

GEOLOGY OF WYOMING (/)

BIGHORN MOUNTAIN BYWAYS



Vertical Madison beds at Five Springs Structure on US 14 Alt

Picture by Mark Fisher

Wow Factor *(4 out of 5 stars):*



Geologist Factor *(4 out of 5 stars):*



Attraction

Goosebumps on your arms views! A steep curving roadtrip from the basin to the top of the Bighorn Mountains and back to the basin with faults, canyons, cliffs, creeks, waterfalls, meadows, hikes and the sacred Native American Medicine Wheel.

Geology of Bighorn Mountain Byways

A road trip on the Bighorn Byways is a journey across one of the oldest pieces of North America. These 2.8 to 3.0 billion year old basement rocks of the Wyoming Craton were covered by sediments from ancient oceans for hundreds of millions of years. Tectonic forces about 70 million years ago uplifted the area into a great northwest trending arch that extended for 200 miles. Continental erosion, and accompanying sediment deposition, nearly buried the range over the next 30 million years. Regional uplift of the middle Rocky Mountains began about 5 million years ago, about the same time the Yellowstone hot spot was approaching Wyoming. Since then the area has been carved by water, wind and ice to what it is today.

This road log is edited and compiled based on the Wyoming Geological Association Guidebooks of 1964 and 1983. Interval and cumulative mileages are reported north to south (blue) and south to north (brown) to allow travel in either direction. The north to south route is probably best choice for those not familiar with driving in the mountains. Road label and black lines are drawn between sections when the highway designation changes.



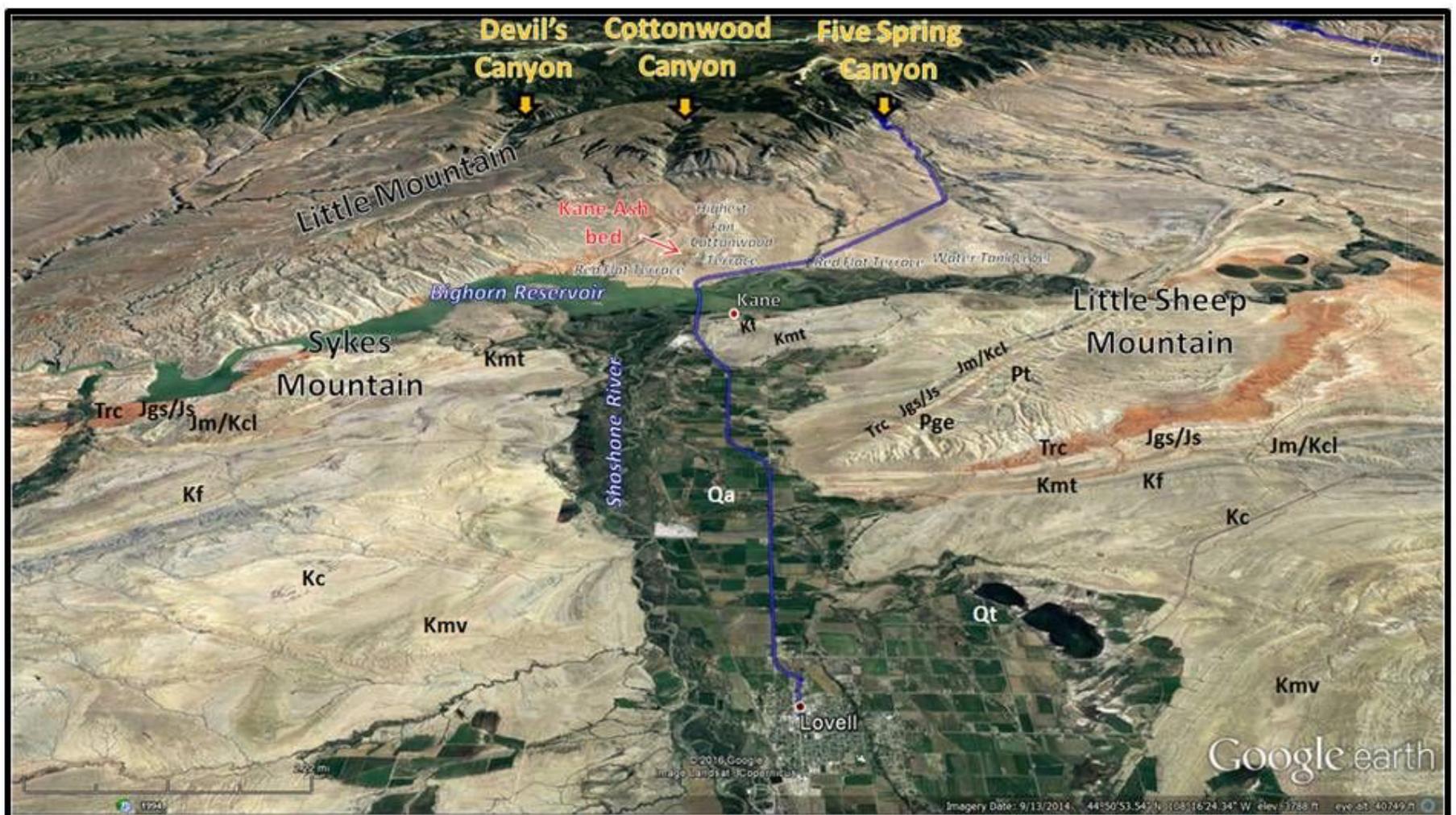
Aerial view of the Bighorn Byways loop. Route between Lovell and Shell, via Burgess Junction, is shown by the blue line. Location of ash deposits from the Yellowstone volcanic field indicated by "X": Red: 600,000 year old Lava Creek ash; Yellow: 100,000 year old West Yellowstone ash.

Image: Google Earth

Bighorn Mountain Byways Geology Road Log

Mileage				Description
N/S		S/N		L = left; R = right
Increment	Cumulative	Increment	Cumulative	Blue = North to South route; Brown = South to North route
<i>U.S. 14 Alt</i>				
0.0	0.0	2.4	90.6	East edge of Lovell, Wyoming. Population 2,471. Elevation 3,814'. Junction of U.S. Highway 14 Alternate with Wyoming Highway 789 and U.S. Highway 310 to the south. Road eastward follows the Shoshone river valley (aka Cody Terrace). Road to the south towards Greybull climbs up the Byron Terrace (aka Powell Terrace). Take US 14 Alt east toward Burgess Junction. Bighorn Canyon National Recreation Area Visitor Center immediately on right.
2.4	2.4	1.4	88.2	Intersection with WY-37 to the north (L/R) that leads to Devil's Overlook in Bighorn Canyon National Recreation Area (see geowyo Bighorn Canyon website http://www.geowyo.com/bighorn-canyon.html).

1.4	3.8	4.9	86.8	Little Sheep Mountain anticline south (R/L) of highway. The Tensleep Formation is exposed in the center of the northwest plunging structure. The Pryor Mountains, which are tilted blocks, elevated by thrust faults, can be seen in the distance to the north (L/R).
4.9	8.7	0.2	81.9	Highway crosses Chicago, Burlington and Quincy Railroad tracks.
0.2	8.9	0.2	81.7	Large bluff south (R/L) of highway is part of the Kane Hills composed of the Mowry-Thermopolis sequence, capped by the Frontier Formation. The ghost town of Kane was located about a mile south of the road just west of the railroad line.
0.2	9.1	1.1	81.5	Road crosses causeway over the Big Horn River/Bighorn Reservoir.

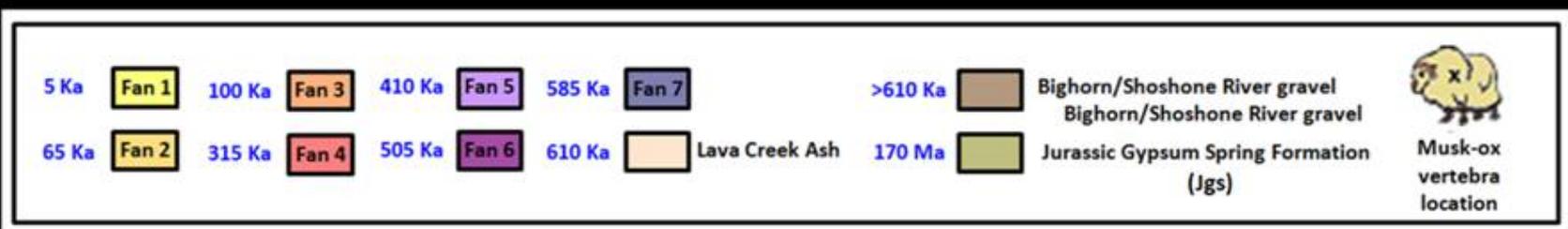
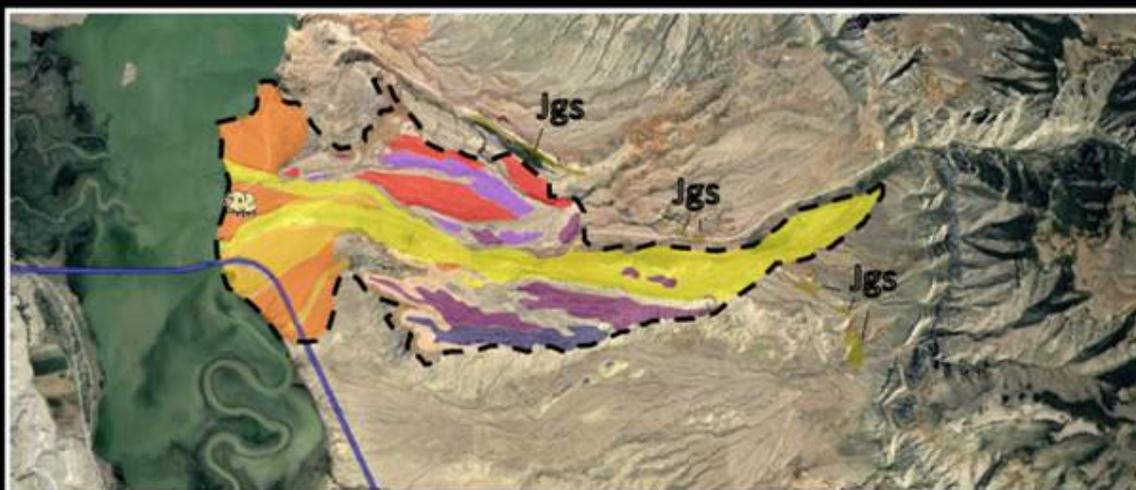


Eastward aerial view of Roadlog route from Lovell, Wyoming. Geologic notation: Qa: Quaternary alluvial deposits; Qt: Quaternary terrace deposits; Kmv: Cretaceous Mesaverde Formation; Kc: Cretaceous Cody Formation; Kf: Cretaceous Frontier Formation; Kmt: Cretaceous Mowry and Thermopolis Formations; Jm/Kcl: Jurassic Morrison and Cretaceous Cloverly Formations; Jgs/Js: Jurassic Gypsum Spring and Sundance Formations; Trc: Triassic

Chugwater Formation; Pge: Permian Goose Egg Formation; Pt: Pennsylvanian Tensleep Formation The Kane Ash is an air fall deposit from the Lava Creek caldera eruption in Yellowstone Park about 600,000 years ago. The landscape in front of the Bighorn Mountains and adjacent to the river is composed of river and alluvial fan deposits.

