agricultural fields and occasionally in rice fields (Berkey 1991).
Adult Food Habits: Granivore, Herbivore, Invertivore
Immature Food Habits: Granivore, Herbivore, Invertivore
Food Comments: Reported foods include small snails, insects, seeds, grasses, and clover leaves (Terres 1980). Vegetation and invertebrates are the most common foods. Most of the feeding activity takes place during the daytime, and when searching for food in water the birds have been seen with their heads 1.5 inches under the water (Savaloja 1981). In Minnesota rails feed on the snail SUCCINEA RETUSA (Savaloja 1981). Adults will feed on snails and small invertebrates found in dry grass, and seeds, grasses, and clover leaves found in sedge marshes. When the young are being reared, snails are an important food resource.
Phenology Comments: Although rails call frequently throughout the day and extensively throughout the night, these birds are not actively nocturnal. During the nighttime they are sedentary. During the day they actively feed and do most of their nest-building. Migration occurs primarily during the night. In the fall the birds are silent and very difficult to locate, in the spring they are much easier to find.
Length: 18 centimeters
Weight: 52 grams

Economic Attributes

Economic Comments: Hunting season has been closed since 1968 (Eddleman et al. 1988).

Management Summary

Stewardship Overview: Ranges from Canada through northern U.S. and winters in southern U.S. (Peterson 1980). Although populations have likely declined due to habitat alteration and destruction, information on current status and past trends for this species is not available. If existing populations and their habitats are monitored and protected and if unoccupied suitable habitat is protected, populations may be maintained.
Restoration Potential: Able to occupy new habitat as it becomes available (Robbins 1991). If wetlands habitat is protected and monitored, then this species may be maintained. Can inhabit areas that have been burned and are free of excessive woody vegetation and urbanization.
Preserve Selection & Design Considerations: The breeding habitat should consist of wetlands, grass or sedge marshes, and wet meadows. Vegetation in this area should range from 5 to 60 cm (2 to over 24 inches) (Berkey 1991) and the degree of wetness should range from damp to 38 cm (15 inches) of water (Savaloja 1981). In Michigan it is essential that CAREX spp. be present. The nesting areas should be at least eight ha for males to establish territories, which may overlap. Females need an area of two ha or more for establishing activity areas. Nesting habitat must contain some dead vegetation available for building the nest. Quality of the feeding habitat depends primarily on the availability and accessibility of prey items. A preserve must include enough habitat to support sufficient prey populations. It is important that snails, insects, seeds, and grasses are available for foraging.
Management Requirements: It is crucial that wetland habitats are maintained. Management of this habitat should include restrictions on wetland draining and coastal development that eliminate breeding sites, and the restriction of stream alteration projects that lower the water table in wetland habitat. Other management factors include vegetation succession, changes in hydrology, and human-disturbance.

Water level management is crucial to maintain the required sedge- and grass-dominated plant cover (Gibbs et al. 1991). Extensive draining and ditching of wetlands can be harmful because it can eliminate breeding sites completely.

Woody vegetation reduces the suitability of wetland habitat. In northern Michigan, prescribed and controlled burns serve to rejuvenate sedge growth, prevent the buildup of dead vegetation, limit woody growth, and impede the establishment of boreal flora (such as sphagnum moss and willows) (Evers 1990). While dead grass and sedges are used for nest platforms and as cover, excessive buildup can act as a wick for evaporation and will eventually fill up the marsh (Savaloja 1981). In Minnesota, if a marsh is burned before rails have arrived in the breeding area, they will use available unburned areas instead, but if burning is done after they have arrived, they will use the freshly burned marsh (Savaloja 1981). In northern Michigan, burning may prove to be a beneficial management tool, but is not recommended in the northeast because too many other rare species are associated with the sedge meadows where rails are found (Gibbs pers. comm.).

Because livestock grazing can lead to loss of cover, trampling, and disturbance of nesting pairs, it should be eliminated or reduced to a very low level in breeding areas (Eddleman et al. 1988).
Monitoring Requirements: Current sites (breeding and wintering) and habitats occupied by these birds should be monitored. Infrared photography can be used to help identify habitat. Densities can be calculated by using the strip-transect procedure or spot mapping via triangulation (Bookhout, pers. comm.). See Bart et al. (1984) for information on survey methods. More intensive surveys are needed in Maine and in the Northeastern United States.
Management Research Needs: Life history information including breeding biology and demographics would be beneficial for future management programs. Also, if natural water level fluctuations could be understood, this would be an important factor for supporting populations over the long-term. Investigate the effects of livestock grazing on winter habitat (Eddleman et al. 1988).
Biological Research Needs: Research on migratory routes, natural water level fluctuations, and behavior is needed. A more definitive determination of the status and distribution in Maine and elsewhere in the Northeastern U.S. is needed (Gibbs et al. 1991).

Population/Occurrence Delineation

Group Name: RAILS

Use Class: Breeding
Minimum Criteria for an Occurrence: Evidence of historical breeding, or current and likely recurring breeding, at a given location, minimally a reliable observation of one or more breeding pairs in appropriate habitat. Be cautious about creating EOs for observations that may represent single breeding events outside the normal breeding distribution.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: The high potential for gene flow among populations of birds separated by fairly large distances makes it difficult to circumscribe occurrences on the basis of meaningful population units without occurrences becoming too large. Hence, a moderate, standardized separation distance has been adopted for rails; it should yield occurrences that are not too spatially expansive while also accounting for the likelihood of gene flow among populations within a few kilometers of each other.

Little information available, but most rails appear to have very small breeding home ranges: Clapper Rail, varies from an average of 0.4 hectares in California and Louisiana (Zembal et al. 1989) to 3.6 hectares (incubating males) in Arizona; Eddleman 1989); Sora, average of 0.19 ha during brood-rearing (Johnson and Dinsmore 1985). Dispersal distances are poorly known but surely extend at least a few kilometers.
Inferred Minimum Extent of Habitat Use (when actual extent is unknown): .1 km
Date: 10Sep2004
Author: Cannings, S., and G. Hammerson
Notes: Includes all species in the family Rallidae.

Use Class: Nonbreeding
Minimum Criteria for an Occurrence: Evidence of traditional occurrence (including historical); minimally a reliable observation of 10 or more wintering or resident individuals in appropriate habitat (for rare taxa can be minimally one individual). Be cautious about creating EOs for observations that may represent single events outside the normal distribution.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: Separation distances are arbitrary and attempt to balance the general sedentary nature of these birds with their capability to disperse significant distances across suitable and unsuitable habitat.

Nonbreeding home ranges are relatively small. In Arizona, home ranges of non-breeding Clapper Rails significantly larger than breeding home ranges; varied from 21.0 hectares (August-October females) to 24.0 hectares (winter males; Eddleman 1989); elsewhere home ranges considerably smaller (Zembal et al. 1989). Soras wintering in Arizona had average home range sizes of 0.78 hectares (Conway 1990). Even at the northern end of their wintering range (British Columbia), Virginia Rails can persist in spring-fed marshes less than 1 ha in extent (R. J. Cannings, pers. comm.)
Inferred Minimum Extent of Habitat Use (when actual extent is unknown): .1 km
Date: 10Sep2004
Author: Cannings, S., and G. Hammerson

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Not yet assessed

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 26Apr1996
NatureServe Conservation Status Factors Author: Jennings, R., B. Van Dam, J. D. Soule, and G. Hammerson
Management Information Edition Date: 30Sep1993
Management Information Edition Author: VAN DAM, B.; REVISIONS BY R. JENNINGS, J.D. SOULE, G. HAMMERSON, M.T. KOENEN, AND D.W. MEHLMAN
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Element Ecology & Life History Edition Date: 14Jan1994
Element Ecology & Life History Author(s): Hammerson, G.

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Note: This report was printed on **May 1, 2012**

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Patterson, B.D., G. Ceballos, W. Sechrest, M.F. Tognelli, T. Brooks, L. Luna, P. Ortega, I. Salazar, and B.E. Young. 2003. Digital Distribution Maps of the Mammals of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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NOTE: Full metadata for the Bird Range Maps of North America is available at:
http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

Full metadata for the Mammal Range Maps of North America is available at:
http://www.natureserve.org/library/mammalsDistributionmetadatav1.pdf.

NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Cicindela denikei - Brown, 1934
Laurentian Tiger Beetle

Related ITIS Name(s): *Cicindela denikei* Brown, 1934 (TSN 697684)
Unique Identifier: ELEMENT_GLOBAL.2.119130
Element Code: IICOL026M0
Informal Taxonomy: Animals, Invertebrates - Insects - Beetles - Tiger Beetles

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Mandibulata	Insecta	Coleoptera	Cicindelidae	Cicindela

Genus Size: D - Medium to large genus (21+ species)

Check this box to expand all report sections: ☐

Concept Reference

Concept Reference: Freitag, R. P. 1999. Catalogue of the tiger beetles of Canada and the United States. National Research Council Research Press, Ottawa, Canada. 195 pp.
Concept Reference Code: B99FRE01EHUS
Name Used in Concept Reference: *Cicindela denikei*
Taxonomic Comments: Formerly *Cicindela sexguttata denikei.* However recent works like Pearson *et al*. (1997) and Freitag's (1999) Catalogue treat this taxon as a full species.

Conservation Status

NatureServe Status

Global Status: G3G4
Global Status Last Reviewed: 04Jun2008
Global Status Last Changed: 25Nov2002
Rounded Global Status: G3 - Vulnerable
Reasons: While this species has a limited range it does not appear to be rare within it. Previous iterations of this database have ranked this taxon as G4, which seems likely to be its rank when more data are assembled. However, based on what is currently known this species is not imminently imperiled (G1 or G2) nor so widespread and common as to merit demonstrably secure (G5), but better information would be needed to determine a confident global rank. This species has a small range and may well be secure in much of it, but at present information on number and viability of occurrences is inadequate to rule out a status of globally uncommon.
Nation: United States
National Status: NNR
Nation: Canada
National Status: NNR

U.S. & Canada State/Province Status	
United States	Minnesota (S2)
Canada	Manitoba (S4), Ontario (S3S4)

Other Statuses

NatureServe Global Conservation Status Factors

Range Extent: 5000-200,000 square km (about 2000-80,000 square miles)
Range Extent Comments: A somewhat limited range in boreal forest regions near the Manitoba, Minnesota and Ontario boundary

area. According to Robert Dana recent inventory shows a somewhat larger range for Minnesota that that mapped by Pearson *et al.* (1997).

Number of Occurrences: 21 - 300
Number of Occurrences Comments: Only a best guess. There are few real data, in particular few data relevant to distinguishing localities as demes or separate occurrences. However this species is generally regarded as fairly common within its limited range. For example Robert Dana (telephone communication to Dale Schweitzer on November 27, 2002) points out that recent surveys have found it around many gravle pits within its Minnesota range.

Population Size: Unknown

Short-term Trend: Unknown
Short-term Trend Comments: Lack of published statements to the contrary suggests this taxon is not in any major decline. Tiger beetles are popular with collectors and any major decline would probably be noticed. Also the recent Minnesota inventory work does not point to a decline.

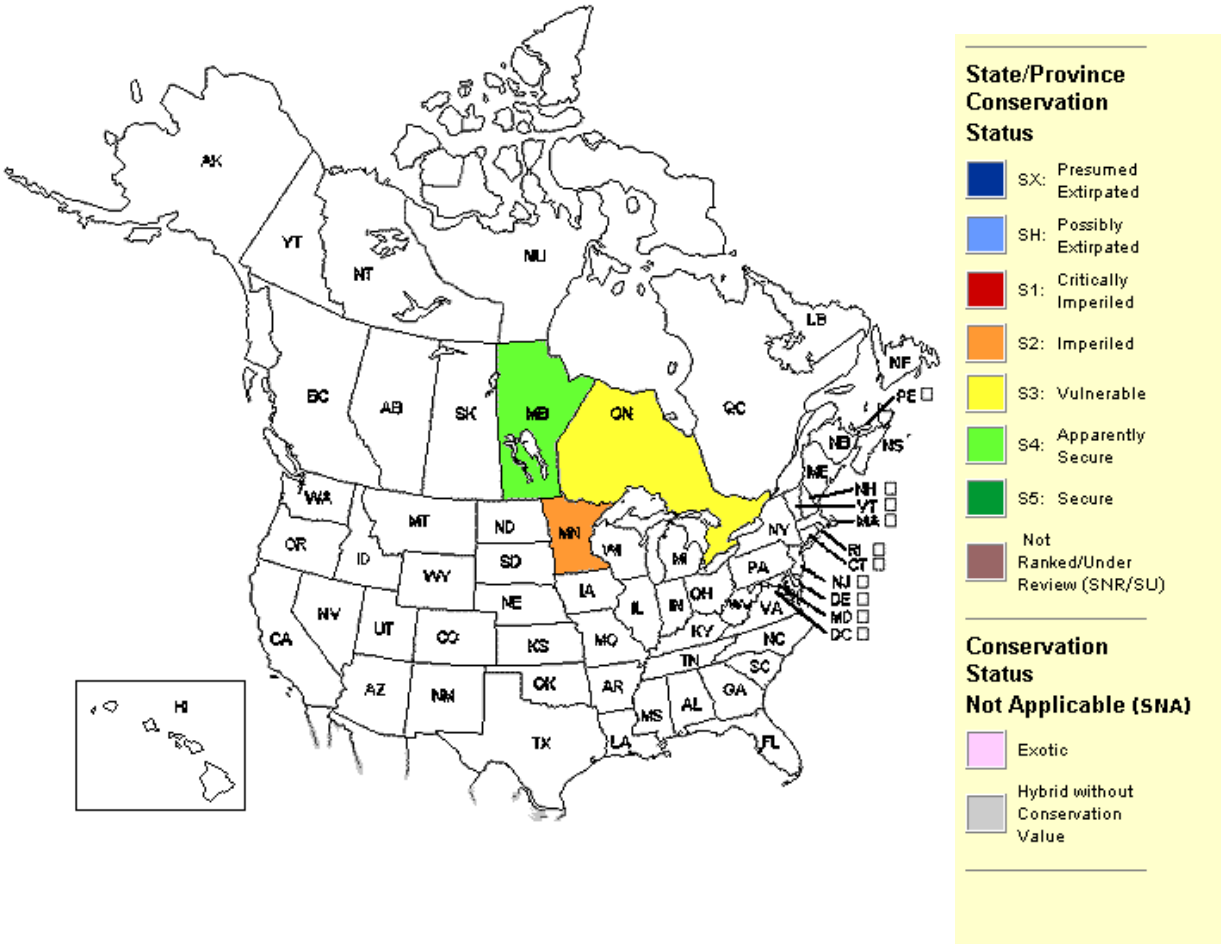
Long-term Trend: Unknown

Other NatureServe Conservation Status Information

Distribution

Global Range: (5000-200,000 square km (about 2000-80,000 square miles)) A somewhat limited range in boreal forest regions near the Manitoba, Minnesota and Ontario boundary area. According to Robert Dana recent inventory shows a somewhat larger range for Minnesota that that mapped by Pearson *et al.* (1997).

U.S. States and Canadian Provinces



Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	MN

Canada	MB, ON

Range Map
No map available.

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
MN	Cook (27031), Koochiching (27071), Lake (27075), Lake of the Woods (27077), St. Louis (27137)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
09	Rainy Headwaters (09030001)+, Vermilion (09030002)+, Rainy Lake (09030003)+, Little Fork (09030005)+, Lower Rainy (09030008)+, Lake of the Woods (09030009)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Non-Migrant: N
Locally Migrant: N
Long Distance Migrant: N
Terrestrial Habitat(s): Forest - Conifer, Forest - Mixed, Woodland - Conifer, Woodland - Mixed

Economic Attributes

Not yet assessed

Management Summary

Not yet assessed

Population/Occurrence Delineation

Use Class: Not applicable
Minimum Criteria for an Occurrence: It is unclear what Specs should be applied. Unlike most western tiger beetles this one may be more or less a woodland or forest edge species. If the local habitat is more or less known confer Specs for eastern woodland species such as C. SEXGUTTATA and C. UNIPUNCTATA as well as the generic Specs for western species.

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Not yet assessed

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 25Nov2002
NatureServe Conservation Status Factors Author: Schweitzer, Dale F.

Zoological data developed by NatureServe and its network of natural heritage programs (see **Local Programs**) and other contributors and cooperators (see **Sources**).

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- Steffens, W. P. 2001. Status surveys for the sensitive species *Cicindela denikei* and other tiger beetles of the Superior National Forest. Report to Superior National Forest, Duluth, Minnesota. 13 pp. + figures.

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Note: All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of **February 2012**.
Note: This report was printed on **May 1, 2012**

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Citation for data on website including State Distribution, Watershed, and Reptile Range maps:
NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 1, 2012).

Citation for Bird Range Maps of North America:
Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

Acknowledgement Statement for Bird Range Maps of North America:
"Data provided by NatureServe in collaboration with Robert Ridgely, James Zook, The Nature Conservancy - Migratory Bird Program, Conservation International - CABS, World Wildlife Fund - US, and Environment Canada - WILDSPACE."

Citation for Mammal Range Maps of North America:
Patterson, B.D., G. Ceballos, W. Sechrest, M.F. Tognelli, T. Brooks, L. Luna, P. Ortega, I. Salazar, and B.E. Young. 2003. Digital Distribution Maps of the Mammals of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

Acknowledgement Statement for Mammal Range Maps of North America:
"Data provided by NatureServe in collaboration with Bruce Patterson, Wes Sechrest, Marcelo Tognelli, Gerardo Ceballos, The Nature Conservancy-Migratory Bird Program, Conservation International-CABS, World Wildlife Fund-US, and Environment Canada-WILDSPACE."

Citation for Amphibian Range Maps of the Western Hemisphere:
IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. IUCN, Conservation International, and NatureServe, Washington, DC and Arlington, Virginia, USA.

Acknowledgement Statement for Amphibian Range Maps of the Western Hemisphere:
"Data developed as part of the Global Amphibian Assessment and provided by IUCN-World Conservation Union, Conservation International and NatureServe."

NOTE: Full metadata for the Bird Range Maps of North America is available at:
http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

Full metadata for the Mammal Range Maps of North America is available at:
http://www.natureserve.org/library/mammalsDistributionmetadatav1.pdf.

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NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Myotis septentrionalis - (Trovessart, 1897)
Northern Myotis
Other Related Name(s): *Myotis keenii septentrionalis* (Trouessart, 1897)
Unique Identifier: ELEMENT_GLOBAL.2.102615
Element Code: AMACC01150
Informal Taxonomy: Animals, Vertebrates - Mammals - Bats

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Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Mammalia	Chiroptera	Vespertilionidae	Myotis

Genus Size: D - Medium to large genus (21+ species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: Jones, J. K., Jr., R. S. Hoffman, D. W. Rice, C. Jones, R. J. Baker, and M. D. Engstrom. 1992. Revised checklist of North American mammals north of Mexico, 1991. Occasional Papers, The Museum, Texas Tech University, 146:1-23.
Concept Reference Code: B92JON01NAUS
Name Used in Concept Reference: *Myotis septentrionalis*
Taxonomic Comments: *Myotis septentrionalis* formerly was regarded as conspecific with *Myotis keenii*; van Zyll de Jong (1979, 1985) and Jones et al. (1992) regarded *Myotis keenii* and *M. septentrionalis* as separate species; Koopman (in Wilson and Reeder 1993) included *septentrionalis* in *Myotis keenii*, noting that they may be separate species. Baker et al. (2003) and Simmons (in Wilson and Reeder 2005) recognized *M. septentrionalis* and *M. keenii* as distinct species. Most literature under the name *Myotis keenii* actually pertains to *Myotis septentrionalis*. No subspecies are recognized.

Conservation Status

NatureServe Status

Global Status: G4
Global Status Last Reviewed: 19Apr2005
Global Status Last Changed: 05Nov1996
Rounded Global Status: G4 - Apparently Secure
Reasons: Large range in the eastern and north-central U.S. and much of southern Canada; most abundant in the northern part of the range but relatively rare rangewide both in terms of hibernacula and in summer foraging and maternity areas; frequently comprising less than 10% of the bat community. Little is known about population trends, though some habitat loss probably has occurred, primarily through the disturbance of hibernacula.
Nation: United States
National Status: N4
Nation: Canada
National Status: N4 (31Dec2011)

U.S. & Canada State/Province Status	
United States	Alabama (S2), Arkansas (S4), Connecticut (SU), Delaware (SU), District of Columbia (S4), Florida (SH), Georgia (S3S4), Illinois (S4), Indiana (S3), Iowa (S4), Kansas (S2), Kentucky (S4), Louisiana (SNR), Maine (S4), Maryland (S4B,S4N), Massachusetts (S4), Michigan (SNR), Minnesota (S3), Mississippi (S3?B,S3?N), Missouri (S4), Nebraska (S4), New Hampshire (S3), New Jersey (SU), New York (S3S4), North Carolina (S3S4), North Dakota (SU), Ohio (SNR), Oklahoma (S2), Pennsylvania (S1), Rhode Island (S2), South Carolina (S4), South Dakota (S3), Tennessee (S4), Vermont (S4S5), Virginia (S3S4), West Virginia (S3S4), Wisconsin (S1S3)
Canada	Alberta (S2S3), British Columbia (S2S3), Labrador (SNR), Manitoba (S3S4N,S4B), New Brunswick (S4), Newfoundland Island (S2S3), Northwest Territories (S1S2), Nova Scotia (S2), Ontario (S3), Prince Edward Island (S1S2), Quebec (S4S5),

	Saskatchewan (S4B,SNRN), Yukon Territory (S3)

Other Statuses

IUCN Red List Category: LC - Least concern

NatureServe Global Conservation Status Factors

Range Extent: 20,000-2,500,000 square km (about 8000-1,000,000 square miles)
Range Extent Comments: Widely distributed in the eastern and northcentral U.S. and adjacent southern Canada; ranges from Newfoundland and eastern Quebec south through New England and the mountains of Virginia, North Carolina, South Carolina, and Georgia to the northcentral panhandle of Florida (formerly) and northwestward through Alabama, northern Arkansas, the eastern Great Plains, and the western provinces, reaching its northwestern limits in northeastern British Columbia and southern Northwest Territories (Harvey 1992, van Zyll de Jong 1985, Hall 1981). Three individuals, including a lactating female, were recently recorded in Louisiana (Crnkovic 2003). The general summer and winter ranges appear to be identical (Barbour and Davis 1969); locally distributed throughout the range all year. Widespread but locally and irregularly distributed (Barbour and Davis 1969). More common in the northern part of the range than in the south (Harvey 1992). Rare in the northwestern portion of its range (Caceres and Barclay 2000). Reported as very rare in Alabama (Best, pers. comm.), uncommon in Indiana, Kentucky, Tennessee, and Wisconsin (Mumford and Cope 1964, Harvey 1991, Jackson 1961), more common in northern Michigan than in southern Michigan (Kurta 1982), and quite common in New York (Hamilton and Whitaker 1979).

Number of Occurrences: 81 to >300
Number of Occurrences Comments: Among five states providing information, some 77 element occurrences (EOs) of all types combined (hibernation, maternity, foraging) are known. With its widespread range, including former mining regions, there certainly are more than 100 EOs. EOs only of the most limiting type (probably hibernating colonies) should be considered when calculating number of EOs.

Population Size: 2500 to >1,000,000 individuals
Population Size Comments: Although there are probably over 100 hibernating colonies rangewide, these colonies only rarely comprise even as many as 50 bats, suggesting that populations may be quite small. It thus is possible that the total rangewide population is less than 10,000 bats (with a colony average of 50 bats it would take 200 occurrences to account for a total population of 10,000 bats). However, until the number of occurrences of hibernacula can be estimated more accurately, "CD" is the most appropriate designation.

Overall Threat Impact Comments: This species can be expected to experience increasing threats in years to come, as more old mines are closed, but at present it is not extremely threatened. Kurta (pers. comm.) suggested that the potential closing of mines serving as hibernacula in the western Upper Peninsula of Michigan is a potential but not currently realized threat. Mines in other states have been permanently closed to reduce landowner legal liability, eliminating access by bats. Presumably, cave and mine visitation during the hibernation period, major changes to the hibernacula (mine cave-ins and closures), and large-scale banding efforts would adversely affect this species. In Alabama, along the Tennessee River, proposed wood chip plants threaten hardwood stands of all ages in an approximate 80-mile radius around Bridgeport (Bailey, pers. comm.). Removal of nursery trees and loss of foraging habitat, principally to logging or other major alterations, would damage local breeding populations.
Sensitive to disturbance during hibernation (Garner, pers. comm., Thomas 1995); frequently aroused bats may deplete their energy reserves. Nursery colonies are very sensitive to disturbance by humans; bats may move to an alternate roost after a single examination, even if no attempt is made to capture the bats (Layne 1978).

Short-term Trend: Relatively stable (=10% change)
Short-term Trend Comments: Adequate data to assess trends are not available, but anecdotal observations have not indicated any obvious declines. There are no published reports of declines in this species, and population data that do exist are too spatially and temporally scattered to reveal a trend. However, since this species seems to depend heavily on old mines for hibernation sites, and this is a diminishing resource, declines are likely in the future, if not already occurring.

Other NatureServe Conservation Status Information

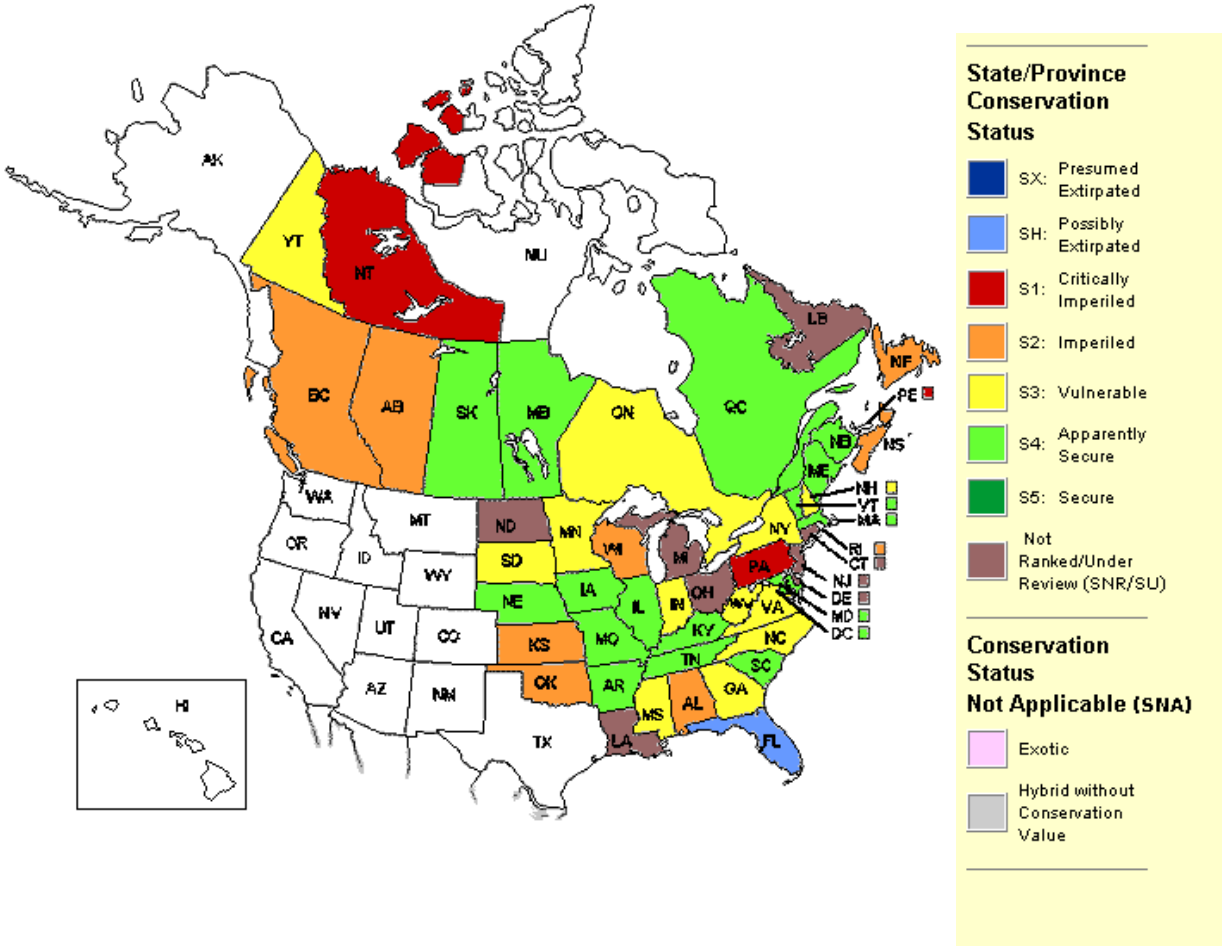
Inventory Needs: Very little research has been directed at this species, and most references are anecdotal accounts of incidental collections. A concentrated effort to survey mines and caves across its range over the next five years would provide a much better picture of its range-wide status, as well as that of a number of other cave and mine-dwelling bats that are known or suspected to be declining. In states where declines or threats and/or impacts are apparent, populations should be monitored every year or two, depending upon pattern of decline or impacts.

Protection Needs: Threatened primarily in the southeastern USA, and in this region better legal protection is needed. Collecting should be limited to approved scientific purposes. More gating of caves and mines throughout the range (rather than closing mines) would benefit this species as well as a number of other rare bats. Protection of hibernacula and maternity roosts from disturbances is of highest priority. Protection of foraging habitat, if disjunct from summer roosts and maternity colonies, may be most effectively gained through private or public landowner cooperation. In caves and mines, hydrological considerations are important. Seasonal flooding may make some caves unsuitable in some years and reduction in ground water flow could alter cave humidity. Thus, alternate sites are needed for periods with unusual climatic conditions. Throughout the range, protection of winter hibernacula from human visitors should be considered a high priority. The invasiveness and long-term impact of monitoring activities should be minimized. See also ES record.

Distribution

Global Range: (20,000-2,500,000 square km (about 8000-1,000,000 square miles)) Widely distributed in the eastern and northcentral U.S. and adjacent southern Canada; ranges from Newfoundland and eastern Quebec south through New England and the mountains of Virginia, North Carolina, South Carolina, and Georgia to the northcentral panhandle of Florida (formerly) and northwestward through Alabama, northern Arkansas, the eastern Great Plains, and the western provinces, reaching its northwestern limits in northeastern British Columbia and southern Northwest Territories (Harvey 1992, van Zyll de Jong 1985, Hall 1981). Three individuals, including a lactating female, were recently recorded in Louisiana (Crnkovic 2003). The general summer and winter ranges appear to be identical (Barbour and Davis 1969); locally distributed throughout the range all year. Widespread but locally and irregularly distributed (Barbour and Davis 1969). More common in the northern part of the range than in the south (Harvey 1992). Rare in the northwestern portion of its range (Caceres and Barclay 2000). Reported as very rare in Alabama (Best, pers. comm.), uncommon in Indiana, Kentucky, Tennessee, and Wisconsin (Mumford and Cope 1964, Harvey 1991, Jackson 1961), more common in northern Michigan than in southern Michigan (Kurta 1982), and quite common in New York (Hamilton and Whitaker 1979).

