

ENGLAND ASSESSMENT

	Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
						Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate						
Erinaceomorpha	Hedgehog	<i>Erinaceus europaeus</i>	Native	LC	13.2	129,914	84,596	597,000	N/A	N/A	VU	A2b+3b+4b	B-D; LC; E:DD	A decline in GB hedgehog population size is inferred from an analysis of five citizen science occupancy studies (Roos et al. 2012). There was considerable inter-annual variation within each study, and also variation between them – annual declines ranged from a mean of 1.8% to 10.7% – but there was consistency in the direction of the effect. The authors inferred a decline of 40% in 10 years, which can be extrapolated to give a decline of 53% over three generations. However, the scale of this decline contrasts with another study which used non-systematic occupancy records from Biological Records Centres and adjusted for survey effort (Hof and Bright 2016). Here, a decline of between 5.0% and 7.5% was found for England over a 40 year period, which would mean a maximum decline of 2.5% over 3 generations. The Review of the Population and Conservation Status of British Mammals estimates a 73% reduction in absolute population size over 21 years (Mathews & Kubsasiewicz et al. 2018), equating to a 46% decline in 3 generations, but the authors caution that the current and historical estimates are both extremely unreliable. Given the conflict between these pieces of evidence, and the fact that comparison with Arnold (1993) provides no indication of a change in EOO, and there was no loss of AOO (based on hectads) between the two Mammal Atlas periods (1960-92 to 2000-16), the species is classified as VU under A2b+3b+4b, on the basis that a population decline of 46% (the median) is a reasonable inference, though it could be much higher or lower. It is noted that hectads are a coarse level of resolution for recording species presence, and the relationship between the decline in occupancy and population size change is unclear: rigorous data on abundance are urgently required. The lack of understanding of the mechanisms underlying current declines reduces the capacity for interventions, so it can be inferred that the declines will continue in the future. As EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , the species does not qualify under B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. Data were not summarised by country in Roos et al. (2012), and it is therefore assumed that the GB value applies to England.
Soricomorpha	Mole	<i>Talpa europaea</i>	Native	LC	N/A	129,901	62,420	24,300,000	N/A	N/A	LC	–	A: DD; B-D; LC; E: DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, moles are recorded over most of England, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO >2,000km <sup>2</sup> so the species does not qualify under B. There is considerable uncertainty about population size, and it has not been possible to compute plausible limits for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	Common shrew	<i>Sorex araneus</i>	Native	LC	N/A	127,995	15,804	11,000,000	3,520,000	29,500,000	LC	–	A:DD; B: LC; C: LC; D:LC; E:DD	Although it is not possible to observe or estimate changes in population size due to lack of data, common shrews are recorded across most of England, and there is no evidence of a contraction of the geographical range over the last 20 years. The area of the key habitat types bog, fen, marsh and swamp, and coniferous woodland remained stable between 1998 and 2007 (Carey et al. 2008). However there was a 6.1% decline in hedgerows; and a longer-term decline (now stabilised) in the condition of vegetation associated with hedgerow bottoms (Carey 2008). The extent of changes to grassland habitats relevant to shrews is unclear (Carey et al. 2008), though the area of unimproved grassland has declined over the last 20 years (see discussion in Review of Population and Conservation Status of British Mammals (Mathews, Kubsasiewicz et al. 2017)). The area of broadleaved woodland has increased by 5.8% and dwarf shrub heath has increased by 25%. It is unclear what impact these habitat changes would have on population size but a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	Pygmy shrew	<i>Sorex minutus</i>	Native	LC	N/A	118,980	6,948	3,690,000	552,000	24,200,000	LC	–	A: DD; B: LC; C: LC; D: LC; E: DD	Although it is not possible to observe or estimate changes in population size due to lack of data, pygmy shrews are recorded across most of England, and there is no evidence of a contraction of the geographical range over the last 20 years. Among key habitats, the area of broadleaved woodland increased by 5.8%; dwarf shrub heath increased by 25% and the area of bog remained stable (Carey et al. 2008). However, there was a 6.1% decline in hedgerows between 1998 and 2007; and also a longer-term decline (now stabilised) in the condition of vegetation associated with hedgerow bottoms (Carey et al. 2008). The extent of changes to grassland habitats relevant to shrews is unclear (Carey 2008), though the area of unimproved grassland has declined (see discussion in Review of the Population and Conservation Status of British Mammals (Mathews, Kubsasiewicz et al. 2018)). It is difficult to infer the impact on population size, but a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. EOO is >20,000km <sup>2</sup> and although AOO is <2,000km <sup>2</sup> , only one of the subcriteria for B is potentially met. Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B2b)(iii), but this assessment should be kept under review. Whilst there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	Water shrew	<i>Neomys fodiens</i>	Native	LC	N/A	117,783	7,088	458,000	147,000	1,228,000	LC	–	A:DD; B: LC; C: LC; D:LC; E:DD	Although it is not possible to observe, estimate, infer or suspect trends in population size due to lack of data, water shrews are recorded across most of England, and there is no evidence of a contraction of the geographical range over the last 20 years. However, there are suspicions of impacts of declining water quality and the quality of wet ditch habitats on the species, so the assessment under criterion A should be kept under review. EOO is >20,000km <sup>2</sup> and although AOO <2,000km <sup>2</sup> , only one of the subcriteria for B is potentially met. Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B2b)(iii), but this assessment should be kept under review. Whilst there is considerable uncertainty about population size (it is based on a ratio with common shrews and that estimate is also uncertain), the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. Given the limitations in the available data, further information is required to permit a re-assessment of this species.
	Lesser white toothed shrew	<i>Crocidura suaveolens</i>	Naturalised or native	LC	N/A	64	17	99,000 <sup>(d)</sup>	N/A	N/A	NT	B1a+2a		Although it is not possible to observe, estimate, infer or suspect trends in population size due to lack of data, Selly shrews are regularly recorded in the Isles of Scilly and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is <100km <sup>2</sup> and AOO is <500km <sup>2</sup> . However, only one of the subcriteria for B is potentially met (a), with the species occurring on 7 islands, so the species is classified as NT under criterion B1a+2a. This assessment should be reviewed when further information is available on the population status of the species on each island, and on the degree of fragmentation within each island. Although no recent assessments of population size are available, the most recent estimate (Temple & Morris 1997) suggests the species is not close to qualifying as threatened under criterion C. There is no identified threat likely to lead drive the species to critically endangered or extinct within a short period, and the number of individuals is well above the threshold for qualifying under criterion D.
Lagomorpha	Rabbit	<i>Oryctolagus cuniculus</i>	Naturalised, non-native	NT	N/A	129,916	69,504	21,300,000	N/A	N/A	Not assessed	–	–	Species is naturalised
	Brown hare	<i>Lepus europaeus</i>	Naturalised, non-native	LC	N/A	129,439	49,452	454,000	336,000	1,480,000	Not assessed	–	–	Species is naturalised

## SCOTLAND ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Hedgehog	<i>Erinaceus europaeus</i>	Native	LC	13.2	73,279	14,212	196,000	N/A	N/A	VU	A2b+3b+4b	B-D; LC; E:DD	A decline in GB hedgehog population size is inferred from an analysis of five citizen science occupancy studies (Roos et al. 2012). There was considerable inter-annual variation within each study, and also variation between them – annual declines ranged from a mean of 1.8% to 10.7% – but there was consistency in the direction of the effect. The authors inferred a decline of 40% in 10 years, which can be extrapolated to give a decline of 53% over three generations. However, the scale of this decline contrasts with another study which used non-systematic occupancy records from Biological Records Centres and adjusted for survey effort (Hof and Bright 2016). Here, a decline of between 5.0% and 7.5% was found for England over a 40 year period, which would mean a maximum decline of 2.5% over 3 generations. The Review of the Population and Conservation Status of British Mammals estimates a 73% reduction in absolute population size over 21 years (Mathews & Kubasiewicz et al. 2018), equating to a 46% decline in 3 generations, but the authors caution that the current and historical estimates are both extremely unreliable. Given the conflict between these pieces of evidence, and the fact that comparison with Arnold (1993) provides no indication of a change in EOO, and there was no loss of AOO (based on hectads) between the two Mammal Atlas periods (1960-92 to 2000-16), the species is classified as VU under A2b+3b+4b on the basis that a population decline of 46% (the median) is a reasonable inference, though it could be much higher or lower. It is noted that hectads are a coarse level of resolution for recording species presence, and the relationship between the decline in occupancy and population size change is unclear: rigorous data on abundance are urgently required. The lack of understanding of the mechanisms underlying current declines reduces the capacity for interventions, so it can be inferred that the declines will continue in the future. As EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , the species does not qualify under B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. Data were not summarised by country in Roos et al. (2012), and data were only available for England in Hof and Bright (2016). It is therefore assumed that these values apply to Scotland.
Mole	<i>Talpa europaea</i>	Native	LC	N/A	69,705	12,440	12,200,000	N/A	N/A	LC	...	A: DD; B: D; LC; E: DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, moles are recorded across most of Scotland, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is > 2,000km <sup>2</sup> , so the species does not qualify under B. There is considerable uncertainty about population size, and it has not been possible to compute plausible limits for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Common shrew	<i>Sorex araneus</i>	Native	LC	N/A	52,938	1,556	7,690,000	1,980,000	22,900,000	LC	...	A: DD; B: LC; C: LC; D: LC; E: DD	Although it is not possible to observe or estimate trends in population size due to lack of data, common shrews are recorded throughout Scotland, and there is no evidence of a contraction of the geographical range over the last 20 years. The area of the area of key habitat types bog, fen, marsh and swamp, and dwarf shrub heath remained stable, and broadleaved woodland increased by 9.6% between 1998 and 2007 (Carey et al. 2008). However there was an 8.7% decline in hedgerows; a 7.7% decline in coniferous woodland; also a longer-term decline (now stabilised) in the condition of vegetation associated with hedgerow bottoms (Carey et al. 2008). The extent of changes to grassland habitats relevant to shrews is unclear (Carey 2008), though the area of unimproved grassland has declined (see discussion in the Review of Population and Conservation Status of British Mammals (Mathews, Kubasiewicz et al. 2017)). It is difficult to infer the impacts for population size, but a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. EOO is >20,000km <sup>2</sup> and although AOO <2,000km <sup>2</sup> , only one of the subcriteria for B is potentially met (b). Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B2b(iii)), but this assessment should be kept under review. Whilst there is considerable uncertainty about population size, the lower plausible limit is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Pygmy shrew	<i>Sorex minutus</i>	Native	LC	N/A	24,563	600	1,430,000	217,000	5,330,000	LC	...	A: DD; B: LC; C: LC; D: LC; E: DD	It is not possible to observe or estimate changes in population size due to lack of data. There is no evidence of a contraction of the geographical range over the last 20 years, but the species is recorded patchily across Scotland and it is unclear whether absences are true absences or reflect a lack of observer effort. Among key habitats, broadleaved woodland increased by 9.6% between 1998 and 2007, and the area of bog and dwarf shrub heath remained stable (Carey et al. 2008). There has been an 8.7% decline in hedgerows, and also a longer-term decline (now stabilised) in the condition of vegetation associated with hedgerow bottoms (Carey et al. 2008). The extent of changes to grassland habitats relevant to shrews is unclear (Carey et al. 2008), though the area of unimproved grassland has declined (see discussion in the Review of Population and Conservation Status of British Mammals (Mathews, Kubasiewicz et al. 2017)). It is difficult to infer the impact this would have on population size, but a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. EOO is >20,000km <sup>2</sup> and although AOO <2,000km <sup>2</sup> , only one of the subcriteria for B is potentially met (b). Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B2b(iii)), but this assessment should be kept under review. Whilst there is considerable uncertainty about population size, the lower plausible limit is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Water shrew	<i>Neomys fodiens</i>	Native	LC	N/A	25,833	552	118,000	30,000	353,000	LC	...	A: DD; B: LC; C: LC; D: LC; E: DD	It is not possible to observe, estimate, infer or suspect trends in population size due to lack of data. There is no evidence of a contraction of the geographical range over the last 20 years, the species is patchily recorded across Scotland and it is unclear whether absences are true absences or a lack of observer effort. There are suspicions of impacts of declining water quality and the quality of wet ditch habitats on the species. It is difficult to infer the impacts on population size, but a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. EOO is >20,000km <sup>2</sup> and although AOO <2,000km <sup>2</sup> , only one of the subcriteria for B is potentially met (b) so the species does not qualify as threatened. Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B2b(iii)), but this assessment should be kept under review. Whilst there is considerable uncertainty about population size (it is based on a ratio with common shrews and that estimate is also uncertain), the lower plausible limit is well above the threshold for criteria C and D and the geographical range is not highly restricted. Given the limitations in the available data, further information is required to permit a re-assessment of this species.
Lesser white toothed shrew	<i>Crocidura suaveolens</i>	Naturalised or native	LC	N/A	Species is not present and is considered highly unlikely to have ever been present, in Scotland.	...	...	...	...	...	...	...	Species is not present in Scotland
Rabbit	<i>Oryctolagus cuniculus</i>	Naturalised, non-native	NT	N/A	75,612	10,152	11,800,000	N/A	N/A	Not assessed	...	...	Species is naturalised
Brown hare	<i>Lepus europaeus</i>	Naturalised, non native	LC	N/A	55,012	6,072	87,700	64,000	342,000	Not assessed	...	...	Species is naturalised

WALES ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale
							Central estimate	Lower plausible limit*	Upper plausible limit*				
Hedgehog	<i>Erinaceus europaeus</i>	Native	LC	13.2	20,643	9,440	86,800	N/A	N/A	VU	A2b+3b+4b	B-D; LC; E:DD	A decline in GB hedgehog population size is inferred from an analysis of five citizen science occupancy studies (Roos et al. 2012). There was considerable inter-annual variation within each study, and also variation between them – annual declines ranged from a mean of 1.8% to 10.7% – but there was consistency in the direction of the effect. The authors inferred a decline of 40% in 10 years, which can be extrapolated to give a decline of 53% over three generations. However, the scale of this decline contrasts with another study which used non-systematic occupancy records from Biological Records Centres and adjusted for survey effort (Hof and Bright 2016). Here, a decline of between 5.0% and 7.5% was found for England over a 40 year period, which would mean a maximum decline of 2.5% over 3 generations. The Review of the Population and Conservation Status of British Mammals estimates a 73% reduction in absolute population size over 21 years (Mathews & Kubasiewicz et al. 2013), equating to a 46% decline in 3 generations, but the authors caution that the current and historical estimates are both extremely unreliable. Given the conflict between these pieces of evidence, and the fact that comparison with Arnold (1993) provides no indication of a change in EOO, and there was no loss of AOO (based on hectads) between the two Mammal Atlas periods (1960-92 to 2000-16), the species is classified as VU under A2b+3b+4b on the basis that a population decline of 46% (the median) is a reasonable inference, though it could be much higher or lower. It is noted that hectads are a coarse level of resolution for recording species presence, and the relationship between the decline in occupancy and population size change is unclear: rigorous data on abundance are urgently required. The lack of understanding of the mechanisms underlying current declines reduces the capacity for interventions, so it can be inferred that the declines will continue in the future. As EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , the species does not qualify under B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. Data were not summarised by country in Roos et al. (2012), and data were only available for England in Hof and Bright (2016). It is therefore assumed that these values apply to Wales.
Mole	<i>Talpa europaea</i>	Native	LC	N/A	20,643	6,316	4,930,000	N/A	N/A	LC	...	A: DD; B: D; LC; E: DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, moles are recorded across most of Wales, and there is no evidence of a decline in the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. There is considerable uncertainty about population size, and it has not been possible to compute plausible limits for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Common shrew	<i>Sorex araneus</i>	Native	LC	N/A	19,424	1,316	2,330,000	1,010,000	6,120,000	LC	...	A:DD; B: LC; C: LC; D: LC; E:DD	Although it is not possible to observe, estimate, infer or suspect trends in population size due to lack of data, common shrews are recorded across most of Wales, and there is no evidence of a contraction of the geographical range over the last 20 years. The area of the key habitats bog, fen, marsh and swamp, broadleaved woodland, and coniferous woodland remained stable between 1998 and 2007 (Carey et al. 2008). However there has been a 5.3% decline in hedgerows, and also a longer-term decline (now stabilised) in the condition of vegetation associated with hedgerow bottoms (Carey et al. 2008). The extent of changes to grassland habitats relevant to shrews is unclear (Carey et al. 2008), though the area of unimproved grassland has declined (see discussion in Review of the Population and Conservation Status of British Mammals (Mathews, Kubasiewicz et al. 2017)). It is difficult to infer the impacts for population size, but a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. AOO is <2,000km <sup>2</sup> and EOO is <20,000km <sup>2</sup> , but only one of the subcriteria for B is potentially met (b). Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B1b(iii)+2b(iii)), but this assessment should be kept under review. Whilst there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Pygmy shrew	<i>Sorex minutus</i>	Native	LC	N/A	18,708	676	1,170,000	231,000	4,970,000	LC	...	A: DD; B: LC; C: LC; D: LC; E: DD	It is not possible to observe or estimate changes in population size due to lack of data. There is no evidence of a contraction of the geographical range over the last 20 years, but the species is recorded patchily across Wales and it is unclear whether absences are true absences or reflect a lack of observer effort. Among key habitats, bog and broadleaved woodland remained stable between 1998 and 2007 (Carey et al. 2008). However, there was a 5.3% decline in hedgerows, and also a longer-term decline (now stabilised) in the condition of vegetation associated with hedgerow bottoms (Carey et al. 2008). The extent of changes to grassland habitats relevant to shrews is unclear (Carey et al. 2008), though the area of unimproved grassland has declined (see discussion in Review of the Population and Conservation Status of British Mammals (Mathews, Kubasiewicz et al. 2017)). It is difficult to infer the impact this would have on population size, but a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. EOO is <20,000km <sup>2</sup> and AOO is <2,000km <sup>2</sup> , but only one of the subcriteria for B is potentially met (b). Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B1b(iii)+2b(iii)), but this assessment should be kept under review. Whilst there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Water shrew	<i>Neomys fodiens</i>	Native	LC	N/A	17,530	644	137,000	60,000	361,000	LC	...	A:DD; B: LC; C: LC; D: LC; E:DD	It is not possible to observe, estimate, infer or suspect trends in population size due to lack of data. There is no evidence of a contraction of the geographical range over the last 20 years. The species is patchily recorded across Wales and it is unclear whether absences are true absences or a lack of observer effort. There are suspicions of impacts of declining water quality and the quality of wet ditch habitats on the species. It is difficult to infer the impacts on population size, but a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. EOO is <20,000km <sup>2</sup> and AOO is <2,000km <sup>2</sup> , but only one of the subcriteria for B1 and B2 is potentially met (b) so the species does not qualify as threatened. Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B1b(iii)+2b(iii)), but this assessment should be kept under review. Whilst there is considerable uncertainty about population size (it is based on a ratio with common shrews and that estimate is also uncertain), the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. Given the limitations in the available data, further information is needed to permit a re-assessment of this species.
Lesser white toothed shrew	<i>Crocidura suaveolens</i>	Naturalised or native	LC	N/A	Species is not present, and is considered highly unlikely to have ever been present, in Wales	...	...	...	...	...	...	...	Species is not present in Wales
Rabbit	<i>Oryctolagus cuniculus</i>	Naturalised, non native	NT	N/A	20,643	6,000	2,910,000	N/A	N/A	Not assessed	...	...	Species is naturalised.
Brown hare	<i>Lepus europaeus</i>	Naturalised, non native	LC	N/A	20,633	5,952	37,300	26,800	171,000	Not assessed	...	...	Species is naturalised

GREAT BRITAIN ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Hedgehog	<i>Erinaceus europaeus</i>	Native	LC	13.2	223,836	108,248	879,000	N/A	N/A	VU	A2b+3b+4b	B-D; LC; E:DD	A decline in GB hedgehog population size is inferred from an analysis of five citizen science occupancy studies (Roos et al. 2012). There was considerable inter-annual variation within each study, and also variation between them – annual declines ranged from a mean of 1.8% to 10.7% – but there was consistency in the direction of the effect. The authors inferred a decline of 40% in 10 years, which can be extrapolated to give a decline of 53% over three generations. However, the scale of this decline contrasts with another study which used non-systematic occupancy records from Biological Records Centres and adjusted for survey effort (Hof and Bright 2016). Here, a decline of between 5.0% and 7.5% was found for England over a 40 year period, which would mean a maximum decline of 2.5% over 3 generations. The Review of the Population and Conservation Status of British Mammals estimates a 73% reduction in absolute population size over 21 years (Mathews & Kubasiewicz et al. 2018), equating to a 46% decline in 3 generations, but the authors caution that the current and historical estimates are both extremely unreliable. Given the conflict between these pieces of evidence, and the fact that comparison with Arnold (1993) provides no indication of a change in EOO, and there was no loss of AOO (based on hectads) between the two Mammal Atlas periods (1960-92 to 2000-16), the species is classified as VU under A2b+3b+4b on the basis that a population decline of 46% (the median) is a reasonable inference, though it could be much higher or lower. It is noted that hectads are a coarse level of resolution for recording species presence, but this is often the only scale available for older data. Further, the relationship between the decline in occupancy and population size change is unclear: rigorous data on abundance are urgently required. The lack of understanding of the mechanisms underlying current declines reduces the capacity for interventions, so it can be inferred that the declines will continue in the future. As EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , the species does not qualify under B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. Data were data were only available for England in Hof and Bright (2016). It is therefore assumed that these values apply to GB.
Mole	<i>Talpa europaea</i>	Native	LC	N/A	220,249	81,176	41,400,000	N/A	N/A	LC	...	A: DD; B: LC; C: LC; D: LC; E: DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, moles are recorded over most of GB, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO >2,000km <sup>2</sup> so the species does not qualify under B. There is considerable uncertainty about population size, and it has not been possible to compute plausible limits for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Common shrew	<i>Sorex araneus</i>	Native	LC	N/A	200,358	18,676	21,100,000	6,520,000	58,500,000	LC	...	A:DD; B: LC; C: LC; D: LC; E:DD	Although it is not possible to observe or estimate changes in population size due to lack of data, common shrews are recorded across most of GB. There is no evidence of a contraction of the geographical range over the last 20 years. The area of key habitats dwarf shrub heath; bog, fen, marsh and swamp; and coniferous woodland remained stable between 1998 and 2007 (Carey et al. 2008). There has been a 6.1% decline in hedgerows and also a longer-term decline (now stabilised) in the condition of vegetation associated with hedgerow bottoms (Carey et al. 2008). The extent of changes to grassland habitats relevant to shrews is unclear (Carey et al. 2008), though the area of unimproved grassland has declined (see discussion in the Review of Population and Conservation Status of British Mammals, (Mathews, Kubasiewicz et al. 2017)). The area of broadleaved woodland has increased by 5.9%. It is unclear what impact these changes would have on population size. Although potentially negative, a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Pygmy shrew	<i>Sorex minutus</i>	Native	LC	N/A	162,251	8,224	6,300,000	999,000	33,500,000	LC	...	A: DD; B: LC; C: LC; D: LC; E: DD	Although it is not possible to observe or estimate changes in population size due to lack of data, pygmy shrews are recorded across most of England, and patchily in Wales and Scotland. There and there is no evidence of a contraction of the geographical range over the last 20 years. Among key habitats, the area of bog and dwarf shrub heath remained stable between 1998 and 2007, and broadleaved woodland increased by 5.9% (Carey et al. 2008). However, there was a 6.1% decline in hedgerows; and also a longer-term decline (now stabilised) in the condition of vegetation associated with hedgerow bottoms (Carey et al. 2008). The extent of changes to grassland habitats relevant to shrews is unclear (Carey et al. 2008), though the area of unimproved grassland has declined (see discussion in Review of the Population and Conservation Status of British Mammals (Mathews, Kubasiewicz et al. 2017)). It is difficult to infer the impact on population size, but a decline of >30% over the past 10 years is unlikely, so the species does not meet the criteria for A. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Whilst there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Water shrew	<i>Neomys fodiens</i>	Native	LC	N/A	161,146	8,284	714,000	237,000	1,942,000	LC	...	A:DD; B: LC; C: LC; D: LC; E:DD	Although it is not possible to observe, estimate, infer or suspect trends in population size due to lack of data, water shrews are recorded across most of England, and are patchily recorded in Scotland and Wales. There is no evidence of a contraction of the geographical range over the last 20 years. However, there are suspicions of impacts of declining water quality and the quality of wet ditch habitats on the species, so the assessment should be kept under review. EOO is >20,000km <sup>2</sup> and AOO >2,000km <sup>2</sup> , so the species does not qualify under B. Whilst there is considerable uncertainty about population size (it is based on a ratio with common shrews and that estimate is also uncertain), the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. Given the limitations in the available data, further information is required to permit a re-assessment of this species.
Lesser white toothed shrew	<i>Crocidura suaveolens</i>	Naturalised or native	LC	N/A	64	17	99,000†	N/A	N/A	NT	B1a+2a	...	Although it is not possible to observe, estimate, infer or suspect trends in population size due to lack of data, Scilly shrews are regularly recorded in the Isles of Scilly and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is <100km <sup>2</sup> and AOO is <500km <sup>2</sup> . However, only one of the subcriteria for B is potentially met (a), with the species occurring on 7 islands, so the species is classified as NT under criterion B1a+2a. This assessment should be reviewed when further information is available on the population status of the species on each island, and on the degree of fragmentation within each island. Although no recent assessments of population size are available, the most recent estimate (Temple & Morris 1997) suggests the species is not close to qualifying as threatened under criterion C. There is no identified threat likely to lead drive the species to critically endangered or extinct within a short period, and the number of individuals is well above the threshold for qualifying under criterion D.
Rabbit	<i>Oryctolagus cuniculus</i>	Naturalised, non-native	NT	N/A	226,172	85,656	36,000,000	N/A	N/A	Not assessed	...	...	Species is naturalised
Brown hare	<i>Lepus europaeus</i>	Naturalised, non-native	LC	N/A	205,083	61,476	579,000	427,000	1,990,000	Not assessed	...	...	Species is naturalised