Image: Google Earth

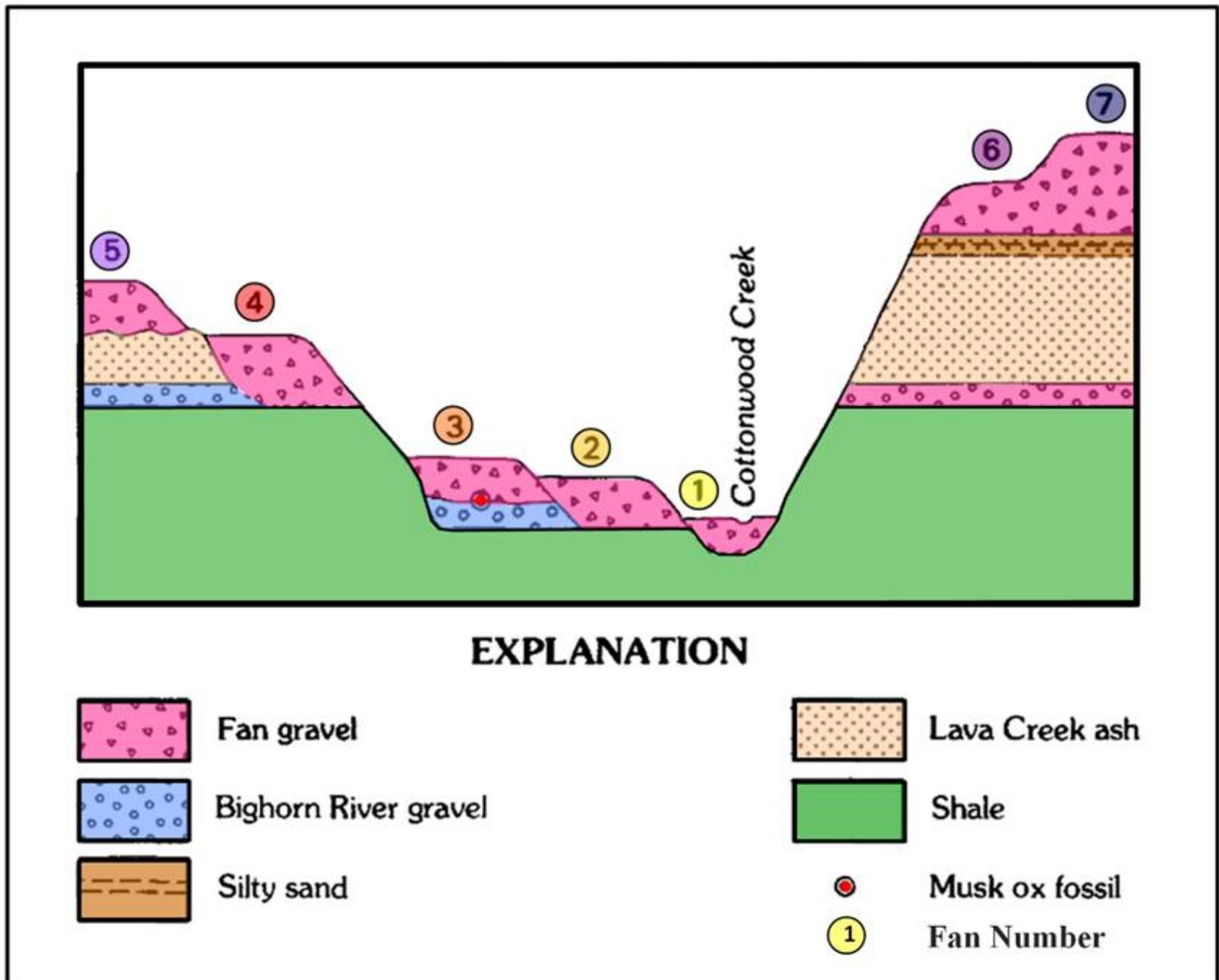
1.1	10.2	2.3	80.4	<p>Road Crosses bridge over Bighorn River. The Large Canyon directly ahead is Cottonwood Canyon. See Geowyo Bighorn River Area Caves for geology of local caves and description of hike up Cottonwood Canyon http://www.geowyo.com/bighorn-river-area-caves.html. The road is built on Quaternary sands and gravels of the Cottonwood Fan Complex.</p>
2.3	12.5	0.9	78.1	<p>Turnoff on right for historic Bighorn Basin open range ML Ranch. US 14 Alt crosses Willow Creek.</p>



Aerial view of the Cottonwood Creek Alluvial Fan complex. Fans are colored and labeled 1 to 7, youngest to oldest. Their relative ages are shown in blue text in thousands of years (Ka) or millions of years (Ma). The lower age of Fan 3 is determined by a fossil musk ox vertebra discovered about a half-mile north of the road.

Image: Google Earth; Cottonwood Creek Fan Data: Reheis, M.C., 1987, Gypsic Soils on the Kane Alluvial Fans, Big Horn County, Wyoming: USGS Bulletin 1590-C, Fig. 2, p. C3.

<https://pubs.usgs.gov/bul/1590c/report.pdf> (<https://pubs.usgs.gov/bul/1590c/report.pdf>)



Schematic diagram of surficial deposits along the east side of the Bighorn River in the Cottonwood Creek area.

Image: Reheis, M.C., 1987, Gypsic Soils on the Kane Alluvial Fans, Big Horn County, Wyoming: USGS Bulletin 1590-C, Fig. 4, p.C73. <https://pubs.usgs.gov/bul/1590c/report.pdf> (<https://pubs.usgs.gov/bul/1590c/report.pdf>)

0.9 13.4 6.8 77.2

Side road to the south (R/L) goes to Crystal Creek oil field, approximately 13 miles away. The field was discovered in 1919 and has a cumulative production of about 50,000 barrels of oil from three Paleozoic reservoirs: Phosphoria, Tensleep and Madison. Little Sheep Mountain anticline can be seen to the west-southwest. The Pryor Mountains are to the northwest (L/R), and the Big Horn Mountains to the northeast (L/R).

6.8 20.2 1.7 70.4

Road to the south (R/L) used to lead to Rainbow Canyon scenic overlook but now ends at Five Springs Creek. At Rainbow Canyon the stream in Black Draw eroded into the Cloverly-Morrison Formations and formed a badlands topography. The highway traverses Mowry-Thermopolis black shale sequences that outcrop in hills and ridges to the south. White to light gray zones are bentonitic.

*Old
U.S.14 Alt*

1.7 21.9 0.7 68.7

Turn left toward Five Springs Campground on Old Alt US 14 (L/R).

0.7 22.6 1.5 68.0

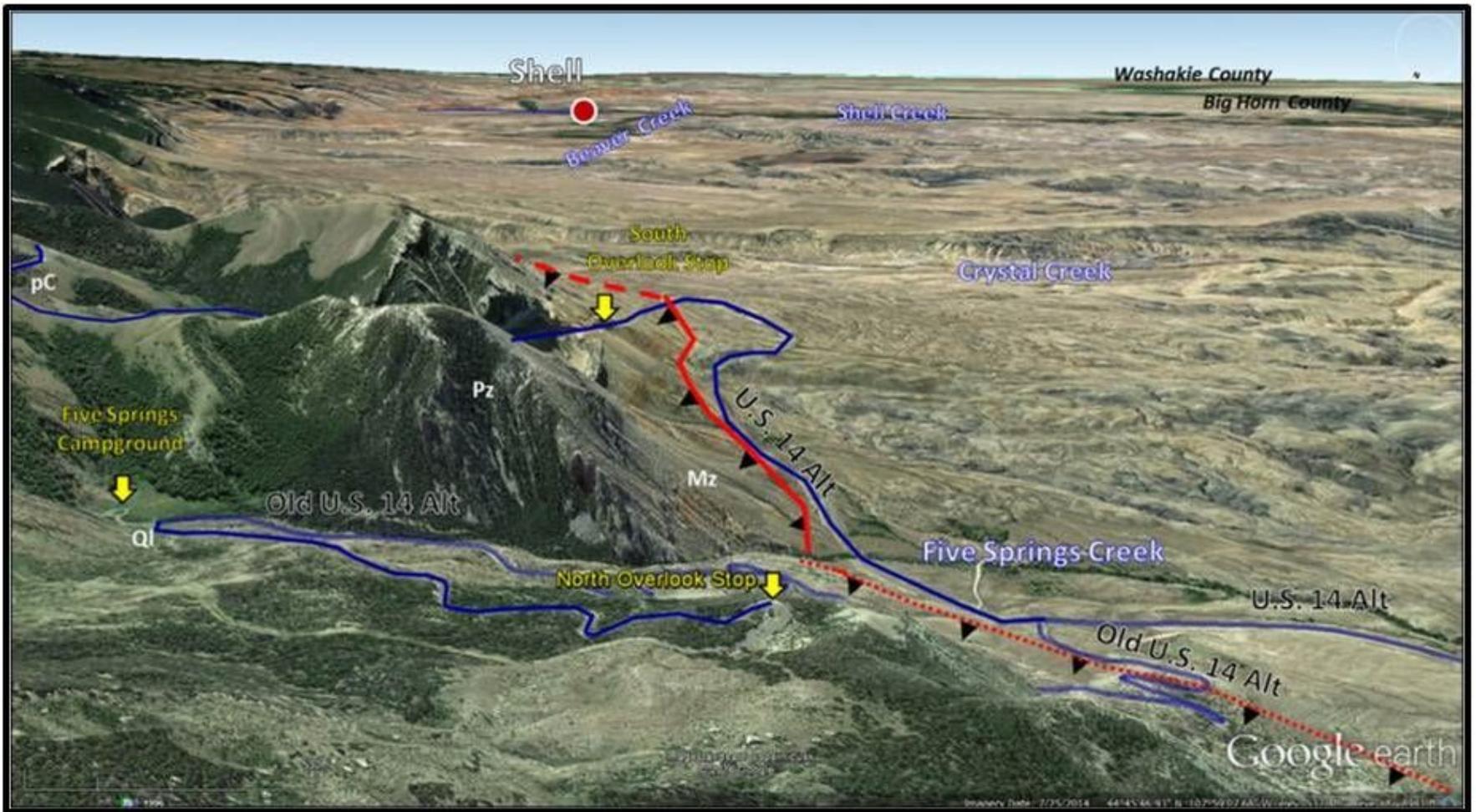
Crossing the approximate trace of the Five Springs Thrust Fault. Road is built on Quaternary landslide debris.

1.5 24.1 1.0 66.5

On the right is Five Springs Campground, a beautiful hidden campground tucked into an amphitheater with walls of granite, a waterfall and a creek lined with pines and cottonwoods. A view of Five Springs Falls is just a 10 minute walk, 0.2 miles and 200 vertical feet up a trail at the end of the campground.

1.0 25.1 3.1 65.5

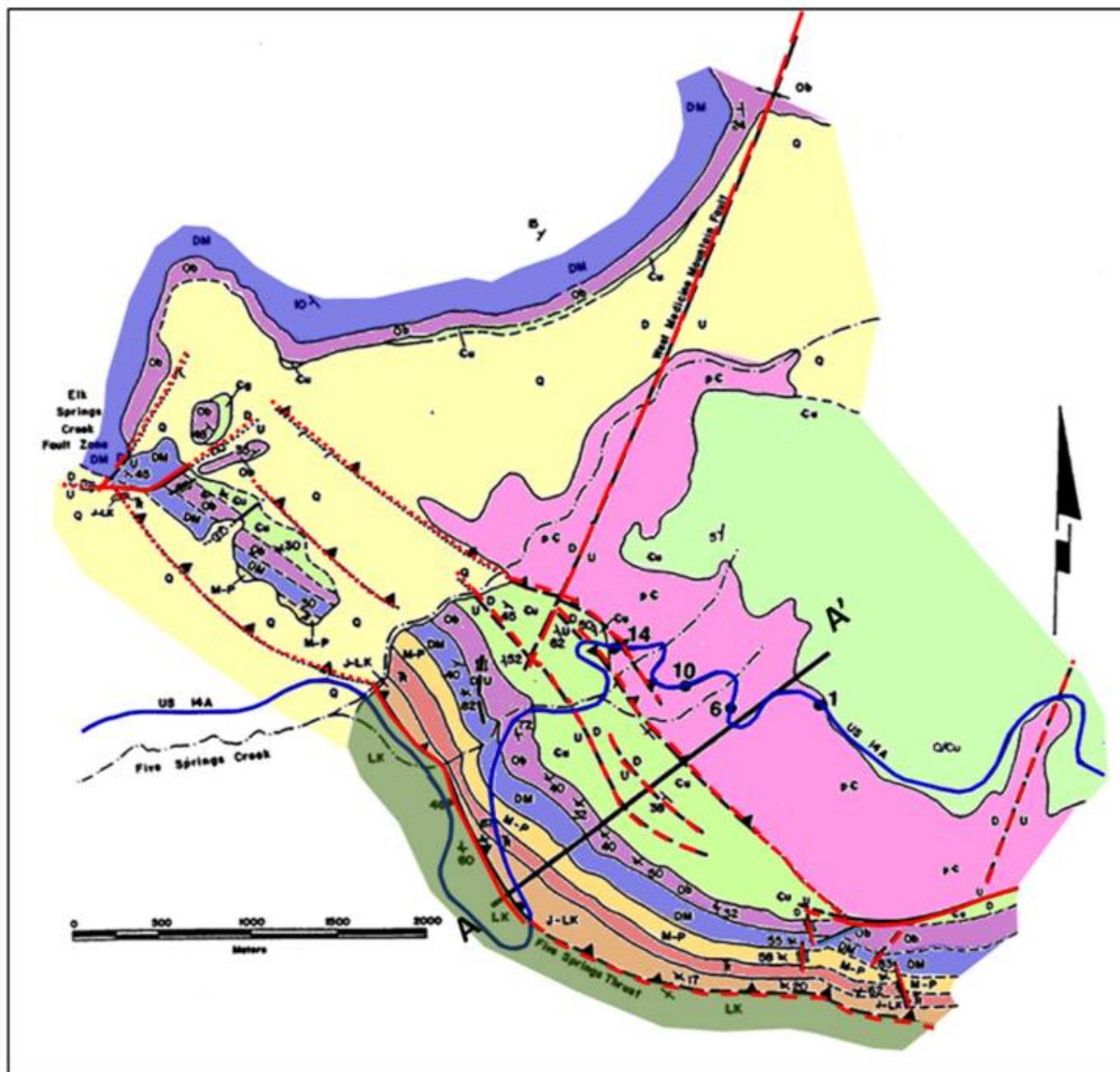
Overlook Stop, Upper Five Springs Campground, end of road, and turnaround spot. High point to the north is Five Springs Point. The carbonate outcrop consist of Madison Limestone, Devonian Darby and Bighorn Dolomite, from top to bottom. Downslope, to the west, are sharply folded beds of the same units. To the south is an excellent view of these steeply dipping to overturned beds above the Five Springs Thrust.