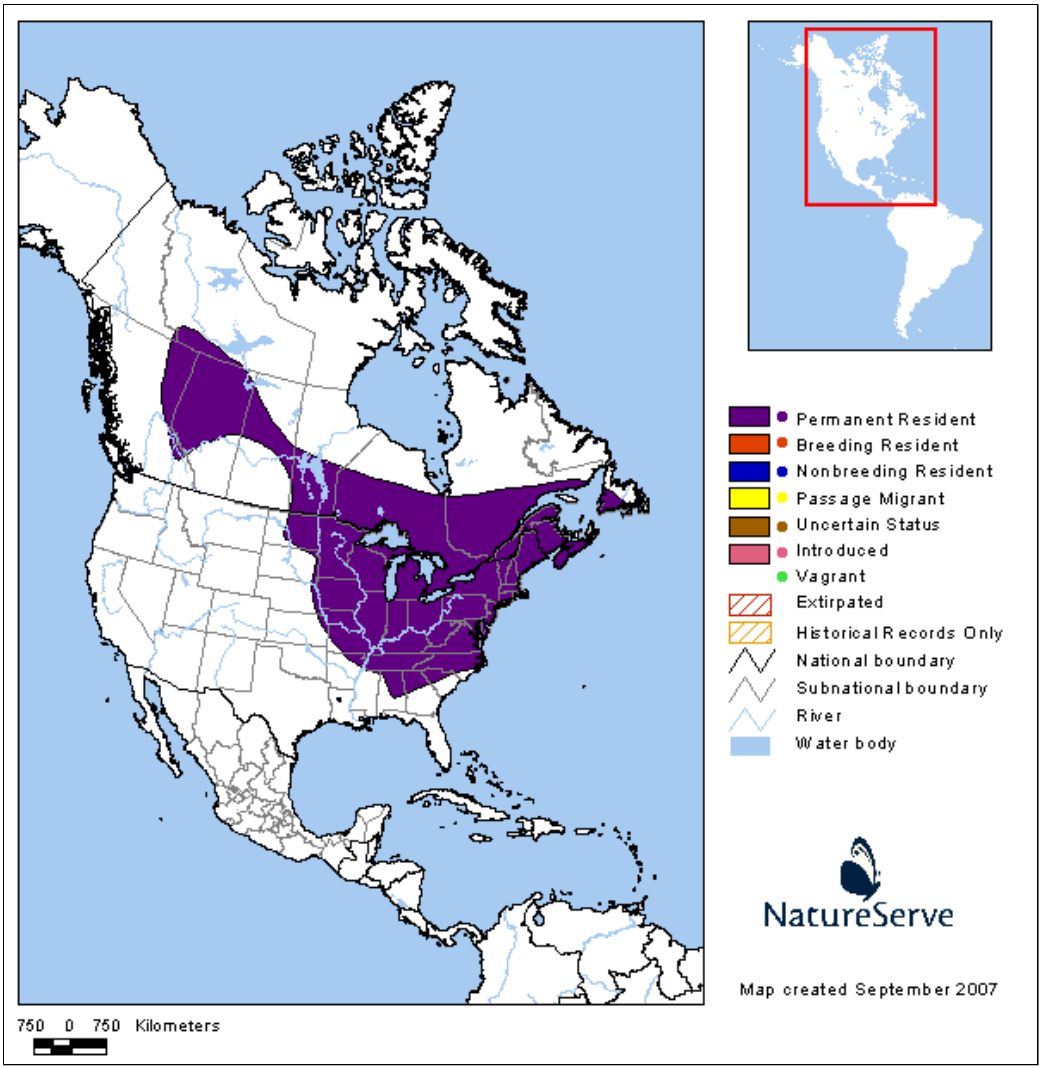
U.S. States and Canadian Provinces



Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	AL, AR, CT, DC, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, ND, NE, NH, NJ, NY, OH, OK, PA, RI, SC, SD, TN, VA, VT, WI, WV
Canada	AB, BC, LB, MB, NB, NF, NS, NT, ON, PE, QC, SK, YT

Range Map
Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: NatureServe, 2005; Sechrest, 2002

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
AL	Colbert (01033), Franklin (01059), Lauderdale (01077), Lawrence (01079)
CT	Litchfield (09005)
FL	Jackson (12063)*
GA	Rabun (13241), Stephens (13257), Towns (13281), Union (13291)
IA	Allamakee (19005), Appanoose (19007), Black Hawk (19013), Boone (19015), Decatur (19053), Delaware (19055), Dubuque (19061), Fremont (19071), Hardin (19083), Jackson (19097), Jones (19105), Lucas (19117), Madison (19121), Marion (19125), Marshall (19127), Monroe (19135), Plymouth (19149), Ringgold (19159), Scott (19163)*, Tama (19171), Van Buren (19177), Webster (19187), Woodbury (19193)
IL	Jo Daviess (17085)
IN	Bartholomew (18005), Benton (18007), Brown (18013), Daviess (18027), Gibson (18051), Greene (18055), Johnson (18081), Knox (18083), La Porte (18091), Lawrence (18093), Marion (18097), Martin (18101), Monroe (18105), Morgan (18109), Newton (18111), Pike (18125), Porter (18127), Randolph (18135), Tippecanoe (18157), Vigo (18167), Warren (18171)
KS	Ellis (20051)*, Graham (20065), Marshall (20117)*, Norton (20137), Osborne (20141), Phillips (20147), Rooks (20163), Russell (20167)
MN	Carlton (27017), Cook (27031), Fillmore (27045), Goodhue (27049), Lake (27075), Nicollet (27103)*, Pine (27115), Ramsey (27123), Sherburne (27141)*, St. Louis (27137), Stearns (27145)*, Wabasha (27157), Washington (27163)
MO	Barry (29009), Boone (29019), Butler (29023), Carter (29035), Crawford (29055), Dent (29065), Douglas (29067), Franklin (29071), Grundy (29079), Howell (29091), Iron (29093), Laclede (29105), Lewis (29111), Linn (29115), Madison (29123), Oregon (29149), Ozark (29153), Phelps (29161), Pulaski (29169), Reynolds (29179), Shannon (29203), Ste. Genevieve (29186), Taney (29213), Texas (29215), Washington (29221), Wayne (29223),

	Wright (29229)
MS	Tishomingo (28141)
NC	Ashe (37009), Avery (37011), Brunswick (37019), Buncombe (37021), Burke (37023), Cherokee (37039)*, Clay (37043), Graham (37075), Haywood (37087), Henderson (37089), Jackson (37099), Macon (37113), Madison (37115), McDowell (37111), Mitchell (37121), New Hanover (37129), Pender (37141), Polk (37149), Rutherford (37161), Swain (37173), Transylvania (37175), Wake (37183)*, Watauga (37189), Wilkes (37193), Yancey (37199)
NE	Brown (31017), Cedar (31027), Cherry (31031), Dakota (31043), Dixon (31051), Franklin (31061), Holt (31089), Jefferson (31095), Knox (31107), Pawnee (31133), Thurston (31173)
NH	Carroll (33003), Cheshire (33005), Coos (33007), Grafton (33009), Hillsborough (33011), Rockingham (33015), Sullivan (33019)
OK	Adair (40001), Choctaw (40023), LeFlore (40079), McCurtain (40089), Pushmataha (40127)
PA	Adams (42001), Allegheny (42003), Armstrong (42005), Bedford (42009), Berks (42011), Blair (42013), Bradford (42015), Bucks (42017), Cambria (42021), Cameron (42023), Carbon (42025), Centre (42027), Chester (42029), Clarion (42031), Clearfield (42033), Clinton (42035), Columbia (42037), Cumberland (42041), Dauphin (42043), Elk (42047), Fayette (42051), Forest (42053), Franklin (42055), Fulton (42057), Greene (42059), Huntingdon (42061), Indiana (42063), Juniata (42067), Lackawanna (42069), Lancaster (42071), Lawrence (42073), Lebanon (42075), Lehigh (42077), Luzerne (42079), Lycoming (42081), McKean (42083), Mercer (42085), Mifflin (42087), Monroe (42089), Montgomery (42091), Northampton (42095), Northumberland (42097), Pike (42103), Schuylkill (42107), Snyder (42109), Somerset (42111), Tioga (42117), Union (42119), Venango (42121), Warren (42123), Washington (42125), Westmoreland (42129), York (42133)
SC	Greenville (45045), Oconee (45073), Pickens (45077)
SD	Bon Homme (46009)*, Brule (46015), Charles Mix (46023), Clay (46027), Custer (46033), Gregory (46053), Hughes (46065), Jackson (46071), Lawrence (46081), Lyman (46085), Meade (46093), Pennington (46103), Stanley (46117), Union (46127), Yankton (46135)
TN	Blount (47009), Cocke (47029), Greene (47059), Sevier (47155), Unicoi (47171)
WI	Bayfield (55007), Dane (55025), Grant (55043), Iowa (55049), Monroe (55081), Oconto (55083), Polk (55095), Richland (55103)*
WY	Weston (56045)*

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
01	Saco (01060002)+, Piscataqua-Salmon Falls (01060003)+, Pemigewasset (01070001)+, Contoocook (01070003)+, Upper Connecticut (01080101)+, Black-Ottauquechee (01080106)+, Middle Connecticut (01080201)+, Housatonic (01100005)+
02	Middle Delaware-Mongaup-Brodhead (02040104)+, Middle Delaware-Musconetcong (02040105)+, Lehigh (02040106)+, Schuylkill (02040203)+, Brandywine-Christina (02040205)+, Tioga (02050104)+, Upper Susquehanna-Tunkhannock (02050106)+, Upper Susquehanna-Lackawanna (02050107)+, Upper West Branch Susquehanna (02050201)+, Sinnemahoning (02050202)+, Middle West Branch Susquehanna (02050203)+, Bald Eagle (02050204)+, Lower West Branch Susquehanna (02050206)+, Lower Susquehanna-Penns (02050301)+, Upper Juniata (02050302)+, Raystown (02050303)+, Lower Juniata (02050304)+, Lower Susquehanna-Swatara (02050305)+, Lower Susquehanna (02050306)+, North Branch Potomac (02070002)+, Cacapon-Town (02070003)+, Conococheague-Opequon (02070004)+
03	Upper Neuse (03020201)+, New River (03020302)+, Lower Cape Fear (03030005)+, Northeast Cape Fear (03030007)+, Upper Yadkin (03040101)+, Upper Catawba (03050101)+, South Fork Catawba (03050102)+, Upper Broad (03050105)+, Saluda (03050109)+, Seneca (03060101)+, Tugaloo (03060102)+, Chipola (03130012)+, Sipsey Fork (03160110)+
04	Baptism-Brule (04010101)+, Beaver-Lester (04010102)+, St. Louis (04010201)+, Bad-Montreal (04010302)+, Duck-Pensaukee (04030103)+, Little Calumet-Galien (04040001)+
05	Upper Allegheny (05010001)+, Middle Allegheny-Tionesta (05010003)+, Clarion (05010005)+, Middle Allegheny-Redbank (05010006)+, Conemaugh (05010007)+, Kiskiminetas (05010008)+, Lower Allegheny (05010009)+, Cheat (05020004)+, Lower Monongahela (05020005)+, Youghiogheny (05020006)+, Shenango (05030102)+, Mahoning (05030103)+, Beaver (05030104)+, Connoquenessing (05030105)+, Upper Ohio-Wheeling (05030106)+, Upper New (05050001)+, Mississinewa (05120103)+, Middle Wabash-Little Vermilion (05120108)+, Middle Wabash-Busseron (05120111)+, Upper White (05120201)+, Lower White (05120202)+, Driftwood (05120204)+, Lower East Fork White (05120208)+, Patoka (05120209)+
06	Watauga (06010103)+, Upper French Broad (06010105)+, Pigeon (06010106)+, Lower French Broad (06010107)+, Nolichucky (06010108)+, Upper Little Tennessee (06010202)+, Tuckasegee (06010203)+, Lower Little Tennessee (06010204)+, Hiwassee (06020002)+, Pickwick Lake (06030005)+, Bear (06030006)+
07	Clearwater-Elk (07010203)+, Twin Cities (07010206)+, Middle Minnesota (07020007)+, Kettle (07030003)+, Lower St. Croix (07030005)+, Rush-Vermillion (07040001)+, Buffalo-Whitewater (07040003)+, La Crosse-Pine (07040006)+, Root (07040008)+, Coon-Yellow (07060001)+, Grant-Little Maquoketa (07060003)+, Turkey (07060004)+, Apple-Plum (07060005)+, Maquoketa (07060006)+, Lower Wisconsin (07070005)+, Kickapoo (07070006)+, Copperas-Duck (07080101)+, South Skunk (07080105)+, Middle Cedar (07080205)

	+, Upper Iowa (07080207)+, Middle Iowa (07080208)+, Crawfish (07090002)+, Middle Des Moines (07100004)+, Lake Red Rock (07100008)+, Lower Des Moines (07100009)+, Bear-Wyaconda (07110001)+, North Fabius (07110002)+, Kankakee (07120001)+, Cahokia-Joachim (07140101)+, Meramec (07140102)+, Big (07140104)+, Upper Mississippi-Cape Girardeau (07140105)+
08	Upper St. Francis (08020202)+
09	Vermilion (09030002)+
10	Beaver (10120107)+, Middle Cheyenne-Spring (10120109)+, Rapid (10120110)+, Middle Cheyenne-Elk (10120111)+, Lower Belle Fourche (10120202)+, Redwater (10120203)+, Lower Lake Oahe (10130105)+, Fort Randall Reservoir (10140101)+, Bad (10140102)+, Middle White (10140202)+, Lower White (10140204)+, Middle Niobrara (10150004)+, Lower Niobrara (10150007)+, Lewis and Clark Lake (10170101)+, Vermillion (10170102)+, Lower Big Sioux (10170203)+, Blackbird-Soldier (10230001)+, West Nishnabotna (10240002)+, Nishnabotna (10240004)+, South Fork Big Nemaha (10240007)+, Middle Republican (10250016)+, Upper Saline (10260009)+, Upper North Fork Solomon (10260011)+, Upper Little Blue (10270206)+, Lower Little Blue (10270207)+, Thompson (10280102)+, Lower Grand (10280103)+, Upper Chariton (10280201)+, Niangua (10290110)+, Upper Gasconade (10290201)+, Big Piney (10290202)+, Lower Missouri-Moreau (10300102)+
11	Beaver Reservoir (11010001)+, James (11010002)+, Bull Shoals Lake (11010003)+, North Fork White (11010006)+, Upper Black (11010007)+, Current (11010008)+, Eleven Point (11010011)+, Illinois (11110103)+, Robert S. Kerr Reservoir (11110104)+, Poteau (11110105)+, Kiamichi (11140105)+, Mountain Fork (11140108)+, Lower Little (11140109)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A small insect-eating bat.
General Description: Methods of aging individuals by morphological features are limited. Juveniles can be distinguished from adults by the incomplete ossification of the phalangeal epiphyses until late August of the year of their birth (Kunz 1971, Caire et al. 1979). After that time, all are typically classified as adults. Degree of wear of the teeth has been used to determine relative age of adults (Guthrie 1933), though Hall et al. (1957) found this to be unreliable. Examination of canine and molars of individuals known to be at least 18-19 years of age revealed very little wear.

In Missouri, prehibernation fat deposition period occurs from August to October and results in an increase in average weight of 41-45% (Caire et al. 1979). By spring, the same study found that both sexes weighed approximately what they had before the prehibernation fat deposition period.
Reproduction Comments: Copulation occurs in the late summer and early fall, during the swarming period when large numbers of bats congregate in and near certain caves (Baker 1983, Kurta 1980). Females store sperm during hibernation, though some may copulate again at spring emergence (Guthrie 1933, Racey 1982). Guthrie (1933) found a portion of the males of some species to be reproductively active in late winter and early spring. However, males emerging from hibernation in Missouri were found to be reproductively inactive (undescended testes) until late July, with the largest percentage of males becoming reproductively active in August and September (Caire et al. 1979). Females ovulate at the time of emergence and parturition occurs 50-60 days later (Baker 1983). Later parturition dates at higher latitudes are due to later emergence and therefore later ovulation (Racey 1982).

Females bear a single young, with parturition occurring in late May or early June in Missouri and Oklahoma (Caire et al 1979, Easterla 1965, Caire et al. 1989), in early to late June in Indiana (Cope and Humphrey 1972), and in late June to early July in Iowa, Illinois, Michigan, and New York (Kunz 1971, Hoffmeister 1989, Kurta 1980, Hamilton and Whitaker 1979). Post-lactating females were observed by mid-June in Missouri (Caire et al. 1979) and by mid- July to late July in Michigan and Iowa (Kurta 1980, Kunz 1971), with volant young observed at about that time in all studies. Young-of-the-year may reproduce in their first fall, but the proportion of the cohort doing so is unknown (Kurta, pers. comm.). Nursery colonies are relatively small, most often including 2-30 adults (10-90 individuals, including young, according to Layne (1978)).
Ecology Comments: Syntopic species during hibernation include MYOTIS LUCIFUGUS, PIPISTRELLUS SUBFLAVUS, and EPTESICUS FUSCUS. MYOTIS SEPTENTRIONALIS generally comprises a small percentage (for example, <1% in Missouri, 6% in Quebec-Ontario, 8% in Michigan, 10% in New England, 15% in Illinois) of the bats found hibernating in any single site (Griffin 1940, Hitchcock 1949, Pearson 1962, Caire et al. 1979, Stones 1981). Summer surveys reveal similar figures. In a netting survey of Iowa bats utilizing stream corridors for foraging, Kunz (1973) captured 64 M. SEPTENTRIONALIS over three years, out of an eight-species sample totaling 540 individuals (12%); M. SEPTENTRIONALIS was the third most abundant species, ranking far behind EPTESICUS FUSCUS (243) and LASIURUS BOREALIS (124). At Renfrew mine, Fenton (1969) found 117 M. SEPTENTRIONALIS compared to 5,712 M. LUCIFUGUS.

Rarely are there more than 100 individuals per hibernation colony (Barbour and Davis 1969, Caire et al. 1979). However, Stones (1981), found over 100 individuals (mean = 226) in 5 of 21 mines in which M. SEPTENTRIONALIS occurred in northern Michigan. In that study, 73% of the entire population was found in 5 mines and 86% in 8 mines of the 21 mines containing the species. Individuals usually roost solitarily.

In summer, these bats generally are colonial, but reproductive females and juveniles often roost alone. As many as 60 adults have been found in a single tree (Foster and Kurta 1999).

No single population of significant size has been studied intensively or long enough to determine population structure. Habitat utilization biases are reflected in sex ratios of animals captured during the summer, when females are more frequently taken near streams and males are more frequently taken at caves. Sex ratio data from hibernacula are more consistent. Griffin (1940) reported on sex ratios from New England hibernacula, where he found males comprised 77.8% of a sample population of 877 individuals over an 8 year period. In southern Illinois, Pearson (1962) found 72% males among the groups hibernating in silica mines and Hitchcock (1949) found

that 76.0% of 242 individuals hibernating in eastern Canada were males and that the sexes did not segregate during hibernation. In northern Michigan, males comprised 60% of winter populations and were more abundant than females in all but 3 of 21 mines searched (Stones 1981).

The disparity in the sex ratio appears to be quite consistent among studies, seasons, and sites. Griffin (1940) suggested that females may have a higher mortality rate than males and consequently, a shorter life span and lower representation in the population. Hitchcock's (1949) original data recently were statistically analyzed and shown to support this hypothesis (Hitchcock et al. 1984).

Although age structure is not known for any population, potential longevity is at least two decades. Hall et al. (1957) reported one banded M. SEPTENTRIONALIS that was found recently dead in the cave in which it had been banded almost 19 years earlier.

In West Virginia, foraging home ranges of seven females averaged 61.1 hectares (Menzel et al. 1999).

In Michigan, radio-tagged bats in spring-summer changed roosts every 2 days; distance between roosts was 6-2000 m (Foster and Kurta 1999).

In an experiment to determine the homing ability of blinded and deafened bats, a blinded individual returned 32 miles to its home cave in 2.5 hr after being held in captivity for 3 days (Stones and Branick 1969). The return rate of this animal was at an average, straight-line speed of 12.8 miles per hour. Overall, blinded bats returned to their home cave at the same frequency as did the control animals over the 6-week period following their release. However, none of the bats with impaired hearing returned during that time.

No significant predators are known (Baker 1983). Reported parasites include chiggers, mites, and trematodes (Whitaker and Winter 1977, Whitaker and Mumford 1971).
Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: N
Mobility and Migration Comments: Information on migration is scanty. Barbour and Davis (1969) reported that the winter and summer geographic ranges of the species appear to be identical. However, the lack of hibernacula and gravid or nursing females in some areas indicates that significant portions of the population may move seasonally. Late summer swarming behavior resulting in relatively high concentrations at some caves indicates that there is some degree of local or regional movement prior to reproduction. The low numbers of females captured at cave entrances and along streams throughout the summer in Missouri indicates dispersal to maternity sites, perhaps beyond the cave region of the state (Caire et al. 1979). The lack of hibernacula in southern Michigan suggests that bats must migrate either south to the karst regions of Indiana and Ohio or north to the abandoned mines of the Upper Peninsula to overwinter (Kurta 1982).

A few observations indicate that this species is capable of moving relatively long distances, often in a short period of time. One male recaptured by Caire et al. (1979) in Missouri had traveled at least 56 km in about one month, from its cave of origin to its apparent summering area where it was found behind the shutter of a house. Griffin (1945) reported one individual that flew approximately 60 miles between two caves sometime between February and April of the same year.
Palustrine Habitat(s): Riparian
Terrestrial Habitat(s): Forest - Conifer, Forest - Hardwood, Forest - Mixed, Urban/edificarian, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed
Subterranean Habitat(s): Subterrestrial
Habitat Comments: Generally associated with forested communities. Hibernates in caves, mines, and tunnels from late fall through early spring (Kurta 1982, Mumford and Cope 1964, Jackson 1961, Griffin 1940, and others). Hibernators frequently roost in crevices, drill holes, and similar sites (Caire et al. 1979, Pearson 1962, Layne 1958, Griffin 1940), but roosting in the open is not uncommon.

Use of different types of hibernacula can vary considerably among areas, depending upon quality and availability of sites. In a study of 71 potential hibernation sites, including large and small caves, overhangs, and mines, on the Shawnee National Forest in southern Illinois (Whitaker and Winter 1977), mines were the only occupied habitat. Mines also are the principal hibernation sites in northern Michigan where there are no caves (Stones 1981). In the northeastern U.S., hibernation sites include mines and caves (Griffin 1940, Hall et al. 1957) as well as large, cavelike water conduit tunnels (G. Hammerson, pers. obs.).

The principal requirements of a suitable hibernation site are winter-long, low temperatures above freezing, high humidity, and lack of disturbances, both natural (floods) and anthropogenic (visitation) (Barbour and Davis 1969, Hitchcock 1949). At least two studies have provided contradictory information on thermal habitat preferences, suggesting that warmer temperatures sometimes are selected or at least tolerated. In Illinois, Pearson (1962) found that the mean temperature at hibernation sites averaged 9.7 C. Stones (1981) studied the occurrence of bats in northern Michigan mines that were vertically thermally stratified. The mean ambient temperature was 5.9 C, with 43% of the population occurring in the range 7-8 C and 6.5% occurring in the range 9-11 C.

There appears to be a high degree of philopatry in hibernaculum use. In Missouri, over 90% of recaptured banded individuals, representing 5% of the original banded population of 945 (753 males and 192 females), were recaptured at their cave of origin (Caire et al. 1979). Mills (1971) recaptured 4.8% of 358 individuals at their cave of origin the year after banding. Griffin (1945) found that of over 13,000 banded bats of various species, of which about 8,500 were banded in their winter hibernacula, the ratio was 100:1 for bats that were observed to return to their cave of origin over subsequent winters vs. those that were recaptured elsewhere.

Night roosts used in summer between foraging bouts are in different habitats than day roosts. Caves, mines, and quarry tunnels are used as night roosts, typically by males, but also by nonreproductive females (Clark et al. 1987, Jones et al. 1967). They are joined later in the summer by juveniles and post-lactating females (Kunz, 1973). During the day, these same sites usually house no M. SEPTENTRIONALIS. Daytime observations typically are of individuals in crevices or hollows or under loose bark on trees (Foster and Kurta 1999) and in a variety of small spaces associated with buildings and other structures (Hoffmeister 1989, Caire et al. 1979, Hamilton and Whitaker 1979, Barbour and Davis 1969). At times M. SEPTENTRIONALIS has been found in or around caves on summer nights, but not actually roosting in them (Mills 1971). Early in the summer, these groups mostly comprise males, with females and

young-of-the-year joining later in the season (Caire et al. 1979).

Nothing has been published on the fidelity of individuals or colonies to particular swarming sites, nor the relationship of swarming site selection to hibernaculum and summer roost selection. Given the low numbers found in most hibernacula and summer night roosts relative to the higher numbers found at swarming sites, it appears that certain caves serve as congregation points for fall mating activity. However, short-term banding returns at swarming sites are very low, indicating movement among swarming sites (Kurta, pers. comm.).

Nursery colonies have rarely been located. Those that have been found were small and in a variety of sites, including a barn (Cope and Humphrey 1972) and a small cabin (Brandon 1961), though most likely the majority occur under the loose bark of trees, similar to the colonies reported from Indiana (Mumford and Cope 1964). Perhaps the single largest colony reported was found in a barn in Indiana (Cope and Humphrey 1972) on 22 June comprising 24 adult females, 12 immature females, and 18 immature males; 10 other adults escaped. Of the 24 females, 23 were lactating and 1 was pregnant. The ratio of number of adults to young confirmed the suspected litter size of one.

Maternity roosts are warm sites that maximize the growth rate of young while providing protection from predation and the weather. Cool summer temperatures can slow juvenile growth, thereby reducing the fat accumulation period prior to hibernation, and ultimately increasing the risk of overwintering mortality in young-of-the-year (McNab 1982).

Sex ratios from summer studies in different habitats demonstrate sexual dimorphism in habitat selection at this time of the year. In riparian areas in Iowa, Kunz (1971) found a 2:1 ratio of females to males, with most males taken in May and late August, apparently during migration. Caire et al. (1979), trapping at caves, found a preponderance of males.

Small, highly fragmented, or young forests that provide limited areas of subcanopy foraging habitat may not be suitable. Young forests may also lack appropriate nursery sites. A lack of suitable hibernacula may prevent occupancy of areas that otherwise have adequate habitat (Kurta 1982).
Adult Food Habits: Invertivore
Immature Food Habits: Invertivore
Food Comments: Evidently an opportunistic insectivore (Kunz 1973); prey composition varies widely among sites and seasons; diet includes Lepidoptera, Coleoptera, Neuroptera, Diptera, Hymenoptera, Homoptera, and Hemiptera (Whitaker 1972, LaVal and LaVal 1980, Griffith and Gates 1985). The presence of green plant material in some individuals, suggesting that some insects may have been gleaned from vegetation, is consistent with this species large ears and high echolocation frequency which provide better resolution of target detail (Fenton 1982).

Foraging typically occurs in forested habitats, above and below the canopy; forages also over forest clearings and occasionally over water. Eleven individuals (10 males, 1 female) tagged with chemical lights observed during the summer in Missouri (LaVal et al. 1977), foraged almost exclusively among the trees of hillside and ridge forests, rather than utilizing floodplain and riparian forests; frequently foraging occurred within 1 to 3 m of the ground. Foraging bats doubled back frequently and only slowly moved out of the observation area. In Iowa, Kunz (1973, 1971) found primarily females foraging in mature deciduous uplands with adjacent deep ravines and in a disturbed riparian area with an adjacent floodplain and agricultural lands.
Adult Phenology: Hibernates/aestivates, Nocturnal
Immature Phenology: Hibernates/aestivates, Nocturnal
Phenology Comments: Hibernation occurs from late summer/early fall to spring. In more northerly locations, hibernation begins earlier in the fall and extends later into the spring. In Missouri, hibernation has been reported from October to late March, with numbers of individuals captured at cave entrances beginning to decline significantly in September (Caire et al. 1979). In Michigan's Upper Peninsula, hibernation began by late August, while the earliest reported capture of an active bat in the spring was a gravid female on 29 May (Kurta 1980) in the southern Lower Peninsula. In New England, arrival at hibernation caves begins by early October (Griffin 1940). In Indiana, a few flew outside a hibernation site periodically throughout winter, especially in mild weather; feeding apparently did not begin until mid-March (Whitaker and Rissler 1992).

In summer, an activity peak generally occurs 1-2 hours after sunset, with a secondary peak 7-8 hours after sunset. Nocturnal insects often exhibit a strong flight period among nocturnal insects beginning before sunset, peaking near midnight, and waning throughout the early morning hours, and a second but less intense flight period may occur before sunrise (see Kunz 1973). In Iowa, both LASIONYCTERIS NOCTIVAGANS and MYOTIS SEPTENTRIONALIS showed a similar bimodal activity pattern with a period of reduced activity from 4 to 6 hours after sunset (Kunz 1973).
Colonial Breeder: Y
Length: 95 centimeters
Weight: 8 grams

Economic Attributes

Not yet assessed

Management Summary

Species Impacts: Rabies is always a concern among workers who handle bats. Although MYOTIS SEPTENTRIONALIS is a potential carrier of this disease, none of the 24 individuals submitted to the Michigan Department of Public Health between 1956 and 1978 showed any evidence of it and the examination of an additional 82 bats in 1974 also proved negative (Kurta 1979). However, two rabid MYOTIS, probably SEPTENTRIONALIS, were obtained by the Michigan Department of Natural Resources during a rabies survey in 1971 (Kurta 1979). The incidence of rabies is likely quite low in other states as well (Kurta 1992). Although it is unlikely that M. SEPTENTRIONALIS, with its weak jaws and small teeth is a significant vector of rabies for humans (Baker 1983), workers should protect themselves with appropriate vaccinations prior to beginning any field or laboratory studies.
Restoration Potential: With a reproductive rate of just one offspring per year per female, damage to a population could be very slow to repair.
Preserve Selection & Design Considerations: An assessment of the need to protect all habitat types required by this species should be conducted as part of the preserve design process. It is unlikely that all types would fall within the boundaries of small preserves or even traditionally large preserves, but protection of hibernacula and maternity roosts is likely to be most critical. Protection of foraging

habitat, if disjunct from summer roosts and maternity colonies, may be most effectively gained through private or public landowner cooperation. Hydrological considerations are important. Seasonal flooding may make some caves unsuitable in some years and reduction in ground water flow could alter cave humidity. Winter visitations of hibernacula by humans are the most significant threat in most areas.
Management Requirements: Maintenance of adequate habitat for all life history stages and activities, and protection of hibernacula from disturbances, including hydrological changes, are important management requirements.
Monitoring Requirements: In states where declines or threats and/or impacts are apparent, populations should be monitored every year or two, depending upon pattern of decline or impacts. The invasiveness and long-term impact of monitoring activities should be minimized.

Telemetry should be done with care so as not to overburden this small species with additional weight. At a mean body weight of 7.4 gm (van Zyll de Jong, 1985) and following the conservative 10% rule, a transmitter and adhesive should not exceed 0.74 gm (Strayer 1992).
Management Research Needs: Very little is known about most aspects of life history, including hibernation, roosting, and foraging habitat requirements, population dynamics, population trends, and migration and dispersal patterns. Telemetry studies of both sexes are needed (Garner 1992, Kurta 1992) and ideally should be conducted in advance of potentially detrimental, large-scale habitat modifications, such as intensive logging of older forests and removal of standing dead timber in areas known or suspected to contain this species.
Biological Research Needs: Research is needed on most aspects of life history, including hibernation, roosting, and foraging habitat requirements, population dynamics, population trends, and migration and dispersal patterns. An assessment of the habitats needed to support all life history stages and activities is needed before adequate stewardship programs can be devised. Telemetry studies of both sexes are necessary (Garner 1992, Kurta 1992) and should be conducted in advance of potentially detrimental, large-scale habitat modifications, such as intensive logging of older forests and removal of standing dead timber in areas known or suspected to contain this species. However, telemetry should be done with care not to overburden this small species with additional weight. At a mean body weight of 7.4 g (van Zyll de Jong, 1985) and following the conservative 10% rule, a transmitter and adhesive should not exceed 0.74 g (Strayer 1992).

Population/Occurrence Delineation

Group Name: SMALL AND MEDIUM BATS

Use Class: Bachelor colony
Subtype(s): Diurnal Roost, Foraging Area, Nocturnal Roost
Minimum Criteria for an Occurrence: An area occupied either historically or at present by a persisting or recurring population of males during summer (approximately May through August). Includes mist net captures away from roost sites obtained during the summer months even if the actual roost site(s) are not known. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. In certain regions, recorded echolocation sequences of individuals may be considered reliable observations for certain species that can be confidently identified by their echolocation calls alone, although caution must be used in determining Location Use Class for such observations during the breeding season.
Mapping Guidance: EO includes both the colony site and the associated foraging areas. If separate, the colony site and foraging areas are bounded by separate polygons; that is, areas over which the bats simply commute to and from foraging areas and the colony are not included in the EO.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: The assigned separation distance is intended to generate occurrences that consist of spatially proximate roost sites and capture locations. However, include in the same occurrence (1) any roost sites between which significant of individuals are known to move, regardless of how far apart they are, and (2) known significant foraging areas of occurrences that are based on roost sites.

In two studies, male MYOTIS SODALIS foraged a maximum of 2.0 and 4.2 kilometers from their summer roosts (summarized in USFWS 1999).
Date: 29Mar2004
Author: Cannings, S., and G. Hammerson

Use Class: Hibernaculum
Subtype(s): Hibernaculum, Pre-hibernation roost site
Minimum Criteria for an Occurrence: A site occupied either historically or at present by a recurring population of hibernating individuals. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. EO also includes immediately surrounding areas used by bats immediately before hibernation, where these areas are known.
Mapping Guidance: Cave/mine passages should be projected to the surface for the purpose of mapping EO boundary.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: These bats sometimes move long distances between different hibernacula. For example, individuals of M. LUCIFUGUS and M. SEPTENTRIONALIS have been recorded flying up to 219 and 89 kilometers respectively between hibernacula during the winter months (Linzey 1998, Griffin 1940). However,
such movements are not a good basis for distinguishing occurrences (occurrences would become too expansive). The assigned separation distance is intended to generate occurrences that consist of spatially proximate hibernacula.

Separation distances suggested take into account the fact that, during the fall, some bats (e.g. M. SODALIS) swarm and mate at their hibernaculum, and males roost in trees nearby during the day and fly to the cave during the night. In two studies, M. SODALIS males roosted within a maximum of 5.6 kilometers of the hibernaculum (Kiser and Elliott 1996; Craig Stihler, West Virginia Division of Natural Resources, pers. observ., October 1996, cited in USFWS 1999).

Although they do not generally fly from one hibernaculum to another, hibernating bats are known to wake and move around to some extent within their hibernating site. As long as the areas are connected (even though they may not be passable by humans) the bats could be expected to move from one part of the system to another (e.g. MYOTIS SODALIS, Clawson et al. 1980).
Date: 29Mar2004
Author: Cannings, S., and G. Hammerson

Use Class: Maternity colony
Subtype(s): Colony Site, Foraging Area, Nocturnal Roost
Minimum Criteria for an Occurrence: An area occupied either historically or at present by a persisting or recurring population of breeding females and their young during summer (approximately May through August). Includes mist net captures away from colony sites obtained during the summer months even if the associated roost site is not known. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. In certain regions, echolocation sequences of individuals may be considered reliable observations for certain species that can be confidently identified by their echolocation calls alone, although caution must be used in determining Location Use Class for such observations during the breeding season.
Mapping Guidance: The EO includes both the colony site and the associated foraging areas. If separate, the colony site and foraging areas are bounded by separate polygons; that is, areas over which the bats simply commute to and from foraging areas and the colony are not included in the EO.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: It is impractical to attempt to delineate occurrences on the basis of discrete populations. Instead, the assigned separation distance is intended to generate occurrences that consist of spatially proximate roost sites and capture locations.

