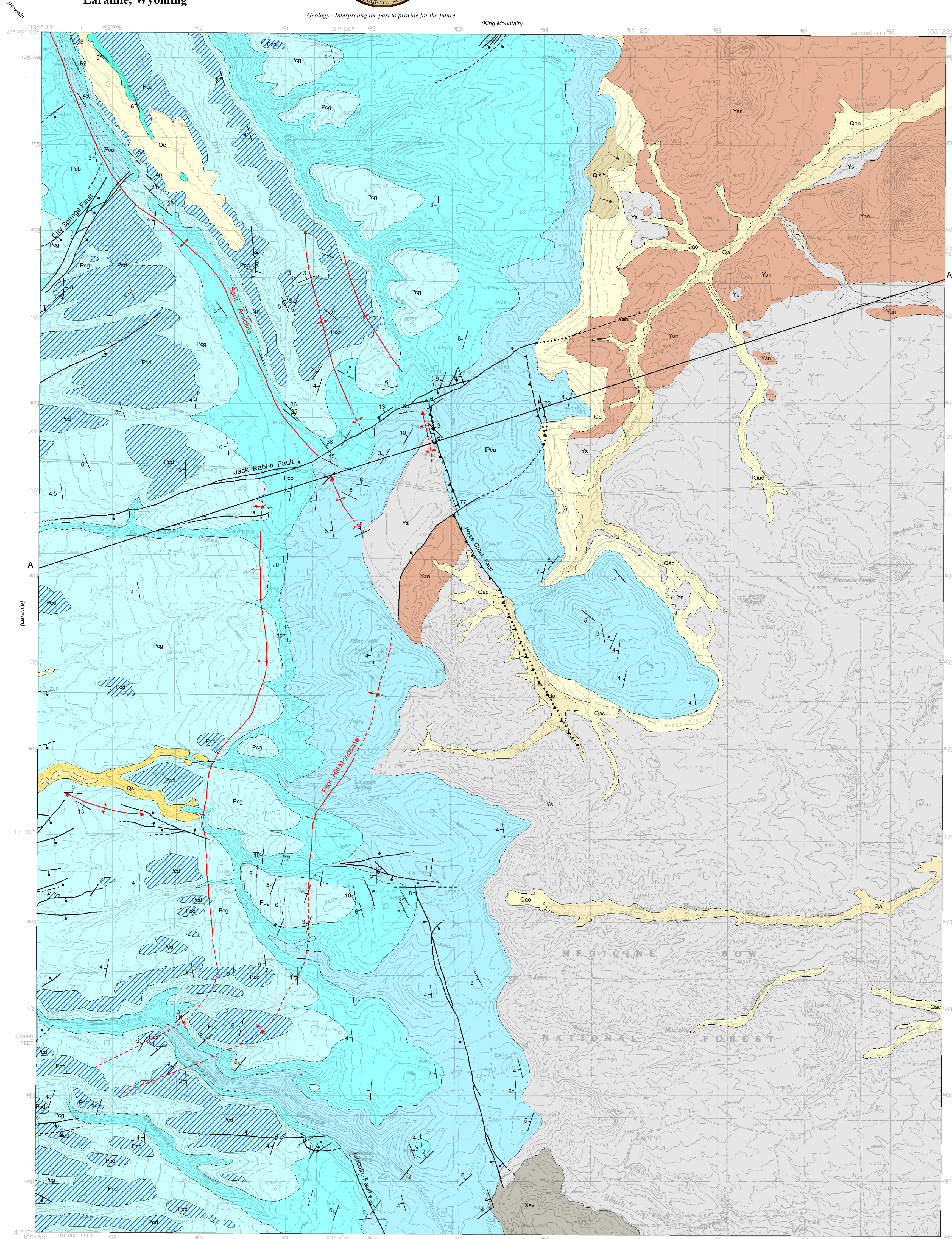


Geology - Interpreting the past to provide for the future