South aerial view of North overlook stop on Old U.S. 14 Alternate. Geologic notation: QI: Quaternary landslide debris; Mz: Mesozoic age rocks; Pz: Paleozoic age rocks; pC: Precambrian age rocks. Thrust fault: red line with black triangles, solid: cut surface, dashed: buried, dotted: inferred.

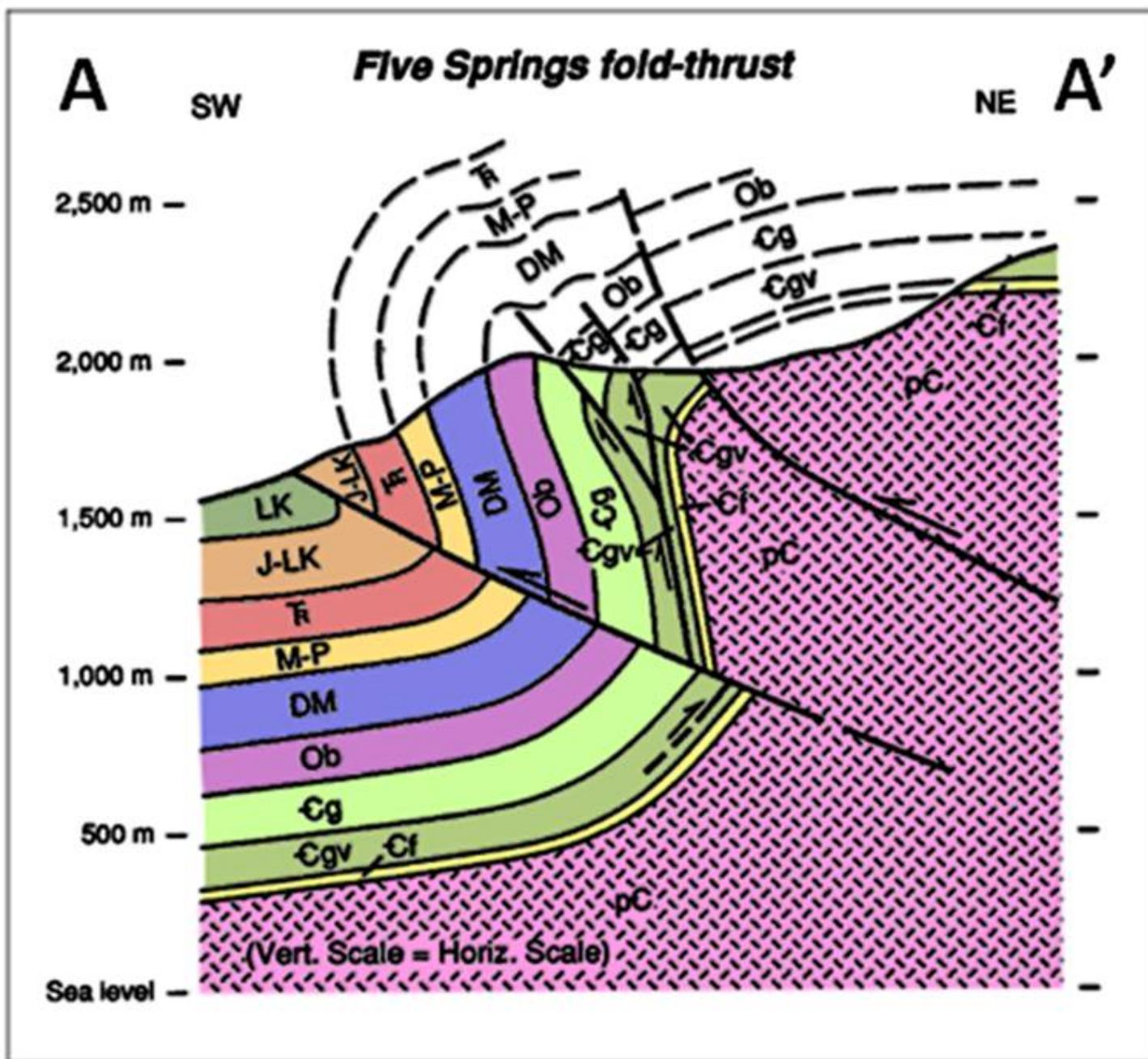
Image: Google Earth

3.1	28.2	0.2	62.4	Return to U.S. 14 Alt/Old U.S. 14 Alt intersection. Turn east (L/R).
<i>U.S. 14 Alt</i>				
0.2	28.4	2.5	62.2	Highway crosses Five Springs Creek.
2.5	30.9	0.9	59.7	Overlook pull-out. View north of Five Springs structure. Five Springs Thrust has about 1.25 miles of horizontal shortening and 6,500 feet of structural relief. The fault loses offset towards the south, becoming a monoclinial fold at Shell Canyon.



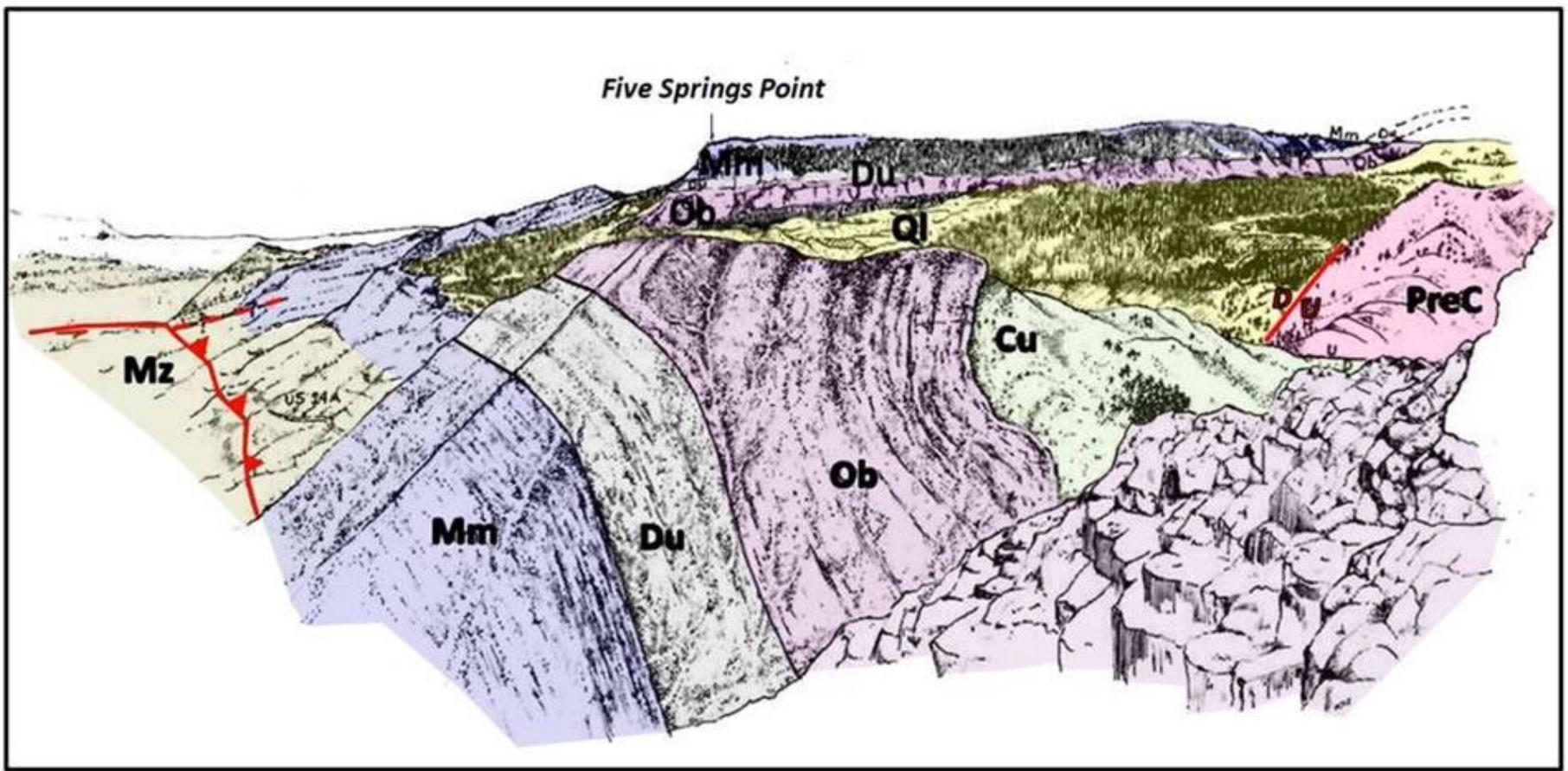
Geologic map of the Five Springs Area. US 14 Alt Road: solid blue line; Faults: Red solid, dashed and dotted lines; Geologic Notation: LK: Lower Cretaceous units, J-LK: Lower Cretaceous and Jurassic units, Tr: Triassic units; M-P: Pennsylvanian and Mississippian units; D-M: Devonian and Mississippian units; Ob: Ordovician Bighorn Formation; Cu: undifferentiated Cambrian units; pC: Precambrian basement rock.

Image: After Willis, J.J., 1994, Laramide Basement Deformation in an Evolving Stress Field, Bighorn Mountain Front, Five Springs Area, Wyoming: Discussion: AAPG Bulletin, Vol. 78, No. 4, Fig. 2, p. 646.



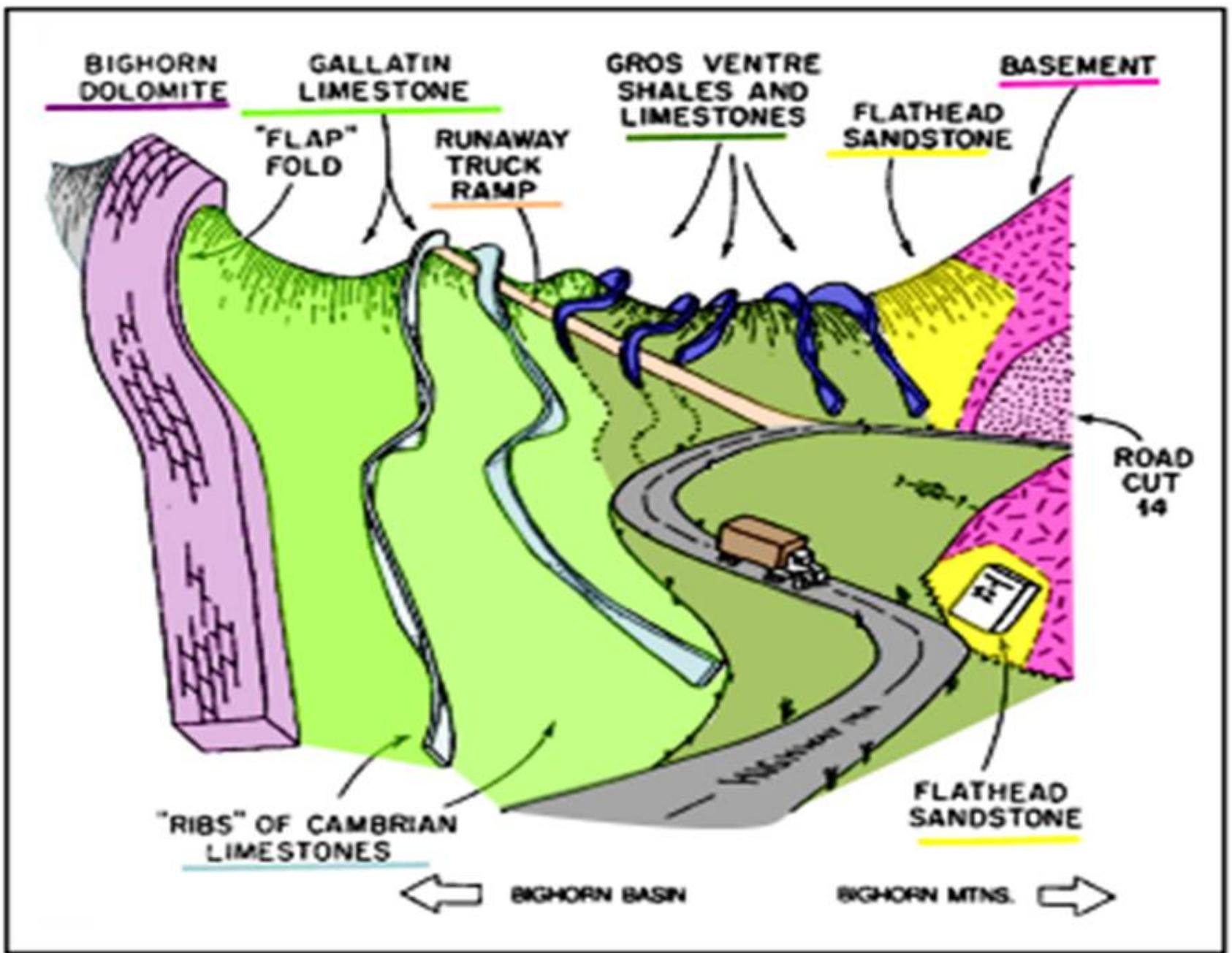
Geologic cross section A-A' showing the structure at Five Springs. Location of line shown on geologic map above. Geologic notation as above except for the Cambrian units that are differentiate: Cg: Cambrian Gallatin Formation; Cgv: Cambrian Gros Ventre Formation; Cf: Cambrian Flathead Formation.