ENGLAND ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate						
Mountain hare	<i>Lepus timidus</i>	Native	LC	N/A	2,423	520	2,500	1,500	9,500	Not assessed	...	...	The species was introduced to the Peak District during the late 19th century (Corbet & Southern, 1977), as well as to other sites in Westmorland, Cumberland, and Northumbria (Mennell & Perkins, 1864). Mountain hares survived in Cumberland and Northumbria until at least 1954, and there are records from one Northumbrian valley until the mid 1980s (Kerslake 1998). However the Peak District population is the only one remaining. Prior to these 19th century introductions, the species is highly likely to have been extinct in England since at least the Iron Age (Valden 1999). However, its status should be kept under review as new historical, genetic and archaeological evidence becomes available.
Red squirrel	<i>Sciurus vulgaris</i>	Native	LC	13.3	18,449	5,528	38,900	29,500	91,000	EN	A2ce+3ce+4ce	B1:1C; B2:1C; C:1C; D:1C; E:DD	EOO has declined by approximately 60% in England over 3 generations (inferred from 90% decline over 20 years; Arnold 1993; Mathews & Kubasiewicz 2017). AOO has declined by 55% in the 24 years between the first Mammal Atlas period and the second (set as 2010 and 2016 for this species because of recent rapid contraction in the range; comparison based on occupied hectads because this is the resolution at which much data are available in the first period). This implies a decline in AOO of 31% over 3 generations. Squirrel pox virus and other disease outbreaks are known to cause high mortality and are implicated in local extinctions and ongoing population declines: it is inferred that these have resulted in population declines of >50% (but not by as much as 90%) over 3 generations. These declines are likely to continue, given lack of progress in combating disease threats and the impact of the introduced competitor (qualifying under A2ce+4ce). Some further declines within Scottish strongholds are likely with expansion of grey squirrel, meaning that a conservative view must be taken of the conservation prospects of the English populations. EOO is >20,000km <sup>2</sup> and AOO is >2,000 km <sup>2</sup> so it does not qualify under B. The lower plausible estimate of population size is well above the threshold for C and D, and the range is not sufficiently restricted to meet criterion D2. Reliable data on abundance and area of occupancy are urgently required.
Grey squirrel	<i>Sciurus carolinensis</i>	Non-native	LC	N/A	129,135	27,924	1,940,000	957,000	2,560,000	Not assessed	...	...	Species is non-native
Eurasian Beaver	<i>Castor fiber</i>	Native (reintroduced)	LC	27	244	140 <sup>(1)</sup>	41	N/A	N/A	CR	D1	A:1C; B1a+2b; NT; C:1C; D2: VU; E:DD	Information on the historical extinction of beavers in Britain is scarce, and largely based on indirect evidence. However, they are thought to have been exterminated from southern Britain by 1300 (Raye, 2014). Beavers were introduced to a site in Devon in 2015 and have been monitored subsequently, with that population now including at least 7 breeding pairs. Offspring of the animals introduced are now of breeding age. A second population is also present in Devon (on a different river catchment) and also in Kent, though little information is available from these sites except that the combined AOO is at least 84km <sup>2</sup> . There are occasional records from 9 other locations, though it is not known whether these animals are singletons or breeding populations. No confidence intervals could therefore be calculated for the AOO or population size. EOO is <1,000km <sup>2</sup> and AOO is <500km <sup>2</sup> , the thresholds for CR and EN respectively. Nevertheless, only one of the sub-criteria for B is met (a), giving a classification of NT. The number of mature individuals is within the threatened categories for C, but there is no evidence of a population decline so the sub-criteria are not met. The best estimate of number of individuals results in the species being listed as CR under D1. Although plausible intervals for the population have not been formally calculated, it is unlikely that there are >50 mature individuals, the threshold for qualification under D1. It is also categorised as VU under D2 since the number of locations is small and there is a plausible threat from persecution.
Hazel dormouse	<i>Muscardinus avellanarius</i>	Native	LC	N/A	67,601	10,704	757,000	298,000	2,110,000	VU	A2b+3b+4b	B-D 1C; EDD	Across England and Wales, a decline of 48% (95%CI 39% - 55%) in relative occurrence of hazel dormice has been estimated using data on nest box occupancy from the National Dormouse Monitoring Programme between 2005 and 2014 (Goodwin et al. 2017). There is no evidence to suggest that this trend would differ in England alone, and so this value is used in the current assessment. The species therefore qualifies as VU under criterion A2b. The cause of the decline is not understood. Similar reductions are therefore suspected in the future (VU: A3b+4b). There are suspicions that declining habitat quality may be important, but this effect has not been quantified. Were the upper confidence limits of this decline used, the species would qualify as EN. There is no evidence of any contraction in the geographical range over the past 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Edible dormouse	<i>Glis glis</i>	Non-native	LC	N/A	2,368	244	23,000	9,800	82,000	Not assessed	...	...	Species is non-native
Bank vole	<i>Myodes glareolus</i>	Native	LC	N/A	125,389	14,148	19,100,000	10,400,000	35,600,000	LC	...	A:DD; B1:1C; B2:1C; C:1C; D:1C; EDD	Although it is not possible to observe or estimate changes in population size due to lack of data, bank voles are recorded throughout England, and there is no evidence of a contraction of the geographical range over the last 20 years. There has been a 6.1% decline in hedgerows, a primary habitat type, between 1998 and 2007, and also a longer-term decline in the condition of vegetation associated with hedgerow bottoms which has now stabilised (Carey et al. 2008). A decline as large as 30% over the past 10 years cannot be inferred from these changes, so the species does not meet the criteria for A at present. However it is noted that for all small mammals, good quantitative data on trends are lacking and this species should be re-assessed under A2c+3c when more data become available. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Field vole	<i>Microtus agrestis</i>	Native	LC	N/A	128,942	18,292	28,600,000	16,900,000	44,000,000	LC	...	A:DD; B1:1C; B2:1C; C:1C; D:1C; EDD	Although it is not possible to observe, estimate, infer or suspect trends in population size due to lack of data, field voles are recorded across most of England, and there is no evidence of a contraction of the geographical range over the last 20 years. However, declining availability of suitable habitat (particularly tussocky grassland with a deep litter layer, typically associated with unimproved grasslands with limited grazing) between 1998 and 2007 (Carey et al. 2008), presents a potential threat. The area of unimproved grassland has declined over the last 20 years (see discussion in Review of the Population and Conservation Status of British Mammals (Mathews, Kubasiewicz et al. 2017)). More data are required to permit a re-evaluation of this species under A2c+3c. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Orkney Vole	<i>Microtus arvalis orcadensis</i>	Naturalised (island endemic)	LC	N/A	Species is not present, and there is no evidence that it has ever been present, in England	...	...	...	...	...	...	...	Species is not present in England

SCOTLAND ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Mountain hare	<i>Lepus timidus</i>	Native	LC	N/A	57,411	4,916	132,000	79,500	516,000	NT	Close to VU under A2bcd+4bcd	B:LC; C:LC; D:LC; E:DD	Population size estimation is extremely difficult for this species due to lack of data, highly variable population density and population cycles, and potential for species misidentification. The only substantial dataset with reliable identification covering the species' full range is the National Gamebag Census, which suggests cyclical fluctuations in culls. The confidence intervals for trends are extremely wide, partly reflecting this cyclical variability, and whilst the trend between 1995 and 2006 is for a 40% decline, this is not statistically significant (95% CI -70% to 22%). Similar patterns are observed over longer time-frames in this dataset. However, beyond suggesting cyclical fluctuations, the data are difficult to interpret in terms of population trends owing to the status of the species as quarry. As in the Review of the Population and Conservation Status of British Mammals (Mathews et al. 2018), data from the BTO breeding bird survey are considered unreliable for this species. Patton et al. (2010) estimated that 25,000 mountain hares were shot in 2006-07 in Scotland: this is a substantial proportion of the total population estimated here. Recently, an analysis of spring transect counts at 42 moorland sites suggested that the population index had declined by 31% per year between 1999 and 2014, with the most severe reductions being on sites subjected to burning for grouse-habitat management (Wilson & Watson 2018). If these results were replicated nationally then it would clearly result in a classification of CR under A2bcd+4bcd. However, these catastrophic declines contrast with trends presented by Hesford et al. (2019), based on spring transect counts at 76 blocks on 33 moors, which imply a stable population over the last 16 years, with some evidence of population increases in sites most actively used for grouse-shooting. In both cases, sites were not studied in every year, and there are potential confounding effects from the stage of the population cycle that the site was at in the time of the counts. Importantly, it is not clear whether either study can be generalised, as the study sites were not randomly selected. The population impacts of culls at a national scale are therefore unclear, but local population impacts are likely where culling is intensive, given the relative difficulty of recolonisation; and this may have a wider-scale impact on population viability. Declines >20% in 10 years are plausible which gives a classification of NT under A2bcd+4bcd. Further evidence is urgently required since re-evaluation may move the species to the VU category. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Red squirrel	<i>Sciurus vulgaris</i>	Native	LC	13.3	55,060	12,192	239,000	181,000	444,000	NT	A2ce+3ce+4ce	B1:LC; B2:LC; C:LC; D:LC; E:DD	Squirrel pox virus and other disease outbreaks are known to cause high mortality and are implicated in local extinctions and ongoing population declines. EOO appears stable in Scotland compared with Arnold (1993). AOO has declined by 7% in the 24 years between the first Mammal Atlas period and the second (set as 2010 and 2016 for this species because of recent rapid contraction in the range; comparison based on occupied hectads because this is the resolution at which much data are available in the first period). This implies a decline in AOO of 4% over 3 generations. These declines in occupancy appeared to have stabilised recently in some regions of Scotland but, local initiatives notwithstanding, the reversal of previous trends is unlikely. Population declines within Scottish strongholds in the future are inferred from the continued expansion of grey squirrel population and the lack of progress with combatting disease threats. Robust data on the extent of previous and continuing declines are not available but this could plausibly amount to a 20% decline over 3 generations (NT A3ce+4ce). AOO for this species is > 2,000 km <sup>2</sup> , and EOO is >20,000km <sup>2</sup> , so it does not qualify under B. The lower plausible population size estimate is well above the threshold for C and D, and the range is not sufficiently restricted to meet criterion D2. Reliable data on occupancy and abundance are urgently required to assess whether the scale of decline in the population is >30% and hence whether the species needs to be reclassified as VU.
Grey squirrel	<i>Sciurus carolinensis</i>	Non-native	LC	N/A	33,831	6,468	478,000	249,000	808,000	Not assessed	...	...	Species is non-native
Eurasian Beaver	<i>Castor fiber</i>	Native (reintroduced)	LC	27	5,016	228	156	N/A	N/A	EN	D1	A:LC; B1a:NT; B2a:NT; C:LC; D:VU; E:DD	Evidence of the extinction of beavers in northern Britain is scarce and primarily based on indirect historical sources. The date of extinction is thought to be around 1600 (Raye, 2014). The species was reintroduced in 2009, and populations have been increasing since that time, with offspring of the released animals now breeding. EOO is <10,000km <sup>2</sup> and AOO is <10km <sup>2</sup> (the threshold for CR), but only one of the sub-criteria for B is met (a), giving a classification of NT. The number of mature individuals is within the threatened categories for C, but there is no evidence of a population decline — indeed the population is expanding — so the sub-criteria are not met. The best estimate of number of individuals results in the species being listed as EN under D1. Although plausible intervals for the population have not been formally calculated, it is highly unlikely that there are >1,000 mature individuals, the threshold for qualification under D1. It would also be categorised as VU under D2 since the number of locations is small and there is a plausible threat from persecution.
Hazel dormouse	<i>Muscardinus avellanarius</i>	Native	LC	N/A	Species is not present, and is considered highly unlikely to have ever been present, in Scotland.	...	...	...	...	...	...	...	Evidence that the species once occurred in Scotland is extremely scant, for whilst the species once bred in the northernmost counties of England, the only two Scottish claims are uncorroborated. There are two records available (1736 and 1959) but very little information is available on these (Arnold, 1993) and no additional evidence suggesting presence is available from the national museums. In neighbouring English counties, the most northerly record is for Hexham in Northumbria (Rope 1885), and an isolated population in Northumberland is reported in the 1993 Mammal Atlas (Arnold, 1993). The species is therefore treated as having not been present in Scotland since at least 1500.
Edible dormouse	<i>Glis glis</i>	Non-native	LC	N/A	0	0	0	0	0	Not assessed	...	...	Species is non-native
Bank vole	<i>Myodes glareolus</i>	Native	LC	N/A	32,206	808	5,390,000	3,130,000	11,900,000	LC	...	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe or estimate changes in population size due to lack of data, there are scattered records of bank voles across approximately a third of Scotland (it is unclear whether absences are the result of insufficient recording effort) with no evidence of a contraction of the geographical range over the last 20 years. There has been an 8.7% decline in hedgerows, a primary habitat type, between 1998 and 2007, and also a longer-term decline in the condition of vegetation associated with hedgerow bottoms which has now stabilised (Carey et al. 2008). A decline of >30% over the past 10 years cannot be inferred from these changes, so the species does not meet the criteria for A at present. However it is noted that for all small mammals, good quantitative data on trends are lacking so this species should be re-assessed under A2c+3c when more data become available. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Field vole	<i>Microtus agrestis</i>	Native	LC	N/A	63,098	2,860	21,500,000	13,600,000	24,500,000	LC	...	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, field voles are recorded across much of Scotland with no evidence of a contraction of geographical range over the last 20 years. However, declining availability of suitable habitat (particularly tussocky grassland with a deep litter layer, typically associated with unimproved or semi-improved grasslands with limited grazing) between 1998 and 2007 (Carey et al. 2008), presents a potential threat. The area of unimproved grassland has declined over the last 20 years (see discussion in Review of the Population and Conservation Status of British Mammals (Mathews, Kutasiewicz et al. 2017)). More data are required to permit a re-evaluation of this species under A2c+3c. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate of population size is well above the threshold for criteria C and D, and the geographical range is not highly restricted.
Orkney Vole	<i>Microtus arvalis orcadensis</i>	Naturalised (island endemic)	LC	N/A	706	92	N/A*	N/A	N/A	VU	A2c+3c; B1ab(ii,iii)+2ab(ii,iii)	B:VU; C:LC; D1:LC; D:NT; E:DD	A Regional Red List assessment is made for Orkney vole, <i>Microtus arvalis orcadensis</i> , because of its formal status as an island endemic (it is suspected that the species was introduced around 5,000 years ago). <i>Microtus arvalis</i> found in Guernsey and continental Europe. There are no direct counts or estimates of population change. However, the number of occupied hectads has fallen by 38% between the two Mammal Atlas periods (1960-92 to 2000-16), and it is inferred that this equates to an equivalent decline in population size. Concerns about declining habitat suitability for Orkney voles were raised >20 years ago (Gorman & Reynolds 1993). Although more recent assessments are not available, the species is an important prey item for hen harriers, and reported declines in that species may also be indicative of a continuing decline in Orkney vole populations (Amar et al. 2003). The species is therefore classified as VU under A2c+3c. EOO is <5,000km <sup>2</sup> and AOO is <500km <sup>2</sup> . The population is fragmented across different islands (n=10: 7 main islands and 3 small islands). There is continued loss of habitat quality, though the scale of recent deterioration is unclear. The species is therefore classified as VU under B1ab(ii,iii)+2ab(ii,iii). There are no recent data on population sizes, and estimates could not be made for the Mammal Population Review (Mathews & Kutasiewicz et al. 2018), but an estimate of >2 million individuals was made for the years 1998-1990 (Reynolds, 1992). Whilst a substantial population decline since that time is inferred, the species is still unlikely to qualify under criterion C. Given the very restricted geographical range, the fragmentation across islands, and the threats from habitat loss and alien predators (stoats introduced in 2010 and have spread rapidly) that could plausibly send the species to CR in a short period, the species is classified as NT under D2.



WALES ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale
							Central estimate	Lower plausible limit*	Upper plausible limit*				
Mountain hare	<i>Lepus timidus</i>	Native	LC	N/A	Species not present in Wales and unlikely to have been present since the year 1500.	—	—	—	—	—	—	Yalden (1999) suggests that the species used to be found in Wales before the Mesolithic. However, there is no evidence of a native population in Wales over the past 500 years; and as in England, natural populations are likely to have been extinct since at least the Iron Age. There were introductions in 1885 near Bangor, but these populations died out at least 30 years ago (Corbet & Southern, 1977).	
Red squirrel	<i>Sciurus vulgaris</i>	Native	LC	13.3	3,192	232	9,190	6,970	18,200	EN	A2ce+3ce+4ce; B2ab(i,ii,iii)	B1:VU; C:VU; D:VU; E:DD	EOO has declined by approximately 60% in Wales over 3 generations (inferred from 90% decline over 20 years; Arnold 1993; Mathews & Kubasiewicz et al. 2017). AOO has declined by 70% in the 24 years between the first Mammal Atlas period and the second (set as 2010 and 2016 for this species because of recent rapid contraction in the range; comparison based on occupied hectads because this is the resolution at which much data are available in the first period). This implies a decline in AOO of 44% over 3 generations. Squirrel pox virus and other disease outbreaks are known to cause high mortality and are implicated in local extinctions and ongoing population declines: it is inferred that these have resulted in declines of >50% (but not as much as 80%) over the last 3 generations. These declines are expected to continue, given lack of progress in combatting disease threats and the impact of the introduced competitor (qualifying as EN under A2ce+4ce). AOO is <500km <sup>2</sup> , EOO is <20,000km <sup>2</sup> , and the species is present in <5 locations, with evidence of a continued decline. It is therefore classified as EN under B2ab(i,ii,iii) and VU under B1ab(i,ii,iii). The species is also classified as VU under C1+2a(i). The best estimate of population size is above the threshold for D1, but occupancy is restricted, so it is classified as VU under D2. The lower plausible estimate of population size is fairly close to the best estimate and assessment based on this value does not alter any of the classifications above.
Grey squirrel	<i>Sciurus carolinensis</i>	Non-native	LC	N/A	19,658	1,732	283,000	139,000	423,000	Not assessed	—	—	Species is non-native
Eurasian Beaver	<i>Castor fiber</i>	Native (reintroduced)	LC	27	Species not established in Wales and highly likely to have not been present since 1500.	—	—	—	—	—	—	—	Information on the historical extinction of beavers in Britain is scarce, and largely based on indirect evidence. However, they are thought to have been exterminated from Southern Britain (including Wales) by 1300 (Raye, 2014). The species is considered to have no established population in Wales, though a single individual has recently been recorded.
Hazel dormouse	<i>Muscardinus avellanarius</i>	Native	LC	N/A	14,677	1,300	172,000	90,700	529,000	VU	A2b+3b+4b	B1:NT; B2:NT; C:D:LC; E:DD	Across England and Wales, a decline of 48% (95%CI 39% - 55%) in relative occurrence of hazel dormice has been estimated using data on nest box occupancy from the National Dormouse Monitoring Programme between 2005 and 2014 (Goodwin et al. 2017). There is no evidence to suggest that this trend would differ in Wales alone and so this value is used in the current assessment. The species therefore qualifies as VU under criterion A2b. The cause of the decline is not understood. Similar reductions are therefore suspected in the future (VU: A3b+4b). There are suspicions that declining habitat quality may be important, but this effect has not been quantified. Were the upper confidence limits of this decline used, the species would qualify as EN. There is no evidence of any contraction in the geographical range over the past 20 years. EOO is <20,000km <sup>2</sup> and AOO <2,000km <sup>2</sup> , but the species does not meet the IUCN definition of fragmented and there are not thought to be extreme fluctuations in the population. The species is therefore classified as NT under B1 and B2 as only one sub-criterion (b(v)) applies. Although there is considerable uncertainty about population size, the lower plausible limit is well above the threshold for criterion C and it does not have a restricted geographical range.
Edible dormouse	<i>Glis glis</i>	Non-native	LC	N/A	0	0	0	0	0	Not assessed	—	—	Species is non-native
Bank vole	<i>Myodes glareolus</i>	Native	LC	N/A	20,037	1,516	2,930,000	1,560,000	6,560,000	LC	—	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, the species is recorded across most of Wales, with no evidence of a contraction of the geographical range over the last 20 years. There has been a 5.3% decline in hedgerows, a primary habitat type, between 1998 and 2007, and also a longer-term decline in the condition of vegetation associated with hedgerow bottoms which has now stabilised (Carey et al. 2008). However, a population decline as great as 30% over the past 10 years cannot be inferred from these changes, so the species does not meet the criteria for A at present. However it is noted that for all small mammals, good quantitative data on trends are lacking so this species should be re-assessed under A2c+3c when more data become available. EOO is >20,000km <sup>2</sup> , and although AOO is <2,000km <sup>2</sup> , only one of the sub-criteria for B is potentially met. Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B2b(iii)), but this assessment should be kept under review. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Field vole	<i>Microtus agrestis</i>	Native	LC	N/A	18,996	2,580	9,760,000	6,430,000	11,800,000	LC	—	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, the species is recorded across much of Wales, with no evidence of a contraction of the geographical range over the last 20 years. However, declining availability of suitable habitat (particularly tussocky grassland with a deep litter layer, typically associated with unimproved or semi-improved grasslands with limited grazing) between 1998 and 2007 (Carey et al. 2008), presents a potential threat. The area of unimproved grassland has declined over the last 20 years (see discussion in Review of the Population and Conservation Status of British Mammals (Mathews, Kubasiewicz et al. 2017)). More data are required to permit a re-evaluation of this species under A2c+3c. AOO is close to 2,000km <sup>2</sup> , and EOO is <20,000km <sup>2</sup> . Because of the uncertainty about the size and impact of habitat change, the species is not currently classified as NT under (B2b(iii)), but this assessment should be kept under review. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Orkney Vole	<i>Microtus arvalis orcadensis</i>	Naturalised (island endemic)	LC	N/A	Species is not present, and there is no evidence that it has ever been present, Wales.	—	—	—	—	—	—	—	Species is not present in Wales

