OVERVIEW

FORT BELKNAP RESERVATION

Assiniboine and Gros Ventre Tribes

TRIBAL HEADQUARTERS: Fort Belknap Agency, Montana
GEOLOGIC SETTING: Williston Basin

Location and Access

The Fort Belknap Reservation is located in southeast Blaine and western Phillips Counties of north-central Montana. The reservation lands are situated 45 miles east of Harve on State Highways 87 and 191 east of Great Falls. Tribal headquarters are located at the Fort Belknap Agency, four miles east of Harlem. The Bureau of Indian Affairs Area Office is located in Billings.

Topography

Most of the reservation is located on the northern Great Plains. The southeastern portion, however, is located on the flanks of the Little Rocky Mountains. Most of the available acreage is located on the flat, easily accessible plains. Three prominent buttes dominate the western side. These are Twin Buttes, Wild Horse Butte and Snake Butte. Elevations within the reservation range from 2,300 ft. to 5,000 ft. Principal rivers are the Milk River, which forms the northern reservation boundary, White Bear Creek, in the northwestern corner, and the east-flowing South Fork of Peoples Creek, which roughly divides the reservation in half.

Land Ownership

The Fort Belknap Reservation consists of 980 square miles or approximately 627,000 acres, of which, the tribes have mineral interest (BIA Trust Estate) in about 61,000 acres. In addition to the reservation lands, the tribes at Fort Belknap hold mineral interest in 25,5000 acres immediately west of the reservation, referred to as submarginal lands. Approximately 21,000 mineral acres within the boundary of the reservation are under patented-in-fee or state ownership. About 2,000 tribal mineral acres are withdrawn from development activities due to religious significance and 26,800 tribal mineral acres are in the timber reserve. The latter acreage are in the Little Rockies and probably are not of oil and gas interest since Paleozoic rocks outcrop. Available tribal minerals for an oil and gas agreement amount to about 58,000 acres. The Tribal Community Council with BIA concurrence could authorize an agreement for this entire acreage or portions thereof.

Individual Indians (Allottees) have a mineral interest in approximately 535,000 acres although their surface interest is about 400,000 acres. The 1982 Indian Mineral Development Act would allow allottees to join a Tribal Agreement (25 U.S.C. Sec. 210(b)) which equates to possibly upwards of 600,000 available acres.

Allottees normally must have their parcels individually offered in an administered lease sale prior to entering direct negotiations with a company. Therefore this proposal offers a unique opportunity for interested companies and mineral owners alike. The conditions of allottee joinders to a Tribal Agreement will be discussed further in the section entitled Tribal Government and Operating Regulations.

Competitive Negotiations for Mineral Agreements

The Assiniboine and Gros Ventre Tribes of the Fort Belknap Reservation are sincerely interested in working with energy companies and individuals towards the development of the oil and gas resources underlying the reservations. The acquisition of oil or gas prospects through leasing or other agreements, the diligent exploration of prospects generated, and the ultimate production from the wells drilled are three compatible goals for all the parties. The Tribes may be amenable to a variety of arrangements to see that these goals are reached, and feel that competitive solicitations leading to negotiated contracts offers the maximum flexibility to all parties concerned.

Authority to Negotiate Oil and Gas Agreements

The lands described in this Atlas are held in trust by the Bureau of Indian Affairs. Therefore, oil and gas leases must be consummated pursuant to federal regulations. Authority to lease Indian trust lands through a negotiated agreement is provided in the Indian Minerals Development Act of 1982 (P.L. 97-382). However, final regulations implementing the 1982 Act have not been promulgated at this writing. The regulations governing the leasing of Indian lands under the 1938 Mineral Leasing Act can be found in the Code of Federal Regulation, Title 25, Part 211 for tribal lands. The July 12, 1984 edition of the Federal Register has proposed regulations for 25 CFR, Part 225 Oil and Gas Mineral Contracts to encompass the 1982 Indian Mineral Development Act.

Since the enactment of the Indian Mineral Development Act of 1982, tribes have been afforded the opportunity to directly negotiate leases or other contracts (i.e. joint ventures) in contrast to procedures and regulatory minimums imposed by the previous 1938 Minerals Leasing Act. The 1982 Act further provides that individual Indian allottees may join agreements negotiated for tribal lands. The section entitled Operating Regulations discusses the procedures for obtaining allottee participance in the negotiated agreement.

Principal components for the formal corporate proposal should include the area(s) of interest, type of contract, elaboration of proposed agreement terms, points of potential negotiation, diligence commitments (i.e. drilling), bonus considerations, acreage relinquishments, tribal employment or training, etc. Also, an interested company or individual should provide evidence of experience and ability to meet financial or diligence commitments.

Joinder Agreement For Individual Indians

Pursuant to the 1982 Indian Minerals Development Act, Indian allottees may join a tribal negotiated agreement. The Fort Belknap Community Council plan to solicit allottee interest once negotiations are underway to minimize company curative land acquisition.

The BIA Area Office in Billings is currently developing an administrative process to streamline this effort and yet protect their trustee interest. A joinder agreement was reviewed by the BIA Solicitor's Office in 1984. At that time the Solicitor concluded "-- we see no reason why this agreement would not comply with all legal requirements." The 1982 Act provides for two legal requirements for allottees to join a tribal mineral agreement:

(1) all parties must consent

(2) the Secretary must find that it is in the best interest of the individual to participate

The Secretary must evaluate within 180 days to approve or disapprove the terms of any agreement regardless of allottee participation.

Requirement for Environmental Assessment

A negotiated contract pursuant to the Indian Mineral Development Act will require an Environmental Assessment (EA) for the area under consideration for oil and gas exploration and development activities. Generally the BIA requires the company to prepare this documentation which can equate to delays in the final review and approval process of the negotiated contract. Numerous previous investigations exist that relate to the needed components of the EA. The tribes and CERT are in the process of assembling these reference studies for use by the company and the BIA. Additionally, the tribes have requested that BIA initiate or fund the duration of this study to expedite the final approval process. For the initial submittal, the company need not concern themselves with the baseline data acquisition but should give the tribe some idea about a plan of operations and precautions that will be taken to insure environmental protection and mitigation of damages to flora, fauna, air, water and property.

Operational Regulations

Tribal Government

Fort Belknap Indian Reservation, the home of the Gros Ventre and Assiniboine Tribes, was created by treaty on October 17, 1885 and by an Act of Congress on May 1, 1888. The business and governmental affairs of Fort Belknap are conducted under the authority of a constitution and bylaws ratified by members of the Tribes on October 19, 1935, and approved by the Secretary of the Interior on December 13, 1935, pursuant to the Indian Reorganization Act of 1934. Subsequently, a corporate charter for the Fort Belknap Indian Community was ratified by members of the Community on August 25, 1937.

The principal decision-making body for the Reservation is the Fort Belknap Community Council, consisting of six Assiniboine and six Gros Ventre members.

Each council member serves for a four year term. Every two years, each of the three voting districts--Milk River and Lodge Pole elect an Assiniboine and a Gros Ventre member to the Council. On the first Monday in January following each election, a president, vice-president and secretary/treasurer are elected from within the twelve council members. Council officers serve for a period of two years. Any council member or officer may serve as long as he/she is re-elected to office.

The Tribal President appoints standing committees which meet monthly as needed. Negotiation for an oil and gas agreement would be conducted by the Tribal Community Committee. Any oil and gas development agreement would have to receive final approval from the Tribal Council.

Operating Regulations

The reservation lands available for oil and gas leasing or other types of mineral agreements are largely allotted lands (86.5%) with the Tribes holding mineral rights to 9.8% of the reservation lands and all of the submarginal lands. Therefore, the governmental authorities for the disposition of the contracts will be the tribal councils, allottees, and the trustee, the Bureau of Indian Affairs, acting on behalf of the Secretary of the Interior. Environmental assessments are currently being prepared by the BIA to aid in rapid implementation of a contract after economic analysis and approval by the BIA.

The Tribes have not enacted any specific codes, ordinances, regulations nor mineral taxes relating to oil and gas exploration and development, therefore the chief regulations governing oil and gas activities are those of Title 25 of the Code of Federal Regulations (CFR) Subchapter 1 - Energy & Minerals Part 225 (applicable to P.L. 97-382 CFR), Part 216 (applicable to revenue reporting and payments) and Title 43 CFR Part 3160 (applicable to production reporting and operating procedures).

The Bureau of Indian Affairs Area Offices in Billings, Montana and Aberdeen, South Dakota have entered into a memorandum of understanding with the Montana State Office of the Bureau of Land Management (BLM) whereby BLM will provide certain oil and gas management operations on Indian lands.

CONTACT

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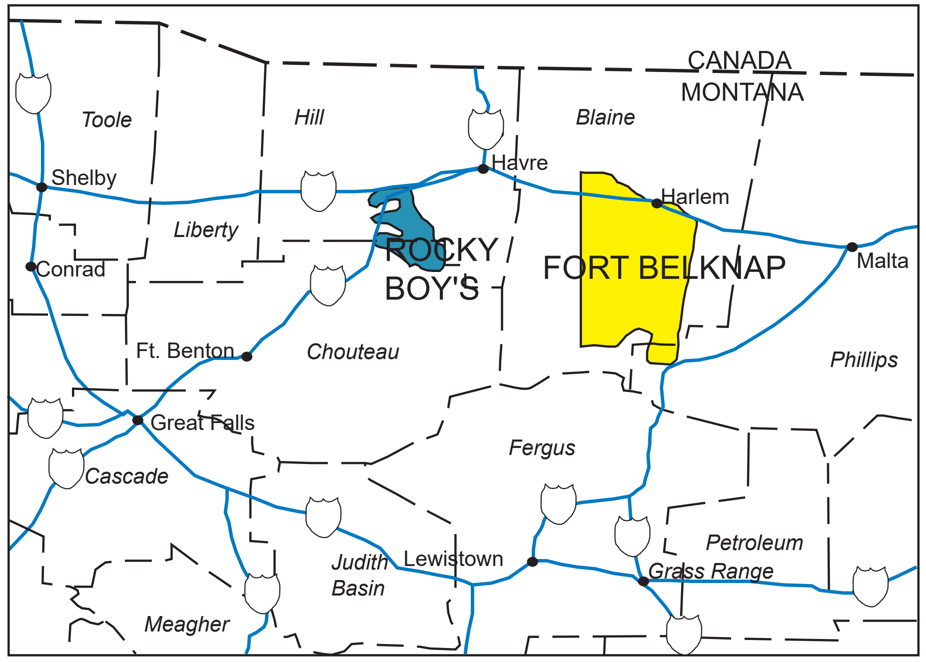


Regional Geology

The Fort Belknap Reservation is situated on the northern flank of the Little Rocky Mountains, an early Tertiary intrusion. The reservation is west of the Bowdoin Dome, east of the Bearpaw Uplift and south of the Hogland Basin (Figure BK-2.1).

The geologic section is represented by Pre-Cambrian metamorphics, Paleozoic carbonates and Jurassic and Cretaceous sandstones. The Paleozoic rocks are mainly dolomites and limestones deposited within the Williston Basin and Alberta Shelf depocenters. Jurassic and Cretaceous rocks vary from continental to marine sandstones and shales.

Most of the reservation is overlain by Quaternary alluvium deposits, Cretaceous Bearpaw shale (high bentonite content) and Judith River sandstones and siltstones.

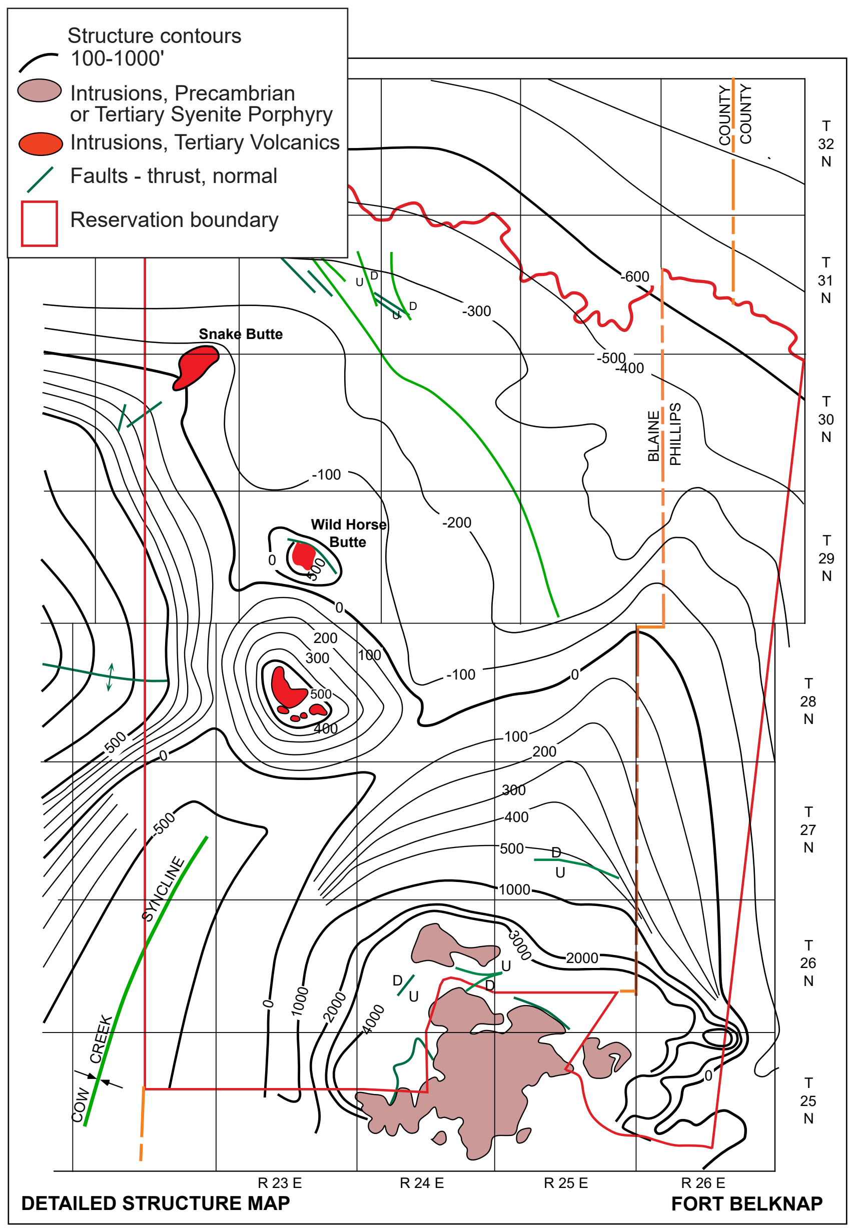


FIGURE BK-2.2. Detailed structure map of Fort Belknap Indian Reservation (after Knechtel, 1959).