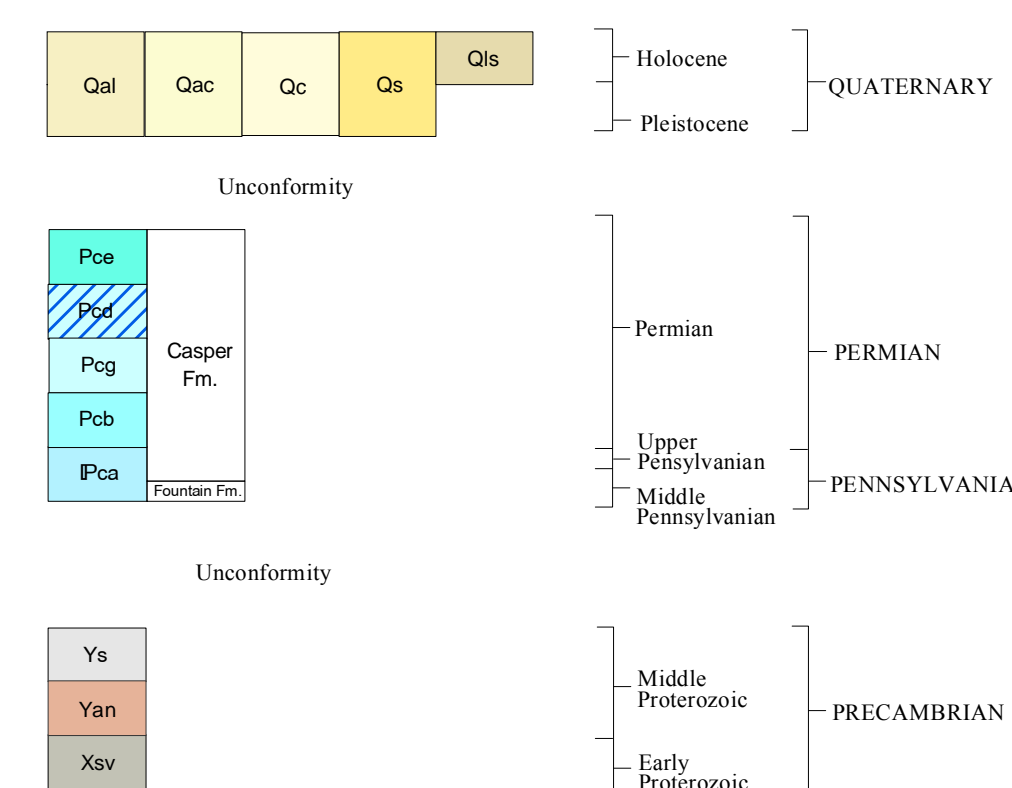


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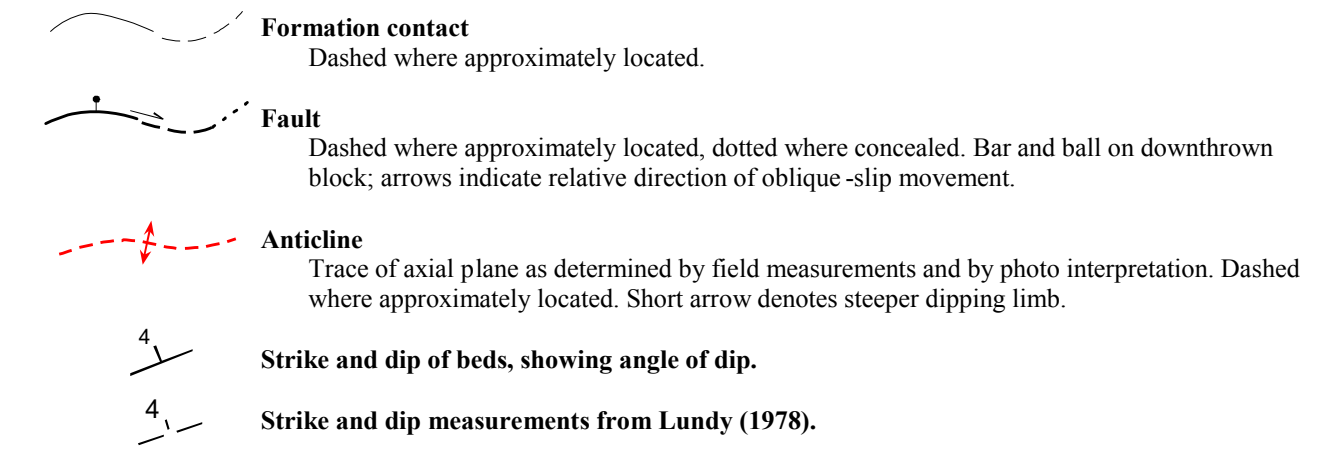


