Supporting Information

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SI Methods

Simulations were written as macros in Microsoft Excel. Details are provided below.

Continental Simulation. There are 1,955 stratigraphic occurrences of 31 genera of extinct North American mammals. Of those stratigraphic occurrences, 66 are associated with a terminal Pleistocene taxon date (12,000–10,000 radiocarbon years B.P.) (Table 1 and Table S2). Those 66 terminal Pleistocene taxon dates are distributed among 16 genera, providing an empirical probability of observing a terminal Pleistocene fossil occurrence of 3.4% (66 of 1,955). The continental simulation randomly assigns each of the 1,955 stratigraphic occurrences a pre- or post-12,000 radiocarbon years B.P. date based on this probability (3.4%). Afterward, the total number of genera receiving a terminal Pleistocene taxon date is tallied. This process is repeated 10,000 times and provides a sampling distribution of the number of genera that we can expect to recover from the terminal Pleistocene, if all of the taxa had survived to that time. From this distribution, we are able to calculate the probability of observing 16 or fewer terminal Pleistocene genera. This simulation assumes that all of the 31 genera included in the analysis survived to the terminal Pleistocene and that all of the fossil occurrences are equally likely to receive a terminal Pleistocene taxon date.

Restricting the analysis to include only the highest rated radiocarbon dates requires minor changes to the simulation parameters. There are 24 highly rated terminal Pleistocene radiocarbon dates distributed among 11 genera. The empirical probability of observing a highly rated terminal Pleistocene radiocarbon date is 1.2%. Each of the 1,955 stratigraphic occurrences is assigned a pre- or post-12,000 radiocarbon years B.P. date based on this probability. This process is repeated 10,000 times, and the probability of observing 11 or fewer terminal Pleistocene genera is determined.

Biogeographic Simulation. The biogeographic simulation recognizes seven physiographic zones across the continental United States (Fig. 2). The number of stratigraphic occurrences of extinct genera and the frequency of terminal Pleistocene radiocarbon dates in each zone are reported in Table S4. In this simulation, the stratigraphic occurrences of a given genus are assigned randomly to a physiographic zone based on its relative abundance in each zone (derived from Table S4). The simulated fossil occurrence is then assigned a pre- or post-12,000 radiocarbon years B.P. taxon date based on the relative frequency of terminal Pleistocene taxon dates known from that zone (Table S4). For example, there are four fossil occurrences of *Glyptotherium*, one located in the Interior Plains and three from the Atlantic Plains (Table S4). Each of the four fossil occurrences is reassigned randomly to one of these physiographic zones based on the relative abundance of *Glyptotherium* in each zone (0.25 for the Interior Plains and 0.75 for the Atlantic Plains). Next, the four simulated fossil occurrences are assigned randomly to a pre- or post-12,000 radiocarbon years B.P. date based on the probability of observing a terminal Pleistocene fossil occurrence within each physiographic zone (Interior Plains, 21 terminal Pleistocene taxon dates of 590 fossil occurrences, 0.0344; Atlantic Plains, 4 terminal Pleistocene taxon dates of 370 fossil occurrences, 0.0107). This is carried out for each of the 31 extinct genera, and the number of genera that receive a terminal Pleistocene taxon date is tallied. The process is repeated 10,000 times, and the probability of observing 16 or fewer terminal Pleistocene genera is determined.

The biogeographic simulation also examines the possibility of preterminal Pleistocene extinctions. The simulation follows the procedures described above except that we prohibited between 0 and 15 randomly selected genera from receiving a terminal Pleistocene taxon date. This process was carried out for 16 separate trials of 10,000 iterations, varying the number of preterminal Pleistocene extinctions from 0 to 15. As above, the number of genera receiving a terminal Pleistocene taxon date is calculated. This simulation allows us to consider how many genera can disappear before 12,000 radiocarbon years B.P. before the empirical observation of 16 terminal Pleistocene genera becomes statistically unlikely.

Restricting the analysis to include only the highest rated radiocarbon requires minor changes to the simulation parameters. In this case, a simulated fossil occurrence is assigned a terminal Pleistocene taxon date based on the relative frequency of highly reliable radiocarbon dates in each physiographic zone (Table S4). Because only 11 genera are associated with such dates, we now calculate the number of times that we observe 11 or fewer terminal Pleistocene genera.