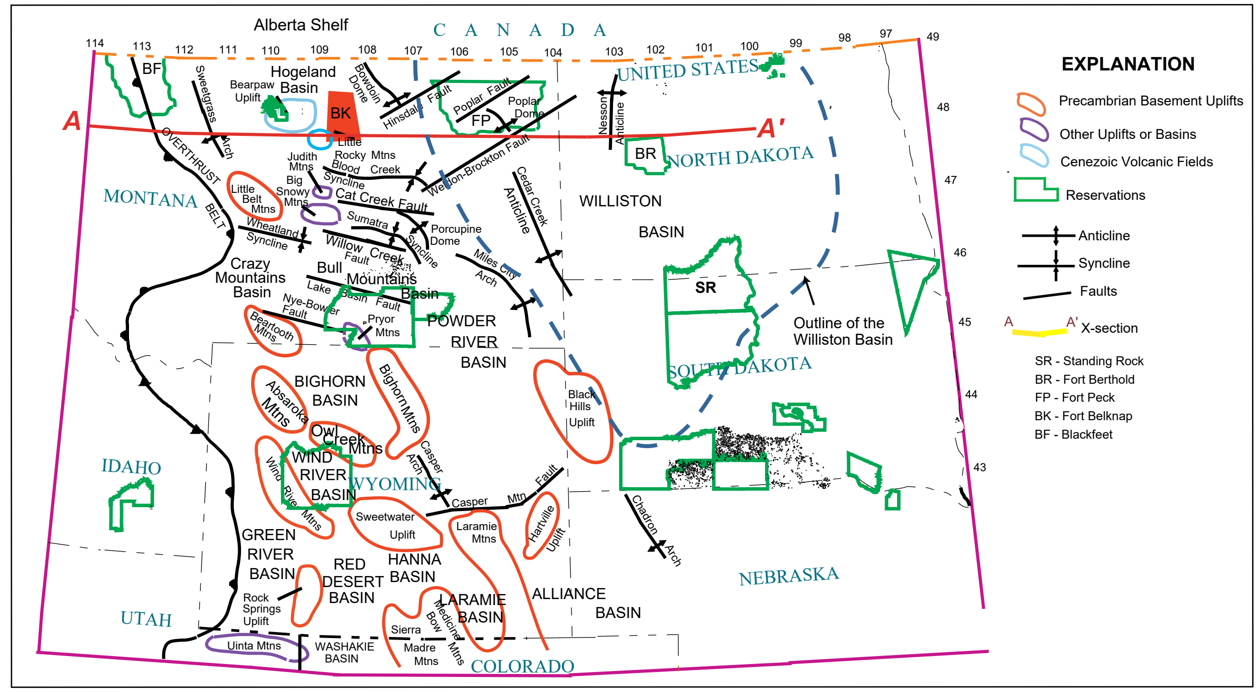


FIGURE BK-2.1. Present day structural features in the Rocky Mountain region (after Peterson, 1987). Cross section is shown on the next page.

Exploration History

Twenty nine wells have been drilled to date on the reservation with minimal commercial success. Fifteen shallow (< 2000') Eagle Sandstone gas wells were drilled in 2007 - 2008. Cumulative production as of 2018 has averaged 20 - 30 MMcf, with the highest at 83 MMcf. All wells have ceased gas production on the reservation since 2012. The deepest well drilled on the reservation was the Ft. Belknap 1-A, which encountered PreCambrian rocks at 7070' and TD'd at 7074 feet.

Structural Geology

The Fort Belknap Reservation is dominated by the Little Rock Mountains of Paleocene-Eocene age. The Little Rocky Mountains are a series of igneous intrusions (Syenite Porphyries) that have generated numerous structural domes (over 50) of various sizes (see detailed structure map). Several domes have been breached by erosion and expose the igneous core. Others have Paleozoic rocks exposed at the surface. Dips within the complex area are steeply tilted to vertical. Dip decreases away from the dome to about 80 feet/mile.

The southern end consists of several domes, averaging two to three miles in diameter. Small intrusions are present on the western edge of the reservation (Snake Butte, Wild Horse Butte) (Figure BK-2.2).

The Bearpaw Uplift, located west of the reservation, is also Tertiary in age and consists of a series of intrusions and complex thrust and normal faults. As the Bearpaw intrusion was emplaced, the paleo gas field that existed in the Cretaceous sands was broken, carried by landslides into downdip positions. The Bearpaws contain large, shallow gas fields trapped in these "landslide" fault blocks.

Rocks in the northern part of the reservation gently dip to the north-northeast, although a major thrust fault (present at the surface) trends northwest to southeast. Its orientation suggests it is related to the fault systems that were created during the Bearpaw intrusive episode. Smaller folds and faults have been identified from surface geology.

Most Likely Hydrocarbon Zones

Based on current gas shows and regional hydrocarbon production (Figure BK-2.3), regional cross-sections and depositional maps, the most likely plays to develop on the Fort Belknap Reservation are:

1) Cretaceous rocks-Upper Cretaceous section is very thick; gas shows and production; high potential for additional Eagle sand biogenic gas accumulations.
2) Cretaceous rocks-discontinuous reservoir rocks encased within marine shales; Bowdoin, Virgelle sandstones and Greenhorn Limestone. Biogenic gas accumulations are possible.
3) Jurassic and Lower Cretaceous rocks-no shows reported, but lack of well control does not preclude biogenic gas potential.

Note: Paleozoic rocks are not considered prospective due to exposure at the surface in the Little Rocky Mountains at the south end of the reservation. Those rocks are open to the atmosphere and would be charged with fresh water. The Mission Canyon Limestone is cavernous where exposed, and is an excellent aquifer. Other Paleozoic units penetrated by well control have been found to be wet.

PRODUCING HORIZON LEGEND

= Oil = Gas S = Source Rock

ERA	SYSTEM	SERIES		WILLISTON BASIN	POWDER RIVER BASIN	WESTERN WYOMING SOUTHERN MONTANA	WESTERN & NORTHERN MONTANA
CENOZOIC	TERTIARY			Fort Union	White River Wasatch Fort Union	Green River Wind River Wasatch Fort Union	Fort Union
MESOZOIC	CRETACEOUS	UPPER		Fox Hills Judith River Eagle Niobrara Greenhorn	Lance Teckla Mesaverde Teapot Parkman Sussex Shannon Niobrara Frontier	Lance Fox Hills Mesaverde Cody Shannon Niobrara Frontier	Hell Creek Judith River Claggett Eagle Telegraph Creek Niobrara Greenhorn Frontier BIOGENIC
		LOWER		Dakota Group	Mowry Muddy Dakota Fall River Lakota	Mowry Muddy Bear River Dakota Cloverly	Blackleaf Bow Island S Kootenai Cat Creek Moulton Sunburst S Cut Bank
	JURASSIC			Morrison Ellis Group Swift Reirdon Piper Nesson	Morrison Sundance Canyon Springs Gypsum Spring	Gannet Morrison Sundance Stump-Preuss Twin Creek	Morrison Ellis Group Swift Reirdon Sawtooth
	TRIASSIC			Spearfish	Chugwater Spearfish	Nugget Chugwater Ankareh Thaynes Woodside	
PALEOZOIC	PERMIAN			Minnekahta Opeche	Goose Egg	Dinwoody Phosphoria Park City	
	PENNSYLVANIAN			Minnelusa Amsden Tyler	Minnelusa	Weber Tensleep Amsden Darwin	Amsden Tyler S
	MISSISSIPPIAN			Big Snowy Group Heath Otter Kibbey Madison Group Charles Mission Canyon Lodgepole	Madison Englewood	Madison Mission Canyon Lodgepole	Big Snowy Group Heath Otter Kibbey Madison Group Sun River Charles Mission Canyon Lodgepole
	DEVONIAN			Bakken Three Forks Nisku Duperow Souris River Dawson Bay Winnipegosis	Jefferson	Jefferson Darby	Three Forks S Nisku Duperow Souris River
	SILURIAN			Interlake	Interlake		
	ORDOVICIAN			Stonewall Stony Mountain Red River	Big Horn Winnipeg	Big Horn	Red River
	CAMBRIAN			Winnipeg Deadwood	Deadwood	Gallatin Gros Ventre Flathead	Emerson Flathead

FIGURE BK-2.3. Detailed stratigraphic column of Fort Belknap area (after Peterson et al, 1987).

GEOLOGIC HISTORY

One generalized structural cross-section (see cross-section A-A') has been constructed to summarize present day tectonic provinces and older paleostructure. The cross-section uses rock thickness values from each of the geologic periods. Section A runs along the 48 degree north latitude line and values were selected at one degree longitude intervals. The western end of the section, near the Blackfeet Reservation is dominated by high relief (greater than 5000 feet). The Cretaceous and older Paleozoic section is about 11,000 feet thick. Major basement uplifts, such as the Sweetgrass Arch and the Bearpaw Uplift, influenced sedimentation throughout geologic time.

The eastern side of the cross-section is dominated by the Williston Basin, a stable cratonic depocenter which contains more than 15,000 feet of sediments. The center part of the illustration is influenced by the Bearpaw Uplift and the Little Rocky Mountains Tertiary intrusions. The southern end of the reservation is located on the Little Rocky Mountain intrusion.

To better illustrate the geologic history of the region, which has been influenced by all of these tectonic provinces, a series of paleo cross-sections are shown. Each section summarizes a particular time interval; Cambrian and older rocks, Ordovician to Triassic and Cretaceous to Jurassic (Figures BK-3.1 & 3.2). Since Tertiary sediments are present only in the Williston Basin, no paleostructure section of these sediments is shown.

A paleo cross-section attempts to show what the subsurface geology may have looked like within that time interval. For the sake of space, only the particular interval is shown; no rocks older than it are illustrated. The rock units above the interval have not yet been deposited; the top of the section is the datum. The datum is flat, representing the paleo ground surface.

Cambrian and Older Rocks

The oldest rocks exposed at the Fort Belknap Reservation are Pre-Cambrian metamorphosed sedimentary and igneous rocks. These rocks are mainly biotite schist and gneiss. Some metavolcanics comprised of hornblende gneiss and amphibolite are present.

During Cambrian time, a major seaway existed in western Montana and eastern Idaho. This seaway gradually transgressed from west to east across eastern Montana and the Dakotas. The major source of coarse-grained clastics was to the east (from the Sioux Arch) and graded into shales and limestones to the west. Thickness of the Cambrian rocks varies from over 2000 feet thick in the Montana Disturbed Belt to less than 100 feet thick at the eastern edge of the Williston Basin (Figure BK-3.3). Cambrian rocks at the Fort Belknap Reservation are represented by the Flathead Sandstone and are about 1000 to 1100 feet thick. There is no evidence that any major structural features existed during Cambrian time in this area.

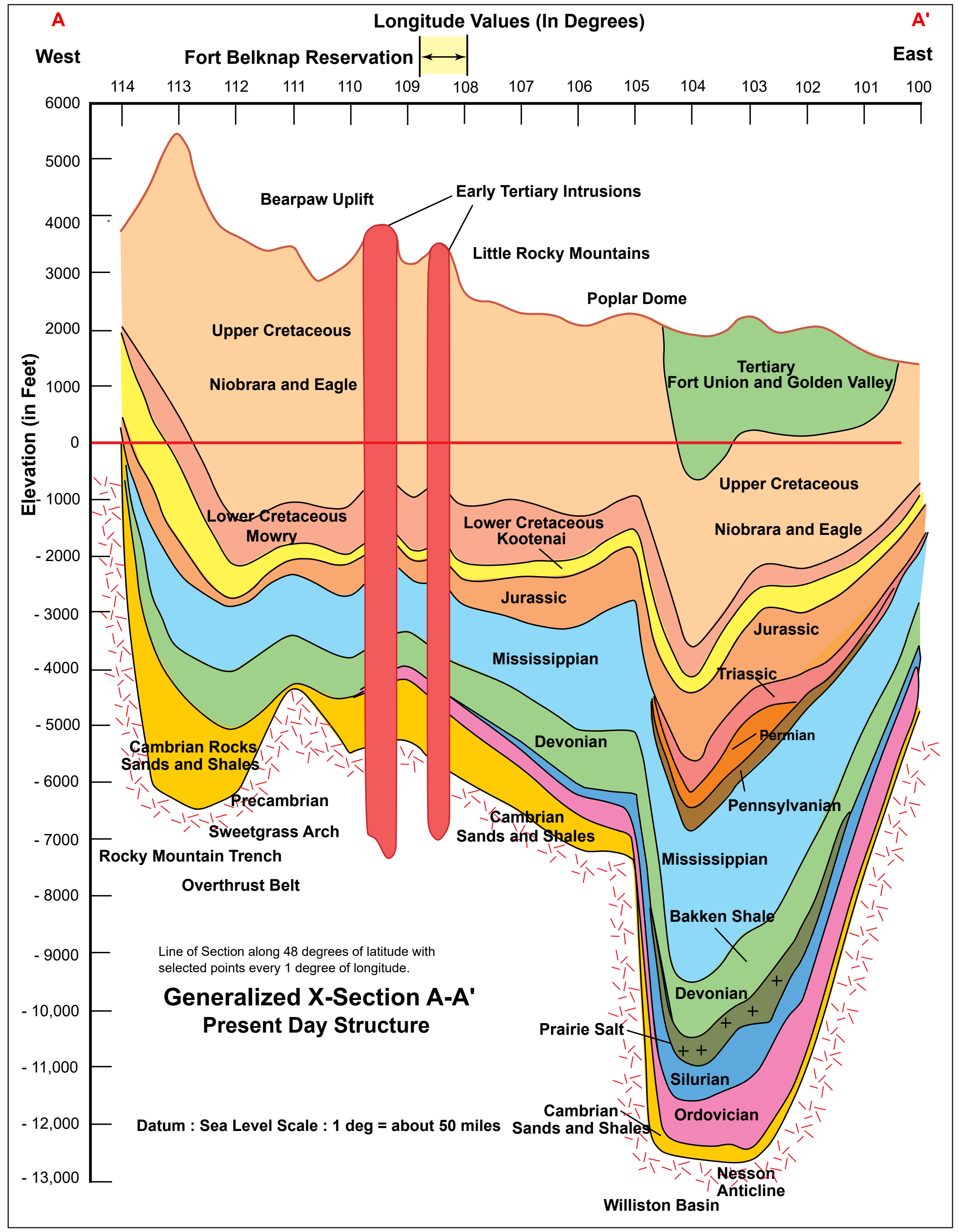


FIGURE BK-3.1. Generalized cross-section A-A'.

