

Bogdziewicz, M., Zwolak, R. and Crone, E. E. 2015. How do vertebrates respond to mast seeding? – Oikos doi: 10.1111/oik.03012.

## Appendix 1

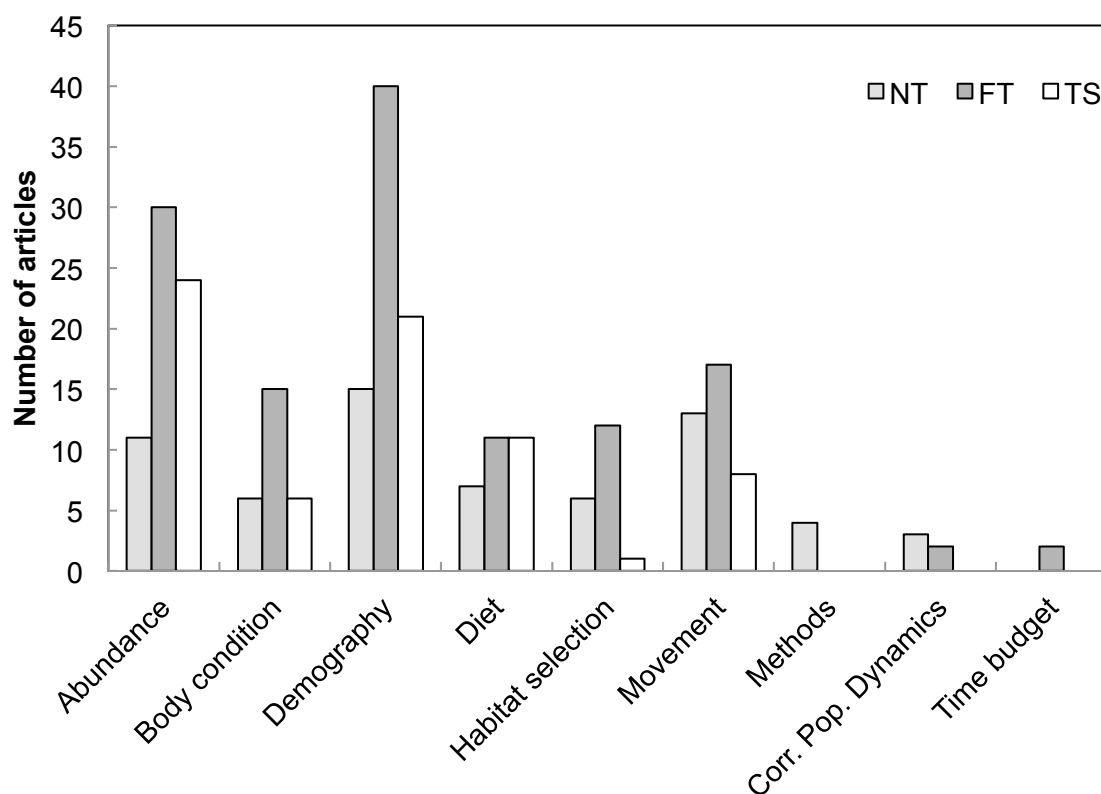


Figure A1. Number of articles reporting different responses of wildlife to mast seeding. TS stands for studies found by traditional search of online databases, FT stands for studies designed to investigate masting and NT for non-targeted reports (see Methods for more information). FT and NT studies were identified with full-text search (Methods). Note that in ‘demography’ we included studies reporting changes in survival, reproduction and nest success.