GREAT BRITAIN ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Mountain hare	<i>Lepus timidus</i>	Native	LC	N/A	59,834	5,436	135,000	81,000	526,000	NT	Close to VU under A2bcd+4bcd	B: 1C; C: 1C; D: 1C; E: DD	Population size estimation is extremely difficult for this species due to lack of data, highly variable population density, population cycles, and potential for species misidentification. GB has two separate populations: 95% of the population is in Scotland, and the remainder is in an isolated (likely to be naturalised) population in the Peak District in England. The only substantial dataset with reliable identification is the National Gamebag Census from Scotland, which suggests cyclical fluctuations in the number of animals culled. The confidence intervals for trends are extremely wide, partly reflecting this cyclical variability, and whilst the trend between 1995 and 2006 is for a 40% decline, this is not statistically significant (95% CI -70% to 22%). Similar patterns are observed over longer time-frames in this dataset. However, beyond suggesting cyclical fluctuations, the data are difficult to interpret in terms of population trends due to the status of the species as quarry. As in the Review of the Population and Conservation Status of British Mammals (Mathews et al. 2018), data from the BTO breeding bird survey are considered unreliable for this species. Patton et al. (2010) estimated that 25,000 mountain hares were shot in 2006-07 in Scotland: this is a substantial proportion of the total population estimated here. Recently, an analysis of spring transect counts at 42 moorland sites suggested that the population index had declined by 31% per year between 1999 and 2014, with the most severe reductions being on sites subjected to burning for grouse-habitat management (Wilson & Watson 2018). If these results were replicated nationally then it would clearly result in a classification of CR under A2bcd+4bcd. However, these catastrophic declines contrast with trends presented by Hesford et al. (2019), based on spring transect counts at 76 blocks on 33 moors, which imply a stable population over the last 15 years, with some evidence of population increases in sites most actively used for grouse-shooting. In both cases, sites were not studied in every year, and there are potential confounding effects from the stage of the population cycle that the site was at in the time of the counts. Importantly, it is not clear whether either study can be generalised, as the study sites were not randomly selected. The population impacts of culls at a national scale are therefore unclear; but local population impacts are likely where culling is intensive, given the relative difficulty of recolonisation; and this may have a wider-scale impact on population viability. Population declines ≥20% in 10 years are plausible for Scotland in the past, and also going forward into the future, which gives a classification of NT under A2bcd+4bcd. Further evidence is urgently required since re-evaluation may move the species to the VU category. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the threshold for criteria C and D, and although the population in the Peak District in geographically restricted, the status of that population (VU) has only limited influence on the status of the national population. The species is therefore classified as NT.
Red squirrel	<i>Sciurus vulgaris</i>	Native	LC	13.3	76,701	17,952	287,000	218,000	553,000	EN	A2ce	B: 1C; B2: 1C; C: 1C; D: 1C; E: DD	EOO has declined by approximately 60% in each of England and Wales over 3 generations (inferred from 90% decline over 20 years), and by approximately 33% across GB as a whole. The AOO has declined by 36.6% in the 24 years between the first Mammal Atlas period and the second (records from 2010 and 2016 were included in the second Atlas for this species because of recent rapid contraction in the range; comparison based on occupied hectads because this is the resolution at which much data are available in the first period). This implies a decline in AOO of 20% over 3 generations. It is inferred that these multiple indications of reduction in geographical range correspond with a decline in population size: although reliable data on abundance are not available. Squirrel pox virus and other disease outbreaks are known to cause extremely high mortality and are implicated in local extinctions and ongoing population declines. In some parts of Scotland, declines appear to have stabilised recently but, local initiatives notwithstanding, reversal of previous trends is unlikely. Further declines within Scottish strongholds are likely with expansion of grey squirrel and the consequent introduction of disease into areas previously unaffected. Given the lack of progress in combatting disease threats and the impact of the introduced competitor on resource availability, the red squirrel is classified as EN under A2ce+4ce. It is inferred that population declines across the remaining strongholds at rates approaching those already experienced in the rest of GB are highly likely over the next 3 generations. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> so it does not qualify under B. The lower plausible estimate of population size is well above the threshold for C and D, and the range is not sufficiently restricted to meet criterion D2. Reliable data on abundance and area of occupancy are urgently required for this species.
Grey squirrel	<i>Sciurus carolinensis</i>	Non-native	LC	N/A	182,623	36,124	2,700,000	1,340,000	3,790,000	Not assessed	...	...	Species is non-native
Eurasian Beaver	<i>Castor fiber</i>	Native (reintroduced)	LC	27	5,261	368	197	N/A	N/A	EN	D1	A: 1C; B1a: NT; B2a: NT; C: 1C; D2: VU; E: DD	Beavers were extinct in GB by around the year 1600 (Raye 2014). The species was reintroduced to Scotland in 2009, and population size has increased since then, with offspring of the introduced animals now breeding. There are 45 occupied hectads in GB. EOO is <10,000km <sup>2</sup> and AOO is <500km <sup>2</sup> (the threshold for EN), however, only one of the sub-criteria for B is met (A), giving a classification of NT. The number of mature individuals is within the threatened categories for C, but there is no evidence of a population decline so the sub-criteria are not met. The best estimate of number of individuals results in the species being listed as EN under D1. Although plausible intervals for the population have not been formally calculated, it is highly unlikely that there are >1,000 mature individuals, the threshold for qualification under D1. It is also categorised as VU under D2 since the number of locations is small and there is a plausible threat from persecution.
Hazel dormouse	<i>Muscardinus avellanarius</i>	Native	LC	N/A	82,277	12,004	930,000	389,000	2,640,000	VU	A2b+3b+4b	B: D: 1C; E: DD	A decline of 48% (95%CI 39% - 55%) in relative occurrence of hazel dormice in GB has been estimated using data on nest box occupancy from the National Dormouse Monitoring Programme for 2005 to 2014 inclusive (Goodwin et al. 2017). The species therefore qualifies as VU under criterion A2b. The cause of the decline is not understood. Similar reductions are therefore suspected in future (VU: A3b+4b). There are suspicions that declining habitat quality may be important, but this effect has not been quantified. Were the upper confidence limits of this decline used, the species would qualify as EN. There is no evidence of any contraction in the geographical range over the past 20 years, and the number of occupied hectads has increased by 27% between the two Mammal Atlas periods (1960-1992 and 2000-2016), possibly because of greater recording effort. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Edible dormouse	<i>Glis glis</i>	Non-native	LC	N/A	2,368	244	23,000	9,800	82,000	Not assessed	...	...	Species is non-native
Bank vole	<i>Myodes glareolus</i>	Native	LC	N/A	177,632	16,472	27,400,000	15,100,000	54,100,000	LC	...	A: DD; B1: 1C; B2: 1C; C: 1C; D: 1C; E: DD	Although it is not possible to observe or estimate changes in population size due to lack of data, bank voles are recorded across much of GB, and there is no evidence of a contraction of the geographical range over the last 20 years. There has been a 6.1% decline in hedgerows, a primary habitat type, between 1998 and 2007, and also a longer-term decline in the condition of vegetation associated with hedgerow bottoms which has now stabilised (Carey et al. 2008). A decline as large as 30% over the past 10 years cannot be inferred from these changes, so the species does not meet the criteria for A at present. However it is noted that for all small mammals, good quantitative data on trends are lacking so this species should be re-assessed under A2c+3c when more data become available. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Field vole	<i>Microtus agrestis</i>	Native	LC	N/A	211,036	23,732	59,900,000	37,000,000	80,300,000	LC	...	A: 1C; B1: 1C; B2: 1C; C: 1C; D: 1C; E: DD	Although it is not possible to observe, estimate, infer or suspect trends in population size due to lack of data, field voles are recorded across most of GB, and there is no evidence of a contraction of the geographical range over the last 20 years. However, declining availability of suitable habitat (particularly tussocky grassland with a deep litter layer, typically associated with unimproved or semi-improved grasslands with limited grazing) between 1998 and 2007 (Carey et al. 2008), presents a potential threat. The area of unimproved grassland has declined over the last 20 years (see discussion in Review of the Population and Conservation Status of British Mammals (Mathews, Kubasiwicz et al. 2017)). More data are required to permit a re-evaluation of this species under A2c+3c. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Orkney Vole	<i>Microtus arvalis orcadensis</i>	Naturalised (island endemic)	LC	N/A	706	92	N/A*	N/A	N/A	VU	A2c+3c; B1ab(i,ii,iii)+2ab(i,ii)	B: VU; C: 1C; D1: 1C; D2: NT; E: DD	In GB, species is restricted to Orkney, though it is also found in Guernsey and mainland continental Europe. A Regional Red List assessment is made for the Orkney vole because of its formal status as an island endemic (it is suspected to have been introduced around 5,000 years ago). There are no direct counts or estimates of population change. However, the number of occupied hectads has fallen by 38% between the two Mammal Atlas periods (1960-92 to 2000-16), and it is inferred that this equates to an equivalent decline in population size. Concerns about declining habitat suitability for Orkney voles were raised >20 years ago (Gorman & Reynolds 1993). Although more recent assessments are not available, the species is an important prey item for hen harriers, and reported declines in that species may also be indicative of a continuing decline in Orkney vole populations (Amar et al. 2003). The species is therefore classified as VU under A2c+3c. EOO is <5,000km <sup>2</sup> and AOO is <500km <sup>2</sup> . The population is fragmented across different islands (n=10; 7 main islands and 3 small islands). There is continued loss of habitat quality, though the scale of recent deterioration is unclear. The species is therefore classified as VU under B1ab(i,ii,iii)+2ab(i,ii). There are no recent data on population sizes, and estimates could not be made for the Mammal Population Review (Mathews & Kubasiwicz et al. 2018), but an estimate of >2 million individuals was made for the years 1998-1990 (Reynolds, 1992). Whilst a substantial population decline since that time is inferred, the species is still unlikely to qualify under criterion C. Given the very restricted geographical range, the fragmentation across islands, and the threats from habitat loss and alien predators (stoats introduced in 2010 and have spread rapidly) that could plausibly send the species to CR in a short period, the species is classified as NT under D2.



ENGLAND ASSESSMENT

	Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
						Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate						
Rodentia	Water vole	<i>Arvicola amphibius</i>	Native	LC	N/A	109,996	16,476	77,200	57,900	193,000	EN	A2c	A2be+3bce+4bce: VU; B: LC; C: D: LC; E: DD	English populations are inferred to have declined very rapidly over recent years. A comparison of population estimates from the current review (Mathews et al. 2018) and those reported by Strachan et al. (2000) (population estimate of 145,800 in 1998-99 and 77,000 in 2016), gives a 47% decline over 17 years, equating to a mean decline of 28% over 10 years. A much larger decline of 81% was estimated to have occurred between 1989-90 and 1996-98 based on the data presented in Harris et al. (1995) (population estimate 752,000) and Strachan et al. (2000) (population estimate 145,800). It is unclear whether the rate of decline in population size has truly slowed down, because population size estimates are uncertain and more recent surveys have been in restricted areas. The overall mean annual decline in population size (from 752,000 in 1995 (Harris et al. 1995) to 77,000 in 2016 (Mathews et al. 2018)) is 4.3%, which gives a 10-year decline of 43%, and results in a classification of VU under A2be. Occupancy fell by >80% in most areas covered by the two National Water Vole Surveys (1989-90 (Strachan and Jefferies 1993) and 1996-98 (Strachan et al. 2000)), implying a 10-year decline of 88%. Strachan et al. (2000) estimated an 80% decline in area of occupancy between 1989-90 and 1996-98, so a decline of >80% is inferred for the 10 year period 1989-1999. This leads to classification as EN under A2c. Notwithstanding local conservation efforts, including reintroductions and habitat management, further population reductions are suspected in the future, though most likely not as rapid as previous declines (VU A3bce+4bce). There is no evidence to suggest that these declines, calculated for the whole of GB, would be lower in England, so the national value is used in the current assessment. EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> . Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	Harvest mouse	<i>Micromys minutus</i>	Native	LC	N/A	101,637	6,024	532,000	272,000	879,000	LC	—	A:DD; B-D:LC; E:DD	Population size estimates are currently reliant on ratio values with wood mice, and are therefore uncertain. There is no evidence of a contraction of geographical range over the last 20 years, and there has been a 35% increase in occupied hectads between the two Mammal Atlas periods (1960-1992 and 2000-2016). However in part this is likely to reflect an increase in recording effort (for example by Wildlife Trusts and the Mammal Society) following anecdotal reports of local declines in the species. A population reduction which may not have ceased is suspected based on a continuing loss of habitat (a significant decline of 8.8% for enclosed arable and horticultural land, and 6.1% for hedgerows between 1998 and 2007 (Carey et al. 2008)). Although there has been a long-term decline in the condition of vegetation associated with hedgerow bottoms, with a fall in diversity and an increase in taller more competitive species, this decline stabilised between 1998 and 2007 (Carey et al. 2008), and it is also unclear whether such changes would affect harvest mice since they are largely arboreal. Agricultural practices have also shifted towards winter crops, which are harvested earlier in summer, resulting in a loss of nests and young. Climate change is likely to result in wetter summers, which will limit any potential expansion in range. Whilst it is not currently thought that historical or projected declines would be as high as 30%, it is plausible that at re-evaluation with additional data, the species may be moved to the NT category under A2. Further data collection for this species is therefore strongly advised to permit a re-assessment under criterion A. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D, and the geographical range is not highly restricted.
	Wood mouse	<i>Apodemus sylvaticus</i>	Native	LC	N/A	127,593	20,908	22,700,000	11,600,000	37,800,000	LC	—	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe or estimate changes in population size due to lack of data, wood mice are recorded throughout England, and there is no evidence of a contraction of the geographical range over the last 20 years. Whilst there has been a 6.1% decline in hedgerows, a key habitat type, between 1998 and 2007, there has also been an increase of 5.8% in deciduous woodland area (Carey et al. 2008), so the net effect is likely to be positive since the latter habitat contributes more to the total estimated population size. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	Yellow-necked mouse	<i>Apodemus flavicollis</i>	Native	LC	N/A	55,974	3,124	1,360,000	426,000	3,940,000	LC	—	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, yellow-necked mice are recorded across a large area. There is no evidence of a contraction of the geographical range over the last 20 years, and the number of occupied hectads has increased between the two Mammal Atlas recording periods (1960-1992 to 2000-2016). However, the plausible intervals around the current population estimate are extremely wide, so declines are also possible. Whilst there has been a 6.1% decline in hedgerows, a primary habitat type, between 1998 and 2007, there has also been an increase of 5.8% in deciduous woodland area (Carey et al. 2008); the net effect is therefore likely to be positive given the latter habitat contributes more to the total estimated population size. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	House mouse	<i>Mus domesticus</i>	Naturalised, non-native	LC	N/A	105,477	5,400	4,340,000	N/A	N/A	Not assessed	—	—	Species is naturalised
	Brown rat	<i>Rattus norvegicus</i>	Non-native	LC	N/A	127,511	24,840	4,730,000	N/A	N/A	Not assessed	—	—	Species is non-native
	Black rat	<i>Rattus rattus</i>	Naturalised, non-native	LC	N/A	N/A	24	0	0	N/A	Not assessed	—	—	Species is naturalised
	Wildcat	<i>Felis silvestris</i>	Native	LC	23.9	0	0	0	—	—	RE	—	—	The species was regularly found in northern England in 1800: the last records are probably those from Castle Eden, Durham in 1843, Eslington, Northumberland in 1853 and Wensleydale in 1854 (Barker 1854; Langley & Yalden 1977; Mennel & Perkins, 1863). The species is therefore considered to be regionally extinct in the wild (RE).
	Red Fox	<i>Vulpes vulpes</i>	Native	LC	17.3	129,901	62,620	255,000	65,200	464,000	LC	—	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	A significant increase in the game bag density index was reported in the National Gamebag Census for England 1995-2009 (26%, 95%CI 13% to 39%; Rieley et al. 2010). However, the most recent BBS report indicates a decline of 44% for the period 1995 to 2016 (95%CI -53% to -33%; Harris et al. 2016). Both surveys suffer from errors that are difficult to account for analytically (e.g. hunting effort to unquantified in National Gamebag Census). An intermediate approach has therefore been taken due to data uncertainty. Taking the median of the annual changes in each survey gives a decline of 0.2% per year and therefore 3.5% over 3 generations. It should be noted that there are issues about the interpretation of both surveys, and further data should be gathered to assess the scale of any decline and permit a re-assessment under criterion A. Population estimates are very uncertain, as are inferences about the scale of any decline based on the available indices. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , and there is no evidence of any contraction of the geographical range over the past 20 years. Although there is uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.

SCOTLAND ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Water vole	<i>Arvicola amphibius</i>	Native	LC	N/A	43,930	2,440	50,000	37,500	125,000	NT	A2bce+3bce+4bce	B: LC; C: LC; D: LC; E: DD	<p>Scottish populations are inferred to have declined very rapidly over recent years. A comparison of population estimates from the current review (Mathews et al. 2018) and those reported by Strachan et al. (2000) (population estimate of 106,000 in 1998-99 and 50,000 in 2016), gives a 53% decline over 17 years, equating to a mean decline of 31% over 10 years. A much larger decline of 72% was estimated to have occurred between 1989-90 and 1996-98 based on the data presented in Harris et al. (1995) (population estimate 376,000 and Strachan et al. (2000) (population estimate 106,000). It is unclear whether the rate of decline in population size has truly slowed down, because population size estimates are uncertain, particularly in more recent years. The overall mean annual decline in population size (from 376,000 in 1995 (Harris et al. 1995) to 50,000 in 2016 (Mathews et al. 2018)) is 4.1%, which gives a 10-year decline of 41%, and results in a classification of VU under A2bce. Occupancy fell by &gt;80% in most areas covered by the two National Water Vole Surveys (1989-90 (Strachan and Jeffries 1993) and 1996-98 (Strachan et al. 2000), implying a 10-year decline of 88%. This leads to classification as EN under A2c. However, there is a large ongoing conservation effort across a substantial region of Scotland, mainly focused on mink control. Therefore recent declines, and suspected future declines, are likely to occur at a lower rate than in England and Wales provided mink populations remain low. The classification for this species is therefore downgraded to NT under criteria A2bce+3bce+4bce. IUCN also recommend the use of this category for species receiving substantial support through management, and where the cessation of the intervention would lead to a threatened category within 5 years, as is likely to be the case here. AOO is close to the threshold of 2,000km<sup>2</sup> but this estimate is very uncertain because of patchy recording in the uplands where much of the population is found. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.</p> <p>*AOO was computed by multiplying the total areas of waterway occupied by a 4m width, representing bankside vegetation, according to the IUCN recommended approach for dealing with linear habitats.</p>
Harvest mouse	<i>Micromys minutus</i>	Native	LC	N/A	N/A	20	N/A	N/A	N/A	CR	D1:CR	A:DD; B:DD; C:DD; E:DD	<p>Multiple confirmed records dating from the nineteenth century from Paisley, Kilbarchan, Edinburgh, Aberdeenshire and Fife (Harris, 1979; Macgillivray, 1838; Harting, 1895; Millais, 1905; English, 1908; Adams, 1913) indicates that the species was historically present throughout southern Scotland. However, records are now very scarce - only 5 records across the whole of Scotland for the last 20 years - and these are scattered (the Borders, Paisley and the north coast), suggesting that an established population is unlikely. Nevertheless, at least two recent records are very reliable. AOO is based on tetrads for which records are available; no EOO could be computed because the records are dispersed. Although the AOO is &lt;500km<sup>2</sup>, and one subcriterion of B2 applies (a), lack of data mean it is not possible to judge whether any of the other subcriteria apply. Similarly, it is unclear whether any of the subcriteria for C apply. The species is therefore considered critically endangered based on likely very small population size inferred from the small number of records (D1).</p>
Wood mouse	<i>Apodemus sylvaticus</i>	Native	LC	N/A	55,946	2,188	12,300,000	6,510,000	18,800,000	LC	...	A:DD; B1: LC; B2: LC; C:LC; D:LC; E:DD	<p>Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, wood mice are recorded throughout Scotland. The extent of occurrence appears unchanged compared with Arnold (1995), but there has been a 20% decline in the number of positive hectads between the two Mammal Atlas recording periods (1962-1992 and 2000-2016). This may suggest a population decline, but the scale is insufficient to classify the species as threatened under criterion A. Whilst there has been a 8.7% decline in hedgerows, a primary habitat type, between 1998 and 2007, there has also been an increase of 9.6% in deciduous woodland area (Carey et al. 2008), so the net effect is likely to be positive since the latter habitat contributes more to the total estimated population size. EOO is &gt; 20,000km<sup>2</sup>; AOO is close to 2,000km<sup>2</sup> and it is possible that subcriterion b(i) may apply. The species is therefore considered close to qualifying as NT under B2b(ii) and should be re-assessed against this and the other subcriteria as further information becomes available. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.</p>
Yellow-necked mouse	<i>Apodemus flavicollis</i>	Native	LC	N/A	Species is not present, and is considered unlikely to have ever been present, in Scotland.	...	...	...	...	...	...	...	<p>This species is not present in Scotland</p>
House mouse	<i>Mus domesticus</i>	Naturalised, non-native	LC	N/A	12,806	368	523,900	N/A	N/A	Not assessed	...	...	<p>Species is naturalised</p>
Brown rat	<i>Rattus norvegicus</i>	Non-native	LC	N/A	36,835	1,572	1,060,000	N/A	N/A	Not assessed	...	...	<p>Species is non-native</p>
Black rat	<i>Rattus rattus</i>	Naturalised	LC	N/A	N/A	4	0	0	N/A	Not assessed	...	...	<p>Species is naturalised</p>
Wildcat	<i>Felis silvestris</i>	Native	LC	23.9	26,700	1,040	200	30	430	CR	A2ace+4ace; C1	B1: LC; B2ab(L,U,V); VU; ; C2a(i); EN; D: EN	<p>The species used to be widespread in Scotland in 1800 (Langley &amp; Yalden, 1977). Population size is estimated to have declined by &gt;80% in the last 3 generations (derived by comparison of data from the current review, Kishaw et al. (2015) and Harris et al. (1995)), qualifying the species as CR under A2ace. Examination of the number of hectads reported occupied in the previous Mammal Atlas period (1960-92) and the latest period (2000-16) also indicates a decline in occupancy (-68% across 24 years, which supports an inference of a decline of 68% in the last 3 generations). Conservation efforts are currently in progress and, in the absence of these efforts, the previous trajectory of decline would be expected to continue in the future (CR under A4ace). In addition, there is strong evidence of cryptic extinction through hybridisation with domestic cats: the population estimates given here are based on pelage and morphology alone, but in a recent survey only 2 of &gt;100 carcasses thought to be wild cat on this basis were genetically characterised as pure wild cat (Scottish Wildcat Action 2017). The species is therefore classified as CR under C1 (&lt;250 mature individuals and &gt;25 decline in 1 generation); and it is also close to CR under D. AOO is &lt;2,000 km<sup>2</sup>, which qualifies the species as EN under B2a and b. (Note that it is difficult to define subpopulations for this species, but it is likely that &gt;50% of the total patches occupied are non-viable and have &lt;250 mature individuals due to the extreme fragmentation of the population.) Population modelling suggests a 20% probability of extinction within 10 years (Littlewood et al. 2014) given a starting population size of 16 animals, and this can be inferred to imply a probability of 28% over 3 generations. However, the actual number of wildcats within priority conservation areas is actually lower than this, without accounting for genetic introgression. The species is therefore classified as CR under E.</p>
Red fox	<i>Vulpes vulpes</i>	Native	LC	17.3	69,721	9,572	74,000	30,100	132,000	NT	A2b+4b	B1: LC; B2: LC; C:LC; D:LC; E:DD	<p>A small but significant decrease in the game bag density index was reported in the National Gamebag Census for Scotland 1995-2009 (-15%, 95%CI -29% to -3%, Risely et al. 2010), although it is difficult to infer trends on these data alone because survey effort is not standardised. BBS data are not available for Scotland individually. If the median is taken of the national value from the BBS (-39%, 95%CI -49% to -29%) and the NGB for Scotland, then the annual decline is 1.5%, which implies a 26% decline over 3 generations, qualifying the species as NT under A2b+4b. Further data should be collected to permit re-assessment of this species under criterion A. Population estimates are very uncertain, as are inferences about the scale of any decline based on the available indices. EOO is &gt; 20,000km<sup>2</sup> and AOO is &gt; 2,000km<sup>2</sup>, with no evidence of any contraction of the geographical range over the past 20 years. Although there is uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.</p>