Image: After Willis, J.J., 1994, *Laramide Basement Deformation in an Evolving Stress Field, Bighorn Mountain Front, Five Springs Area, Wyoming: Discussion: AAPG Bulletin, Vol. 78, No. 4, Fig. 6, p. 650.*



North view sketch of the Five Springs structure. Geologic notation: Ql: Quaternary landslide debris; Mm: Mississippian Madison Formation; Du: undifferentiated Devonian units; Ob: Ordovician Bighorn Dolomite; Cu: undifferentiated Cambrian units; Pre C: Precambrian basement. Thrust fault: red triangles; Strike-slip fault: red arrow; Normal fault: red "U" (up), "D" (down)

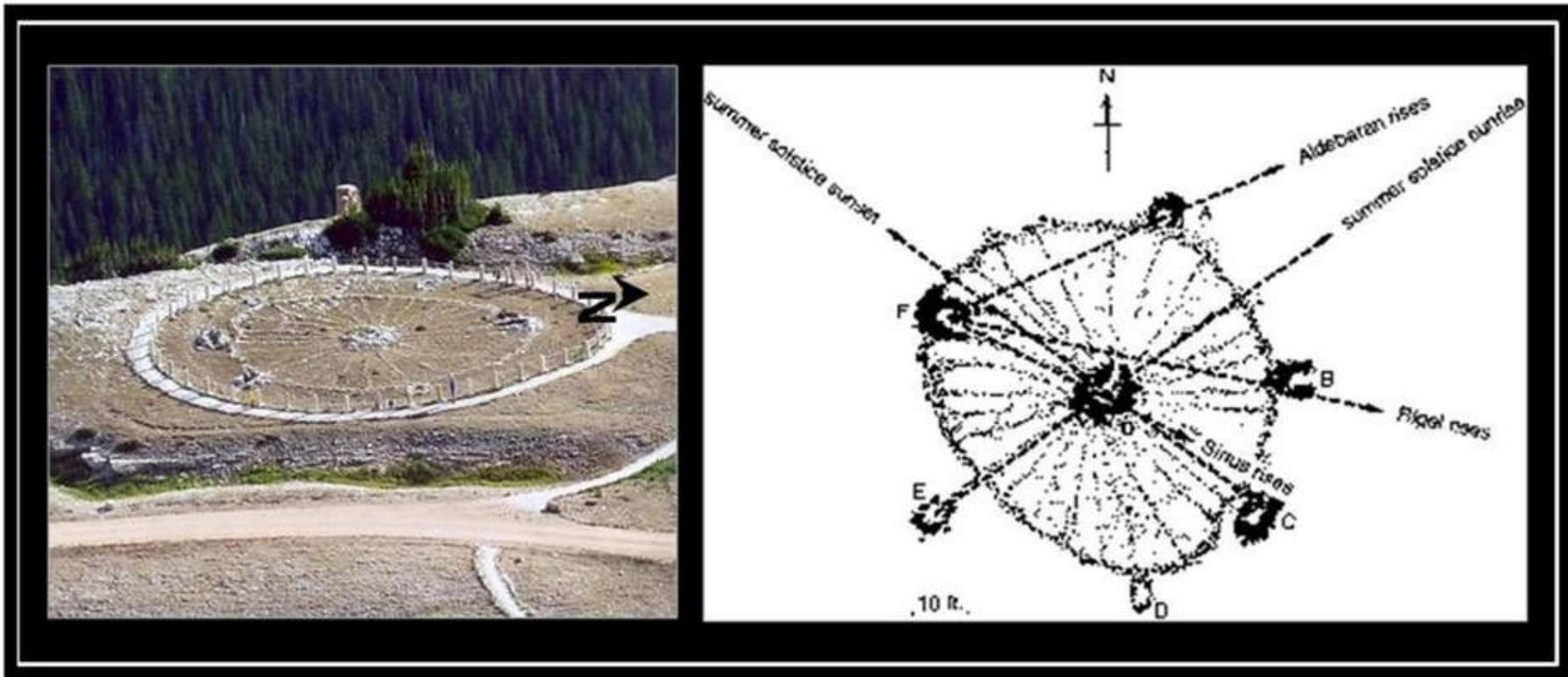
Image: After Hoppin, R.A., 1970, *Structural Development of Five Springs Creek Area, Bighorn Mountains, Wyoming*: GSA Bulletin, Vol. 81, Fig. 3, p. 2405.



West view sketch showing folded stratigraphic rocks contact with basement. Cambrian Flathead Sandstone is dipping at 52 degrees to the west-southwest at Precambrian basement contact

After Wise, D.U. and Obi, C.M., 1992, Laramide Basement Deformation in an Evolving Stress Field, Bighorn Mountain Front, Five Springs Area, Wyoming: AAPG Bulletin, Vol. 76, No. 10, Fig. 6, p. 1592.

0.9	31.8	4.4	58.8	<p>Precambrian rock contact. The Bighorn Mountains Precambrian rock complex consists of 2.85 billion year old granites in the northern part and 2.95 billion year old gneissic rocks in the southern part. These rocks are part of the ancient Wyoming Craton. This mini-continental plate attached to other mini-continents through plate tectonics to create the North American Craton (1.85 to 1.75 billion years ago).</p>
4.4	36.2	1.4	54.4	<p>Medicine Mountain to the north (L/R). Ordovician Bighorn Dolomite caps the top of the peak with an elevation of 9,962 feet.</p>
1.4	37.6	0.4	53.0	<p>Dirt road FS 12 to the north (L/R) heads to the Medicine Wheel National Historic Landmark. The structure consists of an 80 foot diameter stone circle with 28 spokes extending from the center to the rim. There are 5 stone cairns around the outside of the rim with a sixth positioned on the inside. This pre-Columbian structure has both religious and scientific significance. Native American used the site for religious ceremonies and vision quests. According to astronomer John Eddy the site served as a summer astrological calendar. Given an altitude of almost 10,000 feet and winter snows, it is no surprise that use of the site was restricted to the summer months. In 1970 the Bighorn Medicine wheel was made a National Historic Landmark. The name was officially changed to Medicine Wheel/Medicine Mountain National Historic Landmark in 2011. Drive 1.7 miles on FS 12 to parking lot and then easy hike 1.4 miles each way to Medicine Wheel. If you are unable to walk, you are allowed to drive all the way to the Medicine Wheel.</p>



Left: Bighorn Medicine Wheel located atop Medicine Mountain. Right: Diagram showing summer alignments.

Image: Left: U.S. Forest Service Photo, 2008,

<https://upload.wikimedia.org/wikipedia/commons/9/91/MedicineWheel.jpg>

(<https://upload.wikimedia.org/wikipedia/commons/9/91/MedicineWheel.jpg>); Right: Sunrise Magazine, 1998, <http://www.theosociety.org/pasadena/sunrise/47-97-8/4s-wtst.htm>

(<http://www.theosociety.org/pasadena/sunrise/47-97-8/4s-wtst.htm>)

0.4 38.0 0.4 52.6

Diabase dike crosses highway, striking N 40° E. The dike appears spotted due to white plagioclase within the dark gray diabase. This dike rock is called "leopard rock" due to this appearance. They are found in east-northeast swarms throughout the Bighorn and Beartooth Mountains and are dated at 2.45 billion years ago. Dirt road FS 13 to north leads to Porcupine Campground (1.7 miles), Porcupine Falls trailhead (8.2 miles) and Bucking Mule Falls trailhead (10.3 miles). See things to do at end of roadlog for details on these hikes.



Left: “Leopard rock” dike north of highway; Right: Close-up of “leopard rock” from northern Big Horn Mountains, with large feldspar crystals in mafic ground mass.

Image: Left: Harlan, S.S., 2005, Poster GSA Conference; Right: Harlan, S.S., Fig. 2, https://d32ogoqmya1dw8.cloudfront.net/files/NAGTWorkshops/petrology03/Mafic_dykes.doc (https://d32ogoqmya1dw8.cloudfront.net/files/NAGTWorkshops/petrology03/Mafic_dykes.doc)

0.4 38.4 0.8 52.2

Dirt road to the south (R/L) leads to Bald Mountain Campground.

0.8 39.2 1.0 51.4

Scenic turn out to the north (L/R). Trail leads to an outcrop of Precambrian granite about 350 feet north. Medicine Mountain radio tower can be seen 3 miles to the west. Bald Mountain (10,042 ASL) is visible 1.4 miles to the southeast. Notice the tree "blow-down" about a half mile to the southwest in the meadow at the base of Bald Mountain. An F3 tornado touched down in 1985.



View North and west from scenic pull out. Left: Precambrian outcrop; Right: Medicine Mountain.

Image: Left: *chris1073*, 2013, <http://www.panoramio.com/photo/92138157>

(<http://www.panoramio.com/photo/92138157>); Right: *tutunaku*, 2010,

<http://www.panoramio.com/photo/30820273> (<http://www.panoramio.com/photo/30820273>)

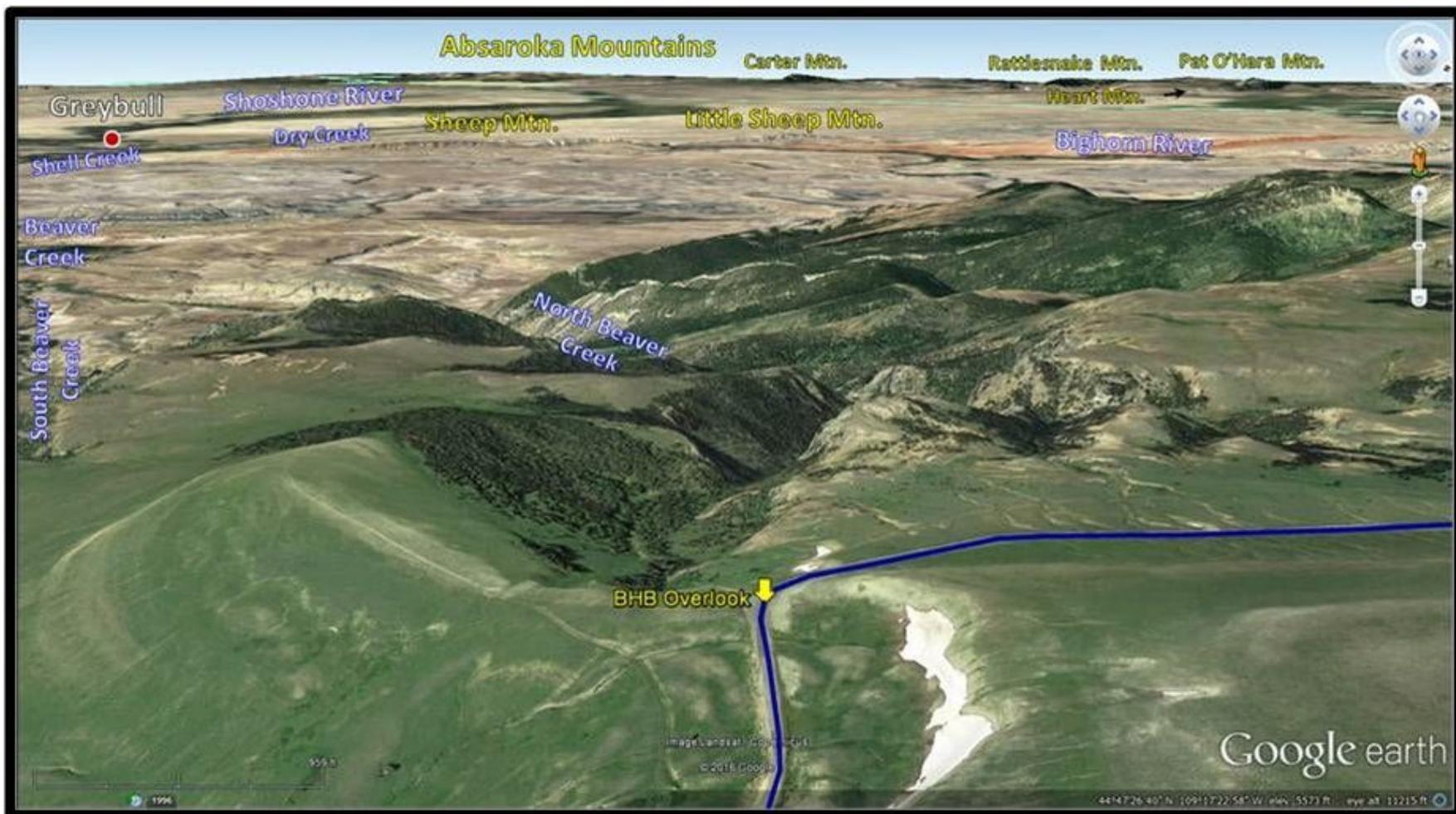


View south from scenic pull out. Left: Bald Mountain outcrop; Right: Bald Mountain tornado site. Area of tree blowdown shown by red dashed line.