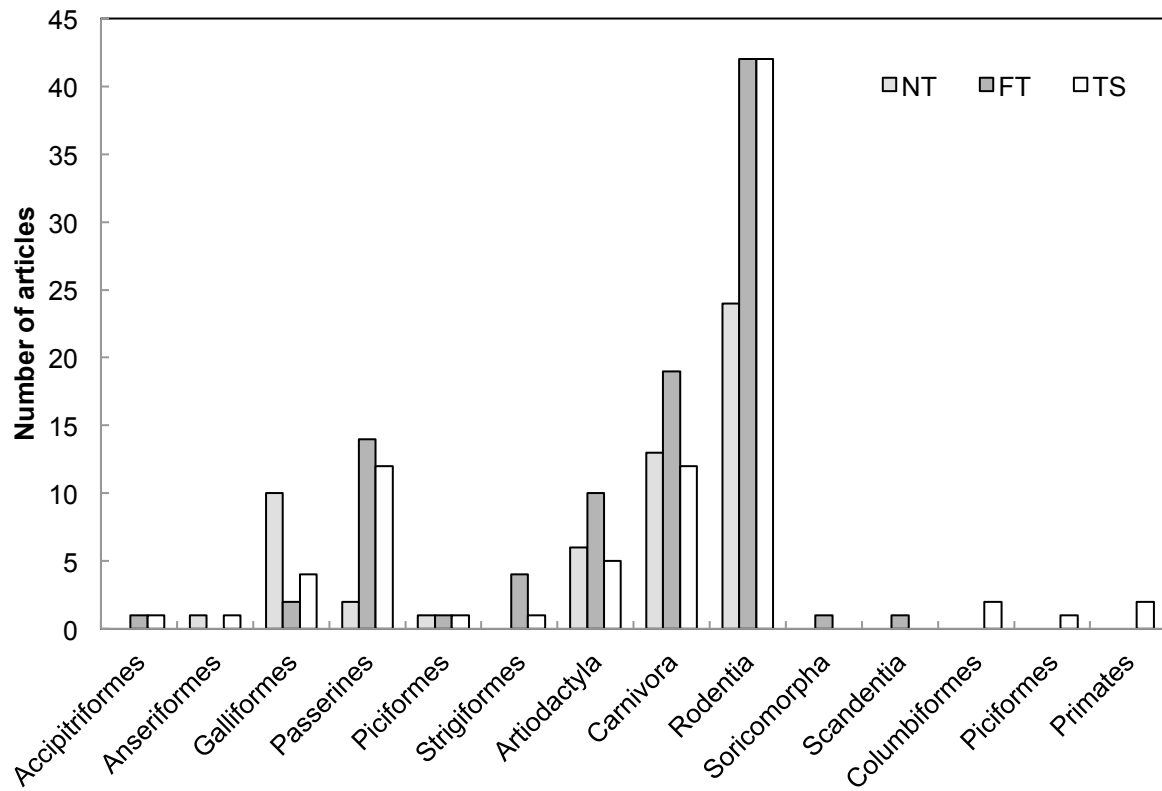


Figure A2. Number of articles reporting responses of different taxonomic orders to mast seeding. TS stands for studies found by traditional search of online databases, FT stands for studies designed to investigate masting and NT for non-targeted reports (see Methods for more information). FT and NT studies were identified with full-text search (Methods).

Table A1. Wildlife responses to mast seeding identified in the review. Direct effects are caused by changes in availability of seeds and indirect effects are driven by changes in abundance of primary consumers of seeds. TS stands for studies found by traditional search of online databases, FT stands for studies designed to investigate masting and NT for non-targeted reports (see Methods for more information). FT and NT studies were identified with full-text search (Methods).

Response	Response category (direct/indirect)	Study category (FT/NT/TS)	Species	References
<u>Demographic</u>				
Reproduction	Direct	FT	Mammals: <i>Apodemus sylvaticus</i> , <i>Clethrionomys rutilus</i> , <i>Glis glis</i> , <i>Microtus</i> spp., <i>Peromyscus maniculatus</i> , <i>Peromyscus leucopus</i> , <i>Proechimys semispinosus</i> , <i>Sciurus vulgaris</i> , <i>Sus scrofa</i> , <i>Tamias striatus</i> , <i>Tamiasciurus hudsonicus</i> , <i>Tupaina tana</i> , <i>Ursus americanus</i> ; Birds: <i>Parus major</i>	Montgomery et al. 1991, Wauters and Dhondt 1995, Wolff 1996, McCracken et al. 1999, Wheatley et al. 2002, Pilastro et al. 2003, Clark et al. 2005, Ruf et al. 2006, Munshi-South et al. 2007, Descamps et al. 2008a, 2008b, Bouwhuis et al. 2010, Krebs et al. 2010, Bergeron et al. 2011, Bridges et al. 2011, Lebl et al. 2011, Archibald et al. 2013
		NT	Mammals: <i>Sciurus arizonensis</i> , <i>Sus scrofa</i> ,	Klenner and Krebs 1991, Descamps et