EXPLANATION

CORRELATION OF MAP UNITS



MAP SYMBOLS



DESCRIPTION OF MAP UNITS

HOLOCENE AND PLEISTOCENE SURFICIAL DEPOSITS

- Qal** ALLUVIAL DEPOSITS (HOLOCENE)—Unconsolidated and poorly consolidated clay, silt, sand, and gravel, mainly in floodplains and lowest stream terraces. Thickness approximately 0 to 50 feet.
- Qc** COLLUVIUM (HOLOCENE/PLEISTOCENE)—Unconsolidated masses of rock fragments and soil material on relatively steep slopes with thickest accumulations at the bases of slopes.
- Qac** MIXED ALLUVIUM AND COLLUVIUM (HOLOCENE/PLEISTOCENE)—Sand, silt, clay, and gravel deposited mainly along intermittent streams; includes slope wash and smaller alluvial fan deposits that coalesce with alluvium. Thickness approximately 0 to 50 feet.
- Qts** LANDSLIDE DEPOSITS (HOLOCENE/PLEISTOCENE)—Blocks of bedrock or loose slope debris; arrows on the map show the inferred direction of movement. Many occur in the Alpha Member of the Casper Formation, detaching at the contact with the underlying Precambrian rocks.
- Qs** WINDBLOWN SAND DEPOSITS (HOLOCENE)—Active and stabilized dunes, made up of fine- to fine-grained sand, sourced by Casper Formation sandstones. Thickness approximately 0 to 15 feet.

PERMIAN AND PENNSYLVANIAN ROCKS

CASPER AND FOUNTAIN FORMATIONS UNDIVIDED
Casper Formation (Permian and Pennsylvanian)—Buff to reddish, calcareous to quartzitic, very fine- to coarse-grained, well cemented subarkose sandstone interbedded with buff to purplish-gray limestone and dolomite beds, usually micritic and locally fossiliferous. Sandstone often exhibits large-scale festoon cross-bedding, increasing toward the south. The Casper Formation thins to the south and west as the Fountain Formation increases in thickness. Also, limestone units thin and eventually disappear southward and westward in the Laramie Basin, suggesting a northwest-southeast trending shoreline during deposition. As many as 10 distinct limestone or dolomite beds, which are locally quarried for cement or gravel uses, have been identified in the Casper formation (Benjamin, 1970), in the Laramie area. The Casper Formation serves as the prime aquifer for the city of Laramie. Thickness 690-735 feet (Benjamin, 1970, and Kim, 1972).

Casper/Fountain subdivisions—this unit has been subdivided into separate informal members based on 10 distinct limestone units (10 being the youngest limestone, 1 being the oldest) that are separated by sandstones (Figure 1). The sandstone units act as local aquifers. Lundy, 1978, combined the limestone units into 5 informal members (Epsilon, Delta, Gamma, Beta, and Alpha) based upon local, confined aquifer packages (Figure 1).