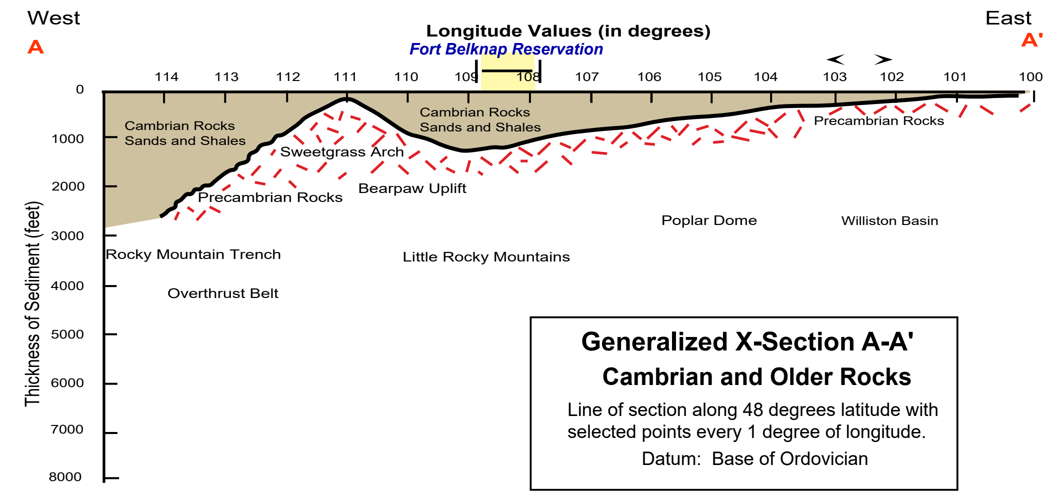


FIGURE BK-3.2. Generalized time-interval (flattened) cross-section for Cambrian and older rocks along line of section A-A'.

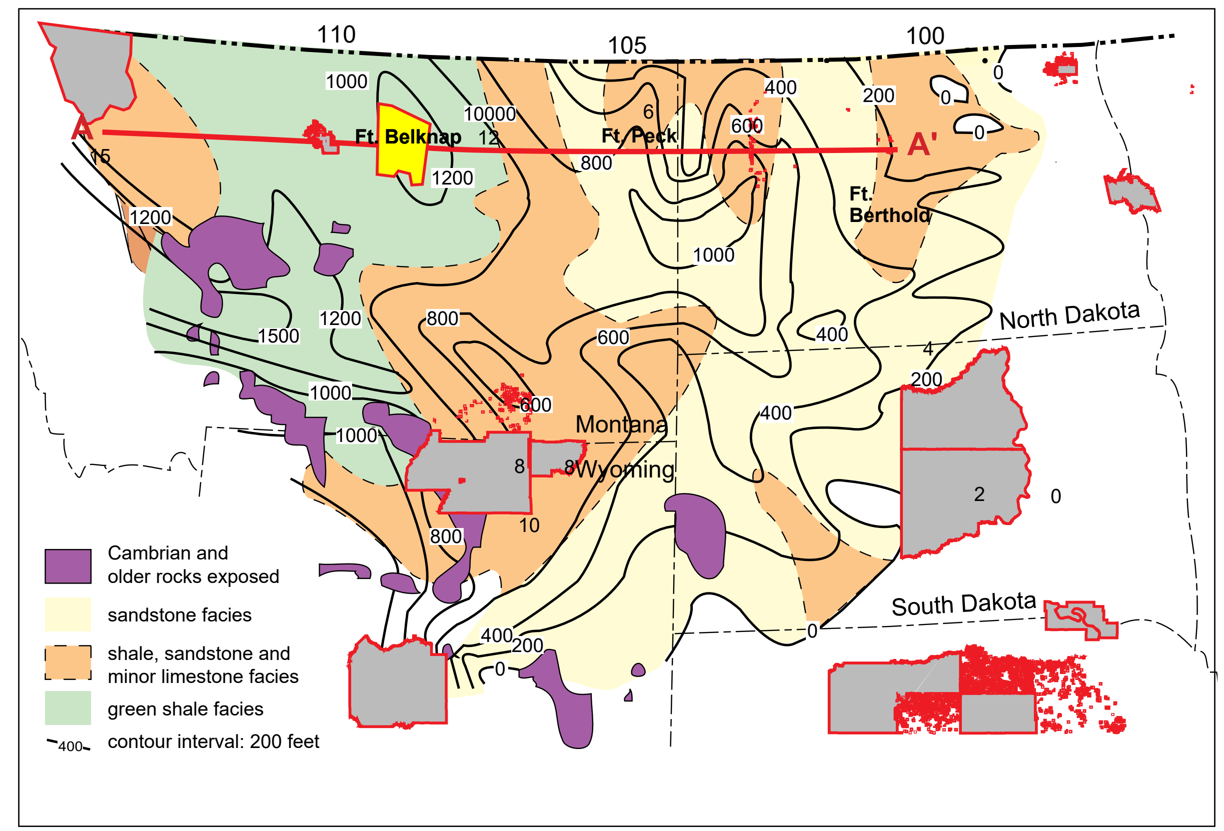


FIGURE BK-3.3 Thickness in hundreds of feet and rock facies map of Deadwood Formation or equivalent rocks (Cambrian and Lower Ordovician).

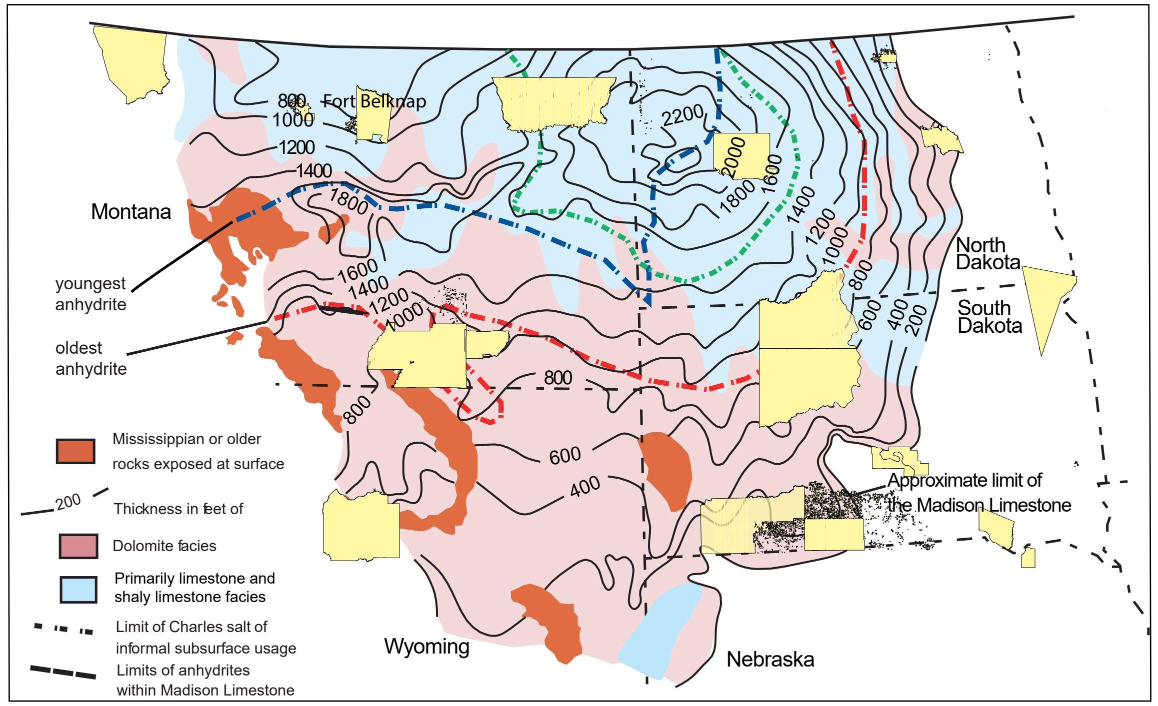


Figure BK-4.1. Thickness in feet and generalized rock facies of the Madison group (Mississippian) and equivalent rocks (modified after Peterson, 1987).

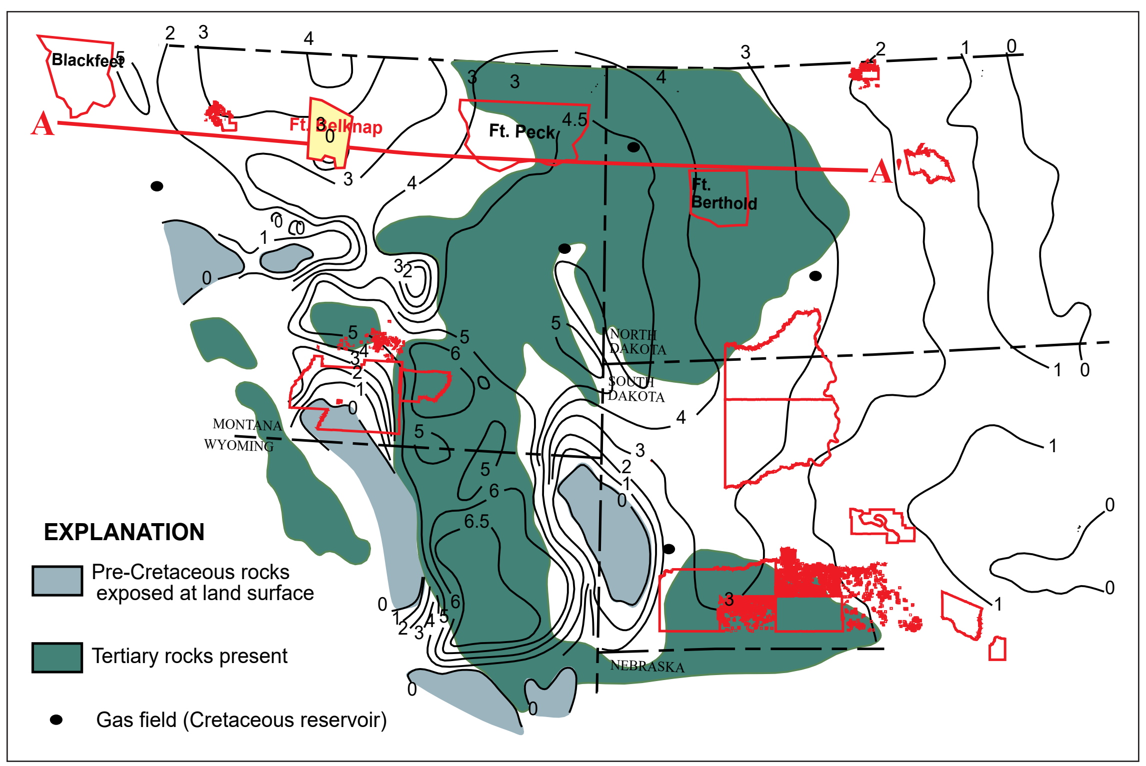


Figure BK-4.3. Thickness of Cretaceous rocks in thousands of feet, showing areas where Tertiary rocks are present. Gas fields producing from Cretaceous sandstones are outlined (modified after McGookey et al.

Ordovician to Mississippian Rocks

From late Cambrian through most of the Paleozoic, the Williston Basin, which is located on the east side of cross-section A-A' (Figures BK-4.1 and BK-4.2), has been a stable, shallow marine shelf through most of the Paleozoic Era. Ordovician and Silurian rocks were deposited in a tidal flat environment with alternating cycles of limestone/dolomite, marine shales and evaporites. At the end of Silurian time, a regional unconformity extended across the Williston Basin and to the west. Present thickness of Ordovician rocks on the Fort Belknap Reservation are from 120 to 300 feet. The Silurian is not present (either having never been deposited or having been completely eroded).

Devonian deposition was similar to that in Ordovician time. Within the reservation boundaries, these rocks are about 600 to 1100 feet thick, thickening northward, and include the Jefferson Group (possible Duperow rocks) and the Three Forks Shale.

Mississippian rocks thicken southward towards the Big Snowy Trough. Included within the Mississippian are the Lodgepole Limestone and the Mission Canyon Limestone. The Mission Canyon is coarse grained with numerous solution cavities at the top of the unit. Total thickness of Mississippian rocks varies within the reservation boundaries from about 700 to 1100 feet.

A major unconformity at the end of Mississippian time led to widespread erosion and karstification. Pennsylvanian sediments are confined to the center of the Williston Basin and central Montana south of the reservation, in the Big Snowy Trough. No Pennsylvanian, Permian or Triassic rocks are present at Fort Belknap.

Jurassic to Cretaceous Rocks

In Jurassic time, the Williston Basin was still the major depocenter for clastic and marine carbonate/evaporite sediments. Thickness of Jurassic rocks is estimated to be about 400 to 700 feet, thickening northward into the Hogeland Basin (Figure BK-4.4).

Early Cretaceous rocks (Lower Kootenai) are about 150 to 300 feet thick at the reservation. The early lower Cretaceous is thought to have been a time of continental to nearshore deposits. Source area for these deposits (i.e., Lakota Formation) is thought to have been to the southwest in Montana and northern Wyoming.

The late, Early Cretaceous rocks (Colorado Group-Mowry/Skull Creek) are about 700 to 800 feet thick. These rocks were deposited in a transgressing marine sequence that extended from western Montana eastward into the Dakotas and from Texas into Canada. These rocks are represented by the Thermopolis, Mowry, and Warm Creek Shales. All are impermeable marine shales.

Upper Cretaceous rocks (Montana Group) are from 3500 to 4000 feet thick at Fort Belknap (Figure BK-4.3). These rocks thicken southward into the Rocky Mountain Trough. These units contain the Eagle and Judith River sandstones. The Bearpaw Uplift began to form at this time and created large scale gas traps.

Tertiary and Younger

In early Tertiary time (Paleocene or Eocene), a large mass of syenite porphyry intruded the Precambrian basement rocks forming a dome about 10 miles in diameter. Smaller intrusions formed to the northwest and include, Twin Buttes, Wild Horse Butte and Snake Butte. Erosion has since removed much of the sediment cover, exposing the syenite porphyry core (Figure BK-5.1).