WALES ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale
							Central estimate	Lower plausible limit*	Upper plausible limit*				
Water vole	<i>Arvicola amphibius</i>	Native	LC	N/A	14,512	1,252	4,500	3,400	11,300	EN	A2c	A2be+3bce+4bce: VU; B1ab:VU; B2ab(ii,iv,v); C: VU; D2: VU; E:DD	Welsh populations are inferred to have declined very rapidly over recent years. A comparison of population estimates from the current review (Mathews et al. 2018) and those reported by Strachan et al. (2000) (population estimate of 10,500 in 1998-99 and 4,500 in 2016), gives a 57% decline over 17 years, equating to a mean decline of 34% over 10 years. A much larger decline of 74% was estimated to have occurred between 1989-90 and 1996-98 based on the data presented in Harris et al. (1995) (population estimate 41,000) and Strachan et al. (2000) (population estimate 10,500). It is unclear whether the rate of decline in population size has truly slowed down, because population size estimates are uncertain. The overall mean annual decline in population size (from 41,000 in 1995 (Harris et al. 1995) to 4,500 in 2016 (Mathews et al. 2018)) is 4.2%, which gives a 10-year decline of 42%, and results in a classification of VU under A2be. Occupancy fell by >80% in most areas covered by the two National Water Vole Surveys (1989-90 (Strachan and Jefferies 1993) and 1996-98 (Strachan et al. 2000), implying a 10-year decline of 88%. This leads to classification as EN under A2c. Notwithstanding local conservation efforts, including reintroductions and habitat management, further population reductions are suspected in the future, though most likely not as rapid as previous declines (VU A3bce+4bce). EOO is <20,000km <sup>2</sup> and AOO is <2,000km <sup>2</sup> . Based on expert opinion, it is likely that at least 50% of the total occupancy is in patches that do not support a minimum viable population and that are separated by large distances. Therefore the species is assessed as VU under B1ab(ii,iv,v) and B2ab(ii,iv,v). The best estimate of population size is <10,000, and given the observed decline of >40% in 10 years, the species is classified as EN (and close to EN) under C1 and C2a(i). The lower plausible estimate of population size is close to the best estimate, and both are above the threshold for qualifying under D1. The very limited AOO and the suspected continuing decline that could lead to CR status in a short period mean that the species is classified as VU under D2.
Harvest mouse	<i>Micromys minutus</i>	Native	LC	N/A	5,042	100	34,000	16,600	55,700	VU	B1ab(iii)+2ab(iii)	A:DD; A2c:NT; C1C; D1: LC; D2:NT; E:DD	Population size estimates are currently reliant on ratio values with wood mice, and are therefore uncertain. Although there is no evidence of a contraction of geographical range over the last 20 years, changes in habitat quality are likely to affect the species negatively. A population reduction which may not have ceased is therefore suspected based on a continuing loss of habitat: in Wales between 1989 and 2007 there was a significant decline in the availability of plants classified as providing food for birds (and by inference a loss in food availability for harvest mice), and also a loss of 5.3% of hedgerows (Carey 2008) and a decline in habitat quality. Although there has been a long-term decline in the condition of vegetation associated with hedgerow bottoms, with a fall in diversity and an increase in taller more competitive species, this decline stabilised between 1998 and 2007 (Carey 2008), and it is unclear whether such changes would affect harvest mice since they are largely arboreal. Agricultural practices are shifting towards winter crops, which are harvested earlier in summer, resulting in a loss of nests and young. Climate change is likely to result in wetter summers, which will limit any potential expansion in range. The species is therefore assessed as NT under A2c. Although a decline in extent of occurrence has not been observed, data are extremely sparse, with just 40 records between 1995 and 2016 (data from Mathews and Kubasiewicz et al. 2017); and there was a 38% decline in the number of positive hectads between the two Mammal Atlas periods (1960-1992 and 2000-2016). Whilst it is not currently thought that historical or projected declines would be as high as 30% in 10 years, it is plausible that at re-evaluation with additional data, the species may be moved to the VU category under A2. Further data collection for this species is therefore strongly advised to permit a re-assessment under criterion A. AOO is very close to 100 km <sup>2</sup> and EOO is close to 5,000km <sup>2</sup> . The population along the Welsh border is contiguous with populations in England, but those populations in SW, SE and NE Wales are extremely isolated. The species is therefore classified as VU under B1ab(iii)+2ab(iii), and is very close to qualifying as EN. The lower plausible estimate of population size is well above the threshold for criteria C and D1. The number of locations supporting subpopulations is <5, but it is unclear whether there is a plausible threat likely to drive the taxon to CR in a very short period. The species is therefore classified as NT under D2. Systematic data collection to enable assessment of any populations size reduction (criterion A) to assess whether the population size is small and declining (criterion C) is strongly advised in order to permit a re-assessment of the species.
Wood mouse	<i>Apodemus sylvaticus</i>	Native	LC	N/A	20,051	2,144	4,600,000	2,240,000	7,680,000	LC	...	A:DD; B1: LC; B2: LC; C1C; D1C; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, wood mice are recorded throughout Wales, and there is no evidence of a contraction of the geographical range over the last 20 years. There has been a 5.3% decline in hedgerows, an important habitat type, between 1998 and 2007. However, unlike the other GB countries, there has been no change in deciduous woodland area (Carey et al. 2008), so overall there is likely to be only a limited change in the availability of suitable habitat. EOO is >20,000km <sup>2</sup> and although AOO is close to the qualifying value of 2,000km <sup>2</sup> , it is unlikely that any of the sub-criteria for B are met. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Yellow-necked mouse	<i>Apodemus flavicollis</i>	Native	LC	N/A	6,795	296	140,000	40,600	423,000	LC	...	A:DD; B1: LC; B2: LC; C1C; D1C; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, yellow-necked mice are recorded throughout Wales. There is no evidence of a contraction of the geographical range over the last 20 years, and the number of occupied hectads has increased between the two Mammal Atlas recording periods (1960-1992 to 2000-2016). There has been a 5.3% decline in hedgerows, an important habitat type, between 1998 and 2007. However, unlike the other GB countries, there has been no change in deciduous woodland area (Carey et al. 2008), so overall there is likely to be only a limited change in the availability of suitable habitat. Even so, confidence intervals around the current population estimate are extremely wide for this species, and therefore declines are plausible. EOO is <20,000km <sup>2</sup> , and AOO is <500km <sup>2</sup> but it appears unlikely that any of the sub-criteria for B will apply. Further data are required to permit a re-assessment of this species. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
House mouse	<i>Mus domesticus</i>	Naturalised, non-native	LC	N/A	9,146	280	339,000	N/A	N/A	Not assessed	...	...	Species is naturalised
Brown rat	<i>Rattus norvegicus</i>	Non-native	LC	N/A	18,653	1,244	1,280,000	N/A	N/A	Not assessed	...	...	Species is non-native
Black rat	<i>Rattus rattus</i>	Naturalised	LC	N/A	N/A	4	0	0	N/A	Not assessed	...	...	Species is naturalised
Wildcat	<i>Felis silvestris</i>	Native	LC	23.9	0	0	0	...	...	RE	...	...	The species was widespread in Wales in 1800, but persecution led to a rapid decline of the species. Accurate records are lacking, but it is likely that the species went extinct in the wild at the start of the 20th century (Langley & Yalden & Yalden, 1992).
Red Fox	<i>Vulpes vulpes</i>	Native	LC	17.3	20,643	7,032	27,700	9,260	50,000	LC	...	A:DD; B1: LC; B2: LC; C1C; D1C; E:DD	It is not possible to observe, estimate, infer or suspect changes in population size due to lack of data: sample sizes are too small to permit robust calculation of trends from either the BTO BBS or GWCT NGB census for Wales specifically. If national values are applied then the median value across the two surveys implies a decline of 0.6% per year, or 10% over 3 generations (see GB assessment). Foxes are recorded throughout Wales and there is no evidence of a contraction of the geographical range over the last 20 years. Population estimates are very uncertain, as are inferences about the scale of any decline based on the available indices. EOO is >20,000km <sup>2</sup> and AOO >2,000km <sup>2</sup> . The best estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted. The lower plausible population estimate is below the threshold of VU under C, but none of the sub-criteria apply. The lower estimate is well above the threshold for a threatened category under D. Although the declines reported in the other countries are below the threshold for a VU category under A2, more data should be gathered to permit a re-assessment of this species.

GREAT BRITAIN ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Water vole	<i>Arvicola amphibius</i>	Native	LC	N/A	168,437	20,168	132,000	99,000	329,000	EN	A2c	A2b: VU; A3bce+4bce: NT; B: LC; C: LC; D: LC; E:DD	GB populations are inferred to have declined very rapidly over recent years. A comparison of population estimates from the current review (Mathews et al. 2018) and those reported by Strachan et al. (2000) (population estimate of 262,500 in 1998-99 and 132,000 in 2016), gives a 50% decline over 17 years, equating to a mean decline of 29% over 10 years. A much larger decline of 78% was estimated to have occurred between 1989-90 and 1996-98 based on the data presented in Harris et al. (1995) (population estimate 1,169,000) and Strachan et al. (2000) (population estimate 262,500). It is unclear whether the rate of decline in population size has truly slowed down, because population size estimates are uncertain and more recent surveys have been in restricted areas, and in some of these declines are thought to be lower than average. The overall mean annual decline in population size (from 1,169,000 in 1995 (Harris et al. 1995) to 132,000 in 2016 (Mathews et al. 2018)) is 4.2%, which gives a 10-year decline of 42%, and results in a classification of VU under A2b. Occupancy fell by >80% in most areas covered by the two National Water Vole Surveys (1989-90 (Strachan and Jefferies 1993) and 1996-98 (Strachan et al. 2000)), implying a 10-year decline of 88%. This leads to classification as EN under A2c. While this decline is much greater than that recorded using all verified Biological Records included in the two Mammal Atlas periods (8.3% decline for 1960-92 compared with 2005-16), precedence should be given to the more systematic survey approach used in the National Water Vole Surveys, and this is supported by expert opinion about the scale of decline for this species. Notwithstanding local conservation efforts, including reintroductions and habitat management, further population reductions are suspected in the future, though these are potentially at a slower rate in Scotland, which currently holds about a third of the national population. The species is therefore classified as NT under A3bce+4bce. EOO is >20,000km <sup>2</sup> and AOO >2,000km <sup>2</sup> . Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Harvest mouse	<i>Micromys minutus</i>	Native	LC	N/A	106,680	6,124	566,000	288,000	934,000	NT	A2c	A1:DD; A3-4:DD; B-D:LC; E:DD	Population size estimates are currently reliant on ratio values with wood mice, and are therefore uncertain. There is no evidence of a contraction of geographical range over the last 20 years, and there has been a 31% increase in occupied hectads between the two Mammal Atlas periods (1960-1992 and 2000-2016), though this is likely to reflect recent increases in survey effort as a consequence of local initiatives prompted anecdotal reports of declines in the species. A population reduction which may not have ceased is suspected based on a continuing loss of habitat (a significant decline of 9.1% for enclosed arable and horticultural land, and 6.1% for hedgerows between 1998 and 2007 (Carey et al. 2008)). Although there has been a long-term decline in the condition of vegetation associated with hedgerow bottoms, with a fall in diversity and an increase in taller more competitive species, this decline stabilised between 1998 and 2007 (Carey et al. 2008) and it is unclear whether such changes would affect harvest mice since they are largely arboreal. Agricultural practices have also shifted towards winter crops, which are harvested earlier in summer, resulting in a loss of nests and young. Climate change is likely to result in wetter summers, which will limit any potential expansion in range. Whilst it is not currently thought that historical or projected declines would be as high as 30%, it is plausible that re-evaluation with additional data would result in the species being moved to the VU category under A2. It is therefore currently classified as NT. Further data collection for this species is therefore strongly advised to permit a re-assessment under criterion A. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D, and the geographical range is not highly restricted.
Wood mouse	<i>Apodemus sylvaticus</i>	Native	LC	N/A	203,590	25,240	39,600,000	20,400,000	64,300,000	LC	---	A:LC; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe or estimate changes in population size due to lack of data, wood mice are recorded throughout GB, and there is no evidence of a contraction of the geographical range over the last 20 years. Whilst there has been a 6.1% decline in hedgerows, a key habitat type, between 1998 and 2007, there has also been an increase of 5.9% in deciduous woodland area (Carey et al. 2008), so the net effect is likely to be positive since the latter habitat contributes more to the total estimated population size. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Yellow-necked mouse	<i>Apodemus flavicollis</i>	Native	LC	N/A	62,769	3,420	1,500,000	467,000	4,360,000	LC	---	A:LC; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, yellow-necked mice are recorded across a large area. There is no evidence of a contraction of the geographical range over the last 20 years, and the number of occupied hectads has increased between the two Mammal Atlas recording periods (1960-1992 to 2000-2016). However, the plausible limits around the current population estimate are extremely wide, so declines are possible. Whilst there has been a 6.1% decline in hedgerows, a primary habitat type, between 1998 and 2007, there has also been an increase of 5.9% in deciduous woodland area (Carey et al. 2008): the net effect is therefore likely to be positive given that the latter habitat contributes more to the total estimated population size. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
House mouse	<i>Mus domesticus</i>	Naturalised, non-native	LC	N/A	127,429	6,048	5,203,000	N/A	N/A	Not assessed	---	---	Species is naturalised
Brown rat	<i>Rattus norvegicus</i>	Non-native	LC	N/A	183,000	27,656	7,070,000	N/A	N/A	Not assessed	---	-	Species is non-native
Black rat	<i>Rattus rattus</i>	Naturalised	LC	N/A	N/A	32	0	0	N/A	Not assessed	---	---	Species is naturalised
Wildcat	<i>Felis silvestris</i>	Native	LC	23.9	26,700	1,040	200	30	430	CR	A2ace+4ace; C1	B1:LC; B2ab(II,V):VU; C2a(I):EN; D:EN	Population size is estimated to have declined by >80% in the last 3 generations (derived by comparison of data from the current review, Kilshaw et al. (2015) and Harris et al. (1995)), qualifying the species as CR under A2ace. Examination of the number of hectads reported occupied in the previous Mammal Atlas period (1960-92) and the latest period (2000-16) also indicates a decline in occupancy (-68% across 24 years, which supports an inference of a decline of 68% in the last 3 generations). Conservation efforts are currently in progress and, in the absence of these efforts, the previous trajectory of decline would be expected to continue in the future (CR under A4ace). In addition, there is strong evidence of cryptic extinction through hybridisation with domestic cats: the population estimates given here are based on pelage and morphology alone, but in a recent survey only 2 of >100 carcasses thought to be wild cat on this basis were genetically characterised as pure wild cat (Scottish Wildcat Action 2017). The species is therefore classified as CR under C1 (<250 mature individuals and decline >25% in 1 generation); and it is also close to CR under D. AOO is <2,000 km <sup>2</sup> , which qualifies the species as EN under B2a and b. (Note that it is difficult to define subpopulations for this species, but it is likely that >50% of the total patches occupied are non-viable and have <250 mature individuals due to the extreme fragmentation of the population.) Population modelling suggests a 20% probability of extinction within 10 years (Littewood et al. 2014) given a starting population size of 16 animals, and this can be inferred to imply a probability of 28% over 3 generations. However, the actual number of wildcats within priority conservation areas is actually lower than this, without accounting for genetic introgression. The species is therefore classified as CR under E.
Red Fox	<i>Vulpes vulpes</i>	Native	LC	17.3	220,265	79,224	357,000	104,000	646,000	LC	---	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	A small but significant increase in the game bag density index was reported in the National Gamebag Census for GB between 1995 and 2009 (11%, 95%CI 1% to 21%, Riseley et al. 2010). However, the most recent BBS report indicates a decline of 39% (95% CI -49% to -29%) between 1996 and 2015 (Harris et al. 2016). Both surveys suffer from errors that are difficult to adjust for analytically (e.g. unquantified hunting effort in National Gamebag Census). An intermediate approach has therefore been taken owing to data uncertainty. Using the median of the annual trends for each survey gives a decline of 0.6% over 10 years. Over 3 generations, this implies a decline of 10%. It should be noted that there are issues about the interpretation of both surveys, and further data should be gathered to assess the scale of any decline and permit reassessment under criterion A. Population estimates are very uncertain, as are inferences about the scale of any decline based on the available indices. EOO is >20,000km <sup>2</sup> and AOO is >2000km <sup>2</sup> , and there is no evidence of any contraction of the geographical range over the past 20 years. Despite the uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.

ENGLAND ASSESSMENT

	Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
						Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate						
Carnivora	Badger	<i>Meles meles</i>	Native	LC	17.8	129,901	72,596	384,000	259,000	711,000	LC	—	A:LC; B1: LC; B2: LC; C:LC; D:LC; E:DD	Population size is inferred to be increasing for this species (Wilson et al. 1997; Judge et al. 2013). There is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000 km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted. The impact of the extension of the badger cull programme in England is not currently known, and the regional status of the species should be kept under review.
	Otter	<i>Lutra lutra</i>	Native	NT	22.8	125,672	39,276	2,900	N/A	N/A	LC	—	A:LC; B1: LC; B2: LC; C:LC; D:LC; E:DD	An increase in the population size in England is inferred from increasing geographical range and occupancy (62% increase in occupied hectads between the two Mammal Atlas periods 1960-1992 and 2000-2016); and larger increases reported in the systematic National Otter Surveys of England). There is no evidence of a contraction of the geographical range over the last 20 years, and the EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> so it does not qualify under B1 or B2. The population is estimated at only 2,800 individuals, but the population is expanding and so does not meet criteria C1 or C2. It has not been possible to calculate plausible population estimates for this species, but the best estimate will be above the threshold for D1, and the geographical range is not highly restricted.
	Pine marten	<i>Martes martes</i>	Native	LC	17.3	12,358	500	N/A	N/A	N/A	CR	D1	A: DD; B1: NT; B2: NT; C: DD; E: DD	The pine marten has been absent from England as a breeding species since at least 1900, having been eliminated by persecution. There are very occasional records, including recent video footage from Northumbria and Shropshire, but extensive research by the Vincent Wildlife Trust suggests that there is not breeding population in England. There is, currently no estimate of population size. It is not possible to estimate, infer or suspect a decline in population size because of a lack of data, and is unclear whether there has been a change in geographical range. It is therefore not possible to make an assessment under criterion A. EOO is <20,000km <sup>2</sup> , and AOO is <2,000km <sup>2</sup> , but these are generated from incidental records reported over the last 20 years: the area currently occupied is likely to be very much smaller (AOO likely to be <500km <sup>2</sup> ), given the lack of evidence of an established population. The records are from four locations – the New Forest, North West England, Shropshire and Northumberland. In the absence of data on sub-criteria (b) and (c), the species is classified as NT under B1a+2a. The species is data deficient for C1 and C2. It is inferred that the number of mature individuals is <50, giving a classification of CR under criterion D.
	Stoat	<i>Mustela erminea</i>	Native	LC	N/A	128,226	22,556	260,000	N/A	N/A	LC	—	A:DD; B1: LC; B2: LC; C:LC; D:LC; E:DD	Although it is not possible to observe, infer, estimate or suspected a change in population size due to lack of data, stoats are recorded throughout England, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. However, it is noted that this species is extremely data deficient, with estimates of population size and changes being extremely uncertain. Further information is required to permit a re-assessment of this species.
	Weasel	<i>Mustela nivalis</i>	Native	LC	N/A	129,390	17,788	308,000	N/A	N/A	LC	—	A:DD; B1: LC; B2: LC; C:LC; D:LC; E:DD	Although it is not possible to observe, infer, estimate or suspect a change in population size due to lack of data, weasels are recorded throughout England, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. However, it is noted that this species is extremely data deficient, with estimates of population size and changes being entirely dependent on the assumed ratio of stoats: weasels. Further information is required to permit re-assessment of this species.
	Polecat	<i>Mustela putorius</i>	Native	LC	13.6	85,377	9,140	66,400	53,900	79,000	LC	—	A:LC; B1: LC; B2: LC; C:LC; D:LC; E:DD	Following long-term historical depletion, the geographical range has increased in this species over the last 20 years, particularly in South West England and East Anglia (Croose et al. 2016). EOO is > 20,000km <sup>2</sup> and AOO is > 2,000km <sup>2</sup> , so the species does not qualify under B. Although there is considerable uncertainty about population size, the lower plausible population estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	Mink	<i>Neovion vison</i>	Non-native	LC	N/A	128,900	18,052	62,400	N/A	N/A	Not assessed	—	—	Species is non-native
Wild boar	<i>Sus scrofa</i>	Native (reintroduced)	LC	N/A	6,889	388	500	30	1,500	DD	—	A-E: DD	Wild boar are widely considered to have been extinct by the 13th Century in England (Yalden 1999), though there were various attempts at reintroduction, for example, in the 16th Century to Savernake Forest (Wiltshire) and Chartley Park (Staffordshire) (Rackham 1997). Further reintroductions continued until the end of the 17th century, but the species once again became extinct by 1800 (Goulding 2003). The provenance of the current, small, population is unknown and this is the basis for classifying the species as DD. As with other populations of wild boar elsewhere in Europe, the English population is likely to include a proportion of farm stock, though these will be under strong selection pressure in favour of wild-type genes. It is therefore likely that the population will be dominated rapidly by wild-type individuals this is not already the case. Further information should be gathered to enable a formal assessment to be made. A reduction in population size has not been observed, inferred, estimated or suspected for this species. EOO is <20,000km <sup>2</sup> , AOO is <500km <sup>2</sup> , and the number of locations with established populations is <5 (based on individual population ranges outlined by 20km kernel smoothing - see Review of Population and Conservation Status of British Mammals, Mathews and Kubasiewicz et al. 2018). It meets only one of the three sub-criteria (a) for B1 and B2. The population is not in decline and so does not qualify under criterion C. The number of mature individuals is estimated at 500, with the lower plausible population estimate being just 30. However, the data are very uncertain. The most recent estimate for the entire Forest of Dean population is 1,562 individuals (Gill & Waiber 2016), but approximately 25% of these animals were piglets, and further adjustment must be made for non-breeding juveniles. So the total number of mature individuals in the Forest of Dean population is likely to be <1,000. Taken in combination with the estimates from the current review, it is likely that the entire population size is less than the upper plausible estimate of 1,400, which would classify the species as NT were an assessment to be made. The number of locations is <5, and there is a plausible future threat from hunting that could drive the taxon to CR in a short period, so the species would also qualify as VU under D2.	
Artiodactyla	Red deer	<i>Cervus elaphus</i>	Native	LC	42.8	97,559	7,836	79,700	31,400	124,000	LC	—	A:LC; B1: LC; B2: LC; C:LC; D:LC; E:LC	A reduction in population size has not been observed, inferred, estimated or suspected for this species. There is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible population estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	Sika deer	<i>Cervus nippon</i>	Non-native	LC	N/A	26,183	1,372	45,300	8,200	107,000	Not assessed	—	—	Species is non-native
	Fallow deer	<i>Dama dama</i>	Naturalised, non-native	LC	27	114,602	12,592	188,000	138,000	245,000	Not assessed	—	—	Species is naturalised