- Pcd** **Epsilon Member**—The Epsilon member represents the youngest Casper Formation member and it is capped by limestone 10 in the south (which does not appear in the mapped area) and a sandstone unit that grades into the Satanka Shale. It consists of red to pink, medium to fine-grained sandstone, mostly covered in the Laramie area. Overall thickness 22 to 30 ft.
- Pcg** **Delta Member**—Includes limestones 9 and 8 and two separate sandstone units. Limestone 9 is a white-gray to pink, massive, fractured lime that caps the Delta Member (thickness of 8 to 10 feet). A reddish-brown to buff, thinly laminated fine-grained cross-bedded subangular to subrounded sandstone separates the limestones of the Delta Member (thickness 20-35 feet). Limestone 8 is a pink to light-gray massive, fractured lime that outcrops mostly at the base of the Laramie Mountains (thickness 12 feet). A light tan to red calcareous cross-laminated porous sandstone lies beneath limestone 8 (thickness 40 to 55 feet). Overall thickness 80 to 112 feet.
- Pcb** **Gamma Member**—Includes limestones 7 and 6 and two separate sandstone units. Limestone 7 is an extensive unit that forms prominent ridges and the main dip-slope of the western Laramie Mountains, as well as capping the Gamma member. It has a tan to buff dolomitic base overlain by a sandy grayish limestone (thickness 17-18 feet). Limestone 6 is a dense, fossiliferous limestone that is only present on the northern portion of the map area (thickness 6 to 8 feet). A pink to red, fine to medium grade, friable, calcareous sandstone extends from the base of limestone 7 to the top of limestone 5. It is divided by limestone 6 to the north (thickness 30 to 60 feet). Overall thickness 73 to 86 feet.
- Pca** **Beta Member**—Includes limestones 5 and 4 and two separate sandstone units. Limestone 5 is a finely crystalline, purple to pink, dense, highly fractured limestone that weathers to dark gray and caps the Beta Member. It is thickest slightly north of Pilot Hill (thickness 8 to 12 feet). A light brown to tan-red, calcareous, fine-grained, friable sandstone separates limestones 5 and 4 (thickness 25 to 30 feet). Limestone 4 has a buff to tan dolomitic base that grades upward into light gray to purple, dense, ridge forming limestone (thickness 18 to 26 feet). Below limestone 4, a red to buff, moderately resistive, extremely calcareous, thick, moderately sorted sandstone layer forms the base of the Beta Member (thickness 90 feet). Overall thickness 141 to 158 feet.
- Pca** **Alpha Member**—The Alpha Member represents the oldest member of the Casper Formation and includes limestones 3, 2, and 1 and three separate sandstone units, the lower unit grading into the Fountain Formation, which forms the base of this member. Limestone 3 forms the top of the Alpha Member and is one of the more prominent limestones in this section of the Casper Formation. The base is light tan to brown sandy dolomite, fining upward into a purplish carbonate that weathers gray and forms ridges (thickness 29 to 40 feet). A light-brown to reddish brown, poorly sorted, fine-grained sandstone unit separates limestone 3 and limestone 2 (thickness 75 to 80 feet). Limestone 2 is a thin, pink to purple, sandy unit that is mostly covered in the map area (thickness 8 to 12 feet). A pink to brown, calcareous, cross-laminated, medium-sorted, fine-grained sandstone separates limestones 2 and 1 (thickness 65 to 80 feet). Limestone 1 is a purple to pink, massive, fossiliferous, sandy unit (thickness 9 to 13 feet). The bottom sandstone is a tan, pink, and red, cross-bedded, medium grained sand that interfingers with thin, sandy limestones (up to 1 inch) that is slightly arkosic; more so as it grades into the Fountain Formation (thickness 80 to 150 feet). Overall thickness 266 to 375 feet.

Fountain Formation (Pennsylvanian)—Coarse-grained pink to red to purple sandstone and arkose, with some conglomerates, siltstones and shales. Interfingers with and underlies Casper Formation, thinning to the north and pinching out near Rogers Canyon. For mapping purposes, the Fountain Formation was included with the Alpha Member. The Fountain Formation lies unconformably on top of Precambrian basement rock. Possibly deposited by an alluvial plain or a series of coalescing fans at the base of the Ancestral Rockies. Approximately 30 ft. thick at Pilot Hill (Benjamin, 1970).

MIDDLE PROTEROZOIC ROCKS

- Ys** **SHERMAN GRANITE (MIDDLE PROTEROZOIC)**—Medium to coarse grained, pink to orange, biotite hornblende granitic, syenogranitic, quartz monzonitic and granodioritic. The Sherman Granite is gradational with or interfingers with the syenite of the Laramie Mountains. The Sherman Granite has been dated at 1,430 ± 20 MA (million years ago) by a Rb-Sr whole rock isochron (Zielinski and others, 1981).
- Yan** **LARAMIE MOUNTAINS ANORTHOSITE AND NORITE (MIDDLE PROTEROZOIC)**—White to light bluish gray, medium to coarse grained, generally leucocratic anorthositic that is massive to layered to brecciated. A minor gray mafic anorthosite or norite commonly forms a gradational phase between syenites and the leucocratic anorthositic, or forms less resistant, more mafic layers in layered anorthositic. This unit commonly occurs as sharply bounded angular inclusions in the syenite, but as noted above is gradational into the syenite. This anorthositic is the bulk of what some geologists call the Laramie Anorthositic Complex.

EARLY PROTEROZOIC ROCKS

- Xsv** **OLDER PROTEROZOIC METASEDIMENTARY AND METAVOLCANIC ROCKS**
Laramie Mountains—Pelitic schist, marble, granite gneiss, layered amphibolite, and felsic gneiss (Houston and Marlatt, 1997).