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Table S1. Extinct late Pleistocene genera of North America (after ref. 3)

Order	Family	Genus	Common name
Cingulata	Pampatheriidae	*Pampatherium*	Southern pampathere
		Holmesina	Northern pampathere
	Glyptodontidae	*Glyptotherium*	Simpson's glyptodont
Pilosa	Megalonychidae	*Megalonyx*	Jefferson's ground sloth
	Megatheriidae	*Eremotherium*	Rusconi's ground sloth
		Nothrotheriops	Shasta ground sloth
	Mylodontidae	*Paramylodon*	Harlan's ground sloth
Carnivora	Mustelidae	*Brachyprotoma*	Short-faced skunk
	Canidae	*Cuon**	Dhole
	Ursidae	*Tremarctos**	Florida cave bear
		Arctodus	Giant short-faced bear
	Felidae	*Smilodon*	Dirktooth
		Homotherium	Scimitar cat
		Miracinonyx	American cheetah
Rodentia	Castoridae	*Castoroides*	Giant beaver
	Hydrochoeridae	*Hydrochoerus**	Holmes' capybara
		Neochoerus	Pinckney's capybara
Lagomorpha	Leporidae	*Aztlanolagus*	Aztlan rabbit
Perissodactyla	Equidae	*Equus**	Horses
	Tapiridae	*Tapirus**	Tapirs
Artiodactyla	Tayassuidae	*Mylohyus*	Long-nosed peccary
		Platygonus	Flat-headed peccary
	Camelidae	*Camelops*	Yesterday's camel
		Hemiauchenia	Large-headed llama
		Palaeolama	Stout-legged llama
	Cervidae	*Navahoceros*	Mountain deer
		Cervalces	Elk-moose
	Antilocapridae	*Capromeryx*	Diminutive pronghorn
		Tetrameryx	Shuler's pronghorn
		Stockoceros	Pronghorns
	Bovidae	*Saiga**	Saiga
		Euceratherium	Shrub ox
		Bootherium	Harlan's musk ox
Proboscidea	Mammutidae	*Mammut*	American mastodon
	Elephantidae	*Mammuthus*	Mammoths

*Genus survives outside North America.