Nursing female *Myotis sodalis* moved an average of 1.04 kilometers from roost to center of foraging area, giving a mean foraging diameter of 2.08 kilometers; however, post-lactating females moved more than twice as far, travelling an average of 2.6 kilometers (Garner and Gardner 1992). In Indiana, 11 foraging adult females that were tracked for 2-7 days moved up to 8.4 km from their roost; home range during this brief period averaged 3.35 square kilometers (Sparks et al. 2005). *Myotis grisescens* females move up to 6.6 kilometers (Tuttle 1976). Female *M. septentrionalis* had an average foraging home range of 61.1 hectares (Menzel et al. 1999), equivalent to a circle with a diameter of 880 meters.
Date: 08Mar2001
Author: Cannings, S.

Use Class: Nonbreeding
Subtype(s): Diurnal Roost, Foraging Area, Nocturnal Roost
Minimum Criteria for an Occurrence: A site occupied either historically or at present by a recurring population of migrating or otherwise nonhibernating individuals during the nonbreeding season. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. In certain regions, recorded echolocation sequences of individuals may be considered reliable observations for certain species that can be confidently identified by their echolocation calls alone.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: The assigned separation distance is intended to generate occurrences that consist of spatially proximate roost sites and capture locations. However, include in the same occurrence (1) any roost sites between which individuals are known to move, regardless of how far apart they are, and (2) known significant foraging areas of occurrences that are based on roost sites.

In California, Fellers and Pierson (2002) studied a group of *Corynorhinus townsendii* inhabiting a maternity colony site after the nursery season had passed and found that the mean center of female foraging activity was 3.2 kilometers from the diurnal roost, whereas the mean center of male foraging activity was only 1.3 kilometers from the roost. No bats traveled more than 10.5 kilometers from the roost, and individuals showed considerable loyalty to the primary roost. Otherwise, little movement data are available.
Date: 19Apr2001
Author: Cannings, S.

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank) **Not yet assessed**

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 19Apr2005
NatureServe Conservation Status Factors Author: Wilsmann, L. A., J. Soule, and G. Hammerson
Management Information Edition Date: 28Oct1992
Management Information Edition Author: Leni A. Wilsmann, Michigan Natural Features Inventory, 5th Floor Mason Bldg., P.O. Box 30028, Lansing, MI 48909.

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Citation for data on website including State Distribution, Watershed, and Reptile Range maps:
NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 1, 2012).

Citation for Bird Range Maps of North America:
Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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"Data provided by NatureServe in collaboration with Robert Ridgely, James Zook, The Nature Conservancy - Migratory Bird Program, Conservation International - CABS, World Wildlife Fund - US, and Environment Canada - WILDSPACE."

Citation for Mammal Range Maps of North America:
Patterson, B.D., G. Ceballos, W. Sechrest, M.F. Tognelli, T. Brooks, L. Luna, P. Ortega, I. Salazar, and B.E. Young. 2003. Digital Distribution Maps of the Mammals of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

Acknowledgement Statement for Mammal Range Maps of North America:
"Data provided by NatureServe in collaboration with Bruce Patterson, Wes Sechrest, Marcelo Tognelli, Gerardo Ceballos, The Nature Conservancy-Migratory Bird Program, Conservation International-CABS, World Wildlife Fund-US, and Environment Canada-WILDSPACE."

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IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. IUCN, Conservation International, and NatureServe, Washington, DC and Arlington, Virginia, USA.

Acknowledgement Statement for Amphibian Range Maps of the Western Hemisphere:
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NOTE: Full metadata for the Bird Range Maps of North America is available at:
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NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Perimyotis subflavus - (Menu, 1984)
Eastern Pipistrelle

Other Related Name(s): *Pipistrellus subflavus* (F. Cuvier, 1832)
Related ITIS Name(s): *Pipistrellus subflavus* (F. Cuvier, 1832) (TSN 180025)
Unique Identifier: ELEMENT_GLOBAL.2.102580
Element Code: AMACC03020
Informal Taxonomy: Animals, Vertebrates - Mammals - Bats

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Mammalia	Chiroptera	Vespertilionidae	Perimyotis

Genus Size: A - Monotypic genus

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: Wilson, D. E., and D. M. Reeder (editors). 1993. Mammal Species of the World: a Taxonomic and Geographic Reference. Second Edition. Smithsonian Institution Press, Washington, DC. xviii + 1206 pp. Available online at: http://www.nmnh.si.edu/msw/.
Concept Reference Code: B93WIL01NAUS
Name Used in Concept Reference: *Pipistrellus subflavus*
Taxonomic Comments: See Davis (1959) for information on geographic variation and subspecies.

The relationships of the genera *Eptesicus* and *Pipistrellus* are unclear; for several Old World species there is some uncertainty as to which is the appropriate genus (see Morales et al. 1991 and Hilton and Harrison 1978).

Menu (1984) transferred *P. subflavus* to a new genus (*Perimyotis*), "but comparisons are clearly inadequate" (Koopman, in Wilson and Reeder 1993), and Koopman, Jones et al. (1992), and Simmons (in Wilson and Reeder 2005) retained this species in the genus *Pipistrellus*. Hoofer et al. (2006) revised the generic status of American pipistrelles and transferred *Pipistrellus hesperus* to the genus *Parastrellus* and *Pipistrellus subflavus* to the genus *Perimyotis*.

Conservation Status

NatureServe Status

Global Status: G5
Global Status Last Reviewed: 09Feb2007
Global Status Last Changed: 05Feb1997
Rounded Global Status: G5 - Secure
Nation: United States
National Status: N5 (09Feb2007)
Nation: Canada
National Status: N2N3 (01Jan2012)

U.S. & Canada State/Province Status	
United States	Alabama (S5), Arkansas (S5), Connecticut (S4), Delaware (S4), District of Columbia (S4), Florida (SNR), Georgia (S5), Illinois (S5), Indiana (S4), Iowa (S4), Kansas (S4), Kentucky (S4S5), Louisiana (S4S5), Maine (SU), Maryland (S5B,S5N), Massachusetts (S3), Michigan (S2), Minnesota (S3), Mississippi (S5), Missouri (SNR), Nebraska (S1), New Hampshire (S1N,SUB), New Jersey (SU), New York (S3), North Carolina (S5), Ohio (SNR), Oklahoma (S4), Pennsylvania (S1), Rhode Island (S4), South Carolina (SNR), Tennessee (S5), Texas (S5), Vermont (S2S3), Virginia (S5), West Virginia (S5), Wisconsin (S1S3)

Canada	New Brunswick (S2?), Nova Scotia (S1?), Ontario (S3?), Quebec (S2)

Other Statuses

IUCN Red List Category: LC - Least concern

NatureServe Global Conservation Status Factors

Range Extent Comments: Nova Scotia, southern Quebec, Michigan (Kurta and Teramino 1994), and Minnesota south to Honduras, Texas, Gulf Coast, and Florida.

Population Size Comments: See Arita (1993) for information on population size in Mexico.

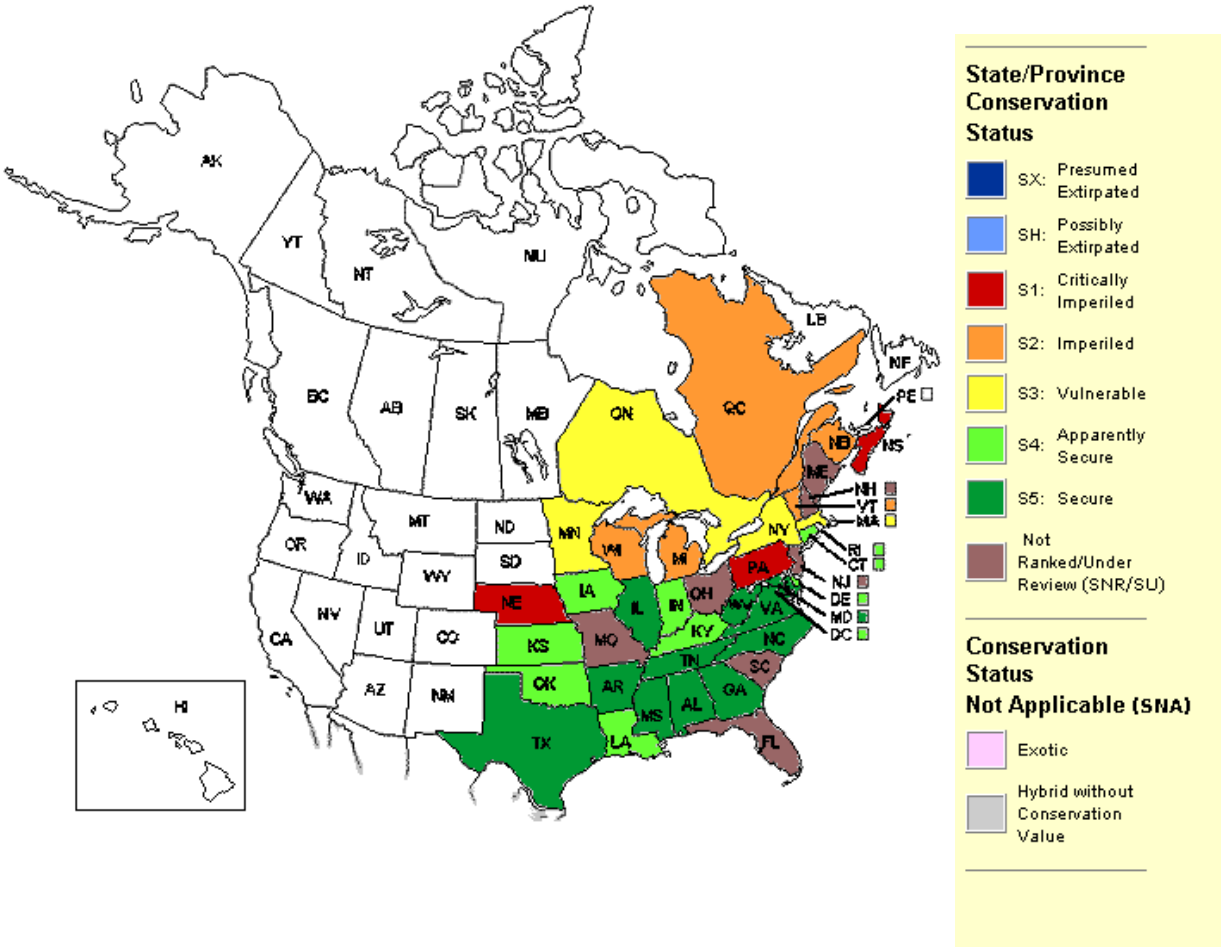
Short-term Trend Comments: See Arita (1993) for general information on conservation status in Mexico.

Other NatureServe Conservation Status Information

Distribution

Global Range: Nova Scotia, southern Quebec, Michigan (Kurta and Teramino 1994), and Minnesota south to Honduras, Texas, Gulf Coast, and Florida.

U.S. States and Canadian Provinces

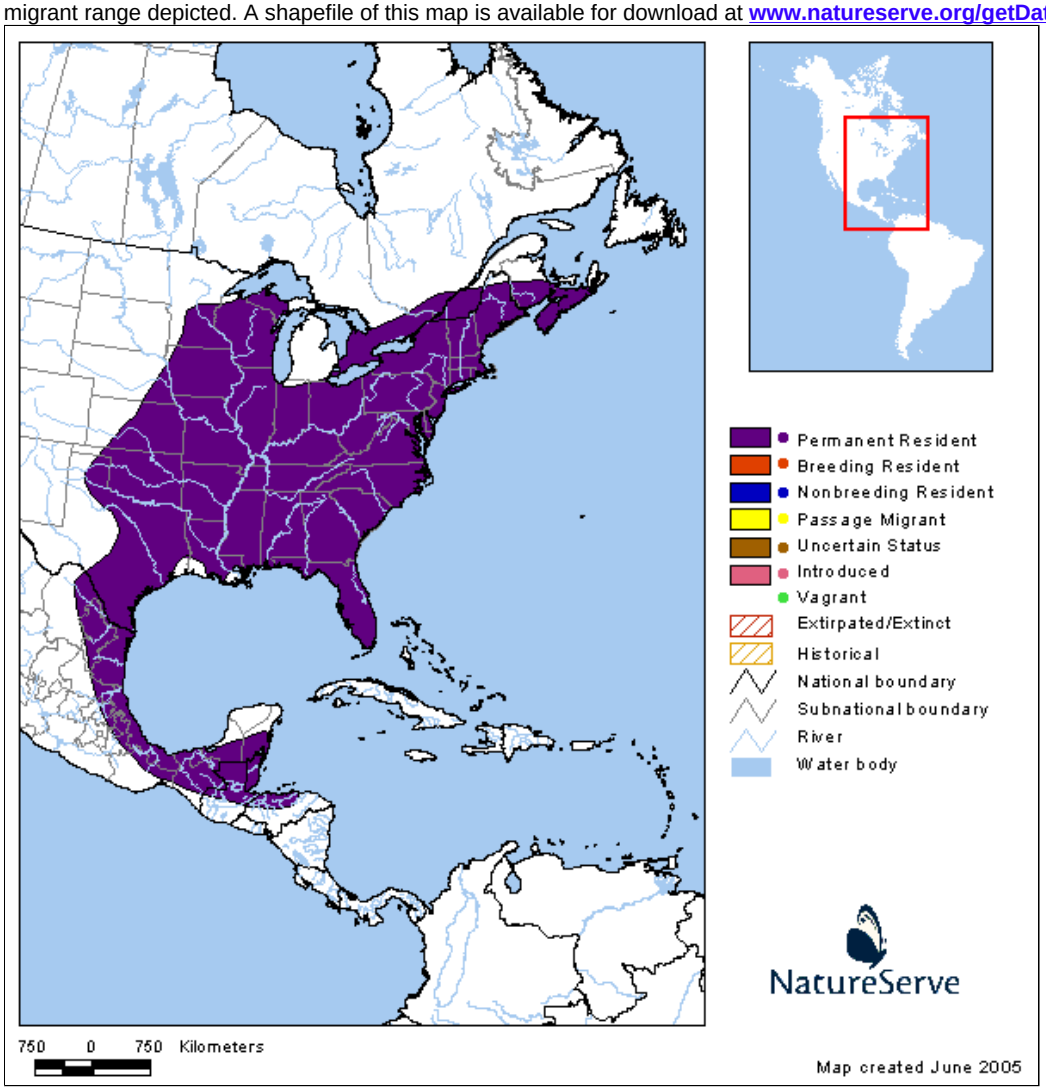


Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	AL, AR, CT, DC, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, NE, NH, NJ, NY, OH, OK, PA, RI, SC, TN, TX, VA, VT, WI, WV
Canada	NB, NS, ON, QC

Range Map

Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: NatureServe, 2005; Sechrest, 2002

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
IA	Guthrie (19077)
IN	Bartholomew (18005), Brown (18013), Crawford (18025), Daviess (18027), Dubois (18037), Gibson (18051), Greene (18055), Harrison (18061), Johnson (18081), Knox (18083), Lawrence (18093), Martin (18101), Monroe (18105), Morgan (18109), Newton (18111), Orange (18117), Pike (18125), Porter (18127), Vigo (18167), Washington (18175)
MN	Anoka (27003)*, Carlton (27017), Carver (27019)*, Chisago (27025)*, Dakota (27037)*, Dodge (27039)*, Fillmore (27045), Goodhue (27049), Hennepin (27053), Houston (27055), Lake (27075), Le Sueur (27079), Nicollet (27103), Olmsted (27109)*, Ramsey (27123), Rice (27131)*, Scott (27139)*, Sibley (27143)*, St. Louis (27137), Stearns (27145)*, Wabasha (27157), Washington (27163), Winona (27169)
MS	Adams (28001), Forrest (28035), Grenada (28043), Perry (28111), Smith (28129), Stone (28131), Tishomingo (28141), Wayne (28153)
NE	Cass (31025), Dakota (31043), Sarpy (31153), Thurston (31173)
NH	Coos (33007), Merrimack (33013)
VT	Addison (50001), Bennington (50003), Orange (50017), Rutland (50021), Windham (50025), Windsor (50027)
WI	Buffalo (55011)*, Crawford (55023)*, Grant (55043), Iowa (55049), Lafayette (55065), Pepin (55091)*, Pierce (55093), Polk (55095), Richland (55103), St. Croix (55109)*, Vernon (55123)*

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
01	Lower Androscoggin (01040002)+, Contoocook (01070003)+, Upper Connecticut-Mascoma (01080104)+, White (01080105)+, Black-Ottauquechee (01080106)+, West (01080107)+
02	Hudson-Hoosic (02020003)+
03	Upper Chickasawhay (03170002)+, Black (03170007)+, Middle Pearl-Strong (03180002)+
04	Beaver-Lester (04010102)+, St. Louis (04010201)+, Lake Superior (04020300)+, Little Calumet-Galien (04040001)+, Mettawee River (04150401)+, Otter Creek (04150402)+, Lake Champlain (04150408)+
05	Middle Wabash-Busseron (05120111)+, Upper White (05120201)+, Lower White (05120202)+, Driftwood (05120204)+, Lower East Fork White (05120208)+, Patoka (05120209)+, Blue-Sinking (05140104)+, Highland-Pigeon (05140202)+
06	Bear (06030006)+
07	Clearwater-Elk (07010203)+, Twin Cities (07010206)+, Middle Minnesota (07020007)+, Lower Minnesota (07020012)+, Lower St. Croix (07030005)+, Rush-Vermillion (07040001)+, Cannon (07040002)+, Buffalo-Whitewater (07040003)+, Zumbro (07040004)+, Root (07040008)+, Lower Chippewa (07050005)+, Grant-Little Maquoketa (07060003)+, Apple-Plum (07060005)+, Lower Wisconsin (07070005)+, Kickapoo (07070006)+, Pecatonica (07090003)+, South Raccoon (07100007)+, Kankakee (07120001)+
08	Yalobusha (08030205)+, Homochitto (08060205)+
10	Lower Platte (10200202)+, Blackbird-Soldier (10230001)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Reproduction Comments: Mates in October/November. Litter size usually is 2, born June to mid-July in north, May in south. Probably sexually mature 1st summer. Young able to fly within a month. Maternity colonies are small.
Ecology Comments: Probably feeds within a 5-mile radius of its roosting site. In spring and summer in Indiana, the maximum distance traveled by 19 radio-tagged reproductive females was 4.3 km (Veilleux et al. 2003). Probably occurs in low densities. Relatively uncommon. Generally solitary or in small groups.
Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: N
Palustrine Habitat(s): Riparian
Terrestrial Habitat(s): Grassland/herbaceous, Old field, Suburban/orchard, Urban/edificarian, Woodland - Hardwood
Subterranean Habitat(s): Subterrestrial
Habitat Comments: Prefers partly open country with large trees and woodland edges. Avoids deep woods and open fields. Probably roosts in the summer in tree foliage and occasionally in buildings; may use cave as night roost between foraging forays. Usually hibernates in caves and mines with high humidity. Generally, maternity colonies utilize manmade structures or tree cavities; often in open sites that would not be tolerated by most other bats (Schmidly 1991). However, in Indiana, pregnant and lactating females roosted exclusively in foliage, typically in clusters of dead leaves and less often in live foliage or squirrel nests (Veilleux et al. 2003).
Adult Food Habits: Invertivore
Immature Food Habits: Invertivore
Food Comments: Solitary feeder on various flying insects. Forages at treetop level, often over water.
Adult Phenology: Hibernates/aestivates, Nocturnal
Immature Phenology: Hibernates/aestivates, Nocturnal
Phenology Comments: Feeds after dark until dawn. Has intermittent feeding periods to midnight and another period of feeding activity toward dawn. Rarely may fly outside hibernation site in winter (Whitaker and Rissler 1992).
Colonial Breeder: Y
Length: 9 centimeters
Weight: 6 grams

Economic Attributes

Not yet assessed

Management Summary

Not yet assessed

Population/Occurrence Delineation

Group Name: SMALL AND MEDIUM BATS

Use Class: Bachelor colony
Subtype(s): Diurnal Roost, Foraging Area, Nocturnal Roost
Minimum Criteria for an Occurrence: An area occupied either historically or at present by a persisting or recurring population of males during summer (approximately May through August). Includes mist net captures away from roost sites obtained during the summer months even if the actual roost site(s) are not known. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. In certain regions, recorded echolocation sequences of individuals may be considered reliable observations for certain species that can be confidently identified by their echolocation calls alone, although caution

must be used in determining Location Use Class for such observations during the breeding season.
Mapping Guidance: EO includes both the colony site and the associated foraging areas. If separate, the colony site and foraging areas are bounded by separate polygons; that is, areas over which the bats simply commute to and from foraging areas and the colony are not included in the EO.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: The assigned separation distance is intended to generate occurrences that consist of spatially proximate roost sites and capture locations. However, include in the same occurrence (1) any roost sites between which significant of individuals are known to move, regardless of how far apart they are, and (2) known significant foraging areas of occurrences that are based on roost sites.

In two studies, male MYOTIS SODALIS foraged a maximum of 2.0 and 4.2 kilometers from their summer roosts (summarized in USFWS 1999).
Date: 29Mar2004
Author: Cannings, S., and G. Hammerson

Use Class: Hibernaculum
Subtype(s): Hibernaculum, Pre-hibernation roost site
Minimum Criteria for an Occurrence: A site occupied either historically or at present by a recurring population of hibernating individuals. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. EO also includes immediately surrounding areas used by bats immediately before hibernation, where these areas are known.
Mapping Guidance: Cave/mine passages should be projected to the surface for the purpose of mapping EO boundary.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: These bats sometimes move long distances between different hibernacula. For example, individuals of M. LUCIFUGUS and M. SEPTENTRIONALIS have been recorded flying up to 219 and 89 kilometers respectively between hibernacula during the winter months (Linzey 1998, Griffin 1940). However,
such movements are not a good basis for distinguishing occurrences (occurrences would become too expansive). The assigned separation distance is intended to generate occurrences that consist of spatially proximate hibernacula.

Separation distances suggested take into account the fact that, during the fall, some bats (e.g. M. SODALIS) swarm and mate at their hibernaculum, and males roost in trees nearby during the day and fly to the cave during the night. In two studies, M. SODALIS males roosted within a maximum of 5.6 kilometers of the hibernaculum (Kiser and Elliott 1996; Craig Stihler, West Virginia Division of Natural Resources, pers. observ., October 1996, cited in USFWS 1999).

Although they do not generally fly from one hibernaculum to another, hibernating bats are known to wake and move around to some extent within their hibernating site. As long as the areas are connected (even though they may not be passable by humans) the bats could be expected to move from one part of the system to another (e.g. MYOTIS SODALIS, Clawson et al. 1980).
Date: 29Mar2004
Author: Cannings, S., and G. Hammerson

Use Class: Maternity colony
Subtype(s): Colony Site, Foraging Area, Nocturnal Roost
Minimum Criteria for an Occurrence: An area occupied either historically or at present by a persisting or recurring population of breeding females and their young during summer (approximately May through August). Includes mist net captures away from colony sites obtained during the summer months even if the associated roost site is not known. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. In certain regions, echolocation sequences of individuals may be considered reliable observations for certain species that can be confidently identified by their echolocation calls alone, although caution must be used in determining Location Use Class for such observations during the breeding season.
Mapping Guidance: The EO includes both the colony site and the associated foraging areas. If separate, the colony site and foraging areas are bounded by separate polygons; that is, areas over which the bats simply commute to and from foraging areas and the colony are not included in the EO.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: It is impractical to attempt to delineate occurrences on the basis of discrete populations. Instead, the assigned separation distance is intended to generate occurrences that consist of spatially proximate roost sites and capture locations.

Nursing female *Myotis sodalis* moved an average of 1.04 kilometers from roost to center of foraging area, giving a mean foraging diameter of 2.08 kilometers; however, post-lactating females moved more than twice as far, travelling an average of 2.6 kilometers (Garner and Gardner 1992). In Indiana, 11 foraging adult females that were tracked for 2-7 days moved up to 8.4 km from their roost; home range during this brief period averaged 3.35 square kilometers (Sparks et al. 2005). *Myotis grisescens* females move up to 6.6 kilometers (Tuttle 1976). Female *M. septentrionalis* had an average foraging home range of 61.1 hectares (Menzel et al. 1999), equivalent to a circle with a diameter of 880 meters.

Date: 08Mar2001
Author: Cannings, S.

Use Class: Nonbreeding
Subtype(s): Diurnal Roost, Foraging Area, Nocturnal Roost
Minimum Criteria for an Occurrence: A site occupied either historically or at present by a recurring population of migrating or otherwise nonhibernating individuals during the nonbreeding season. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. In certain regions, recorded echolocation sequences of individuals may be considered reliable observations for certain species that can be confidently identified by their echolocation calls alone.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: The assigned separation distance is intended to generate occurrences that consist of spatially proximate roost sites and capture locations. However, include in the same occurrence (1) any roost sites between which individuals are known to move, regardless of how far apart they are, and (2) known significant foraging areas of occurrences that are based on roost sites.

In California, Fellers and Pierson (2002) studied a group of *Corynorhinus townsendii* inhabiting a maternity colony site after the nursery season had passed and found that the mean center of female foraging activity was 3.2 kilometers from the diurnal roost, whereas the mean center of male foraging activity was only 1.3 kilometers from the roost. No bats traveled more than 10.5 kilometers from the roost, and individuals showed considerable loyalty to the primary roost. Otherwise, little movement data are available.
Date: 19Apr2001
Author: Cannings, S.

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Not yet assessed

Authors/Contributors

Element Ecology & Life History Edition Date: 07Oct2003
Element Ecology & Life History Author(s): Hammerson, G.

Zoological data developed by NatureServe and its network of natural heritage programs (see Local Programs) and other contributors and cooperators (see Sources).

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Note: All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of **February 2012**.
Note: This report was printed on **May 1, 2012**

Citation for data on website including State Distribution, Watershed, and Reptile Range maps:
NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 1, 2012).

Citation for Bird Range Maps of North America:
Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

Acknowledgement Statement for Bird Range Maps of North America:
"Data provided by NatureServe in collaboration with Robert Ridgely, James Zook, The Nature Conservancy - Migratory Bird Program, Conservation International - CABS, World Wildlife Fund - US, and Environment Canada - WILDSPACE."

Citation for Mammal Range Maps of North America:
Patterson, B.D., G. Ceballos, W. Sechrest, M.F. Tognelli, T. Brooks, L. Luna, P. Ortega, I. Salazar, and B.E. Young. 2003. Digital Distribution Maps of the Mammals of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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Citation for Amphibian Range Maps of the Western Hemisphere:
IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. IUCN, Conservation International, and NatureServe, Washington, DC and Arlington, Virginia, USA.

Acknowledgement Statement for Amphibian Range Maps of the Western Hemisphere:
"Data developed as part of the Global Amphibian Assessment and provided by IUCN-World Conservation Union, Conservation International and NatureServe."

NOTE: Full metadata for the Bird Range Maps of North America is available at:
http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

Full metadata for the Mammal Range Maps of North America is available at:
http://www.natureserve.org/library/mammalsDistributionmetadatav1.pdf.

NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Myotis lucifugus - (Le Conte, 1831)
Little Brown Myotis
Related ITIS Name(s): *Myotis lucifugus* (LeConte, 1831) (TSN 179988)
Unique Identifier: ELEMENT_GLOBAL.2.100473
Element Code: AMACC01010
Informal Taxonomy: Animals, Vertebrates - Mammals - Bats

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Mammalia	Chiroptera	Vespertilionidae	Myotis

Genus Size: D - Medium to large genus (21+ species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: Wilson, D. E., and D. M. Reeder (editors). 2005. Mammal species of the world: a taxonomic and geographic reference. Third edition. The Johns Hopkins University Press, Baltimore. Two volumes. 2,142 pp. Available online at: http://www.bucknell.edu/msw3/.
Concept Reference Code: B05WIL01NAUS
Name Used in Concept Reference: *Myotis lucifugus*
Taxonomic Comments: Certain southwestern populations formerly included in this species are now regarded as a distinct species, *Myotis occultus* (Hoffmeister 1986; Piaggio et al. 2002). Jones et al. (1992) and Koopman (in Wilson and Reeder 1993) included *M. occultus* in *M. lucifugus*. Allozyme data suggest that the two are conspecific (Valdez et al. 1999), but mitochondrial DNA evidence suggests that *M. occultus* is a specifically distinct monophyletic lineage (Piaggio et al. 2002). The mammal checklists by Baker et al. (2003) and Simmons (in Wilson and Reeder 2005) accepted *M. occultus* as a valid species.

In southern British Columbia, electrophoresis indicated no hybridization with *M. yumanensis* (Herd and Fenton 1983).

Recent work in Oregon suggests that *M. lucifugus* may be polyphyletic (J. Hayes, pers. comm. 2004).

Conservation Status

NatureServe Status

Global Status: G5
Global Status Last Reviewed: 14Jan2008
Global Status Last Changed: 04Nov1996
Rounded Global Status: G5 - Secure
Reasons: Widespread in North America from Alaska-Canada boreal forest south through most of the contiguous United States to central Mexico.
Nation: United States
National Status: N5
Nation: Canada
National Status: N5 (31Dec2011)

U.S. & Canada State/Province Status	
United States	Alabama (S3), Alaska (S4), Arkansas (S3), California (S2S3), Colorado (S5), Connecticut (S5), Delaware (S5), District of Columbia (S4), Florida (SNR), Georgia (S3), Idaho (S5), Illinois (S5), Indiana (S4), Iowa (S4), Kansas (S3S4), Kentucky (S5), Maine (S5), Maryland (S5B,S5N), Massachusetts (S5), Michigan (S5), Minnesota (SNR), Mississippi (S2), Missouri (S4), Montana (S4), Nebraska (S4), Nevada (S3), New Hampshire (S5), New Jersey (S5), New Mexico (S5), New York (S5), North Carolina (S4), North Dakota (SNR), Ohio (SNR), Oklahoma (S1), Oregon (S4), Pennsylvania (S1), Rhode Island (S5), South

	Carolina (S3?), South Dakota (S5), Tennessee (S5), Utah (S4), Vermont (S5), Virginia (S5), Washington (S4S5), West Virginia (S5), Wisconsin (S2S4), Wyoming (S5)
Canada	Alberta (S5), British Columbia (S5), Labrador (S4), Manitoba (S2N,S5B), New Brunswick (S4), Newfoundland Island (S4), Northwest Territories (S1S2), Nova Scotia (S4), Ontario (S4), Prince Edward Island (S5), Quebec (S5), Saskatchewan (S5B,S5M), Yukon Territory (S4S5)

Other Statuses

IUCN Red List Category: LC - Least concern

NatureServe Global Conservation Status Factors

Range Extent: >2,500,000 square km (greater than 1,000,000 square miles)
Range Extent Comments: Widespread in North America from Alaska-Canada boreal forest south through most of the contiguous U.S.; generally missing from the southern Great Plains region. Southwestern populations formerly assigned to this species have now been assigned to *M. occultus* (Piaggio et al. 2002; Wilson and Reeder 2005), so southwestern boundary of range includes southern California (except extreme southeast), Nevada, northern Utah, northern Colorado, and perhaps northeastern New Mexico (Piaggio et al. 2002; Valdez, pers. comm.). Specific status of populations in northern Mexico and eastern Texas is unknown (Valdez, pers. comm.).

Population Size: 100,000 to >1,000,000 individuals
Population Size Comments: Total adult population size is unknown but certainly exceeds 100,000. For general information on population size in Mexico see Arita (1993).

Overall Threat Impact Comments: Threats include deforestation (Parker 1996, Parker et al. 1996), use of pesticides (Fenton and Barclay 1980, Agosta 2002), use of cyanide in mining (Helfferich 1991), and destruction of caves and shafts associated with karst topography (Agosta 2002), along with control measures being implemented in nursery colonies and collecting of bats for experimentation (Fenton and Barclay 1980).

