Supplementary Table DR1: site location information for the southern Bighorn Arch

site	latitude	longitude	strike	dip	TR	σ (TR)	rotation
CH139	43.2603	107.2262	129	8	290	10	[309,08]
CH140	43.2919	107.2555	95	14	290	10	[275,14]
CH141	43.3364	107.1530	16	9	290	10	[196,09]
CH142	43.3652	107.0626	43	5	300	10	[223,05]
CH143	43.4193	106.9329	72	6	340	10	[252,06]
CH144	43.3880	106.8534	127	21	340	5	[307,27]
CH145	43.4315	106.8054	354	9	340	5	[174,09]
CH146	43.4457	106.8056	349	8	340	5	[169,08]
CH147	43.6595	106.8968	2	8	340	5	[182,08]
CH148	43.7074	106.9166	343	8	340	5	[163,08]
CH149	43.7495	106.9300	35	4	340	5	[215,04]
CH150	43.6165	106.8755	331	12	340	5	[151,12]
CH151	43.5287	106.8382	14	13	340	5	[250,08];[160,11]
CH152	43.5608	106.8493	328	7	340	5	[148,07]
CH153	43.6845	106.8182	138	39	340	5	[250,15];[340,36]
CH154	43.6822	106.7982	4	11	340	5	[184,11]
CH155	43.6641	106.7949	67	11	340	5	[247,11]
CH156	43.7355	106.8998	140	44	340	5	[250,18];[340,40]
CH157	43.7169	106.8844	155	51	340	5	[250,07];[340,50]
CH158	43.6900	106.8602	116	35	335	5	[245,23];[335,27]
CH159	43.7039	106.8362	149	24	340	5	[329,24]
CH160	43.6669	106.8028	156	66	340	5	[336,66]
CH161	43.7544	106.8016	105	19	340	5	[250,14];[340,11]
CH162	43.7485	106.7850	12	13	340	5	[250,08];[160,11]
CH163	43.8092	106.8150	347	11	345	5	[167,11]
CH164	43.8379	106.8479	347	15	345	5	[167,15]
CH165	43.9120	106.8781	343	11	345	5	[163,11]
CH166	43.8813	106.8643	0	16	345	5	[180,16]
CH167	43.9383	106.8027	350	26	350	5	[170,26]
CH168	44.0175	106.8236	41	24	350	5	[170,15];[260,18]
CH169	44.0234	106.8134	53	44	350	5	[170,22];[260,40]
CH170	44.0235	106.8145	66	52	350	5	[170,17];[260,50]
CH171	43.9938	106.8148	340	24	345	5	[160,24]
CH263	44.2078	107.5172	303	16	330	5	[120,20]
CH264	44.1856	107.5601	148	5	330	5	[328,05]
CH265	44.1063	107.5075	137	5	330	5	[317,05]
CH266	44.0311	107.3755	122	12	285	10	[302,12]
CH267	44.0296	107.4009	110	20	285	10	[290,20]
CH268	44.0282	107.3545	138	10	330	5	[318,10]
CH269	43.9887	107.3478	145	4	330	5	[325,04]
CH270	43.9449	107.3078	170	7	330	5	[350,07]
CH271	43.8798	107.3076	190	6	330	5	[010,06]
CH272	43.8133	107.3444	308	22	320	5	[128,22]
CH273	43.7065	107.2812	149	7	320	5	[329,07]
CH274	43.6595	107.3714	254	18	310	5	[074,18]
CH275	43.6306	107.4123	195	17	310	5	[015,17]
CH276	43.5841	107.4651	287	50	305	5	[025,10],[115,48]
CH277	43.5791	107.4751	219	9	305	5	[039,09]
CH278	43.5455	107.5199	297	18	320	5	[117,18]
CH279	43.2869	107.2075	65	5	290	10	[245,05]
CH280	43.2840	107.3163	87	10	290	10	[267,10]
CH281	43.4725	107.7596	236	5	320	10	[056,05]
CH282	43.4546	107.7972	275	4	320	10	[095,04]
CH292	44.2337	107.5005	160	9	325	5	[340,09]
CH293	44.3132	107.5679	142	11	325	5	[322,11]
CH294	44.3612	107.6364	135	25	315	5	[315,25]
CH295	44.0629	107.4932	200	7	320	5	[020,07]
CH296	43.9744	107.3370	128	7	300	10	[308,07]