The nearby Bearpaw Uplift was subject to intense igneous activity which produced extrusive deposits (lava flows). Extensive landslides occurred on both the north and south flanks of the uplift. Subsurface well control shows volcanic flows resting on Lower Colorado Shale (Early Upper Cretaceous). The landslides created both normal and thrust faults (at the head and toe of the slides). The displaced gas migrated to these new traps.

By Pliocene (mid-Tertiary) time, erosion had reduced both the Little Rocky Mountains and Bearpaws to low-lying hills. Detrital material extended many miles outward from the uplifts and were reworked as alluvial terraces. Pleistocene glaciation covered most of the reservation, although glaciers never overran the Little Rocky Mountains. After the retreat of the ice, glacial material was dropped, forming hummocky, poorly drained topography.

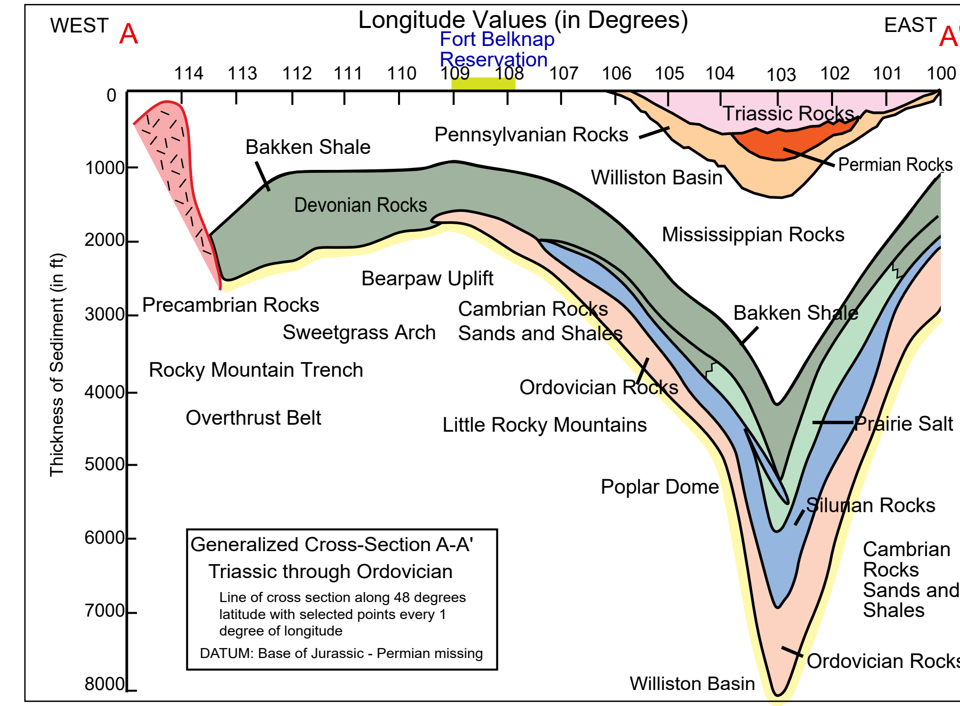


Figure BK-4.2. Generalized time-interval cross-section of Triassic through Ordovician rocks.

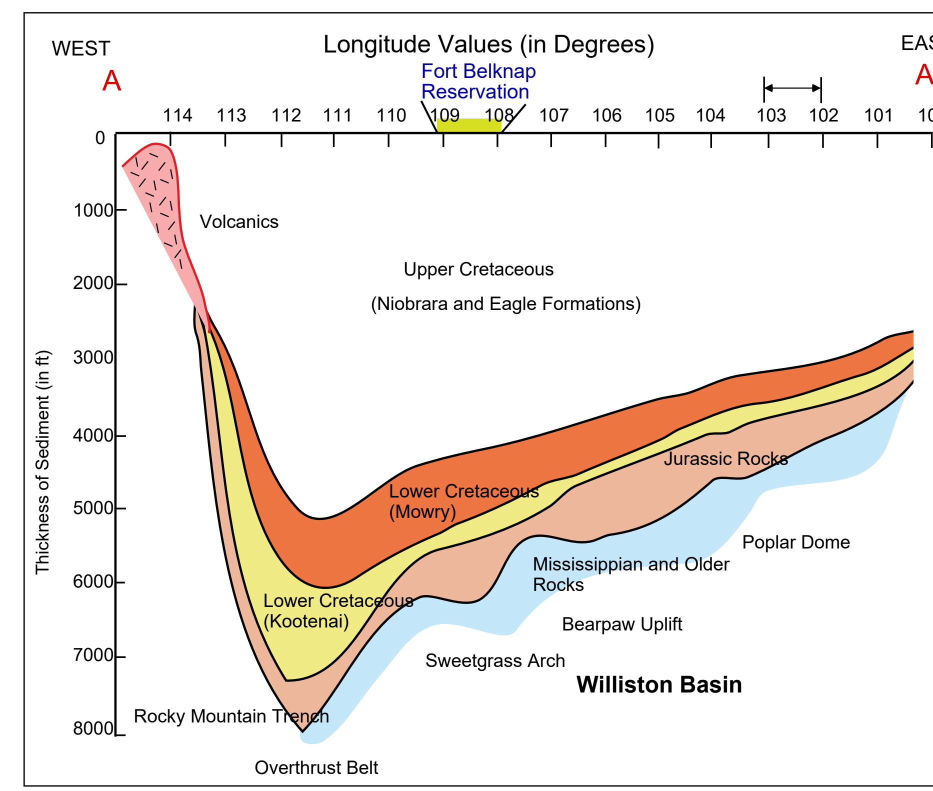
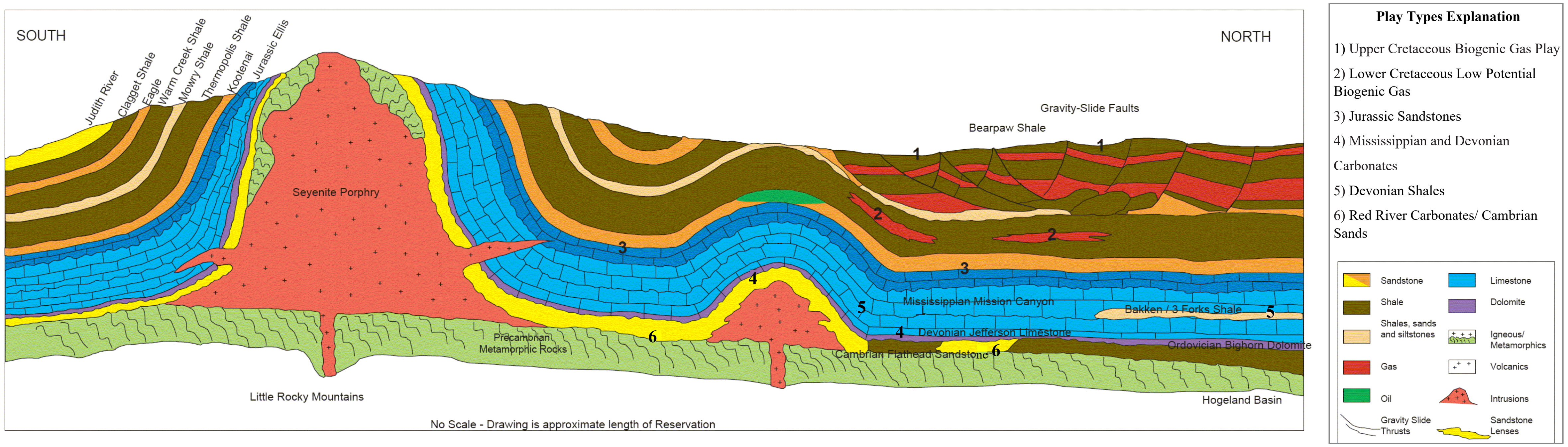


Figure BK-4.4. Generalized time-interval cross-section of Cretaceous and older rocks along A-A' line of section.

Figure BK-5.1. Schematic section through the Little Rocky Mountains, showing the laccolithic intrusion of syenite porphyry and the doming of the sedimentary rocks (after Carleton, 2007). The diagram also shows the play types at Fort Belknap Reservation.



Play summary chart

Reservation:	**Fort Belknap**	**Total Production (by province-1996)**	**No attempt has been made to estimate number of undiscovered fields within the Fort Belknap Indian Reservation.**
Geologic Province:	**North Central Montana**	**North Central Montana**	
Province Area:	**North Central Montana (62,500 sq. miles)**	**Oil: 1,570 MMBO**	
Reservation Area:	**947 sq. miles (606,080 acres)**	**Gas: 5.7 TCFG**	

Play Type	USGS Designation	Description of Play	Oil or Gas	Known Accumulations	Drilling Depths	Favorable factors	Unfavorable factors
1 **Upper Cretaceous Biogenic Gas Play**	2809	Porous and permeable sandstones of Upper Cretaceous age (Eagle and Judith River). Biogenic gas accumulations.	Biogenic Gas	Probably equivalent to accumulations at Tiger Ridge. 3.5 TCF from numerous fields in Province.	700 - 3000 ft	1) gas shows southern end of reservation 2) shallow drilling 3) structures present; domes, faults 4) source rock-self source	1) no production on reservation 2) lack of well control 3) reservoir rock unknown 4) size of accumulation unknown
2 **Lower Cretaceous Low Potential Biogenic Gas**	2808	Stratigraphic traps; discontinuous sands, updip pinchouts. Stratigraphic pinchouts of fluvial and near-shore sandstones in equivalents of the Swift and Kootenai Formations.	Both	534 MMBO 1.3 TCFG (Montana cumulative production)	700 - 3000 ft	1) gas shows north and west of reservation, near Tiger Ridge 2) structures present; domes, faults. 3) source rock/ self source	1) no production on reservation 2) lack of well control 3) reservoir rock unknown 4) size of accumulation unknown
3 **Jurassic Sandstones**	2807	Stratigraphic traps; discontinuous sands, updip pinchouts. Fluvial and nearshore sandstones.	Both	83.5 MMBO 180 BCFG (numbers include Bowes, Sawtooth, Firemoon, Swift, Piper, Sundance, Morrison and Rierdon)	1000 - 4000 ft	1) gas shows north and west of reservation 2) structures present; domes, faults 3) source rock/ self source	1) no production on reservation 2) lack of well control 3) reservoir rock unknown 4) size of accumulation unknown
4 **Mississippian and Devonian Carbonates***	2805	1) Jurassic/Mississippian regional unconformity traps 2) Devonian structural traps	Both	41 MMBO 220 BCFG (numbers include Mississippian Charles, Ratcliff, Mission Canyon, Heath, Midale, Lodgepole, Nisku, Duperow, Dawson Bay and Winnepegosis)	1,300 - 7,000 ft.	1) structures exist; folds, faults, domes 2) reservoir rock exists 3) regionally thermally mature	1) no production on reservation 2) rocks exposed to atmosphere at Little Rocky Mountains: strong hydrodynamic gradient-flushed? 3) deeper well control limited on reservation
5 **Devonian Shales***	2811, 2812	Bakken/Exshaw Shale high organic content, thermally mature; fractured reservoir.	Both	225 MMBO 223 BCFG (numbers from Bakken and Three Forks shales and include portions of the Williston Basin)	5,000 - 10,000 ft.	1) Bakken/Three Forks as a resource play 2) thermally mature 3) structures and flexures exist	1) no existing production within province 2) no Bakken at southern end of reservation 3) deep well control limited
6 **Red River Carbonates/ Cambrian Sands***	2802	Coarse sands trapped as pinchouts or on deeper structures.	Both	638 MMBO 236 BCFG (Montana portion of the Williston Basin only, mostly Red River)	1,700 - 7,000 ft.	1) structures exist; folds, faults, domes 2) reservoir rock known to exist though drilling	1) no existing production within province 2) rocks exposed to atmosphere at Little Rocky Mountains: strong hydrodynamic gradient-flushed? 3) source rock unknown 4) thermal maturity unknown 5) deep well control limited

***Hypothetical Play**

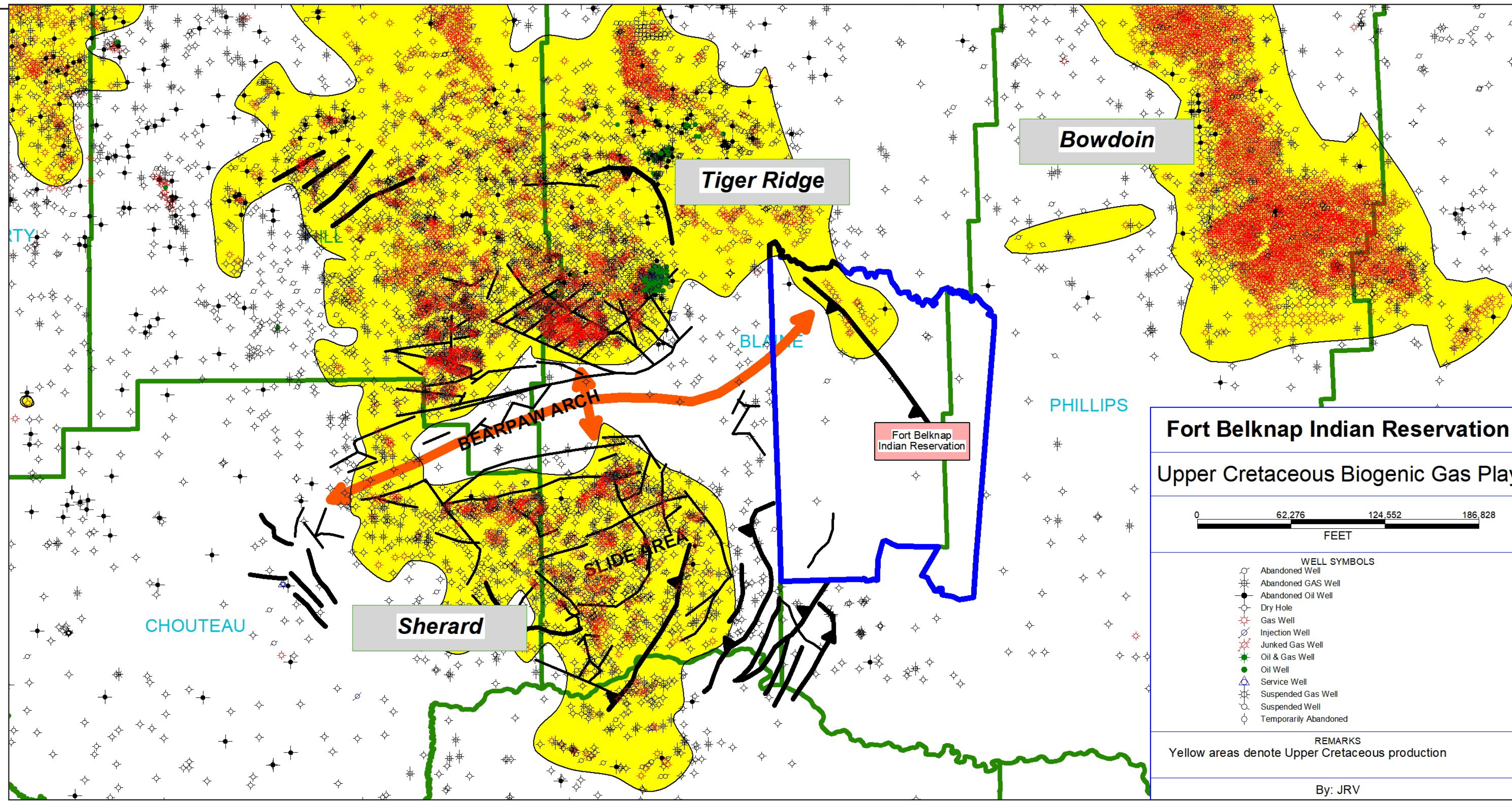


FIGURE BK-6.1. Upper Cretaceous gas producing fields with major faults and structures.