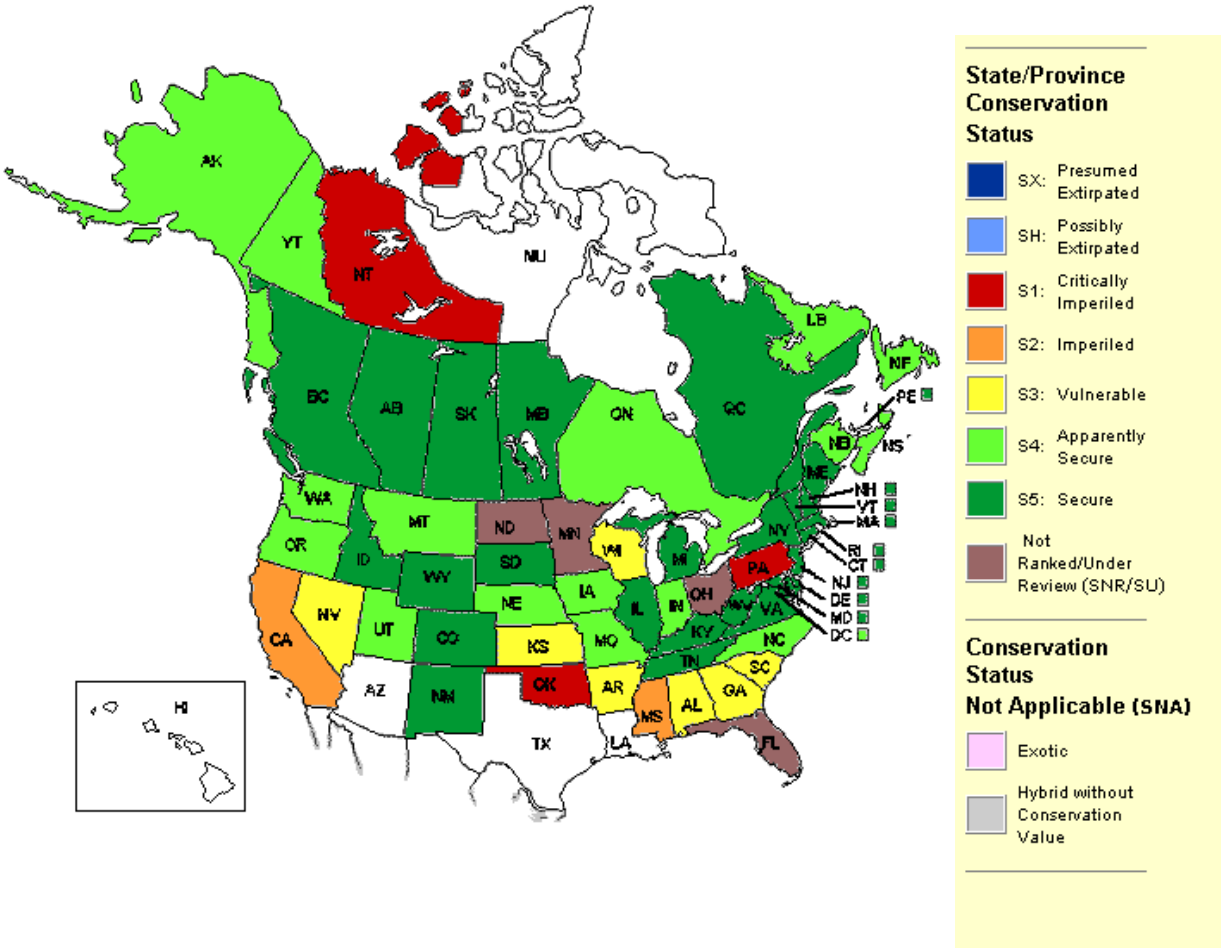
Special precautions should be taken when mine and cave surveys are conducted during breeding periods and winter hibernation. Hibernating bats are sensitive to human disturbance (Thomas 1995). Disturbance during hibernation can cause bats to use up stored fat reserves and starve to death. Disturbance of breeding colonies can cause young to lose their grasp and fall to their death.

Other NatureServe Conservation Status Information

Distribution

Global Range: (>2,500,000 square km (greater than 1,000,000 square miles)) Widespread in North America from Alaska-Canada boreal forest south through most of the contiguous U.S.; generally missing from the southern Great Plains region. Southwestern populations formerly assigned to this species have now been assigned to *M. occultus* (Piaggio et al. 2002; Wilson and Reeder 2005), so southwestern boundary of range includes southern California (except extreme southeast), Nevada, northern Utah, northern Colorado, and perhaps northeastern New Mexico (Piaggio et al. 2002; Valdez, pers. comm.). Specific status of populations in northern Mexico and eastern Texas is unknown (Valdez, pers. comm.).

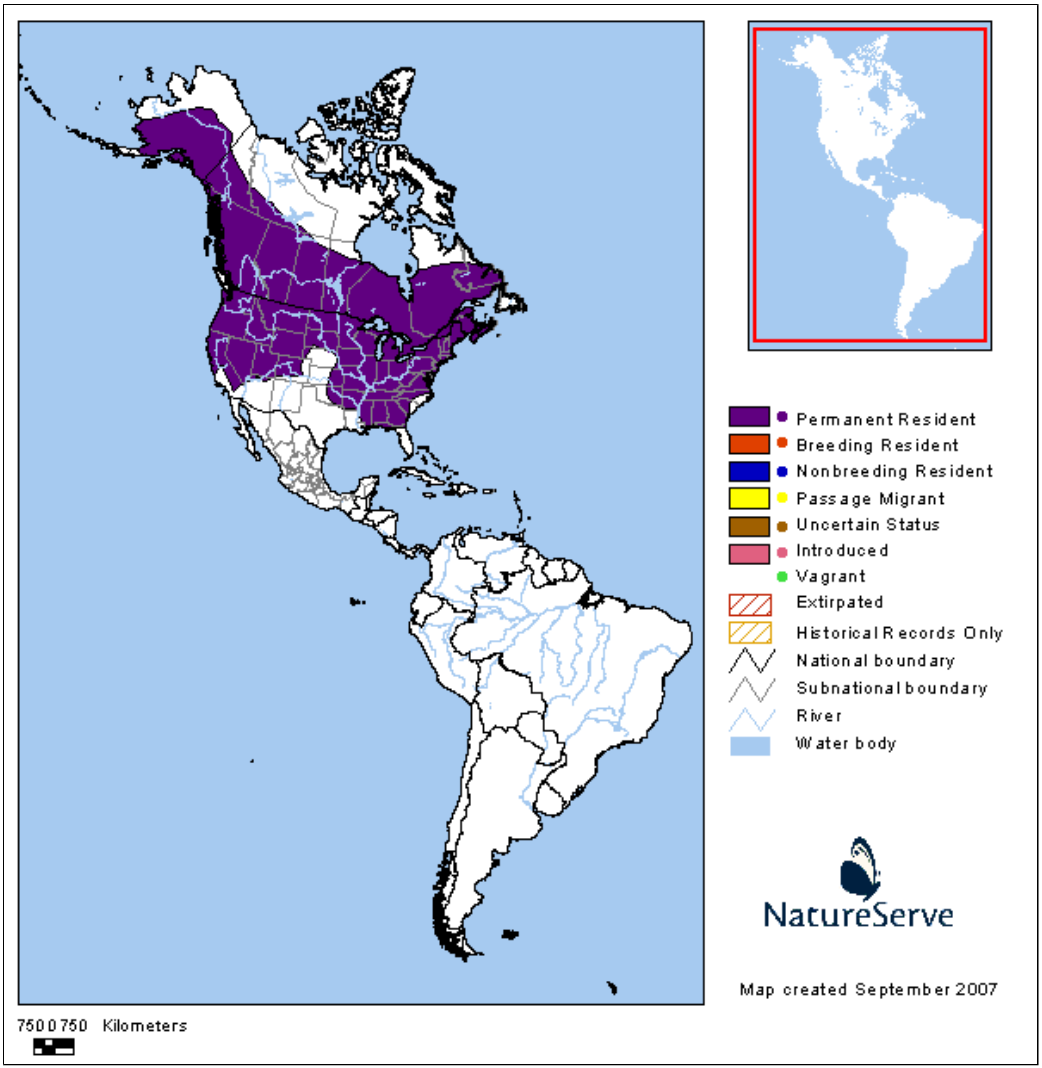
U.S. States and Canadian Provinces



Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	AK, AL, AR, CA, CO, CT, DC, DE, FL, GA, IA, ID, IL, IN, KS, KY, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, UT, VA, VT, WA, WI, WV, WY
Canada	AB, BC, LB, MB, NB, NF, NS, NT, ON, PE, QC, SK, YT

Range Map
Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: NatureServe, 2005; Sechrest, 2002

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
AK	Anchorage (02020), Bethel (CA) (02050), Bristol Bay (02060), Dillingham (CA) (02070), Fairbanks North Star (02090)*, Haines (02100), Juneau (02110), Kenai Peninsula (02122), Ketchikan Gateway (02130), Kodiak Island (02150), Lake and Peninsula (02164), Matanuska-Susitna (02170), Nome (CA) (02180), Prince of Wales-Outer Ketchikan (CA) (02201), Sitka (02220), Skagway-Hoonah-Angoon (CA) (02232), Southeast Fairbanks (CA) (02240), Valdez-Cordova (CA) (02261), Wrangell-Petersburg (CA) (02280), Yakutat (02282), Yukon-Koyukuk (CA) (02290)
AL	Conecuh (01035)*
IN	Bartholomew (18005), Crawford (18025), Daviess (18027), Dubois (18037), Gibson (18051), Greene (18055), Harrison (18061), Johnson (18081), Knox (18083), La Porte (18091), Lawrence (18093), Marion (18097), Martin (18101), Monroe (18105), Morgan (18109), Orange (18117), Porter (18127), Vigo (18167), Warren (18171), Washington (18175)
MS	Jackson (28059)*, Wayne (28153)
NV	Elko (32007), White Pine (32033)
OK	Adair (40001), Cimarron (40025)*, McCurtain (40089)*
SC	Beaufort (45013), Greenville (45045), Oconee (45073), Pickens (45077)
WY	Crook (56011), Platte (56031), Weston (56045)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**

03	Saluda (03050109)+, Salkehatchie (03050207)+, Broad-St. Helena (03050208)+, Seneca (03060101)+, Tugaloo (03060102)+, Sepulga (03140303)+, Upper Chickasawhay (03170002)+, Mississippi Coastal (03170009)+
04	Little Calumet-Galien (04040001)+
05	Middle Wabash-Little Vermilion (05120108)+, Middle Wabash-Busseron (05120111)+, Upper White (05120201)+, Lower White (05120202)+, Driftwood (05120204)+, Lower East Fork White (05120208)+, Patoka (05120209)+, Blue-Sinking (05140104)+, Highland-Pigeon (05140202)+
10	Beaver (10120107)+, Redwater (10120203)+, Glendo Reservoir (10180008)+
11	Upper Cimarron (11040002)+, Robert S. Kerr Reservoir (11110104)+, Mountain Fork (11140108)+
16	Upper Humboldt (16040101)+, North Fork Humboldt (16040102)+, Long-Ruby Valleys (16060007)+, Spring-Steptoe Valleys (16060008)+
17	Bruneau (17050102)+, South Fork Owyhee (17050105)+
19	Southeast Mainland (19010101)+, Ketchikan (19010102)+, Prince of Wales (19010103)+, Mainland (19010201)+, Kuiu-Kupreanof-Mitkof-Etolin-Zarembo-Wrangell Isla (19010202)+, Baranof-Chichagof Islands (19010203)+, Admiralty Island (19010204)+, Lynn Canal (19010301)+, Glacier Bay (19010302)+, Chilkat-Skagway Rivers (19010303)+, Yakutat Bay (19010401)+, Icy Strait-Chatham Strait (19010500)+, Middle Copper River (19020102)+, Chitina River (19020103)+, Lower Copper River (19020104)+, Eastern Prince William Sound (19020201)+, Western Prince William Sound (19020202)+, Lower Kenai Peninsula (19020301)+, Upper Kenai Peninsula (19020302)+, Anchorage (19020401)+, Matansuka (19020402)+, Lower Susitna River (19020505)+, Tuxdeni-Kamishak Bays (19020602)+, Kodiak-Afognak Islands (19020701)+, Shelikof Straight (19020702)+, Cook Inlet (19020800)+, Naknek (19030204)+, Lake Clark (19030205)+, Lake Iliamna (19030206)+, Lower Nushagak River (19030303)+, Stony River (19030405)+, Middle Fork Kuskokwim River (19030406)+, Aniak (19030501)+, Kuskokwim Delta (19030502)+, Fortymile River (19040104)+, Birch-Beaver Creeks (19040402)+, Yukon Flats (19040403)+, Ramparts (19040404)+, Tok (19040502)+, Healy Lake (19040503)+, Delta River (19040504)+, Chena River (19040506)+, Tanana River (19040507)+, Tolovana River (19040509)+, Unalakleet (19050102)+, Nome (19050104)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A small brown bat.
General Description: Cinnamon-buff to dark brown above, buffy to pale gray below; hairs on back have long glossy tips; ear when laid forward reaches approximately the nostril; tragus about half as high as ear; calcar without keel; length of head and body 41-54 mm, ear 11.0-15.5 mm, forearm 33-41 mm; braincase rises gradually from rostrum; greatest length of skull 14-16 mm; length of upper toothrow 5.0-6.6 mm (Hall 1981).
Diagnostic Characteristics: Differs from *M. sodalis* in unkeeled calcar. Differs from *M. austroriparius* in smaller size, glossy rather than dull pelage, and usual absence of a sagittal crest. Differs from *M. grisescens* in banded dorsal hairs banded (vs. unicolored) and wing attached to the foot at the base of the toe rather than at the ankle. Differs from *M. velifer* in smaller size, glossy rather than dull pelage, and lack of sagittal crest. Differs from *M. keenii* and *M. septentrionalis* in shorter ears that do not extend beyond the nose when laid forward. Differs from *M. volans* in smaller size, glossy rather than dull pelage, and unkeeled calcar. Differs from *M. yumanensis* in larger size, larger skull (greatest length usually more than 14 mm rather than usually less than 14 mm), and usually glossy pelage rather than dull pelage. Differs from *M. thysanodes* in absence of a conspicuous fringe of hairs along the edge of the interfemoral membrane. Differs from *M. californicus* in larger size, unkeeled calcar, and skull rising gradually from rostrum. Differs from *M. leibii* in larger size and unkeeled calcar. (Hall 1981).
Reproduction Comments: Usually mates in September-October. Ovulation and fertilization are delayed until spring. Gestation lasts 50-60 days. Gives birth to 1 litter of 1 young, late spring-early summer. Females produce first young usually in first (Indiana, New Mexico) or second year (British Columbia) (Herd and Fenton 1983). In British Columbia, may delay or forego reproduction in wet years (Grindal et al. 1992). Survival for a decade may be fairly common; a few live as long as 20-30 years; females may be reproductive to an age of at least 12 years (Hall et al. 1957, Keen and Hitchcock 1980). Most summer colonies range from 50 to 2500 individuals (average 400) (Mumford and Cope 1964).
Ecology Comments: Winter concentrations may include tens of thousands. Summer home range is poorly understood. Experiences low survival during first winter, higher in subsequent years.
Non-Migrant: N
Locally Migrant: Y
Long Distance Migrant: Y
Mobility and Migration Comments: In the northeast, may migrate hundreds of miles between winter and summer habitats; in the west, believed to hibernate near their summer range (Schmidly 1991).
Palustrine Habitat(s): Bog/fen, FORESTED WETLAND, HERBACEOUS WETLAND, Riparian
Terrestrial Habitat(s): Forest - Hardwood, Forest - Mixed, Grassland/herbaceous, Old field, Shrubland/chaparral, Suburban/orchard, Urban/edificarian, Woodland - Hardwood, Woodland - Mixed
Subterranean Habitat(s): Subterrestrial
Habitat Comments: Has adapted to using human-made structures for resting and maternity sites; also uses caves and hollow trees. Foraging habitat requirements are generalized; usually forages in woodlands near water. In winter, a relatively constant temperature of about 40 F and 80% relative humidity is required; uses caves, tunnels, abandoned mines, and similar sites. Maternity colonies commonly are in warm sites in buildings and other structures; also infrequently in hollow trees. Narrow microclimate is suitable for raising young, and availability of suitable maternity sites may limit abundance and distribution.
Adult Food Habits: Invertivore
Immature Food Habits: Invertivore
Food Comments: Often hunts over water or along the margins of lakes and streams; consumes flying insects, especially mosquitoes,

midges, caddisflies, moths, various hoppers, and smaller beetles, sometimes spiders (e.g., see Whitaker and Lawhead 1992). Insects with wingspans of 1/8-1/2" are pursued (Schwartz and Schwartz 1981). Prey are detected by echolocation at a range of 1 m (Fenton and Bell 1979).
Adult Phenology: Hibernates/aestivates, Nocturnal
Immature Phenology: Hibernates/aestivates, Nocturnal
Phenology Comments: Most active during the first 2-3 hours after sunset. Following a mid-night roost is a second foraging period. Cool temperatures and a low abundance of prey will lengthen the mid-night roost. Hibernates September-October to April-May. In Indiana, a few bats flew outside a hibernation site periodically throughout the winter, especially in mild weather; feeding apparently did not begin until mid-March (Whitaker and Rissler 1992).
Colonial Breeder: Y
Length: 9 centimeters
Weight: 14 grams

Economic Attributes

Not yet assessed

Management Summary

Management Requirements: See Greenhall (1982) for information on house bat management.

Population/Occurrence Delineation

Group Name: SMALL AND MEDIUM BATS

Use Class: Bachelor colony
Subtype(s): Diurnal Roost, Foraging Area, Nocturnal Roost
Minimum Criteria for an Occurrence: An area occupied either historically or at present by a persisting or recurring population of males during summer (approximately May through August). Includes mist net captures away from roost sites obtained during the summer months even if the actual roost site(s) are not known. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. In certain regions, recorded echolocation sequences of individuals may be considered reliable observations for certain species that can be confidently identified by their echolocation calls alone, although caution must be used in determining Location Use Class for such observations during the breeding season.
Mapping Guidance: EO includes both the colony site and the associated foraging areas. If separate, the colony site and foraging areas are bounded by separate polygons; that is, areas over which the bats simply commute to and from foraging areas and the colony are not included in the EO.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: The assigned separation distance is intended to generate occurrences that consist of spatially proximate roost sites and capture locations. However, include in the same occurrence (1) any roost sites between which significant of individuals are known to move, regardless of how far apart they are, and (2) known significant foraging areas of occurrences that are based on roost sites.

In two studies, male MYOTIS SODALIS foraged a maximum of 2.0 and 4.2 kilometers from their summer roosts (summarized in USFWS 1999).
Date: 29Mar2004
Author: Cannings, S., and G. Hammerson

Use Class: Hibernaculum
Subtype(s): Hibernaculum, Pre-hibernation roost site
Minimum Criteria for an Occurrence: A site occupied either historically or at present by a recurring population of hibernating individuals. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. EO also includes immediately surrounding areas used by bats immediately before hibernation, where these areas are known.
Mapping Guidance: Cave/mine passages should be projected to the surface for the purpose of mapping EO boundary.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: These bats sometimes move long distances between different hibernacula. For example, individuals of M. LUCIFUGUS and M. SEPTENTRIONALIS have been recorded flying up to 219 and 89 kilometers respectively between hibernacula during the winter months (Linzey 1998, Griffin 1940). However,
such movements are not a good basis for distinguishing occurrences (occurrences would become too expansive). The assigned separation distance is intended to generate occurrences that consist of spatially proximate hibernacula.

Separation distances suggested take into account the fact that, during the fall, some bats (e.g. M. SODALIS) swarm and mate at their hibernaculum, and males roost in trees nearby during the day and fly to the cave during the night. In two studies, M. SODALIS males roosted within a maximum of 5.6 kilometers of the hibernaculum (Kiser and Elliott 1996; Craig Stihler, West Virginia Division of Natural Resources, pers. observ., October 1996, cited in USFWS 1999).

Although they do not generally fly from one hibernaculum to another, hibernating bats are known to wake and move around to some extent within their hibernating site. As long as the areas are connected (even though they may not be passable by humans) the bats could be expected to move from one part of the system to another (e.g. MYOTIS SODALIS, Clawson et al. 1980).

Date: 29Mar2004
Author: Cannings, S., and G. Hammerson

Use Class: Maternity colony
Subtype(s): Colony Site, Foraging Area, Nocturnal Roost
Minimum Criteria for an Occurrence: An area occupied either historically or at present by a persisting or recurring population of breeding females and their young during summer (approximately May through August). Includes mist net captures away from colony sites obtained during the summer months even if the associated roost site is not known. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. In certain regions, echolocation sequences of individuals may be considered reliable observations for certain species that can be confidently identified by their echolocation calls alone, although caution must be used in determining Location Use Class for such observations during the breeding season.
Mapping Guidance: The EO includes both the colony site and the associated foraging areas. If separate, the colony site and foraging areas are bounded by separate polygons; that is, areas over which the bats simply commute to and from foraging areas and the colony are not included in the EO.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: It is impractical to attempt to delineate occurrences on the basis of discrete populations. Instead, the assigned separation distance is intended to generate occurrences that consist of spatially proximate roost sites and capture locations.

Nursing female *Myotis sodalis* moved an average of 1.04 kilometers from roost to center of foraging area, giving a mean foraging diameter of 2.08 kilometers; however, post-lactating females moved more than twice as far, travelling an average of 2.6 kilometers (Garner and Gardner 1992). In Indiana, 11 foraging adult females that were tracked for 2-7 days moved up to 8.4 km from their roost; home range during this brief period averaged 3.35 square kilometers (Sparks et al. 2005). *Myotis grisescens* females move up to 6.6 kilometers (Tuttle 1976). Female *M. septentrionalis* had an average foraging home range of 61.1 hectares (Menzel et al. 1999), equivalent to a circle with a diameter of 880 meters.
Date: 08Mar2001
Author: Cannings, S.

Use Class: Nonbreeding
Subtype(s): Diurnal Roost, Foraging Area, Nocturnal Roost
Minimum Criteria for an Occurrence: A site occupied either historically or at present by a recurring population of migrating or otherwise nonhibernating individuals during the nonbreeding season. Identification evidence minimally includes collection or reliable observation and detailed documentation of one or more individuals. In certain regions, recorded echolocation sequences of individuals may be considered reliable observations for certain species that can be confidently identified by their echolocation calls alone.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: The assigned separation distance is intended to generate occurrences that consist of spatially proximate roost sites and capture locations. However, include in the same occurrence (1) any roost sites between which individuals are known to move, regardless of how far apart they are, and (2) known significant foraging areas of occurrences that are based on roost sites.

In California, Fellers and Pierson (2002) studied a group of *Corynorhinus townsendii* inhabiting a maternity colony site after the nursery season had passed and found that the mean center of female foraging activity was 3.2 kilometers from the diurnal roost, whereas the mean center of male foraging activity was only 1.3 kilometers from the roost. No bats traveled more than 10.5 kilometers from the roost, and individuals showed considerable loyalty to the primary roost. Otherwise, little movement data are available.
Date: 19Apr2001
Author: Cannings, S.

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Not yet assessed

Authors/Contributors

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Element Ecology & Life History Edition Date: 10Oct1995
Element Ecology & Life History Author(s): Hammerson, G.

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IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. IUCN, Conservation International, and NatureServe, Washington, DC and Arlington, Virginia, USA.

Acknowledgement Statement for Amphibian Range Maps of the Western Hemisphere:
"Data developed as part of the Global Amphibian Assessment and provided by IUCN-World Conservation Union, Conservation International and NatureServe."

NOTE: Full metadata for the Bird Range Maps of North America is available at:
http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

Full metadata for the Mammal Range Maps of North America is available at:
http://www.natureserve.org/library/mammalsDistributionmetadatav1.pdf.

Accipiter gentilis - (Linnaeus, 1758)
Northern Goshawk
Related ITIS Name(s): *Accipiter gentilis* (Linnaeus, 1758) (TSN 175300)
Unique Identifier: ELEMENT_GLOBAL.2.104351
Element Code: ABNKC12060
Informal Taxonomy: Animals, Vertebrates - Birds - Other Birds


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View image report from CalPhoto

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Accipitriformes	Accipitridae	Accipiter

Genus Size: D - Medium to large genus (21+ species)

Check this box to expand all report sections: ☐

Concept Reference

Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, D.C. [as modified by subsequent supplements and corrections published in *The Auk*]. Also available online: http://www.aou.org/.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: *Accipiter gentilis*
Taxonomic Comments: Contains two groups: *atricapillus* of North America and *gentilis* of Eurasia (AOU 1998). See Whaley and White (1994) for information on geographic variation in North America. Validity of subspecies *apache* is questionable (see Banks 1995).

Conservation Status

NatureServe Status

Global Status: G5
Global Status Last Reviewed: 30Nov1999
Global Status Last Changed: 22Nov1996
Rounded Global Status: G5 - Secure
Reasons: Relatively abundant and widespread, Holarctic; population trends are difficult to determine; no hard evidence of a significant decline in recent decades, but probably declining in some areas primarily as a result of habitat alteration (especially logging), which can be expected to continue; effectiveness of forest management guidelines in providing adequate protection remains to be determined.
Nation: United States
National Status: N4B,N4N
Nation: Canada
National Status: N5 (09Sep2011)

U.S. & Canada State/Province Status	
	Alaska (S4), Arizona (S3), California (S3), Colorado (S3B), Connecticut (S4B), Delaware (SNA), Idaho (S4), Illinois (SNA), Indiana (SNA), Iowa (SNA), Kansas (SNA), Kentucky (SNA), Maine (S3?B,S3?N), Maryland (S1B), Massachusetts (S3),

United States	Michigan (S3), Minnesota (SNRB,SNRN), Montana (S3), Navajo Nation (S3), Nebraska (SNRN), Nevada (S2), New Hampshire (S3), New Jersey (S1B,S3N), New Mexico (S2B,S3N), New York (S4B,S3N), North Carolina (SUB), North Dakota (SNA), Ohio (SNRN), Oklahoma (S2N), Oregon (S3), Pennsylvania (S2S3B,S3N), Rhode Island (S1B,S1N), South Carolina (SNA), South Dakota (S3B,S2N), Tennessee (S2N), Utah (S3?), Vermont (S3S4B), Washington (S2S3B,S3N), West Virginia (S1B,S1N), Wisconsin (S2B,S2N), Wyoming (S3)
Canada	Alberta (S3S4), British Columbia (S4B,S4N), Labrador (S3?), Manitoba (S4), New Brunswick (S4), Newfoundland Island (S3B), Northwest Territories (S5), Nova Scotia (S3S4), Nunavut (SNR), Ontario (S4), Prince Edward Island (S4), Quebec (S4), Saskatchewan (S4B,S4M,S3N), Yukon Territory (S4)

Other Statuses

Implied Status under the U.S. Endangered Species Act: PS

Implied Status under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC):T,NAR

IUCN Red List Category: LC - Least concern

Convention on International Trade in Endangered Species Protection Status (CITES): Appendix II

Comments on official statuses: USFWS found that listing the population in the contiguous U.S. west of the 100th meridian as threatened or endangered was not warranted (Federal Register 63:35183-35184, 29 June 1998). USFWS (Federal Register, 3 November 2009) proposed to list the British Columbia distinct population segment (DPS) of subspecies *laingi* as threatened, except on the Queen Charlotte Islands (a significant portion of the DPS's range), where they proposed to list the goshawk as endangered.

NatureServe Global Conservation Status Factors

Range Extent: >2,500,000 square km (greater than 1,000,000 square miles)

Range Extent Comments: BREEDING: North America: western and central Alaska to northeastern Manitoba, Labrador, and Newfoundland, south to central California, southern Arizona, eastern foothills of Rockies, central Alberta, southern Manitoba, central Michigan, Pennsylvania, northwestern Connecticut, and in the Appalachians south to West Virginia and Maryland; locally in highlands of Mexico to Jalisco and Guerrero. Eurasia: British Isles, Scandinavia, northern Russia, and northern Siberia south to the Mediterranean, Asia Minor, Iran, the Himalayas, eastern China, and Japan (Squires and Reynolds 1997, AOU 1998). NON-BREEDING: throughout breeding range and irregularly southward (Squires and Reynolds 1997, AOU 1998). In some years there are large flights (irruptions) south beyond the usual wintering range. These excursions are prompted by changing conditions on the northern breeding grounds (Mueller et al. 1977). Recorded occasionally as far south as Arkansas, Louisiana, Kentucky, Alabama, and North Carolina (Adkisson 1990). The three subspecies in the U.S. have the following ranges: 1) ATRICAPILLUS: Alaska, Canada, eastern U.S., and the more northerly mountains of the west. 2) LAINGI: islands off the Canadian Pacific coast. 3) APACHE: southern Arizona, New Mexico, and the mountains of northwestern Mexico (Jones 1979).

Number of Occurrences: 81 to >300

Number of Occurrences Comments: Unknown, but likely to be more than 300.

Population Size: 10,000 - 1,000,000 individuals

Population Size Comments: Relatively common in the main part of its range.

Overall Threat Impact: Medium

Overall Threat Impact Comments: HABITAT: Timber harvest is the principal threat to breeding populations (Squires and Reynolds 1997). In addition to the relatively long-term impacts of removing nest trees and degrading habitat by reducing stand density and canopy cover, logging activities conducted near nests during the incubation and nestling periods can have an immediate impact: nest failure due to abandonment (Boal and Mannan 1994, Squires and Reynolds 1997). Following canopy reduction by logging, goshawks are often replaced by other raptors including Red-tailed Hawk (BUTEO JAMAICENSIS), Great Horned Owl (BUBO VIRGINIANUS), and Long-eared Owl (ASIO OTUS; Crocker-Bedford 1990, Erdman et al. 1998). Fire suppression, grazing, and insect and tree disease outbreaks can result in the deterioration or loss of nesting habitat (Graham et al. 1999). PREDATION: The incursion of Great Horned Owls is especially significant as they prey on both adult and nestling goshawks (Boal and Mannan 1994, Erdman et al. 1998, Rohner and Doyle 1992). Other known or suspected predators include martens (MARTES AMERICANA), fishers (MARTES PENNANTI), and wolverines (GULO GULO; Doyle 1995, Erdman et al. 1998, Graham et al. 1999, Paragi and Wholecheese 1994). PESTICIDES: Presently, pesticides do not appear to be a major threat, presumably since agricultural landscapes are seldom used. In the early 1970s, pesticide levels in tested birds were low, and egg thinning due to DDT contamination had not occurred in most populations (Snyder et al. 1973). In addition, population trends derived from counts of migrants at Hawk Mountain, Pennsylvania, were generally upward during DDT period, 1946-1972 (Squires and Reynolds 1997). HUMAN DISTURBANCE: Although often persecuted in the past (Bent 1937), intentional shooting or trapping is no longer considered a significant source of mortality. The impact of falconry is generally unknown; however, in northern Wisconsin falconers removed an estimated 5 percent of young annually from monitored nests during a 21-year period (Erdman et al. 1998). DISEASE: Bacterial and fungal diseases have been observed, as have infestations of both external and internal parasites (summarized in Squires and Reynolds 1997). Infections of the fungus ASPERGILLUS were found to be more prevalent in migrants captured in Minnesota during invasion years than non-invasion years, possibly due to stress (Redig et al. 1980).

Short-term Trend: Relatively stable (=10% change)

Short-term Trend Comments: Trends are difficult to determine due to the paucity of historic quantitative data and because of biases inherent in the various methodologies used to track bird populations. Nesting range in the eastern U.S. is currently expanding as second-growth forests mature (Squires and Reynolds 1997). In the west, clearcut logging of old-growth forests, fire suppression, and catastrophic fire are postulated to be reducing habitat and thus populations, especially that of the subspecies LAINGI (USFWS 1994). However, conclusive data supporting the purported decline in the western U.S. are lacking (USFWS 1997, Kennedy 1997). Christmas Bird Count

(CBC) data (1959-1988; Sauer et al. 1996), North American Breeding Bird Survey (BBS) data (1966-1996; Sauer et al. 1997), and counts of migrants in the eastern U.S. (1972-1987; Titus and Fuller 1990) do not indicate any significant changes in populations. Data derived from CBC and BBS are difficult to interpret due to low sample sizes and the possibility that birds counted may not be a random sample of the breeding population. Counts from migration monitoring stations are complicated by population fluctuations resulting from periodic invasions of large numbers of birds (Bednarz et al. 1990, Titus and Fuller 1990, USFWS 1998).

Long-term Trend:
Long-term Trend Comments: Bent (1937) reported a population decline in Pennsylvania and implied that the extinction of the passenger pigeon (ECTOPISTES MIGRATORIUS) played a role. However, extensive logging likely contributed to the decline in Pennsylvania and other eastern states (Squires and Reynolds 1997).

Other NatureServe Conservation Status Information

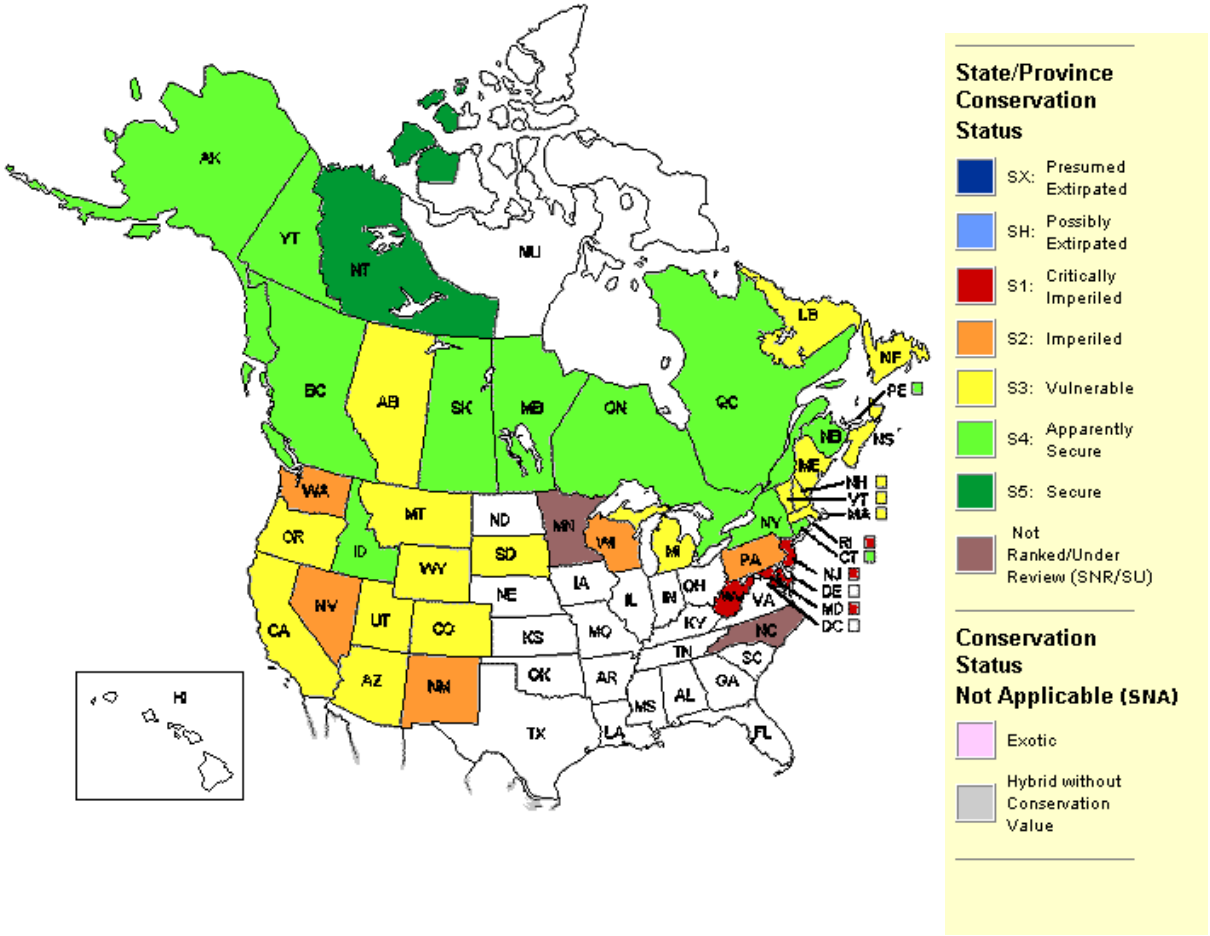
Inventory Needs: Better estimates of population size and distribution of this species are needed, especially on nonfederal lands. Good baseline data is needed in areas expected to experience increased logging of mature forests in next decade.

