



Patrick Sullivan, PhD Student, Exp. Grad. Spring 2024

# **STRATIGRAPHIC RELATIONSHIPS AND SEDIMENTOLOGY OF THE WALL CREEK-TURNER SYSTEM, POWDER RIVER BASIN, WY.**

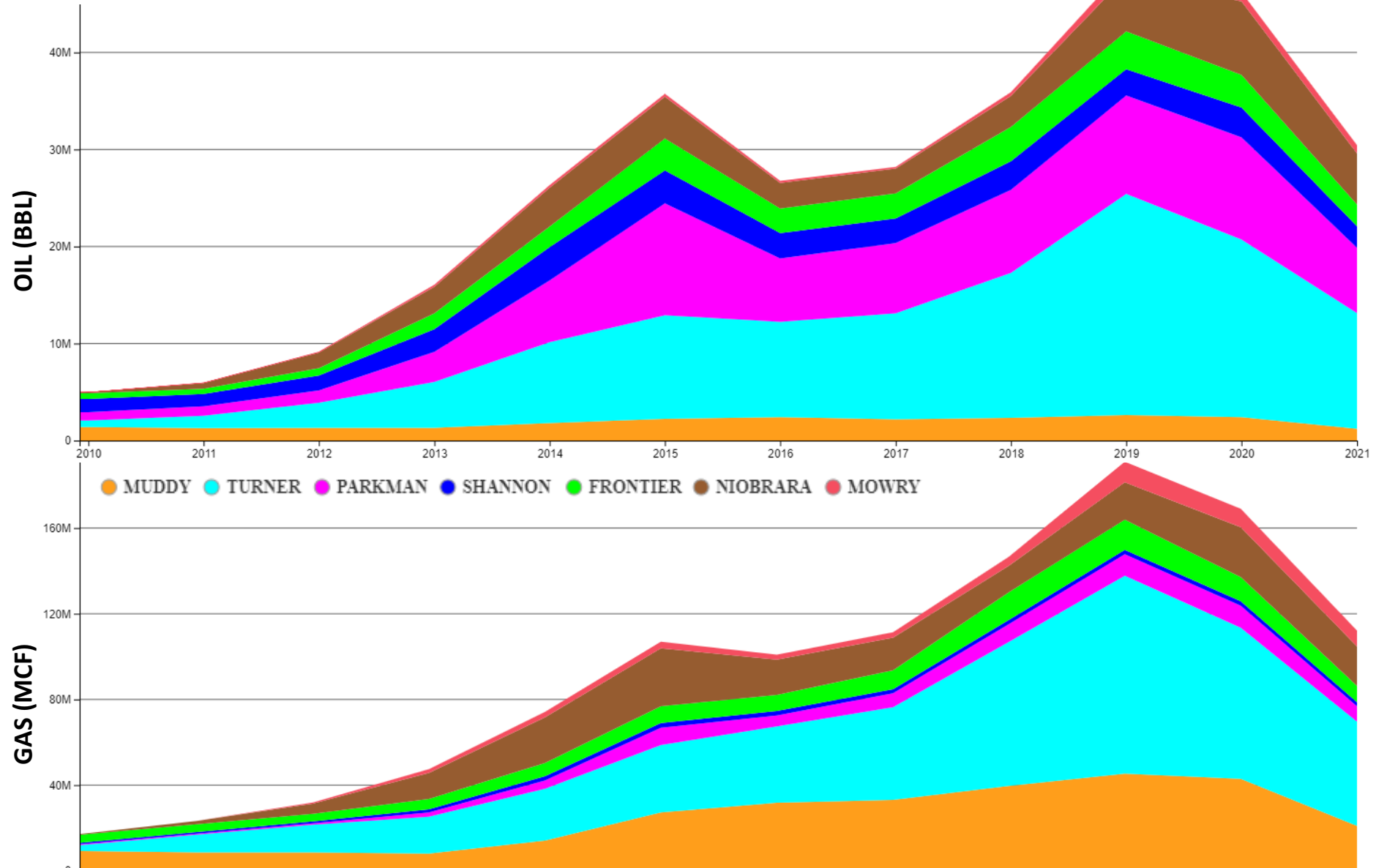


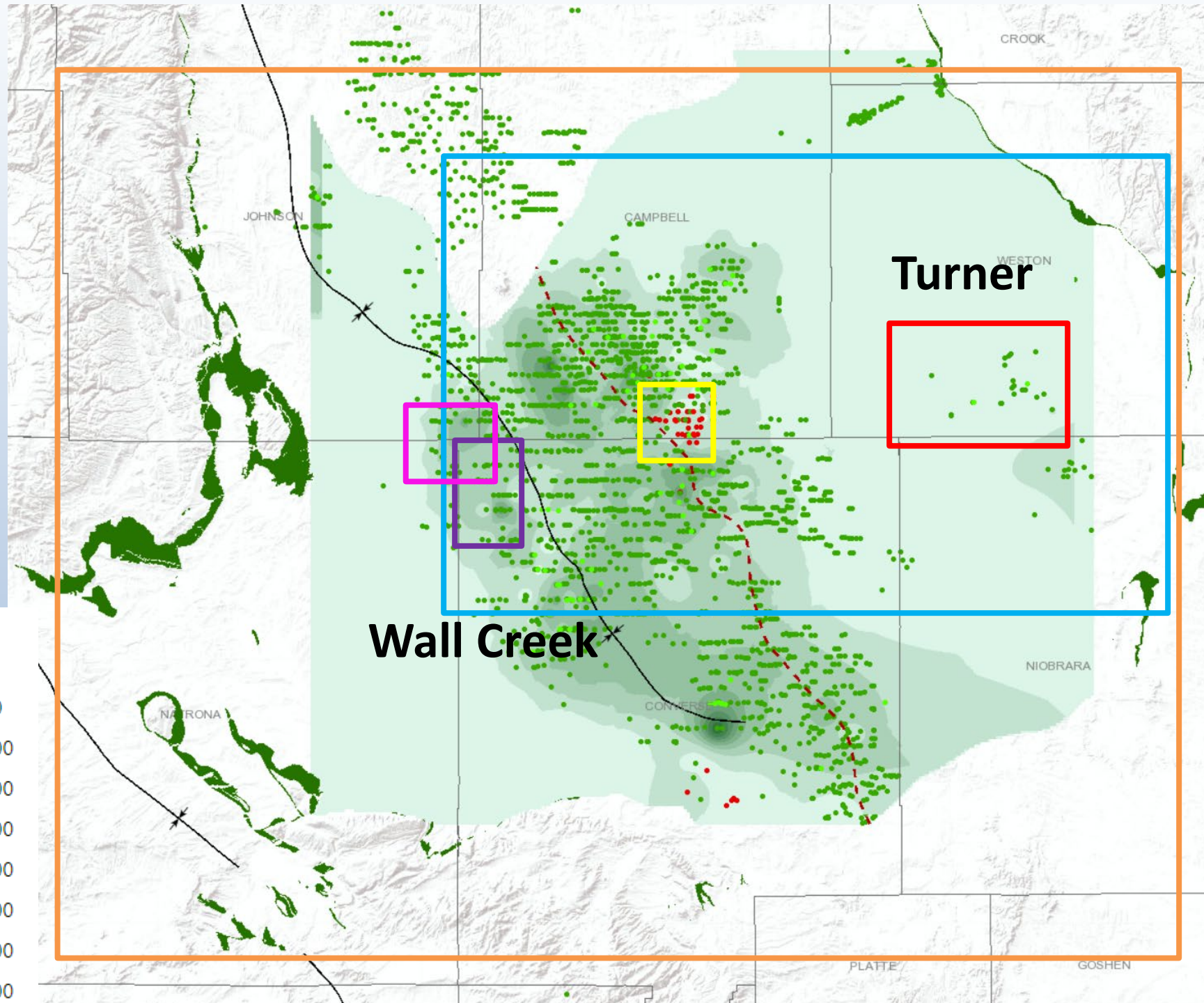
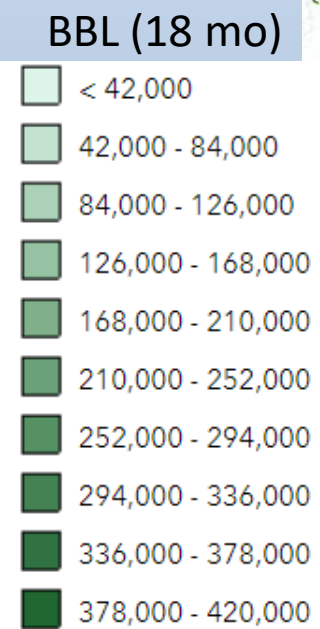