Image: Left: *musicman82*, 2009, <http://images.summitpost.org/original/451830.jpg>

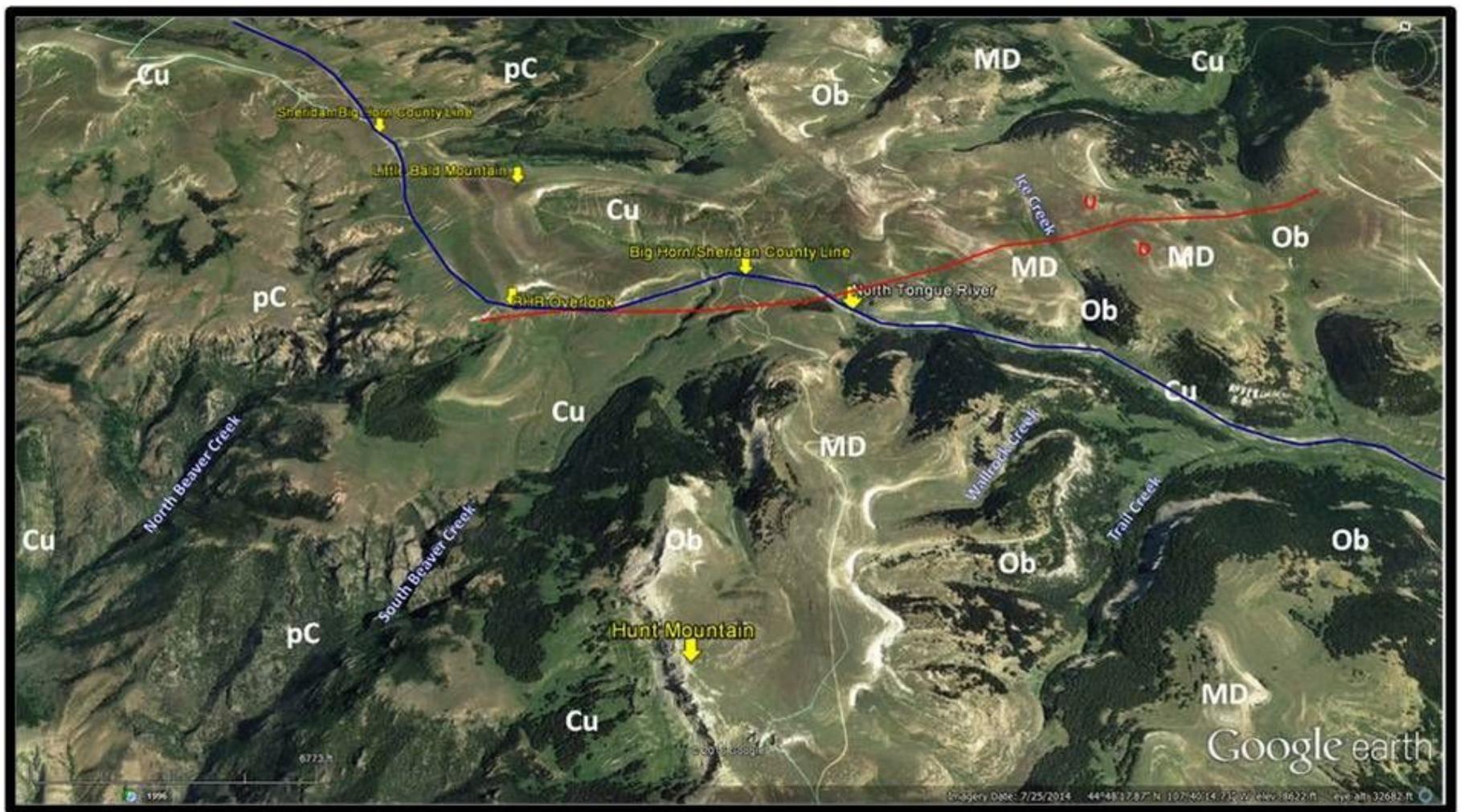
(<http://images.summitpost.org/original/451830.jpg>); Right: Google Earth

1.0	40.2	1.2	50.4	<p>Big Horn/Sheridan County Line. Dirt road FS 14 and then FS 125 to north (L/R) is the path to the ghost town of Bald Mountain City (no buildings remain standing). The community was established in the Spring of 1891 as a base for the mining activity on Bald Mountain, 2.5 miles to the southwest. "Gold fever" erupted in the summer of 1890, when 3 prospectors filed a claim. The city grew to some 50 buildings in its heyday. Little gold was recovered and the town was abandoned by the Fall of 1896. FS 14 also leads to Porcupine Falls Trailhead (7.4 miles) and Bucking Mule Falls trailhead (9.8 miles)</p>
1.2	41.4	0.9	49.2	<p>To the east, northeast, west and southwest is an old Precambrian erosion surface. Bald Mountain to the west. Two tenths of a mile north of road is a diabase dike trending 56 degrees in a northeasterly direction.</p>
0.9	42.3	1.9	48.3	<p>Dirt road FS 15 to north leads to Dayton Gulch. Sheridan/Big Horn County Line. The boundary tracks to the north of the crest of Little Bald Mountain (9907 feet ASL) a mile to the southeast on the north (L/R) side of the highway.</p>
1.9	44.2	1.2	46.4	<p>Bighorn Basin Observation point. Elevation 9,430 feet. Panoramic view of Bighorn basin. Little Bald Mountain north of highway. Across the basin is the Beartooth Mountains to the northwest, Absaroka Range to the west, and the Owl Creek Mountains to the south.</p>



Southwest aerial view at Bighorn Basin Overlook. U.S. 14 Alt is solid blue line. Note the contrast between the relatively flat surface of the Bighorn Mountains and the steeply westward dipping flatirons along the west mountain front.

Image: Google Earth



North Aerial View at Bighorn Basin Overlook showing Geology of area. Geologic notation: MD: Mississippian and Devonian units; Ob: Ordovician Bighorn Dolomite; Cu: undifferentiated Cambrian Formations; pC: Precambrian basement. Location of normal fault shown by solid red line with direction of offset indicated by "U" (up) and "D" (down). This is one of a group of east-north eastern trending normal faults leading to Tongue River Canyon west of Dayton. U.S. 14 Alt is solid blue line.

Image: Google Earth

1.2 45.4 0.8 45.2

Hunt Mountain Road FS 10 to the south leads to Hunt Mountain. It is capped by Bighorn Formation with an excellent collecting site for Endoceras and Cyclendoceras, (large straight nautiloids), Halysites (chain coral), and Bighornia (horn coral).

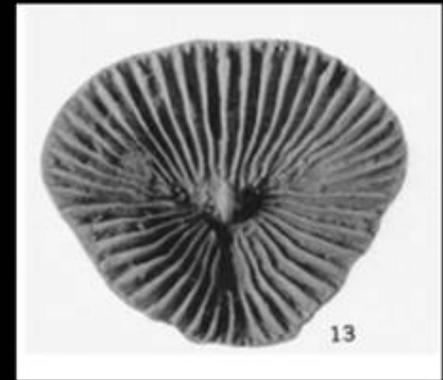
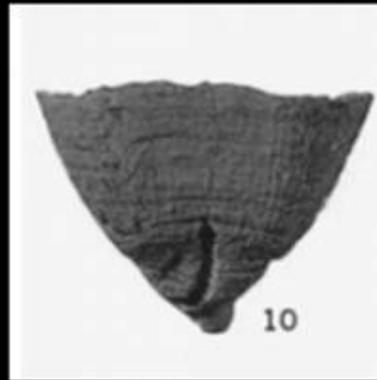
Endoceras and Cyclendoceras (large straight nautiloids)



Halysites (chain coral)



Bighornia (horn coral)



Types of fossils found in The Ordovician Bighorn Dolomite at Hunt Mountain.

Images:

Endoceras: https://upload.wikimedia.org/wikipedia/commons/c/cf/Endoceras_1.jpg

(https://upload.wikimedia.org/wikipedia/commons/c/cf/Endoceras_1.jpg);

Cyclendoceras: http://geokogud.info/elm/specimen_image/g1/g1-56.jpg

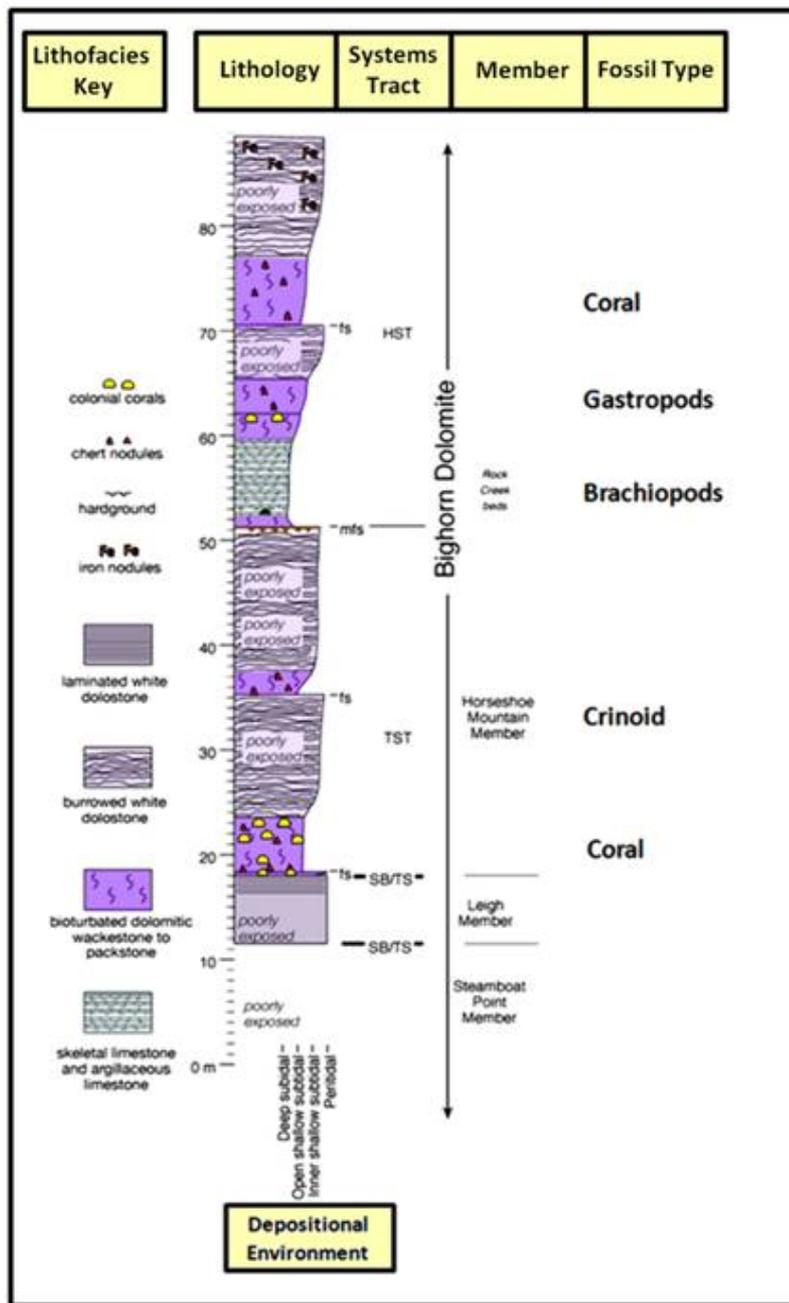
(http://geokogud.info/elm/specimen_image/g1/g1-56.jpg);

Halysites:

<https://upload.wikimedia.org/wikipedia/commons/thumb/0/09/HalysitesSilurian.jpg/220px-HalysitesSilurian.jpg>

(<https://upload.wikimedia.org/wikipedia/commons/thumb/0/09/HalysitesSilurian.jpg/220px-HalysitesSilurian.jpg>);