			<i>Tamiasciurus hudsonicus</i>	al. 2007, Lane et al. 2009, Ditchkoff et al. 2012, Cudworth and Koprowski 2013
		TS	Mammals: <i>Apodemus flavicollis</i> , <i>Apodemus speciosus</i> , <i>Apodemus sylvaticus</i> , <i>Glis glis</i> , <i>Mus musculus</i> , <i>Myodes glareolus</i> , <i>Peromyscus leucopus</i> , <i>Sciurus vulgaris</i> , <i>Sus barbatus</i> , <i>Tamiasciurus hudsonicus</i> , <i>Ursus americanus</i> ; Birds: <i>Bonasa umbellus</i> , <i>Cyanoramphus auriceps</i> , <i>Lophura</i> spp <i>Rollulus rouloul</i> , <i>Strigops habroptilus</i> ,	Jensen 1982, Pucek et al. 1993, Curran and Leighton 2000, Verhagen et al. 2000, Alley et al. 2001, Scarlett 2004, Fietz et al. 2005, Boutin et al. 2006, Suchomel and Heraldova 2006, Reynolds-Hogland et al. 2007, Saitoh et al. 2008, Suchomel and Heraldova 2008, Bieber and Ruf 2009, Fietz et al. 2009, Kager and Fietz 2009
	Indirect	FT	Mammals: <i>Mustela erminea</i> , <i>Peromyscus maniculatus</i> ; Birds: <i>Strix aluco</i> , <i>Strix occidentalis</i>	Jędrzejewski et al. 1996, Seamans et al. 2002, LaHaye et al. 2004, Wittmer et al. 2007, Lobo and Millar 2013
		TS	Mammals: <i>Mustela erminea</i>	Purdey et al. 2004
Survival	Direct	FT	Mammals: <i>Dasyprocta punctata</i> , <i>Glis glis</i> , <i>Mazama americana</i> , <i>Microtus</i> spp., <i>Myodes glareolus</i> , <i>Pecari tajacu</i> , <i>Sciurus carolinensis</i> , <i>Sciurus niger</i> , <i>Sus scrofa</i> , <i>Tamias striatus</i> , <i>Tamiasciurus hudsonicus</i> ,	Koprowski 1991, Pease and Mattson 1999, Wright et al. 1999, Humphries and Boutin 2000, Crespin et al. 2002, Sunde 2005, Ruf et al. 2006, Focardi et al. 2008, Obbard and Howe 2008, Krebs

			<i>Ursus americanus, Ursus arctos</i>	et al. 2010, Bergeron et al. 2011
		NT	Mammals: <i>Sciurus carolinensis, Ursus americanus</i> ; Birds: <i>Meleagris gallopavo</i>	Oberlag et al. 1990, Beringer et al. 1998, Miller et al. 1998a, Miller et al. 1998b, Alpizar–Jara et al. 2001, Norman et al. 2001, LoGiudice et al. 2008
		TS	Mammals: <i>Apodemus flavicollis, Myodes glareolus, Ursus americanus</i> ;	Pucek et al. 1993, Verhagen et al. 2000, Reynolds-Hogland et al. 2007
	Indirect	FT	Mammals: <i>Mustela erminea, Peromyscus maniculatus, Ursus americanus</i> ; Birds: <i>Hylocichla mustelina, Strix aluco, Strix occidentalis</i> ,	Noyce and Garshelis 1997, Beringer et al. 1998, Seamans et al. 2002, LaHaye et al. 2004, Wittmer et al. 2007, Schmidt et al. 2008, Lobo and Millar 2013
		TS	Mammals: <i>Mustela americana</i> ; Birds: <i>Mohoua ochrocephala</i>	King 1983, O’Donnell and Phillipson 1996
Nest predation/ nest success	Indirect	FT	Birds: <i>Catharus fuscescens, Hylocichla mustelina, Setophaga ruticilla, Vireo olivaceus</i>	McShea 2000, Schmidt 2003, Schmidt and Ostfeld 2003, 2008
		NT	Birds: <i>Dendroica cerulea, Poecile rufescens, Sphyrapicus varius</i>	Mahon and Martin 2006, Buehler et al. 2008, Tozer et al. 2012