## SCOTLAND ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Badger	<i>Meles meles</i>	Native	LC	17.8	64,552	8,212	115,000	85,000	198,000	LC	---	A:LC; B:LC; B2:LC; C:LC; D:LC; E:DD	Population size is inferred to be increasing for this species (Wilson et al. 1997; Judge et al. 2013). There is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000 km <sup>2</sup> , so the species does not qualify under B. Although there is some uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Otter	<i>Lutra lutra</i>	Native	NT	22.8	76,479	8,676	7,100	N/A	N/A	VU <sup>1</sup>	A4+C1	B1:LC; B2:LC; D:LC; E:DD	Inferences about population sizes in Scotland are difficult based on current data. Occupancy estimated from field signs in the National Otter Survey in Scotland indicates an increase from 57% in 1977-79 to 92% in 2003-04 (Strachan 2007) but a decline to 80% in 2011-12 (Findlay et al. 2015). If real and continuing, this 12% decline in 8 years would equate to a 34% decline over 3 generations, which would qualify as VU under A4. It has been noted that the last survey was hampered by poor weather conditions, and could therefore be unreliable; and under A2 (changes in the past), the average decline would be defined as less severe because the population was increasing between 1979 and 2003. However, examination of the number of hectads reported occupied in the previous Mammal Atlas period (maximum AOO observed 1960-92) and the latest period (maximum AOO observed 2000-16) also indicates a decline in occupancy (-23% across the last 24 years, which supports an inference of a decline of at least 17% in the last 3 generations). It is noted that the extent of sampling has declined over sequential National Otter Surveys in Scotland from around 4,500 sites to around 1,000 sites in the most recent survey. It is therefore possible that despite being relatively easy to survey using field signs, in some sparsely surveyed areas the decline seen in the Mammal Atlas may be an artefact of declining sampling effort. Nevertheless, whilst there is uncertainty in the evidence, there is some basis for suspecting that there may be some real decline, and the precautionary principle indicates that further data should be gathered to permit a re-assessment. The decline currently inferred is too small to permit classification as threatened under A. EOO is >20,000km <sup>2</sup> and the AOO is >500km <sup>2</sup> . The population is estimated at 8,000 individuals, but it was not possible to compute plausible intervals for this estimate, and the true value may be lower. If the extent of decline in occupancy is real, then this results in a classification of VU under C1. It has not been possible to calculate plausible limits for this species, but the best estimate is above the threshold for D1, and the geographical distribution is not highly restricted.
Pine marten	<i>Martes martes</i>	Native	LC	17.3	61,049	4,496	3,700	1,600	8,900	LC	---	A:LC; B1:LC; B2:LC; C:LC; D:LC; E:DD	Geographical range has increased in the last 10 years (Croose et al. 2013), which infers an increase in population size. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> so the species does not qualify under criterion B. Although population size is <10,000, a decline has not been observed, estimated, projected or inferred so the species does not qualify under C. Although there is some uncertainty about population size, the lower plausible estimate is above the threshold for criteria C and D (though close to qualifying as NT under D) and the geographical range is not highly restricted.
Stoat	<i>Mustela erminea</i>	Native	LC	N/A	56,350	4,460	140,000	N/A	N/A	LC	---	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, infer, estimate or suspect a change in population size due to lack of data, stoats are recorded throughout most of Scotland, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under criterion B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. However, it is noted that this species is extremely data deficient, with estimates of population size and changes being extremely uncertain. Further information is required to permit a re-assessment of this species.
Weasel	<i>Mustela nivalis</i>	Native	LC	N/A	54,012	2,308	106,000	N/A	N/A	LC	---	A:LC; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, infer, estimate or suspect a change in population size due to lack of data, weasels are recorded throughout most of Scotland. There is no evidence of a contraction of the extent of occurrence over the last 20 years, but the number of positive hectads declined by 24% between the two Mammal Atlas recording periods (1960-1992 and 2000-2016). The scale of this decline is unlikely to qualify the species as threatened under criterion A. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> so the species does not qualify under criterion B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. However, it is noted that this species is extremely data deficient, with estimates of population size and changes being entirely dependent on the assumed ratio of stoats: weasels. Further information is required to permit a re-assessment of this species.
Polecat	<i>Mustela putorius</i>	Native	LC	13.6	3,108	68	N/A	N/A	N/A	EN	B2ab(v); C1+2a(i)	A2e+4e; NT; D1+2:VU; E:DD	In Scotland, there is considerable uncertainty about the status of this species because of confusion with ferrets and ferret-hybrids: a very high proportion of apparent polecat records (>85%) received by the Vincent Wildlife Trust during 2014-15 were polecat-ferret hybrids or ferrets (Croose 2016). It therefore appears that there is a significant threat from introgression, and the population size of true polecats is thought to be very low. The rate at which this is reducing the population size of true polecats is unknown, but is likely to be 20% over 10 years, leading to a classification as NT under A2e+4e. Although there has been a shift in range (with fewer records in Caithness and Argyll in 2014-15 than 2004-06 but a re-colonisation of Dumfriesshire), there is no evidence of a contraction in the geographical range over the past 20 years. AOO is <500km <sup>2</sup> and EOO is <5,000km <sup>2</sup> , and a decline resulting from introgression is inferred, giving a classification of EN under B2ab(v). The number of mature individuals is suspected to be <1,000 and the suspected rate of hybridisation means it qualifies as EN under C1. The species is found at <5 locations, and these are widely separated from the rest of the GB population. The number of mature individuals within each population is likely to be <250, giving a classification of EN under C2a(i). The number of mature individuals and locations also qualifies the species as VU under D1 and D2. It is emphasised that the available data are very uncertain, and further information, supported by genetic analysis, is required.
Mink	<i>Neovison vison</i>	Non-native	LC	N/A	51,308	3,164	46,600	N/A	N/A	Not assessed	---	---	Species is non-native
Wild boar	<i>Sus scrofa</i>	Native (reintroduced)	LC	N/A	1,149	28	2,000	100	6,500	DD	---	A-E:DD	Wild boar are widely considered to have been extinct by the 13th century across Britain (Yalden, 1999). However, there were various attempts at reintroduction including to the palace of King James V, though these populations were also extinct by 1800 (Goulding, 2003). The provenance of the current, small, population is unknown and this is the basis for classifying the species as DD. As with other populations of wild boar elsewhere in Europe, the Scottish population is likely to include a proportion of farm stock, though these will be under strong selection pressure in favour of wild-type genes it is therefore likely that the population will be dominated rapidly by wild-type individuals this is not already the case. Further information should be gathered to enable a formal assessment to be made.  A reduction in population size has not been observed, inferred, estimated or suspected for this species, and there is no evidence of geographical range contraction over the last 20 years, so the species does not qualify under A. Whilst the EOO is <5,000km <sup>2</sup> and AOO is <500 km <sup>2</sup> it meets only one of the three sub-criteria (a) under B1 and B2. The number of mature individuals is estimated at <2,500, but none of the sub-criteria are met for designation as threatened under C as the population is not in decline. The qualifying criteria for D1 indicate that a species should be classified as NT where population size is estimated to be 2,000 or lower, an estimate as low as 1,000 cannot be ruled out, so the species is close to qualifying as NT under D1 given the uncertainties in the estimates. Established wild boar populations are found in 3 locations (western Highlands, Dumfries and Galloway), with a plausible future threat from hunting that could drive the taxon to CR in a short period, which would classify the species as VU under D2 if an assessment were made.
Red deer	<i>Cervus elaphus</i>	Native	LC	42.8	62,966	24,528	256,000	176,000	376,000	LC	---	A:LC; B1:LC; B2:LC; C:LC; D:LC; E:LC	A reduction in population size has not been observed, inferred, estimated or suspected for this species, and whilst the AOO has changed slightly, losses in South East Scotland are counterbalanced by an increase in scattered records from elsewhere in Scotland. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate for population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Sika deer	<i>Cervus nippon</i>	Non-native	LC	N/A	41,366	3,636	54,000	17,900	149,000	Not assessed	---	---	Species is non-native
Fallow deer	<i>Dama dama</i>	Naturalised, non-native	LC	27	14,291	812	56,700	41,700	73,900	Not assessed	---	---	Species is naturalised



WALES ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Badger	<i>Meles meles</i>	Native	LC	17.8	20,643	9,660	62,900	47,000	104,000	LC	...	A:LC; B:LC; B2:LC; C:LC; D:LC; E:DD	Population size is inferred to be increasing for this species (Wilson et al. 1997; Judge et al. 2013). There is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000 km <sup>2</sup> , so the species does not qualify under B. Although there is some uncertainty about population size, the lower plausible limit is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Otter	<i>Lutra lutra</i>	Native	NT	22.8	20,643	7,676	1,000	N/A	N/A	VU	D1	A:LC; B:LC; B2:LC; C:LC; E:DD	An increase in the population size in Wales is inferred from increasing geographical range and occupancy (24% increase in occupied hectads between the two Mammal Atlas periods [1960-1992 and 2000-2016]), and larger increases reported in the systematic National Otter Surveys of England and Wales). There is no evidence of a contraction of the geographical range over the last 20 years. The EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> , so it does not qualify under B1 or B2. The population is estimated at only 900 individuals, but the population is not declining, and so does not meet criteria C1 or C2. The number of mature individuals falls within the VU category of D1, but it is likely that better estimates of population size would remove it from this category, particularly given the geographical range expansion of otters in Wales. The geographical range is not highly restricted in Wales so the species does not qualify as threatened under D2.
Pine marten	<i>Martes martes</i>	Native	LC	17.3	9,544	248	39	N/A	N/A	CR	D1	A:DD; B:DD; C:DD; D2:VU; E:DD	The population over the last 10 years was assessed as being extremely small, and presumed non-viable by extensive research by the Vincent Wildlife Trust (VWT). In the 10 years from 2005-2014, there were just 29 verified records. The VWT released 39 translocated animals in 2015-16, and the reinforcement programme continues. The first generation has not yet bred and therefore these animals are excluded from the current assessment. A lack of data precludes assessment under criterion A. EOO is <20,000km <sup>2</sup> and AOO is <2,000km <sup>2</sup> , and whilst sub-criterion (a) applies, there is a lack of data for the other sub-criteria. The species is therefore classified as NT under B1 and B2. In the absence of the reinforcement programme, the number of mature individuals is highly likely to be extremely small and fall into the category of CR under C, but the species is data deficient on all sub-categories. However, it qualifies as CR under D, and as VU under D2, as the number of current locations is very small.
Stoat	<i>Mustela erminea</i>	Native	LC	N/A	16,416	1,748	37,600	N/A	N/A	NT	B1b(ij)+2b(ii)	A:DD; C:LC; D:LC; E:DD	Although it is not possible to observe, infer, estimate or suspect a change in population size due to lack of data, stoats are recorded across much of Wales. There is no evidence of a contraction of the geographical range over the last 20 years but the number of positive hectads declined by 22% between the two Mammal Atlas recording periods (1960-1992 and 2000-2016). The scale of any inferred decline in population size is unlikely to qualify the species as threatened under criterion A. EOO is <20,000km <sup>2</sup> and AOO is <2,000km <sup>2</sup> , but only one of the sub-criteria apply: the species is therefore classified as NT under B1b(ij)+2b(ii) though it is noted that information for this species is severely limited, and a re-assessment should be conducted when further evidence becomes available. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. This species is extremely data deficient, with estimates of population size and changes being extremely uncertain: further information is required to permit a re-assessment of this species.
Weasel	<i>Mustela nivalis</i>	Native	LC	N/A	19,563	1,464	36,000	N/A	N/A	LC	...	A:DD; B:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, infer, estimate or suspect a change in population size due to lack of data, weasels are recorded across most of Wales, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is <20,000km <sup>2</sup> and AOO is <2,000km <sup>2</sup> , but the species not classified as threatened under criterion B because sub-criteria (a) and (c) do not apply. It is noted that the species is data deficient for sub-criterion (b), so potentially it could qualify as NT under B1 and B2, and this should be reviewed if further evidence becomes available. This species is extremely data deficient, with estimates of population size and changes being entirely dependent on the assumed ratio of stoats: weasels. Further information is required to permit a re-assessment of this species.
Polecat	<i>Mustela putorius</i>	Native	LC	13.6	20,552	2,988	16,800	13,700	20,000	LC	...	A:LC; B:LC; B2:LC; C:LC; D:LC; E:DD	Following long-term historical depletion, the geographical range has increased in this species over the last 20 years, stabilising in the last 10 years. Although AOO is <2,000km <sup>2</sup> and EOO is close to <20,000km <sup>2</sup> , the sub-criteria for B are not met. There is considerable uncertainty about population size, but the lower plausible estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Mink	<i>Neovison vison</i>	Non-native	LC	N/A	20,411	2,484	12,900	N/A	N/A	Not assessed	...	...	Species is non-native
Wild boar	<i>Sus scrofa</i>	Native (reintroduced)	LC	N/A	309	8	150	<10	500	DD	...	A:E:DD	Wild boar are generally considered to have been extinct in Britain by the end of the 13th Century (Valden, 1999) and no additional further information on subsequent reintroductions is available for Wales. The provenance of the current, small, population is unknown and this is the basis for classifying the species as DD. As with other populations of wild boar elsewhere in Europe, the Welsh population is likely to include a proportion of farm stock, though these will be under strong selection pressure in favour of wild-type genes it is therefore likely that the population will be dominated rapidly by wild-type individuals this is not already the case. Further information should be gathered to enable a formal assessment to be made. A reduction in population size has not been observed, inferred, estimated or suspected, and the geographical range has not contracted over the last 20 years. EOO is <5,000km <sup>2</sup> and AOO is <10 km <sup>2</sup> , but it meets only one of the three sub-criteria (a) of B1 and B2. The number of mature individuals is estimated at <250, but none of the sub-criteria for C are met as the population is not in decline. The number of mature individuals would give a classification of EN under D if an assessment were made. Consideration must be given to this population being contiguous with the English population (Forest of Dean). The most recent estimate for the entire Forest of Dean population is 1,562 individuals (Gill & Waeber 2016), but approximately 25% of these animals were piglets, and further adjustment must be made for non-breeding juveniles. So the total number of mature individuals in the Forest of Dean population is likely to be <1,000 (which would result in a VU classification under D1). The species is found in 1 location, with a plausible future threat from hunting that could drive the taxon to CR in a short period, which would categorise the species as VU under D2 if an assessment were made.
Red deer	<i>Cervus elaphus</i>	Native	LC	42.8	8,956	228	10,200	4,110	16,100	LC	...	A:LC; B:LC; B2:LC; C:LC; D:LC; E:LC	A reduction in population size has not been observed, inferred, estimated or suspected for this species. There is some evidence of an increase in geographical range, notably two new populations in South and South West Wales. Although EOO is <20,000km <sup>2</sup> and AOO is <500km <sup>2</sup> , the sub-criteria for B are not met. The best estimate of population size is close to the threshold for VU under C, and the lower plausible estimate is within the threshold, but the sub-criteria are not met. The species does not qualify as threatened under D1; and although the number of locations is small, there is no plausible threat likely to drive the species to CR in a short time-scale and so it does not qualify under D2.
Sika deer	<i>Cervus nippon</i>	Non-native	LC	N/A	1,398	52	3,600	900	9,300	Not assessed	...	...	Species is non-native
Fallow deer	<i>Dama dama</i>	Naturalised, non-native	LC	27	18,479	1,324	19,000	14,000	24,800	Not assessed	...	...	Species is naturalised

GREAT BRITAIN ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Badger	<i>Meles meles</i>	Native	LC	17.8	215,096	90,468	562,000	391,000	1,014,000	LC	...	A-1C; B1; LC; B2; LC; C-1C; D-1C; E-DD	Population size is inferred to be increasing for this species (Wilson et al. 1997; Judge et al. 2013). There is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. Although there is some uncertainty about population size, the lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted. The regional impact of the badger cull in England is not currently known, and the status of the species should be kept under review.
Otter	<i>Lutra lutra</i>	Native	NT	22.8	222,794	55,628	11,000	N/A	N/A	LC	...	A-1C; B1; LC; B2; LC; C-1C; D-1C; E-DD	An increase in the population size in England is inferred from increasing geographical range and occupancy (27.8% increase in occupied hectares between the two Mammal Atlas periods (1960-1992 and 2000-2016), and larger increases reported in the systematic National Otter Surveys of England and Wales). EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> , so it does not qualify under B1 or B2. It has not been possible to calculate plausible population estimates for this species, but the best estimate will be above the threshold for C and D1, and the geographical range is not highly restricted.
Pine marten	<i>Martes martes</i>	Native	LC	17.3	82,952	5,244	3,700	1,600	8,900	LC	...	A-1C; B1; LC; B2; LC; C-1C; D-1C; E-DD	More than 98% of the GB population occurs in Scotland, where the geographical range has increased over the last 10 years (Croose et al. 2013), inferring an increase in population size. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. In England and Wales, the species is classified as CR under D1 because of extremely small population sizes. However, at GB level, despite the uncertainty about population size, the lower plausible estimate is well above the threshold for criteria C and D, and the geographical range is not highly restricted. It is therefore classified as LC.
Stoat	<i>Mustela erminea</i>	Native	LC	N/A	200,992	28,764	438,000	N/A	N/A	LC	...	A-DD; B1; LC; B2; LC; C-1C; D-1C; E-DD	Although it is not possible to observe, infer, estimate or suspect a change in population size due to lack of data, stoats are recorded throughout most of GB, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. However, it is noted that this species is extremely data deficient, with estimates of population size and changes being extremely uncertain. Further information is required to permit a re-assessment of this species.
Weasel	<i>Mustela nivalis</i>	Native	LC	N/A	202,965	21,560	450,000	N/A	N/A	LC	...	A-1C; B1; LC; B2; LC; C-1C; D-1C; E-DD	Although it is not possible to observe, infer, estimate or suspect a change in population size due to lack of data, weasels are recorded throughout most of GB, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> so the species does not qualify under B. No plausible limits for the population size could be calculated for this species, but the best estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted. However, it is noted that this species is extremely data deficient, with estimates of population size and changes being entirely dependent on the assumed ratio of stoats: weasels. Further information is required to permit re-assessment of this species.
Polecat	<i>Mustela putorius</i>	Native	LC	13.6	109,037	12,196	83,300	67,600	98,900	LC	...	A-1C; B1; LC; B2; LC; C-1C; D-1C; E-DD	Following long-term historical depletion, the geographical range has increased by at least 100%, and it is estimated that the population size has increased by 460% over the last 20 years in GB. However, most of this increase is in England and Wales. In Scotland there has been extensive hybridisation with ferrets, and it is likely that this country has <2% of the national population. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible population estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Mink	<i>Neovison vison</i>	Non-native	LC	N/A	200,619	23,700	122,000	N/A	N/A	Not assessed	...	...	Species is non-native
Wild boar	<i>Sus scrofa</i>	Native (reintroduced)	LC	N/A	8,347	424	2,600	200	8,400	DD	...	A-E; DD	Wild boar are widely considered to have been extinct by the 13th Century in Britain (Yalden 1999), though there were various attempts at reintroduction, for example, in the 16th Century to Savernake Forest (Wiltshire), Chartley Park (Staffordshire) (Rackham 1997). Further reintroductions continued until the end of the 17th century, but the species once again became extinct by 1800 (Goulding 2003). The provenance of the current, small, population is unknown and this is the basis for classifying the species as DD. As with other populations of wild boar elsewhere in Europe, the British population is likely to include a proportion of farm stock, though these will be under strong selection pressure in favour of wild-type genes. It is therefore likely that the population will be dominated rapidly by wild-type individuals this is not already the case. Further information should be gathered to enable a formal assessment to be made.  A reduction in population size has not been observed, inferred, estimated or suspected for this species. The extent of occupancy is expanding in comparison with Arnold (1995), and there is an increase in positive hectares between the two Mammal Atlas periods (1960-1992 and 2000-2016). EOO is <20,000km <sup>2</sup> and AOO is <500km <sup>2</sup> ; the number of locations with established populations is thought to be 56 and certainly <10, based on individual population ranges outlined by 20km kernel smoothing (see Mathews and Kubasiewicz et al. 2017). It meets only one of the three sub-criteria of B1 and B2 (a). The number of mature individuals is estimated at 2,600 with the lower confidence limit being just 200 (which would qualify as EN if an assessment were made). The population is not in decline and so does not qualify under criterion C. The qualifying criteria for D1 state that a species should not be classed as NT unless population size is estimated to be lower than 2,000, even where population size estimates are uncertain. The species does not, therefore qualify as NT under D1, although the collection of additional data to allow for a more robust estimate of population size is strongly advised for this species as most surveys report total population size rather than the number of mature individuals. The number of locations with established populations is <5 and there is a plausible risk from hunting that could drive the population to CR in a short time. However, the AOO is relatively large, with the Forest of Dean and Scottish populations occupying reasonable areas: the species therefore could be classified as NT under D2.
Red deer	<i>Cervus elaphus</i>	Native	LC	42.8	169,481	32,592	346,000	212,000	516,000	LC	...	A-1C; B1; LC; B2; LC; C-1C; D-1C; E-1C	A reduction in population size has not been observed, inferred, estimated or suspected for this species. Extent of occupancy is estimated to have increased slowly across GB (<3% per year) over the last 10 years (SNH 2016), and the number of positive hectares increased by 24% between the two Mammal Atlas recording periods (1960-1992 and 2000-2016). The AOO increased by 61% between the two Mammal Atlas recording periods (1960-1992 and 2000-2016). Population increases are therefore inferred from these increases in geographical range. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> so the species does not qualify under B. The lower plausible population estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Sika deer	<i>Cervus nippon</i>	Non-native	LC	N/A	68,947	5,060	103,000	27,000	266,000	Not assessed	...	...	Species is non-native
Fallow deer	<i>Dama dama</i>	Naturalised, non-native	LC	27	147,371	14,728	264,000	194,000	343,000	Not assessed	...	...	Species is naturalised

