Foreman et al.
Supplemental Data
Reconstructing paleo-catchments by integrating stable isotope records, sedimentology, and taphonomy: A Late Cretaceous case study (Montana, U.S.A.)
*denotes data from Fricke et al. (2010)
**denotes data from Fricke et al. (2009)
***denotes data from Fricke et al. (2008)

Sample ID	Formation	Depositional Environment	δ13C ‰ (VPDB)	δ18O ‰ (VPDB)	δ18O ‰ (VSMOW) water assuming modern relationship
UNIONID BIVALVES					
UC8302-1*	JRF	large river	-4.92	-16.31	-17.22
UC8302-2*	JRF	large river	-3.15	-15.89	-16.75
UC8302-3*	JRF	large river	-3.87	-16.09	-16.97
UC8302-4*	JRF	large river	-1.62	-16.39	-17.32
UC8302-5*	JRF	large river	-2.91	-14.65	-15.36
UC8302-6*	JRF	large river	-1.54	-16.18	-17.08
UC8302-7*	JRF	large river	-3.06	-16.90	-17.89
UC8302-8*	JRF	large river	-2.77	-14.54	-15.24
UC8302-9*	JRF	large river	-3.06	-15.27	-16.05
UC8302-10*	JRF	large river	-4.10	-13.02	-13.52
UC8302-11*	JRF	large river	-3.50	-15.42	-16.22
UC8302-12*	JRF	large river	-2.44	-14.78	-15.50
UC8302-13*	JRF	large river	-2.86	-15.44	-16.25
UC8302-14*	JRF	large river	-2.84	-16.82	-17.80
UC8302-15*	JRF	large river	-0.89	-14.20	-14.85
UC8302-16*	JRF	large river	-1.78	-16.61	-17.56
UC8302-17*	JRF	large river	-0.30	-14.92	-15.67
UC8302-18*	JRF	large river	-2.23	-17.17	-18.20
UC8302-19*	JRF	large river	-0.63	-16.81	-17.79
UC8302-20	JRF	large river	-2.38	-15.28	-16.07
UC8302-21	JRF	large river	-2.94	-17.52	-18.58
UC8302-22	JRF	large river	-2.94	-17.58	-18.65
UC8302-23	JRF	large river	-3.01	-15.68	-16.52
UC8302-24	JRF	large river	-3.90	-16.62	-17.57
UC8302-25	JRF	large river	-2.06	-14.91	-15.65
UC8322-1	JRF	large river	-1.53	-16.83	-17.80

UC8322-2	JRF	large river	-3.41	-17.08	-18.09
UC8322-3	JRF	large river	-3.89	-17.30	-18.34
UC8322-4	JRF	large river	-1.43	-15.89	-16.76
UC8322-5	JRF	large river	-2.76	-16.80	-17.77
UC8325-1	JRF	large river	-1.04	-18.05	-19.18
UC8325-2	JRF	large river	-1.05	-17.59	-18.66
UC8325-3	JRF	large river	-0.89	-17.86	-18.96
UC8325-4	JRF	large river	-1.14	-17.17	-18.19
UC8325-5	JRF	large river	-0.83	-17.71	-18.80
UC935-1	JRF	pond	-2.97	-15.76	-16.61
UC935-2	JRF	pond	-4.26	-15.91	-16.77
UC935-3	JRF	pond	-3.14	-16.43	-17.36
UC935-4	JRF	pond	-1.67	-16.22	-17.13
UC935-5	JRF	pond	-2.88	-16.37	-17.29
UC8303-1*	JRF	pond	-2.53	-16.55	-17.50
UC8303-2*	JRF	pond	-4.08	-12.12	-12.51
UC8303-3**	JRF	pond	-3.65	-12.58	-13.03
UC8303-4*	JRF	pond	-2.44	-14.31	-14.97
UC8303-5**	JRF	pond	-1.98	-14.60	-15.30
UC8303-6**	JRF	pond	-2.65	-15.47	-16.28
UC8303-7*	JRF	pond	-3.66	-16.08	-16.97
UC8303-8*	JRF	pond	-3.78	-7.56	-7.39
UC8303-9*	JRF	pond	-3.15	-16.12	-17.01
UC8303-10*	JRF	pond	-5.54	-7.37	-7.18
UC8303-11*	JRF	pond	-4.00	-8.33	-8.26
UC8326-1	JRF	pond	-3.76	-14.96	-15.71
UC8326-2	JRF	pond	-3.30	-15.52	-16.34
UC8326-3	JRF	pond	-2.38	-15.67	-16.51
UC8326-4	JRF	pond	-3.37	-14.79	-15.51
UC8326-5	JRF	pond	-1.32	-16.66	-17.62
UC8326-6	JRF	pond	-1.50	-17.27	-18.31
UC9314-1	JRF	pond	-2.75	-18.95	-20.20
UC9314-2	JRF	pond	-1.12	-17.95	-19.07
UC9314-3	JRF	pond	-4.10	-8.49	-8.44
UC9314-4	JRF	pond	-4.95	-9.58	-9.66
UC9314-5	JRF	pond	0.87	-16.28	-17.19
M2-1**	TMF	stream	-3.25	-9.59	-9.67
M2-2**	TMF	stream	-1.49	-8.03	-7.92
M2-3**	TMF	stream	-6.02	-8.85	-8.85
M2-4**	TMF	stream	-4.75	-8.86	-8.85
M2-5**	TMF	stream	-5.03	-8.20	-8.12
M2-6**	TMF	stream	-4.83	-7.77	-7.63