		TS	Birds: <i>Bonasa umbellus</i> , <i>Cyanoramphus auriceps</i> , <i>Junco hyemalis</i>	Elliott et al. 1996, Clotfelter et al. 2007, Devers et al. 2007
Abundance	Direct	FT	Mammals: <i>Apodemus flavicollis</i> , <i>Apodemus sylvaticus</i> , <i>Blarina brevicauda</i> , <i>Clethrionomys rutilus</i> , <i>Dasyprocta punctata</i> , <i>Glaucomys sabrinus</i> , <i>Mazama americana</i> , <i>Microtus</i> spp., <i>Mus musculus</i> , <i>Myodes gapperi</i> , <i>Oligoryzomys longicaudatus</i> , <i>Myodes glareolus</i> , <i>Pecari tajacu</i> , <i>Peromyscus maniculatus</i> , <i>Peromyscus leucopus</i> , <i>Proechimys semispinosus</i> , <i>Rattus rattus</i> , <i>Sciurus carolinensis</i> , <i>Sciurus granatensis</i> , <i>Tamiasciurus hudsonicus</i> , <i>Tamias striatus</i> ; Birds: <i>Carduelis flammea</i> , <i>Carduelis pinus</i> , <i>Erithacus rubecula</i> , <i>Loxia leucoptera</i> , <i>Parus atricapillus</i> , <i>Pinicola enucleator</i> , <i>Sitta europaea</i> , <i>Sitta canadensis</i> , <i>Turdus merula</i> , <i>Turdus iliacus</i> , <i>Turdus viscivorus</i>	Enoksson 1990, Montgomery et al. 1991, Wolff 1996, Selås 1997, Adler 1998, McCracken et al. 1999, Wright et al. 1999, Choquenot and Ruscoe 2000, McShea 2000, Koenig and Knops 2001, Selås et al. 2001, Crespín et al. 2002, Blackwell et al. 2003, Schnurr et al. 2002, Wheatley et al. 2002, Yungler 2002, Murúa et al. 2003, Elias et al. 2004, 2006, Schnurr et al. 2004, Guitián and Munilla 2008, Schmidt and Ostfeld 2008, Schmidt et al. 2008, Stradiotto et al. 2009, Krebs et al. 2010, Bergeron et al. 2011, Jensen et al. 2012
		NT	Mammals: <i>Apodemus flavicollis</i> , <i>Clethrionomys rutilus</i> , <i>Glaucomys sabrinus</i> ,	Ruthven III et al. 1994, Hansson 1988, Waithman et al. 1999, Clark and

		<i>Glaucomys volans, Myodes gapperi, Myodes glareolus, Ochrotomys nuttalli, Odocoileus virginianus, Peromyscus maniculatus, Peromyscus leucopus, Sus scrofa, Tamias striatus</i>	Durden 2002, Boonstra 2006, Holloway and Malcolm 2006, Bowman et al. 2008, Schaubert et al. 2009, Ditchkoff et al. 2012, Feldhamer et al. 2012, Linzey et al. 2012,
	TS	Mammals: <i>Apodemus flavicollis, Apodemus speciosus, Apodemus sylvaticus, Glis glis, Mus musculus, Myodes glareolus, Neotoma magister, Oligoryzomys longicaudatus, Peromyscus maniculatus, Peromyscus leucopus, Rattus rattus</i> ; Birds: <i>Aphelocoma californica, Bonasa bonasia, Carduelis flamma, Carduelis spinus, Certhia familiaris, Cyanoramphus auriceps, Dendrocopos major, Fringilla coelebs, Fringilla montifringilla, Lagopus lagopus, Loxia curvirostra, Loxia pytyopsittacus, Parus ater, Parus cinctus, Parus montanus, Perisoreus infaustus, Regulus regulus, Sitta europea, Tetrao tetrax</i>	Enoksson and Nilsson 1983, King 1983, Pucek et al. 1993, Elliott et al. 1996, O'Donnell and Phillipson 1996, Alley et al. 2001, Lithner and Jonsson 2002, Purdey et al. 2004, Scarlett 2004, Abe et al. 2005, Murúa and Briones 2005, Selås et al. 2006, Clotfelter et al. 2007, Saitoh et al. 2007, Mengak and Castleberry 2008, Saitoh et al. 2008, Suchomel and Heraldova 2007, 2008, Koenig et al. 2009, Fietz et al. 2009, Wang et al. 2009, Wilson and Lee 2010,
Indirect	FT	Mammals: <i>Martes americana, Mustela</i>	Jędrzejewski et al. 1996, McShea 2000,