CH297	43.9882	107.3467	162	7	320	10	[342,07]
CH298	43.7547	107.3069	146	11	320	5	[326,11]
CH299	44.1741	106.8126	349	20	350	5	[169,20]
CH300	44.1099	106.8043	342	30	345	5	[162,30]
CH301	44.0897	106.7951	347	22	345	5	[167,22]
CH302	44.0627	106.7867	351	20	350	5	[171,20]
CH303	44.2612	106.8134	359	27	350	5	[179,27]

Latitude and longitude gives site location in decimal degrees; strike - bed strike in degrees using right-hand rule; dip - bed dip in degrees from horizontal; TR -structural trend of site location in degrees; σ (TR) - error estimate of trend measurement in degrees; rotation - brackets are rotation parameters [horizontal axis trend, rotation amount in degrees] to restore bedding to horizontal given in chronologic order.

Supplementary Table DR2: structural, paleomagnetic and AMS data for the Sevier belt and the Laramide foreland of Wyoming

	Pmag		In situ		Restored						AMS	In situ						Restored								LPS	In situ strain		In situ stress		Restored		
site	N/No	Nn/Nr	dec (°)	inc (°)	dec (°)	inc (°)	α95	k	dec-Rd	DR	n/no	K_{max} trend	K_{max} plunge	K_{int} trend	K_{int} plunge	K_{min} trend	K_{min} plunge	K_{max} trend	K_{max} plunge	2σ	L'	F	Pj	T	Km	Nf	ε_3 tr	ε_3 pl	σ_1 tr	σ_1 pl	σ_1 tr	σ_1 pl	2σ
CH139	6/8	0/6	155	-4	155	-8	13	30	-1	10	11/11	301	1	211	10	35	80	121	0	18	0.009	1.060	1.076	0.732	1.39E-04	14	217	8	212	10	212	02	05
CH140	8/8	0/8	139	1	138	-9	11	27	-19	9	10/10	112	3	202	9	6	81	292	1	17	0.006	1.059	1.073	0.816	1.14E-04	14	210	4	210	6	211	-07	04
CH141	8/8	0/8	146	-13	148	-20	5	119	-8	5	15/15	132	8	42	4	286	81	312	0	8	0.011	1.063	1.081	0.687	9.52E-05	24	39	3	218	0	217	04	04
CH142	8/8	0/8	143	-6	143	-11	7	61	-13	7	10/10	139	7	230	4	347	82	139	2	14	0.007	1.069	1.084	0.814	1.18E-04	13	237	1	230	1	231	02	04
CH143	8/8	8/0	341	13	341	19	10	35	5	8	10/10	170	3	260	0	2	87	350	3	16	0.004	1.054	1.065	0.867	9.96E-05	17	263	2	258	2	258	03	04
CH144	8/8	7/1	341	3	337	17	11	25	1	10	13/13	162	22	261	22	32	59	167	5	9	0.004	1.023	1.030	0.674	8.08E-05	20	247	30	250	28	249	04	05
CH145	8/8	3/5	151	-4	152	-6	8	44	-4	7	14/15	170	2	80	8	270	82	170	2	19	0.008	1.051	1.064	0.732	1.29E-04	8	59	10	71	10	252	-01	05
CH146	0/8	-	-	-	-	-	-	-	-	-	10/10	299	3	29	10	190	80	299	9	41	0.003	1.024	1.030	0.770	5.00E-05	25	75	6	74	5	253	03	03
CH147	8/8	8/0	353	1	353	-3	5	153	17	5	10/15	169	6	74	8	286	80	168	4	21	0.006	1.049	1.061	0.786	8.32E-05	17	267	3	87	6	267	02	03
CH148	5/8	8/0	335	9	337	9	15	14	1	12	10/10	7	1	97	7	272	83	187	2	17	0.004	1.043	1.053	0.812	9.61E-05	12	279	2	96	4	276	03	05
CH149	8/8	7/1	150	-12	150	-16	13	18	-6	11	13/13	168	1	78	10	263	80	348	2	13	0.008	1.055	1.070	0.731	1.38E-04	17	78	5	77	0	257	03	04
CH150	7/9	1/6	141	-13	144	-14	12	26	-12	10	15/17	341	2	71	2	203	88	161	0	23	0.004	1.046	1.057	0.822	1.44E-04	8	254	5	75	6	255	05	07
CH151	7/9	5/2	330	10	333	20	8	61	-3	7	11/13	175	3	85	1	341	87	356	2	17	0.004	1.056	1.067	0.858	1.10E-04	NA	-	-	-	-	-	-	-
CH152	8/8	7/1	338	11	339	10	8	44	3	7	11/12	349	2	79	6	239	84	169	1	12	0.006	1.040	1.050	0.744	7.55E-05	15	252	4	75	1	255	05	06
CH153	8/8	6/2	341	3	330	15	9	37	-6	8	10/10	155	12	255	40	52	48	154	0	10	0.010	1.039	1.052	0.600	1.08E-05	15	264	32	272	37	259	05	04
CH154	8/8	6/2	341	17	345	21	13	18	9	12	10/10	344	1	74	7	245	83	345	5	8	0.010	1.031	1.043	0.497	1.05E-04	18	77	12	78	7	258	04	05