Protection Needs: Protection needs are still being debated among experts. Critical habitat needs better definition for the various parts of the range before protection needs can be clearly detailed. However, in general, protection of large, mature to old-growth forest tracts should be beneficial.

Distribution

Global Range: (>2,500,000 square km (greater than 1,000,000 square miles)) BREEDING: North America: western and central Alaska to northeastern Manitoba, Labrador, and Newfoundland, south to central California, southern Arizona, eastern foothills of Rockies, central Alberta, southern Manitoba, central Michigan, Pennsylvania, northwestern Connecticut, and in the Appalachians south to West Virginia and Maryland; locally in highlands of Mexico to Jalisco and Guerrero. Eurasia: British Isles, Scandinavia, northern Russia, and northern Siberia south to the Mediterranean, Asia Minor, Iran, the Himalayas, eastern China, and Japan (Squires and Reynolds 1997, AOU 1998). NON-BREEDING: throughout breeding range and irregularly southward (Squires and Reynolds 1997, AOU 1998). In some years there are large flights (irruptions) south beyond the usual wintering range. These excursions are prompted by changing conditions on the northern breeding grounds (Mueller et al. 1977). Recorded occasionally as far south as Arkansas, Louisiana, Kentucky, Alabama, and North Carolina (Adkisson 1990). The three subspecies in the U.S. have the following ranges: 1) ATRICAPILLUS: Alaska, Canada, eastern U.S., and the more northerly mountains of the west. 2) LAINGI: islands off the Canadian Pacific coast. 3) APACHE: southern Arizona, New Mexico, and the mountains of northwestern Mexico (Jones 1979).

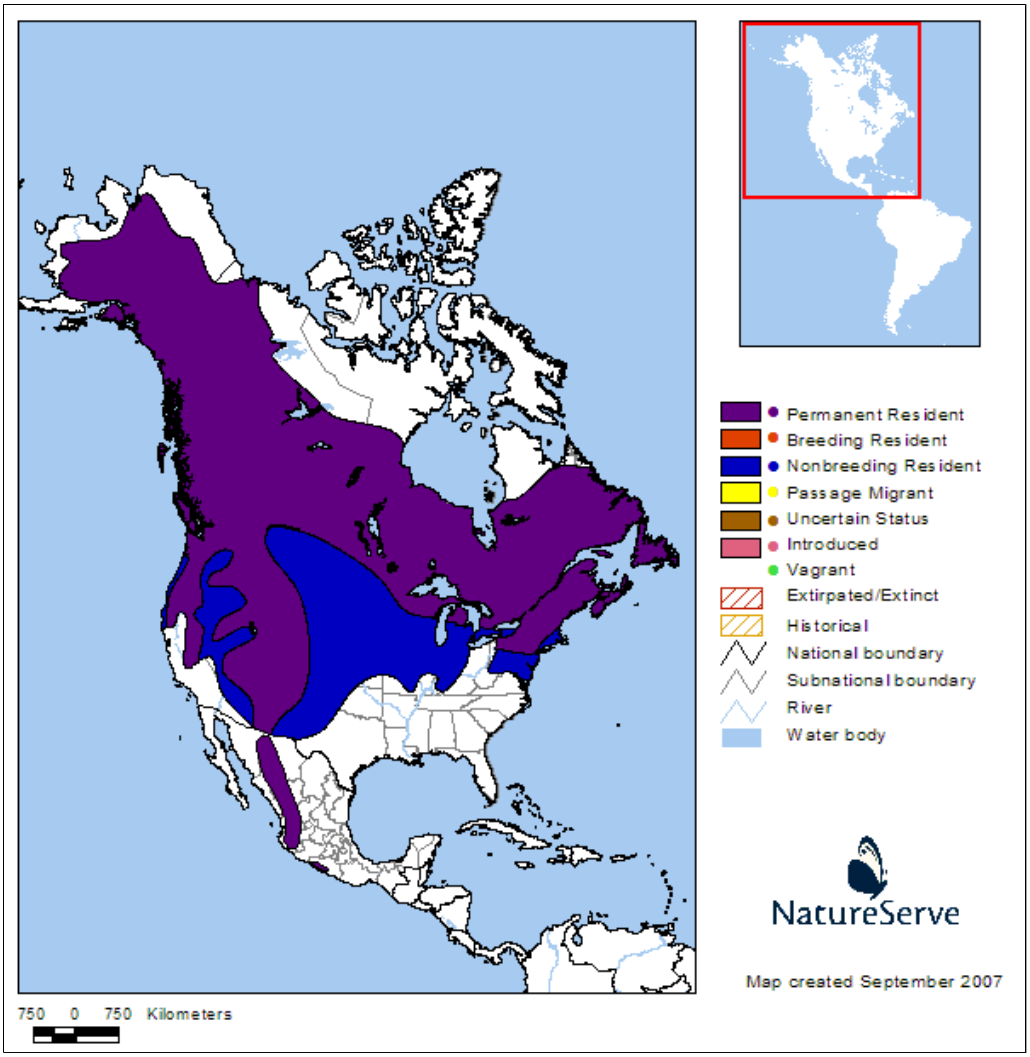
U.S. States and Canadian Provinces



NOTE: The maps for birds represent the breeding status by state and province. In some jurisdictions, the subnational statuses for common species have not been assessed and the status is shown as not-assessed (SNR). In some jurisdictions, the subnational status refers to the status as a non-breeder; these errors will be corrected in future versions of these maps. A species is not shown in a jurisdiction if it is not known to breed in the jurisdiction or if it occurs only accidentally or casually in the jurisdiction. Thus, the species may occur in a jurisdiction as a seasonal non-breeding resident or as a migratory transient but this will not be indicated on these maps. See other maps on this web site that depict the Western Hemisphere ranges of these species at all seasons of the year.
Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	AK, AZ, CA, CO, CT, DE, IA, ID, IL, IN, KS, KY, MA, MD, ME, MI, MN, MT, NC, ND, NE, NH, NJ, NM, NN, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, UT, VT, WA, WI, WV, WY
Canada	AB, BC, LB, MB, NB, NF, NS, NT, NU, ON, PE, QC, SK, YT

Range Map
Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: NatureServe, 2002; WILDSPACETM 2002

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
AK	Juneau (02110), Ketchikan Gateway (02130), Prince of Wales-Outer Ketchikan (CA) (02201), Sitka (02220), Skagway-Hoonah-Angoon (CA) (02232), Wrangell-Petersburg (CA) (02280)
AZ	Apache (04001), Cochise (04003), Coconino (04005), Gila (04007), Graham (04009), Greenlee (04011), Mohave (04015), Navajo (04017), Pima (04019), Santa Cruz (04023), Yavapai (04025)
CA	Alpine (06003)*, Butte (06007), Calaveras (06009), El Dorado (06017), Fresno (06019), Glenn (06021), Humboldt (06023)*, Inyo (06027), Kern (06029), Lake (06033), Lassen (06035), Mariposa (06043), Mendocino (06045), Modoc (06049), Mono (06051), Nevada (06057), Placer (06061), Plumas (06063), Shasta (06089), Sierra (06091), Siskiyou (06093), Tehama (06103), Trinity (06105), Tulare (06107), Tuolumne (06109)
CO	Moffat (08081)*
ID	Adams (16003), Bannock (16005), Bear Lake (16007), Blaine (16013), Boise (16015), Bonner (16017), Bonneville (16019), Boundary (16021), Camas (16025), Caribou (16029), Cassia (16031), Clark (16033), Clearwater (16035), Custer (16037), Elmore (16039), Franklin (16041), Fremont (16043), Gem (16045), Idaho (16049), Kootenai (16055), Latah (16057), Lemhi (16059), Madison (16065), Power (16077)*, Shoshone (16079), Teton (16081), Twin Falls (16083), Valley (16085), Washington (16087)
MD	Allegany (24001), Garrett (24023)
MI	Alcona (26001), Alger (26003), Antrim (26009), Bay (26017), Benzie (26019), Charlevoix (26029)*, Cheboygan (26031), Chippewa (26033), Clare (26035), Crawford (26039), Delta (26041), Dickinson (26043), Gogebic (26053), Grand Traverse (26055), Iosco (26069), Iron (26071), Kalamazoo (26077), Kalkaska (26079), Lake (26085), Luce (26095), Mackinac (26097), Manistee (26101), Marquette (26103), Mason (26105), Menominee (26109), Midland (26111), Montcalm (26117), Muskegon (26121), Newaygo (26123), Oceana (26127), Ogemaw (26129), Ontonagon (26131), Oscoda (26135), Otsego (26137), Schoolcraft (26153), Tuscola (26157), Wexford (26165)

MN	Aitkin (27001)*, Anoka (27003)*, Becker (27005), Beltrami (27007), Carlton (27017), Carver (27019)*, Cass (27021), Clearwater (27029), Cook (27031), Dakota (27037)*, Hennepin (27053)*, Hubbard (27057), Itasca (27061), Koochiching (27071), Lake (27075), Lake of the Woods (27077)*, Morrison (27097)*, Pine (27115), Ramsey (27123)*, Roseau (27135)*, Scott (27139)*, Sherburne (27141)*, St. Louis (27137), Wadena (27159), Wright (27171)*
MT	Beaverhead (30001), Broadwater (30007), Carbon (30009), Carter (30011), Deer Lodge (30023), Fergus (30027), Flathead (30029), Gallatin (30031), Glacier (30035), Granite (30039), Jefferson (30043), Judith Basin (30045), Lake (30047), Lewis and Clark (30049), Liberty (30051), Lincoln (30053), Madison (30057), Meagher (30059), Mineral (30061), Missoula (30063), Park (30067), Powder River (30075), Powell (30077), Ravalli (30081), Rosebud (30087), Sanders (30089), Silver Bow (30093), Stillwater (30095), Sweet Grass (30097), Teton (30099), Wheatland (30107)
NH	Carroll (33003), Rockingham (33015)
NJ	Cape May (34009), Hunterdon (34019), Morris (34027), Passaic (34031), Somerset (34035), Sussex (34037), Warren (34041)
NM	Bernalillo (35001), Catron (35003), Cibola (35006), Dona Ana (35013), Grant (35017), Hidalgo (35023), Lincoln (35027), Los Alamos (35028), Mckinley (35031), Mora (35033), Otero (35035), Rio Arriba (35039), San Juan (35045), San Miguel (35047), Sandoval (35043), Sierra (35051), Socorro (35053), Taos (35055), Torrance (35057)
NV	Elko (32007), Washoe (32031)
OR	Baker (41001), Clackamas (41005), Crook (41013), Deschutes (41017), Douglas (41019), Grant (41023), Harney (41025), Jackson (41029), Jefferson (41031), Klamath (41035), Lake (41037), Lane (41039), Malheur (41045), Marion (41047), Umatilla (41059), Union (41061), Wallowa (41063), Wasco (41065), Wheeler (41069)
PA	Bedford (42009), Berks (42011), Cameron (42023), Centre (42027), Clearfield (42033), Clinton (42035), Crawford (42039), Elk (42047), Forest (42053), Huntingdon (42061), Jefferson (42065), Lackawanna (42069)*, Luzerne (42079), Lycoming (42081)*, McKean (42083), Mifflin (42087), Monroe (42089)*, Pike (42103)*, Potter (42105), Schuylkill (42107), Sullivan (42113), Susquehanna (42115), Tioga (42117), Union (42119), Warren (42123), Wayne (42127)*
RI	Providence (44007)
SD	Custer (46033), Harding (46063), Lawrence (46081), Meade (46093), Pennington (46103)
UT	Beaver (49001)*, Box Elder (49003), Cache (49005), Carbon (49007), Daggett (49009), Duchesne (49013), Emery (49015), Garfield (49017), Grand (49019), Iron (49021), Juab (49023), Kane (49025), Millard (49027)*, Morgan (49029)*, Piute (49031), Rich (49033), Salt Lake (49035), San Juan (49037), Sanpete (49039), Sevier (49041), Summit (49043), Tooele (49045)*, Uintah (49047), Utah (49049), Wasatch (49051), Washington (49053), Wayne (49055), Weber (49057)*
WI	Ashland (55003), Barron (55005), Bayfield (55007), Burnett (55013), Clark (55019), Door (55029), Douglas (55031), Florence (55037), Forest (55041), Iron (55051), Jackson (55053), Juneau (55057), Langlade (55067), Lincoln (55069), Marathon (55073), Marinette (55075), Monroe (55081), Oconto (55083), Oneida (55085), Portage (55097), Price (55099), Rusk (55107), Sawyer (55113), Shawano (55115), Sheboygan (55117), Taylor (55119), Vilas (55125), Washburn (55129), Waushara (55137)
WV	Hampshire (54027), Mineral (54057), Pocahontas (54075), Preston (54077), Randolph (54083), Tucker (54093), Webster (54101)
WY	Albany (56001), Big Horn (56003), Campbell (56005), Carbon (56007), Converse (56009), Crook (56011), Fremont (56013), Goshen (56015), Hot Springs (56017), Johnson (56019), Laramie (56021), Lincoln (56023), Natrona (56025), Niobrara (56027), Park (56029), Platte (56031), Sheridan (56033), Sublette (56035), Sweetwater (56037), Teton (56039), Uinta (56041), Washakie (56043), Weston (56045)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
01	Saco (01060002)+, Merrimack (01070006)+, Narragansett (01090004)+, Quinebaug (01100001)+
02	Rondout (02020007)+, Hackensack-Passaic (02030103)+, Raritan (02030105)+, Lackawaxen (02040103)+, Middle Delaware-Mongaup-Brodhead (02040104)+, Middle Delaware-Musconetcong (02040105)+, Schuylkill (02040203)+, Cohansey-Maurice (02040206)+, Upper Susquehanna-Tunkhannock (02050106)+, Upper Susquehanna-Lackawanna (02050107)+, Upper West Branch Susquehanna (02050201)+, Sinnemahoning (02050202)+, Middle West Branch Susquehanna (02050203)+, Bald Eagle (02050204)+, Pine (02050205)+, Lower West Branch Susquehanna (02050206)+, Lower Susquehanna-Penns (02050301)+, Upper Juniata (02050302)+, Lower Juniata (02050304)+, South Branch Potomac (02070001)+, North Branch Potomac (02070002)+, Cacapon-Town (02070003)+
04	Baptism-Brule (04010101)+, Beaver-Lester (04010102)+, St. Louis (04010201)+, Cloquet (04010202)+, Beartrap-Nemadji (04010301)+, Bad-Montreal (04010302)+, Black-Presque Isle (04020101)+, Ontonagon (04020102)+, Sturgeon (04020104)+, Betsy-Chocolay (04020201)+, Tahquamenon (04020202)+, Waiska (04020203)+, Lake Superior (04020300)+, Manitowoc-Sheboygan (04030101)+, Door-Kewaunee (04030102)+, Oconto (04030104)+, Peshtigo (04030105)+, Brule (04030106)+, Menominee (04030108)+, Cedar-Ford (04030109)+, Tacoosh-Whitefish (04030111)+, Fishdam-Sturgeon (04030112)+, Wolf (04030202)+, St. Joseph (04050001)+, Pere Marquette-White (04060101)+, Muskegon (04060102)+, Manistee (04060103)+, Betsie-Platte (04060104)+, Boardman-Charlevoix (04060105)+, Manistique (04060106)+, Carp-Pine (04070002)+, Lone Lake-Ocqueoc (04070003)+,

	Cheboygan (04070004)+, Black (04070005)+, Au Sable (04070007)+, Au Gres-Rifle (04080101)+, Kawkawlin-Pine (04080102)+, Tittabawassee (04080201)+, Cass (04080205)+
05	Upper Allegheny (05010001)+, Middle Allegheny-Tionesta (05010003)+, Clarion (05010005)+, Middle Allegheny-Redbank (05010006)+, Tygart Valley (05020001)+, Cheat (05020004)+, Youghiogheny (05020006)+, Greenbrier (05050003)+, Gauley (05050005)+
07	Mississippi Headwaters (07010101)+, Leech Lake (07010102)+, Prairie-Willow (07010103)+, Elk-Nokasippi (07010104)+, Crow Wing (07010106)+, Long Prairie (07010108)+, Crow (07010204)+, South Fork Crow (07010205)+, Twin Cities (07010206)+, Lower Minnesota (07020012)+, Upper St. Croix (07030001)+, Namekagon (07030002)+, Kettle (07030003)+, Lower St. Croix (07030005)+, Black (07040007)+, Upper Chippewa (07050001)+, Flambeau (07050002)+, South Fork Flambeau (07050003)+, Jump (07050004)+, Lower Chippewa (07050005)+, Red Cedar (07050007)+, Upper Wisconsin (07070001)+, Lake Dubay (07070002)+, Castle Rock (07070003)+
09	Red Lakes (09020302)+, Two Rivers (09020312)+, Roseau (09020314)+, Rainy Headwaters (09030001)+, Vermilion (09030002)+, Rainy Lake (09030003)+, Little Fork (09030005)+, Big Fork (09030006)+, Lake of the Woods (09030009)+, St. Marys (09040001)+
10	Red Rock (10020001)+, Beaverhead (10020002)+, Ruby (10020003)+, Big Hole (10020004)+, Jefferson (10020005)+, Madison (10020007)+, Gallatin (10020008)+, Upper Missouri (10030101)+, Upper Missouri-Dearborn (10030102)+, Smith (10030103)+, Sun (10030104)+, Marias (10030203)+, Teton (10030205)+, Arrow (10040102)+, Judith (10040103)+, Upper Musselshell (10040201)+, Box Elder (10040204)+, Sage (10050006)+, Yellowstone Headwaters (10070001)+, Upper Yellowstone (10070002)+, Shields (10070003)+, Stillwater (10070005)+, Clarks Fork Yellowstone (10070006)+, Upper Wind (10080001)+, Little Wind (10080002)+, Popo Agie (10080003)+, Upper Bighorn (10080007)+, Nowood (10080008)+, Greybull (10080009)+, Big Horn Lake (10080010)+, North Fork Shoshone (10080012)+, South Fork Shoshone (10080013)+, Shoshone (10080014)+, Little Bighorn (10080016)+, Upper Tongue (10090101)+, Lower Tongue (10090102)+, Middle Fork Powder (10090201)+, Upper Powder (10090202)+, South Fork Powder (10090203)+, Crazy Woman (10090205)+, Clear (10090206)+, Middle Powder (10090207)+, Lower Yellowstone-Sunday (10100001)+, Rosebud (10100003)+, Upper Little Missouri (10110201)+, Boxelder (10110202)+, Angostura Reservoir (10120106)+, Beaver (10120107)+, Middle Cheyenne-Spring (10120109)+, Rapid (10120110)+, Middle Cheyenne-Elk (10120111)+, Upper Belle Fourche (10120201)+, Lower Belle Fourche (10120202)+, Redwater (10120203)+, Upper Moreau (10130305)+, Niobrara Headwaters (10150002)+, Upper North Platte (10180002)+, Pathfinder-Seminoe Reservoirs (10180003)+, Medicine Bow (10180004)+, Little Medicine Bow (10180005)+, Sweetwater (10180006)+, Middle North Platte-Casper (10180007)+, Glendo Reservoir (10180008)+, Middle North Platte-Scotts Bluff (10180009)+, Upper Laramie (10180010)+, Lower Laramie (10180011)+, Crow (10190009)+
11	Mora (11080004)+
13	Upper Rio Grande (13020101)+, Rio Chama (13020102)+, Rio Grande-Santa Fe (13020201)+, Jemez (13020202)+, Rio Grande-Albuquerque (13020203)+, Arroyo Chico (13020205)+, Rio San Jose (13020207)+, Elephant Butte Reservoir (13020211)+, El Paso-Las Cruces (13030102)+, Mimbres (13030202)+, Western Estancia (13050001)+, Tularosa Valley (13050003)+, Salt Basin (13050004)+, Pecos headwaters (13060001)+, Arroyo Del Macho (13060005)+, Gallo Arroyo (13060006)+, Rio Hondo (13060008)+, Rio Penasco (13060010)+
14	Lower Dolores (14030004)+, Upper Colorado-Kane Springs (14030005)+, Upper Green (14040101)+, New Fork (14040102)+, Upper Green-Slate (14040103)+, Big Sandy (14040104)+, Bitter (14040105)+, Upper Green-Flaming Gorge Reservoir (14040106)+, Blacks Fork (14040107)+, Muddy (14040108)+, Vermilion (14040109)+, Great Divide closed basin (14040200)+, Little Snake (14050003)+, Muddy (14050004)+, Ashley-Brush (14060002)+, Duchesne (14060003)+, Strawberry (14060004)+, Lower Green-Desolation Canyon (14060005)+, Willow (14060006)+, Price (14060007)+, San Rafael (14060009)+, Upper Lake Powell (14070001)+, Muddy (14070002)+, Fremont (14070003)+, Escalante (14070005)+, Lower Lake Powell (14070006)+, Paria (14070007)+, Middle San Juan (14080105)+, Chaco (14080106)+, Lower San Juan-Four Corners (14080201)+, Montezuma (14080203)+, Chinle (14080204)+
15	Lower Colorado-Marble Canyon (15010001)+, Grand Canyon (15010002)+, Kanab (15010003)+, Havasu Canyon (15010004)+, Upper Virgin (15010008)+, Fort Pierce Wash (15010009)+, Lower Virgin (15010010)+, Little Colorado headwaters (15020001)+, Upper Little Colorado (15020002)+, Carrizo Wash (15020003)+, Zuni (15020004)+, Silver (15020005)+, Upper Puerco (15020006)+, Middle Little Colorado (15020008)+, Chevelon Canyon (15020010)+, Corn-Oraibi (15020012)+, Canyon Diablo (15020015)+, Lower Little Colorado (15020016)+, Dinnebito Wash (15020017)+, Moenkopi Wash (15020018)+, Big Sandy (15030201)+, Burro (15030202)+, Upper Gila (15040001)+, Upper Gila-Mangas (15040002)+, Animas Valley (15040003)+, San Francisco (15040004)+, Upper Gila-San Carlos Reservoir (15040005)+, San Simon (15040006)+, Willcox Playa (15050201)+, Upper San Pedro (15050202)+, Lower San Pedro (15050203)+, Upper Santa Cruz (15050301)+, Rillito (15050302)+, Black (15060101)+, Upper Salt (15060103)+, Carrizo (15060104)+, Tonto (15060105)+, Big Chino-Williamson Valley (15060201)+, Upper Verde (15060202)+, Lower Verde (15060203)+, Agua Fria (15070102)+, Hassayampa (15070103)+, Whitewater Draw (15080301)+
16	Upper Bear (16010101)+, Central Bear (16010102)+, Bear Lake (16010201)+, Middle Bear (16010202)+, Little Bear-Logan (16010203)+, Upper Weber (16020101)+, Lower Weber (16020102)+, Utah Lake (16020201)+, Spanish Fork (16020202)+, Provo (16020203)+, Jordan (16020204)+, Hamlin-Snake Valleys (16020301)+, Pine Valley (16020302)+, Tule Valley (16020303)+, Rush-Tooele Valleys (16020304)+, Southern Great Salt Lake Desert (16020306)+, Northern Great Salt Lake Desert (16020308)+, Curlew Valley (16020309)+, Upper Sevier (16030001)+, East Fork Sevier (16030002)+, Middle Sevier (16030003)+, Lower Sevier (16030005)+, Escalante Desert (16030006)+, Beaver Bottoms-Upper Beaver (16030007)+, Lower Beaver (16030008)+, Sevier Lake (16030009)+, North Fork Humboldt (16040102)+, Lake Tahoe (16050101)+, Truckee (16050102)

	+, East Walker (16050301)+, West Walker (16050302)+, Fish Lake-Soda Spring Valleys (16060010)+
17	Upper Kootenai (17010101)+, Fisher (17010102)+, Yaak (17010103)+, Lower Kootenai (17010104)+, Moyie (17010105)+, Elk (17010106)+, Upper Clark Fork (17010201)+, Flint-Rock (17010202)+, Blackfoot (17010203)+, Middle Clark Fork (17010204)+, Bitterroot (17010205)+, North Fork Flathead (17010206)+, Middle Fork Flathead (17010207)+, Flathead Lake (17010208)+, South Fork Flathead (17010209)+, Swan (17010211)+, Lower Flathead (17010212)+, Lower Clark Fork (17010213)+, Pend Oreille Lake (17010214)+, Priest (17010215)+, Upper Coeur D'alene (17010301)+, St. Joe (17010304)+, Snake headwaters (17040101)+, Gros Ventre (17040102)+, Greys-Hobock (17040103)+, Palisades (17040104)+, Salt (17040105)+, Upper Henrys (17040202)+, Lower Henrys (17040203)+, Teton (17040204)+, Willow (17040205)+, Blackfoot (17040207)+, Portneuf (17040208)+, Lake Walcott (17040209)+, Raft (17040210)+, Goose (17040211)+, Upper Snake-Rock (17040212)+, Salmon Falls (17040213)+, Beaver-Camas (17040214)+, Medicine Lodge (17040215)+, Camas (17040220)+, South Fork Boise (17050113)+, Lower Malheur (17050117)+, South Fork Payette (17050120)+, Payette (17050122)+, North Fork Payette (17050123)+, Weiser (17050124)+, Brownlee Reservoir (17050201)+, Burnt (17050202)+, Powder (17050203)+, Imnaha (17060102)+, Upper Grande Ronde (17060104)+, Wallowa (17060105)+, Lower Grande Ronde (17060106)+, Palouse (17060108)+, Upper Salmon (17060201)+, Middle Salmon-Panther (17060203)+, Upper Middle Fork Salmon (17060205)+, Middle Salmon-Chamberlain (17060207)+, South Fork Salmon (17060208)+, Lower Salmon (17060209)+, Little Salmon (17060210)+, Lower Selway (17060302)+, Middle Fork Clearwater (17060304)+, Clearwater (17060306)+, Lower North Fork Clearwater (17060308)+, Umatilla (17070103)+, Upper John Day (17070201)+, North Fork John Day (17070202)+, Upper Deschutes (17070301)+, Little Deschutes (17070302)+, Upper Crooked (17070304)+, Lower Deschutes (17070306)+, North Santiam (17090005)+, Clackamas (17090011)+, Alsea (17100205)+, Siuslaw (17100206)+, North Umpqua (17100301)+, South Umpqua (17100302)+, Upper Rogue (17100307)+, Middle Rogue (17100308)+, Applegate (17100309)+, Alvord Lake (17120009)+
18	Mad-Redwood (18010102)+, Upper Eel (18010103)+, Middle Fork Eel (18010104)+, Lower Eel (18010105)+, South Fork Eel (18010106)+, Big-Navarro-Garcia (18010108)+, Russian (18010110)+, Williamson (18010201)+, Upper Klamath Lake (18010203)+, Lost (18010204)+, Butte (18010205)+, Upper Klamath (18010206)+, Shasta (18010207)+, Scott (18010208)+, Lower Klamath (18010209)+, Salmon (18010210)+, Trinity (18010211)+, South Fork Trinity (18010212)+, Goose Lake (18020001)+, Upper Pit (18020002)+, Lower Pit (18020003)+, Mccloud (18020004)+, Sacramento headwaters (18020005)+, Upper Stony (18020115)+, North Fork Feather (18020121)+, East Branch North Fork Feather (18020122)+, Middle Fork Feather (18020123)+, Upper Yuba (18020125)+, North Fork American (18020128)+, South Fork American (18020129)+, Cow Creek (18020151)+, Battle Creek (18020153)+, Clear Creek-Sacramento River (18020154)+, Thomes Creek-Sacramento River (18020156)+, Big Chico Creek-Sacramento River (18020157)+, Butte Creek (18020158)+, Upper Kern (18030001)+, South Fork Kern (18030002)+, Upper Poso (18030004)+, Upper Deer-Upper White (18030005)+, Upper Kaweah (18030007)+, Upper King (18030010)+, Upper San Joaquin (18040006)+, Upper Merced (18040008)+, Upper Tuolumne (18040009)+, Upper Stanislaus (18040010)+, Upper Calaveras (18040011)+, Upper Mokelumne (18040012)+, Upper Cosumnes (18040013)+, Surprise Valley (18080001)+, Madeline Plains (18080002)+, Honey-Eagle Lakes (18080003)+, Mono Lake (18090101)+, Crowley Lake (18090102)+
19	Southeast Mainland (19010101)+, Ketchikan (19010102)+, Prince of Wales (19010103)+, Mainland (19010201)+, Kuiu-Kupreanof-Mitkof-Etolin-Zarembo-Wrangell Isla (19010202)+, Baranof-Chichagof Islands (19010203)+, Admiralty Island (19010204)+, Lynn Canal (19010301)+, Chilkat-Skagway Rivers (19010303)+, Taku River (19010304)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A fairly large hawk; male 55 cm in length with a wingspan of 98-104 cm, female 61 cm in length with a wingspan of 105-115 cm (Squires and Reynolds 1997). Male is brown-gray to slate gray on back, head with black cap and pronounced white supercilary line. Undersides are light gray with fine horizontal vermiculations and fine black vertical streaks. Long, rounded tail, white undertail coverts, dark gray above with 3-5 dark bands and a think, white terminal band (reduced or absent with wear). Female is similar to male but browner on back and more heavily marked on underside, sometimes appearing barred. Feet, cere, toes, legs, and mouth-lining are yellow, eyes are red. Juveniles dark brown to brown-black on back with buff white and cinnamon streaks. Undersides buff white with thick cinnamon to blackish brown streaks on throat. Tail is dark brown with wavy dark-brown bands that are bordered by thin whitish bands, forming a zigzag pattern.
General Description: A fairly large hawk with a long tail, rounded wing tips, and a conspicuous pale eyebrow; adult has dark crown, blue-gray back, white underparts with dense gray barring, and conspicuous fluffy white undertail coverts; immature is brown above, buffy below, with dense blurry streaking, undertail coverts are dark-streaked, and tail has wavy dark bands bordered with white and a thin white tip; total length is 53-66 cm, with females averaging lager than males (NGS 1983).
Reproduction Comments: Usually one clutch produced per year, from late April through early May (Squire and Reynolds 1997); however, some individuals may not breed during cold, wet springs (DeStefano et al. 1994). Egg-laying may begin later at higher elevations and during cold, wet springs (Henny et al. 1985, Younk and Bechard 1994). Clutch is typically two to four eggs, rarely one to five (Squires and Reynolds 1997). Average clutch size of 44 North American clutches is 2.7 eggs (Apfelbaum and Seelbach 1983 cited in Squires and Reynolds 1997). Eggs are laid every two to three days and incubation usually begins after the second egg is laid. Incubation, conducted principally by the female, takes 28-38 days; hatching is asynchronous.

Few data regarding hatching success. In Oregon, hatching success in five nests was 81 percent (Reynolds and Wight 1978 cited in Squires and Reynolds 1997). Nest success (percentage of active nests that fledge greater than one young) in North America ranges from 44-94 percent and most populations produce 2-2.8 fledglings per successful nest (summarized in Squires and Reynolds 1997).

Egg/nestling mortality has been attributed to exposure to cold and rain and siblicide (Boal and Bacorn 1994, Squires and Reynolds 1997).

In northern Wisconsin, nest success dropped from 94 percent to 62 percent due to an increase in predation of nest contents and adult females by fishers. Increased predation by fishers was attributed to an increase in the fisher population and nest exposure due to tree defoliation by forest tent caterpillars (MALACOSOMA DISSTRIA; Erdman et al. 1998).

Brooding and feeding of nestlings is performed principally by the female; the male brings food to the nest. The young begin flying at 35-42 days and become independent at about 70 days (Boal 1994, Squires and Reynolds 1997). Maintain one to eight alternate nests within a nest area (Squire and Reynolds 1997). Alternate nests range from 15-2066 meters apart (Reynolds and Wight 1978, cited in Squires and Reynolds 1997; Woodbridge and Detrich 1994). The average distance between nests of nearest neighboring pairs in Arizona was 3 kilometers (range = 1.6-6.4 kilometers; Reynolds et al. 1994). A small percentage (less than 10 percent) of subadults (1-2 years old) are sexually mature; however, most breeding birds are young adults (2-3 years old) or adults (Squires and Reynolds 1997). Nesting by subadults is more frequent in expanding populations and less frequent in stable populations (Reynolds and Wight 1978, cited in Squires and Reynolds 1997).
Ecology Comments: Nesting densities of most western U.S. populations range from 6.6-10.7 pairs per 100 square kilometers (summarized in Squires and Reynolds 1997). The single nesting density estimate for the eastern U.S. is 1.17 pairs per 100 square kilometers (Kimmel and Yahner 1994, cited in Squires and Reynolds 1997). Home ranges during nesting vary from 95-3500 hectares depending on sex and habitat characteristics (Squires and Reynolds 1997). Home ranges of males are typically larger than those of females (Hargis et al. 1994, Keane and Morrison 1994, Kennedy et al. 1994). Exclusive of nesting areas, home ranges of adjacent pairs are not defended and may overlap (Squires and Reynolds 1997). The core area (encompasses nest site) constitutes 32 percent of the home range (Kennedy et al. 1994). Individuals typically enlarge or sometimes shift location of home ranges after breeding (Hargis et al. 1994, Keane and Morrison 1994).