			<i>erminea, Martes pennanti, Peromyscus maniculatus</i> ; Birds: <i>Accipiter cooperii, Accipiter striatus, Catharus fuscescens, Helmitheros vermivorum, Hylocichla mustelina, Strix aluco, Turdus migratorius, Wilsonia citrina</i>	Schmidt and Ostfeld 2003, Wittmer et al. 2007, Schmidt and Ostfeld 2008, Schmidt et al. 2008, Jensen et al. 2012, Lobo and Millar 2013
		TS	Mammals: <i>Mustela erminea</i> ; Birds: <i>Aegolius funereus, Asio otus, Junco hyemalis, Strix aluco</i>	King 1983, O'Donnell and Phillipson 1996, Lithner and Jonsson 2002, Clotfelter et al. 2007, King and Powell 2010
Correlated population dynamics	Direct	FT	Mammals: <i>Peromyscus leucopus</i> ; Birds: <i>Cyanistes caeruleus, Parus major</i>	Sæther et al. 2007, Haynes et al. 2009
		NT	Mammals: <i>Apodemus speciosus, Clethrionomys rufocanus</i> ; Birds: <i>Meleagris gallopavo</i>	Bjørnstad et al. 1999, Koenig 2001, Fleming and Porter 2007
<u>Behavioral</u>				
Small-scale movement (home range size, daily	Direct	FT	Mammals: <i>Apodemus sylvaticus, Odocoileus virginianus, Sciurus niger, Ursus tibetanus, Tamiasciurus hudsonicus, Tamias striatus,</i>	Kantola and Humphrey 1990, McSchea and Schwede 1993, Weckerly 1993, Laher and Mares 1996, Goheen and

distance moved)			<i>Tupaina tana</i>	Swihart 2005, Munshi-South et al. 2007, Stradiotto et al. 2009, Bergeron et al. 2011, Koike et al. 2011, Kozakai et al. 2011
		NT	Mammals: <i>Apodemus flavicollis</i> , <i>Martes americana</i> , <i>Martes pennanti</i> , <i>Neotoma magister</i> , <i>Ursus americanus</i> ; Birds: <i>Argusianus argus</i> , <i>Meleagris gallopavo</i>	Samson and Huot 1998, Castleberry et al. 2001, Holdstock et al. 2006, Benson and Chamberlain 2007, Garrison et al. 2007, Tioli et al. 2009, Winarni et al. 2009, Jensen et al. 2012
		TS	Mammals: <i>Ursus tibetanus</i> ; Birds: <i>Sitta europea</i>	Enoksson and Nilsson 1983, Koike et al. 2012
Large-scale (between habitats)	Direct	FT	Mammals: <i>Odocoileus virginianus</i> , <i>Ursus americanus</i> , <i>Ursus arctos</i> , <i>Ursus tibetanus</i> ; Birds: <i>Bombycilla garrulus</i> , <i>Carduelis spinus</i> , <i>Dendrocopos major</i> , <i>Hesperiphona vespertina</i> , <i>Loxia curvirostra</i> , <i>Parus atricapillus</i> , <i>Parus major</i> , <i>Pinicola enucleator</i> , <i>Sitta canadensis</i>	Koenig and Knops 2001, Oka et al. 2004, Felix et al. 2007, Grøtan et al. 2009, Lindén et al. 2011, Fortin et al. 2013
		NT	Mammals: <i>Ursus americanus</i> , <i>Ursus arctos</i> ;	Beringer et al. 1998, Samson and Huot