Bighornia: Duncan, H., 1957, *Journal of Paleontology*, Vol. 31, No. 3, Plate 70



Ordovician Bighorn Formation lithologic column at Hunt Mountain showing stratigraphic position of fossils. Systems Tract Code: fs: flooding surface; mfs: maximum flooding surface; HST: high stand systems tract; SB/TS: sequence boundary/ transgressive surface; TST: transgressive systems tract

Image: After Holland, S.M. and Patzkowsky, S.M., 2009, The stratigraphic distribution of fossils in a tropical carbonate succession: Ordovician Bighorn Dolomite, Wyoming, USA: Palaios, Vol. 24, No. 5; <https://www.google.com/search?q=The+stratigraphic+distribution+of+fossils+in+a+tropical+carbonate+succession:+Ordovician+Bighorn+Dolomite,+Wyoming,+USA&biw=1680&bih=847&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjZt-76jobSAhVCRSYKHcfcDJoQsAQIJQ&dpr=1#imgrc=YORsQWN14zqN6M>

(<https://www.google.com/search?q=The+stratigraphic+distribution+of+fossils+in+a+tropical+carbonate+succession:+Ordovician+Bighorn+Dolomite,+Wyoming,+USA&biw=1680&bih=847&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjZt-76jobSAhVCRSYKHcfcDJoQsAQIJQ&dpr=1#imgrc=YORsQWN14zqN6M>)

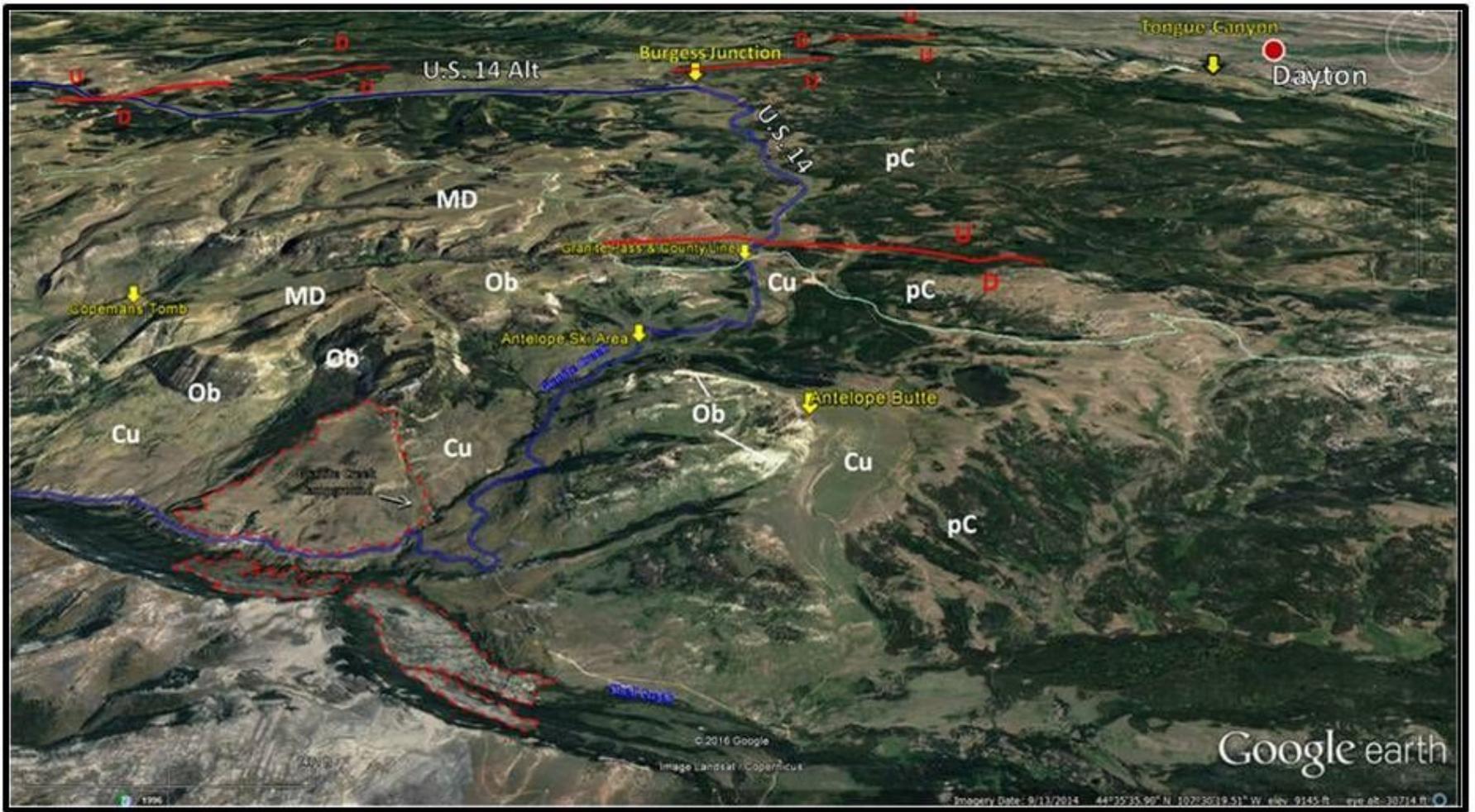
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q=The+stratigraphic+distribution+of+fossils+in+a+tropical+carbonate+succession:+Ordovician+Bighorn+Dolomite,+Wyoming,+USA&biw=1680&bih=847&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwjZt-76jobSAhVCRSYKHcfcDJoQsAQIJQ&dpr=1#imgrc=YORsQWN14zqN6M)

0.8	46.2	7.0	44.4	Highway on north side of North Tongue River valley. Immediately east (L/R) along road is the contact of the Cambrian Gallatin Formation and the Big Horn Formation.
7.0	53.2	4.8	37.4	Highway crosses the North Tongue River. To the south (R/L) is a grassy covered slope of Cambrian age, and Bighorn Formation of Ordovician Age.
4.8	58.0	0.6	32.6	Bear Lodge Resort on the north side of highway (L/R).
0.6	58.6	1.3	32.0	Turn south (R/L) at intersection of U.S 14 Alt with U.S. 14 at Burgess Junction. Burgess Junction is at an elevation of 8,040 feet ASL and is part of Dayton, Wyoming although located 25 miles to the west of that town. Driving on Precambrian basement.

U.S. 14

1.3	59.9	0.1	30.7	Elk View Inn to the east (L/R).
0.1	60.0	3.6	30.6	Cattle Guard.
3.6	63.6	4.7	27.0	Dirt road FS 26 to east leads to Tie Flume Campground and Dead Swede Campground.
4.7	68.3	2.8	22.3	Crossing Granite Pass, elevation 9,035 feet ASL. This is also the Sheridan/Big Horn County Line.
2.8	71.1	0.8	19.5	Road to the east (L/R) leads to Antelope Butte Ski Area. The facility was closed after 40 years of operation in 2004. The Forest Service sold the facility to the Antelope Butte Foundation in 2016. They plan to re-open the ski area in December of 2017.
0.8	71.9	3.0	18.7	Highway is in the valley of Granite Creek.
3.0	74.9	0.9	15.7	Highway now following the valley of Shell Creek. Paint Rock road FS 17 to southeast leads to Shell Creek Campground and Ranger Creek Campground.
0.9	75.8	0.3	14.8	Crossing Granite Creek and site of old campground and picnic area. Granite Creek flows into Shell Creek to the south (L/R) in about a third of a mile.
0.3	76.1	2.9	14.5	Turnout on south side of highway (L/R). The downed timber on the south side of Shell Creek Canyon (L/R) and on the northwest side of Granite Creek (L/R) was caused by a 1959 tornado. This F2 storm killed one person in the old Granite Creek Campground. This area was completely closed by the U.S. Forest Service in 2012.



North aerial view of Granite and Shell Creek area showing the bedrock geology. Bighorn Byway shown by solid blue line. Normal fault near Granite Pass is the solid red line with direction of offset indicated by "U" (up) and "D" (down). Area of tree "blowdown" from 1959 tornado is outlined by dashed red line. Geologic notation: MD: Mississippian and Devonian Formations; Ob: Ordovician Bighorn Dolomite; Cu: undifferentiated Cambrian Formations; pC: Precambrian basement.

Image: Google Earth

2.9	79.0	0.5	11.6	Runaway truck ramp to north (R/L).
0.5	79.5	0.1	11.1	Shell Creek Bridge. Granite outcrops to the north.
0.1	79.6	2.8	11.0	Shell Falls Interpretive Site to the north (R/L).



RESTING PLACE NATURAL TOMB

WHERE NATHAN A. LINDSEY
LAID DOWN AND DIED IN
MOUNTAINS.

A MAGNIFICENT PANORAMA

For Two Long Months His Skeleton
Was Guarded by Stars and
Faithful Dog.

Near where the body of N. A. Lindsey was found, in the Big Horn mountains, there rises a massive, square plateau of granite. Gleaming and glistening in the bright sunlight the face on the southwest rears over, it is said, a sheer 200 feet. For miles before the foothills are even reached this rectangular mass of rock impresses one with its solid grandeur and for this reason it has been named "Copman's Tomb."

Once upon top, the most magnificent panorama unfolds. Below lays the picturesque valley of Shell, whose velvety verdure, green topped trees are relieved by the silvery flowing waters of Shell creek, carrying as they flow encouragement and confidence to the tiller of the soil.

To reach the top of Copman's Tomb one must make a tedious and toilsome, always upward and heavenward detour to the east before the ascent can be successfully made.

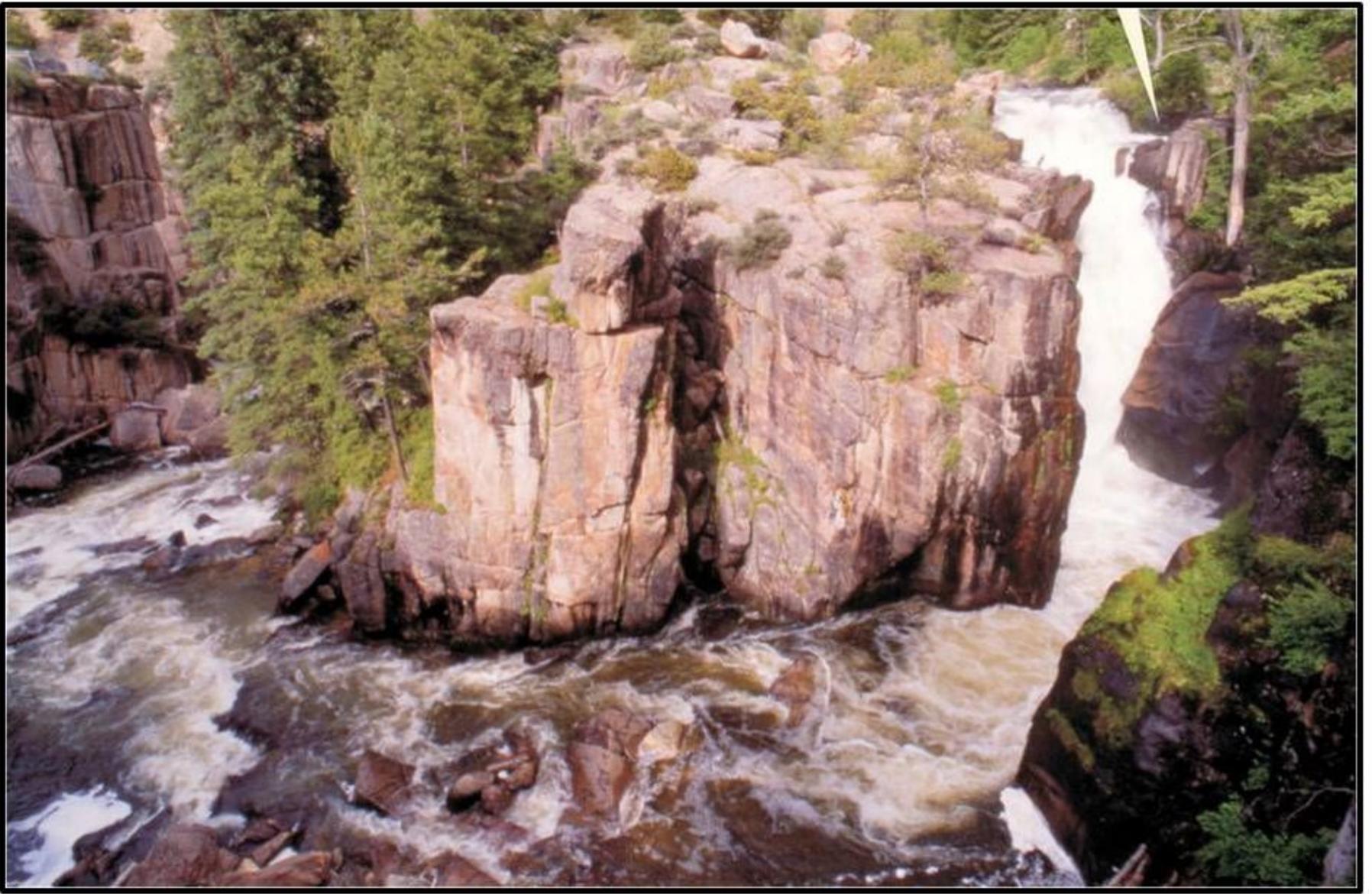
'Twas here in its cooling shades and under its shadow all that remained of Nathan A. Lindsey was found, guarded only by the stars and his faithful dog—*Basin Republican*.

