

Supplementary Table 1: Pedogenic carbonate isotope values measured in this study.

Location	Sample	Age (Ma)	$\delta^{18}\text{O}$ (‰ VPDB)
Hagerman, ID	Glenns Ferry Fm. Oolite		
	ID-CH 01-07	3.83	-17.83
	ID-CH 02-07	3.83	-17.60
	ID-CH 03-07	3.82	-16.79
	ID-CH 04-07	3.82	-15.17
	ID-CH 05-07	3.81	-16.64
	ID-CH 06-07	3.81	-16.54
	ID-CH 07-07	3.80	-15.75
	ID-CH 08-07	3.80	-16.15
	ID-CH 09-07	3.79	-16.66
	ID-CH 10-07	3.79	-16.58
	Glenns Ferry Fm.		
	ID-GF 01-07	3.02	-15.15
	ID-GF 02-07	3.03	-15.54
	ID-GF 03-07	3.04	-15.54
	ID-GF 04-07	3.05	-15.54
	Hagerman Fossil Beds		
	ID-HFB 01-07	3.32	-15.63
	ID-HFB 02-07	3.32	-15.19
	ID-HFB 03-07	3.32	-15.72
	ID-HFB 05-07	3.31	-15.56
	ID-HFB 06-07	3.31	-15.21
	ID-HFB 07-07	3.31	-14.15
	ID-HFB 08-07	3.31	-15.19
	ID-HFB 09-07	3.30	-16.00
	ID-HFB 10-07	3.30	-16.30
	ID-HFB 11-07	3.52	-16.44
	ID-HFB 12-07	3.50	-16.33
	ID-HFB 13-07	3.50	-14.30
	ID-HFB 14-07	3.48	-15.81
	ID-HFB 15-07	3.32	-16.30
	ID-HFB 16-07	2.12	-14.58
	ID-HFB 17-07	2.13	-15.02
	Tuana Gravels Fm.		
	TG 01-07	2.00	-15.82
	TG 03-07	2.01	-15.42
	TG 04-07	2.02	-15.65
	TG 05-07	2.02	-15.15
	TG 06-07	2.02	-15.83
	TG 07-07	2.07	-15.37

	TG 08-07	2.08	-15.69
	TG 09-07	2.13	-14.84
	TG 10-07	2.13	-14.64
	Bruneau Fm.		
	ID-BF 04-07	1.92	-15.68
	ID-BF 05-07	1.92	-16.03
	ID-BF 06-07	1.92	-15.86
	ID-BF 07-07	1.92	-15.38
	ID-BF 08-07	1.92	-15.46
San Timoteo, CA	Jack Rabbit Trail		
	CA - 11 - 01	2.10	-8.49
	CA - 11 - 02	2.13	-9.41
	CA - 11 - 03	2.30	-7.56
	CA - 11 - 04	2.50	-9.49
	CA - 11 - 05	2.60	-8.02
	CA - 11 - 06	2.70	-9.46
	CA - 11 - 07	2.80	-6.06
	CA - 11 - 08	2.90	-5.43
	CA - 11 - 09	3.05	-4.57
	CA - 11 - 10	3.08	-9.22
	CA - 11 - 11	3.09	-5.57
	CA - 11 - 12	3.09	-6.84
	CA - 11 - 13	3.11	-8.42
	CA - 11 - 14	3.12	-7.80
	CA - 11 - 15	3.15	-6.65
	CA - 11 - 16	3.17	-7.15
	CA - 11 - 17	3.19	-7.96
	CA - 11 - 18	3.20	-5.44
	CA - 11 - 19	3.21	-6.27
	CA - 11 - 20	3.29	-7.85
	CA - 11 - 21	3.30	-4.70
	CA - 11 - 22	3.35	-7.92
	CA - 11 - 23	3.39	-3.93
	CA - 11 - 24	3.42	-4.50
	CA - 11 - 25	3.50	-4.62
	CA - 11 - 26	3.54	-5.10
	CA - 11 - 27	3.75	-6.13
	CA - 11 - 28	3.80	-5.96
	CA - 11 - 29	3.90	-6.66