CH155	8/8	7/1	348	5	348	15	10	30	12	9	10/10	161	4	251	2	7	86	341	7	8	0.014	1.028	1.043	0.347	9.63E-05	17	70	11	74	1	252	00	05
CH156	10/10	3/7	161	5	158	-13	15	11	2	13	10/10	162	24	268	32	41	48	165	3	19	0.006	1.042	1.053	0.758	1.22E-04	21	277	43	270	40	253	04	03
CH157	10/10	10/0	350	0	341	12	12	18	5	10	10/10	157	12	263	52	59	35	162	5	10	0.005	1.043	1.053	0.802	8.07E-05	12	284	58	278	50	262	04	06
CH158	8/8	8/0	328	-23	329	-3	6	86	-7	6	10/10	153	27	256	23	21	53	156	4	16	0.005	1.043	1.053	0.784	8.06E-05	10	257	23	260	25	249	02	06
CH159	8/8	0/8	154	-13	148	-14	12	23	-8	10	17/17	166	8	259	23	58	66	168	1	9	0.011	1.052	1.068	0.643	1.65E-04	17	253	17	254	24	254	01	04
CH160	7/8	8/0	347	-1	341	10	9	47	5	8	10/10	154	24	285	57	53	22	177	11	7	0.008	1.038	1.049	0.632	7.16E-05	17	270	58	272	60	259	-03	04
CH161	7/7	7/0	325	5	321	15	10	39	-15	9	13/15	162	16	255	11	17	70	162	2	25	0.003	1.041	1.049	0.855	6.81E-05	14	243	0	242	12	243	00	08
CH162	6/8	4/2	325	13	329	23	12	33	-7	11	10/12	329	0	59	3	232	87	331	10	10	0.008	1.053	1.067	0.736	1.12E-04	6	241	8	248	0	248	10	11
CH163	8/8	5/3	347	11	349	10	13	20	13	10	12/12	351	9	83	14	231	73	353	8	25	0.004	1.046	1.056	0.855	1.43E-04	NA	-	-	-	-	-	-	-
CH164	7/8	6/2	337	16	342	17	8	65	6	7	10/10	356	3	86	7	246	82	356	1	7	0.009	1.039	1.051	0.629	1.08E-04	20	84	9	84	14	264	01	03
CH165	8/8	5/3	332	10	334	12	10	32	-2	9	10/10	354	4	85	11	244	78	355	2	11	0.011	1.051	1.067	0.652	1.37E-04	NA	-	-	-	-	-	-	-
CH166	7/8	4/3	329	10	333	17	10	35	-4	9	12/12	352	2	83	9	251	81	353	4	12	0.013	1.052	1.070	0.603	1.20E-04	9	97	15	92	12	269	05	05
CH167	8/8	0/8	135	-9	141	-21	10	35	-15	9	10/10	145	7	52	24	250	65	324	4	28	0.007	1.045	1.057	0.717	1.45E-04	NA	-	-	-	-	-	-	-
CH168	8/13	2/6	146	-1	145	-23	10	32	-11	9	10/12	150	13	59	6	307	76	327	9	8	0.014	1.072	1.093	0.672	1.51E-04	NA	-	-	-	-	-	-	-
CH169	8/8	0/8	151	21	143	-24	6	75	-13	6	10/10	147	41	53	5	317	48	319	4	15	0.009	1.044	1.057	0.657	1.19E-04	NA	-	-	-	-	-	-	-
CH170	6/7	0/6	161	7	155	-45	6	134	-1	7	10/10	147	55	57	0	327	35	143	3	29	0.006	1.031	1.040	0.686	8.62E-05	NA	-	-	-	-	-	-	-
CH171	7/8	7/0	343	10	347	8	9	42	11	8	13/13	143	4	51	23	243	66	323	3	13	0.010	1.039	1.052	0.584	8.32E-05	NA	-	-	-	-	-	-	-
CH263	6/6	0/6	141	-24	148	-16	10	50	-8	8	9/9	324.9	13	61	23	208	63	328	4	13	0.007	1.039	1.050	0.695	9.91E-05	5	72	2	63	12	243	03	15
CH264	7/8	0/7	159	-20	157	-21	14	19	1	12	10/10	143.6	2	234	3	24	87	144	2	18	0.005	1.060	1.073	0.831	1.11E-04	NA	-	-	-	-	-	-	-
CH265	6/6	0/6	153	-17	152	-18	13	27	-4	11	12/15	168	5	258	3	9	85	168	2	22	0.004	1.052	1.063	0.858	9.34E-05	NA	-	-	-	-	-	-	-
CH266	6/6	0/6	162	-3	161	-11	7	102	5	6	11/11	129.6	8	222	13	10	74	131	6	20	0.008	1.038	1.049	0.646	3.08E-05	12	204	43	211	48	207	-02	06
CH267	6/6	0/6	166	6	166	-11	6	125	10	6	12/12	132.1	12	227	20	13	66	135	4	20	0.005	1.051	1.063	0.810	3.98E-05	9	200	45	210	38	207	00	08
CH268	7/8	7/0	342	5	342	6	10	32	6	8	10/10	306	6	214	11	64	78	305	4	19	0.005	1.037	1.046	0.749	9.07E-05	10	230	6	231	10	231	00	07
CH269	6/6	0/6	155	-6	155	-7	1	37	-1	3	10/10	153	2	243	3	26	87	153	1	37	0.003	1.051	1.062	0.881	1.88E-04	7	239	14	240	2	240	-02	08
CH270	6/6	0/6	154	-25	151	-23	7	95	-5	7	11/11	289.1	1	199	5	32	85	109	5	45	0.002	1.057	1.067	0.936	9.42E-05	NA	-	-	-	-	-	-	-