Daily Enterprise
August 09, 1910, page 3

North view of Shell Falls Interpretive Site with Copemans Tomb on the skyline. Wolfgang Robert Copeman was a pioneer sheepman working in the Shell area for which he had a great love. He loved the area so much that he wanted his ashes scattered on one of the peaks. But when he died in 1907, his wife's religious objections to cremation prevented his wishes from being fulfilled. The locals memorialized him by naming his desired resting place Copemans Tomb. However, the peak did serve as a temporary headstone for one Nathan A. Lindsey who went to get the mail and supplies in 1920 and never returned.

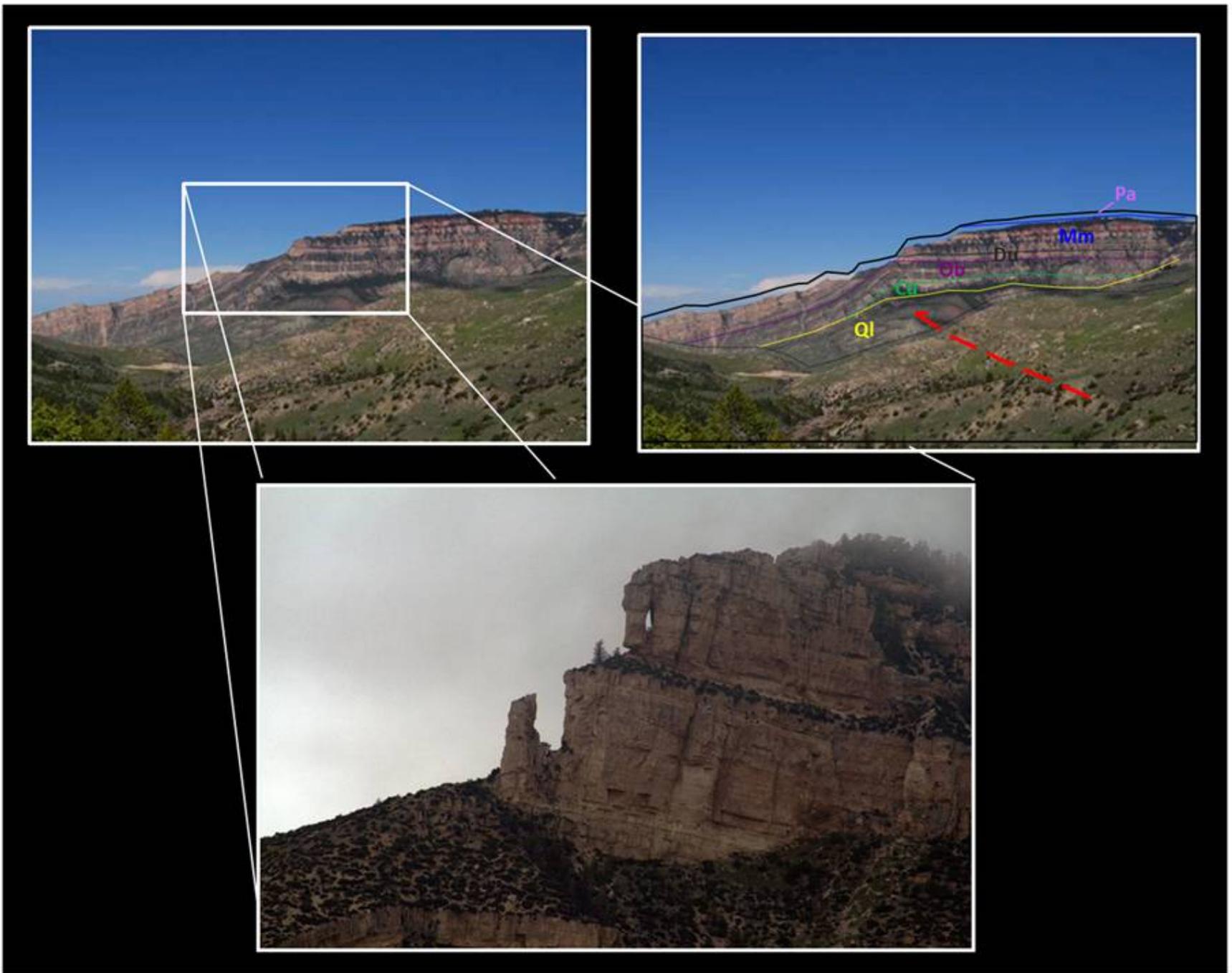
Image: https://www.fs.usda.gov/Internet/FSE_MEDIA/stelprdb5364725.jpg

(https://www.fs.usda.gov/Internet/FSE_MEDIA/stelprdb5364725.jpg)



Shell Falls and Creek. Shell Creek has cut a narrow v-shaped canyon in the last million years. The canyon is over 8 miles long and 2,500 feet deep. At the falls Shell Creek drops 120 feet over eroded 2.9 billion year old Precambrian granite. Its maximum flow rate is 3,600 gallons per second. Shell Creek elevation drops from 11,000 feet in the Cloud Peak Wilderness to under 3,800 feet where it flows into the Bighorn River.

*Image: https://www.fs.usda.gov/Internet/FSE_MEDIA/stelprdb5364725.jpg
(https://www.fs.usda.gov/Internet/FSE_MEDIA/stelprdb5364725.jpg)*



Top Left: Shell Monocline fold is generated by a buried reverse fault. This structure was used to develop the “block uplift model” of Laramide folding. This vertical uplift interpretation was shown to be incorrect by seismic data obtained in the 1980s. Box shows area of enlarged image. Top Right: Geology of monoclinial fold. Buried reverse fault: red dash line. Geologic notation: Ql: Quaternary landslide debris; Pa: Pennsylvanian Amsden Formation; Mm: Mississippian Madison Formation; Du: undifferentiated Devonian formations; Ob: Ordovician Bighorn Formation; Cu: undifferentiated Cambrian formations.

Bottom: Elephant Head Rock to the right (northeast) of the monoclinial flexure.

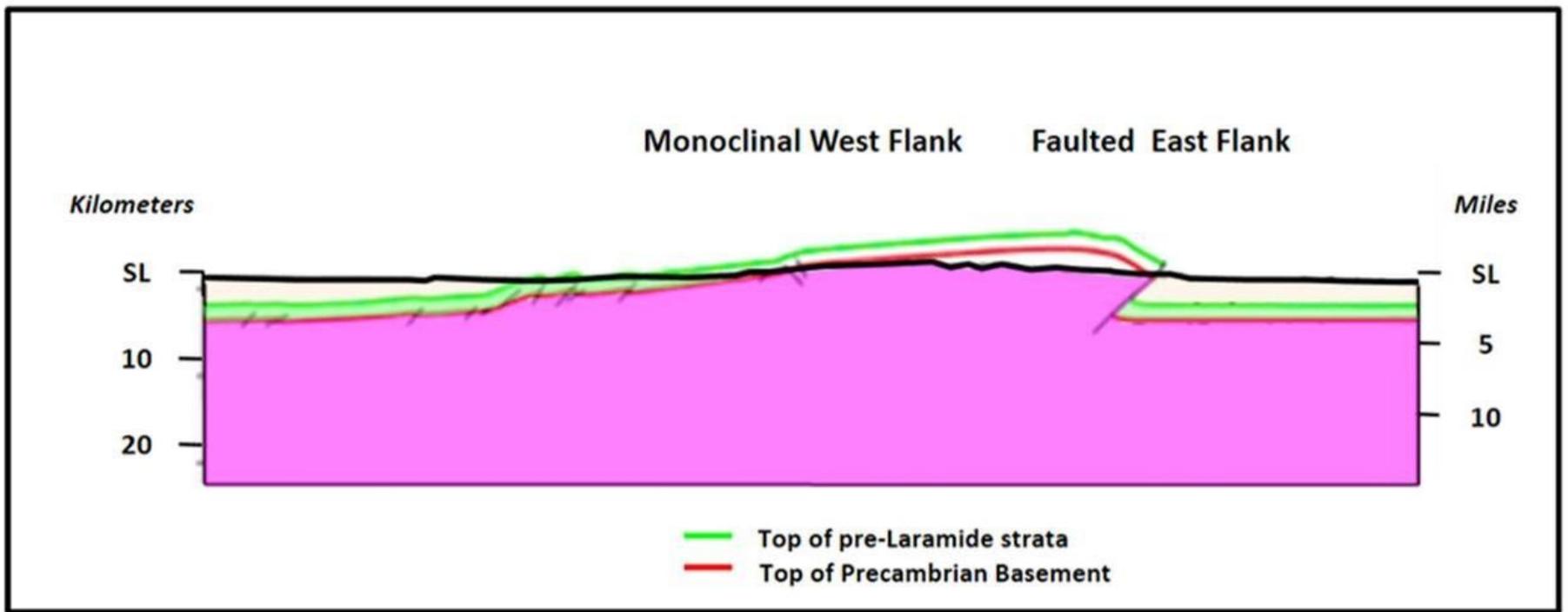
Image: Top Left and Right: After

http://www.cco.caltech.edu/~nova/Site/2011_PCC_Geology_Field_Trip_Blog/Entries/2011/6/26_June_24_-_Cody,_Wyoming.html

(http://www.cco.caltech.edu/~nova/Site/2011_PCC_Geology_Field_Trip_Blog/Entries/2011/6/26_June_24_-_Cody,_Wyoming.html);

Bottom: https://farm3.staticflickr.com/2072/2184995004_d2366eae12_b.jpg

(https://farm3.staticflickr.com/2072/2184995004_d2366eae12_b.jpg)

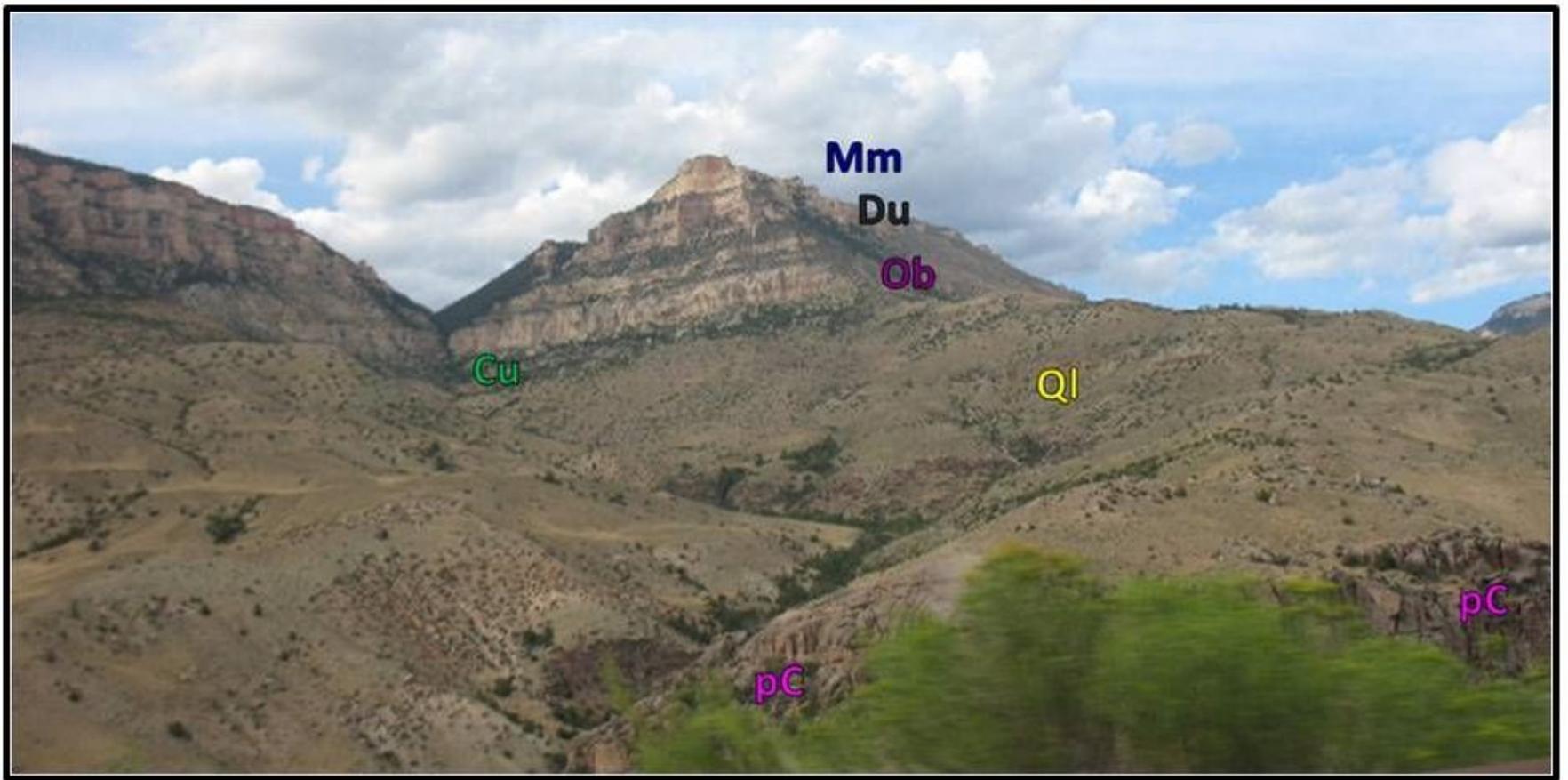


Structure of the Bighorn Mountains Arch. A monocline, such as at Shell Canyon, is formed when the fault does not cut through the stratigraphic section (often called a blind or buried thrust).