Table S2. Reliable terminal Pleistocene radiocarbon dates

Genus	Site	Date	Material dated	Ref.
Palaeolama	Woody Long, MO	10,890 ± 130	Unpublished	10
Euceratherium	Bechan Cave, UT	11,630 ± 150*	Dung	11
	Falcon Hill, NV	11,950 ± 50	Bone collagen (AMS)	12
Castoroides	Sheriden Cave, OH	10,850 ± 60*	Bone collagen (AMS)	13
	Dutchess Quarry Cave, NY	11,670 ± 70	Bone collagen (AMS)	5
Smilodon	Rancho la Brea, CA	11,130 ± 275*	Bone	1
Arctodus	Huntington Dam, UT	10,870 ± 75*	Bone collagen (AMS)	14
	Sheriden Cave, OH	11,480 ± 60*	Bone collagen (AMS)	13
Cervalces	Lang Farm, IL	11,405 ± 50*	Bone collagen (AMS)	6
	Kendallville, IN	11,420 ± 70*	Bone collagen (AMS)	15
Nothrotheriops	Rampart Cave, AZ (Dung Unit 1)	10,400 ± 275*	Dung	1
	Rampart Cave, AZ (Dung Unit 2)	11,020 ± 200*	Dung	1
	Aden Crater, NM	11,080 ± 200	Dung	1
	Muav Caves, AZ	10,650 ± 220	Dung	1
	Guadalupe Mts., TX	10,750 ± 140	Dung	1
	Gypsum Cave, NV	11,005 ± 100	Dung	16
	Williams Cave, TX	11,140 ± 320	Dung	1
	Shelter Cave, NM	11,330 ± 370	Dung	1
Mylohyus	Sheriden Cave, OH	11,860 ± 40*	Bone collagen (AMS)	17
Megalonyx	Little River Rapids, FL	11,450 ± 90	Wood	18
	Lang Farm, IL	11,485 ± 40*	Bone collagen (AMS)	6
Tapirus	Lehner Ranch, AZ	10,940 ± 100	Charcoal	1
	Little River Rapids, FL	11,450 ± 90	Wood	19
Platygonus	Sheriden Cave, OH	11,060 ± 60	Bone collagen (AMS)	17
	Franklin Peccary, ID	11,340 ± 50	Bone collagen (AMS)	20
Bootherium	Wally's Beach, Alberta	10,980 ± 80	Bone collagen (AMS)	7
Camelops	Jaguar Cave, ID	10,370 ± 350	Charcoal	1
	Lehner Ranch, AZ	10,940 ± 100	Charcoal	1
	Pine Springs, WY	11,180 ± 45	Bone collagen (AMS)	8
	Casper, WY	11,190 ± 50	Bone collagen (AMS)	21
	Sunshine Locality, NV	11,390 ± 60	Bone collagen (AMS)	22
	Tule Springs, NV	11,500 ± 500	Charcoal	1
	Dry Cave, NM	11,880 ± 250	Charcoal	1
Mammut	Pleasant Lake, MI	10,395 ± 100	Wood	23
	Rappuhn, MI	10,400 ± 400	Wood	1
	Hiscock, NY	10,630 ± 80*	Bone collagen (AMS)	4
	Deerfield, WI	10,780 ± 60*	Bone collagen (AMS)	4
	Grandville, MI	10,920 ± 190	Bone collagen (AMS)	4
	Lehner Ranch AZ	10,940 ± 100	Charcoal	1
	Temple Hill, NY	11,000 ± 80	Bone collagen (AMS)	24
	Burning Tree, OH	11,390 ± 80*	Bone collagen (AMS)	25
	Heisler, MI	11,770 ± 110*	Bone collagen (AMS)	25
Mammuthus	Pyramid Lake, NV	10,340 ± 50	Bone collagen (AMS)	12
	Rawhide Butte, WY	10,550 ± 350	Charcoal	1
	Big Bone Lick, KY	10,600 ± 250	Wood	1
	Lange-Ferguson, SD	10,710 ± 130*	Bone collagen (AMS)	26
	Colby, WY	10,790 ± 30*	Bone collagen (AMS)	26
	Bindloss Gravel Pit, AB	10,930 ± 100	Bone collagen (AMS)	27
	Dent, CO	10,940 ± 30*	Bone collagen (AMS)	26
	Lehner Ranch, AZ	10,940 ± 100	Charcoal	1
	Domebo, OK	10,960 ± 30*	Bone collagen (AMS)	26
	Santa Rosa, CA	11,030 ± 50*	Bone collagen (AMS)	28
	Blackwater Draw, NM	11,040 ± 500	Plant remains	1
	Murray Springs, AZ	11,150 ± 450	Charcoal	1
	Huntington Dam, UT	11,220 ± 110*	Bone	29
	Bechan Cave, UT	11,670 ± 300*	Dung	2
	Little River Rapids, FL	11,450 ± 90	Wood	18
Equus	Jaguar Cave, ID	10,370 ± 350	Charcoal	1
	Pashley Gravel Pit, AB	10,870 ± 45	Bone collagen (AMS)	27
	Lehner Ranch, AZ	10,940 ± 100	Charcoal	1
	Rancho la Brea, CA	10,940 ± 510	Bone	1
	Fishbone Cave, NV - Horse #1	11,210 ± 50*	Bone collagen (AMS)	12
	Fishbone Cave, NV - Horse #2	11,350 ± 40*	Bone collagen (AMS)	12
	Wally's Beach, Alberta	11,330 ± 70	Bone collagen (AMS)	7
	Little River Rapids, FL	11,450 ± 90	Wood	18
	Pine Springs, WY	11,530 ± 50	Bone collagen (AMS)	8

AMS, accelerator mass spectrometry.

*Radiocarbon date considered highly reliable according to Pettitt et al. (31).