			Birds: <i>Meleagris gallopavo</i>	1998, Pease and Mattson 1999, Garrison et al. 2007, Miller and Conner 2007
		TS	Mammals: <i>Sus barbatus</i> , <i>Ursus americanus</i> , <i>Ursus tibetanus</i> ; Birds: <i>Carduelis spinus</i> , <i>Chalcophaps indica</i> , <i>Claravis godefrida</i> , <i>Lophura</i> spp., <i>Parus ater</i> , <i>Psittacula longicauda</i> , <i>Rollulus rouloul</i> , <i>Sporophila frontalis</i> , <i>Sporophila falcirostris</i>	Curran and Leighton 2000, Areta et al. 2009, Arimoto et al. 2011, McKenzie et al. 2007, Noyce et al. 2011
Diet-switching	Direct	FT	Mammals: <i>Odocoileus virginianus</i> , <i>Ursus americanus</i> , <i>Ursus americanus</i> , <i>Ursus arctos</i> , <i>Ursus tibetanus</i> , <i>Sciurus carolinensis</i> , <i>Sciurus niger</i> , <i>Sus scrofa</i>	Koprowski 1991, Clevenger et al. 1992, McSchea 1993, Stromayer et al. 1998, McDonald and Fuller 2005, Sabrina et al. 2009, Koike et al. 2011, Fortin et al. 2013
		NT	Mammals: <i>Martes zibellina</i> , <i>Odocoileus virginianus</i> , <i>Ursus americanus</i> , <i>Ursus arctos</i> , <i>Sciurus arizonensis</i> , <i>Sciurus carolinensis</i> , <i>Sciurus niger</i> ; Birds: <i>Anas platyrhynchos</i>	Buskrik et al. 1996, Combs and Fredrickson 1996, Edwards et al. 1998, Jacoby et al. 1999, Naves et al. 2006, Timmons et al. 2010, Cudworth and Koprowski 2013
		TS	Mammals: <i>Apodemus flavicollis</i> , <i>Callicebus nigrifrons</i> , <i>Callosciurus prevostii</i> ,	Curran and Leighton 2000, Castleberry et al. 2002, Fietz et al. 2005, Tsuji et al.

			<i>Capreolus capreolus</i> , <i>Glis glis</i> , <i>Macaca fascicularis</i> , <i>Macaca fuscata</i> , <i>Mus musculus</i> , <i>Myodes glareolus</i> , <i>Neotoma magister</i> , <i>Pongo pygmaeus</i> , <i>Presbytis rubicunda</i> , <i>Ratufa affinis</i> , <i>Sus barbatus</i> , <i>Ursus tibetanus</i> ; Birds: <i>Chalcophaps indica</i> , <i>Psittacula longicauda</i> , <i>Rollulus rouloul</i>	2006, Wilson and Lee 2010, Abbas et al. 2011, Arimoto et al. 2011, dos Santos et al. 2012, Koike et al. 2012, Selva et al. 2012,
	Indirect	FT	Birds: <i>Strix aluco</i> , mammalian and avian predators (not specified)	Jędrzejewski et al. 1996, Schmidt and Ostfeld 2008, Schmidt et al. 2008
		TS	Mammals: <i>Mustela erminea</i>	King 1983, Purdey et al. 2004
Habitat selection	Direct	FT	Mammals: <i>Myodes gapperi</i> , <i>Ochrotomys nuttalli</i> , <i>Peromyscus leucopus</i> , <i>Peromyscus sp.</i> , <i>Tamias striatus</i> , <i>Tamiasciurus hudsonicus</i> , <i>Ursus americanus</i> ; Birds: <i>Bonasa umbellus</i> , <i>Meleagris gallopavo</i> , <i>Parus inornatus</i>	With and Morrison 1990, McShea and Gilles 1992, Clark et al. 1993, Schooley et al. 1994, McCracken et al. 1999, Miller et al. 1999, Mitchell and Powell 2003, Schnurr et al. 2004, Christopher and Barrett 2006, Whitaker et al. 2006, Reynolds-Hogland and Mitchell 2007, Wood et al. 2007
		NT	Mammals: <i>Peromyscus leucopus</i> , <i>Sciurus aureogaster</i> , <i>Sciurus carolinensis</i> , <i>Sciurus niger</i> , <i>Tamias amoneus</i> , <i>Tamias striatus</i> ,	Hellgren et al. 1991, Robb et al. 1996, Koenig 2001, Moore and Swihart 2005, Lohr et al. 2011, Ramos-Lara and