M2-7**	TMF	stream	-3.03	-9.32	-9.37
HSH-1*	TMF	stream	-0.58	-6.22	-5.88
HSH-2*	TMF	stream	-0.81	-16.85	-17.83

Sample ID	Formation	δ13C ‰ (VPDB)	δ18O ‰ (VPDB)	δ18O ‰ (VSMOW)	δ18O ‰ (VSMOW) water at 18.5°C
PEDOGENIC CARBONATES					
Bc1	TMF	-8.34	-11.41	19.15	-10.38
Bc2-1	TMF	-8.70	-11.82	18.73	-10.79
Bc2-2	TMF	-7.55	-11.09	19.48	-10.06
Bc2-3	TMF	-7.36	-11.39	19.17	-10.36
Bc3	TMF	-8.31	-11.79	18.76	-10.76
Bc4	TMF	-8.31	-11.32	19.24	-10.29
Bc5	TMF	-6.10	-10.29	20.30	-9.26
Bc6	TMF	-6.09	-10.36	20.23	-9.33
Bc7	TMF	-6.14	-10.44	20.14	-9.41
Bc8	TMF	-8.30	-10.62	19.97	-9.59
Bc9	TMF	-6.53	-10.63	19.95	-9.60
Bc10	TMF	-8.81	-11.40	19.16	-10.37
TM4-1	TMF	-6.60	-10.66	19.92	-9.63
TM4-2***	TMF	-7.96	-8.86	21.77	-7.83
TM4-3***	TMF	-8.15	-9.87	20.73	-8.84
TM4-4***	TMF	-7.95	-9.52	21.09	-8.49
TM4-5***	TMF	-8.07	-9.84	20.76	-8.81
TM4-6***	TMF	-7.54	-9.60	21.01	-8.57
TM4-7***	TMF	-7.58	-10.97	19.61	-9.94
TM4-8***	TMF	-7.31	-10.45	20.14	-9.42
TM4-9***	TMF	-7.84	-10.13	20.47	-9.09
TM4-10***	TMF	-7.78	-9.80	20.81	-8.77
TM4-11***	TMF	-7.97	-9.93	20.68	-8.90
TM4-12***	TMF	-8.09	-10.51	20.08	-9.47
TM4-13***	TMF	-8.08	-10.20	20.40	-9.16