Home ranges of non-breeders are poorly known, but may be larger than those of breeders (Squires and Reynolds 1997). In North America, winter home ranges are unknown. In Sweden, winter home-ranges of males and females were similar and averaged 5700 hectares (Widen 1989).

In California, 76.5 percent of males and 71.4 percent of females returned to the same nesting area in subsequent years. Males were significantly more likely to return to previously-inhabited territories in consecutive years than females (Detrich and Woodbridge 1994). In Arizona, 80 percent of nest areas examined in two consecutive years were re-used the second year by one or both members of the pair banded the first year (Reynolds et al. 1994). Sixty to 72 percent of adults located in consecutive years retained the mate from the previous year (Detrich and Woodbridge 1994, Reynolds et al. 1994).

Dispersal of young is not well documented. Detrich and Woodbridge (1994) recaptured two adult females, banded as nestlings 5-7 years prior, 16 and 24 kilometers from their natal sites. Three females, banded as nestlings and recaptured as breeding adults, moved an average of 21.5 kilometers from their natal sites, and another female, captured as a breeding adult seven years after being banded as a nestling, moved 100 kilometers from its natal site (Squires and Reynolds 1997).

Little is known regarding survivorship in the U.S. In Arizona, annual survivorship of male and females more than 1 year old was estimated to be 68.8 percent and 86.6 percent, respectively (Squires and Reynolds 1997). In Yukon, Canada, an observed population decline was attributed to increased mortality of eggs, nestlings, immatures and adults, as well as to dispersal following a precipitous decline in number of snowshoe hares (Doyle and Smith 1994). The maximum lifespan of a wild bird is 11 years (Squires and Reynolds 1997). The sex ratio is 1:1 prior to fledging and among adults (Mueller and Berger 1968, Reynolds et al. 1994).
Non-Migrant: Y
Locally Migrant: Y
Long Distance Migrant: N
Mobility and Migration Comments: Generally a permanent resident or conducts only short-distance movements over most of range, but periodically has irruptions of movement out of northern portions of range. Fall migration appears to be influenced by prey availability (Squires and Reynolds 1997). For example, in Yukon Territory, Canada, year-round residents are abundant when snowshoe hares (LEPUS AMERICANUS) are abundant, but scarce in winter when hare population is low (Doyle and Smith 1994). Approximately once per decade, large numbers migrate southward, apparently in response to a decline in prey populations, particularly snowshoe hares and ruffed grouse (BONASA UMBELLUS; Bent 1937, Doyle and Smith 1994, Mueller et al. 1977, Squires and Reynolds 1997). Depending on location and year, fall movements begin in late August through September, peak in late September through mid-November, and typically end in December. Spring movements, which are less pronounced, begin in late February and continue through late May. Movement routes are poorly defined, particularly in the western U.S. In the eastern U.S., migrates along the Great lakes, the Appalachian Mountains and the Atlantic coast (Squires and Reynolds 1997). Some birds make extensive movements; four individuals, banded in Minnesota, were recovered up to 2400 kilometers away in British Columbia (Evans and Rosenfield 1985, cited in Squires and Reynolds 1997; Campbell et al. 1990). Other birds, however, undergo short movements from one elevation to another (Squires and Reynolds 1997).
Palustrine Habitat(s): Riparian
Terrestrial Habitat(s): Forest - Conifer, Forest - Hardwood, Forest - Mixed, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed
Habitat Comments: BREEDING: Nests in a wide variety of forest types including deciduous, coniferous, and mixed forests. Has a complexity of habitat needs in the breeding season, which vary among forest types and region (Johnsgard 1990). Typically nests in mature or old-growth forests (Hayward and Escano 1989, Reynolds et al. 1982, Speiser and Bosakowski 1987, Squires and Ruggiero 1996, Squires and Reynolds 1997, McClaren 1998, Daw and Stefano 2001), and generally selects larger tracts of forest over smaller tracts (Bosakowski and Speiser 1994, Woodbridge and Detrich 1994). In the eastern U.S., nests in hardwood-hemlock (TSUGA CANADENSIS) forests, where black birch (BETULA LENTA) and American beech (FAGUS GRANDIFOLIA) are preferred nest trees (Speiser and Bosakowski 1987). In the western U.S., characteristically nests in coniferous forests including those dominated by ponderosa pine (PINUS PONDEROSA; Bright-Smith and Mannan 1994, Reynolds et al. 1992), lodgepole pine (PINUS CONTORTA; Squires and Ruggiero 1996), or in mixed forests dominated by various coniferous species including fir (ABIES spp.), Douglas-fir (PSEUDOTSUGA MENZIESII), cedar (THUJA spp.), hemlock, spruce (PICEA spp.), and larch (LARIX spp.; Hayward and Escano 1989, Reynolds et al. 1982). Western birds also nest in deciduous forests dominated by aspen (POPULUS TREMULOIDES), paper birch (BETULA PAPYRIFERA), or willow (SALIX spp.; McGowan 1975, cited in Squires and Reynolds 1997; Swem and Adams 1992, cited in Squires and Reynolds 1997; Younk and Bechard 1994).

While generally associated with remote habitat, goshawks in Europe apparently have adapted to human-occupied landscapes and nest

near farms and settlements (Palmer 1988). Palmer noted that this species may be undergoing similar adaptation in northeastern U.S.; for example, it is apparently not uncommon in suburbs of Boston (L. Master, pers. comm.).

Nests are generally constructed in the largest trees of dense, old or mature stands with high canopy closure (60-95 percent) and sparse groundcover, near the bottom of moderate slopes, and near water or dry openings(Bull and Hohmann 1994, Daw and DeStefano 2001, Hargis et al. 1994, Reynolds et al 1982, Siders and Kennedy 1994, Squires and Ruggiero 1996, Younk and Bechard 1994). Occasionally will nest in relatively open stands (10 percent canopy coverage; Reynolds et al. 1982). Nest height above the ground is significantly correlated with nest-tree height (Kennedy 1988, cited in Squires and Reynolds 1997). Nest height ranges from 2.5-43 meters (Gabrielson and Lincoln 1959, Siders and Kennedy 1994). May use same nest in successive years. May use other hawk nest as base. Nests in arctic tundra and taiga have also been documented in interior Alaska (Olendorff et al. 1989).

Forages in both heavily forested and relatively open habitats. In Ponderosa pine forest of Arizona, habitat on sites selected for foraging had higher canopy coverage, greater tree density, and greater density of large trees (greater than 40.5 centimeter DBH), but lower prey abundance than non-foraging sites (Beier and Drennan 1997). In Nevada, foraged in open sagebrush (ARTEMISIA spp.) adjacent to riparian aspen stands (Younk and Bechard 1992, cited in Squires and Reynolds 1997).

NON-BREEDING: habitat requirements during winter are poorly understood, especially in the U.S. (Squires and Reynolds 1997). During winter in Sweden, inhabits a fragmented landscape of forests, clearcuts, wetlands and agricultural lands. Whereas non-forested habitats were used in proportion to their availability, large tracts of mature forest were used preferentially (Widen 1989).
Adult Food Habits: Carnivore
Immature Food Habits: Carnivore
Food Comments: Forages during short flights alternated with brief prey searches from perches. Also hunts by flying rapidly along forest edges, across openings, and through dense vegetation. An opportunistic hunter, preys on a wide variety of vertebrates and, occasionally, insects. Prey is taken on the ground, in vegetation, or in the air. Despite their larger size, females do not capture larger or heavier prey than males (Boal and Mannan 1996). Dominant mammalian prey include five species of tree squirrels, four ground squirrels, and lagomorphs. Frequently killed birds include three galliformes, four corvids, six woodpeckers (piciformes) and the American robin (TURDUS MIGRATORIUS; Squires and Reynolds 1997). During the nesting season, the diet can vary with prey availability. For example, as more fledgling passerines become available, they make up a greater portion of the diet (Linden and Wikman 1983, Reynolds and Meslow 1984). Ratio of mammalian prey to avian prey in the diet during the breeding season (in percent): Arizona, 76:24 and 62:38 (Boal and Mannan 1994, Reynolds et al. 1994); Nevada, 67:32 (Younk and Bechard 1994); New York, 39:61 (Grzybowski and Eaton 1976); and Oregon, 42:59 and 45:55 (Bull and Hohmann 1994, Reynolds and Meslow 1984).

Nonbreeding season food habits are unknown for North American populations. In Sweden, birds dominate the diet during the nesting season (86 percent of prey), whereas in winter, red squirrels (SCIURUS VULGARIS) comprise the bulk of the diet (79 percent; Widen 1987, cited in Squires and Reynolds 1997).
Adult Phenology: Diurnal
Immature Phenology: Diurnal
Length: 66 centimeters
Weight: 1137 grams

Economic Attributes

Not yet assessed

Management Summary

Stewardship Overview: Population trends are obscured by the lack of historic data and periodic fall irruptions of large numbers of individuals. The principal threat to breeding populations is timber harvest and large tree-killing fires. Large, landscape-level ecological units need to be identified and managed in such a way that all necessary habitat attributes, from nesting sites to foraging areas, are available to support the species at the population level. Monitoring methods include broadcasting taped conspecific vocalizations along transects during the nesting season or listening for spontaneous vocalizations of breeding pairs prior to egg-laying.
Restoration Potential: Given that this species re-inhabits forests recovering from logging, restoration potential is good (Squires and Reynolds 1997).
Preserve Selection & Design Considerations: In addition to forest cover type, other habitat attributes such as stand structure, patch size, landscape features, woody debris, snags, understory vegetation, openings, and canopy closure are important to goshawks and their prey, and therefore must be considered in preserve design (Graham et al. 1999). On the Colorado Plateau, estimated area requirements are 500 square kilometers of forest for 40 pairs and 1000 square kilometers for 80 pairs (Reynolds and Joy 1998). Habitat patch connectivity is also important to consider. One suggestion is that patches of high quality habitat should not be separated by more than 96 kilometers (recommendation based on known dispersal distances; Graham et al. 1999). Scale is another important consideration. Rather than concentrating on breeding home-ranges, entire ecological units (about 100,000 hectares in extent) need to be managed across vegetation types, land ownership, and political boundaries (Graham et al. 1994). Ecological units need to include a wide variety of forest conditions, from regenerating stands to mature second-growth or old-growth stands (Reynolds et al. 1992).
Management Requirements: The U.S. Forest Service has developed forest management recommendations for the southwestern U.S. designed to sustain forest composition and structure necessary for goshawk reproduction (Reynolds et al. 1992, Graham, et al. 1994). Reynolds et al. (1992) divided the nesting home range (about 2400 hectares) into three components - nesting area, post-fledging family area (PFA), and foraging area - and provided size and management recommendations for each. Three nesting areas per home range - each encompassing approximately 12 hectares of large, mature trees - should be available. In addition, three replacement nesting areas per home range should be in some phase of development to provide alternates to currently used sites. The PFA should encompass approximately 170 hectares and be maintained by management tools such as timber harvest and prescribed fire to provide a variety of forest conditions and prey habitat attributes. Management activities should be confined to the non-breeding period. The foraging area should encompass approximately 2200 hectares and be managed similarly to the PFA except that it should provide larger forest openings and less canopy coverage. To replace the late-seral stages of forest lost through natural or anthropogenic events, Bassett et al. (1994) and Graham et al. (1994) recommended that 10 percent of the forest be regenerated every 20 years. Minimum recommendations for timber harvest include leaving an 8-hectare forest buffer around nests (Reynolds et al. 1982).
Monitoring Requirements: Playing taped goshawk vocalizations along transects during the nesting season is an effective means of detecting breeding birds (Joy et al. 1994; Kennedy and Stahlecker 1993; Kimmel and Yahner 1990, cited in Kennedy and Stahlecker 1993). Responses by adults are highest when vocalizations are broadcast during the nestling and fledgling-dependency periods. In New

Mexico, the alarm call elicited the greatest response during the nestling period, whereas the wail and food-begging calls resulted in a greater response during the fledgling stage (Kennedy and Stahlecker 1993). In Arizona, adults responded at similar rates to the alarm and food-begging calls during the fledgling stage. However, when combining both nesting stages, adults approached more often to the alarm call than to the begging call (Joy et al. 1994). Both sexes respond to broadcast calls, although males are more likely to approach silently than females (Joy et al. 1994). In steep, rugged terrain, where transects are difficult to follow, broadcasting calls from a vehicle on roads can be a labor-efficient and equally effective method of detecting breeding birds, depending on road density and distribution (Bosakowski and Vaughn 1996). Researchers relying on responses to broadcasted calls must be mindful of vocal mimicry by Steller's jays (CYANOCITTA STELLERI; Kennedy and Stahlecker 1993). Rather than using taped calls, Penteriani (1999) found that listening for spontaneous vocalizations of breeding pairs in the three months preceding egg laying, from 0.5 hour before dawn to approximately 3.25 hours after dawn, resulted in a 100 percent detection rate. However, this technique may have limited usefulness since it requires prior knowledge of territory and nest locations (Reynolds, pers. comm.). Because not all nest sites are used every year, multiple-year surveys may be necessary to determine site use (DeStefano et al. 1994). New monitoring procedures are needed to assess population status (Squires and Reynolds 1997).

Management Research Needs: Additional studies are needed on population size and structure; population trend and rate of population change; age-specific fecundity and survival; life span; mate and territory fidelity; adult and juvenile dispersal; variations in diet composition and prey abundance in various forest types; response of populations to variations in prey abundance; seasonal and annual variations in habitat use (particularly winter habitat selection; Beier and Drennan 1997), in home range size, and in dietary composition; foraging behavior; and activity budgets. In addition, monitoring and inventorying techniques need to be improved, the factor or combination of factors that limit population size need to determined, and forest dynamics, as they relate to maintenance and enhancement of preferred habitat, need to be better understood (Keane and Morrison 1994, Reynolds, et al. 1992).

Biological Research Needs: Need to evaluate effects of pesticides and extent of movement patterns for all populations. Also need information on preferred habitat characteristics in the Northeast and Great Lakes regions and size of home range, feeding areas, and post-fledging area, especially in areas where harvest of mature forests is ongoing or anticipated in the next decade. Need to develop compatible forest management practices and an effective means of tracking population trends through time.

Population/Occurrence Delineation

Use Class: Breeding

Subtype(s): Foraging area, Nest site

Minimum Criteria for an Occurrence: Evidence of breeding (including historical); and potential recurring breeding at a given location, minimally a reliable observation of one or more breeding pairs in appropriate habitat. Be cautious about creating EOs for observations that may represent single breeding events outside the normal breeding distribution.

Separation Barriers: None.

Separation Distance for Unsuitable Habitat: 15 km

Separation Distance for Suitable Habitat: 15 km

Alternate Separation Procedure: Where an occurrence is at least twice the size of a minimum A-ranked occurrence, it may be divided into two or more A-ranked occurrences along divisions that are narrower than the separation distances given. The dividing lines should be made as much as possible along lines of limited goshawk use; for example, along rugged, alpine ridges or bodies of water 0.5-10 kilometers wide.

Separation Justification: Separation distance is arbitrary and is not intended to establish occurrences that represent discrete populations. Instead, it attempts to balance the high mobility of these birds against the need for occurrences of practical size for conservation purposes. Separation distance is based on nest sites or nesting territories; nest sites separated by a gap that is less than the separation distance represent the same occurrence.

Home ranges are highly variable in size and during nesting vary from 95-3500 hectares depending on sex and habitat characteristics (Squires and Reynolds 1997).

Inferred Minimum Extent of Habitat Use (when actual extent is unknown): 2.5 km

Inferred Minimum Extent Justification: Based on a modest home range of 500 hectares.

Date: 28Sep2004

Author: Cannings, S., and G. Hammerson

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Not yet assessed

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 30Nov1999

NatureServe Conservation Status Factors Author: Palis, J., J. Soule, and G. Hammerson; revisions by D.W. Mehlman and M. Koenen

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Management Information Edition Author: PALIS, J., J. SOULE, AND G. HAMMERSON; REVISIONS BY D.W. MEHLMAN AND M. KOENEN

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Note: All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of **February 2012**.
Note: This report was printed on **May 1, 2012**

Citation for data on website including State Distribution, Watershed, and Reptile Range maps:
NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 1, 2012).

Citation for Bird Range Maps of North America:
Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

Acknowledgement Statement for Bird Range Maps of North America:
"Data provided by NatureServe in collaboration with Robert Ridgely, James Zook, The Nature Conservancy - Migratory Bird Program, Conservation International - CABS, World Wildlife Fund - US, and Environment Canada - WILDSPACE."

Citation for Mammal Range Maps of North America:
Patterson, B.D., G. Ceballos, W. Sechrest, M.F. Tognelli, T. Brooks, L. Luna, P. Ortega, I. Salazar, and B.E. Young. 2003. Digital Distribution Maps of the Mammals of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. IUCN, Conservation International, and NatureServe, Washington, DC and Arlington, Virginia, USA.

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"Data developed as part of the Global Amphibian Assessment and provided by IUCN-World Conservation Union, Conservation International and NatureServe."

NOTE: Full metadata for the Bird Range Maps of North America is available at:
http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

Full metadata for the Mammal Range Maps of North America is available at:
http://www.natureserve.org/library/mammalsDistributionmetadatav1.pdf.

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NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Strix nebulosa - Forster, 1772
Great Gray Owl
Related ITIS Name(s): *Strix nebulosa* J. R. Forster, 1772 (TSN 177929)
Unique Identifier: ELEMENT_GLOBAL.2.100756
Element Code: ABNSB12040
Informal Taxonomy: Animals, Vertebrates - Birds - Other Birds


© Dennis Donohue

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Strigiformes	Strigidae	Strix

Genus Size: C - Small genus (6-20 species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, D.C. [as modified by subsequent supplements and corrections published in *The Auk*]. Also available online: http://www.aou.org/.
Concept Reference Code: B98AOU01NAUS
Name Used in Concept Reference: *Strix nebulosa*

Conservation Status

NatureServe Status

Global Status: G5
Global Status Last Reviewed: 27Nov1996
Global Status Last Changed: 27Nov1996
Rounded Global Status: G5 - Secure
Reasons: Large circumboreal range; no decline is evident in the vast majority of the range, but few data are available for most areas.
Nation: United States
National Status: N4
Nation: Canada
National Status: N5 (13Feb2012)

U.S. & Canada State/Province Status	
United States	Alaska (S4), California (S1), Idaho (S3), Maine (S1S2N), Michigan (SNRN), Minnesota (SNR), Montana (S3), New York (SNRN), Oregon (S3), Utah (S1N), Washington (S2B), Wyoming (S2)
Canada	Alberta (S4), British Columbia (S4B), Manitoba (S4), Northwest Territories (S5), Ontario (S4), Quebec (S3S4), Saskatchewan (S3B,S3N), Yukon Territory (S4)

Other Statuses

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Not at Risk (01Apr1996)

IUCN Red List Category: LC - Least concern
Convention on International Trade in Endangered Species Protection Status (CITES): Appendix II

NatureServe Global Conservation Status Factors

Range Extent Comments: BREEDS: central Alaska to northern Ontario, south locally in mountains to California (vicinity of Yosemite), Idaho, Montana, Wyoming, central Saskatchewan, northern Minnesota, and south-central Ontario. WINTERS: generally throughout breeding range, wandering south irregularly to northern U.S. Also in Old World. Usually uncommon, but sometimes may be locally abundant.

Population Size: 10,000 to >1,000,000 individuals
Population Size Comments: Guesstimated number of breeding pairs in Canada in the early 1990s was 10,000-25,000 (Kirk et al. 1995). See Johnsgard (1988) for listing of recent status studies in Manitoba, Saskatchewan, California (about 10 breeding pairs, California Department of Fish and Game 1990), Wyoming, Idaho, and Oregon.

Overall Threat Impact Comments: In California, habitat loss through logging of mature forest and overgrazing of meadows has been the primary cause for decline (California Department of Fish and Game 1990).

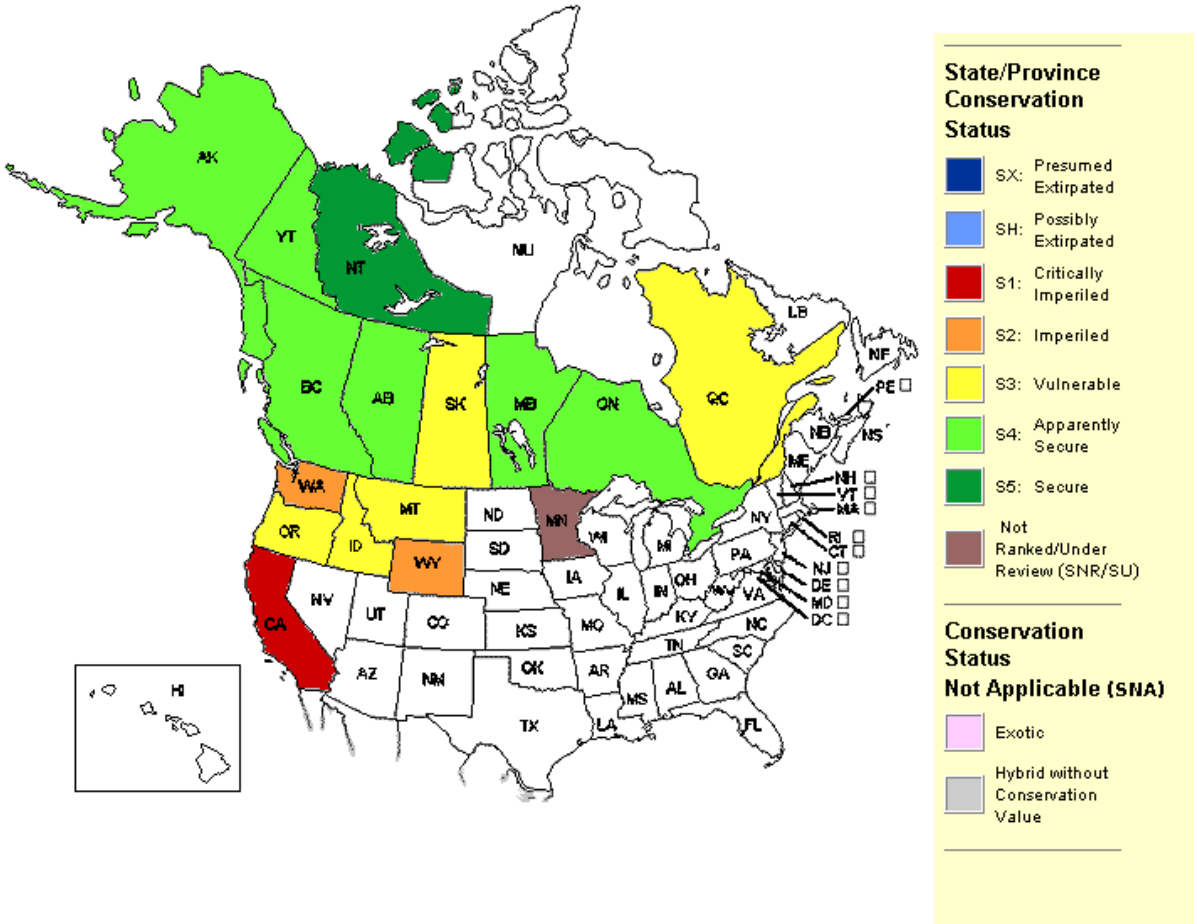
Short-term Trend Comments: No evident population decline in the vast majority of the range; apparently stable, but actual population data are lacking for many areas (Nero, 1979 COSEWIC report; Kirk et al. 1995).

Other NatureServe Conservation Status Information

Distribution

Global Range: BREEDS: central Alaska to northern Ontario, south locally in mountains to California (vicinity of Yosemite), Idaho, Montana, Wyoming, central Saskatchewan, northern Minnesota, and south-central Ontario. WINTERS: generally throughout breeding range, wandering south irregularly to northern U.S. Also in Old World. Usually uncommon, but sometimes may be locally abundant.

U.S. States and Canadian Provinces

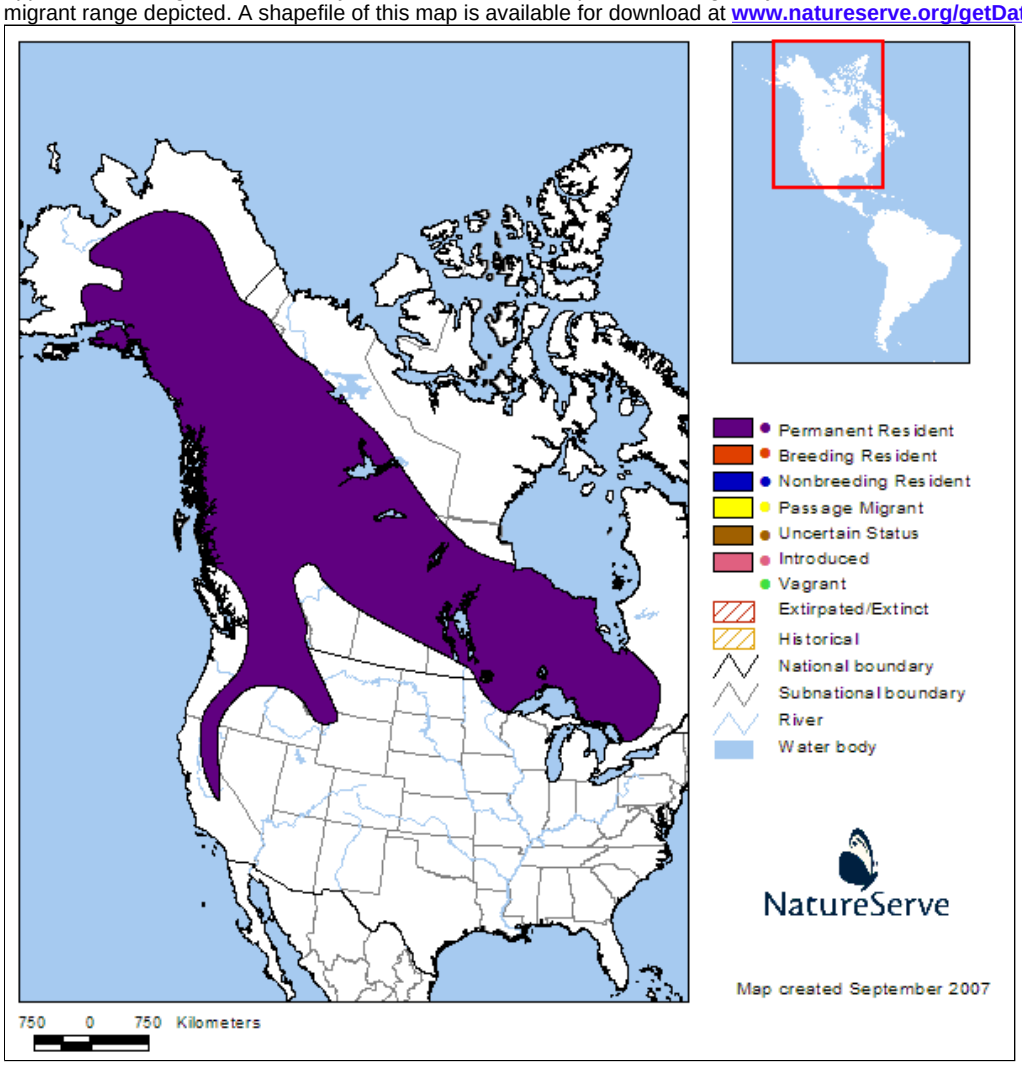


NOTE: The maps for birds represent the breeding status by state and province. In some jurisdictions, the subnational statuses for common species have not been assessed and the status is shown as not-assessed (SNR). In some jurisdictions, the subnational status refers to the status as a non-breeder; these errors will be corrected in future versions of these maps. A species is not shown in a jurisdiction if it is not

known to breed in the jurisdiction or if it occurs only accidentally or casually in the jurisdiction. Thus, the species may occur in a jurisdiction as a seasonal non-breeding resident or as a migratory transient but this will not be indicated on these maps. See other maps on this web site that depict the Western Hemisphere ranges of these species at all seasons of the year.
Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	AK, CA, ID, ME, MI, MN, MT, NY, OR, UT, WA, WY
Canada	AB, BC, MB, NT, ON, QC, SK, YT

Range Map
Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: WILDSPACETM 2002

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
CA	Alpine (06003)*, El Dorado (06017), Fresno (06019), Glenn (06021), Lassen (06035)*, Madera (06039), Mariposa (06043), Modoc (06049)*, Mono (06051)*, Sierra (06091)*, Tulare (06107), Tuolumne (06109)
ID	Adams (16003), Bannock (16005), Bear Lake (16007), Bonner (16017), Bonneville (16019), Caribou (16029), Clark (16033), Custer (16037), Franklin (16041), Fremont (16043), Idaho (16049), Lemhi (16059), Lewis (16061), Madison (16065), Nez Perce (16069), Teton (16081), Valley (16085), Washington (16087)
MN	Aitkin (27001)*, Cass (27021), Cook (27031), Itasca (27061), Lake (27075), Roseau (27135), St. Louis (27137)
MT	Beaverhead (30001), Carbon (30009), Deer Lodge (30023), Flathead (30029), Gallatin (30031), Granite (30039), Judith Basin (30045), Lake (30047), Lincoln (30053), Meagher (30059), Missoula (30063), Park (30067), Powell (30077), Ravalli (30081), Silver Bow (30093), Teton (30099), Wheatland (30107)

OR	Josephine (41033)
UT	Wasatch (49051)
WY	Crook (56011), Fremont (56013), Lincoln (56023), Park (56029), Sublette (56035), Teton (56039), Weston (56045)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
04	Baptism-Brule (04010101)+, St. Louis (04010201)+, Cloquet (04010202)+
07	Mississippi Headwaters (07010101)+, Leech Lake (07010102)+, Elk-Nokasippi (07010104)+
09	Roseau (09020314)+, Rainy Headwaters (09030001)+
10	Red Rock (10020001)+, Beaverhead (10020002)+, Big Hole (10020004)+, Gallatin (10020008)+, Upper Missouri (10030101)+, Teton (10030205)+, Judith (10040103)+, Upper Musselshell (10040201)+, Yellowstone Headwaters (10070001)+, Shields (10070003)+, Stillwater (10070005)+, Clarks Fork Yellowstone (10070006)+, Upper Wind (10080001)+, Popo Agie (10080003)+, North Fork Shoshone (10080012)+, Upper Cheyenne (10120103)+, Upper Belle Fourche (10120201)+
14	Upper Green (14040101)+, New Fork (14040102)+, Duchesne (14060003)+
16	Bear Lake (16010201)+, Little Bear-Logan (16010203)+, Provo (16020203)+, Upper Carson (16050201)+, West Walker (16050302)+
17	Fisher (17010102)+, Upper Clark Fork (17010201)+, Flint-Rock (17010202)+, Blackfoot (17010203)+, Bitterroot (17010205)+, North Fork Flathead (17010206)+, Flathead Lake (17010208)+, Lower Flathead (17010212)+, Priest (17010215)+, Snake headwaters (17040101)+, Gros Ventre (17040102)+, Greys-Hobock (17040103)+, Palisades (17040104)+, Salt (17040105)+, Upper Henrys (17040202)+, Lower Henrys (17040203)+, Teton (17040204)+, Willow (17040205)+, Blackfoot (17040207)+, Portneuf (17040208)+, Beaver-Camas (17040214)+, Medicine Lodge (17040215)+, North Fork Payette (17050123)+, Weiser (17050124)+, Brownlee Reservoir (17050201)+, Middle Salmon-Panther (17060203)+, Lemhi (17060204)+, Upper Middle Fork Salmon (17060205)+, Middle Salmon-Chamberlain (17060207)+, Lower Salmon (17060209)+, Little Salmon (17060210)+, South Fork Clearwater (17060305)+, Clearwater (17060306)+, Middle Rogue (17100308)+, Lower Rogue (17100310)+
18	Middle Fork Eel (18010104)+, Upper Pit (18020002)+, Middle Fork Feather (18020123)+, Upper Yuba (18020125)+, South Fork American (18020129)+, South Fork Kern (18030002)+, Upper Kaweah (18030007)+, Upper King (18030010)+, Upper San Joaquin (18040006)+, Upper Merced (18040008)+, Upper Tuolumne (18040009)+, Upper Stanislaus (18040010)+, Upper Cosumnes (18040013)+, Crowley Lake (18090102)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A very large owl.
Reproduction Comments: Egg dates: late March-May in Alberta, late April-early June in Ontario, peak mid-April to late May in California, mean date of first egg 5 May in southern Idaho and northwestern Wyoming; eggs laying may be delayed in years with deep snow (Franklin 1988). Clutch size is 2-5 (usually 2-3 or 3-4). Incubation lasts 28-29 days, by female (male brings food). Young begin to leave nest at 3-4 weeks (4 weeks in Idaho/Wyoming), fly well at 5-6 weeks (6 weeks in Idaho/Wyoming), independent at about 4-5 months (Idaho/Wyoming: Franklin 1988). Usually first breeds at 3-4 years. Pair bond is not maintained outside breeding season, but bond may reform if both birds return to the same breeding territory. Some pairs may not breed in years of low prey abundance.
Ecology Comments: Some may remain on breeding territory all year; others may move irregularly in search of favorable foraging conditions. In Oregon, radio-tagged juveniles moved 9-31 km from nest over period of 1 year, adults moved 3-43 km during same period (see Johnsgard 1988). Predation by great horned owl was greatest known mortality factor in northern Minnesota and southeastern Manitoba (Duncan 1987).
Non-Migrant: Y
Locally Migrant: N
Long Distance Migrant: N
Mobility and Migration Comments: Greater mobility exhibited in years when food scarce (Duncan 1987). Food scarcity or unavailability may cause post-breeding movement upslope and downslope movement in winter (California Department of Fish and Game 1990). May move several hundred km southward for winter; in some areas, longest movements made by immatures (but see ECOLCOM).
Palustrine Habitat(s): Bog/fen, Riparian
Terrestrial Habitat(s): Forest - Conifer, Forest - Hardwood, Forest - Mixed, Grassland/herbaceous, Woodland - Conifer, Woodland - Hardwood, Woodland - Mixed
Habitat Comments: Dense coniferous and hardwood forest, especially pine, spruce, paper birch, poplar; also second growth, especially near water, foraging in wet meadows; boreal forest and spruce-tamarack bogs in far north, coniferous forest and meadows in mountains.

