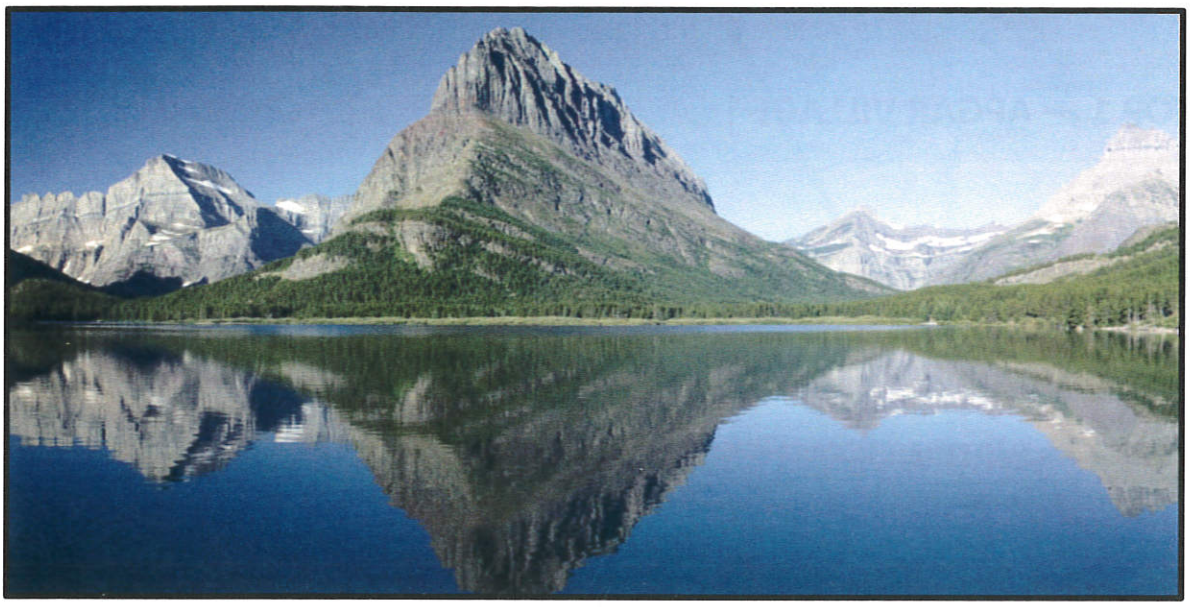
GLACIER NATIONAL PARK



Driving through Glacier National Park along Going-to-the-Sun road is to experience 1.4 billion years of Earth history unfolding before you…

In the 50 miles between West Glacier and Saint Mary, you will pass through eight different formations of the Belt Supergroup, sediments deposited in a restricted sea roughly 1.4 billion years ago and subsequently squeezed, tilted and faulted by extreme tectonic forces.

You will also see dozens of classic glacial features—hanging valleys, cirques, and paternoster lakes—evidence of the power of the ice, once a mile thick near the park, that sculpted the Belt rocks during the last Ice Age, a mere 12,000 years ago.

