

# Rodents of Eastern North America

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## Habitat and species diversity

The Eastern North America Region as defined by the IUCN/SSC Rodent Specialist Group, includes the six eastern Canadian provinces of Quebec, Ontario, Prince Edward Island, Nova Scotia, New Brunswick, and Newfoundland (including Labrador), the 31 eastern U.S. states and the District of Columbia west to (and including) Minnesota, Iowa, Missouri, Arkansas, and Louisiana (Fig. 4.1). Most of the region of about 6.4 million km<sup>2</sup> is characterized by large tracts of relatively uniform climate

and topography. Historically this was reflected in the large, continuous tracts of natural vegetation, ranging from evergreen forests in the north to mixed deciduous and evergreen forests in the south (Küchler 1970). Mammals of the region follow a similar pattern: the region includes only seven mammal provinces, all of which are distributed as broad east-west bands (Hagmeier 1966). Only the Florida Peninsula once possessed the patchy distribution of diverse natural vegetation that is so common in western North America: pockets of pine and bald cypress forests alternated with extensive saw grass and marsh grass over much of the



**Figure 4.1.** Eastern North America Rodent Specialist Group Region, which includes eastern provinces of Canada and eastern states of the United States.

**Table 4.1. Rodents of conservation concern in the Eastern Region.**

Species that are widespread and secure throughout most of their range, but have subspecies of conservation concern in this region, are considered to be of Lower Risk and least concern, and are listed as LR(lc). Status codes are defined in Appendix 2.

	Historical distribution	Red List Category	Species Account (p.)
<b>SCIURIDAE</b>			
<i>Glaucomys sabrinus</i>	USA, Canada	LR(lc)	37
<i>G. s. coloratus</i>	USA: NC,TN,VA	VU:A2c;B1;B2c	
<i>G. s. fuscus</i>	USA: VA,WV	VU:A2c;B1;B2c	
<i>Sciurus niger</i>	USA, Canada, Mexico	LR(lc)	41
<i>S. n. avicennia</i>	USA: FL	LR(cd)	
<i>S. n. cinereus</i>	USA: DE,MD,PA	LR(cd)	
<i>S. n. shermani</i>	USA: FL	LR(nt)	
<i>S. n. vulpinus</i>	USA: CT,MD,NJ,NY,PA,VA,WV	DD	
<b>GEOMYIDAE</b>			
<i>Geomys pinetis</i>	USA: AL,FL,GA	LR(lc)	61
<i>G. p. colonus</i>	USA: GA	LR(nt)	
<i>G. p. cumberlandius</i>	USA: GA	VU:D2	
<i>G. p. fontanelus</i>	USA: GA	VU:D2	
<i>G. p. goffi</i>	USA: FL	EX	
<b>MURIDAE</b>			
<i>Clethrionomys gapperi</i>	USA, Canada	LR(lc)	87
<i>C. g. maurus</i>	USA: KY	LR(nt)	
<i>Microtus breweri</i>	USA: MA	LR(nt)	90
<i>Microtus chrotorrhinus</i>	USA, Canada	LR(lc)	
<i>M. c. carolinensis</i>	USA: NC,TN,VA,WV	LR(nt)	92
<i>M. c. rarus</i>	Canada: LB	DD	
<i>Microtus pennsylvanicus</i>	USA, Canada	LR(lc)	99
<i>M. p. dukecampbelli</i>	USA: FL	VU:D2	
<i>M. p. proVectus</i>	USA: RI	LR(nt)	
<i>M. p. shattucki</i>	USA: ME	LR(nt)	
<i>Neofiber alleni</i>	USA: FL,GA	LR(nt)	
<i>Neotoma floridana</i>	USA	LR(lc)	102
<i>N. f. haematoreaia</i>	USA: GA,NC,SC	LR(nt)	
<i>N. f. smalli</i>	USA: FL	EN:B2c;C2b	
<i>Neotoma magister</i>	USA: AL,CT,GA,IL,IN,KY,MD,NC,NY,OH,PA,TN,VA,WV	LR(nt)	105
<i>Oryzomys palustris</i>	USA, Mexico	LR(lc)	
<i>O. p. natator</i>	USA: FL	DD	108
<i>Peromyscus gossypinus</i>	USA	LR(lc)	
<i>P. g. allapaticola</i>	USA: FL	VU:D2	
<i>P. g. restrictus</i>	USA: FL	EX	109
<i>Peromyscus leucopus</i>	USA, Canada, Mexico	LR(lc)	
<i>P. l. ammodytes</i>	USA: MA	DD	110
<i>Peromyscus polionotus</i>	USA: AL,FL,GA,MS,SC	LR(lc)	
<i>P. p. alloparys</i>	USA: FL	EN:B1;B2c	
<i>P. p. ammobates</i>	USA: AL	EN:B1;B2c	
<i>P. p. decoloratus</i>	USA: FL	EX	
<i>P. p. leucocephalus</i>	USA: FL	LR(nt)	
<i>P. p. niveiventris</i>	USA: FL	LR(nt)	
<i>P. p. peninsularis</i>	USA: FL	EN:B1;B2c	
<i>P. p. phasma</i>	USA: FL	EN:B1;B2c	
<i>P. p. trissyllepsis</i>	USA: AL,FL	CR:B1;B2c	
<i>Podomys floridanus</i>	USA: FL	VU:A1a;A2d	
<i>Sigmodon hispidus</i>	USA, Mexico	LR(lc)	
<i>S. h. insulicola</i>	USA: FL	LR(nt)	118
<i>Synaptomys borealis</i>	USA, Canada	LR(lc)	
<i>S. b. sphagnicola</i>	USA: ME,NH Canada: PQ,NB	LR(nt)	