Nests in top of large broken-off tree trunks (especially in south), in old nests of other large birds (e.g., hawk nest) (especially in north), or in debris platforms from dwarf mistletoe; frequently near bogs or clearings. Nests frequently reused (Franklin 1988). Same pair often nests in same area in successive years.
Adult Food Habits: Carnivore
Immature Food Habits: Carnivore
Food Comments: Diet in North America dominated by pocket gophers and voles. Forages usually in open area where scattered trees or forest margin provides suitable sites for visual searching; also uses sound to locate prey under snow cover.
Adult Phenology: Circadian
Immature Phenology: Circadian

Phenology Comments: In winter, hunts primarily in early morning and from late afternoon until dusk. When nesting, may hunt day or night.
Length: 69 centimeters
Weight: 1298 grams

Economic Attributes

Not yet assessed

Management Summary

Management Requirements: In addition to the provision of suitable habitat, management needs include protection of nesting areas from excessive human activity during the nesting season. For the Pacific Northwest, U.S. Forest Service et al. (1993) and Thomas et al. (1993) recommended providing a no-harvest buffer of 300 feet around meadows and natural openings and establishment of a 1/4-mile protection zone around known nest sites.

Artificial nest platforms have been used successfully (Bull et al. 1987, California Department of Fish and Game 1990).
Monitoring Requirements: Duncan and Duncan (1995) described a standardized method used for general owl surveys in Manitoba. Surveys are conducted during the first two weeks of April. They must begin at least 30 minutes after sunset, must end at least 30 minutes before sunrise. Routes average 25 km in length and are travelled by car with stops every 0.8 km. At each stop, volunteers listen for an initial 1-minute period and note all owls heard or seen, including direction from the stop and loudness (to prevent double-counting). Other vertebrates seen also are counted. After the initial 1-minute listening period, the tape-recorded call of a male boreal owl is played for 20 seconds, followed by another minute of listening. Next the tape-recorded call of a male great gray owl is played for 20 seconds, and again all owls seen or heard during the next 1-minute period are noted.

See Bull (1987) for capture techniques.

Population/Occurrence Delineation

Group Name: LARGE OWLS

Use Class: Breeding
Minimum Criteria for an Occurrence: Evidence of historical breeding, or current and likely recurring breeding, at a given location, minimally a reliable observation of one or more breeding pairs in appropriate habitat. Be cautious about creating EOs for observations that may represent single breeding events outside the normal breeding distribution.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 10 km
Separation Distance for Suitable Habitat: 10 km
Separation Justification: Separation distance based conservatively on larger home ranges (greater than 800 hectares). Home ranges generally well over 100 hectares, often over 500 hectares. Northern Hawk-Owl: average 372 hectares (Baekken et al. 1987). Great Horned Owl: average 483 hectares in Yukon (Rohner 1997), average about 106 hectares in Utah (Smith 1969). Barred Owl: average 273-971 hectares (Elody and Sloan 1985, Nicholls and Fuller 1987, Mazur et al. 1998). Great Gray Owl, varied from 239-400 hectares (Craighead and Craighead 1956, Winter 1982). Barn Owl: averages range from 198-921 hectares (Byrd 1982, Colvin 1984, Hegdal and Blaskiewicz 1984, Rosenburg 1986, Byrd and Johnston 1991, Gubanyi 1989).
Inferred Minimum Extent of Habitat Use (when actual extent is unknown): 1.5 km
Inferred Minimum Extent Justification: Based on a conservatively small home range of just under 200 hectares (see Separation Justification).
Date: 02Nov2001
Author: Cannings, S.
Notes: Contains all North American owls larger than Screech-Owls, except Spotted, Long-eared, and Short-eared Owls.

Use Class: Nonbreeding
Minimum Criteria for an Occurrence: Evidence of recurring presence of wintering individuals outside their breeding area (including historical); and potential recurring presence at a given location. Occurrences should be locations where the species is resident for some time during the appropriate season; it is preferable to have observations documenting presence over at least 20 days annually. Be cautious about creating EOs for observations that may represent single events.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 10 km
Separation Distance for Suitable Habitat: 10 km
Separation Justification: Separation distance based conservatively on larger home ranges (greater than 800 hectares; see Separation Justification in Breeding class).
Inferred Minimum Extent of Habitat Use (when actual extent is unknown): 1.5 km
Inferred Minimum Extent Justification: Based on a conservatively small home range of just under 200 hectares (see Separation Justification in Breeding Class).
Date: 16Oct2002
Author: Cannings, S.
Notes: Contains all North American owls larger than Screech-Owls, except Spotted, Long-eared, and Short-eared Owls.

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Not yet assessed

Authors/Contributors

Element Ecology & Life History Edition Date: 31Mar1995

Element Ecology & Life History Author(s): HAMMERSON, G.

Zoological data developed by NatureServe and its network of natural heritage programs (see **Local Programs**) and other contributors and cooperators (see **Sources**).

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Note: All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of **February 2012**.
Note: This report was printed on **May 1, 2012**

Citation for data on website including State Distribution, Watershed, and Reptile Range maps:
NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 1, 2012).

Citation for Bird Range Maps of North America:
Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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"Data provided by NatureServe in collaboration with Robert Ridgely, James Zook, The Nature Conservancy - Migratory Bird Program, Conservation International - CABS, World Wildlife Fund - US, and Environment Canada - WILDSPACE."

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Patterson, B.D., G. Ceballos, W. Sechrest, M.F. Tognelli, T. Brooks, L. Luna, P. Ortega, I. Salazar, and B.E. Young. 2003. Digital Distribution Maps of the Mammals of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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IUCN, Conservation International, and NatureServe. 2004. Global Amphibian Assessment. IUCN, Conservation International, and NatureServe, Washington, DC and Arlington, Virginia, USA.

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"Data developed as part of the Global Amphibian Assessment and provided by IUCN-World Conservation Union, Conservation International and NatureServe."

NOTE: Full metadata for the Bird Range Maps of North America is available at:
http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

Full metadata for the Mammal Range Maps of North America is available at:
http://www.natureserve.org/library/mammalsDistributionmetadatav1.pdf.

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NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Picoides dorsalis - Baird, 1858
American Three-toed Woodpecker
Other Related Name(s): *Picoides tridactylus dorsalis*
Related ITIS Name(s): *Picoides dorsalis* S. F. Baird, 1858 (TSN 685725)
Unique Identifier: ELEMENT_GLOBAL.2.106444
Element Code: ABNYF07110
Informal Taxonomy: Animals, Vertebrates - Birds - Other Birds

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Craniata	Aves	Piciformes	Picidae	Picoides

Genus Size: C - Small genus (6-20 species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: American Ornithologists' Union (AOU). 1957. The A.O.U. Check-list of North American Birds, 5th ed. Port City Press, Inc., Baltimore, MD. 691 pp.
Concept Reference Code: B57AOU01HQUS
Name Used in Concept Reference: *Picoides tridactylus dorsalis*
Taxonomic Comments: Formerly considered conspecific with the Old World *P. tridactylus* (Linnaeus) [Eurasian Three-toed Woodpecker], but separated because of significant differences in mitochondrial DNA sequences (Zink et al. 1995, 2002) and (Winkler and Short 1978, Short 1982) (AOU 2003).

Conservation Status

NatureServe Status

Global Status: G5
Global Status Last Reviewed: 30Sep2003
Global Status Last Changed: 02Dec1996
Rounded Global Status: G5 - Secure
Reasons: Extensive Holarctic distribution with numerous occurrences, but uncommon in most areas; threatened in some areas by timber harvest, incompatible forestry practices, and probably by fire suppression; more information is needed. Trends unknown, but quite likely downward.
Nation: United States
National Status: N5
Nation: Canada
National Status: N5 (12Feb2012)

U.S. & Canada State/Province Status	
United States	Alaska (S5), Arizona (S3), Colorado (S3S4), Idaho (S2), Maine (S3), Michigan (SNRN), Minnesota (SNRB,SNRN), Montana (S4), Navajo Nation (S3), Nevada (S2), New Hampshire (S2), New Mexico (S3B,S3N), New York (S2), Oregon (S3), South Dakota (S2), Utah (S2S3), Vermont (S1), Washington (S3), Wyoming (S3)
Canada	Alberta (S4), British Columbia (S5B), Labrador (S5), Manitoba (S5), New Brunswick (S3?), Newfoundland Island (S3S4), Northwest Territories (S4S5), Nova Scotia (S1S2), Nunavut (SNR), Ontario (S4), Prince Edward Island (S1), Quebec (S4), Saskatchewan (S4B,S4N), Yukon Territory (S5)

Other Statuses

IUCN Red List Category: LC - Least concern

NatureServe Global Conservation Status Factors

Range Extent: >2,500,000 square km (greater than 1,000,000 square miles)
Range Extent Comments: RESIDENT: often locally, in North America from northern Alaska across Canada through northern Saskatchewan to north-central Labrador and Newfoundland, south to western and southern Alaska, southern Oregon, eastern Nevada, central Arizona, southern New Mexico, and the Black Hills of South Dakota; and to central Alberta and Saskatchewan, southern Manitoba, northeastern Minnesota, northern Michigan, central Ontario, northern New England, southern Quebec and Nova Scotia.

Number of Occurrences: > 300
Number of Occurrences Comments: Widespread, Holarctic range.

Population Size: >1,000,000 individuals
Population Size Comments: Locally distributed and nowhere very numerous; not enough information to determine absolute abundance. However, some measured densities in unburned forests are 0.25/ha (Colorado; Koplin 1969), less than 0.1/ha in Alaska (Murphy and Lehnhausen 1998), 0.06/100 ha (Finland, unprotected forests; Virkkala et al. 1994), and 0.7/100 ha (Finland, virgin forests; Virkkala et al. 1991). Densities are significantly higher in burned forests, 1-2 years post-fire (1.2/ha in Colorado, Koplin 1969; 0.2/ha in Alaska, Murphy and Lehnhausen 1998). Using the lower densities above as a guide, total population undoubtedly exceeds 1 million, and is probably substantially more.

Overall Threat Impact Comments: Threats include incompatible forestry practices and deforestation. This species' association with spatially unpredictable disturbance and its large home range make it sensitive to logging and forest fragmentation, and these activities have undoubtedly resulted in population declines (Hunter 1992, Hagan et al. 1997, Imbeau et al. 1999, Leonard 2001). In many cases, this species is restricted to forests older than planned cutting rotations (Imbeau et al. 1999). In Finland, has declined or disappeared in old-growth tracts less than about 140 square kilometers in area (Vaisanen et al. 1986). In Oregon, the liquidation of old growth lodgepole pine due to its infestation with the mountain pine beetle may reduce or eliminate habitat for this species. In Vermont, clear-cutting threatens the black spruce-balsam fir forest habitat.

Because densities increase following fires, probably detrimentally affected by fire suppression (Spahr et al. 1991).

Short-term Trend: Relatively stable to decline of 30%
Short-term Trend Comments: Not enough information to draw clear conclusions. Limited North American Breeding Bird Survey (BBS) data indicate a significant decline, although the data should be viewed with extreme caution geven the low number of samples (Sauer et al. 2001). Declining in Maine, likely a result of timber harvest (Hagan et al. 1997, cited in Leonard 2001). Beginning in the 1960s the number of sightings in Michigan increased. Observations in the 1970s and 1980s continued to increase in Michigan (Brewer et al. 1991); within the last six years, sightings have been much less common (Adams, pers. comm.).

In Eurasia, declining in former Yugoslavia and Czechoslovakia, and in Lithuania, Sweden and Finland (Cramp 1985, Ruge 1997, Vaisanen et al. 1986).

Long-term Trend: Relatively stable to decline of 50%
Long-term Trend Comments: Has been extirpated in parts of Eurasian range, although recolonization has been noted (Ruge 1997). In New York, was once abundant (1883), but more recently (1974), it is rare, though probably under-recorded (Peterson 1988). Was probably more numerous in Vermont than at present (Oatman 1985).

Other NatureServe Conservation Status Information

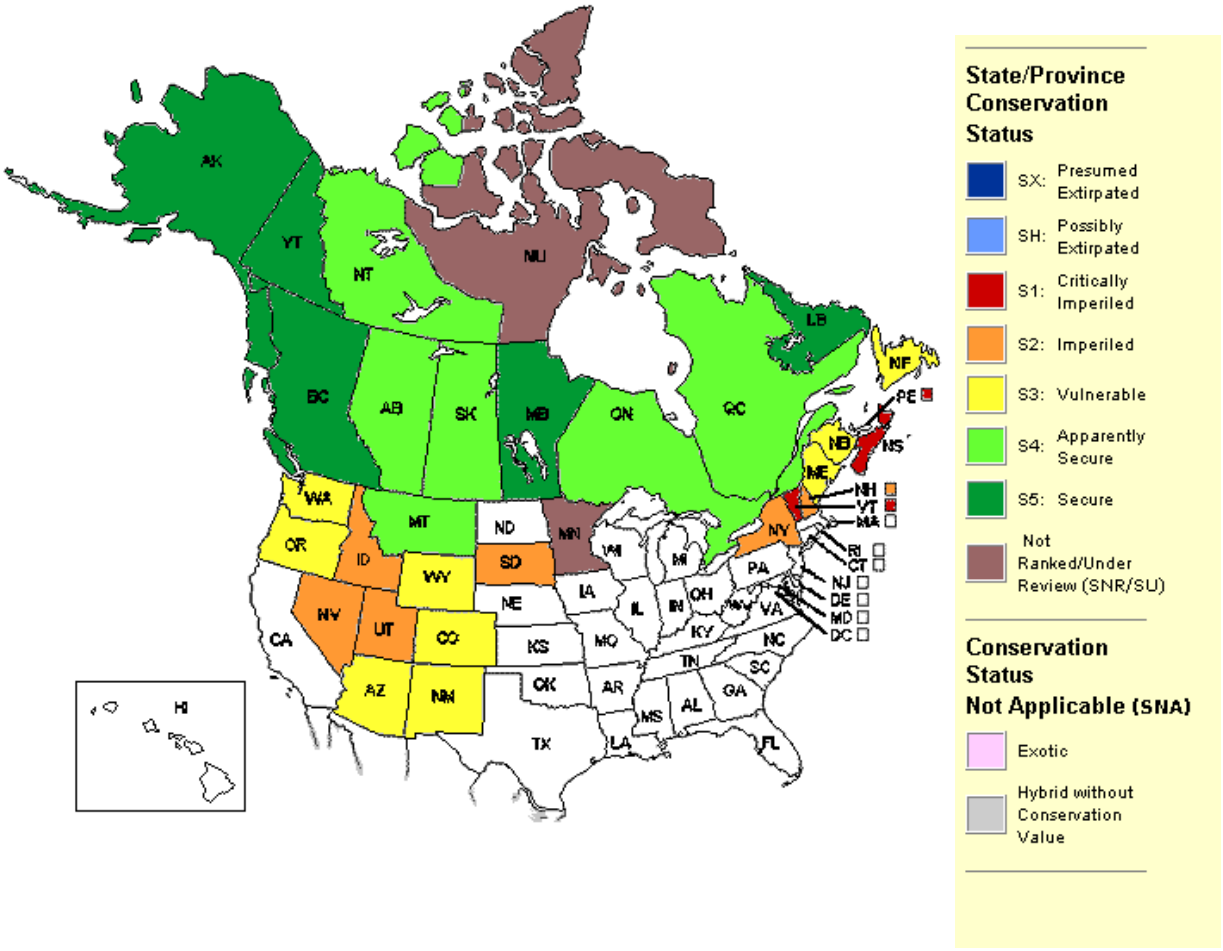
Inventory Needs: Rangewide inventory would help clarify status.

Protection Needs: Protect large forest tracts so that adequate habitat is continuously available as local conditions change through time.

Distribution

Global Range: (>2,500,000 square km (greater than 1,000,000 square miles)) RESIDENT: often locally, in North America from northern Alaska across Canada through northern Saskatchewan to north-central Labrador and Newfoundland, south to western and southern Alaska, southern Oregon, eastern Nevada, central Arizona, southern New Mexico, and the Black Hills of South Dakota; and to central Alberta and Saskatchewan, southern Manitoba, northeastern Minnesota, northern Michigan, central Ontario, northern New England, southern Quebec and Nova Scotia.

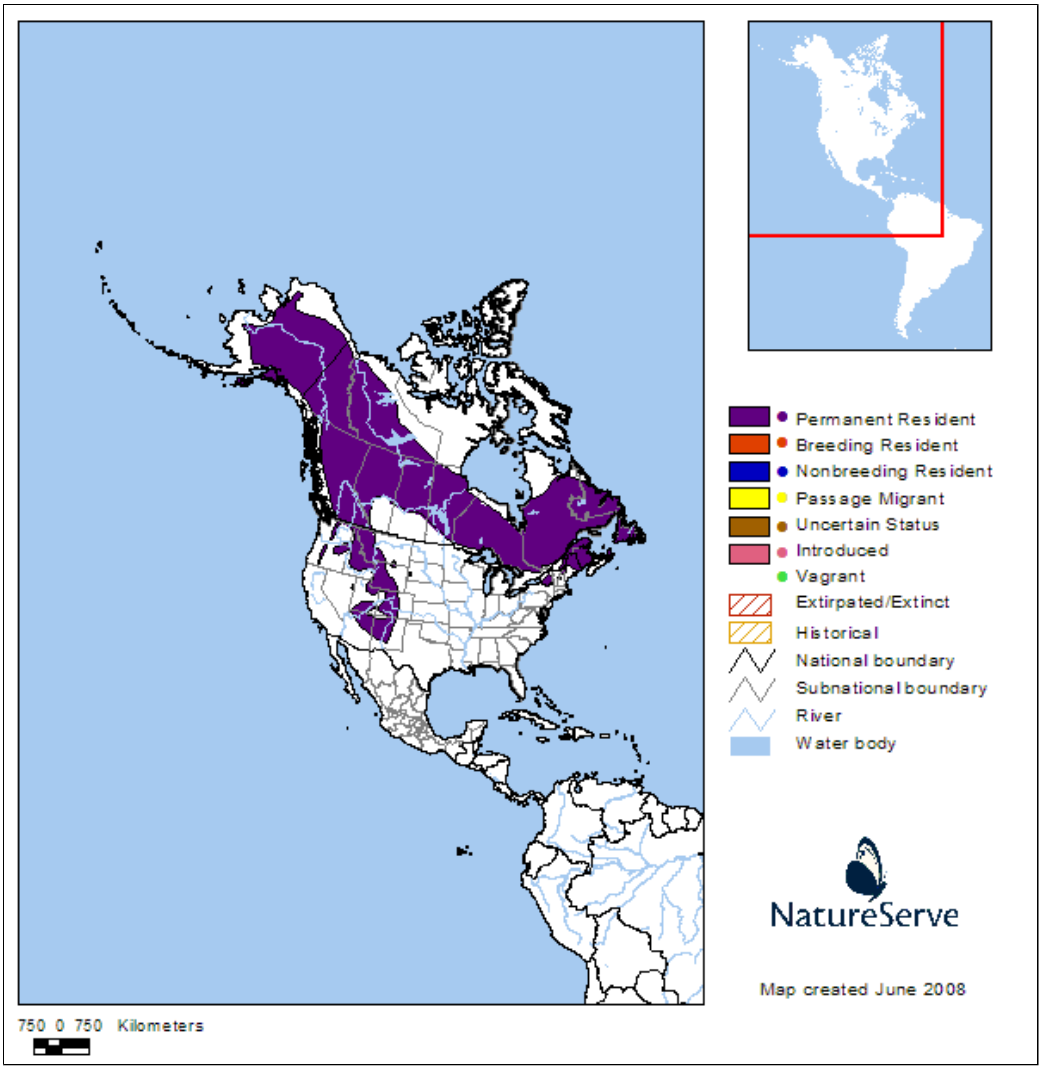
U.S. States and Canadian Provinces



NOTE: The maps for birds represent the breeding status by state and province. In some jurisdictions, the subnational statuses for common species have not been assessed and the status is shown as not-assessed (SNR). In some jurisdictions, the subnational status refers to the status as a non-breeder; these errors will be corrected in future versions of these maps. A species is not shown in a jurisdiction if it is not known to breed in the jurisdiction or if it occurs only accidentally or casually in the jurisdiction. Thus, the species may occur in a jurisdiction as a seasonal non-breeding resident or as a migratory transient but this will not be indicated on these maps. See other maps on this web site that depict the Western Hemisphere ranges of these species at all seasons of the year.
Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	AK, AZ, CO, ID, ME, MI, MN, MT, NH, NM, NN, NV, NY, OR, SD, UT, VT, WA, WY
Canada	AB, BC, LB, MB, NB, NF, NS, NT, NU, ON, PE, QC, SK, YT

Range Map
Note: Range depicted for New World only. The scale of the maps may cause narrow coastal ranges or ranges on small islands not to appear. Not all vagrant or small disjunct occurrences are depicted. For migratory birds, some individuals occur outside of the passage migrant range depicted. A shapefile of this map is available for download at **www.natureserve.org/getData/animalData.jsp.**



Range Map Compilers: NatureServe 2008

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
AZ	Apache (04001)
ID	Blaine (16013), Bonner (16017), Caribou (16029), Clearwater (16035), Custer (16037), Idaho (16049), Valley (16085)
NH	Coos (33007), Grafton (33009)
NM	San Juan (35045)
NY	Franklin (36033), Hamilton (36041), Herkimer (36043), Lewis (36049)
OR	Baker (41001), Coos (41011), Deschutes (41017), Grant (41023), Jackson (41029)*, Klamath (41035), Linn (41043)*, Umatilla (41059), Union (41061), Wallowa (41063)
SD	Custer (46033), Lawrence (46081), Pennington (46103)
UT	Beaver (49001), Cache (49005), Daggett (49009), Duchesne (49013), Garfield (49017)*, Grand (49019), Juab (49023)*, Kane (49025)*, Rich (49033), Salt Lake (49035), San Juan (49037), Sanpete (49039)*, Sevier (49041), Summit (49043), Uintah (49047), Utah (49049)*, Washington (49053)*
VT	Essex (50009), Franklin (50011), Orleans (50019)
WY	Albany (56001), Big Horn (56003), Carbon (56007), Crook (56011), Johnson (56019), Sheridan (56033), Teton (56039), Uinta (56041)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**

01	Saco (01060002)+, Pemigewasset (01070001)+, Upper Connecticut (01080101)+, Waits (01080103)+
02	Mohawk (02020004)+
04	Salmon-Sandy (04140102)+, Black (04150101)+, St. Regis (04150306)+, Saranac River (04150406)+, Missiquoi River (04150407)+, St. Francois River (04150500)+
10	Big Horn Lake (10080010)+, Upper Tongue (10090101)+, Middle Fork Powder (10090201)+, Crazy Woman (10090205)+, Clear (10090206)+, Middle Cheyenne-Spring (10120109)+, Rapid (10120110)+, Middle Cheyenne-Elk (10120111)+, Upper Belle Fourche (10120201)+, Lower Belle Fourche (10120202)+, Redwater (10120203)+, Upper North Platte (10180002)+, Upper Laramie (10180010)+, Lower Laramie (10180011)+
14	Upper Dolores (14030002)+, Lower Dolores (14030004)+, Upper Colorado-Kane Springs (14030005)+, Upper Green-Flaming Gorge Reservoir (14040106)+, Blacks Fork (14040107)+, Little Snake (14050003)+, Ashley-Brush (14060002)+, Duchesne (14060003)+, Upper Lake Powell (14070001)+, Fremont (14070003)+, Escalante (14070005)+, Chaco (14080106)+, Lower San Juan-Four Corners (14080201)+, Montezuma (14080203)+, Chinle (14080204)+
15	Upper Virgin (15010008)+
16	Upper Bear (16010101)+, Bear Lake (16010201)+, Little Bear-Logan (16010203)+, Utah Lake (16020201)+, Provo (16020203)+, Jordan (16020204)+, Upper Sevier (16030001)+, East Fork Sevier (16030002)+, Middle Sevier (16030003)+, San Pitch (16030004)+, Beaver Bottoms-Upper Beaver (16030007)+
17	Pend Oreille Lake (17010214)+, Priest (17010215)+, Snake headwaters (17040101)+, Salt (17040105)+, Teton (17040204)+, North Fork Payette (17050123)+, Brownlee Reservoir (17050201)+, Powder (17050203)+, Imnaha (17060102)+, Upper Grande Ronde (17060104)+, Wallowa (17060105)+, Upper Salmon (17060201)+, Upper Middle Fork Salmon (17060205)+, Middle Salmon-Chamberlain (17060207)+, Lochsa (17060303)+, South Fork Clearwater (17060305)+, North Fork John Day (17070202)+, Upper Deschutes (17070301)+, Little Deschutes (17070302)+, Mckenzie (17090004)+, Coquille (17100305)+, Middle Rogue (17100308)+
18	Upper Klamath (18010206)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A quiet, 22-cm-long woodpecker of boreal forests.
General Description: PLUMAGE: Adult male has a yellow crown, black forehead that is more or less spotted with dull white, black back and sides that are usually broadly barred with white, secondary feathers that are distinctly spotted with white and quills with white spots (Gabrielson and Lincoln 1959). The adult female is similar to the adult male but without any yellow on the head. The female's forehead and crown is usually spotted or streaked with grayish white but sometimes is completely black. Immatures are similar to adults. Young woodpeckers are naked and blind when hatched (Gabrielson and Lincoln 1959). CALLING BEHAVIOR: make tapping sounds while feeding. In the spring and summer you can hear courtship drumming. The call is a rattle similar to that of the hairy woodpecker (PICOIDES VILLOSUS) (Adams, pers. comm.) although the intervals between taps are longer at the beginning of calling episodes. The voice consists of a squeal resembling that of a small mammal and a short quap or quip (Gabrielson and Lincoln 1959).

NEST: Nesting habitat includes coniferous forests (with spruce, larch, or fir trees), or logged areas and swamps. Cavity nest dug by both sexes and are placed 1.5 to 15 m (5 to 50 feet) high in a stump or other dead or dying trees often near water. The entrance is about 4 centimeters by 5 centimeters (1 3/4 by 2 inches), and the cavity is about 25 to 38 centimeters (10 to 15 inches) deep (Oatman 1985).

EGGS: lie on beds of chips within the nest and are ovate, pure white, and only moderately glossy (Gabrielson and Lincoln 1959).
Diagnostic Characteristics: Morphologically very similar to the black-backed woodpecker (PICOIDES ARCTICUS) but is smaller. They are sympatric and occur together ecologically. The barred pattern on back distinguishes it from the black-backed.
Reproduction Comments: Nesting occurs in May and June, young can be found in the nest into July (Oatman 1985, Brewer et al. 1991, Adams pers. comm.). In Montana, nest building is observed in June, with the young out of the nest by early August (Davis 1961). One broods per year. Clutch size usually is four. Incubation, by both sexes, lasts 12-14 days. During incubation birds are rather quiet. Male roosts nightly in nest throughout incubation (Ehrlich et al. 1988). Young are tended by both parents, fledge in 22-26 days, remain with adults for at least a month after fledging. Nesting may be somewhat colonial where food is abundant. Pair bond sometimes lasts multiple years. Nesting times are very similar for the three-toed and black-backed woodpeckers.
Ecology Comments: IRRUPTIONS: Periodic irruptions occur, presumably due to a failure of the food supply. Sympatric with Black-backed Woodpecker (PICOIDES ARCTICUS) but irruptions do not coincide possibly due to difference in dependence on live and dead wood insects (Yunick 1985). Less likely to wander in the winter than the black-backed woodpecker. Interspecific competition may be reduced by taking advantage of different foraging heights and having differently sized bills (Peterson 1988).

Forest fire may lead to local increases in woodpecker populations 3-5 years after a fire (Spahr et al. 1991). In the northeastern U.S., territory size of 74 acres and density of 3 pairs per 247 acres (with increases after fire) have been recorded.
Non-Migrant: Y
Locally Migrant: N
Long Distance Migrant: N
Palustrine Habitat(s): FORESTED WETLAND, Riparian
Terrestrial Habitat(s): Forest - Conifer, Forest - Mixed, Woodland - Conifer, Woodland - Mixed
Habitat Comments: Coniferous forest (primarily spruce), less frequently mixed forest. Optimal habitat includes areas with 42-52 snags per 100 acres, with snags occurring in clumps, measuring 12-16 inches dbh and 20-40 feet tall, and mostly with bark still present (Spahr et al. 1991). Cavity nests placed in dead (occasionally live) tree (commonly conifer or aspen). Sometimes nests in utility poles.

Prefers coniferous forest, primarily spruce and balsam fir in the East. It inhabits areas where dead timber remains after fires or logging. It

is found less frequently in mixed forest, and occasionally in willow thickets along streams. Also found in high elevation aspen groves, bogs, and swamps.

In the west, they occur in dense coniferous forests, and are associated with subalpine fir and Engelmann spruce at higher elevations; they occur mainly in lodgepole pine forests or in mixed-conifer forests with a lodgepole component at lower elevations (Short 1982). Seem to prefer disturbed coniferous forests with trees that exhibit thin, flaky bark such as spruce and lodgepole pine.

Adult Food Habits: Invertivore
Immature Food Habits: Invertivore
Food Comments: Eats mainly insects obtained by chipping off pieces of tree bark. Seventy-five percent of its diet consists of wood-boring beetles and caterpillars that attack dead or dying conifers (Oatman 1985). It eats a few ants, weevils, spiders, berries, acorns, cambium, and sap (Terres 1980). This woodpecker taps softly when feeding, and generally uses an angular bill motion to strip or flake bark pieces from conifers. In Vermont, birds have been seen tapping straight into the wood (Oatman 1985). Forages most often on dead (including fire-killed) trees.
Adult Phenology: Diurnal
Immature Phenology: Diurnal
Phenology Comments: Diurnal.
Length: 22 centimeters
Weight: 70 grams

Economic Attributes

Economic Comments: May contribute to control of spruce bark beetle, a major food during epidemics (Spahr et al. 1991).

Management Summary

Stewardship Overview: The three-toed woodpecker inhabits boreal forests. In some areas (Colorado, Montana, and British Columbia), there is enough potential habitat available for this species. In areas where this woodpecker is rare (Vermont, New Hampshire, Arizona, Utah and New York), protection of its habitat is required.
Restoration Potential: Populations can be maintained if suitable habitat is available.
Management Requirements: Management that provides for leaving stands of standing or fallen dead wood in boreal forests will be beneficial. Also, leaving downed wood after fire or disease outbreaks may benefit this species. In areas where this woodpecker is rare (Vermont, New Hampshire, Arizona, Utah and New York), regulating the harvesting of boreal forests would be beneficial.
Monitoring Requirements: Fairly secure and monitoring may only be necessary every few years. In areas where this woodpecker is especially rare, monitoring every year may help detect declines; however, because populations tend to irrupt, long-term data is necessary to clearly detect trends.
Management Research Needs: Determine compatible forest management practices. Research on whether these birds may respond to playbacks of taped calls.
Biological Research Needs: The paucity of data from North American populations makes this species an ideal candidate for further study. Demographic studies across different habitat types and subspecies is a research priority (Leonard 2001). Studies that clarify the response of this species to fire (of varying intensities), insect outbreaks, and different logging practices would be valuable (Hutto 1995b, Murphy and Lehnhausen 1998, Leonard 2001).

Population/Occurrence Delineation

Group Name: WOODPECKERS

Use Class: Breeding
Minimum Criteria for an Occurrence: Evidence of historical breeding, or current and likely recurring breeding, at a given location, minimally a reliable observation of one or more breeding pairs in appropriate habitat. Be cautious about creating EOs for observations that may represent single breeding events outside the normal breeding distribution.
Separation Barriers: None.
Separation Distance for Unsuitable Habitat: 5 km
Separation Distance for Suitable Habitat: 5 km
Separation Justification: The high potential for gene flow among populations of birds separated by fairly large distances makes it difficult to circumscribe occurrences on the basis of meaningful population units without occurrences becoming too large. Hence, a moderate, standardized separation distance has been adopted for woodpeckers; it should yield occurrences that are not too spatially expansive while also accounting for the likelihood of gene flow among populations within a few kilometers of each other.

Be careful not to separate a population's nesting areas and foraging areas as different occurrences; include them in the same occurrence even if they are more than 5 km apart.