Table S3. Last appearance dates (LADs) for extinct North American genera*

Genus	LAD	Site	Ref. or FAUNMAP machine no.
Aztlanolagus	>31,150	U-Bar Cave	1173
Eremotherium	**38,860 ± 1,300**	Munroe Sloth Site	(30)
Glyptotherium	23,230 ± 490	Laubach Cave No. 3	718
Brachyprotoma	13,740 ± 145	Frankstown Cave	890
Miracinonyx	14,935 ± 610	Haystack Cave	736
Tetrameryx	23,230 ± 490	Laubach Cave No. 3	718
Hydrochoerus	12,000 ± 300	Avery Island	339
Homotherium	13,970 ± 310	Laubach Cave No. 2	719
Navahoceros	12,860 ± 400	Black Rock Canyon	1015
Stockoceros	12,520 ± 200	Shelter Cave	1304
Palaeolama	**10,890 ± 130**	Woody Long	(10)
Euceratherium	**11,630 ± 150**	Bechan Cave	(11)
Tremarctos	23,230 ± 490	Laubach Cave #3	718
Holmesina	21,150 ± 400	West Palm Beach	1669
Capromeryx	12,200 ± 200	Rancho la Brea	(1)
Castoroides	**10,850 ± 60**	Sheriden Cave	(13)
Smilodon	**11,130 ± 275**	Rancho la Brea	(1)
Arctodus	**10,870 ± 75**	Huntington Mammoth	(14)
Cervalces	**11,405 ± 50**	Lang Farm	(6)
Nothrotheriops	**10,400 ± 275**	Rampart Cave	(1)
Paramylodon	**20,450 ± 460**	Rancho la Brea	(1)
Mylohyus	**11,860 ± 40**	Sheridan Cave	(17)
Megalonyx	**11,450 ± 90**	Little River Rapids	(18)
Hemiauchenia	12,210 ± 430	Dagget Waste Locality	1364
Tapirus	**10,940 ± 90**	Lehner Ranch	(1)
Platygonus	**11,060 ± 60**	Sheridan Cave	(17)
Bootherium	**10,980 ± 80**	Wally's Beach	(7)
Camelops	**10,370 ± 350**	Jaguar Cave	(1)
Mammut	**10,395 ± 100**	Pleasant Lake	(1)
Mammuthus	**10,340 ± 40**	Pyramid Lake	(1)
Equus	**10,370 ± 350**	Jaguar Cave	(7)

*For those taxa lacking a reliable radiocarbon date, the reported LAD is the youngest preterminal Pleistocene radiocarbon date reported by FAUNMAP (9). Only dates in bold are considered reliable according to Meltzer and Mead (1).

Table S4. Abundances of extinct Pleistocene genera and terminal Pleistocene radiocarbon dates across seven physiographic zones

	Pacific Mountain System	Intermontane Plateau	Rocky Mountain System	Interior Plains	Interior Highlands	Appalachian Highlands	Atlantic Plains
Aztlanolagus	0	1	0	0	0	0	0
Eremotherium	0	0	0	0	0	0	2
Glyptotherium	0	0	0	1	0	0	3
Brachyprotoma	0	1	0	1	2	1	0
Miracinonyx	0	1	4	0	0	0	0
Tetrameryx	0	3	0	2	0	0	0
Hydrochoerus	0	0	0	0	0	0	7
Homotherium	0	3	1	3	0	0	2
Navahoceros	0	5	1	3	0	0	0
Stockoceros	0	9	0	1	0	0	0
Palaeolama	0	0	0	0	1	0	14
Euceratherium	7	9	0	0	0	0	0
Tremarctos	0	0	0	1	0	2	15
Holmesina	0	0	0	1	0	0	21
Capromeryx	11	11	0	6	0	0	0
Castoroides	0	0	0	2	21	5	9
Smilodon	13	6	1	5	3	0	9
Arctodus	7	12	3	6	6	1	3
Cervalces	0	0	0	28	4	6	0
Nothrotheriops	10	32	0	2	0	0	0
Paramylodon	13	8	1	6	5	0	17
Mylohyus	0	0	0	11	6	16	20
Megalonyx	11	4	0	15	5	6	16
Hemiauchenia	5	23	1	12	1	0	16
Tapirus	5	6	0	2	9	12	31
Platygonus	3	4	1	35	19	14	21
Bootherium	1	13	26	56	9	4	3
Camelops	23	64	21	29	1	1	8
Mammut	11	7	1	120	24	19	40
Mammuthus	27	71	16	188	8	5	41
Equus	34	140	29	75	17	17	76
Terminal Pleistocene taxon dates*	3/2	25/8	6/1	22/11	2/0	4/2	4/0

*Terminal Pleistocene taxon dates are reported as (no. of terminal Pleistocene radiocarbon dates)/(no. of terminal Pleistocene taxon dates considered highly reliable according to ref. 31).