CH271	6/6	0/6	158	-19	156	-16	11	36	0	10	9/10	345	1	255	3	96	87	165	2	14	0.004	1.047	1.058	0.830	1.03E-04	NA	-	-	-	-	-	-	-
CH272	6/6	4/2	342	12	344	-1	8	68	8	7	10/10	141.9	1	52	24	233	66	141	6	9	0.007	1.041	1.052	0.716	8.36E-05	6	56	3	47	22	228	01	06
CH273	6/6	3/3	329	12	328	12	11	35	-8	10	10/10	132	3	223	12	27	78	132	5	13	0.005	1.040	1.050	0.771	9.52E-05	13	33	8	214	1	214	-05	05
CH274	7/9	0/7	155	-31	156	-13	10	41	0	8	10/10	329	18	62	10	179	70	330	2	8	0.019	1.044	1.066	0.380	1.74E-04	14	63	10	63	2	243	02	08
CH275	6/6	3/3	339	33	332	22	11	36	-4	10	10/12	334	15	241	11	116	72	332	4	6	0.012	1.045	1.061	0.578	9.40E-05	14	236	18	239	11	239	00	06
CH276	6/6	3/3	328	42	338	4	13	26	2	11	10/10	321	29	71	33	199	44	146	3	9	0.026	1.044	1.073	0.255	9.47E-05	22	77	33	74	30	239	01	04
CH277	7/8	0/7	163	-32	161	-24	10	39	5	9	12/12	330.5	4	240	3	113	85	151	4	14	0.012	1.047	1.062	0.594	1.18E-04	15	243	9	245	7	246	02	05
CH278	6/6	0/6	149	-36	158	-25	14	24	2	13	11/12	331	13	62	6	177	76	333	3	14	0.010	1.050	1.065	0.651	1.25E-04	14	66	16	61	12	241	-02	07
CH279	6/6	0/6	149	-8	149	-13	15	22	-7	12	10/10	296	2	206	4	51	86	296	6	11	0.008	1.061	1.077	0.763	1.08E-04	10	228	6	228	0	228	00	06
CH280	6/6	6/0	343	6	343	16	13	26	7	11	11/11	131	10	223	11	359	75	132	3	16	0.004	1.050	1.061	0.853	8.33E-05	15	214	4	220	7	220	00	05
CH281	6/6	6/0	337	8	337	3	12	32	1	10	10/10	332	6	62	1	161	85	332	1	17	0.004	1.043	1.052	0.807	8.12E-05	14	232	7	230	1	231	02	05
CH282	5/6	0/5	152	-30	153	-27	8	92	-3	8	10/10	323	0	53	8	230	82	143	3	16	0.006	1.034	1.043	0.685	7.25E-05	15	236	5	236	1	236	04	04
CH292	6/6	2/4	151	-18	148	-16	14	23	-8	12	11/11	321	2	231	5	69	85	141	2	38	0.004	1.052	1.062	0.860	1.19E-04	9	52	2	232	7	232	-01	06
CH293	6/6	0/6	147	-26	142	-26	13	28	-14	12	10/10	132	7	223	5	345	82	134	9	28	0.005	1.060	1.073	0.837	1.15E-04	6	227	6	228	6	228	-05	07
CH294	4/6	0/4	156	-7	152	-15	7	187	-5	6	11/12	303	0	121	18	34	73	124	5	18	0.005	1.039	1.048	0.783	8.54E-05	5	227	20	228	16	228	-08	10
CH295	6/6	6/0	340	12	339	8	17	17	3	14	11/11	332	1	242	1	84	89	153	5	8	0.008	1.034	1.044	0.629	8.01E-05	8	228	16	228	10	228	06	07
CH296	5/6	3/3	154	-14	152	-17	15	26	-4	13	9/12	160	7	251	5	17	82	160	3	29	0.003	1.051	1.061	0.875	1.18E-04	10	37	1	215	3	215	-03	06
CH297	6/6	5/1	342	2	341	1	13	27	5	11	10/10	263	5	353	5	126	84	83	2	46	0.003	1.037	1.045	0.860	6.72E-05	14	235	3	234	7	234	00	05
CH298	6/6	0/6	153	-16	150	-17	9	44	-7	8	10/10	322	1	232	13	54	78	142	0	10	0.011	1.049	1.065	0.625	1.49E-04	16	223	1	226	10	225	00	05
CH299	-	-	-	-	-	-	-	-	-	-	8/9	333	3	63	6	219	83	334	8	12	0.007	1.038	1.049	0.678	1.09E-04	NA	-	-	-	-	-	-	-
CH300	6/6	2/4	143	-7	149	-16	7	102	-7	6	11/11	154	1	63	26	245	64	334	3	9	0.010	1.045	1.058	0.638	1.11E-04	5	61	28	65	11	245	00	10
CH301	6/6	0/6	150	-13	154	-19	13	29	-2	11	10/10	333	0	63	23	243	67	334	5	12	0.010	1.051	1.066	0.660	1.26E-04	5	66	32	68	32	248	-09	10
CH302	6/6	0/6	146	-5	149	-13	7	82	-7	7	10/10	153	4	62	11	262	79	332	3	10	0.014	1.051	1.068	0.567	1.40E-04	NA	-	-	-	-	-	-	-
CH303	-	-	-	-	-	-	-	-	-	-	10/10	171	3	80	26	267	64	351	1	28	0.006	1.035	1.044	0.714	9.73E-05	NA	-	-	-	-	-	-	-