Sample ID	Formation	δ13C ‰ (VPDB)	δ18O ‰ (VPDB)	δ18O ‰ (VSMOW)	δ18O ‰ (VSMOW) water at 24°C
LACUSTRINE CARBONATES					
A3-1	TMF	-8.29	-11.65	18.90	-9.83
A3-2	TMF	-8.05	-11.29	19.27	-9.46
A3-3	TMF	-8.46	-10.93	19.64	-9.10
A5-1	TMF	-8.70	-10.91	19.66	-9.08
A5-2	TMF	-8.71	-11.14	19.42	-9.31
A5-3	TMF	-8.72	-11.18	19.38	-9.35
A7-1	TMF	-8.31	-11.53	19.02	-9.70
A7-2	TMF	-9.66	-10.92	19.65	-9.09
A7-3	TMF	-8.51	-11.22	19.34	-9.39
A9-1	TMF	-8.04	-11.53	19.03	-9.70
A9-2	TMF	-8.16	-11.79	18.75	-9.96
A9-3	TMF	-7.75	-11.44	19.11	-9.61
A11-1	TMF	-7.57	-11.40	19.16	-9.57
A11-2	TMF	-7.80	-12.25	18.28	-10.42
A11-3	TMF	-7.80	-11.91	18.64	-10.08
A13-1	TMF	-7.30	-10.85	19.72	-9.03
A13-2	TMF	-7.38	-10.80	19.78	-8.97
A13-3	TMF	-7.16	-11.02	19.54	-9.20
A15-1	TMF	-7.34	-10.64	19.94	-8.81
A15-2	TMF	-7.50	-11.32	19.24	-9.49
A15-3	TMF	-7.32	-10.54	20.04	-8.71
A17-1	TMF	-7.11	-10.26	20.33	-8.43
A17-2	TMF	-7.51	-10.31	20.29	-8.47
A17-3	TMF	-7.23	-10.15	20.45	-8.32
A19-1	TMF	-7.44	-11.13	19.43	-9.30
A19-2	TMF	-7.25	-10.63	19.95	-8.80
A19-3	TMF	-7.14	-10.65	19.93	-8.82
A21-1	TMF	-7.27	-10.55	20.03	-8.72
A21-2	TMF	-7.42	-12.68	17.84	-10.85
A21-3	TMF	-7.55	-10.71	19.87	-8.88
A23-1	TMF	-7.69	-10.06	20.54	-8.23
A23-2	TMF	-7.62	-9.98	20.63	-8.14
A23-3	TMF	-7.59	-10.10	20.50	-8.27
B4-1	TMF	-7.60	-10.78	19.80	-8.95
B4-2	TMF	-7.42	-10.82	19.76	-8.99
B4-3	TMF	-7.38	-10.52	20.07	-8.69
B7-1	TMF	-6.97	-10.86	19.71	-9.04
B7-2	TMF	-7.71	-10.71	19.87	-8.88

B7-3	TMF	-7.59	-10.65	19.93	-8.82
B9-1	TMF	-7.54	-10.24	20.35	-8.41
B9-2	TMF	-7.58	-10.49	20.09	-8.66
B9-3	TMF	-7.83	-9.96	20.64	-8.13
R7-1	TMF	-7.07	-11.37	19.19	-9.54
R7-2	TMF	-6.97	-11.38	19.18	-9.55
F1-1	TMF	-7.35	-10.16	20.43	-8.33
F1-2	TMF	-7.94	-9.98	20.63	-8.15
F1-3	TMF	-7.60	-10.55	20.03	-8.72

Sample ID	Formation	Depositional Environment	δ13C ‰ (VPDB)	δ18O ‰ (VPDB)	δ18O ‰ (VSMOW)
GAR SCALES					
UC8302-GAR1	JRF	large river	2.69	-9.10	21.52
UC8302-GAR2	JRF	large river	0.56	-10.27	20.32
UC8302-GAR3	JRF	large river	1.22	-9.63	20.99
UC8302-GAR4	JRF	large river	-1.59	-11.50	19.05
UC8302-GAR5	JRF	large river	-1.73	-11.05	19.52
UC8302-GAR6	JRF	large river	0.46	-10.37	20.22
UC8303-GAR1***	JRF	pond	1.63	-11.12	19.44
UC8303-GAR2***	JRF	pond	-2.49	-10.03	20.57
UC8303-GAR3***	JRF	pond	2.19	-8.76	21.88
UC8303-GAR4***	JRF	pond	0.95	-9.89	20.72
UC8303-GAR5***	JRF	pond	-0.07	-11.09	19.48
UC8303-GAR6***	JRF	pond	-0.94	-10.47	20.12
UC8303-GAR7***	JRF	pond	1.34	-8.53	22.12
UC8303-GAR8***	JRF	pond	0.04	-7.62	23.06
UC8303-GAR9***	JRF	pond	1.02	-9.64	20.97
M2-GAR1***	TMF	stream	-3.73	-13.19	17.31
M2-GAR2***	TMF	stream	-4.12	-10.96	19.61
M2-GAR3	TMF	stream	-2.18	-10.59	19.99
M2-GAR4	TMF	stream	-3.56	-10.92	19.66
M2-GAR5	TMF	stream	-3.10	-12.16	18.38
M2-GAR6	TMF	stream	-4.62	-10.04	20.56
HSH-GAR1	TMF	stream	-3.21	-11.82	18.72
HSH-GAR2	TMF	stream	-0.84	-9.50	21.12
HSH-GAR3***	TMF	stream	-4.49	-12.86	17.65
HSH-GAR4	TMF	stream	-4.22	-13.28	17.22