# Wall Creek-Turner Petroleum System

Powder River Basin - Cumulative Production by Formation





Payne, 2017

Heger, 2017

Dellenbach, 2019

Bone, 2020

Milar, 2020

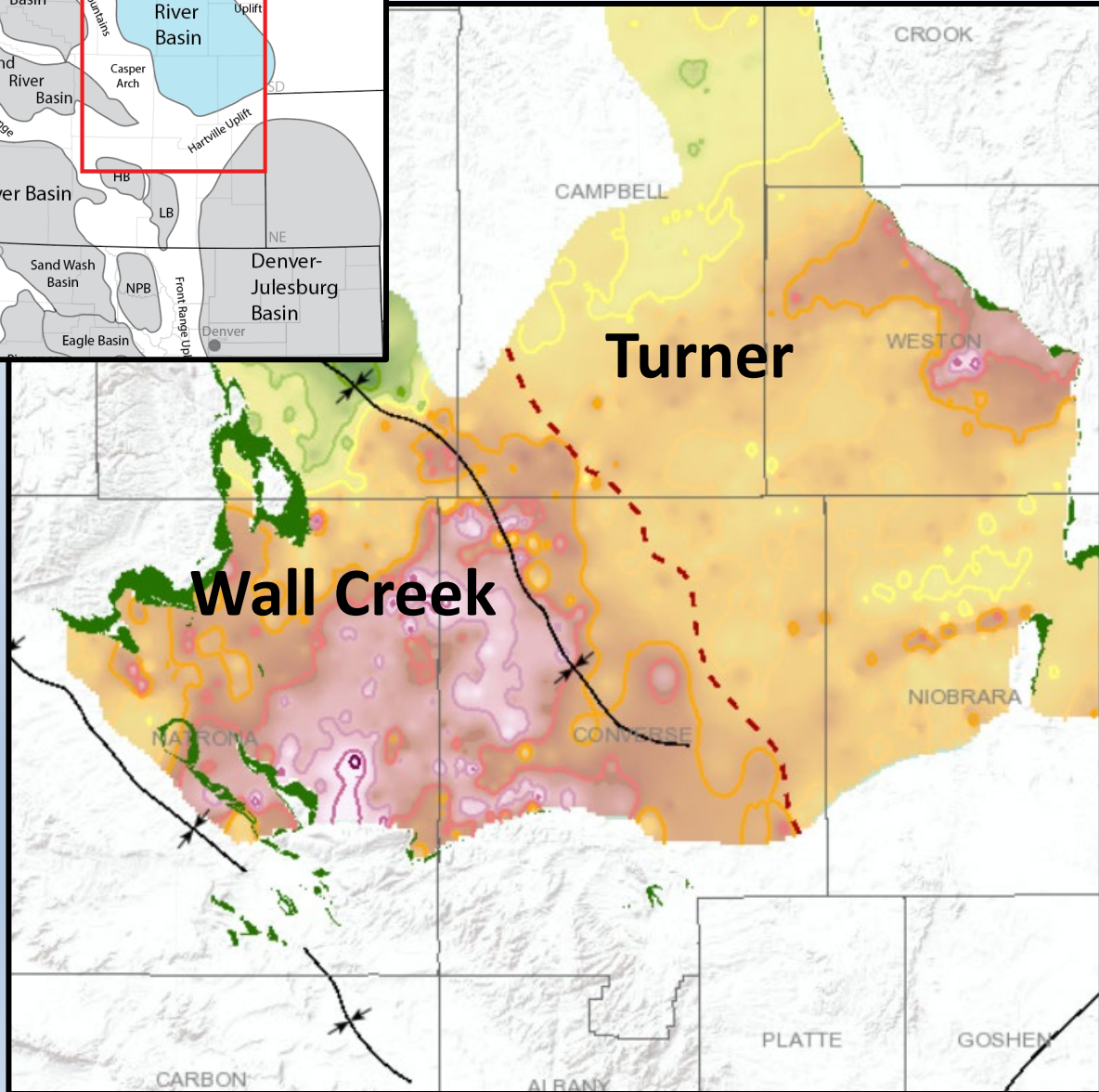
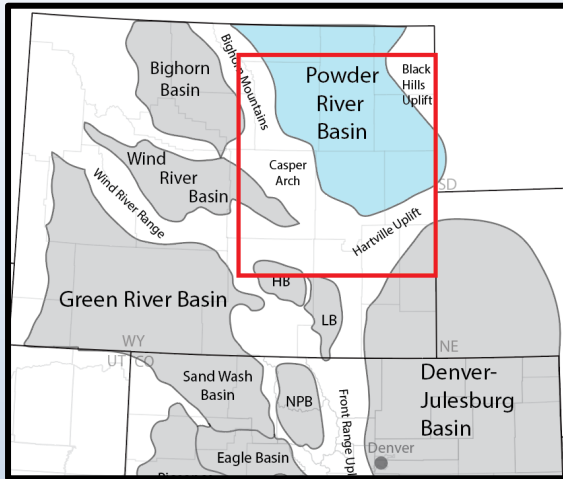
Sullivan (Proposed)

# Research Questions

1. What is the **stratigraphic relationship** between the Wall Creek and Turner units?
  - a) What is the depositional age of the units?
  - b) Do the sediments share provenance?
2. What **depositional environments** are represented by the Wall Creek-Turner System?
3. How does the sedimentology and stratigraphy of the system affect **reservoir quality and distribution** in the Powder River Basin?