Territories generally smaller than non-breeding home ranges. Territories/home ranges: Red-headed Woodpecker, summer territories 3.1-8.5 hectares (Venables and Collopy 1989), winter territories smaller (0.17 hectare to 1 hectare (Williams and Batzli 1979, Venables and Collopy 1989, Moskovits 1978); Lewis's Woodpecker, 1.0-6.0 hectares (Thomas et al. 1979); Golden-fronted Woodpecker, summer ranges larger than breeding territories, ranging from 15.4 to 41.7 hectares (average 24.9, Husak 1997); Gila Woodpecker, pair territories ranged from 4.45 to 10.0 hectares (n = 5) (Edwards and Schnell 2000); Nuttall's Woodpecker, about 65 hectares (0.8 kilometers diameter; Miller and Bock 1972); Hairy Woodpecker: breeding territories averaged 2.8 hectares, range 2.4 to 3.2 hectares (Lawrence 1967); Black-backed Woodpecker, home ranges 61-328 hectares (Goggans et al. 1988, Lisi 1988, Dixon and Saab 2000); White-headed Woodpecker, mean home ranges 104 and 212 hectares on old-growth sites and 321 and 342 hectares on fragmented sites (Dixon 1995a,b); Williamson's Sapsucker, home ranges 4-9 hectares (Crockett 1975).

Fidelity to breeding site: high in Red-headed Woodpeckers--15 of 45 banded adults returned to vicinity following year (Ingold 1991); one adult moved 1.04 kilometers between breeding seasons (Belson 1998).

Inferred Minimum Extent of Habitat Use (when actual extent is unknown): .2 km
Inferred Minimum Extent Justification: Based on a conservatively small home range of 3 hectares.
Date: 10Sep2004
Author: Cannings, S., and G. Hammerson

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank) Not yet assessed

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 26Nov2002
NatureServe Conservation Status Factors Author: Van Dam, B., J. D. Soule, and G. Hammerson; revised by S. Cannings
Management Information Edition Date: 30Sep1993
Management Information Edition Author: VAN DAM, B.; REVISIONS BY J.D. SOULE, G. HAMMERSON, M. KOENEN, AND D.W. MEHLMAN
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Element Ecology & Life History Edition Date: 13May1996
Element Ecology & Life History Author(s): Hammerson, G.

Zoological data developed by NatureServe and its network of natural heritage programs (see **Local Programs**) and other contributors and cooperators (see **Sources**).

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Note: This report was printed on **May 1, 2012**

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Patterson, B.D., G. Ceballos, W. Sechrest, M.F. Tognelli, T. Brooks, L. Luna, P. Ortega, I. Salazar, and B.E. Young. 2003. Digital Distribution Maps of the Mammals of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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NOTE: Full metadata for the Bird Range Maps of North America is available at:
http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

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NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Somatochlora brevicincta - Robert, 1954
Quebec Emerald

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Related ITIS Name(s): *Somatochlora brevicincta* Robert, 1954 (TSN 101964)
Unique Identifier: ELEMENT_GLOBAL.2.107406
Element Code: IIODO32020
Informal Taxonomy: Animals, Invertebrates - Insects - Dragonflies and Damselflies

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Mandibulata	Insecta	Odonata	Corduliidae	Somatochlora

Genus Size: D - Medium to large genus (21+ species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: Paulson, D.R. and S.W. Dunkle. 1999. A Checklist of North American Odonata. Slater Museum of Natural History, University of Puget Sound Occasional Paper, 56: 86 pp. Available: http://www.ups.edu/x7015.xml. Updated: November 2008.
Concept Reference Code: A99PAU01EHUS
Name Used in Concept Reference: *Somatochlora brevicincta*

Conservation Status

NatureServe Status

Global Status: G4
Global Status Last Reviewed: 22Aug2006
Global Status Last Changed: 22Aug2006
Rounded Global Status: G4 - Apparently Secure
Reasons: More widespread than previously thought. The range of this species has been greatly extended into the Maritime Provinces and its habitat is not rare within this large range. It has also recently extended into the U.S.
Nation: United States
National Status: N2 (04Nov2004)
Nation: Canada
National Status: N3N4 (14Jan2012)

U.S. & Canada State/Province Status	
United States	Maine (S2), Minnesota (SNR)
Canada	British Columbia (S3), New Brunswick (S2), Newfoundland Island (SU), Nova Scotia (S1), Quebec (S3)

Other Statuses

IUCN Red List Category: VU - Vulnerable

NatureServe Global Conservation Status Factors

Range Extent: 20,000-2,500,000 square km (about 8000-1,000,000 square miles)
Range Extent Comments: Known from eastern Canada (Quebec, New Brunswick, Nova Scotia, Newfoundland), northern Maine, and a western population in British Columbia. Recently discovered in Minnesota.

Number of Occurrences: 6 - 20
Number of Occurrences Comments: Known from eastern Canada (Quebec, New Brunswick, Nova Scotia, Newfoundland), northern Maine, and a western population in British Columbia. Recently a breeding population was discovered in Minnesota in Lake Co. just south of the Canadian border (Tveekrem, 2006).

Population Size: 1000 - 2500 individuals

Overall Threat Impact Comments: Current threats appear minor over much of the species' range. Potential threats of habitat degradation are secondary impacts from harvesting of peatmoss and fuel peat, and cranberry farming, and primary impacts from broadcast toxic pollution, and water level alteration leading to inundation or dessication of the habitat.

Intrinsic Vulnerability Comments: Given the high vagility of the species (estimated 5 kilometers (3 miles) per day) and the prevalence of suitable habitat over much of its range, the species' overall population is not considered fragile. Localized extirpations would likely be re-inhabited very shortly (less than 2 years) after habitat recovery.

Short-term Trend: Relatively stable (=10% change)
Short-term Trend Comments: No abundance changes not attributable to flight season have been noted.

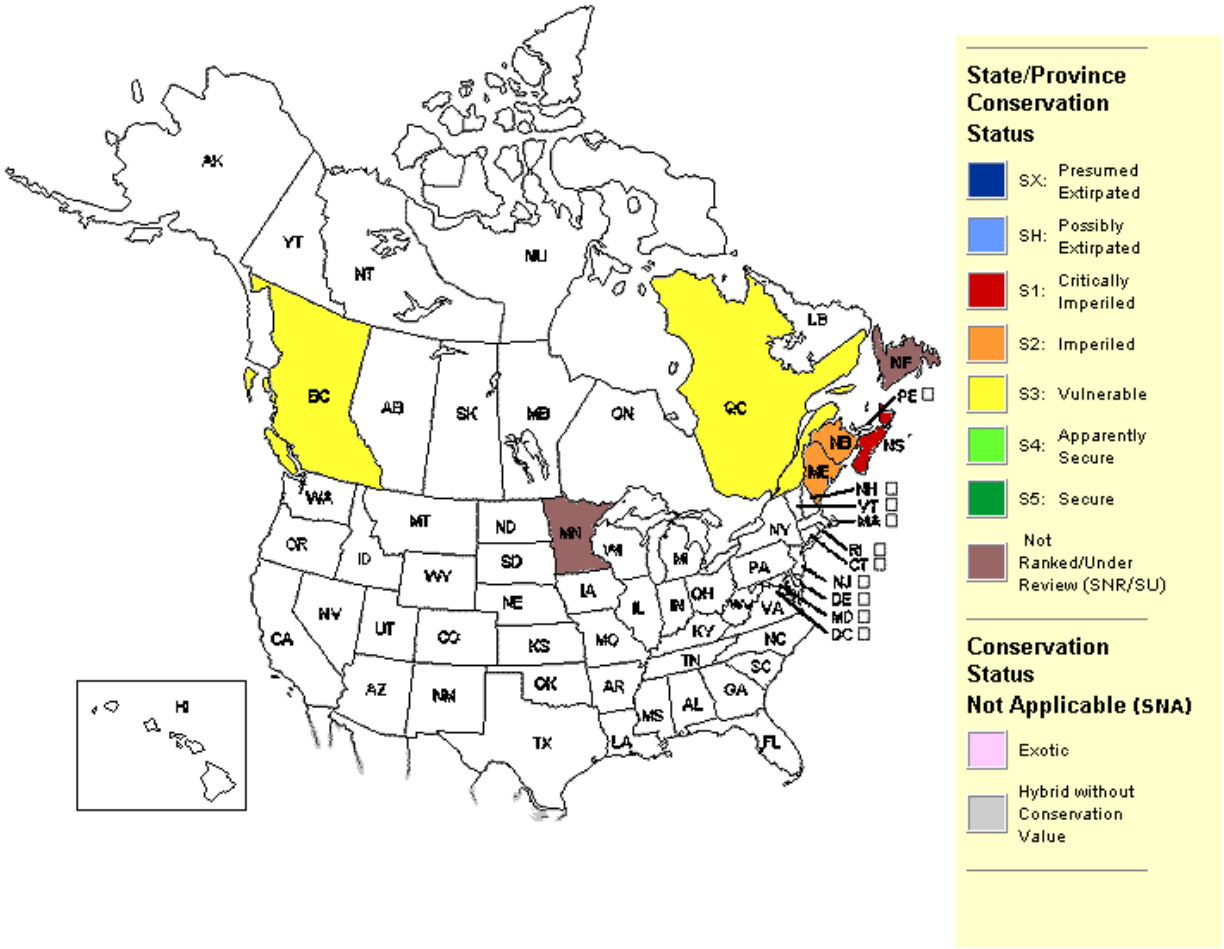
Other NatureServe Conservation Status Information

Inventory Needs: Survey for adults of the species within and peripheral to its current known range, Cape Breton Island (Nova Scotia) in the east, Maine and the rest of northern New England to the south as far as upstate New York. Also Michigan and Wisconsin.

Distribution

Global Range: (20,000-2,500,000 square km (about 8000-1,000,000 square miles)) Known from eastern Canada (Quebec, New Brunswick, Nova Scotia, Newfoundland), northern Maine, and a western population in British Columbia. Recently discovered in Minnesota.

U.S. States and Canadian Provinces



Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	ME, MN
Canada	BC, NB, NF, NS, QC

Range Map
No map available.

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
ME	Aroostook (23003), Penobscot (23019), Piscataquis (23021), Somerset (23025)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
01	Upper St. John (01010001)+, Allagash (01010002)+, West Branch Penobscot (01020001)+, East Branch Penobscot (01020002)+, Mattawamkeag (01020003)+, Lower Penobscot (01020005)+, Upper Kennebec (01030001)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A moderate sized dragonfly, its thorax metallic green with one lateral light stripe, the dorsal abdomen black.
General Description: Metallic brown with eyes bright green in life. Larva unknown.
Diagnostic Characteristics: Very like S. ALBICINTA, but male hamule curved and not bent, male cerci with 1 lateral angle at base instead of 2, female subgenital plate as long as abdominal segment 9 and not notched (1/2 as long and notched in ALBICINTA). (Walker & Corbet, 1975)
Non-Migrant: N
Locally Migrant: N
Long Distance Migrant: N
Palustrine Habitat(s): Bog/fen
Habitat Comments: Lentic. Habitat is predominantly bogs, fens, and heaths.

The microhabitat (sub-EO) is water-suspended or water-saturated SPHAGNUM ("quaking bog" and "moss lawn") whether or not associated with open water, and typically showing graminaceous emergents indicating weak minerotrophism.

Eggs are laid outside plant tissues on the moss or adjacent water surface, with the larvae likely living within the saturated moss itself rather than on its interface with open water. The species has not been observed at open-water peatland ponds. Landforms in which the habitat can develop will generally be of bedrock or surficial deposits with little mineralizing potential and be of some relief as the habitat is dependent for its weak mineralization upon short or isolated catchments. However these habitats may also form adjacent to or within peat bogs or heaths which can form in low relief areas.
Adult Food Habits: Invertivore
Immature Food Habits: Invertivore
Adult Phenology: Diurnal
Phenology Comments: Larvae must overwinter, life cycle probably at least 2 years, flight season mid July to early September.
Length: 5 centimeters

Economic Attributes

Not yet assessed

Management Summary

Biological Research Needs: The larvae of this species must be described, and a clearer definition of its habitat preferences arrived at and disseminated.

Population/Occurrence Delineation

Group Name: POND-BREEDING ODONATES

Use Class: Not applicable
Minimum Criteria for an Occurrence: Occurrences are based on some evidence of historical or current presence of single or multiple specimens ideally with evidence of on-site breeding (teneral adults, mating pairs, territorial males, ovipositing females, larvae, or exuviae) at a given location with potential breeding habitat. Although oviposition may not necessarily yield progeny that survive to adulthood (Fincke, 1992) and movements resembling oviposition may not necessarily result in egg deposition (Okazawa and Ubukata, 1978; Martens, 1992; 1994), presence of on-site oviposition is here accepted as an indicator of a minimum element occurrence because the time and effort involved in determining success of emergence is beyond the scope of the general survey. As adults of some species might disperse moderate distances (see below), only sites with available larval habitat can be considered appropriate for a minimum occurrence. Single, non-breeding adults captured away from potential suitable breeding habitat should not be treated as element

occurrences. Evidence is derived from reliable published observation or collection data; unpublished, though documented (i.e. government or agency reports, web sites, etc.) observation or collection data; or museum specimen information. A photograph may be accepted as documentation of an element occurrence for adults only (nymphs and subimagos are too difficult to identify in this manner) provided that the photograph shows diagnostic features that clearly delineate the species from other species with similar features. Sight records, though valuable, should not be accepted as the basis for new element occurrences. Instead, such records should be utilized to further study an area to verify the element occurrence in that area.
Separation Barriers: Within catchments there are likely no significant barriers to movement of sexually mature adults between microhabitats, with even extensive sections of inappropriate waterway or major obstructions to flow being readily traversed by adults within the flight season.

Separation Distance for Unsuitable Habitat: 3 km

Separation Distance for Suitable Habitat: 3 km
Separation Justification: Adults odonates are known to wander, some over great distances (not so for damselflies). Mass migration over great distances is not herein considered when drafting separation distances as such behavior is limited to few species (e.g. *Anax junius*, *Libellula quadrimaculata*, other *Libellula* spp., *Sympetrum* spp.), occurs unpredictably and infrequently (10 year cycles for *L. quadrimaculata*), are unidirectional or intergenerational (Freeland et al., 2003), or occurs under unusual circumstances such as irritation by trematode parasites (Dumont and Hinnekint, 1973) or major weather events (Moskowitz et al., 2001; Russell et al., 1998).

Corbet (1999) estimated average distance traveled for a commuting flight (between reproductive and foraging sites) to be less than 200 m but sometimes greater than one km. Pond-breeding odonates may wander but generally stay within a few km of their emergence pond. At the species level, overall range (and dispsersal capability) tends to be larger than for lotic species possibly in response to greater instability of lentic versus lotic habitat over time (Hof et al., 2006). Distribution is often limited in response to presence or absence of predators (also dependent on habitat permanence) (McPeek, 1989; Stoks and McPeek, 2003a; 2003b). At night and during inclement weather, adult *Procordulia grayi* roosted at least one km away from the reproductive site (Rowe, 1987). Conrad et al. (1999) listed maximum dispersal distance of *Sympetrum sanguineum* at 1.2 km but at 800 m or less with high dispersal rate between ponds for other species (*Ischnura elegans*, *Coenagrion puella*, *C. pulchellum*, *Lestes sponsa*, *Enallagma cyathigerum*, and *Pyrrhosoma nymphalis*). Michiels and Dhondt (1991) cited dispersal distance of *Sympetrum donae* in Belgium at greater than 1.75 km and most mature adults immigrated away from the emergence site. Moore (1986) cited several species of *Enallagma* as dispersing 2.7 km and found no colonization of artificial acid water ponds in eastern England constructed at least 5 km from colonized natural ponds in 12 consecutive years (single introduced population of *Ceriagrion tenellum* not surviving past the second generation). Purse et al. (2003) found mature adults of the rare European damselfly, *Coenagrion mercuriale*, had a low rate of movement within continuous habitat (< 25 m), low emigration rates (1.3 to 11.4%), and low colonization distances (max. 1 km), comparable to other similarly sized coenagrionids.

Even within genera, however, differences in dispersal patterns may exist. McPeek (1989) found the mechanisms causing *Enallagma* movements between Michigan lakes were due to propensity to leave natal lakes, not active selection of different habitats (e.g. lakes with fish, without fish, or winterkill lakes with fish part-year). With the exception of winterkill lake species (*Enallagma ebrium*), species in lakes with fish (*E. geminatum*, *E. hageni*) and fishless lake species (*E. boreale*, *E. cyathigerum*), moved little or not at all away from natal lakes; even those less than 10 m apart. Natural selection may favor remaining at natal lakes where ecological conditions are constant and dispersal costs (i.e. mortality) high (McPeek, 1989). Uncharacteristic movement of *E. ebrium* away from natal lakes is explained by recolonization of lakes in which populations have been reduced or eliminated and reproducing when winterkill of fish populations changes a lake to the fishless condition.

Considering the above tendency for pond breeding odonates to remain at or near (order of hundreds of meters) natal emergence sites, separation distance has been set at 3 km.

Inferred Minimum Extent of Habitat Use (when actual extent is unknown): .5 km
Inferred Minimum Extent Justification: The few studies determining area of adult foraging habitat surrounding breeding sites have indicated a range of 30 meters to 300 meters [see Briggs (1993) for *Enallagma laterale*; Corbet (1999) for *Nesciothemis nigeriensis* and *Calopteryx haemorrhoidalis*; Beukeman (2002) for *Calopteryx haemorrhoidalis*; and Samways and Steytler (1996) for *Chorolestes tessalatus*]. As a result, an element occurrence should include the breeding site and surrounding pond or upland habitat extending 500 m in a radius from the breeding site.
Date: 12Feb2007
Author: Cordeiro, J.

Population/Occurrence Viability

Justification: Use the Generic Element Occurrence Rank Specifications (2008).
Key for Ranking Species Element Occurrences Using the Generic Approach (2008).

U.S. Invasive Species Impact Rank (I-Rank)

Not yet assessed

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 22Aug2006
NatureServe Conservation Status Factors Author: Brunelle, P.M.; Morrison, M.; Capuano, N.
Element Ecology & Life History Edition Date: 17Jan1991
Element Ecology & Life History Author(s): DUNKLE, S. W.

Zoological data developed by NatureServe and its network of natural heritage programs (see Local Programs) and other contributors and cooperators (see Sources).

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Note: All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of **February 2012**.
Note: This report was printed on **May 1, 2012**

Citation for data on website including State Distribution, Watershed, and Reptile Range maps:
NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 1, 2012).

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NOTE: Full metadata for the Bird Range Maps of North America is available at:
http://www.natureserve.org/library/birdDistributionmapsmetadatav1.pdf.

Full metadata for the Mammal Range Maps of North America is available at:
http://www.natureserve.org/library/mammalsDistributionmetadatav1.pdf.


NatureServe

Version 7.1 (2 February 2009)
Data last updated: February 2012

Williamsonia fletcheri - Williamson, 1923
Ebony Boghaunter

Google
Search for Images on Google

Related ITIS Name(s): *Williamsonia fletcheri* Williamson, 1923 (TSN 101829)
Unique Identifier: ELEMENT_GLOBAL.2.114486
Element Code: IIODO34010
Informal Taxonomy: Animals, Invertebrates - Insects - Dragonflies and Damselflies

Kingdom	Phylum	Class	Order	Family	Genus
Animalia	Mandibulata	Insecta	Odonata	Corduliidae	Williamsonia

Genus Size: B - Very small genus (2-5 species)

Check this box to expand all report sections: ☑

Concept Reference

Concept Reference: Paulson, D.R. and S.W. Dunkle. 1999. A Checklist of North American Odonata. Slater Museum of Natural History, University of Puget Sound Occasional Paper, 56: 86 pp. Available: http://www.ups.edu/x7015.xml. Updated: November 2008.
Concept Reference Code: A99PAU01EHUS
Name Used in Concept Reference: *Williamsonia fletcheri*

Conservation Status

NatureServe Status

Global Status: G4
Global Status Last Reviewed: 28Nov2006
Global Status Last Changed: 24Mar2005
Rounded Global Status: G4 - Apparently Secure
Reasons: At least 100 known occurrences, however it has a large enough range and common (albeit increasingly threatened) habitat so there is a high probability more populations will be located.
Nation: United States
National Status: N4 (24Mar2005)
Nation: Canada
National Status: N3 (15Jan2012)

U.S. & Canada State/Province Status	
United States	Maine (S3), Massachusetts (S2), Michigan (S1S2), New Hampshire (S3), New York (S1), Vermont (S1S2), Wisconsin (S3S4)
Canada	Manitoba (S1), New Brunswick (S3), Nova Scotia (S1), Ontario (S2), Quebec (S2S3), Saskatchewan (SNR)

Other Statuses

NatureServe Global Conservation Status Factors

Range Extent: >2,500,000 square km (greater than 1,000,000 square miles)
Range Extent Comments: Known from widely separated bogs from Nova Scotia west to Manitoba; also Maine, Massachusetts, New York, Michigan and Wisconsin (Walker and Corbet 1975, Needham and Westfall 1955, Brunelle 1997, Ross and O'Brien 1999; Ward and deMaynadier, 2005).

Number of Occurrences: 81 - 300

Number of Occurrences Comments: Based on inventory data from the Acadian Region, Ontario, Michigan, Wisonsin, New York and Massachusetts, there could be as many as 84 occurrences in these states/provinces. This number is likely an underestimate when you consider the area that has yet to be inventoried, especially in Canada. Ward and deMaynadier (2005) collected this species at 18 sites throughout Maine.

Population Size: 2500 - 100,000 individuals

Overall Threat Impact: High - medium
Overall Threat Impact Comments: Potential threats of habitat degradation are secondary impacts from harvesting of peatmoss and fuel peat, and cranberry farming, and primary impacts from broadcast toxic pollution, and water level alteration leading to inundation or dessication of the habitat. Canadian populations apparently secure; ones in U.S. subject to development/logging/peat mining in future.

Intrinsic Vulnerability Comments: Given the high vagility of the species (estimated 2 kilometers (1.2 miles) per day through forests) and the prevalence of suitable habitat over much of its range, the species' overall population is not considered fragile. Localized extirpations would likely be re-inhabited very shortly (less than 2 years) after habitat recovery.

Short-term Trend: Relatively stable (=10% change)
Short-term Trend Comments: No abundance changes not attributable to flight season have been noted.

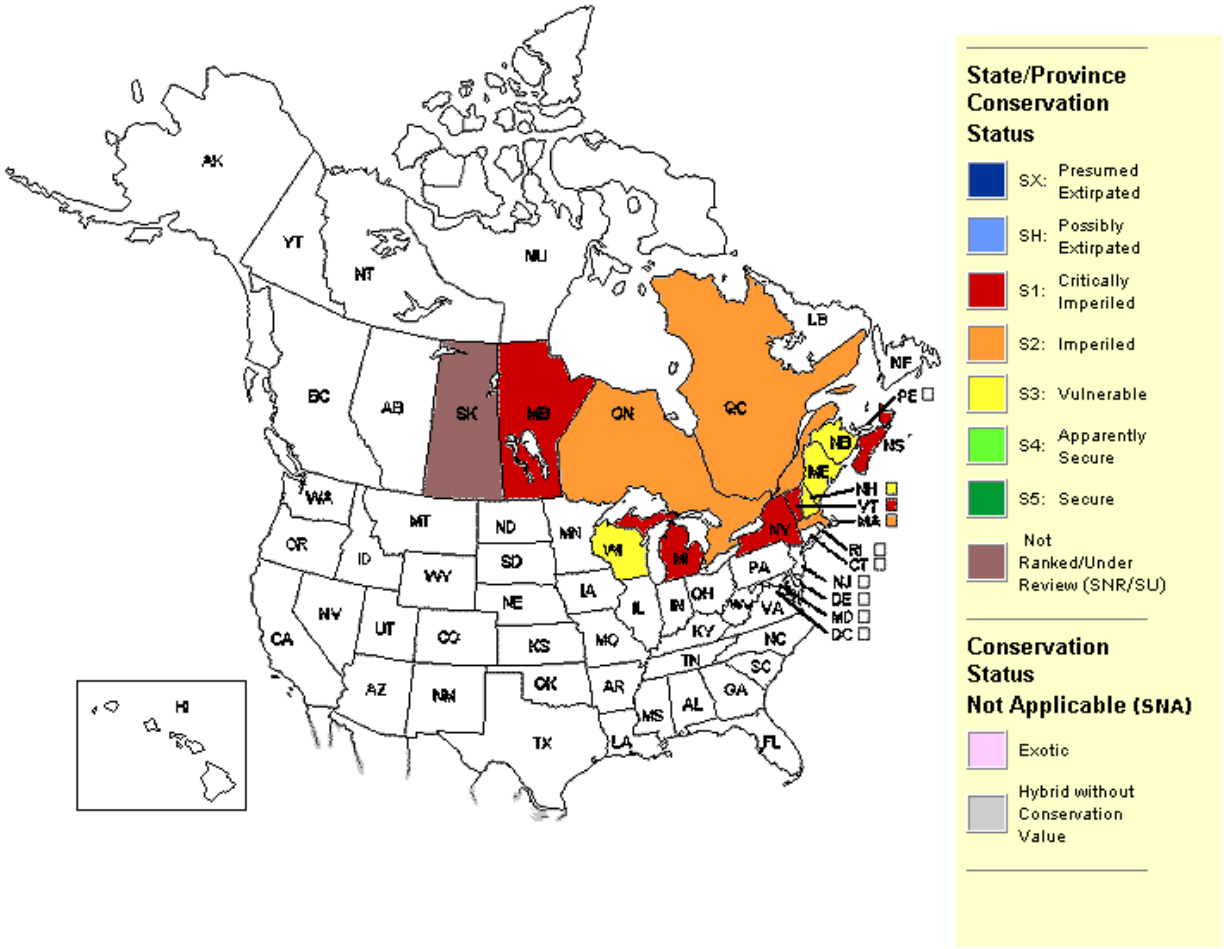
Long-term Trend: Unknown

Other NatureServe Conservation Status Information

Distribution

Global Range: (>2,500,000 square km (greater than 1,000,000 square miles)) Known from widely separated bogs from Nova Scotia west to Manitoba; also Maine, Massachusetts, New York, Michigan and Wisconsin (Walker and Corbet 1975, Needham and Westfall 1955, Brunelle 1997, Ross and O'Brien 1999; Ward and deMaynadier, 2005).

U.S. States and Canadian Provinces



Endemism: occurs (regularly, as a native taxon) in multiple nations

U.S. & Canada State/Province Distribution	
United States	MA, ME, MI, NH, NY, VT, WI
Canada	MB, NB, NS, ON, QC, SK

Range Map
No map available.

Natural heritage records exist for the following U.S. counties	
State	**County Name (FIPS Code)**
MA	Franklin (25011), Middlesex (25017)*, Worcester (25027)
ME	Hancock (23009)*, Knox (23013), Oxford (23017), Piscataquis (23021), Waldo (23027), Washington (23029), York (23031)
MI	Chippewa (26033), Delta (26041), Grand Traverse (26055), Luce (26095), Mecosta (26107), Menominee (26109), Schoolcraft (26153)*
NH	Carroll (33003), Rockingham (33015)
NY	Broome (36007)*, Franklin (36033), Jefferson (36045)
VT	Bennington (50003), Orange (50017), Washington (50023)

* Extirpated/possibly extirpated

U.S. Distribution by Watershed (based on available natural heritage records)	
Watershed Region	**Watershed Name (Watershed Code)**
01	Piscataquis (01020004)+, Upper Kennebec (01030001)+, Upper Androscoggin (01040001)+, St. Croix (01050001)+, Maine Coastal (01050002)+, St. George-Sheepscot (01050003)+, Presumpscot (01060001)+, Saco (01060002)+, Piscataqua-Salmon Falls (01060003)+, Nashua (01070004)+, Merrimack (01070006)+, Upper Connecticut-Mascoma (01080104)+, Middle Connecticut (01080201)+, Miller (01080202)+, Chicopee (01080204)+
02	Hudson-Hoosic (02020003)+, Chenango (02050102)+
04	Betsy-Chocolay (04020201)+, Menominee (04030108)+, Tacoosh-Whitefish (04030111)+, Fishdam-Sturgeon (04030112)+, Betsie-Platte (04060104)+, Boardman-Charlevoix (04060105)+, Manistique (04060106)+, Brevoort-Millecoquins (04060107)+, Carp-Pine (04070002)+, Pine (04080202)+, Chaumont-Perch (04150102)+, Raquette (04150305)+, St. Regis (04150306)+, Winooski River (04150403)+, Saranac River (04150406)+

+ Natural heritage record(s) exist for this watershed
* Extirpated/possibly extirpated

Ecology & Life History

Basic Description: A very small sized, slim, spring-flying dragonfly of bogs and fens, its abdomen totally black.
General Description: A small black dragonfly with white bands at the posterior ends of abdominal segments 2-4, male eyes bright green in life. Larva unknown.
Diagnostic Characteristics: Size and coloration distinctive. (Needham & Westfall, 1955; Walker & Corbet, 1975)
Reproduction Comments: TEST
Non-Migrant: N
Locally Migrant: N
Long Distance Migrant: N
Mobility and Migration Comments: Adults probably seldom go far from breeding sites.
Palustrine Habitat(s): Bog/fen
Habitat Comments: Lentic. Habitat is bogs and fens. The microhabitat (sub-EO) is water-suspended or water-saturated SPHAGNUM ("quaking bog" and "moss lawn") whether or not associated with open water.

Eggs are laid outside plant tissues on the moss or adjacent water surface, with the larvae likely living within the saturated moss itself rather than on its interface with open water. Landforms in which these small bogs and fens can develop will generally be of bedrock or surficial deposits with little mineralizing potential and be of some relief as the habitat is dependent for its weak mineralization upon short or isolated catchments. However these habitats may also form adjacent to peat bogs which form in low relief areas. As the adult male territorial arenas are sun-lit clearing in forest surrounding the laying habitat it is possible but unproven that forest clearing or fragmentation may deleteriously effect the viability of an EO.
Adult Food Habits: Invertivore
Immature Food Habits: Invertivore
Adult Phenology: Diurnal
Phenology Comments: Larvae must overwinter, flight season mid May to early July.
Length: 3.5 centimeters

Economic Attributes

Not yet assessed

Not yet assessed

Management Summary **Not yet assessed**

Population/Occurrence Delineation

Group Name: POND-BREEDING ODONATES

Use Class: Not applicable
Minimum Criteria for an Occurrence: Occurrences are based on some evidence of historical or current presence of single or multiple specimens ideally with evidence of on-site breeding (teneral adults, mating pairs, territorial males, ovipositing females, larvae, or exuviae) at a given location with potential breeding habitat. Although oviposition may not necessarily yield progeny that survive to adulthood (Fincke, 1992) and movements resembling oviposition may not necessarily result in egg deposition (Okazawa and Ubukata, 1978; Martens, 1992; 1994), presence of on-site oviposition is here accepted as an indicator of a minimum element occurrence because the time and effort involved in determining success of emergence is beyond the scope of the general survey. As adults of some species might disperse moderate distances (see below), only sites with available larval habitat can be considered appropriate for a minimum occurrence. Single, non-breeding adults captured away from potential suitable breeding habitat should not be treated as element occurrences. Evidence is derived from reliable published observation or collection data; unpublished, though documented (i.e. government or agency reports, web sites, etc.) observation or collection data; or museum specimen information. A photograph may be accepted as documentation of an element occurrence for adults only (nymphs and subimagos are too difficult to identify in this manner) provided that the photograph shows diagnostic features that clearly delineate the species from other species with similar features. Sight records, though valuable, should not be accepted as the basis for new element occurrences. Instead, such records should be utilized to further study an area to verify the element occurrence in that area.
Separation Barriers: Within catchments there are likely no significant barriers to movement of sexually mature adults between microhabitats, with even extensive sections of inappropriate waterway or major obstructions to flow being readily traversed by adults within the flight season.
Separation Distance for Unsuitable Habitat: 3 km
Separation Distance for Suitable Habitat: 3 km
Separation Justification: Adults odonates are known to wander, some over great distances (not so for damselflies). Mass migration over great distances is not herein considered when drafting separation distances as such behavior is limited to few species (e.g. *Anax junius*, *Libellula quadrimaculata*, other *Libellula* spp., *Sympetrum* spp.), occurs unpredictably and infrequently (10 year cycles for *L. quadrimaculata*), are unidirectional or intergenerational (Freeland et al., 2003), or occurs under unusual circumstances such as irritation by trematode parasites (Dumont and Hinnekint, 1973) or major weather events (Moskowitz et al., 2001; Russell et al., 1998).

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Inferred Minimum Extent Justification: The few studies determining area of adult foraging habitat surrounding breeding sites have indicated a range of 30 meters to 300 meters [see Briggs (1993) for *Enallagma laterale*; Corbet (1999) for *Nesciothemis nigeriensis* and *Calopteryx haemorrhoidalis*; Beukeman (2002) for *Calopteryx haemorrhoidalis*; and Samways and Steytler (1996) for *Chorolestes tessalatus*]. As a result, an element occurrence should include the breeding site and surrounding pond or upland habitat extending 500 m in a radius from the breeding site.
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Author: Cordeiro, J.

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Justification: **Use the Generic Element Occurrence Rank Specifications (2008).**
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U.S. Invasive Species Impact Rank (I-Rank) **Not yet assessed**

Authors/Contributors

NatureServe Conservation Status Factors Edition Date: 24Mar2005
NatureServe Conservation Status Factors Author: Cordeiro, J. (2005); Shiffer, C.N. (2001); and Schweitzer, D.F. (1992)
Element Ecology & Life History Edition Date: 09Nov1994
Element Ecology & Life History Author(s): JD

Zoological data developed by NatureServe and its network of natural heritage programs (see **Local Programs**) and other contributors and cooperators (see **Sources**).

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Note: This report was printed on **May 1, 2012**

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