peninsula, while coastal environments ranged from pine or bald cypress forests and saltmarsh to coastal dunes and mangroves. However, the existing vegetation of the Eastern Region bears little resemblance to that viewed by the first European colonists. The extensive tracts of forests have been reduced to small, isolated stands, while farmland, cropland, and urban sprawl now cover much of the region.

In addition, introduced exotic species pose a major threat to native habitats: Florida (along with California) leads the continental United States, each with nearly 1000 species of invasive introduced species of plants (Vitousek *et al.* 1996).

Of the 44 species of rodents that occur in the Eastern Region, 17 (38.6%) are of concern in at least some portion of the region (Table 4.1). One-half of the 36 threatened

**Table 4.2. Rodent taxa of concern in the Eastern Region.**

“Species of concern” include only those that are of concern at the global level, and do not include those that are LR(lc). Numbers of taxa listed at the species level are indicated in boldface. Families are listed in order of their contribution to the North American rodent fauna.

Family	Total species (n)	IUCN Red List Category						
		EX	CR	EN	VU	LR(cd)	LR(nt)	DD
Muridae	25				<b>1</b>		<b>3</b>	
		2	1	5	2		9	3
Sciuridae	11							
					2	2	1	1
Heteromyidae	2							
Geomyidae	2							
		1			2		1	
Dipodidae	2							
Castoridae	1							
Erethizontidae	1							
Aplodontidae	0							
Totals	44				<b>1</b>		<b>3</b>	
		3	1	5	6	2	11	4

taxa are found in Florida, which has ten threatened species of rodents, including three subspecies that are believed to be extinct. Compared to the other North American regions, a higher proportion of the Eastern Region taxa of concern are in the more threatened Red List categories (Table 4.2). This probably reflects the longer history of urban and agricultural development of the Eastern Region.

## Eastern Canada

### Diversity and history of rodent faunas

Twenty-four native rodent species comprising 86 subspecies are currently found within the 3.1 million km<sup>2</sup> portion of Canada included in the Eastern Region (Peterson 1966, Banfield 1974). Two introduced species, the Norway rat (*Rattus norvegicus*) and house mouse (*Mus musculus*), are widespread commensals with humans in this region.

Two types of rodent faunas occur in eastern Canada. In southern Ontario, populations of typically Carolinian species occur at the northern limits of their geographic distributions. These include abundant populations of the eastern gray squirrel (*Sciurus carolinensis*) and white-footed mouse (*Peromyscus leucopus*), isolates of the eastern fox squirrel (*S. niger*) and woodland vole (*Microtus pinetorum*), and low densities of the southern flying squirrel (*Glaucomys volans*). The Maritime Provinces and the north are dominated by boreal rodents whose distributions often span the entire northern half of the continent. Typical members include the southern red-backed vole (*Clethrionomys gapperi*), deer mouse (*Peromyscus*

*maniculatus*), woodland jumping mouse (*Napaeozapus insignis*), red squirrel (*Tamiasciurus hudsonicus*), northern flying squirrel (*Glaucomys sabrinus*), and meadow vole (*Microtus pennsylvanicus*). The island of Newfoundland is distinct in having a single native rodent (*Microtus pennsylvanicus terraenovae*). Recently, however, other species (*Tamiasciurus hudsonicus*, *Peromyscus maniculatus*) have successfully colonized that island, or have been introduced (eastern chipmunk, *Tamias striatus*). Only one species of rodent, the Labrador collared lemming (*Dicrostonyx hudsonius*) has its entire geographic range within eastern Canada (Hall 1981).