Image: After Stone, D. S. (1993), Basement-involved thrust generated folds as seismically imaged in sub-surface of the central Rocky Mountain foreland, in Laramide Basement Deformation in the Rocky Mountain Foreland of the Western United States, edited by C. J. Schmidt, R. B. Chase, and E. A. Erslev, Spec. Pap. Geol. Soc. Am., 280

2.8 82.4 3.8 8.2

Pulloff on north side. Pyramid Mountain, due north (R/L); Cope's Tomb Mountain to the northeast. The Bighorn Dolomite caps these mountains. Ordovician-Cambrian shale contact may be seen at the base of the lowest massive cliff of Pyramid Mountain. The skyline on the northwest side of Shell Canyon is gypsiferous Permian Goose Egg Formation, beneath which the whole section down to Cambrian Gallatin can be seen.



Pyramid Peak to the north. The larger mountain to the right is Sunlight Mesa. The Shell Monocline and Elephant rock are part of this larger topographic feature. Precambrian rock is exposed in the drainage of Cedar Creek Geologic notation: Ql: Quaternary landslide debris; Mm: Mississippian Madison Formation; Du: undifferentiated Devonian units; Ob: Ordovician Bighorn Formation; Ci: undifferentiated Cambrian units; pC: Precambrian basement.

Image: <http://travellogs.us/2014%20Logs/Wyoming/WY-11%20Shell%20Canyon/WY-11b%20Shell%20Canyon%20Big%20Horn%20Mts.htm>

(<http://travellogs.us/2014%20Logs/Wyoming/WY-11%20Shell%20Canyon/WY-11b%20Shell%20Canyon%20Big%20Horn%20Mts.htm>)

3.8 86.2 0.2 4.4

Shell Creek bridge. The top of the Madison forms the gateway to Shell Creek Canyon. Red stain in Upper Madison is from the overlying Amsden shales that are red.

0.2 86.4 0.2 4.2

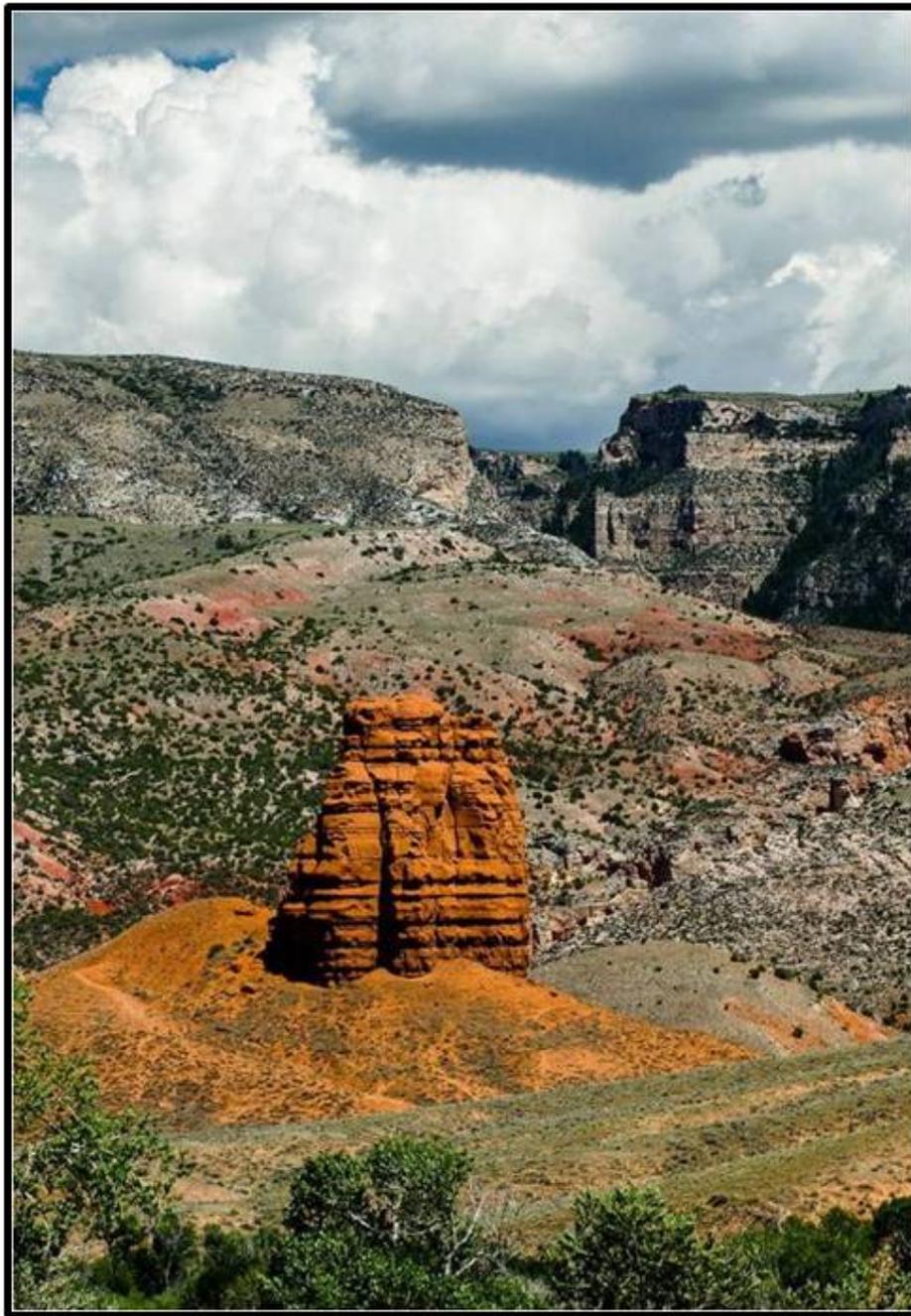
Tensleep outcrop north (R/L) of the road. Erosional contact of Tensleep and overlying Goose Egg as seen in photo below.



Permian Goose Egg Formation overlying Pennsylvanian erosional unconformity. Post-Tensleep uplift of the Greybull Arch to the North of this area lead to the removal of almost the entire Upper Tensleep at this location. The sandstone bed at the right of the outcrop is eroded a short distance to the left. The thin purple unit just beneath this sandstone is the marker bed at the top of the Lower Tensleep. Solid red line marks the Permian-Pennsylvanian unconformity.

*Image: After Bentley, C., 2011, Mountain Beltway: AGU Blogosphere,
<http://blogs.agu.org/mountainbeltway/2011/06/27/goose-egg-tensleep-contact/>*

0.2	86.6	0.7	4.0	Gypsiferous series of Lower Permian Goose Egg Formation redbeds are seen north (R/L) of the road.
0.7	87.3	0.6	3.3	Middle Triassic Chugwater Formation redbeds to the north (R/L) and in the valley to the south (L/R).
0.6	87.9	2.0	2.7	Road to the south (L/R) leads to Iowa State University Geology Field Camp. Alcova limestone is exposed in the arroyo to the north. Eight feet of thin-bedded dolomitic limestone, algal in places, forms the cap rock on bluffs along the south bank of Shell Creek. Prominent spire of Triassic Chugwater Formation is known as Chimney Roc. It is sometimes called "The Guardian of the Canyon." This topographic feature was originally "White's Monument" named after an early prospector who was murdered by one of his partners. The story says that when Riley Kane went to Lander for seasonal supplies, Jim White was killed by their recently acquired partner and their assets were stolen. Jim's body was found near Shell Creek. Although the monument was renamed, Jim White is still remembered by a stream east of Black Mountain named White Creek.
2.0	89.9	0.3	0.7	Shell Creek bridge. Sundance sandstones are exposed on the north side of the road.
0.3	90.2	0.4	0.4	Gravel road to north Bighorn County L31 (R/L) leads to Darton's type Cloverly locality, approximately 10 miles north. Barnum Brown's Sinclair dinosaur quarry is three miles northwest of the Cloverly type locality, in the Morrison Formation, about 200 feet above the glauconitic sandstones of the Sundance. See Geowyo Shell Dinosaur Bone Beds http://www.geowyo.com/shell-dinosaur-bone-beds.html
0.4	90.6	0.0	0.0	Town center of Shell, Wyoming (Elev. 4210', Population 83, unincorporated).



Chimney Rock, known as “The Guardian of the Canyon.” On the skyline Sunlight Mesa is to the left and Rattlesnake Hill is to the right.

Image: <https://s-media-cache-ak0.pinimg.com/736x/44/f7/78/44f778928d33b797dae66641663bec77.jpg> (<https://s-media-cache-ak0.pinimg.com/736x/44/f7/78/44f778928d33b797dae66641663bec77.jpg>)

End of Roadlog

The geologic story recorded in the rocks and the awesome beauty of the mountain landscape of canyons, meadows, streams, falls and towering peaks is reason enough to make this trip. But on top of that, there is the human story of Native Americans, trappers, prospectors, ranchers, farmers, outlaws and entrepreneurs whose lives still echo in the Bighorns.

Things To Do at Bighorn Mountain Byways

Our recommendations are hikes to Medicine Wheel, Porcupine Falls and Bucking Mule Falls. Two additional scenic quick stops worth the time are Five Springs Campground and Shell Falls. The best months to visit are June through mid-October. Highway US 14A closes for the winter, usually in November and opens again by the Memorial Day weekend. US 14 stays open for the winter.

Medicine Wheel

An easy hike of 2.8 miles total roundtrip along a road that takes about an hour of hiking time. It is an out and back with slight elevation gain. If you have a disability that prevents you from walking to the site, you are allowed to drive. The Medicine wheel is 80 foot in diameter and 245 foot in circumference. It has 28 radiating spokes that match the number of days in a lunar month. There are six cairns along the outer edge of the wheel that correspond to the rising and setting of the summer solstice sun and three bright stars. It is believed to be about 700 years old and is still used today for ceremonies, vision quests, meditation and prayer. Be respectful of this Native American sacred site. Great views! **Directions:** At 37.6 miles on roadlog, turn north on FS 12 (purple route on Google Map below), a dirt road fine for passenger vehicles, 1.3 miles cattle guard, 1.7 miles parking lot at Medicine Wheel trailhead.

Porcupine Falls

A short, but steep hike of 0.8 miles total roundtrip that takes about an hour of hiking time. It is an out and back with a 440 foot elevation descent and climb out. You won't be disappointed by these falls that cascade 200 feet into a beautiful pool surrounded by Precambrian cliffs. To the right of the falls is a smaller cascade issuing from a tunnel that gold miners dug in the early 1900's to divert the water flow. **Directions:** At 38.0 miles on roadlog, turn north on FS 13 (green route on Google Map below), a dirt road fine for passenger vehicles, 1.7 miles Porcupine Campground, 1.9 miles cross creek, 2.0 miles road forks, stay left on FS 13, 2.2 miles road forks take left on FS 133, 2.4 miles Jaws trailhead on left, 3.5 miles stop sign turn left on FS 14 (blue route on Google Map below), 7.9 miles turn left on FS 146, this short section is rough and potholed, 8.2 miles remains of old log cabin on right and parking area for Porcupine Falls trailhead.

Porcupine Falls

Image by Lori Trembath



Bucking Mule Falls

A hike of 4.7 miles total roundtrip with a slight elevation change that takes about two hours of hiking time. The hike takes you to an overlook with good views of Devils Canyon and the falls from a distance. **Directions:** Follow directions to Porcupine Falls, but continue at 7.9 miles straight on FS 14 (red route on Google Map below) another 2.4 miles and reach Bucking Mule

Falls trailhead at 10.3 miles. Dirt road is fine for passenger vehicles.



Routes to trailheads for Medicine Wheel (purple), Porcupine Falls (green & blue), Bucking Mule Falls (red), and Five Springs Campground (yellow)

Image by Google Earth

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