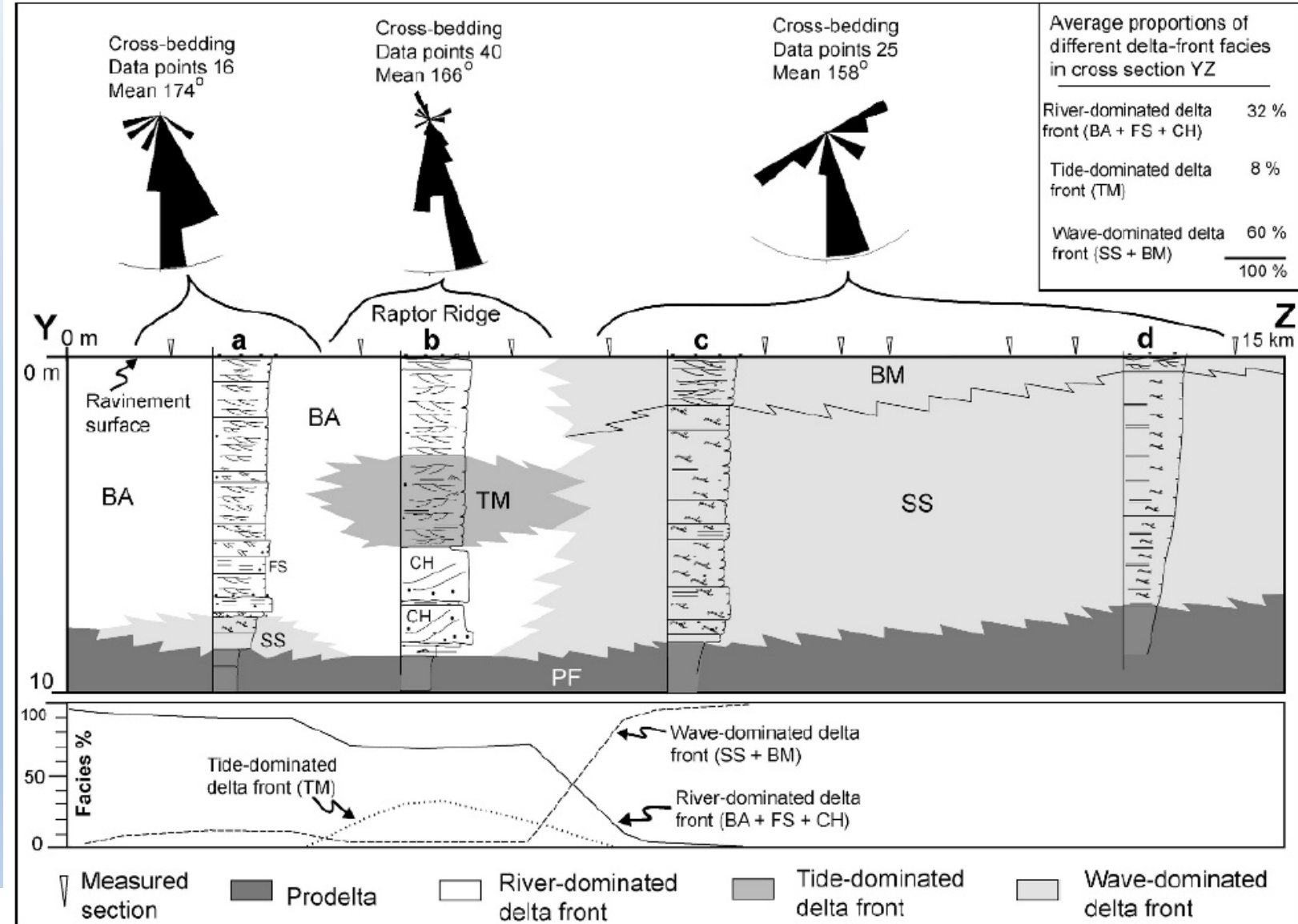
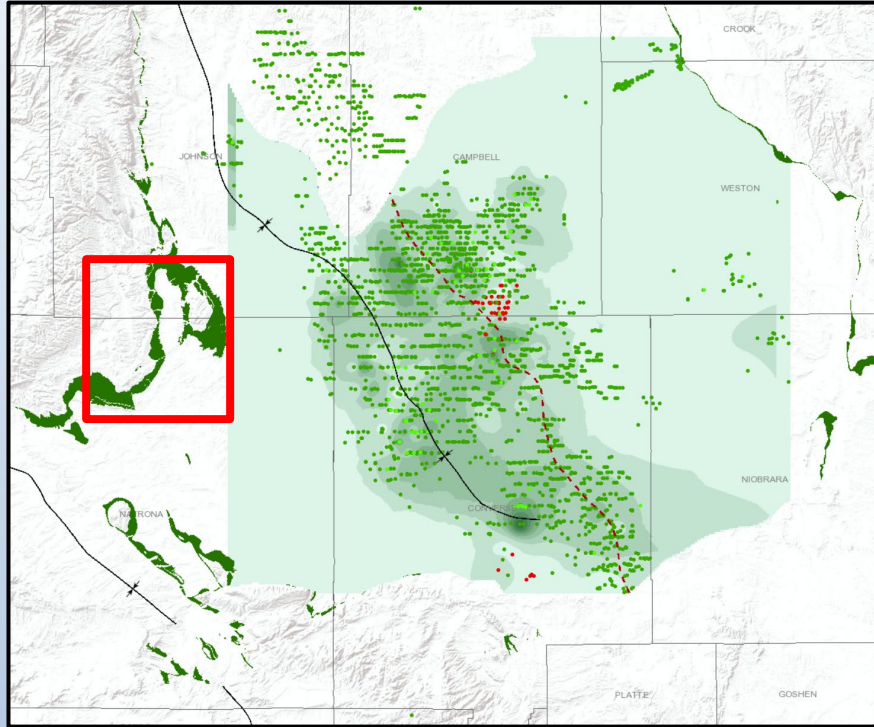


# Wall Creek-Turner System



Age (Ma)	Period	Epoch	Stage and Stage Boundary (Ma)	Northwestern Powder River Basin	Salt Creek	Southwestern Powder River Basin	Southeastern Powder River Basin	Central Black Hills	Northwestern Black Hills
70	Cretaceous (part)	Maastrichtian (part)	upper (part)	Lance Formation (part)	Lance Formation (part)	Lance Fm (part)	Lance Fm (part)	Lance Formation (part)	Lance Formation (part)
				Fox Hills Sandstone	Fox Hills Ss	Fox Hills Ss	Fox Hills Ss	Fox Hills Ss	Fox Hills Sandstone
		lower		Bearpaw Shale	Lewis Shale	Lewis Shale	Kara Bent Mbr	Kara Bent Mbr	Fox Hills Sandstone
					Tekla Sand Mbr				
		upper							
		middle							
75		Campanian							
		lower							
		upper							
80		Santonian							
		middle							
		lower							
85		Coniacian							
		upper							
		middle							
		lower							
90		Turonian							
		middle							
		lower							
95		upper							