UPPER CRETACEOUS BIOGENIC GAS

GENERAL CHARACTERISTICS: This play is characterized by gravity-slide traps that formed during Tertiary time due to emplacement of igneous intrusions. Biogenic gas is trapped by fault blocks in Eagle and Judith River sandstones. Well control is sparse on the reservation, therefore, reservoir quality is speculative.

Reservoir rock at Tiger Ridge and other nearby fields is a fine to medium grained marine sandstone with porosities of 16-20% and permeabilities ranging from 9.5 to 110 millidarcies. Eagle Sandstone thickness varies from 45 to 150 feet thick (Figure BK-6.2).

The north half of the reservation has surface expressed thrust and normal faults (Figure BK-6.1). Gas shows are present in areas south, west and north of the reservation boundaries. Modest gas production from Eagle Sandstone in the northern part of the reservation.

Analog Fields (Outside reservation)

Bullwacker
Leroy
Tiger Ridge
Havre
Sherard
Bowdoin

Tiger Ridge Field Parameters

Formation:	Upper Cretaceous Eagle Sandstone
Lithology:	Continuous unit of fine to medium grained calcareous, marine sandstone, about 130 ft. thick
Porosity:	16 - 20 percent
Permeability:	No information available
Oil/Gas Column:	No information available
Average Net Pay:	50 feet net thickness
Other formations with shows:	Eagle, Judith River, Niobrara gas shows
Other information:	Published literature suggests that permeabilities are low. Production is dependent on the reservoir being fractured.

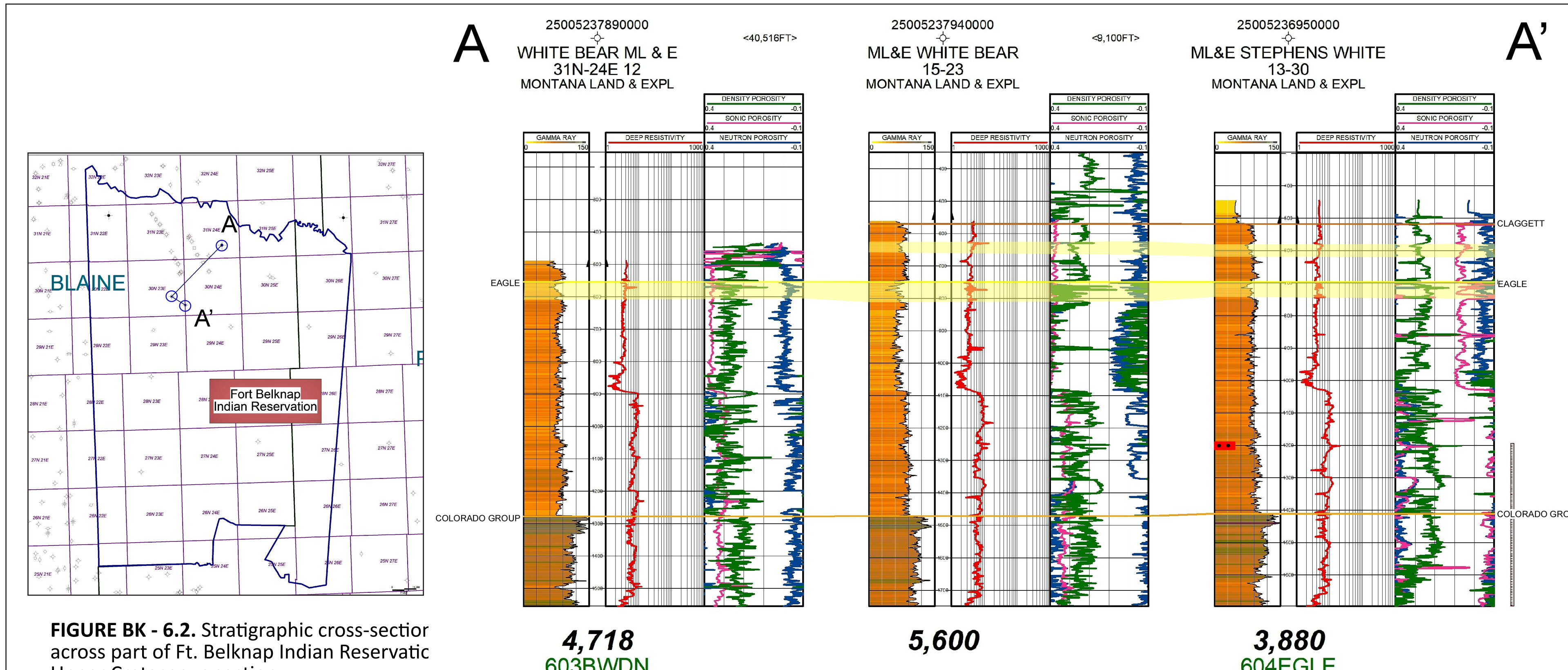


FIGURE BK - 6.2. Stratigraphic cross-section across part of Ft. Belknap Indian Reservatic Upper Cretaceous section.

Lower Cretaceous Low Potential Biogenic Gas Play

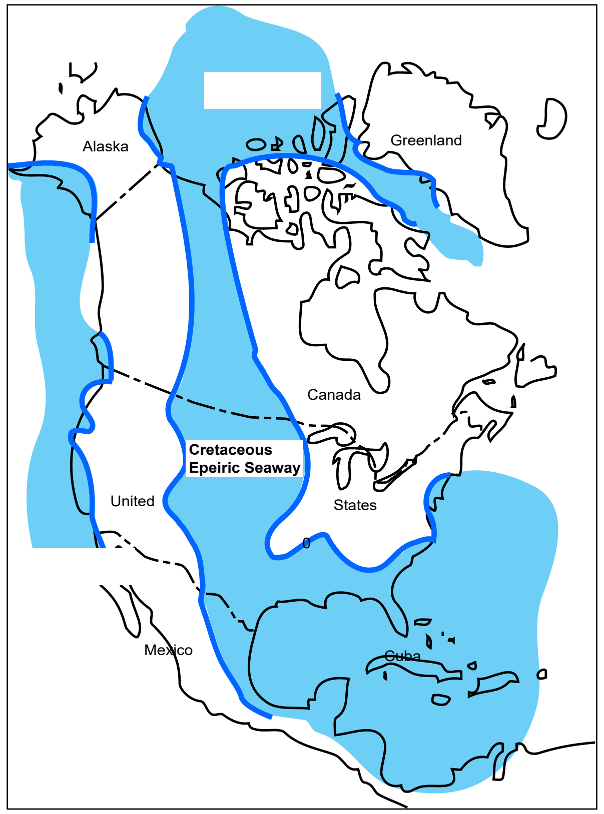


FIGURE BK-7.1. Paleogeographic map of North America during Late Cretaceous time, showing the Cretaceous seaway (after Rice and Shurr, 1980).

GENERAL CHARACTERISTICS: This play is characterized by very fine to fine-grained sandstones and siltstones within the Lower Cretaceous section of the reservation area (Figure BK-7.1 & 7.2). These rocks are equivalent to Dakota, Cutbank, and Sunburst sandstones at Cutbank and Kevin Sunburst Fields on the Sweetgrass Arch. (Figure BK-7.3). Tight gas sandstone production is present in nearby Leroy Field.

Reservoir rocks at Kevin Sunburst Field are fine to medium grained marine sandstones with high porosities and permeabilities. It is assumed that lower porosity and permeability values will be present in the reservation area (Figure BK-7.4). Potential reservoir intervals may be enhanced by location on paleostructures.

Trapping mechanisms could include fault traps, domes and discontinuous sandstone lenses. Potential seal intervals may be sporadic and too porous for efficient gas trapping. The north half of the reservation has surface expressed thrusted and normal faulted horizons. Gas shows from Lower Cretaceous formation tests is shown in Figure BK-7.5. As of 2019, only 10 wells have penetrated this section inside the reservation boundaries. Future additional drilling may prove up gas reserves for this play.

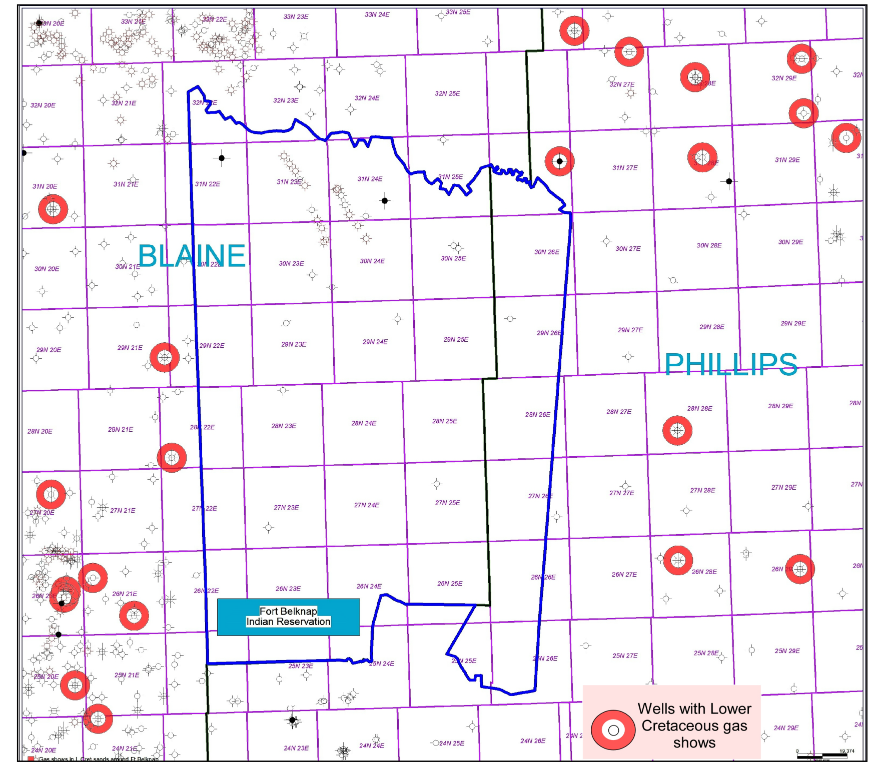


FIGURE BK 7.5. Gas shows from formation tests within the Lower Cretaceous rocks surrounding Fort Belknap Indian Reservation.

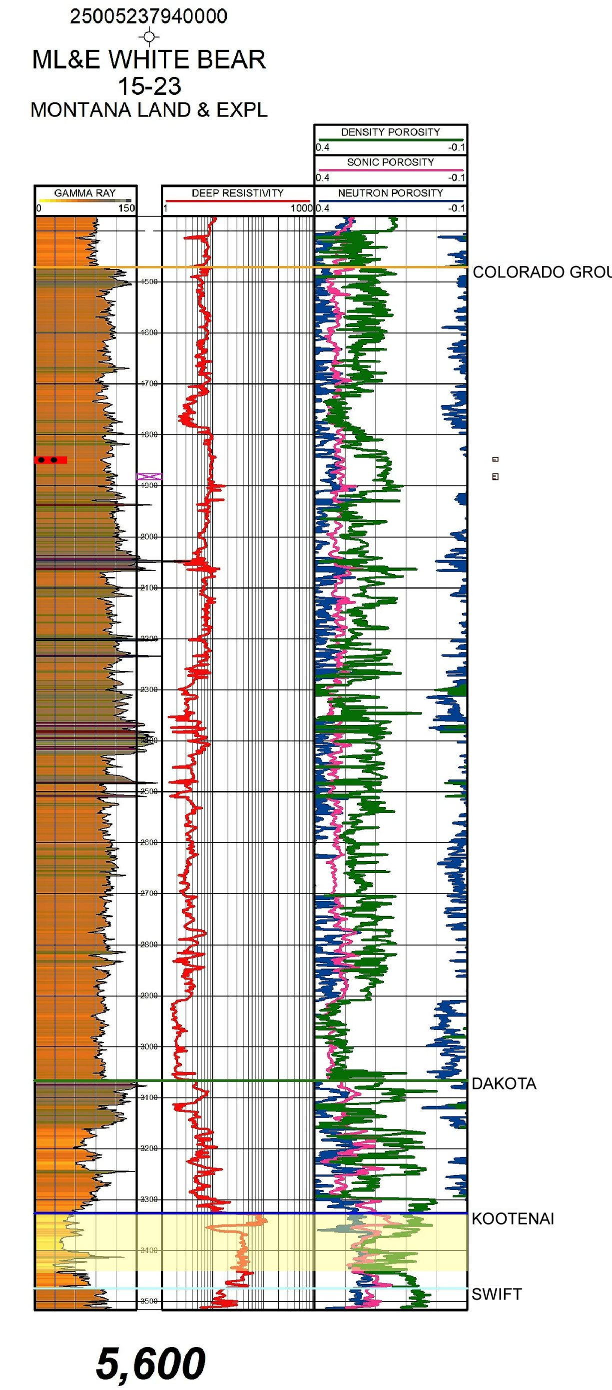


FIGURE BK 7.4. Type log of Lower Cretaceous section within the Fort Belknap Indian Reservation.