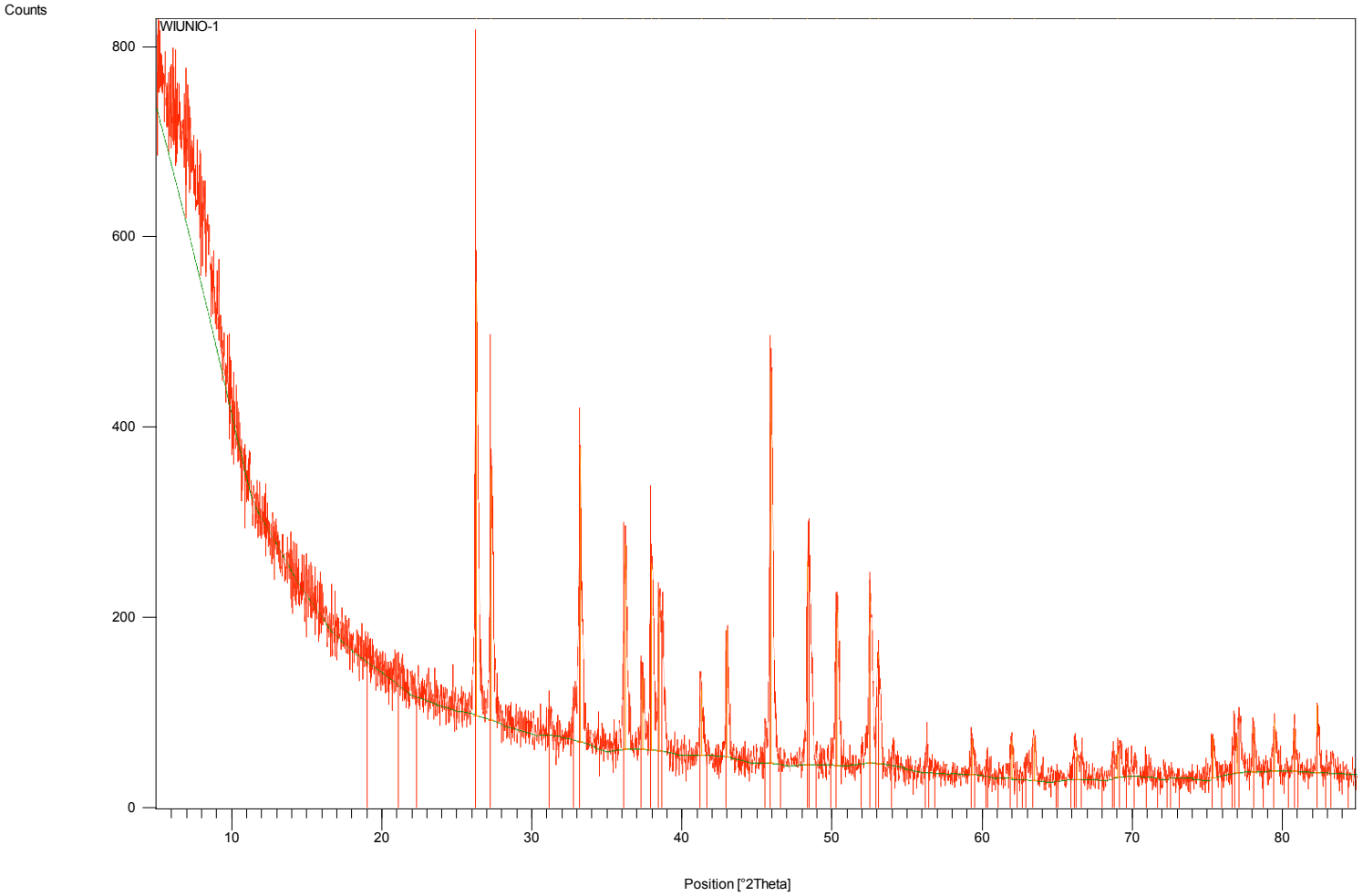
HSH-GAR5***	TMF	stream	-3.23	-12.40	18.13
HSH-GAR6***	TMF	stream	-3.62	-12.57	17.95
HSH-GAR7	TMF	stream	-5.37	-14.08	16.40
HSH-GAR8	TMF	stream	-3.04	-13.61	16.88
HSH-GAR9	TMF	stream	-1.44	-8.99	21.64
HSH-GAR10	TMF	stream	0.90	-7.31	23.37
HSH-GAR11	TMF	stream	1.52	-6.42	24.29