# Depositional Environments – Wall Creek



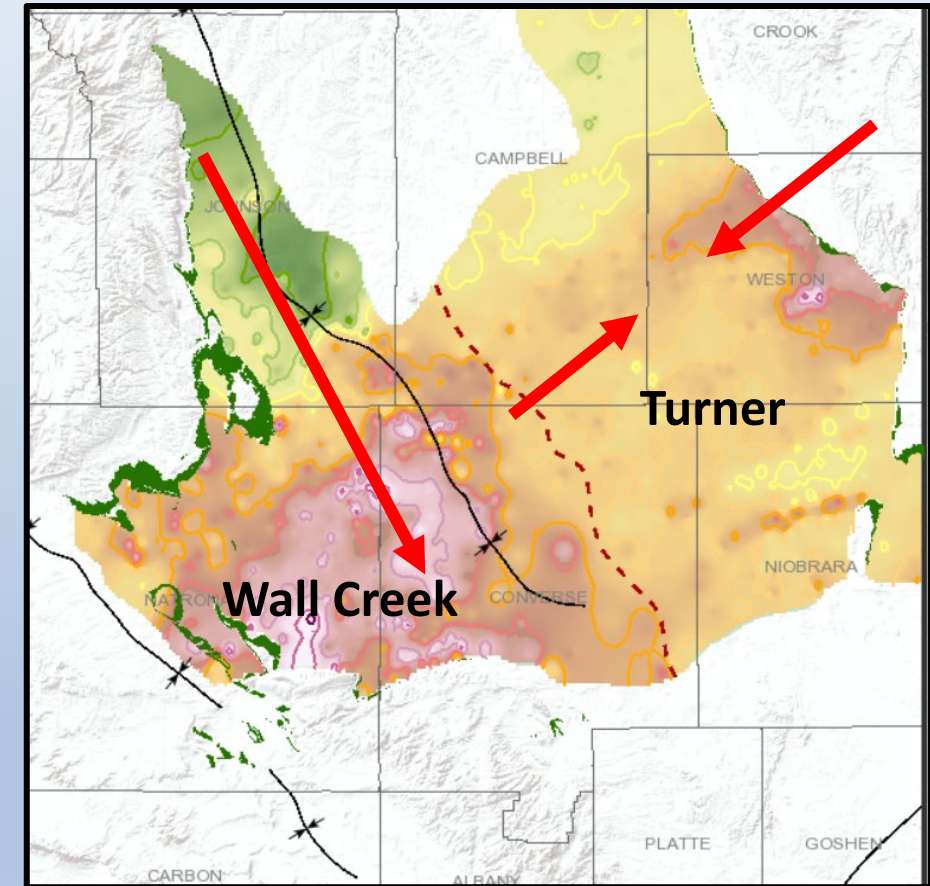
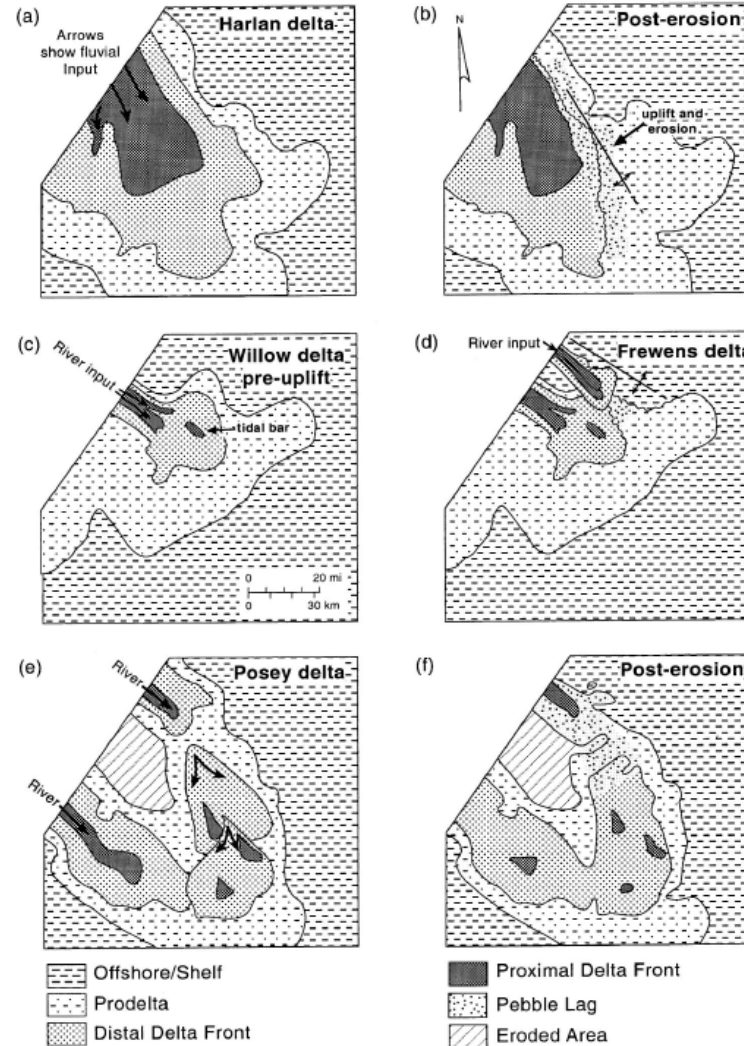
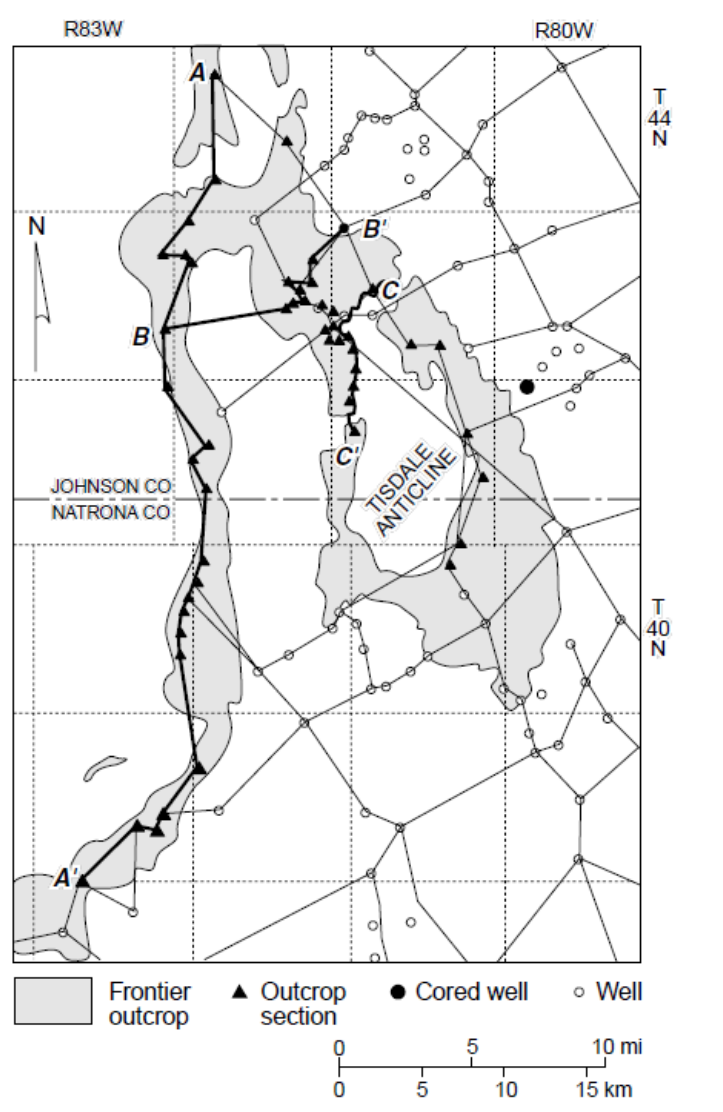
# Depositional Environments - Turner

Table 3.1 Summary of the nomenclature and varying interpretations of depositional environment and sediment transport.