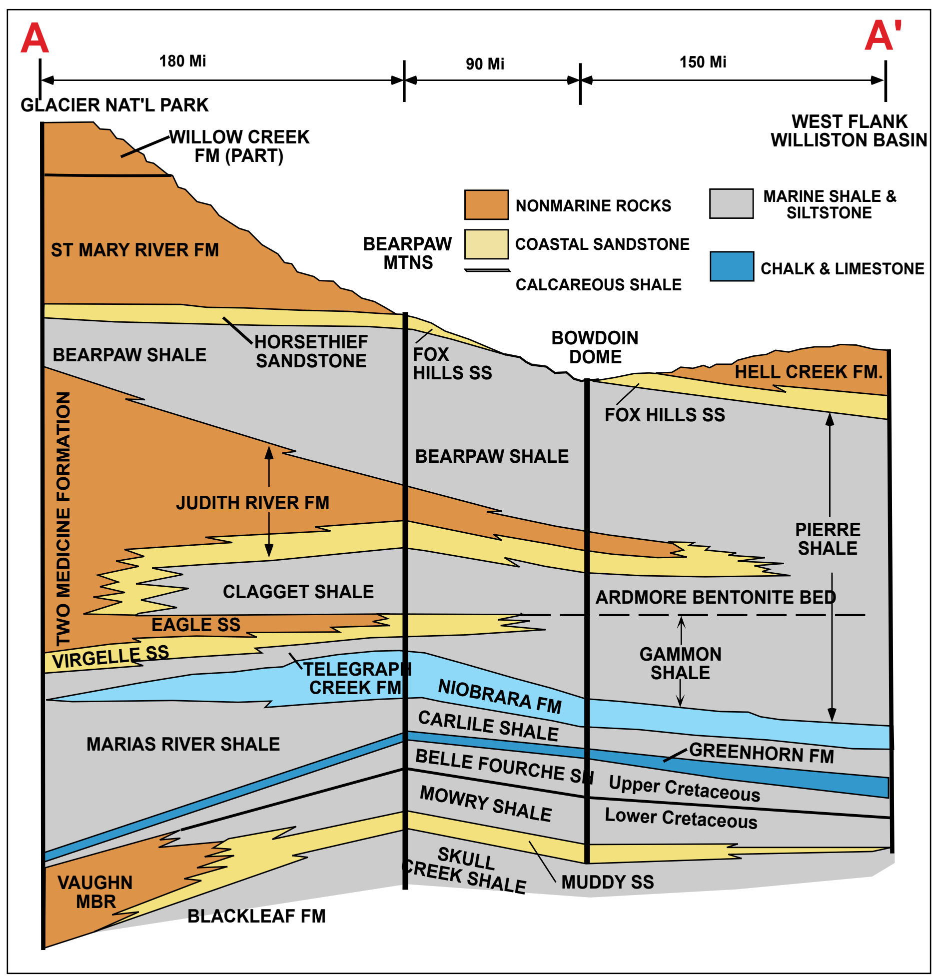


FIGURE BK 7.2. Diagrammatic sequence of selected Cretaceous rocks from Glacier National Park to the west flank of the Williston Basin, Montana (after Rice and Shurr, 1980).

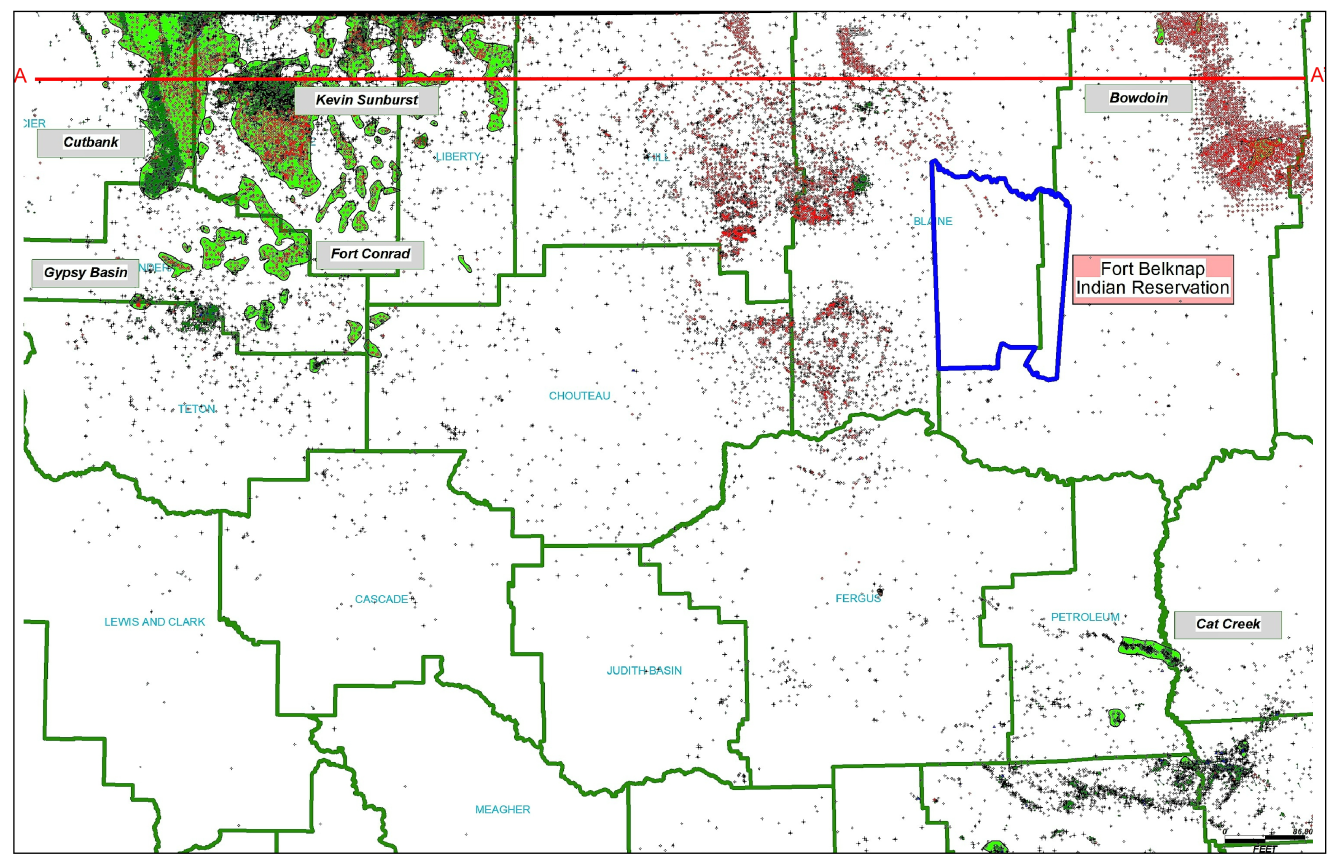


FIGURE BK-7.3. Distribution of Lower Cretaceous oil & gas fields in north-central Montana. Cutbank field produces from the basal Cutbank Sandstone. Kevin Sunburst Field produces from Cutbank, Sunburst and Bow Island sandstone reservoirs in addition to the prolific Madison and Ellis. Bowdoin Field produces from structural traps of conventional Greenhorn reservoirs.

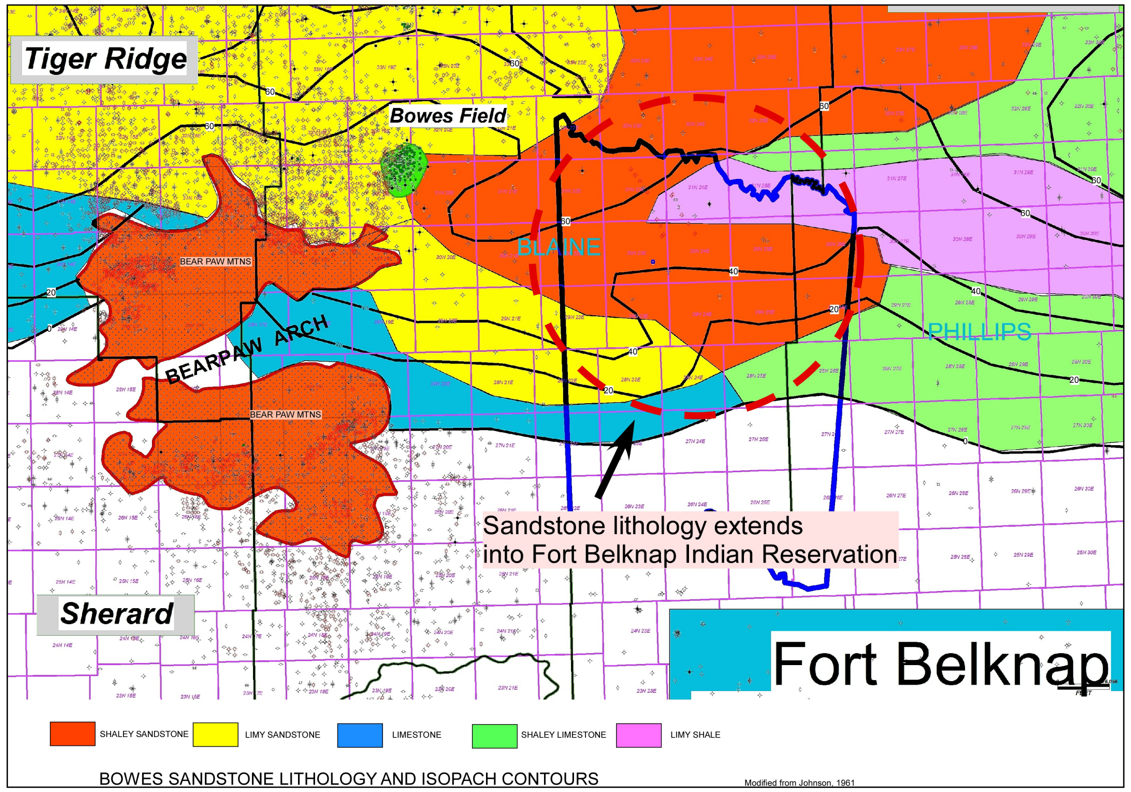
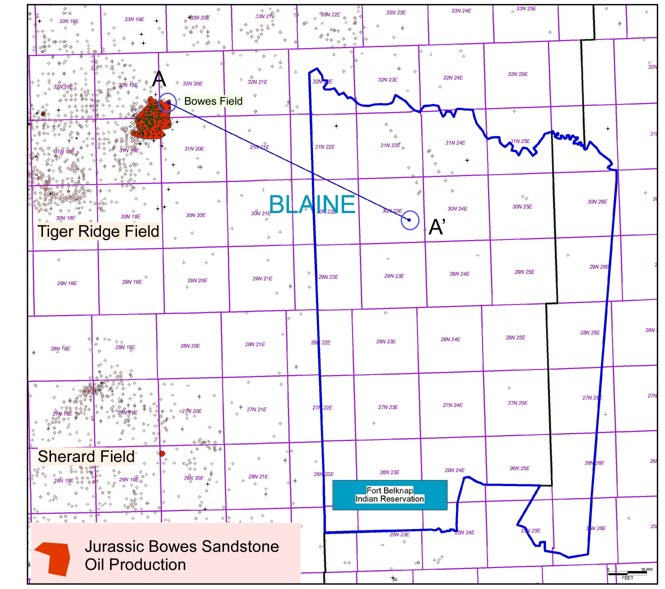


FIGURE BK-8.1. Lithology and isopach thickness of Jurassic "Bowes" sandstone in feet, showing approximate distribution of carbonate facies and sandstone facies (modified after Johnson, 1961).

JURASSIC SANDSTONES

GENERAL CHARACTERISTICS: This play is characterized by possible traps in the Jurassic Swift / Ellis sandstone units and oil production in the "Bowes" Sandstone unit or regionally known as the Sawtooth Formation within the Bowes field to the west of Fort Belknap Indian Reservation (Figure BK-8.1). As of 2019, 13.3 MMBO have been produced since the discovery well was drilled in 1949. The Bowes Field is situated on a large anticlinal dome and dissected by numerous faults. Cross section A-A' and Figure BK-8.2 show the producing sandstone (aka. "Sawtooth") is present within the reservation.

Trapping mechanisms are of a structural and stratigraphic nature. Discontinuous sandstone lenses and sandstone pinchouts are possible. One problem may be breached Jurassic / Cretaceous units exposed to the atmosphere in the Little Rocky Mountains, at the southern end of the reservation. A strong, hydrodynamic flow from south to north may have "flushed", hydrocarbons from the system.



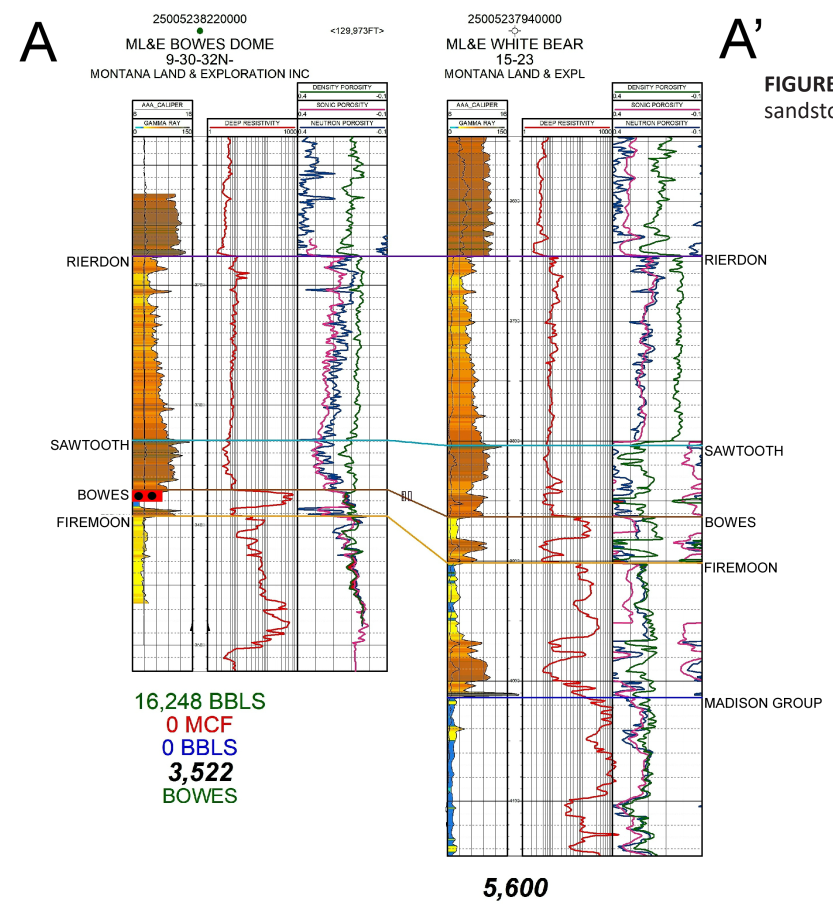


FIGURE BK-8.2. Jurassic Bowes productive sandstone comparison to Ft. Belknap Reservation.