Sample ID	Formation	Depositional Environment	$\delta^{13}C$ ‰ (VPDB)	$\delta^{18}O$ ‰ (VPDB)	$\delta^{18}O$ ‰ (VSMOW)
CROCODILE TEETH					
UC8303-CROC1	JRF	pond	-3.27	-8.76	21.88
UC8303-CROC2	JRF	pond	-1.22	-9.31	21.31
UC8303-CROC3	JRF	pond	-2.49	-8.53	22.12
UC8303-CROC4	JRF	pond	-2.63	-8.96	21.67
UC8303-CROC6	JRF	pond	-2.30	-9.81	20.79
TM-CROC1	TMF	stream	-6.67	-13.49	17.00
TM-CROC2	TMF	stream	-8.68	-13.26	17.24
TM-CROC3	TMF	stream	-8.13	-13.67	16.81
TM-CROC4	TMF	stream	-7.70	-13.92	16.56
TM-CROC5	TMF	stream	-5.43	-13.79	16.70

Measurement Conditions:

Dataset Name	WIUNIO-1
File name	C:\X'Pert Data\RRR\BZF data Unio and Ray bone data\WIUNIO-1.xrdml
Sample Identification	WI-unio-1
Comment	Configuration=Spinner Stage, Owner=User-1, Creation date=9/26/2005 2:00:36 PM Goniometer=PW3050/60 (Theta/Theta); Minimum step size 2Theta:0.001; Minimum step size Omega:0.001 Sample stage=Spinner PW3064 Diffractometer system=XPERT-PRO Measurement program=Mineral Unknown Program, Owner=geology, Creation date=11/10/2008 8:57:27 AM Routine Mineral Fast Scan
Measurement Date / Time	10/26/2008 3:35:52 PM
Operator	geology
Raw Data Origin	XRD measurement (*.XRDML)
Scan Axis	Gonio
Start Position [°2Th.]	5.0114
End Position [°2Th.]	84.9794
Step Size [°2Th.]	0.0170
Scan Step Time [s]	8.3989
Scan Type	Continuous
PSD Mode	Scanning
PSD Length [°2Th.]	2.12
Offset [°2Th.]	0.0000
Divergence Slit Type	Fixed
Divergence Slit Size [°]	0.4785
Specimen Length [mm]	10.00
Measurement Temperature [°C]	25.00
Anode Material	Cu
K-Alpha1 [Å]	1.54060
Generator Settings	40 mA, 45 kV
Diffractometer Type	0000000000031126
Diffractometer Number	0
Goniometer Radius [mm]	240.00
Dist. Focus-Diverg. Slit [mm]	91.00
Incident Beam Monochromator	No
Spinning	Yes

Main Graphics, Analyze View:


Counts
WIUNIO-1
800
600
400
200
0
10
20
30
40
50
60
70
80
Position [°2Theta]

Peak List:

Pos. [°2Th.]	Height [cts]	d-spacing [Å]	Rel. Int. [%]	h	k	l
26.3016	455.36	3.38571	100.00			
27.2704	264.33	3.26759	58.05			
33.2237	310.26	2.69443	68.13			
36.2177	215.09	2.47825	47.23			
37.3698	72.85	2.40445	16.00			
37.9395	196.38	2.36965	43.12			
38.4897	161.82	2.33703	35.54			
41.3015	69.20	2.18419	15.20			
42.9996	134.54	2.10178	29.54			
45.9131	410.69	1.97496	90.19			
48.3740	213.95	1.88008	46.98			
50.3301	164.35	1.81150	36.09			
52.5296	180.94	1.74071	39.73			
53.0779	115.83	1.72401	25.44			
59.3037	36.11	1.55701	7.93			
61.9700	39.13	1.49627	8.59			
63.4744	43.73	1.46438	9.60			
66.3344	28.50	1.40801	6.26			
69.0330	27.21	1.35941	5.97			
75.3644	43.82	1.26014	9.62			
76.9983	37.82	1.23742	8.31			
78.0746	45.27	1.22303	9.94			
79.4772	52.96	1.20494	11.63			
80.8214	42.96	1.18825	9.43			
82.3222	71.22	1.17035	15.64			

Pattern List:

Ref. Code	Compound Name	Chemical Formula	SemiQuant [%]	RIR
01-076-0606	Aragonite	Ca (C O3)	100	1.140