Canada’s rodents occupy diverse landscapes that reflect the nation’s recent glacial history. Except for coastal refugia in what is now the Gulf of St. Lawrence, and possibly scattered mountain nunataks (e.g., the Torngat Mountains of Labrador, the Long Range Mountains of Newfoundland, the Shickshock Mountains on the Gaspé Peninsula, and in the highlands of Cape Breton Island), virtually all of eastern Canada was covered by the huge Laurentide ice sheet 18,000 years ago (Pielou 1991). Some areas in Quebec and Labrador have been free of continental glaciers for less than 7000 years. Many parts of eastern Canada, most notably the Hudson Bay Lowlands, are still in a state of isostatic rebound. Other glacial reminders include vast expanses of muskeg in the north and in Newfoundland, highly eroded mountain ranges, innumerable lakes and ponds, immense dried lake beds in northern Ontario, and underlying the predominant forest vegetation, a network of moraines, eskers, and glacial outwash (Pielou 1991).

### Major threats in Eastern Canada

The eastern Canadian distributions of all mammals are thus of relatively recent origin. Many species that now have disjunct distributions were sympatric only a few thousand years ago (Graham 1986). It is likely that extensive glacial refugia along the Atlantic coast (including the Grand Banks of Newfoundland, and the Sable Island and Georges Banks off Nova Scotia) harbored numerous species of northern rodents. Following the last glacial maximum, “coastal plains” on the currently submerged continental shelf existed as large isolated islands whose faunas may have been extirpated by rising sea levels (Pielou 1991). Many of the larger islands in the Gulf of St. Lawrence had no post-glacial connections to the mainland and must have been colonized by rodents crossing a salt water barrier (Cameron 1958). The most convincing evidence for this comes from the relatively low species diversity but high frequency of rodent subspecies recorded on these islands. Many of these rodent taxa are restricted in distribution and warrant continued vigilance to ensure their survival. None is currently threatened.

Elsewhere, most species and subspecies continue to occupy large geographic ranges. The survival and conservation of some of these taxa may be of local concern, or in the case of *Microtus chrotorrhinus* and *Glaucomys volans* in New Brunswick and Nova Scotia, of regional concern, but none is in imminent danger. Yet all are jeopardized, to some extent, by human activities. In the south, natural forest and wetland habitats have been largely displaced by agriculture and urban encroachment. In more northern areas, natural habitats continue to be modified and fragmented by extensive forestry, associated road networks, and energy transmission corridors. Large expanses of terrestrial habitats have either been flooded, or are under the threat of flooding, by massive hydro-electric power developments. Deciduous and mixed forests in the south are stressed by acid precipitation. Problems of atmospheric pollution are shared by the northern ecosystems, although to a lesser extent.

Even so, Canada is a pristine land by international standards. Natural communities of rodents are widespread throughout the boreal forests of Newfoundland and Labrador, Quebec, and Ontario. Tracts of northern wilderness, including arctic tundra, sub-arctic barrens, and taiga, remain in all three provinces. Mixed forests in the maritime provinces support reasonably diverse rodent assemblages, but the land has lost most of its wilderness character.

Rodent diversity is highest in the south where natural communities cling to isolated woodlots and parks. Many forest species, especially those of deciduous woodlands, now occur in only a fraction of their original abundance. Probabilities of continued survival for the members of these communities are lowest in the heavily populated agro-industrial corridor that runs from southern Ontario through southwestern Quebec. There is no cause for immediate alarm for specific taxa because most are widely distributed either farther north, or in the northern United States. Nevertheless, we should anticipate long-term indirect effects through the disruption of what are likely to be relatively simple food webs (Pimm 1991).

The ability to deal with conservation issues varies dramatically among political jurisdictions in Canada. Nationally, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determines the national status of wild species and subspecies. One rodent, *Glaucomys volans*, occurs on the 1990 COSEWIC list. Although listed as "vulnerable" in Canada, the majority of this species' range occurs in the eastern United States where it is abundant. Two Provinces, Ontario and Quebec, have conservation data centers sponsored by the Nature Conservancy of Canada. A current mammal atlas project in Ontario should help to update the status of all mammals in that province. Conservation activities in other provinces are much less developed. It should be noted, however, that the need for conservation in

much of Canada is less acute than it is in southern Ontario.