ENGLAND ASSESSMENT

	Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
						Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate						
	Roe deer	<i>Capreolus capreolus</i>	Native	LC	19.2	128,604	42,260	120,000	97,900	135,000	LC	—	A:1C; B1: LC; B2: LC; C:1C; D:1C; E:1C	A reduction in population size has not been observed, inferred, estimated or suspected for this species. The EOO has increased over the last 20 years, with an increase in population size being inferred from the expanding geographical range. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible population estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	Chinese water deer	<i>Hydropotes inermis</i>	Non-native	VU	N/A	18,152	1,932	3,600	200	143,000	Not assessed	—	—	Species is non-native
	Reeves' Muntjac deer	<i>Muntiacus reevesi</i>	Non-native	LC	N/A	111,130	21,460	112,000	100,000	128,000	Not assessed	—	—	Species is non-native
	Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>	Native	LC	27	29,567	3,068	10,200	7,280	14,600	LC	—	A:1C; B1:1C; B2:1C; C:1C; D:1C; E:DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO >2,000km <sup>2</sup> , so the species does not qualify under B. Whilst the number of mature individuals is close to the VU threshold for C, and the lower plausible estimate is only 7,277, it does not appear to be in decline so does not qualify under either of the subcategories C1 or C2. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
	Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	Native	LC	21.3	33,552	6,888	19,400	13,900	27,700	LC	—	A:1C; B1: LC; B2:1C; C:1C; D:1C; E:DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the threshold for criteria C and D, and the geographical range is not highly restricted.
	Alcathoe bat	<i>Myotis alcathoe</i>	Native	DD	17.3	5,040	72	N/A	N/A	N/A	DD	—	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	The species has only been recently recognised. Alcathoe bats have been recorded in 18 hectares since 1995. However, information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification; even the AOO and EOO are uncertain. It is therefore categorised as data deficient and requiring urgent survey effort.
	Whiskered bat	<i>Myotis mystacinus</i>	Native	LC	23.5	109,201	8,492	N/A	N/A	N/A	DD	—	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	Information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification. It is therefore categorised as data deficient and in need of urgent survey effort.
	Brandt's bat	<i>Myotis brandtii</i>	Native	LC	17.3	109,201	8,492	N/A	N/A	N/A	DD	—	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	Information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification. It is therefore categorised as data deficient and in need of urgent survey effort.
	Bechstein's bat	<i>Myotis bechsteinii</i>	Native	NT	15	23,344	1,168	21,600	10,200	55,000	LC	—	A:DD; B1:1C; B2: LC; C: LC; D:1C; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, there is no evidence of a contraction of the geographical range over the last 20 years. Data on range and occupancy are difficult to interpret because survey techniques have changed. EOO is >20,000km <sup>2</sup> , and although the AOO is <2,000km <sup>2</sup> , it does not meet any of the sub-criteria for B (though there is some concern about possible loss of suitable habitat and/or habitat quality). Based on current evidence, the species does not meet the criterion of severely fragmented. Whilst the lower plausible estimate of population size is close to 10,000, it does not meet any of the sub-criteria for C. The best estimate of population size, and also the lower plausible estimate, is well above the qualifying thresholds for D, and the geographical range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC. Information on population trends and size is urgently required to permit a re-assessment under criteria A, B and C.
	Daubenton's bat	<i>Myotis daubentonii</i>	Native	LC	27.1	129,146	14,712	682,000	18,100	2,950,000	LC	—	A:DD; B1:1C; B2: LC; C:1C; D:1C; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, Daubenton's bats are recorded across a large area, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the qualifying thresholds for C and D, and the range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.
	Greater mouse-eared bat	<i>Myotis myotis</i>	Native	LC	23.4	4	4	1	1	DD	CR	A2a; B1ab+2ab; C2a(i+ii); D	E:DD	A hibernating population of this species, discovered in Sussex in 1969 has declined from a maximum of 30 individuals to a single male, first recorded as a juvenile in 2002 (indicating a decline of >80% over 47 years i.e. 3 generations), qualifying the species as CR under A2a. No females have been found since 2001. A small hibernating population of up to 10 individuals known in Dorset was lost by 1980. It has been inferred that there are no maternity colonies remaining but this has not been confirmed through exhaustive surveys. The species is therefore classified as CR based on very small geographical range (B1ab+2ab), and very small population size (C2a(i,ii); D. Extensive surveys are required as a matter of urgency to establish the status of this species with greater certainty. If the single male is the only member of this population then a classification of RE will be required in the near future; however it is possible that there are other undiscovered animals in the region and/or that migrants may increasingly come to Great Britain owing to the altered weather patterns associated with climate change.
	Natterer's bat	<i>Myotis nattereri</i>	Native	LC	17.3	126,502	11,636	321,000	11,700	2,040,000	LC	—	A:DD; B1:1C; B2: LC; C:1C; D:1C; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, Natterer's bats are recorded across a large area, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate is well above the qualifying thresholds for C and D, and the geographical range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.
	Serotine bat	<i>Eptesicus serotinus</i>	Native	LC	19.7	78,082	12,248	117,000	6,250	356,000	VU	A2b+4b	B1:1C; B2: LC; C1: close to NT; C2:1C; D:1C; E:DD	A negative trend in population size is estimated from roost counts (-1.9% per annum) from the National Bat Monitoring Programme (NBMP), and whilst this is not statistically significant, the wide confidence intervals reflect the small sample size: it is therefore reasonable to assume that the trend would be significant were further data available, and to adopt a precautionary approach. Over 3 generations, this infers a decline of 37%. The NBMP field study suggests no change in encounter rates, but species identification in this survey is difficult as it is largely based on heterodyne recordings, and it should not outweigh the evidence from the roost survey. The species is therefore classified as VU under A2b+4b. There is suspicion of a recent decline in AOO and population size in the east of England, but there also appears to be a corresponding increase in populations in the north and west of the range. Whilst some of this expansion may be an artefact of better species identification using broadband detectors, the AOO and EOO show no signs of decline over the last 20 years. The size of the inferred population decline from the roost counts is below the thresholds required for criterion A. EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The best estimate of population size is well above the qualifying thresholds for C and D, but the lower plausible estimate is 6,247. This, in combination with the possible annual decline observed in roost counts (>10% in 10 years - see above), leads to the species being close to a classification as NT under C1. The lower plausible estimate of population size is well above the qualifying thresholds for D, and the geographical range is not highly restricted. It is emphasised that this assessment is based on very poor data, with the estimates of population size and availability of suitable habitat in particular being very unreliable. The species should be re-assessed as soon as further information becomes available.
Chiroptera	Leisler's bat	<i>Nyctalus leisleri</i>	Native	LC	13.8	68,353	2,496	N/A	N/A	N/A	NT	D1	A:DD; B1:1C; B2:DD; C1:DD; C:DD; D2:1C; E:DD	There is no evidence on which to base estimates of population size or change. Very few breeding colonies are known, and other records tend to be based on acoustic recordings (which are prone to misidentification) or individual grounded bats. EOO is >20,000km <sup>2</sup> , and although the AOO is close to 2,000km <sup>2</sup> , there is insufficient information to judge whether any of the sub-criteria of B2 are met. Assessments could not be made under C because of data deficiencies for the sub-criteria. The very limited number of known roosts, and the AOO also being close to 2,000km <sup>2</sup> , means that it is classified as NT on the grounds of small population size: this classification should be reviewed as soon as further evidence becomes available. There is considerable uncertainty in the values for EOO and AOO due to likelihood of species misidentification using acoustic surveys. Approaches based on capture and/or genetic identification of droppings are therefore warranted.
	Noctule bat	<i>Nyctalus noctula</i>	Native	LC	12.6	126,913	21,764	565,000	17,700	1,872,000	LC	—	A:AA; B1:1C; B2: LC; C:1C; D:1C; E:DD	Although it is not possible to observe or estimate changes in population size due to lack of data, noctule bats are recorded across England. There is no evidence of range contraction over the last 20 years. EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the qualifying thresholds for C and D, and the range is not highly restricted.

## SCOTLAND ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Roe deer	<i>Capreolus capreolus</i>	Native	LC	19.2	70,294	20,624	122,000	98,900	136,000	LC	---	A:LC; B1:LC; B2:LC; C:LC; D:LC; E:LC	A reduction in population size has not been observed, inferred, estimated or suspected for this species. There is no evidence of a contraction of the geographical range over the last 20 years, and the EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the threshold for criteria C and D, and the geographical range is not highly restricted.
Chinese water deer	<i>Hydropotes inermis</i>	Non-native	VU	N/A	0	0	0	0	0	Not assessed	---	---	Species is non-native
Reeves' Muntjac deer	<i>Muntiacus reevesi</i>	Non-native	LC	N/A	1,530	24	16,300	14,800	18,700	Not assessed	---	---	Species is non-native
Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>	Native	LC	27	Species is not present, and is considered highly unlikely to have ever been present, in Scotland.	---	---	---	---	---	---	---	Species is not present in Scotland, and is considered unlikely to have been present during historical times.
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	Native	LC	21.3	0	0	0	0	0	---	---	---	There is a single record (from the latest review period) derived from a Biological Record Centre in Scotland. However, the species is not generally considered to be present in Scotland and there are no known records from earlier periods (Arnold, 1993)
Alcathoe bat	<i>Myotis alcathoe</i>	Native	DD	17.3	0	0	N/A	N/A	N/A	DD	---	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	This species has not yet been recorded in Scotland. However, this is likely to be due to the high probability of confusion with Whiskered/Brandt's bats, so monitoring is urgently required.
Whiskered bat	<i>Myotis mystacinus</i>	Native	LC	23.5	N/A	36	N/A	N/A	N/A	DD	---	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	Information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification. It is therefore categorised as data deficient and in need of urgent survey effort.
Brandt's bat	<i>Myotis brandtii</i>	Native	LC	17.3	N/A	36	N/A	N/A	N/A	DD	---	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	Information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification. It is therefore categorised as data deficient and in need of urgent survey effort.
Bechstein's bat	<i>Myotis bechsteinii</i>	Native	NT	15	Species is not present, and is considered highly unlikely to have ever been present, in Scotland.	---	---	---	---	---	---	---	Species is not present in Scotland and it is considered unlikely to have ever been present during historical times.
Daubenton's bat	<i>Myotis daubentonii</i>	Native	LC	27.1	44,417	1,424	235,000	6,220	1,020,000	LC	---	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, Daubenton's bats are recorded across a large area, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> , and although the AOO is <2,000km <sup>2</sup> , the species does not meet the sub-criteria for threatened designation under B (it is noted that there are data deficiencies for sub-criterion (b)). The best estimate of population size is well above the qualifying thresholds for C and D, and while the lower plausible population size estimate falls within the VU category of C, it is unlikely to qualify under subcategory C2, and C1 is data deficient. Therefore, despite the assessment being based on very limited data, the species is classified as LC.
Greater mouse-eared bat	<i>Myotis myotis</i>	Native	LC	23.4	Species is not present, and is considered highly unlikely to have ever been present, in Scotland.	---	---	---	---	---	---	---	Species is not present in Scotland, and is considered unlikely to have been present during historical times.
Natterer's bat	<i>Myotis nattereri</i>	Native	LC	17.3	16,172	276	41,000	1,490	260,000	LC	---	A:DD; B1:LC; B2:LC; C:LC; D:LC; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, Natterer's bats are recorded across a large area, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is <20,000km <sup>2</sup> and the AOO is <500km <sup>2</sup> , but the species does not meet any of the sub-criteria for threatened designation under B. The best estimate of population size is well above the qualifying threshold for C and D, though it should be noted that the lower plausible estimate is close to the VU threshold under D1 and would qualify as NT under this criterion. However, the species does not have a restricted distribution. It is unlikely to qualify under subcategory C2, and C1 is data deficient. Therefore, despite the assessment being based on very limited data, the species is classified as LC.
Serotine bat	<i>Eptesicus serotinus</i>	Native	LC	19.7	Species is not present, and is considered highly unlikely to have ever been present, in Scotland.	---	---	---	---	---	---	---	Species is not present in Scotland, and is considered unlikely to have been present during historical times.
Leisler's bat	<i>Nyctalus leisleri</i>	Native	LC	13.8	4978	88	N/A	N/A	N/A	NT	D1	A:DD; B1:DD; B2:DD; C:DD; D2:LC; E:DD	There is no evidence on which to base estimates of population size or change. No breeding colonies are known, and other records tend to be based on acoustic recordings (which are prone to misidentification) or individual grounded bats. EOO is <5,000km <sup>2</sup> , and AOO is <500km <sup>2</sup> (and is close to 100km <sup>2</sup> ), but there is insufficient data to judge whether the sub-criteria for B1 or B2 are met. The species is inferred to have fragmented populations in Scotland, appearing to be separated into two, with little or no linkage with the English population. However, this judgement is based on EOO alone, and there has been no genetic verification. It is also impossible to know at present what % of total occupancy is within populations that are not self-sustaining and so meet IUCN criteria. The species is therefore considered DD under category B and further information is urgently needed. Given the lack of known breeding roosts, and the scattered nature of other records, it is inferred that the number of mature individuals is <10,000, but the species is data deficient for the sub-criteria of C. Given the very limited number of known roosts and the small AOO (<500km <sup>2</sup> ), the species is classified as NT under D1. The classification of this species should be reviewed as soon as further evidence becomes available. There is considerable uncertainty in the values for EOO and AOO due to likelihood of species misidentification using acoustic surveys. Approaches based on capture and/or genetic identification of droppings are therefore warranted.
Noctule bat	<i>Nyctalus noctula</i>	Native	LC	12.6	9,485	156	not assessed	not assessed	not assessed	LC	---	A:DD; B1:LC; B2:LC; C1:DD; C2:LC; D:LC; E:DD	It is not possible to observe or estimate changes in population size due to lack of data. EOO is <20,000km <sup>2</sup> , and AOO is <500km <sup>2</sup> , but the species does not qualify under B1 or B2 because subcategories (a) and (c) do not apply, and it is data deficient for subcategory (b). The lower plausible limit of population size is within the EN category for C but it is unlikely to qualify under subcategory C2, and C1 is data deficient; it is also close to the VU category under D1. The species is therefore currently listed as LC, but further data to permit re-assessment are urgently required as the estimates of all parameters are extremely uncertain.

WALES ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Roe deer	<i>Capreolus capreolus</i>	Native	LC	19.2	16,804	676	22,300	18,100	24,900	LC	---	A:1C; B1: LC; B2: LC; C:1C; D:1C; E:1C	A reduction in population size has not been observed, inferred, estimated or suspected for this species. The EOO has increased over the last 20 years, with an increase in population size being inferred from this expanding geographical range. Although EOO is <20,000km <sup>2</sup> and AOO is <2,000km <sup>2</sup> , the sub-criteria for B are not met. The lower plausible limit of population size is well above the threshold for criteria C and D, and the geographical range is not highly restricted.
Chinese water deer	<i>Hydropotes inermis</i>	Non-native	VU	N/A	0	0	0	0	0	Not assessed	---	---	Species is non-native
Reeves' Muntjac deer	<i>Muntiacus reevesi</i>	Non-native	LC	N/A	11,382	344	0	0	0	Not assessed	---	---	Species is non-native
Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>	Native	LC	27	13,230	764	2,700	1,930	3,850	NT	B1a+2a	A:1C; C:1C; D:1C; E:DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is <20,000km <sup>2</sup> and AOO is <2,000km <sup>2</sup> , but only sub-criterion (a) of B1 and B2 applies (few maternity sites known in Wales), so the species is categorised as NT. None of the sub-criteria for C are met. The lower plausible estimate of population size is above the threshold for criterion D, and the geographical range is not highly restricted.
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	Native	LC	21.3	19,549	3,052	30,900	22,000	44,100	LC	---	A:1C; B1: LC; B2:1C; C:1C; D:1C; E:DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species, and there is no evidence of a contraction of the geographical range over the last 20 years. AOO is >2,000km <sup>2</sup> , and although EOO is <20,000km <sup>2</sup> , none of the sub-criteria are met for B. The lower plausible estimate of population size is well above the threshold for criteria C and D, and the geographical range is not highly restricted.
Alcathoe bat	<i>Myotis alcathoe</i>	Native	DD	17.3	0	0	N/A	N/A	N/A	DD	---	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	This species has not yet been recorded in Wales. However, this is likely to be due to the high probability of confusion with Whiskered/Brandt's bats, so monitoring is urgently required.
Whiskered bat	<i>Myotis mystacinus</i>	Native	LC	23.5	20,488	1,100	N/A	N/A	N/A	DD	---	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	Information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification. It is therefore categorised as data deficient and in need of urgent survey effort.
Brandt's bat	<i>Myotis brandtii</i>	Native	LC	17.3	20,488	1,100	N/A	N/A	N/A	DD	---	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	Information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification. It is therefore categorised as data deficient and in need of urgent survey effort.
Bechstein's bat	<i>Myotis bechsteinii</i>	Native	NT	15	155	4	247	116	626	EN	D	A:DD; B1:DD; B2:DD; C:DD; E:DD	A single breeding colony is known in Wales, and other records are scarce. There is insufficient information to make an assessment of changes in population size or geographical range (criteria A and B); survey techniques have changed over time. The EOO is extremely small (155km <sup>2</sup> ), and is based on the kernel density buffers around the population in the English borders. A single maternity colony has been identified within Wales. It was not possible to assess the species on criterion B, despite its very small EOO and AOO, as no data were available on any of the sub-criteria. Information should therefore be gathered on population trends, availability of suitable habitat and/or fluctuations in population size or extent to permit a re-assessment. The number of mature individuals is very low (best estimate 247; plausible limits 116-626) and information on population trends is urgently required to permit a re-assessment under C2. The species is classified as EN under D.
Daubenton's bat	<i>Myotis daubentonii</i>	Native	LC	27.1	20,377	2,144	108,000	2,860	466,000	LC	---	A:DD; B1:1C; B2: LC; C:1C; D:DD; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, Daubenton's bats are recorded across a large area, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> , and although the AOO is close to 2,000km <sup>2</sup> , the species does not meet the sub-criteria for threatened designation under B. (It is noted that there are data deficiencies for sub-criterion (b)). The best estimate of population size is well above the qualifying thresholds for C and D. However, the lower plausible estimate of population size in Wales is very small. If this represents the true population, then the species would be close to NT under D1, though it would still not qualify under C as the sub-criteria are not known to apply. The current assessment is based on very limited data and further information is required to permit a re-assessment.
Greater mouse-eared bat	<i>Myotis myotis</i>	Native	LC	23.4	Species is not present, and is considered unlikely to have ever been present, in Wales.	---	---	---	---	---	---	---	Species is not present in Wales
Natterer's bat	<i>Myotis nattereri</i>	Native	LC	17.3	20,611	1,716	52,300	1,900	332,000	LC	---	A:DD; B1:1C; B2: LC; C:1C; D:1C; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, Natterer's bats are recorded across most of Wales, and there is no evidence of a contraction of the geographical range over the last 20 years. AOO is <2,000km <sup>2</sup> , and the EOO is close to 20,000km <sup>2</sup> , but sub-criteria (a) and (c) are not met under criterion B, and there is a lack of evidence on sub-criterion (b). The best estimate of population size is well above the qualifying thresholds for C and D. However, this assessment is based on very limited data. It should be noted that the lower plausible estimate of population size, together with the AOO of <2,000km <sup>2</sup> , would qualify the species as NT under D1. Because of the extreme uncertainty in the population size, this classification is not currently applied. More data are required to permit a re-assessment of this species.
Serotine bat	<i>Eptesicus serotinus</i>	Native	LC	19.7	12,499	316	18,700	1,000	57,000	VU	A2b+4b B1b(v)+2b(v)	A:1C; B1b(v)+B2b(v); NT; C1: close to NT; C2:DD; D:DD; E:DD	A negative trend in population size is estimated from roost counts (-1.6% per annum) from the National Bat Monitoring Programme (NBMP), and whilst this is not statistically significant, the wide confidence intervals reflect the small sample size: it is therefore reasonable to assume that the trend would be significant were further data available, and to adopt a precautionary approach, particularly given the decline of 37% implied by GB-wide data (based on a larger sample). Over 3 generations, this infers a decline of 32%. Insufficient data are available to compute trends for Wales individually. The NBMP field study suggests no change in encounter rates, but species identification in this survey is difficult as it is largely based on heterodyne recordings, and it should not outweigh the evidence from the roost survey. The species is therefore classified as VU under A2b+4b. EOO is <20,000km <sup>2</sup> and AOO is <500km <sup>2</sup> . There appears to be an expansion of the geographical range west and north in Wales, which may partly be an artefact of better species identification using broadband detectors. The species meets only one of the subcategories for criterion B (B1b(v)+2b(v)), so is classified as NT. The best estimate of population size is 18,700, which is well above the qualifying thresholds for C and D, but the lower plausible limit of population size is 1,000. Were this value used, it would, in combination with the possible annual decline observed in roost counts (>10% in 10 years - see above), qualify the species as NT under C1 and D1. It is emphasised that this assessment is based on very poor data, with the estimates of population size and availability of suitable habitat in particular being very unreliable. The assessment should be reviewed as soon as further information becomes available.
Leisler's bat	<i>Nyctalus leisleri</i>	Native	LC	13.8	6,739	92	N/A	N/A	N/A	NT	D1	A:DD; B1:DD B2:DD; C:DD; D2:1C; E:DD	There is no evidence on which to base estimates of population size or change. No breeding colonies are known, and other records tend to be based on acoustic recordings (which are prone to misidentification) or individual grounded bats. The EOO is <10,000km <sup>2</sup> and AOO is close to 100km <sup>2</sup> . The species is inferred to have fragmented populations in Wales, with only the population in the south-east being connected with that in England. However, this judgment is based on EOO alone, and there has been no genetic verification. It is also impossible to know at present what % of total occupancy is within populations that are not self-sustaining and so meet IUCN criteria. The species is therefore considered DD under category B and further information is urgently needed. Given the lack of known breeding roosts, and the scattered nature of other records, it is inferred that the number of mature individuals is <10,000, but the species is data deficient for the sub-criteria of C. Given the very small number of known roosts, and the extremely small AOO (<100km <sup>2</sup> ), the species is classified as NT under D1. The classification of this species should be reviewed as soon as further evidence becomes available. There is considerable uncertainty in the values for EOO and AOO due to likelihood of species misidentification using acoustic surveys. Approaches based on capture and/or genetic identification of droppings are therefore warranted.
Noctule bat	<i>Nyctalus noctula</i>	Native	LC	12.6	20,627	2,732	91,900	2,880	304,000	LC	---	A:DD; B1:1C; B2: LC; C:1C; D:1C; E:DD	Although it is not possible to observe or estimate changes in population size due to lack of data, noctule bats are recorded across Wales. There is no evidence of range contraction over the last 20 years. EOO is >20,000km <sup>2</sup> , and although the AOO is close to 2,000km <sup>2</sup> , the species does not qualify as NT under B2 because it does not fulfil subcategory (a) or (c) and is data deficient for subcategory (b). It also does not meet the threshold population size required for C. The lower plausible estimate of population size is well above the qualifying thresholds for D, and the species does not meet any of the sub-criteria for C.