			<i>Ursus americanus</i> ; Birds: <i>Colinus virginianus</i>	Cervantes 2007
		TS	Mammals: <i>Odocoileus virginianus</i> ; Birds: <i>Meleagris gallopavo</i>	Lehman et al. 2007, Kilpatrick et al. 2011
Flock/herd formation tendency	Direct	FT	Mammals: <i>Cervus elaphus</i> ; Birds: <i>Parus gambeli</i>	With and Morrison 1990, Jędrzejewski et al. 2006
Time budget	Direct	FT	Mammals: <i>Tamiasciurus hudsonicus</i> , <i>Ursus tibetanus</i>	Humphries and Boutin 2000, Kozakai et al. 2013
Capture probability	Direct	NT	Mammals: <i>Ursus americanus</i> , <i>Sus scrofa</i> , <i>Martes americana</i> , <i>Martes pennanti</i>	Sweitzer et al. 2000, Clark et al. 2005, Jensen et al. 2012
<u>Physiological</u>				
Body condition	Direct	FT	Mammals: <i>Alces alces</i> , <i>Myodes gapperi</i> , <i>Odocoileus virginianus</i> , <i>Peromyscus leucopus</i> , <i>Sciurus carolinensis</i> , <i>Tamias striatus</i> , <i>Tamiasciurus hudsonicus</i> , <i>Tupaina tana</i> , <i>Ursus americanus</i> ; Birds: <i>Catharus ustulatus</i> , <i>Empidonax alnorum</i> , <i>Parus major</i>	Koprowski 1991, Hellgren et al. 1993, Schooley et al. 1994, Gosler 1996, McCracken et al. 1999, Humphries and Boutin 2000, Selås 2001, Jenks et al. 2002, McDonald and Fuller 2005, Munshi-South et al. 2007, Descamps et al. 2008, Landry–Cuerrier et al. 2008, Wolfe and Ralph 2009
		NT	Mammals: <i>Dasyprocta punctata</i> , <i>Mazama</i>	Ruthven III et al. 1994, Hansson 1995,

		<i>americana, Microtus agrestis, Myodes glareolus, Nasua narica, Odocoileus virginianus, Pecari tajacu, Sciurus arizonensis, Sciurus granatensis, Sus scrofa, Tamias striatus</i>	Wright et al. 1999, Munro et al. 2005, Ditchkoff et al. 2012, Cudworth and Koprowski 2013
	TS	Mammals: <i>Capreolus capreolus, Glis glis, Tamias striatus, Tamiasciurus hudsonicus,</i>	Boutin et al. 2006, Kjellander et al. 2006, Munro et al. 2008, Fietz et al. 2005, 2009
Indirect	FT	Mammals: <i>Peromyscus maniculatus, Strix aluco</i>	Sunde 2005, Lobo and Millar 2013
	TS	Mammals: <i>Mustela erminea</i>	King 1983

Articles of: Combs and Fredrickson 1996, Wolff 1996, Noyce and Garshelis 1997, McSchea 2000, Selås et al. 2001, Schnurr et al. 2002, Schmidt 2003, Schmidt and Ostfeld 2003, Elias et al. 2004, McDonald and Fuller 2005, Christopher and Barrett 2006, Naves et al. 2006, Ruf et al. 2006, Jensen et al. 2012, Schmidt et al. 2008, Schmidt and Ostfeld 2008, Bergeron et al. 2011, Lebl et al. 2011, Lobo and Millar 2013, overlapped between search methods (traditional search and full-text search). In the table, these are listed only in FT category.

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