ITINERARY OVERVIEW

STOP 1 — APGAR VILLAGE | *LAKE McDONALD, TRIP OVERVIEW*

STOP 2 — McDONALD CREEK |*DEEP-WATER DEPOSITS*

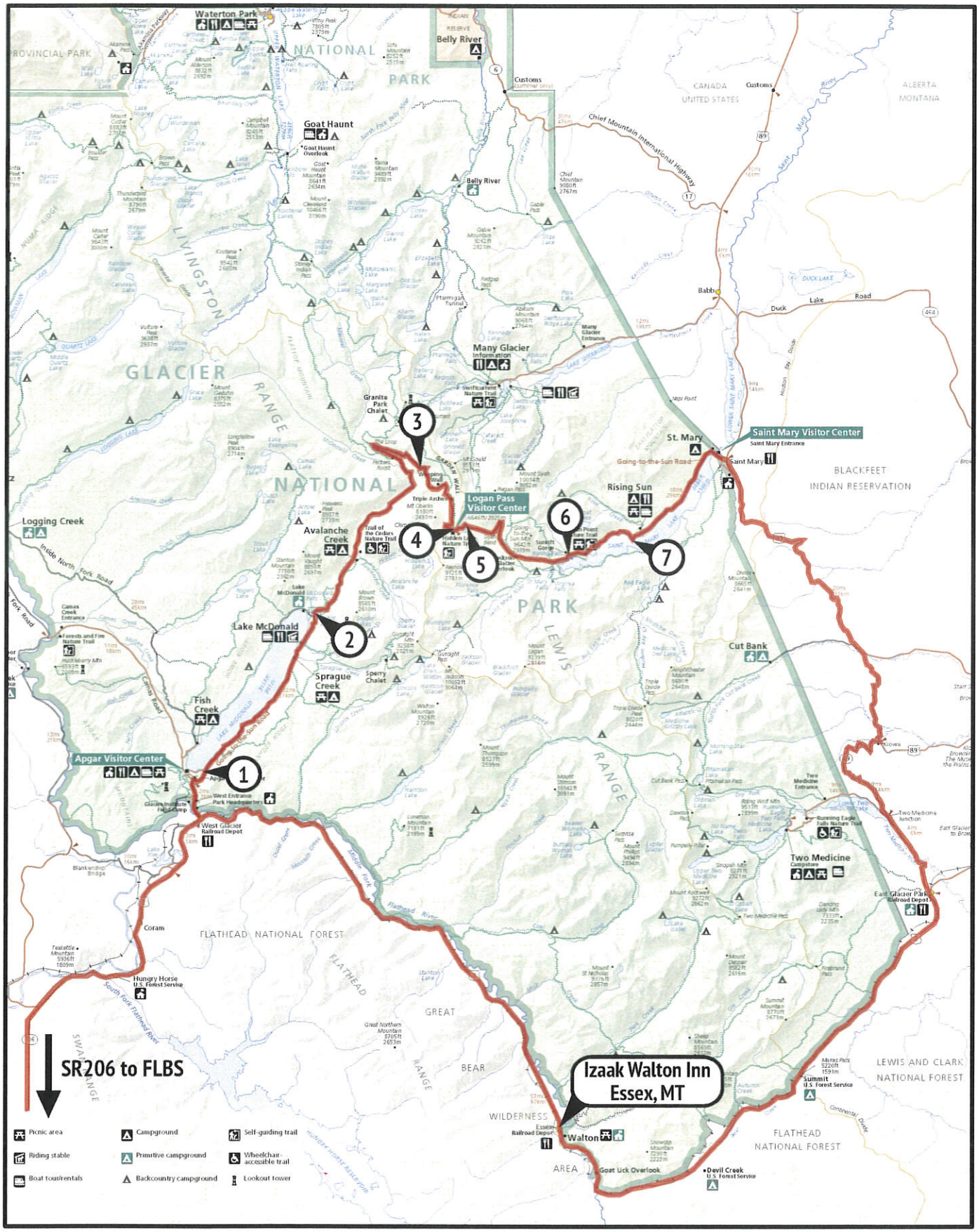
STOP 3 — BIRD WOMAN FALLS | *GLACIAL FEATURES*