Nomenclature	Interpreted Depositional Environment	Sediment Transport Processes & Mechanism	Reference
Wall Creek-Turner: Unit VIII, Unit VII, Unit VI	Channels, nearshore bars, offshore bars	Destructive tide-dominated delta	Merewether et al.1979, p.68, 91
Turner: Type 1 SS Turner: Type 2 SS Turner: Type 3 SS	Lowstand shelf edge sands Intertidal or estuarine valley fill Valley fill, normal marine shelf sand	Sea level drop Sea level rise Sea level rise	Weimer and Flexer 1985, p. 138, 144-145
Lower Turner: Type 1 SS	Wave-dominated Shelf	Major river-dominated delta; minor storm influence	Rice and Gaskill 1988, p.69-70, 72
Lower Turner: Type 2 SS	Wave-dominated shelf	Offshore-flowing submarine channelized currents	
Upper Turner	Storm-dominated shelf, below fwwb	Storm currents	
Lower Turner	Wave-dominated, tide-influenced upper shoreface	Wave-generated currents, tidal currents, minor storm influence	Sawyer 1990, p. 198-202
Middle Turner	Lower shoreface to inner shelf	Reworking by storm currents	
Upper Turner	Lower shoreface to inner shelf	Reworking by storm currents	
Wall Creek-Turner: Unit VII	Middle to outer shelf sand sheet	Storm-generated currents, minor wave-generated currents	Winn 1991, p. 97-99
Turner	Shallow marine shelf, distal delta lobe, nearshore-marine close to lowland vegetation	Deltaic, transgressive onlap during early sea level rise	Merewether 1996, p. T33-34.
Wall Creek-Turner	Wall Creek: strand line, reworked shoreface Turner: proximal - distal shelf hyperpynites	Wall Creek: long-shore currents, storm waves Turner: sediment gravity flows	Melick 2013, p. 156
Upper Turner-Wall Creek	Isolated shelf sand body, sand ridge	Storm-generated currents	Gustason 2015, abs.