Fourteen taxa of eastern Canadian rodents were considered for inclusion in this report. These are *Castor canadensis michiganensis*, *Glaucomys sabrinus goodwini*, *Glaucomys volans volans*, *Marmota monax johnsoni*, *Microtus chrotorrhinus chrotorrhinus*, *M. c. ravidus*, *M. pennsylvanicus magdalenensis*, *Napaeozapus insignis gaspensis*, *Peromyscus leucopus caudatus*, *P. maniculatus anticostiensis*, *P. m. argentatus*, *P. m. eremus*, *P. m. plumbeus*, and *Synaptomys borealis sphagnicola*. Most of these taxa have relatively limited distributions in the region of the Gulf of St. Lawrence. The taxonomy of many of these taxa is debatable, and a careful re-evaluation of many rodent subspecies in eastern Canada is overdue. Most of the rodent subspecies in Labrador, for example, have not been re-evaluated since they were described at the turn of this century. We probably understand even less about the distribution and ecological associations of most rodents in the rest of northeastern Canada. After evaluating the above taxa in the context of threats to survival and the criteria employed for rodents of the eastern United States, only two were considered to be sufficiently threatened to warrant inclusion in this report. These are *M. c. ravidus* and *S. b. sphagnicola*, the rock vole and the northern bog lemming. The other taxa should not be ignored but warrant additional research to evaluate their taxonomic and survival status.

## Eastern United States

### Diversity and History of Rodent Faunas

Thirty-seven native species of rodents, including two monotypic species, and 151 subspecies occur in the United States portion of the Eastern Region. Of these, 32 subspecies representing 13 species plus four monotypic species were considered to be sufficiently of concern to warrant inclusion in this report. Represented are members of the following twelve genera: *Glaucomys*, *Sciurus*, *Geomys*, *Clethrionomys*, *Microtus*, *Neofiber*, *Neotoma*, *Oryzomys*, *Peromyscus*, *Podomys*, *Sigmodon*, and *Synaptomys*.

This region of the eastern United States has a land area of approximately 1.3 million km<sup>2</sup> and encompasses much of the temperate deciduous forest region of North America. Northern regions of New York and New England grade into the coniferous forest biome (Cox 1993). The western portion of the area includes ecotonal regions between the deciduous forest and prairie biomes. In the southeastern United States there are southern evergreen, subtropical, and mangrove forests. Average annual rainfall varies from approximately 60–200cm, and the altitude ranges from sea level to 2038m on Mt. Mitchell, North Carolina.

The northern one-third of the eastern United States was covered by glaciers as recently as 13,000 years ago (Pielou 1991). This included all of present-day New England and Michigan, virtually all of New York, Illinois, and Indiana, and northern portions of Pennsylvania and Ohio (Chapman and Sherman 1967). As is the case in eastern Canada, the mammalian fauna of this sub-region is thus of relatively recent origin. Only one of the eastern United States taxa included in this report, the Allegheny woodrat (*Neotoma magister*), has a range that includes this previously glaciated region.

### **Major threats in the eastern United States**

Threatened habitats for rodents within this region include fresh and salt water marshes, coastal dunes, barrier islands, coastal forests, and relict boreal coniferous forests in the higher elevations of the Appalachian Mountains. The importance of coastal islands is reflected

in the fact that 15 taxa of nine rodent species of conservation concern in the Eastern Region are restricted in distribution to islands along the Atlantic and Gulf coasts, nearly one-half of the threatened rodent taxa of the entire region.

Habitat degradation and loss are the principal threats to the rodent taxa of the eastern United States included in this report. Loss of habitat has occurred because of forest fragmentation (clearcutting), agriculture, suburban sprawl, wetland drainage, channelization of streams and rivers, pollution, and fire suppression. Of particular importance has been the extensive conversion of coastal habitats for vacation and retirement homes. Coastal areas are naturally unstable, and human development makes them even more so. Many of the rodent taxa included in this report are endemic, habitat specialists on coastal islands. In addition to habitat loss, competition for resources with other species, predation by larger animals, both domestic and wild, and exploitation in the form of hunting are other factors that can adversely affect rodent populations.