Pmag: paleomagnetic data; N/No- pmag cores used/ cores sampled; Nn/Nr- normal polarity pmag cores used/ reverse cores used; dec and inc- declination and inclination of in situ and restored (bedding rotated to horizontal) paleomagnetic site means (in degrees); α95- 95% confidence interval for site mean (Fisher, 1953); dec-Rd - difference between structurally restored site mean declination and the reference declination; DR - error estimate for declination difference calculated using the procedure of Demarest (1983).

AMS: anisotropy of magnetic susceptibility data; n/no - AMS cores used/ cores sampled; Kmax, Kint, and Kmin trend and plunge - trend and plunge of in situ and structurally corrected AMS maximum, intermediate, and minimum susceptibility eigen vectors, note Kmax is interpreted to be perpendicular to the shortening direction; 2σ - 95% uncertainty for Kmax trend based on long-axis of bootstrap confidence ellipse; L' = ln (Kmax/Kint) is modified lineation parameter (Weil and Yonkee, 2009); F = Kint/Kmin is foliation parameter; Pj = [exp 2(a12+a22+a32)]½ where a1=ln(Kmax/Km) is corrected anisotropy degree; T =((2×ln(Kint))-ln(Kmax)-ln(Kmin))/(ln(Kmax)-ln(Kmin)) is shape parameter; Km is bulk susceptibility in SI

LPS- layer-parallel shortening fault data; Nf- number of measured minor faults, NA- Alcova limestone not present; tr and pl- trend and plunge of in situ estimated minimum strain (□3) and maximum compression (□1) directions and restored directions estimated from minor fault data (in degrees); 2□-95% level measurement uncertainty.

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