GREAT BRITAIN ASSESSMENT													
Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Roe deer	<i>Capreolus capreolus</i>	Native	LC	19.2	215,701	63,560	264,000	215,000	296,000	LC	...	A:1C; B1: LC; B2: LC; C:1C; D:1C; E:1C	A reduction in population size has not been observed, inferred, estimated or suspected for this species. The EOO has increased over the last 20 years (compared with Arnold 1995), particularly in England; in Scotland, range is thought to be at its limit (J. Irvine, pers. comm.) and stable. The number of occupied hectares has also increased by 42% between the two Mammal Atlas recording periods (1960-1992 and 2000-2016). Population increases are therefore inferred from these increases in geographical range. EOO is >20,000km <sup>2</sup> and AOO is >2000km <sup>2</sup> , so the species does not qualify under B. The lower plausible population estimate is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Chinese water deer	<i>Hydropotes inermis</i>	Non-native	VU	N/A	18,152	1,932	3,600	200	143,000	Not assessed	...		Species is non-native
Reeves' Muntjac deer	<i>Muntiacus reevesi</i>	Non-native	LC	N/A	124,042	21,828	128,000	116,000	147,000	Not assessed	...		Species is non-native
Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>	Native	LC	27	42,797	3,832	12,900	9,210	18,500	LC	...	A:1C; B1:1C; B2:1C; C:1C; D:1C; E:DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species. The extent of occupancy appears stable in comparison with Arnold (1995) and there is an increase in positive hectares between the two Mammal Atlas periods (1960-1992 and 2000-2016). EOO is >20,000km <sup>2</sup> and AOO >2,000km <sup>2</sup> , so the species does not qualify under B. Whilst the lower plausible estimate of population size is 9,210, it does not appear to be in decline so does not qualify under either of the subcategories C1 or C2. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	Native	LC	21.3	53,101	9,940	50,300	35,900	71,800	LC	...	A:1C; B1: LC; B2:1C; C:1C; D:1C; E:DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species. The extent of occupancy appears stable in comparison with Arnold (1995) and there is an increase in positive hectares between the two Mammal Atlas periods (1960-1992 and 2000-2016). EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the threshold for criteria C and D and the geographical range is not highly restricted.
Alcathoe bat	<i>Myotis alcathoe</i>	Native	DD	17.3	5,040	72	2,000	N/A	N/A	DD	...	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	This species has only recently been recognised. Alcathoe bats have been recorded in 18 hectares since 1995, all of which are in England. However, information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification; and even AOO and EOO are uncertain. It is therefore categorised as data deficient and requiring urgent survey effort.
Whiskered bat	<i>Myotis mystacinus</i>	Native	LC	23.5	131,700 (both species combined)	9,628	N/A	N/A	N/A	DD	...	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	Information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification. It is therefore categorised as data deficient and in need of urgent survey effort.
Brandt's bat	<i>Myotis brandtii</i>	Native	LC	17.3	131,700 (both species combined)	9,628	N/A	N/A	N/A	DD	...	A:DD; B1:DD; B2:DD; C:DD; D:DD; E:DD	Information is not available for any of the qualifying criteria, largely due to there being insufficient survey effort and the high probability of species misidentification. It is therefore categorised as data deficient and in need of urgent survey effort.
Bechstein's bat	<i>Myotis bechsteinii</i>	Native	NT	15	23,499	1,172	21,800	10,300	55,600	LC	...	A:DD; B1:1C; B2: LC; C:1C; D:1C; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, there is no evidence of a contraction of the geographical range over the last 20 years. Data on range and occupancy are difficult to interpret because survey techniques have changed. EOO is >20,000km <sup>2</sup> , and although the AOO is <2,000km <sup>2</sup> , it does not meet any of the subcriteria for B (though there is some concern about possible loss of suitable habitat and/or habitat quality). Based on current evidence, the species does not meet the criterion of severely fragmented. Whilst the lower plausible estimate of population size is close to 10,000, it does not meet any of the subcriteria for C. The best estimate of population size, and also the lower plausible estimate, is well above the qualifying thresholds for D, and the geographical range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC. Information on population trends and size is urgently required to permit a re-assessment under criteria A,B and C.
Daubenton's bat	<i>Myotis daubentonii</i>	Native	LC	27.1	193,941	18,280	1,030,000	27,000	4,440,000	LC	...	A:DD; B1:1C; B2: LC; C:1C; D:1C; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, Daubenton's bats are recorded across a large area, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the qualifying thresholds for C and D, and the range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.
Greater mouse-eared bat	<i>Myotis myotis</i>	Native	LC	23.4	4	4	1	1	DD	CR	A2a; B1ab+2ab; C1+2a(=ii); D	E:DD	A hibernating population of this species, discovered in Sussex in 1969 has declined from a maximum of 30 individuals to a single male, first recorded as a juvenile in 2002 (indicating a decline of >80% over 47 years i.e. 3 generations), qualifying the species as CR under A2a. No females have been found since 2001. A small hibernating population of up to 10 individuals known in Dorset was lost by 1980. It has been inferred that there are no maternity colonies remaining but this has not been confirmed through exhaustive surveys. The species is therefore classified as CR based on very small geographical range (B1ab+2ab), and very small population size and decline (C1+2a(=ii); D). Extensive surveys are required as a matter of urgency to establish the status of this species with greater certainty. If the single male is the only member of this population then a classification of RE will be required in the near future; however it is possible that there are other undiscovered animals in the region and/or that migrants may increasingly come to Great Britain owing to the altered weather patterns associated with climate change.
Natterer's bat	<i>Myotis nattereri</i>	Native	LC	17.3	163,286	13,628	414,000	15,100	2,630,000	LC	...	A:DD; B1:1C; B2: LC; C:1C; D:1C; E:DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, Natterer's bats are recorded across a large area, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate is well above the qualifying thresholds for C and D, and the geographical range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.
Serotine bat	<i>Eptesicus serotinus</i>	Native	LC	19.7	90,580	12,564	136,000	7,250	413,000	VU	A2b+4b	A:1C; B1:1C; B2: LC; C1: close to NT; C2:1C; D:1C; E:DD	A negative trend in population size is estimated from roost counts (-1.6% per annum) from the National Bat Monitoring Programme (NBMP), and whilst this is not statistically significant, the wide confidence intervals reflect the small sample size: it is therefore reasonable to assume that the trend would be significant were further data available, and to adopt a precautionary approach, particularly given the higher rate of decline noted for the whole of GB using a larger sample size. Over 3 generations, this infers a decline of 32%. The NBMP field study suggests no change in encounter rates, but species identification in this survey is difficult as it is largely based on heterodyne recordings, and it should not outweigh the evidence from the roost survey. The species is therefore assessed as VU under A2b+4b. There is suspicion of a recent decline in AOO and population size in the east of England, but there also appears to be a corresponding increase in populations in the north and west of the range. Whilst some of this expansion may be an artefact of better species identification using broadband detectors, the AOO and EOO show no signs of decline over the last 20 years. The size of the inferred population decline from the roost counts is below the thresholds required for criterion A. EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The best estimate of population size is 136,000, which is well above the qualifying thresholds for C and D, but the lower plausible estimate is 7,250. This, in combination with the possible annual decline observed in roost counts (>30% in 3 generations - see above), leads to the species being close to a classification as NT under C1. The lower plausible estimate of population size is well above the qualifying thresholds for D, and the geographical range is not highly restricted. It is emphasised that this assessment is based on very poor data, with the estimates of population size and availability of suitable habitat in particular being very unreliable. The species should be re-assessed as soon as further information becomes available.
Leisler's bat	<i>Nyctalus leisleri</i>	Native	LC	13.8	80,070	2,676	N/A	N/A	N/A	NT	D1	A:DD; B1:1C; B2:DD; C1:DD; C2:1C; E:DD	The species is patchily distributed across England, Wales and south-west Scotland. There is no evidence on which to base estimates of population size or change. Very few breeding colonies are known, and other records tend to be based on acoustic recordings (which are prone to misidentification) or individual grounded bats. EOO is >20,000km <sup>2</sup> , and although the AOO is close to 2,000km <sup>2</sup> , there is insufficient information to judge whether any of the sub-criteria for B2 are met. Assessments could not be made under C because of data deficiencies for the sub-criteria. Based on the very small number of known roosts, and the small AOO (close to 2,000km <sup>2</sup> ), it is inferred that the population is very limited: the species is therefore classified as NT under D1: this classification should be reviewed as soon as further evidence becomes available. There is considerable uncertainty in the values for EOO and AOO due to likelihood of species misidentification using acoustic surveys. Approaches based on capture and/or genetic identification of droppings are therefore warranted.
Noctule bat	<i>Nyctalus noctula</i>	Native	LC	12.6	157,025	24,652	not published	not published	not published	LC	...	A:DD; B1:1C; B2: LC; C:1C; D:1C; E:DD	Although it is not possible to observe or estimate changes in population size due to lack of data, noctule bats are recorded across England, Wales and in parts of Southern Scotland, and there is no evidence of range contraction over the last 20 years. EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. GB-level estimates of population size are not published because of uncertainties in the estimates for Scotland. Nevertheless, the lower plausible estimate of population size based on England and Wales alone is well above the qualifying thresholds for C and D, and the range is not highly restricted.



ENGLAND ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2a</sup>	Area of occupancy (AOO) km <sup>2b</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Common pipistrelle bat	<i>Pipistrellus pipistrellus</i>	Native	LC	16.1	129,914	46,976	1,870,000	609,000	4,620,000	LC	—	A-DD; B1-LC; B2-LC; C-LC; D-LC; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, common pipistrelle bats are recorded across England, and there is no evidence of a contraction of the geographical range over the last 20 years. The NBMP colony count and field surveys for this species are not considered sufficiently reliable to be used for the inference of trends. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible population estimate is well above the qualifying thresholds for C and D, and the range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.
Soprano pipistrelle bat	<i>Pipistrellus pygmaeus</i>	Native	LC	15.5	128,458	29,716	2,980,000	1,260,000	5,360,000	LC	—	A-DD; B1-LC; B2-LC; C-LC; D-LC; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, soprano pipistrelle bats are recorded across England, and there is no evidence of a contraction of the geographical range over the last 20 years. The NBMP colony count and field surveys for this species are not considered sufficiently reliable to be used for the inference of trends. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible population estimate is well above the qualifying thresholds for C and D, and the range is not highly restricted. Therefore despite the assessment being based on very limited data, the species is classified as LC.
Nathusius' pipistrelle bat	<i>Pipistrellus nathusii</i>	Native	LC	15.5	70,285	2,248	N/A	N/A	N/A	NT	D1	A-DD; B1-DD; B2-DD; C-LC; D2-LC; E-DD	Very little information is available on this species. The geographical distribution is very poorly characterised, and the true EOO and AOO are uncertain: records are very intermittent, there is potential for acoustic recordings to be misidentified, and the extent of migratory individuals in the population is unclear. AOO is close to 2,000km <sup>2</sup> , but the species is data deficient for the sub-criteria of B2. No information is available on population size or trends. Though capture rates and acoustic records are increasing, there is also a very significant increase in observer effort; it is nevertheless likely that some of the increase in detection reflects either increased immigration or an expansion of a resident population. It is suspected that the number of individuals is <10,000, but the species is probably not declining so it does not meet the sub-criteria of C. It is likely that the number of mature individuals in England is $\geq 1,000$ , based on the wide distribution of acoustic records and the fact that >100 individuals have been ringed over recent years. However, the population is unlikely to be >2,000, given the very small number of known maternity colonies, and it is unclear what proportion of the population is resident. Owing to current uncertainties, the AOO being small (close to 2,000km <sup>2</sup> , which is taken as evidence of small population size given the extensive effort put into surveying this species), and the plausible threat to the species from wind farms (particularly those in coastal areas and offshore), the species is classified as NT under D1. It is also noted that the migratory component of the population may face additional threats from wind farms as it moves through continental Europe. The species should be re-assessed as soon as additional data become available.
Barbastelle bat	<i>Barbastella barbastellus</i>	Native	NT	15	67,610	3,556	N/A	N/A	N/A	VU	C2a(i)	A-DD; B1-LC; B2-LC; C1-DD; D1-LC; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, barbastelle bats are recorded through much of southern England, and there is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> . The species therefore does not qualify as threatened under B. The species is generally considered to be uncommon, and it is highly dependent on ancient woodland and veteran trees - resources which are highly fragmented and declining in the landscape. It can therefore be inferred that there is some decline in this species, although, based on habitat loss alone, it is unlikely to be sufficiently rapid to warrant classification as VU under A or C1 (D0 on other sub-criteria of C). It is plausible that the population size is <10,000 and that the number of mature individuals in each subpopulation may be $\leq 1,000$ . Together with a decline in the availability of suitable veteran trees, this gives a classification of VU under C2a(i). However, it is classified as DD for C1 because of the uncertainties in the scale of the decline. The population is unlikely to be sufficiently small or restricted in distribution to be classified as threatened under D. Re-analysis, preferably informed by a population genetic assessment to determine the number and size of subpopulations, is urgently required.
Brown long-eared bat	<i>Plecotus auritus</i>	Native	LC	30.4	129,683	38,696	607,000	33,700	1,430,000	LC	—	A-DD; B1-LC; B2-LC; C-LC; D1-LC; E-DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species, although this assessment is based on very limited data. National Bat Monitoring programme roost counts are unlikely to provide useful data because of the late emergence of the species, the likely presence of a fission-fusion social structure, and the high proportion of roosts which are in trees rather than buildings. There is no evidence of a contraction in the geographical range over the last 20 years; Brown long-eared bats are recorded throughout England. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , therefore the lower plausible estimate does not qualify under B. The lower plausible estimate of population size is well above the qualifying thresholds for C and D, and the range is not highly restricted.
Grey long-eared bat	<i>Plecotus austriacus</i>	Native	LC	22.7	7,247	372	N/A	N/A	N/A	EN	B2ab(iii,iv)	A-VU; B1ab(iii,iv); VU; C1+2a(i)-VU; D1-VU; D2-LC; E-DD	Little monitoring information is available with which to judge declines in population size. However, it is notable that many roosts with historical records of the species no longer supported colonies when revisited over the last 10 years (Razgour 2012); also, there has been a substantial decline in the availability of species-rich meadows (particularly wet meadows) which the species uses extensively for foraging. This would lead to a categorisation of VU under A2 as a decline of at least 30% is inferred over the last 3 generations (22.7 years) and could potentially be greater. EOO is <10,000km <sup>2</sup> and AOO <500km <sup>2</sup> . The population is severely fragmented, with >50% of the total occupancy found in patches smaller than would be required by sustainable populations and separated from the other colonies by a large distance (B1a; B2a). There is estimated loss in area, extent and quality of habitat (B1b(iii)+2b(iii)) and in the number of subpopulations (B1b(iv)+2b(iv)). This leads to a classification of VU under B1 and EN under B2. The population is very small, with the best estimate being approximately 1,000 individuals and a lower plausible estimate of 400 mature individuals, and a decline of at least 10% in 3 generations is likely (qualifying as VU under C1). The low number of mature individuals means the species also qualifies as VU under D1. It also has a restricted occupancy, and the loss of maternity sites, together with the small colony sizes in each fragmented location, could plausibly drive the species to critically endangered in a very short period. However, it is not close to the threshold of AOO<20km <sup>2</sup> and so is considered LC under D2.
<p><b>References:</b>            Branscombe, J. (ed). The Orkney Bird Report 2015. All other references are provided in Mathews F., Kubiakiewicz L.M., Gurnell J., Harrower C.A., McDonald R.A., Shore R.F. (2018) <i>A Review of the Population and Conservation Status of British Mammals. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage. Natural England, Peterborough. ISBN 978-1-78354-469-1. Natural England Access to Evidence Catalogue code JP025.</i></p> <p>For consistency with Mathews et al. (2018), the 2015 edition of the Bat Conservation Trusts Bat Monitoring Programme Annual Report was used.</p>					<p><b>Note on the start date for the assessment process:</b>            The start date for the assessment process was set the year 1500. For most species, little information is available until the last century, and the assessment criteria used in the IUCN Red Listing process are largely focused on declines within the last 10 years or 3 generations (whichever is longer). Considerations over longer time-scales therefore largely relate to whether or not a species should be considered regionally extinct rather than never having been present. For the purpose of this assessment, species are classified as Regionally Extinct where there is evidence that they existed in the country after 1500 and are no longer present; those present in earlier times, but not since 1500 are simply recorded as 'not present'.</p> <p>Historical evidence was gathered from a review of the literature and from requests for information made to each of the National Natural History Museums, and (where referred) to regional museums. However, there remains much uncertainty about regional extinction dates for many species, including beaver, wolf, wild boar, and wildcat (in England and Wales); and small species - notably bats and rodents - tend to be very poorly recorded. New advances in paleo-molecular techniques, are currently being employed to complement traditional archaeology, and it is anticipated that our understanding of extinction dates, and also of anthropological movement of mammals, will change rapidly over the coming years.</p> <p>It is therefore strongly recommended that dates of extinction are established with greater certainty using molecular and other techniques. Particular attention is warranted for the following species and countries: beaver (England and Wales), mountain hare (Wales), wildcat (England and Wales), wild boar (all countries); and grey long-eared bat (Wales). These data should then be used, as a matter of urgency, to assess whether these species should be classified as RE within the last 500 years. In the interim, it is recommended that beaver and wild boar are not classified as RE in Wales or England, and wild boar are not classified as RE in Scotland.</p> <p>It is considered that the following species have never been present in Scotland during historical times: lesser white-toothed shrew, hazel dormouse, yellow-necked mouse, greater horseshoe bat, lesser horseshoe bat, Bechstein's bat, serotine bat, barbastelle bat and grey long-eared bat.</p> <p>It is considered that the following species have never been present in Wales during historical times: lesser white-toothed shrew, Orkney vole.</p> <p>It is considered that the following species has never been present in England during historical times: Orkney vole</p> <p>All of these assessments should be kept under review should new evidence become available.</p>							<p>* The plausible limits were based on the upper and lower 95% confidence interval around the median for species other than bats. For bats, they were based on the highest and lowest likely values of roost density, roost size and sex ratio (see Mathews et al. 2018).</p> <p>(a) Extent of occurrence (EOO) is based on all records in the population review (1995-2016) and was generated using a 20km alpha-ball to smooth the distributions. Exceptions are for water voles, grey squirrels and red squirrels because their distribution has changed so rapidly in recent years. In these cases the years used are 2005-2016 (water vole) and 2010-2016 (grey squirrel and red squirrel).</p> <p>(b) Area of occupancy (AOO) is based on the number of positive tetrads (2x2km square), including for riparian and coastal species, following IUCN guidelines. AOO was computed from all records in the latest Mammal Atlas period (2000-2016) that fall within the EOO. Exceptions are for water voles, grey squirrels and red squirrels because the distribution has changed so rapidly in recent years. In these cases the years used are 2005-2016 (water vole) and 2010-2016 (grey squirrels and red squirrel). For species where it was not possible to calculate an AOO because of very dispersed records (the black rat and the beaver), EOO is based on all confirmed records. Changes in the number of occupied hectads &gt;20% since the last Mammal Atlas period (1960-1992), which may be indicative of substantial changes in AOO are noted, except for i) bats where the radical change in survey methodologies over this time invalidates comparison; and ii) species where there were very few records in the first Atlas period, which would mean that small changes in observer effort could have a substantial increase on the percentage change observed. For these comparisons, hectads rather than tetrads were used because much of the data from the first Atlas period was available only at hectad-level resolution.</p> <p>(c) (d) For lesser white-toothed shrew, the estimate is based on Temple &amp; Morris (1997).</p>	

SCOTLAND ASSESSMENT

Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale			
					Extent of occurrence (EOO) km <sup>2</sup> (a)	Area of occupancy (AOO) km <sup>2</sup> (b)	Central estimate					Lower plausible limit*	Upper plausible limit*	
Common pipistrelle bat	<i>Pipistrellus pipistrellus</i>	Native	LC	16.1	60,792	4,140	875,000	285,000	2,160,000	LC	...	A-DD; B1-LC; B2-LC; C1-LC; D1-LC; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, common pipistrelle bats are commonly recorded in much of Scotland, and there is no evidence of a contraction of the geographical range over the last 20 years. The NBMP colony count and field surveys for this species are not considered sufficiently reliable to be used for the inference of trends. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the qualifying thresholds for C and D, and the range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.	
Soprano pipistrelle bat	<i>Pipistrellus pygmaeus</i>	Native	LC	15.5	52,223	4,316	1,210,000	512,000	2,180,000	LC	...	A-DD; B1-LC; B2-LC; C1-LC; D1-LC; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, soprano pipistrelle bats are commonly recorded in much of Scotland, and there is no evidence of a contraction of the geographical range over the last 20 years. The NBMP colony count and field surveys for this species are not considered sufficiently reliable to be used for the inference of trends. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible estimate of population size is well above the qualifying thresholds for C and D, and the range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.	
Nathusius' pipistrelle bat	<i>Pipistrellus nathusii</i>	Native	LC	15.5	4,210	132	N/A	N/A	N/A	VU	D1	A-DD; B1-NT; B2-NT; C-DD; D2-LC; E-DD	Very little information is available on this species. The geographical distribution is very poorly characterised, and the true EOO and AOO are uncertain: records are very intermittent, there is potential for acoustic recordings to be misidentified, and the extent of migratory individuals in the population is unclear. There has been relatively little survey effort in Scotland compared with England. EOO is <20,000km <sup>2</sup> and AOO <500km <sup>2</sup> . The population appears fragmented within Scotland (based on EOO alone as no genetic data are available), and there is no link with the English population. Whilst it qualifies as EN under B1 and B2a, the species is data deficient for the other required subcategories of B: the species is therefore classified as NT under criteria B1 and B2. No information is available on population size or trends, though there are increasing capture rates and acoustic records (note that there is also a very significant increase in observer effort). It is suspected that the number of mature individuals is <2,000, and probably <500 as no breeding populations are known. An unknown proportion may also be migratory. The population is below the threshold to qualify as EN under criterion C. However, the species is DD for the sub-criteria. Given the low population size, the uncertainties in the estimate, the small AOO, and the plausible threat to the species from wind farms (particularly those in coastal areas and offshore), the species is classified as VU under D1. It is also noted that the migratory component of the population may face additional threats from wind farms as it moves through continental Europe. The species should be re-assessed as soon as additional data become available.	
Barbastelle bat	<i>Barbastella barbastellus</i>	Native	NT	15	Species is not present, and is considered unlikely to have been present, in Scotland during historical times.	---	---	---	---	---	---	---	---	Species is not present in Scotland, and is considered unlikely to have been present during historical times.
Brown long-eared bat	<i>Plecotus auritus</i>	Native	LC	30.4	49,139	1,988	230,000	12,800	543,000	LC	...	A-DD; B1-LC; B2-LC; C1-LC; D1-LC; E-DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species, although this assessment is based on very limited data. National Bat Monitoring programme roost counts are unlikely to provide useful data because of the late emergence of the species, the likely presence of a fission-fusion social structure, and the high proportion of roosts which are in trees rather than buildings. There is no evidence of a contraction in the geographical range over the last 20 years: Brown long-eared bats are recorded across much of Scotland. EOO is >20,000km <sup>2</sup> and although the AOO is very close to 2,000km <sup>2</sup> , the species does not meet any of the sub-criteria of B2. The lower plausible estimate of population size is well above the qualifying thresholds for C and D, and the species does not have a restricted distribution.	
Grey long-eared bat	<i>Plecotus austriacus</i>	Native	LC	22.7	Species is not present, and is considered unlikely to have been present, in Scotland during historical times.	---	---	---	---	---	---	---	---	Species is not present in Scotland, and is considered unlikely to have been present during historical times.
<p><b>References:</b>                      Branscombe, J. (ed). The Orkney Bird Report 2015. All other references are provided in Mathews F, Kubasiewicz LM, Gurnell J, Harrower CA, McDonald RA, Shore RF. (2018) <i>A Review of the Population and Conservation Status of British Mammals. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage. Natural England, Peterborough.</i> ISBN 978-1-78354-469-1. Natural England Access to Evidence Catalogue code JP025.</p> <p>For consistency with Mathews et al. (2018), the 2015 edition of the Bat Conservation Trust's Bat Monitoring Programme Annual Report was used.</p>					<p><b>Note on the start date for the assessment process:</b>                      The start date for the assessment process was set the year 1500. For most species, little information is available until the last century; and the assessment criteria used in the IUCN Red Listing process are largely focused on declines within the last 10 years or 3 generations (whichever is longer). Considerations over longer time-scales therefore largely relate to whether or not a species should be considered regionally extinct rather than never having been present. For the purpose of this assessment, species are classified as Regionally Extinct where there is evidence that they existed in the country after 1500 and are no longer present; those present in earlier times, but not since 1500 are simply recorded as 'not present'.</p>					<p>*The plausible limits were based on the upper and lower 95% confidence interval around the median for species other than bats. For bats, they were based on the highest and lowest likely values of roost density, roost size and sex ratio (see Mathews et al. 2018).</p> <p>(a) Extent of occurrence (EOO) is based on all records in the population review (1995-2016) and was generated using a 20km alpha-hull to smooth the distributions. Exceptions are for water voles, grey squirrels and red squirrels because their distribution have changed so rapidly in recent years. In these cases the years used are 2005-2016 (water vole) and 2010-2016 (grey squirrel and red squirrel).</p> <p>(b) Area of occupancy (AOO) is based on the number of positive tetrads (2x2km square), including for riparian and coastal species, following IUCN guidelines. AOO was computed from all records in the latest Mammal Atlas period (2000-2016) that fall within the EOO. Exceptions are for water voles, grey squirrels and red squirrels because the distribution has changed so rapidly in recent years. In these cases the years used are 2005-2016 (water vole) and 2010-2016 (grey squirrel and red squirrel). For species where it was not possible to calculate an AOO because of very dispersed records (the black rat, Brandt's bat and whiskered bat), EOO is based on all confirmed records. Changes in the number of occupied hectads &gt;20% since the last Mammal Atlas period (1960-1992), which may be indicative of substantial changes in AOO are noted, except for i) bats where the radical change in survey methodologies over this time invalidates comparisons, and ii) species where there were very few records in the first Atlas period, which would mean that 'small changes' in observer effort could have a substantial increase on the percentage change observed. For these comparisons, hectads rather than tetrads were used because much of the data from the first Atlas period was available only at hectad-level resolution.</p> <p>(d) For Orkney vole, the most recently available estimate (Reynolds 1992) is no longer appropriate because rapid changes in population size in recent years are likely.</p> <p>Footnotes for IUCN Red List Categories applied in Scotland</p> <p>1. Classification is based on a decline in field signs suggesting a decline in occupancy from 92% to 80% over 8-9 years and change in number of occupied hectads between the two Mammal Atlas periods.</p>				
<p>Historical evidence was gathered from a review of the literature and from requests for information made to each of the National Natural History Museums, and (where referred) to regional museums. However, there remains much uncertainty about regional extinction dates for many species, including beaver, wolf, wild boar, and wildcat (in England and Wales); and small species - notably bats and rodents - tend to be very poorly recorded. New advances in paleo-molecular techniques, are currently being employed to complement traditional archaeology, and it is anticipated that our understanding of extinction dates, and also of anthropological movement of mammals, will change rapidly over the coming years.</p> <p>It is therefore strongly recommended that dates of extinction are established with greater certainty using molecular and other techniques. Particular attention is warranted for the following species and countries: beaver (England and Wales), mountain hare (Wales), wildcat (England and Wales), wild boar (all countries); and grey long-eared bat (Wales). These data should then be used, as a matter of urgency, to assess whether these species should be classified as RE within the last 500 years. In the interim, it is recommended that beaver and wild boar are not classified as RE in Wales or England, and wild boar are not classified as RE in Scotland.</p> <p>It is considered that the following species have never been present in Scotland during historical times: lesser white-toothed shrew, hazel dormouse, yellow-necked mouse, greater horseshoe bat, lesser horseshoe bat, Bechstein's bat, serotine bat, barbastelle bat and grey long-eared bat.</p> <p>It is considered that the following species have never been present in Wales during historical times: lesser white-toothed shrew, Orkney vole.</p> <p>It is considered that the following species has never been present in England during historical times: Orkney vole</p> <p>All of these assessments should be kept under review should new evidence become available.</p>														