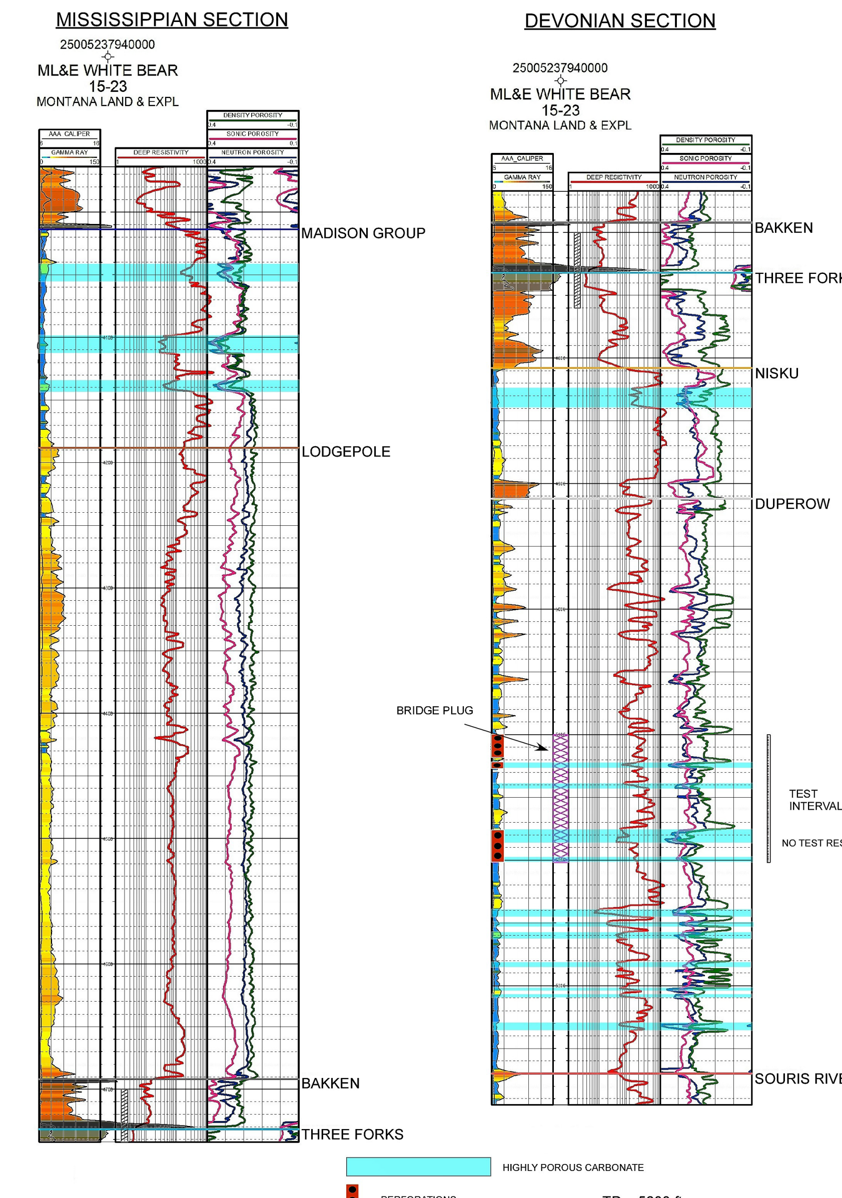


FIGURE BK-8.4. Log section across the Mississippian and Devonian intervals within the Fort Belknap Indian Reservation.

MISSISSIPPIAN & DEVONIAN CARBONATES

GENERAL CHARACTERISTICS: This play is characterized by possible traps in the Mississippian Mission Canyon, and Devonian Nisku and Duperow carbonate units (Figure BK-8.3 & 8.4). No production has been established to date at either Fort Belknap or on the adjacent Bearpaw Uplift.

Possible trapping mechanisms include stratigraphic trapping of discontinuous porosity zones and structural traps. One problem may be breached Mississippian and older units exposed to the atmosphere in the Little Rocky Mountains, at the southern edge of the reservation. The top of the Mission Canyon is cavernous and forms an excellent aquifer. This strong, hydrodynamic flow from south to north may have "flushed", hydrocarbons from the older rocks.

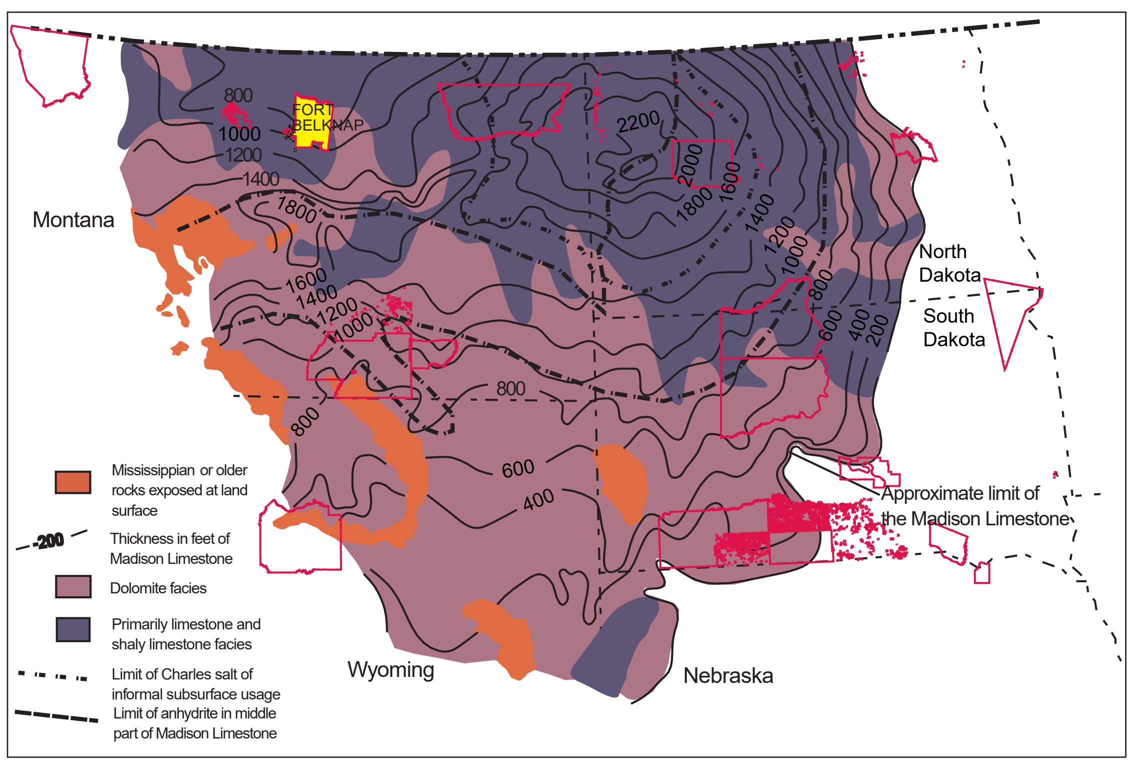


FIGURE BK-8.3. Thickness in feet and generalized rock facies of the Madison Group (Mississippian) and equivalent rocks (modified after Peterson, 1981, 1984b).

DEVONIAN SHALES

GENERAL CHARACTERISTICS: This play involves possible fracture production from the Bakken/-Three Forks Shale (Figure BK-9.1, 9.3 & 9.4). No production has been established to date within the Fort Belknap area or adjacent Bearpaw Uplift. Three Forks Shale is poorly exposed in the Little Rocky Mountains at the southern end of the reservation. Organic content (quality and quantity) and thermal maturity are unknown.

Trapping mechanisms could include discontinuous fracture zones and possible structural closures. The northern end of the reservation is on the southern flank of the Hogeland sub-basin, where it is possible that the Bakken/Three Forks Shale is better developed and thermally mature (Figure BK-9.2).

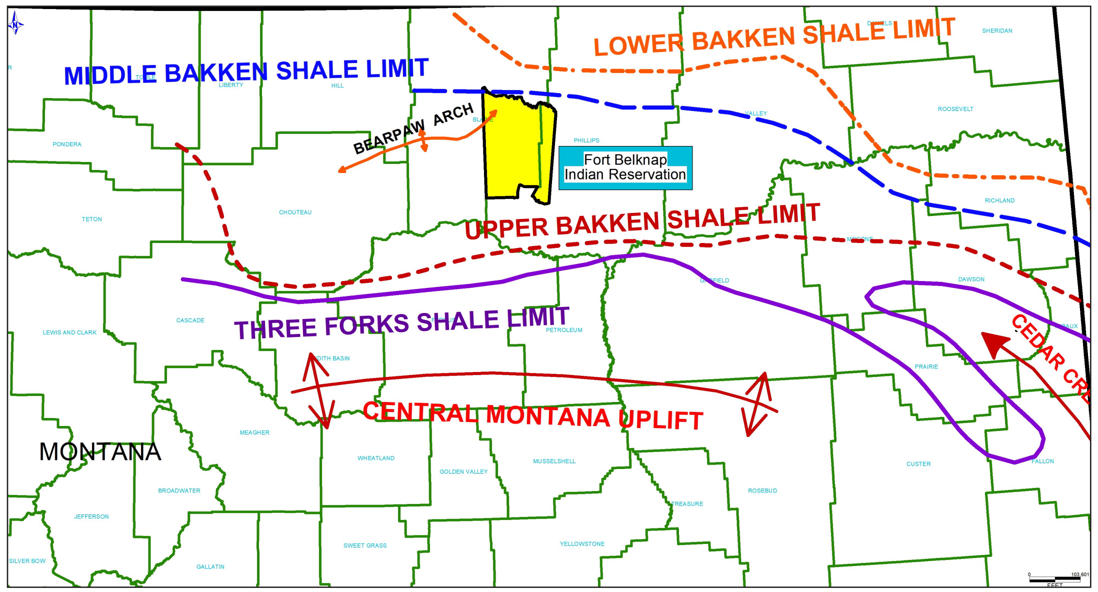


FIGURE BK-9.1. Bakken and Three Forks Shale depositional limits across Montana (after Sonnenberg, 2013).

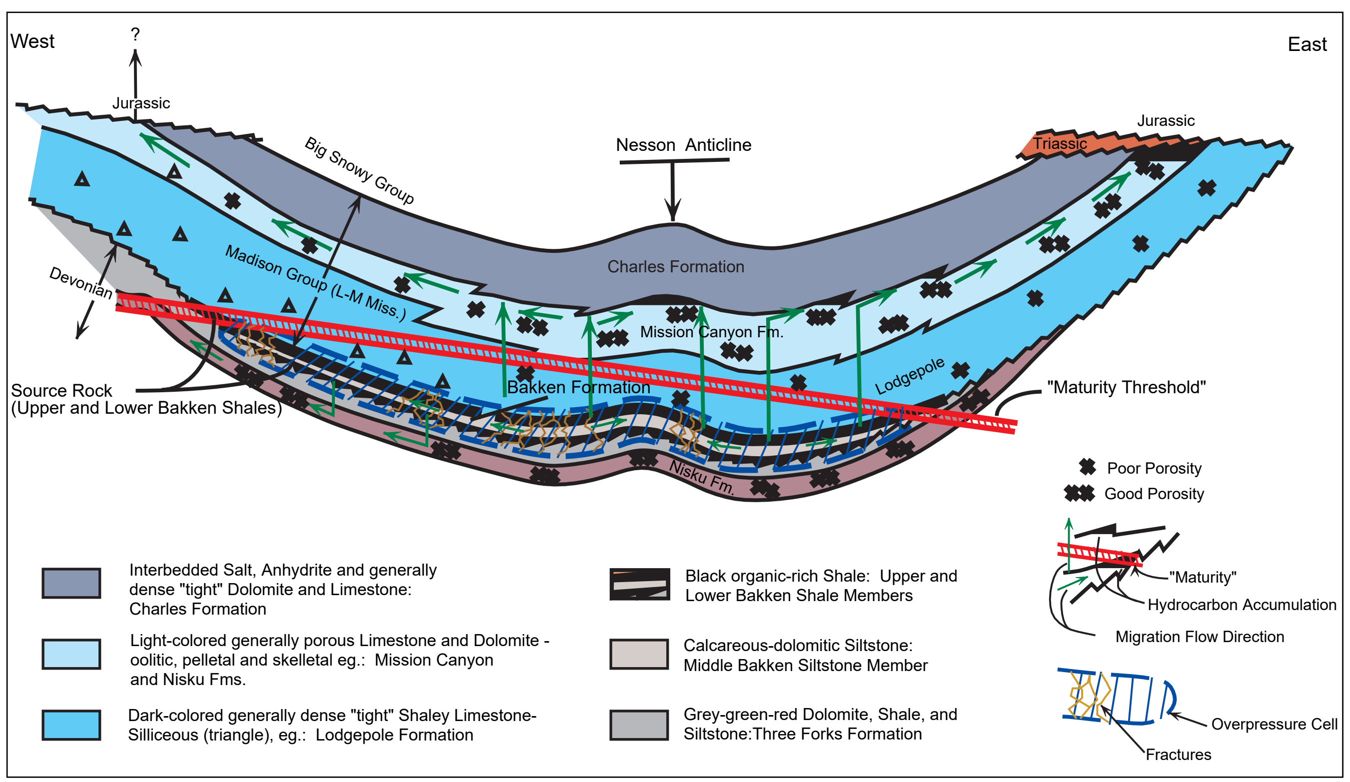


FIGURE BK-9.2. Schematic east-west section across the Williston Basin showing source-rock maturity, fluid over-pressure, fracture, migration and hydrocarbon accumulation patterns in the Bakken Formation and adjacent units (from Meissner, 1984).