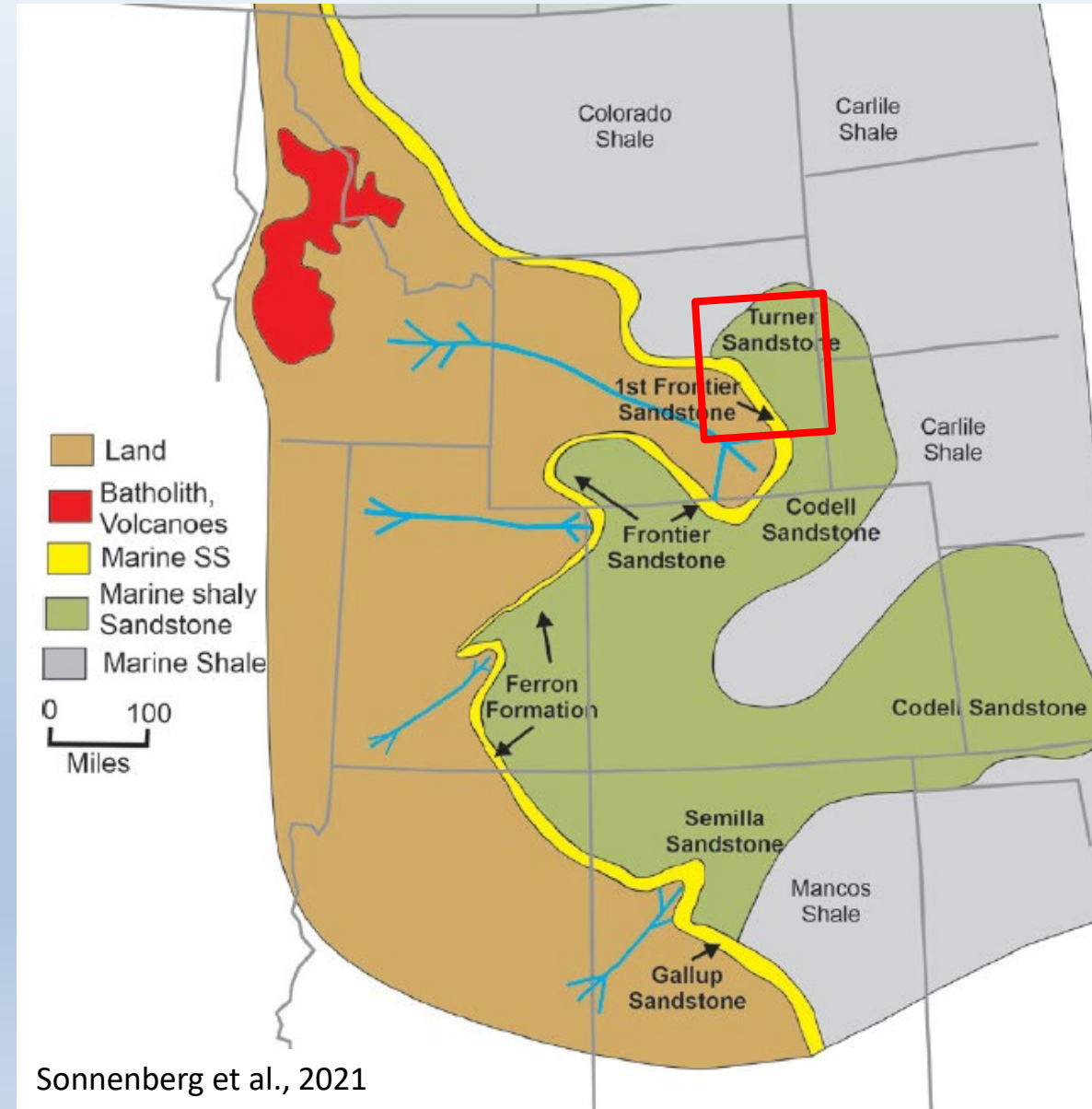


# Wall Creek-Turner Paleogeography



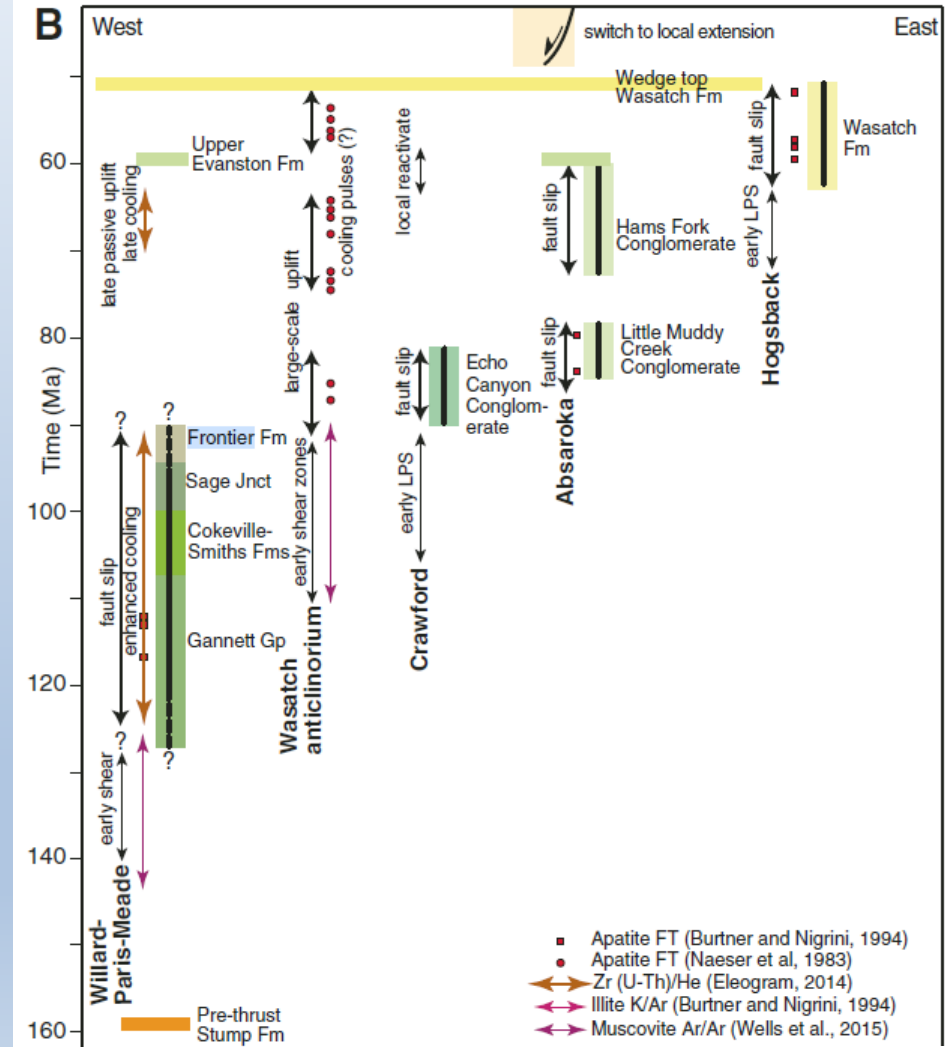
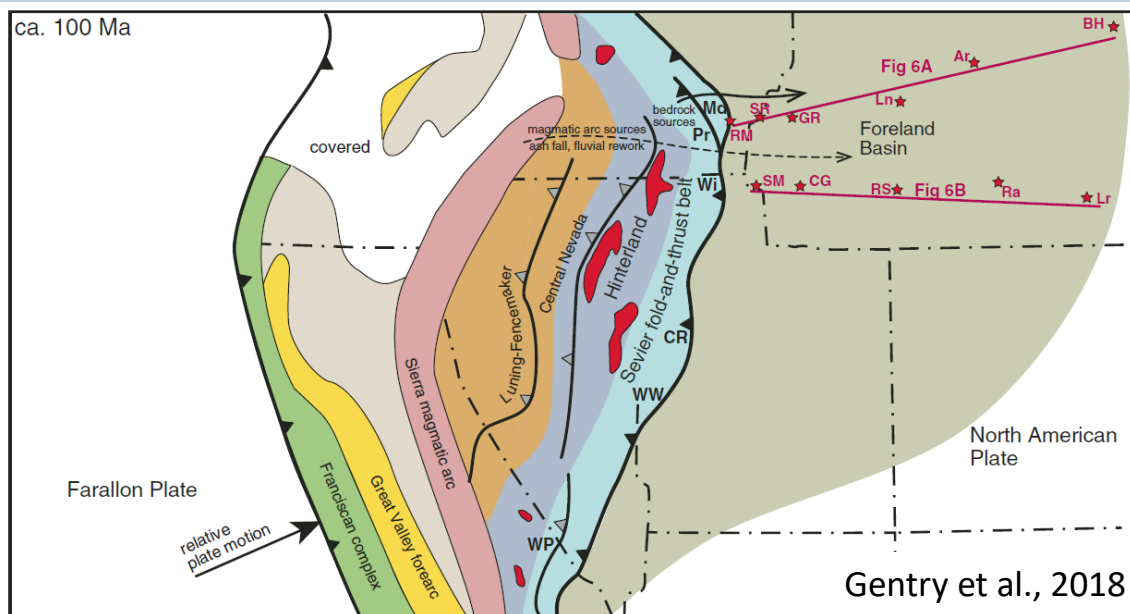
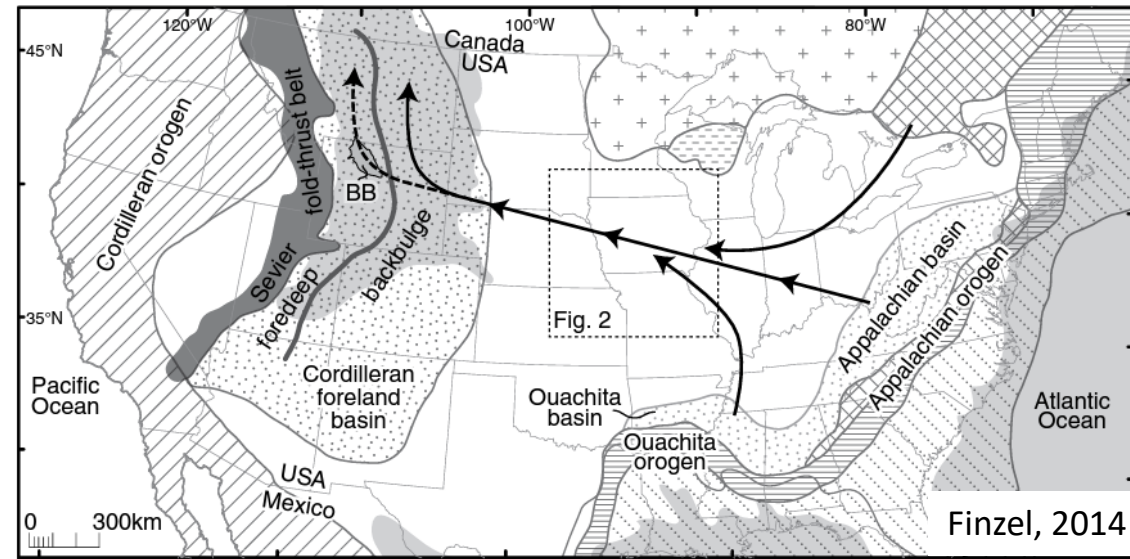
# Wall Creek-Turner Paleogeography