WALES ASSESSMENT

Species	Toxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale			
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*	
Common pipistrelle bat	<i>Pipistrellus pipistrellus</i>	Native	LC	16.1	20,601	4,072	297,000	96,600	732,000	LC	LC	A-DD; B1-LC; B1-LC; B2-LC; C1-C; D1-C; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, common pipistrelle bats are commonly recorded across Wales, and there is no evidence of a contraction of the geographical range over the last 20 years. The NBMP colony count and field surveys for this species are not considered sufficiently reliable to be used for the inference of trends. EOO is close to 20,000km <sup>2</sup> , but sub-criteria (a) and (c) for B1 do not apply, and the species is data deficient for sub-criterion (b). AOO is >2,000km <sup>2</sup> so the species does not qualify under B2. The best estimate of population size, and also the lower plausible estimate, are well above the qualifying thresholds for C and D, and the range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.	
Soprano pipistrelle bat	<i>Pipistrellus pygmaeus</i>	Native	LC	15.5	20,643	5,084	478,000	202,000	862,000	LC	---	A-DD; B1-LC; B2-LC; C1-C; D1-C; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, soprano pipistrelle bats are commonly recorded across Wales, and there is no evidence of a contraction of the geographical range over the last 20 years. The NBMP colony count and field surveys for this species are not considered sufficiently reliable to be used for the inference of trends. EOO is close to 20,000km <sup>2</sup> , but sub-criteria (a) and (c) for B1 do not apply, and the species is data deficient for sub-criterion (b). AOO is >2,000km <sup>2</sup> , so the species does not qualify under B2. The best estimate of population size, and the lower plausible estimate, are well above the qualifying thresholds for C and D, and the range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.	
Nathusius' pipistrelle bat	<i>Pipistrellus nathusii</i>	Native	LC	15.5	6,921	160	N/A	N/A	N/A	VU	D1	A-DD; B1-DD; B2-DD; C-DD; D2-LC; E-DD	Very little information is available on this species. The geographical distribution is very poorly characterised, and the true EOO and AOO are uncertain: records are very intermittent, there is potential for acoustic recordings to be misidentified, and the extent of migratory individuals in the population is unclear. There has been relatively little survey effort in Wales compared with England. EOO is <20,000km <sup>2</sup> and AOO is <500km <sup>2</sup> . There appears to be some fragmentation of the population (based on distribution alone as no genetic data are available), though it is not clear that the extent of fragmentation is sufficient to permit a classification of NT under B1a+B2. Populations in the South-East and North-East of the country also appear to be linked with those in England. The species is data deficient for the other sub-criteria of B. No information is available on population size or trends, though there are increasing capture rates and acoustic records (note that there is also a very significant increase in observer effort). It is suspected that the number of mature individuals is <2,000, and probably <500 as no breeding populations are known. An unknown proportion may be migratory. It is therefore below the threshold for EN under C. However, species is DD for the sub-criteria of C, and is suspected not to be declining. Given the low population size, the uncertainties in the estimate, the small AOO, and the plausible threat to the species from wind farms (particularly those in coastal areas and offshore), the species is classified as VU under D1. It is also noted that the migratory component of the population may face additional threats from wind farms as it moves through continental Europe. The species should be re-assessed as soon as additional data become available.	
Barbastelle bat	<i>Barbastella barbastellus</i>	Native	NT	15	6,386	140	N/A	N/A	N/A	VU	C2a(ii)	A-DD; B1-NT; B2-NT; C1-DD; D1-C; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, barbastelle bats are recorded in South West and North West Wales and in the borders. There is no evidence of a contraction of the geographical range over the last 20 years. EOO is <20,000km <sup>2</sup> and AOO is <500km <sup>2</sup> . The species is generally considered to be uncommon, and it is highly dependent on ancient woodland and veteran trees - resources that are highly fragmented and declining in the landscape. It can therefore be inferred that there is some decline in this species, although, based on habitat loss alone, it is unlikely to be sufficiently rapid to warrant classification as VU under A or C1 (DD on other sub-criteria of C). The species is classified as NT under B1(iii)+B2(iii) on the basis of its small geographical range and declining habitat; sub-criterion (a) is unlikely to be met and the species is data deficient for sub-criterion (c). A population size <10,000, with <1,000 mature adults in each subpopulation, is plausible, particularly given the very small AOO. Together with a decline in the availability of suitable veteran trees, this gives a classification of VU under C2a(ii). It is classified as DD for C1 because of the uncertainties in the scale of decline. However, the population is unlikely to be sufficiently small or restricted in distribution to be classified as threatened under D. Re-analysis, preferably informed by a population genetic assessment to determine the number and size of subpopulations, is urgently required.	
Brown long-eared bat	<i>Plecotus auritus</i>	Native	LC	30.4	20,643	3,416	96,600	5,370	228,000	LC	---	A-LC; B1-LC; B2-LC; C1-C; D1-C; E-DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species, although this assessment is based on very limited data. National Bat Monitoring programme roost counts are unlikely to provide useful data because of the late emergence of the species, the likely presence of a fission-fusion social structure, and the high proportion of roosts which are in trees rather than buildings. There is no evidence of a contraction of the geographical range over the last 20 years. Brown long-eared bats are recorded throughout Wales. EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> , therefore the species does not qualify under B. The best estimate of population size is well above the qualifying thresholds for C and D, and the species does not have a restricted range. Although the lower limit of the plausible population size is <10,000, the species does not fulfil the subcriteria of C, and the estimate is well above the threshold for D1.	
Grey long-eared bat	<i>Plecotus austriacus</i>	Native	LC	22.7	Species is not present in Wales. (See footnote on dates of Regional Extinctions.)	---	---	---	---	---	---	---	---	Species is not present in Wales: the only record verified genetically was an isolated occurrence.

**References:**  
 Branscombe, J. (ed). The Orkney Bird Report 2015. All other references are provided in Mathews F, Kubasiwicz LM, Gurnell J, Harrower CA, McDonald RA, Shore RF. (2018) *A Review of the Population and Conservation Status of British Mammals. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage.* Natural England, Peterborough. ISBN 978-1-78354-469-1. Natural England Access to Evidence Catalogue code JP025.

For consistency with Mathews et al. (2018), the 2015 edition of the Bat Conservation Trust's Bat Monitoring Programme Annual Report was used.

**Note on the start date for the assessment process:**  
 The start date for the assessment process was set the year 1500. For most species, little information is available until the last century; and the assessment criteria used in the IUCN Red Listing process are largely focused on declines within the last 10 years or 3 generations (whichever is longer). Considerations over longer time-scales therefore largely relate to whether or not a species should be considered regionally extinct rather than never having been present. For the purpose of this assessment, species are classified as Regionally Extinct where there is evidence that they existed in the country after 1500 and are no longer present; those present in earlier times, but not since 1500 are simply recorded as 'not present'.

Historical evidence was gathered from a review of the literature and from requests for information made to each of the National Natural History Museums, and (where referred) to regional museums. However, there remains much uncertainty about regional extinction dates for many species, including beaver, wolf, wild boar, and wildcat (in England and Wales); and small species - notably bats and rodents - tend to be very poorly recorded. New advances in paleo-molecular techniques, are currently being employed to complement traditional archaeology, and it is anticipated that our understanding of extinction dates, and also of anthropological movement of mammals, will change rapidly over the coming years.

It is therefore strongly recommended that dates of extinction are established with greater certainty using molecular and other techniques. Particular attention is warranted for the following species and countries: beaver (England and Wales), mountain hare (Wales), wildcat (England and Wales), wild boar (all countries); and grey long-eared bat (Wales). These data should then be used, as a matter of urgency, to assess whether these species should be classified as RE within the last 500 years. In the interim, it is recommended that beaver and wild boar are not classified as RE in Wales or England, and wild boar are not classified as RE in Scotland.

It is considered that the following species have never been present in Scotland during historical times: lesser white-toothed shrew, hazel dormouse, yellow-necked mouse, greater horseshoe bat, lesser horseshoe bat, Bechstein's bat, serotine bat, barbastelle bat and grey long-eared bat.

It is considered that the following species have never been present in Wales during historical times: lesser white-toothed shrew, Orkney vole.

It is considered that the following species has never been present in England during historical times: Orkney vole.

All of these assessments should be kept under review should new evidence become available.

\* The plausible limits were based on the upper and lower 95% confidence interval around the median for species other than bats. For bats, they were based on the highest and lowest likely values of roost density, roost size and sex ratio (see Mathews et al. 2018).

(a) Extent of occurrence (EOO) is based on all records in the population review (1995-2016) and was generated using a 20km alpha-hull to smooth the distributions. Exceptions are for water voles, grey squirrels and red squirrels because their distribution have changed so rapidly in recent years. In these cases the years used are 2005-2016 (water vole) and 2010-2016 (grey squirrel and red squirrel).

(b) Area of occupancy (AOO) is based on the number of positive tetrads (2x2km square), including for riparian and coastal species, following IUCN guidelines. AOO was computed from all records in the latest Mammal Atlas period (2000-2016) that fall within the EOO. Exceptions are for water voles, grey squirrels and red squirrels because the distribution has changed so rapidly in recent years. In these cases the years used are 2005-2016 (water vole) and 2010-2016 (grey squirrels and red squirrel). For species where it was not possible to calculate an AOO because of very dispersed records (the black rat), EOO is based on all confirmed records. Changes in the number of occupied hectads >20% since the last Mammal Atlas period (1960-1992), which may be indicative of substantial changes in AOO are noted, except for i) bats where the radical change in survey methodologies over this time invalidates comparisons; and ii) species where there were very few records in the first Atlas period, which would mean that small changes in survey effort could have a substantial increase on the percentage change observed. For these comparisons, hectads rather than tetrads were used because much of the data from the first Atlas period was available only at hectad-level resolution.

(a)

GREAT BRITAIN ASSESSMENT													
Species	Taxonomic name	GB status	Global IUCN Red List category (2010)	Length of 3 generations in years (if >10 years)	Population estimate			IUCN Red List category	Qualifying criteria	Notes on other criteria	Rationale		
					Extent of occurrence (EOO) km <sup>2</sup>	Area of occupancy (AOO) km <sup>2</sup>	Central estimate					Lower plausible limit*	Upper plausible limit*
Common pipistrelle bat	<i>Pipistrellus pipistrellus</i>	Native	LC	16.1	211,307	55,188	3,040,000	991,000	7,510,000	LC	---	A-DD; B1:LC; B2:LC; C1:LC; D:LC; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, common pipistrelle bats are commonly recorded across GB, and there is no evidence of a contraction of the geographical range over the last 20 years. The NBMP colony count and field surveys for this species are not considered sufficiently reliable to be used for the inference of trends. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible population estimate is well above the qualifying thresholds for C and D, and the range is not highly restricted.
Soprano pipistrelle bat	<i>Pipistrellus pygmaeus</i>	Native	LC	15.5	201,324	39,116	4,670,000	1,970,000	8,400,000	LC	---	A-DD; B1:LC; B2:LC; C1:LC; D:LC; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, soprano pipistrelle bats are commonly recorded across GB, and there is no evidence of a contraction of the geographical range over the last 20 years. The NBMP colony count and field surveys for this species are not considered sufficiently reliable to be used for the inference of trends. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , so the species does not qualify under B. The lower plausible population estimate is well above the qualifying thresholds for C and D, and the range is not highly restricted. Therefore, despite the assessment being based on very limited data, the species is classified as LC.
Nathusius' pipistrelle bat	<i>Pipistrellus nathusii</i>	Native	LC	15.5	81,421	2,540	N/A	N/A	N/A	NT	D1	A-DD; B1:DD; B2:DD; C:LC; D2:LC; E-DD	Very little information is available on this species. The distribution is very poorly characterised, and the true EOO and AOO are uncertain: records are very intermittent, there is potential for acoustic recordings to be misidentified, and the extent of migratory individuals in the population is unclear. AOO is 2,540km <sup>2</sup> which would qualify as NT under B2, but the species is data deficient for all of the sub-criteria. Though capture rates and acoustic records are increasing, there is also a very significant increase in observer effort; it is nevertheless likely that some of the increase in detection reflects either increased immigration or an expansion of a resident population. It is suspected that the number of individuals is <10,000, but the species is probably not declining so it does not meet the sub-criteria of C. It is likely that the number of mature individuals in England (from which most GB records derive) is >1,000, based on the wide distribution of acoustic records and the fact that >100 individuals have been ringed over recent years. However, the GB population is unlikely to be >2,000 as there is a very small number of known maternity colonies, and it is unclear what proportion of the total population is resident. Given current uncertainties, the AOO being close to 2,000km <sup>2</sup> , and the plausible threat to the species from wind farms (particularly those in coastal areas and offshore), the species is classified as NT under D1. It is also noted that the migratory component of the population may face additional threats from wind farms as it moves through continental Europe. The species should be re-assessed as soon as additional data become available.
Barbastelle bat	<i>Barbastella barbastellus</i>	Native	NT	15	73,996	3,696	N/A	N/A	N/A	VU	C2a(ii)	A-DD; B1:LC; B2:LC; C1:DD; D:LC; E-DD	Although it is not possible to observe, estimate, infer or suspect changes in population size due to lack of data, barbastelle bats are recorded through much of southern England, and in parts of Wales. There is no evidence of a contraction of the geographical range over the last 20 years. EOO is >20,000km <sup>2</sup> and the AOO is >2,000km <sup>2</sup> . The species therefore does not qualify as threatened under B. The species is generally considered to be uncommon, and it is highly dependent on ancient woodland and veteran trees - resources which are highly fragmented and declining in the landscape. It can therefore be inferred that there is some decline in this species, although, based on habitat loss alone, it is unlikely to be sufficiently rapid to warrant classification as VU under A or C1 (DD on other sub-criteria of C). It is plausible that the population size is <10,000 and that the number of mature individuals in each subpopulation may be <1,000. Together with a decline in the availability of suitable veteran trees, this gives a classification of VU under C2a(ii). However, it is emphasised that this assessment is made on the basis of very incomplete evidence. It is classified as DD for C1 because of the uncertainties in the scale of the decline. The population is unlikely to be sufficiently small or restricted in distribution to be classified as threatened under D. Re-analysis, preferably informed by a population genetic assessment to determine the number and size of subpopulations, is urgently required.
Brown long-eared bat	<i>Plecotus auritus</i>	Native	LC	30.4	199,464	44,100	934,000	51,900	2,200,000	LC	---	A-DD; B1:LC; B2:LC; C1:LC; D:LC; E-DD	A reduction in population size has not been observed, inferred, estimated or suspected for this species, although this assessment is based on very limited data. National Bat Monitoring programme roost counts are unlikely to provide useful data because of the late emergence of the species, the likely presence of a fission-fusion social structure, and the high proportion of roosts which are in trees rather than buildings. There is no evidence of a contraction of the geographical range over the last 20 years; Brown long-eared bats are recorded throughout GB. EOO is >20,000km <sup>2</sup> and AOO is >2,000km <sup>2</sup> , therefore the species does not qualify under B. The lower plausible estimate of population size is well above the qualifying thresholds for C and D, and the range is not highly restricted.
Grey long-eared bat	<i>Plecotus austriacus</i>	Native	LC	22.7	7,247	372	1,000	400	3,000	EN	B2ab(ii,iv)	A:VU; B1ab(ii,iv):VU; C1+2a(i):VU; D1:VU; D2:LC; E:DD	The species is only established in England. Little monitoring information is available with which to judge declines in population size. However, it is notable that many roosts with historical records of the species no longer supported colonies when revisited over the last 10 years (Ragotz); also, there has been a substantial decline in the availability of species-rich meadows (particularly wet meadows) which the species uses extensively for foraging. This would lead to a categorisation of VU under A2c as a decline of at least 30% is inferred over the last 3 generations (22.7 years) and could potentially be greater. EOO is <10,000km <sup>2</sup> and AOO <500km <sup>2</sup> . The population is severely fragmented, with >50% of the total occupancy found in patches smaller than would be required by sustainable populations and separated from the other colonies by a large distance (B1a; B2a). There is estimated loss in area, extent and quality of habitat (B1b(iii)+2b(iii)) and in the number of subpopulations (B1b(iv)+2b(iv)). This leads to a classification of VU under B1 and EN under B2. The population is very small, with the best estimate being approximately 1,000 individuals and a lower plausible estimate of 400 mature individuals, and a decline of at least 10% in 3 generations is likely (qualifying as VU under C1). The low number of mature individuals means the species also qualifies as VU under D1. It also has a restricted occupancy, and the loss of maternity sites, together with the small colony sizes in each fragmented location, could plausibly drive the species to critically endangered in a very short period. However, it is not close to the threshold of AOO <20km <sup>2</sup> and so is considered LC under D2.
References:	<p>Branscombe, J. (ed). The Orkney Bird Report 2015. All other references are provided in Mathews F, Kubasiewicz LM, Gurnell J, Harrower CA, McDonald RA, Shore RF. (2018) <i>A Review of the Population and Conservation Status of British Mammals. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage, Natural England, Peninsular, ISBN 978-1-78354-469-1. Natural England Access to Evidence Catalogue code JP025.</i></p> <p>For consistency with Mathews et al. (2018), the 2015 edition of the Bat Conservation Trust's Bat Monitoring Programme Annual Report was used.</p>				<p><b>Note on the start date for the assessment process:</b> The start date for the assessment process was set the year 1500. For most species, little information is available until the last century; and the assessment criteria used in the IUCN Red Listing process are largely focused on declines within the last 10 years or 3 generations (whichever is longer). Considerations over longer time-scales therefore largely relate to whether or not a species should be considered regionally extinct rather than never having been present. For the purpose of this assessment, species are classified as Regionally Extinct where there is evidence that they existed in the country after 1500 and are no longer present; those present in earlier times, but not since 1500 are simply recorded as 'not present'.</p> <p>Historical evidence was gathered from a review of the literature and from requests for information made to each of the National Natural History Museums, and (where referred) to regional museums. However, there remains much uncertainty about regional extinction dates for many species, including beaver, wolf, wild boar, and wildcat (in England and Wales); and small species - notably bats and rodents - tend to be very poorly recorded. New advances in paleo-molecular techniques, are currently being employed to complement traditional archaeology, and it is anticipated that our understanding of extinction dates, and also of anthropological movement of mammals, will change rapidly over the coming years.</p> <p>It is therefore strongly recommended that dates of extinction are established with greater certainty using molecular and other techniques. Particular attention is warranted for the following species and countries: beaver (England and Wales), mountain hare (Wales), wildcat (England and Wales), wild boar (all countries); and grey long-eared bat (Wales). These data should then be used, as a matter of urgency, to assess whether these species should be classified as RE within the last 500 years. In the interim, it is recommended that beaver and wild boar are not classified as RE in Wales or England, and wild boar are not classified as RE in Scotland.</p> <p>It is considered that the following species have never been present in Scotland during historical times: lesser white-toothed shrew, hazel dormouse, yellow-necked mouse, greater horseshoe bat, lesser horseshoe bat, Bechstein's bat, serotine bat, barbastelle bat and grey long-eared bat.</p> <p>It is considered that the following species have never been present in Wales during historical times: lesser white-toothed shrew, Orkney vole.</p> <p>It is considered that the following species has never been present in England during historical times: Orkney vole</p> <p>All of these assessments should be kept under review should new evidence become available.</p>				<p>* The plausible limits were based on the upper and lower 95% confidence interval around the median for species other than bats. For bats, they were based on the highest and lowest likely values of roost density, roost size and sex ratio (see Mathews et al. 2018).</p> <p>(a) Extent of occurrence (EOO) is based on all records in the population review (1995-2016) and was generated using a 20km alpha-hull to smooth the distributions. Exceptions are for water voles, grey squirrels and red squirrels because their distribution have changed so rapidly in recent years. In these cases the years used are 2005-2016 (water vole) and 2010-2016 (grey squirrel and red squirrel).</p> <p>(b) Area of occupancy (AOO) is based on the number of positive tetrads (2x2km square), including for riparian and coastal species, following IUCN guidelines. AOO was computed from all records in the latest Mammal Atlas period (2000-2016) that fall within the EOO. Exceptions are for water voles, grey squirrels and red squirrels because the distribution has changed so rapidly in recent years. In these cases the years used are 2005-20+AKS2N16 (water vole) and 2010-2016 (grey squirrels and red squirrel). For species where it was not possible to calculate an AOO because of very dispersed records (the black rat), EOO is based on all confirmed records. Changes in the number of occupied hectads &gt;20% since the last Mammal Atlas period (1960-1992), which may be indicative of substantial changes in AOO are noted, except for i) bats where the radical change in survey methodologies over this time invalidates comparisons; and ii) species where there were very few records in the first Atlas period, which would mean that small changes in observer effort could have a substantial increase on the percentage change observed. For these comparisons, hectads rather than tetrads were used because much of the data from the first Atlas period was available only at hectad-level resolution.</p> <p>(a) (d) For Orkney vole, the most recently available estimate (Reynolds 1992) is no longer appropriate because rapid changes in population size in recent years are likely.</p>				