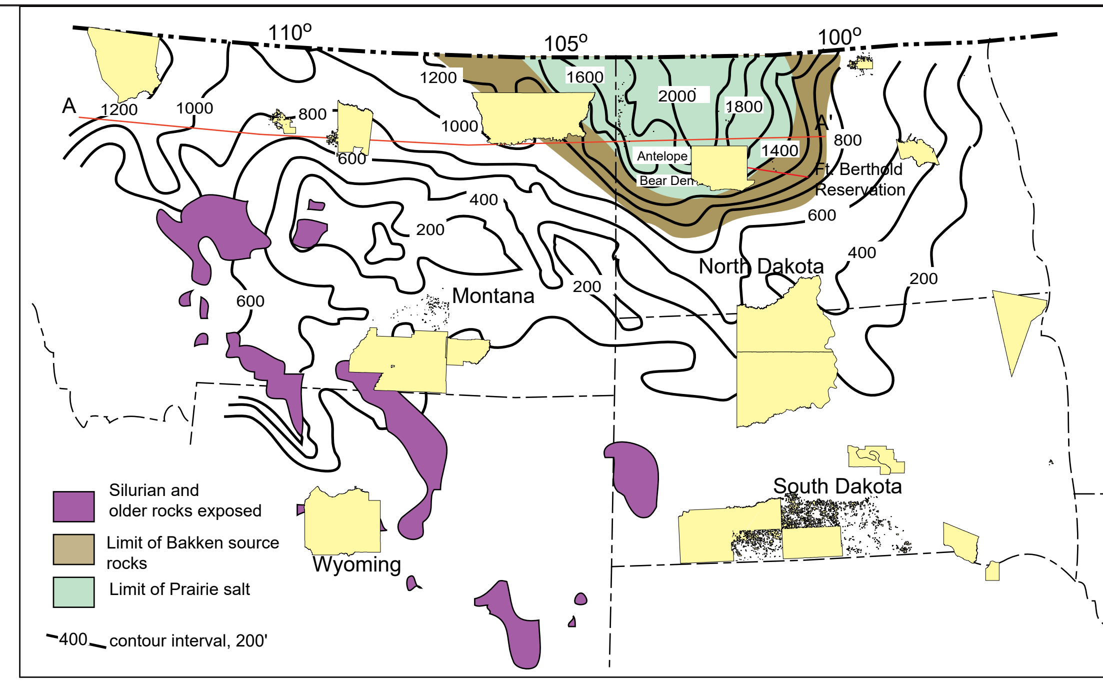
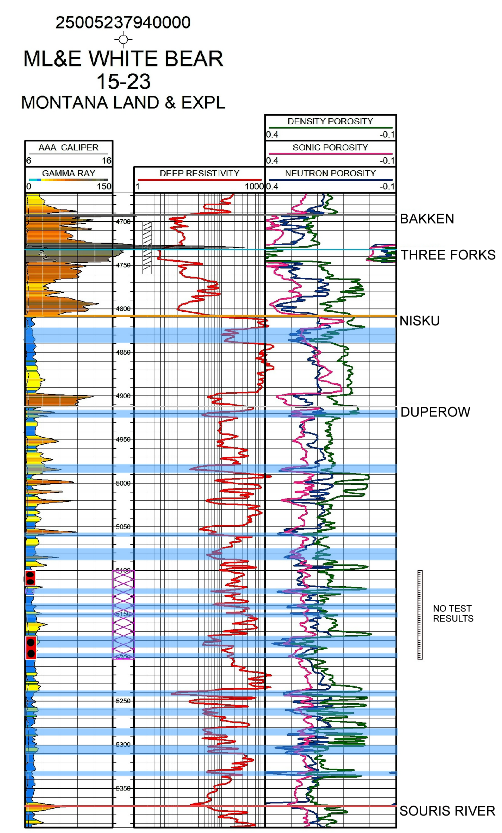
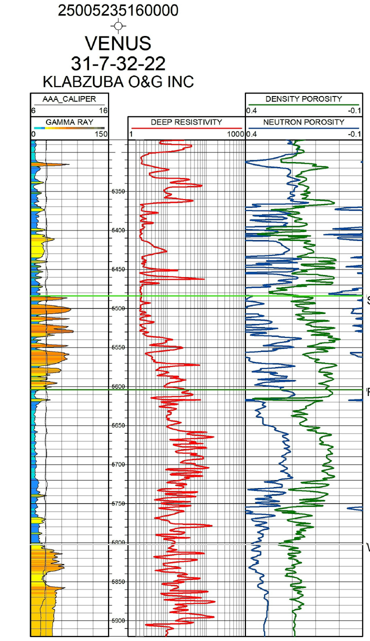


FIGURE BK-9.3. Map showing thickness of Devonian rocks, limit of Prairie salt, limit of Bakken source rock, location of analog fields and reservation, and location of regional cross-section A-A' (modified after Peterson, 1987).



WELL TD : 5,600

FIGURE BK-9.4. Type log section of the Upper Devonian rocks within the Fort Belknap Indian Reservation. Porous units in light blue.



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604EGLE

FIGURE BK-9.6. Type log section for the Red River – Stony Mountain section (Ordovician).

RED RIVER CARBONATES/CAMBRIAN SANDSTONE

GENERAL CHARACTERISTICS: Although no production has been established to date within the Fort Belknap Reservation or adjacent Bearpaw Uplift, Ordovician carbonates and Cambrian Flathead Sandstone may be potential productive horizons. The Flathead interval is well exposed in the Little Rocky Mountains at the southern end of the reservation. It is a fine-grained sandstone with some interbedded conglomeratic lenses and thick shale intervals (Figure BK-11.5 & 11.6). The Red River Formation is a well-known oil reservoir on the western flank of the Williston Basin.

Since the both formations are exposed at the surface to meteoric influx, a hydrodynamic flow gradient from south to north may have flushed hydrocarbons from these older rocks.

Trapping mechanisms would include structural domes, fault traps, and sandstone pinchouts.

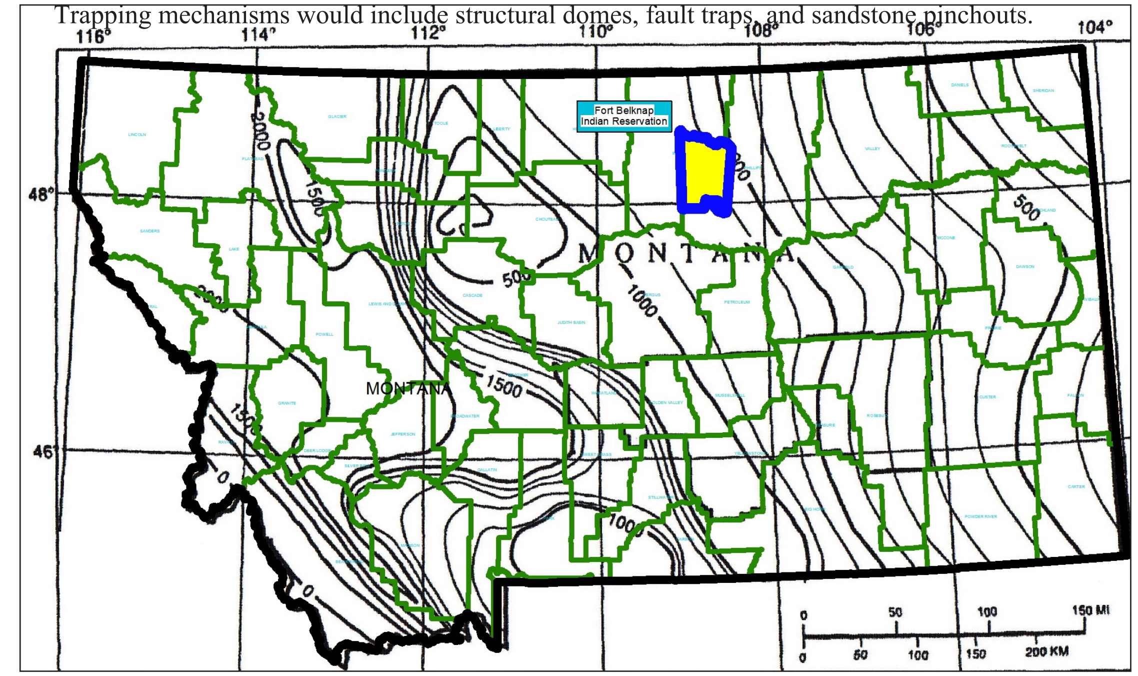

FIGURE BK-9.5. Thickness of Cambrian rocks across Montana. Isopach interval 100 ft (modified after Lochman-Balk, 1972).

REFERENCES

Fort Belknap Indian Reservation

Anderson, R.C., 1995, The Oil and Gas Opportunity on Indian Lands-Exploration Policies and Procedures, Bureau of Indian Affairs, Division of Energy and Mineral Resources, General Publication G-95-3, 158 p.

Beeman, W.R., et al., 1996, Digital Map Data, Text and Graphical Images in Support of the 1995 Assessment of United States Oil and Gas Resources, United States Geological Survey, Digital Data Series DDS-35, CD ROM.

Charpenteir, R.R., et al., 1996, Tubular Data, Text, and Graphical Images in Support of the 1995 National Assessment of United States Oil and Gas Resources, United States Geological Survey, Digital Data Series DDS-36, CD ROM.

Gautier, D.L., et al., 1996, 1995 National Assessment of United States Oil and Gas Resources - Results, Methodology, and Supporting Data, United States Geological Survey Digital Data Series DDS-30 Release 2.

________., et al., 1995, 1995 National Assessment of United States Oil and Gas Resources, Overview of the 1995 National Assessment of Potential Additions to Technically Recoverable Resources of Oil and Gas - Onshore and State Waters of the United States, United States Geological Survey Circular 1118, 20 p.

Johnson, Durwood M., “Middle Jurassic of North Central Montana and Adjacent Areas of Canada”, Montana State University, 1961 Master of Science thesis.

Lochman-Bach, Christina, 1972, Cambrian System, in Mallory WW ed-in-chief, Geologic Atlas of the Rocky Mountain region: Denver, Rocky Mountain Association of Geologists, p. 60-75.

Mallory, W.W., et al., 1972, Geologic Atlas of the Rocky Mountain Region, Rocky Mountain Association of Geologists, 331 p.

Meisner, Fred F., 1984, “Petroleum Geology of the Bakken Formation Williston Basin, North Dakota and Montana” in Petroleum Geochemistry and Basin Evaluation, Gerard Demaison and Roelef J. Murris ed. AAPG Memoir 35.

Peterson, J.A., and MacCary, L.M., 1987, "Regional Stratigraphy and General Petroleum Geology of the U.S. Portion of the Williston Basin and Adjacent Areas", Williston Basin: Anatomy of a Cratonic Oil Province, Rocky Mountain Association of Geologists, p. 9-43.

Rice, D.D., and Shurr, G.W., July 1980, "Shallow, Low-Permeability Reservoirs of the Northern Great Plains - Assessment of their Natural Gas Resources", American Association of Petroleum Geologists Bulletin, Volume 64/7, p. 969-987.

Willette, D.C., et al., 1996, "Oil and Gas Atlas on Indian Lands", Indian Resources Building Partnerships, Sixth Annual Energy and Minerals Conference, Bureau of Indian Affairs, Division of Energy and Mineral Resources, p. 10.

Fields and Articles

Alverson, D.C., 1965, "Geology and Hydrology of the Fort Belknap Indian Reservation, Montana", Water Supply of Indian Reservations; Accession Number 65-18877, p. F1-F59.

Bennett, S., 1985, "Tiger Ridge Field"; Montana Oil and Gas Field Symposium, Montana Geological Society, Billings, Montana, p. 1123-1126.

Erdmann, C.E., and Koskinen, V.K., 1953, "Preliminary Structure Contour Map of Blaine, Northern Chouteau and Hill Counties and Adjoining Areas, Montana", Guidebook, 4th Annual Field Conference, Little Rocky Mountains, Montana, Southwestern Saskatchewan, Billings Geological Society.

Ervin-Cleveland, M. and Shepard, G.W., 1985, "Bullwacker Field", Montana Oil and Gas Field Symposium, Montana Geological Society, Billings, Montana, p. 297-300.

Feltis, R.D., 1993, "Hydrogeology of the Madison Group in Central Montana", Energy and Mineral Resources of Central Montana, Montana Geological Society, Billings, Montana, p. 239-242.

Knechtel, M.M., 1959, "Stratigraphy of the Little Rocky Mountains and Encircling Foothills, Montana", Contribution to Economic Geology, USGS Survey Bulletin 1072-N; includes Geologic Map.

________, et al., 1944, "Oil and Gas Possibilities of the Plains Adjacent to Little Rocky Mountains, Montana", Plains Adjacent to the Little Rocky Mountains, Montana, Oil and Gas Investigation Map, 0004, United Stated Geological Survey.

Maher, P.D., 1969, "Eagle Gas Accumulations of the Bearpaw Uplift Area, Montana", Eastern Montana Symposium, Montana Geological Society 20th Anniversary Field Conference Guidebook, p. 121-127.

Maughan, E.K., 1993, "Stratigraphic and Structural Summary for Central Montana", Energy and Mineral Resources of Central Montana, Montana Geological Society, Billings, Montana, 1993, p. 3-20.

Rice, D.D., 1980, "Coastal and Deltaic Sedimentation of Upper Cretaceous Sandstone, Relation to Shallow Gas Accumulations, North-Central Montana", American Association of Petroleum Geologists Bulletin, Volume 64/3, March, p. 316-338.

Rowley, A.E., 1985, "Leroy Field", Montana Oil and Gas Field Symposium, Montana Geological Society, Billings, Montana, p. 689-692.

Shurr, G.W., et al., 1993, "Regional Pressure Patterns as Evidence for Fractured Reservoirs in the Bowdoin and Phillips Sandstones on the Bowdoin Dome, Montana", Energy and Mineral Resources of Central Montana, Montana Geological Society, Billings, Montana.

Map References

Executive Reference Map 334, 1985 edition, Extended Area, Northern Rocky Mountains, Geomap Company.

Executive Reference Map 321, 1983 edition, Southern Williston Basin, Geomap Company.

Indian Land Areas, 1992, United States Department of the Interior-Bureau of Indian Affairs.

Clayton, L., et al., 1980, Geological Map of North Dakota Geological Survey.

Darton, N.H., et al., 1951, Geologic Map of South Dakota, United States Geological Survey.

Ross, C.P., et al., 1958, Geological Map of Montana, Montana Bureau of Mines.