Kirschbaum and Mercier, 2013





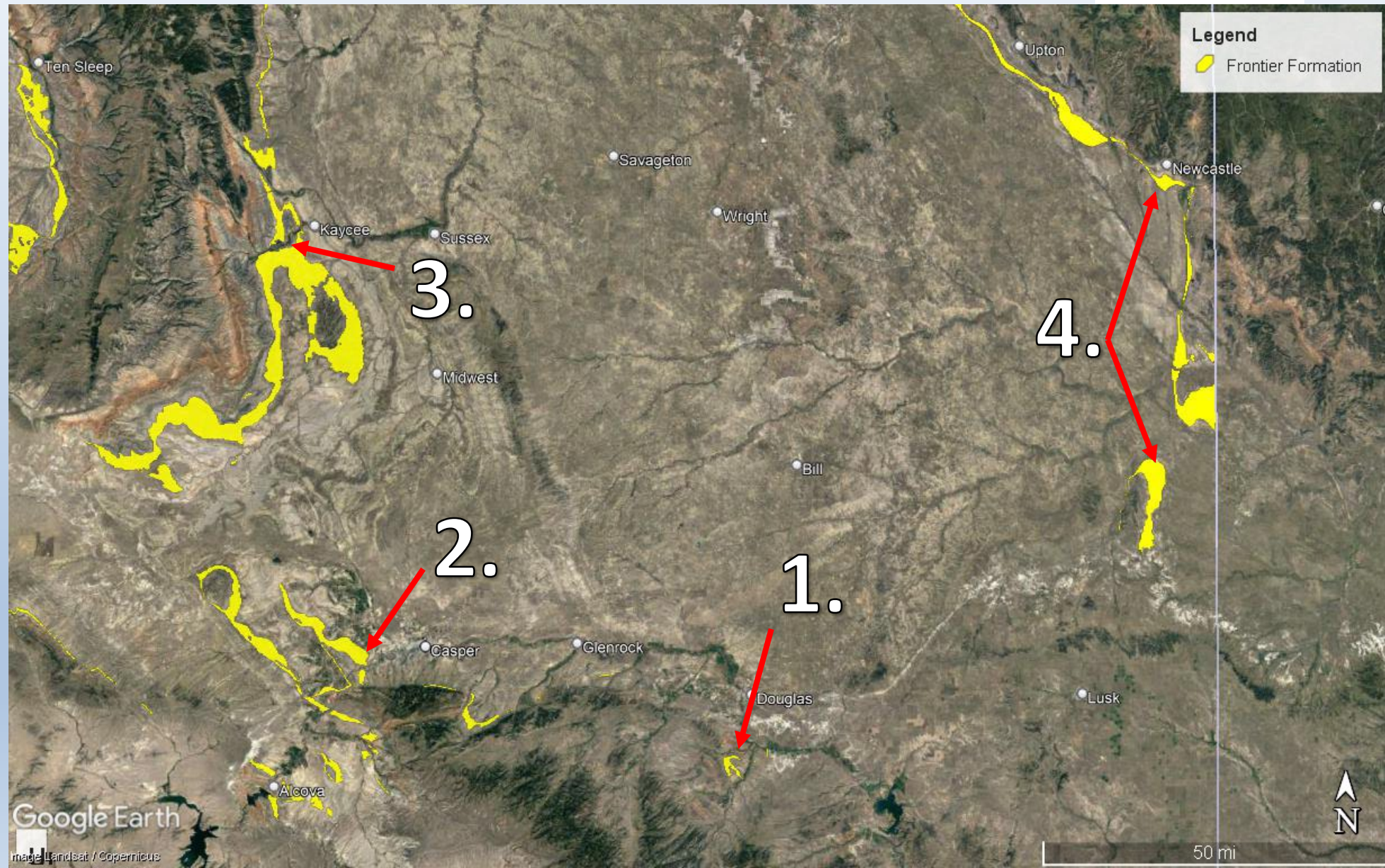
# Sediment Provenance



Gentry et al., 2018



# Research Roadmap





# Research Roadmap

79 cores found for query: state: WY, county: NATRONA, WY, formation: WALL CREEK  
Showing all records.