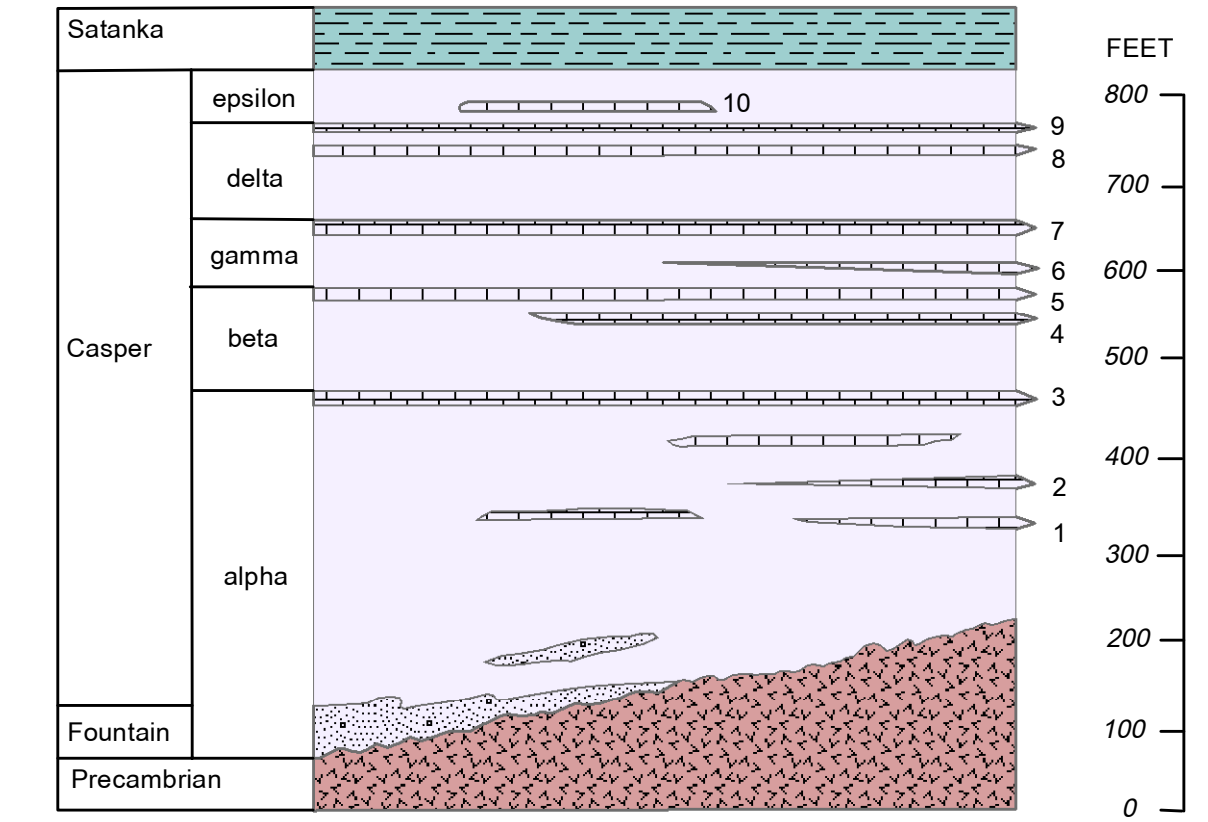


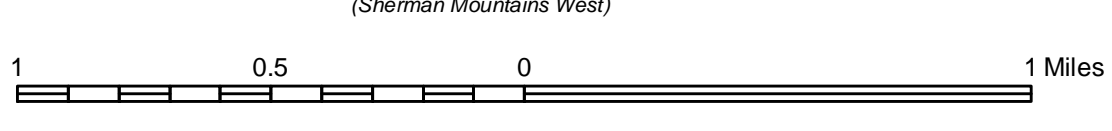
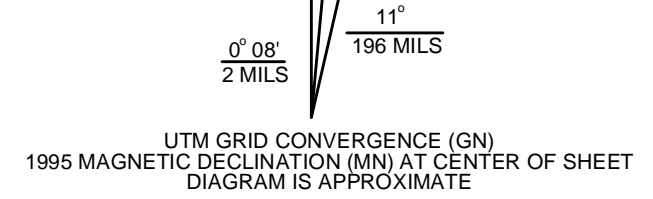
Figure 1 The relationship between Lundy's (1978) informal members of the Casper Formation and the Casper limestones (1-10) as defined by Benjamin (1970) in the vicinity of Laramie, Wyoming. Map area falls within diagram.

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Projection: Universal Transverse Mercator (UTM), zone 13
 North American Datum of 1927 (NAD 27)
 10,000-foot grid ticks Wyoming State Plane Coordinate System, East zone

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Prepared in cooperation with and research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program (USGS award Number 05HQAC0002). The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.
 Minor corrections and revisions to original compiled map by R.W. Jones/2005-2006.
 Digital cartography by J. Fred McLaughlin

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 Base map: Pilot Butte Interior, Geological Survey, Reston, Virginia, 1995