[Refine Search](#)
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Wellship Number	Township Direction	Range Number	Range Direction	Section	Quarter	Library Number	API Number	Operator	Well Name	Field	Type	State	County	Photos	Thin Section	Analysis	Latitude	Longitude	Coord. Source	Security Flag	Formation	Age	Min Depth	Max Depth
39	N	78	W	21	NESW	A795	4902510392	FENIX & SCISSON	36-A-21	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	YES	43.33239	-106.2251	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2779	2825		
39	N	78	W	33	NESW	A959	4902510270	FENIX & SCISSON	AX 33 NPR #3 45AX33	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.30493	-106.22357	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK 2	CRET 3100	3133		
39	N	78	W	34		A960	4902510371	FENIX & SCISSON	21-A-34 NPR	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.31265	-106.2077	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2909	2964		
40	N	78	W	32	SWNNW	B010	4902520596	AMOCO PRODUCTION	17WC2 NW32 LOU	SALT CREEK	SLABBED WY	NATRONA	YES	no	no	43.39678	-106.25087	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2465	2547		
40	N	79	W	22	SE	B027	4902520484	AMOCO PRODUCTION	37WC2 SE22 LOU	SALT CREEK	SLABBED WY	NATRONA	YES	no	no	43.41541	-106.31757	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1864	1966		
35	N	77	W	21	NENE	B199	4902505924	GENERAL PETROLEUM	42-21 GOVERNMENT	COLE CREEK	SLABBED WY	NATRONA	YES	no	no	42.99276	-106.09387	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 6771	6773		
35	N	77	W	21	NENE	B199	4902505924	GENERAL PETROLEUM	42-21 GOVERNMENT	COLE CREEK	SLABBED WY	NATRONA	YES	no	no	42.99276	-106.09387	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 6827	6857		
40	N	79	W	35	SWNNW	T291	4902520409	AMOCO PRODUCTION	9 WC1 NW 35	SALT CREEK	FULL WY	WY	NATRONA	no	no	no	43.39175	-106.30644	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK 1	CRET 972	1082	
39	N	79	W	12	NENE	T341		PACIFIC ENTERPRISES	12-100	SALT CREEK SOUTH	FULL WY	WY	NATRONA	YES	no	no	43.36874	-106.27352	CENTER OF QUARTER SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK 2	CRET 2031	2092	
40	N	78	W	19	SWNW	B701	4902520874	AMOCO PRODUCTION	30 WC2 NW19	SALT CREEK	SLABBED WY	NATRONA	YES	no	no	43.42347	-106.28964	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2055	2152		
35	N	77	W	21	NWSW	D494	4902509756	GENERAL PETROLEUM	F51-21 G GOVT	COLE CREEK	SLABBED WY	NATRONA	no	YES	YES	42.99505	-106.10134	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 6735	6745		
40	N	79	W	23	A362			PAN AM PETROLEUM	22WC1		SLABBED WY	NATRONA	YES	YES	no	43.4209	-106.30084	CENTER OF SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 985	998		
40	N	78	W	30	SWSW	A881	4902520558	AMOCO PRODUCTION	28WC2 SW30 LOU	SALT CREEK	SLABBED WY	NATRONA	YES	YES	no	43.40129	-106.2877	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1933	2030		
38	N	78	W	11	SWSW	A935	4902510435	FENIX & SCISSON	28-A-11	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.27162	-106.18791	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 3110	3163		
38	N	78	W	10	SWNW	A942	4902510399	FENIX & SCISSON	23-A-10	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.28031	-106.2075	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 3156	3217		
39	N	78	W	33	A945		4902510360	FENIX & SCISSON	57-A-33 NPR-3	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.30179	-106.22002	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 3112	3146		
38	N	78	W	15	SWNE	A952	4902510264	FENIX & SCISSON	53-AX-15	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.26543	-106.19969	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 3174	3233		
40	N	79	W	25	SENW	A518		PAN AM PETROLEUM	22WC1		SLABBED WY	NATRONA	YES	no	no	43.40833	-106.2836	CENTER OF QUARTER SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1070	1187		
38	N	78	W	15	NWNE	A292	4902510411	FENIX & SCISSON	52AX15 NPR #3	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.26807	-106.20032	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 3048	3100		
38	N	78	W	4	A301		4902510352	FENIX & SCISSON	85-AX-4 NPR	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.29085	-106.21165	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 3103	3173		
40	N	79	W	23	A362			PAN AM PETROLEUM	22WC1		SLABBED WY	NATRONA	YES	YES	no	43.4209	-106.30084	CENTER OF SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1001	1102		
40	N	78	W	30	SWSW	A881	4902520558	AMOCO PRODUCTION	28WC2 SW30 LOU	SALT CREEK	SLABBED WY	NATRONA	YES	YES	no	43.40129	-106.2877	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1529	1675		
39	N	78	W	27	SWNW	A931	4902510428	FENIX & SCISSON	14-A-27	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.32252	-106.20989	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 3007	3050		
38	N	78	W	10	NESE	A934	4902510400	FENIX & SCISSON	85-AX-10	TEAPOT DOME	SLABBED WY	NATRONA	YES	YES	no	43.27618	-106.192	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK 2	CRET 2993	3050		
39	N	78	W	29	A936			FENIX & SCISSON	77-DX-29	TEAPOT DOME	SLABBED WY	NATRONA	YES	YES	no	43.32033	-106.24115	CENTER OF SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK 2	CRET 3003	3050		
39	N	78	W	29	A936			FENIX & SCISSON	77-DX-29	TEAPOT DOME	SLABBED WY	NATRONA	YES	YES	no	43.32033	-106.24115	CENTER OF SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK 2	CRET 3003	3050		
39	N	78	W	33	SWNW	A938	4902510375	FENIX & SCISSON	21-AX-33 NPR	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.31161	-106.22827	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK 2	CRET 2907	2973		
39	N	78	W	28	NESE	A940	4902510404	FENIX & SCISSON	85-A-28 NPR#3	TEAPOT DOME	SLABBED WY	NATRONA	YES	YES	no	43.31984	-106.21265	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK 2	CRET 2909	2987		
39	N	78	W	28	SWSW	A941	4902510387	FENIX & SCISSON	27-AX-28	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.31688	-106.22797	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2860	2915		
38	N	78	W	3	SESE	A951	4902510406	FENIX & SCISSON	88-AX-3	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.28557	-106.19304	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2937	2970		
39	N	79	W	12	NWNE	D757	4902521223	TERRA RESOURCES	12-83 TRACT 4	SALT CREEK	SLABBED WY	NATRONA	YES	YES	no	43.36926	-106.27638	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK 2	CRET 2030	2080		
40	N	80	W	1	SWSWSE	D803	4902520250	HAWKS COMPANY THE	1 GOVERNMENT	WILDCAT	SLABBED WY	NATRONA	YES	no	no	43.45802	-106.39657	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2252	2299		
38	N	78	W	1	SESE	A951	4902510406	FENIX & SCISSON	88-AX-3	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.28557	-106.19304	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2974	2999		
38	N	77	W	7	NENENE	A436	4902506055	AMERADA HESS CORP	5 UNIT	SAGE SPRING CREEK	SLABBED WY	NATRONA	YES	YES	YES	43.11082	-106.12284	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 6692	6733		
40	N	79	W	13	SW	A437		AMOCO PRODUCTION	12WC2		SLABBED WY	NATRONA	YES	no	no	43.43174	-106.28614	CENTER OF QUARTER SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1815	1908		
40	N	79	W	13	NW	A438		AMOCO PRODUCTION	12WC2		SLABBED WY	NATRONA	YES	no	no	43.43897	-106.28616	CENTER OF QUARTER SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2024	2125		
40	N	78	W	18	SWSW	D651	4902520548	AMOCO PRODUCTION	32-WC2-SW18	SALT CREEK	SLABBED WY	NATRONA	no	no	no	43.42874	-106.28939	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2264	2348		
37	N	78	W	23	SENW	D212	4902506139	AMERADA HESS CORP	48 UNIT	SAGE SPRING CREEK	SLABBED WY	NATRONA	no	no	no	43.16407	-106.18421	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 6507	6547		
39	N	78	W	20	A956		4902510302	FENIX & SCISSON	84-A-20 NPR	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.33588	-106.23258	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2680	2721		
39	N	78	W	33	NESW	A959	4902510270	FENIX & SCISSON	AX 33 NPR #3 45AX33	TEAPOT DOME	SLABBED WY	NATRONA	YES	no	no	43.30493	-106.22357	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK 3	CRET 3355	3370		
39	N	77	W	27	NWSW	S474	4902506122	AMERADA HESS CORP	1 RITCHIE GOVERNMENT	SAGE SPRING CREEK	FULL WY	WY	NATRONA	no	no	43.14637	-106.09069	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 7877	7916		
40	N	78	W	31	NESW	S514	4902520591	AMOCO PRODUCTION	14WC2-SW31 LIGHT OIL	SALT CREEK	FULL WY	NATRONA	no	no	no	43.38911	-106.2648	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1583	1899		
40	N	78	W	30		S521	4902520559	AMOCO PRODUCTION	14WC2-SE30	SALT CREEK	FULL WY	NATRONA	no	no	no	43.40372	-106.25432	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 2360	2445		
40	N	78	W	30		S524		AMOCO PRODUCTION	32WC1 NW31 LOU		FULL WY	NATRONA	no	no	no	43.39246	-106.26148	CENTER OF SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1502	1662		
40	N	79	W	13	SWNW	S528	4902520622	AMOCO PRODUCTION	32WC2 NE13	SALT CREEK	FULL WY	NATRONA	no	no	no	43.4357	-106.28904	FROM STATE RECORDS	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1793	1898		
40	N	79	W	23		S531		PAN AM PETROLEUM	6WC1		FULL WY	WY	NATRONA	no	no	43.4209	-106.30084	CENTER OF SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 998	1115		
40	N	79	W	31		S537		AMOCO PRODUCTION	40WC2 SE34		FULL WY	WY	NATRONA	no	no	43.39125	-106.37926	CENTER OF SECTION	NO SPECIAL RESTRICTIONS	WALL CREEK	CRET 1515	1633		
40	N	79	W	34	SWNE	S538	49025																	

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