STOP 4 — LOGAN PASS | *LUNCH, VISITOR'S CENTER, OPTIONAL HIKE*

STOP 5 — LUNCH CREEK | *MOLAR TOOTH & STROMATOLITES*

STOP 6 — GRINNELL ROAD CUT | *SHALLOW-WATER DEPOSITS*

STOP 7 — ST. MARY LAKE | *ICONIC PARK LANDSCAPE*


Waterton Park
Belly River
Goat Haunt
Many Glacier
Granite Park Chalet
Logan Pass Visitor Center
Saint Mary Visitor Center
St. Mary
Rising Sun
Logging Creek
Avalanche Creek
Lake McDonald
Sprague Creek
Fish Creek
Apgar Visitor Center
West Glacier Railroad Depot
Cut Bank
Two Medicine
East Glacier Park Railroad Depot
Coram
Hungry Horse U.S. Forest Service
Walton
Izaak Walton Inn
Essex, MT
SR206 to FLBS
GLACIER NATIONAL PARK
LIVINGSTON RANGE
LEWIS RANGE
GREAT BEAR WILDERNESS AREA
FLATHEAD NATIONAL FOREST
BLACKFEET INDIAN RESERVATION
LEWIS AND CLARK NATIONAL FOREST
CANADA
UNITED STATES
ALBERTA
MONTANA
Chief Mountain International Highway
Going-to-the-Sun Road
Inside North Fork Road
Picnic area
Riding stable
Boat tour/rentals
Campground
Primitive campground
Backcountry campground
Self-guiding trail
Wheelchair-accessible trail
Lookout tower

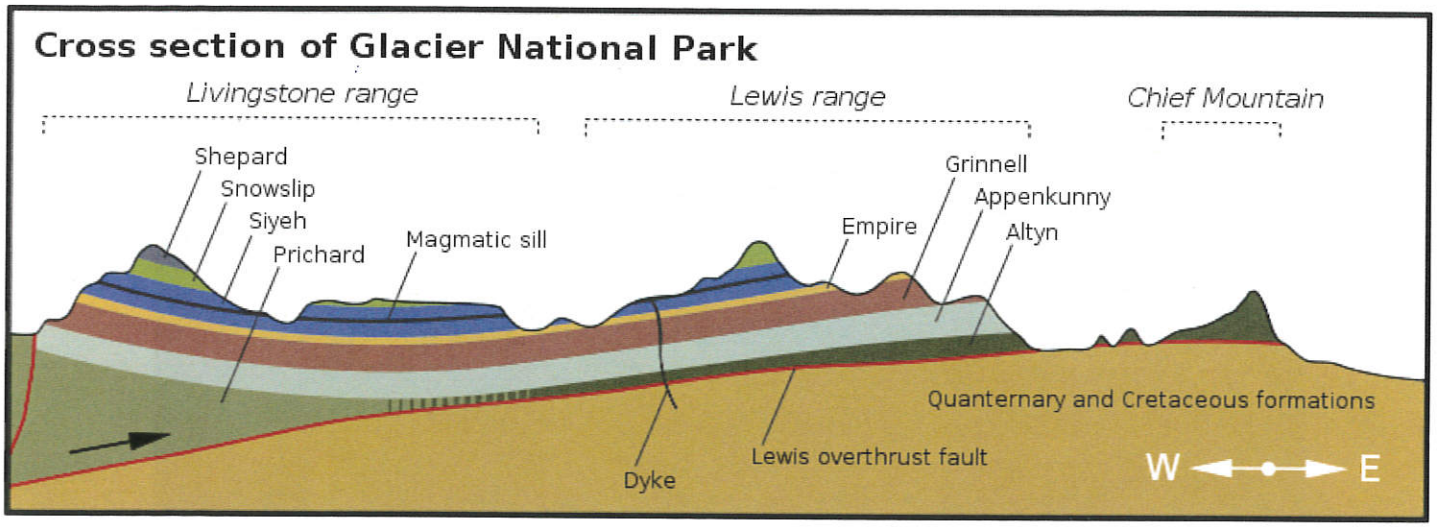
STOP 1 — APGAR VILLAGE

LAKE MCDONALD | GROUP PHOTO | TRIP OVERVIEW

Flathead Lake Biological Station - The University of Montana
32125 Bio Station Lane, Polson, MT 59860

- Head east on Bio Station Ln toward MT-35 E
  0.2 mi
- Turn left onto MT-35 W
  27.4 mi
- Turn right onto Montana Hwy 206
  9.7 mi
- Turn right onto US-2
  14.6 mi
- Turn left onto Glacier Rte 1 Rd/Going-To-The-Sun Rd
  ⚠ Parts of this road may be closed at certain times or days

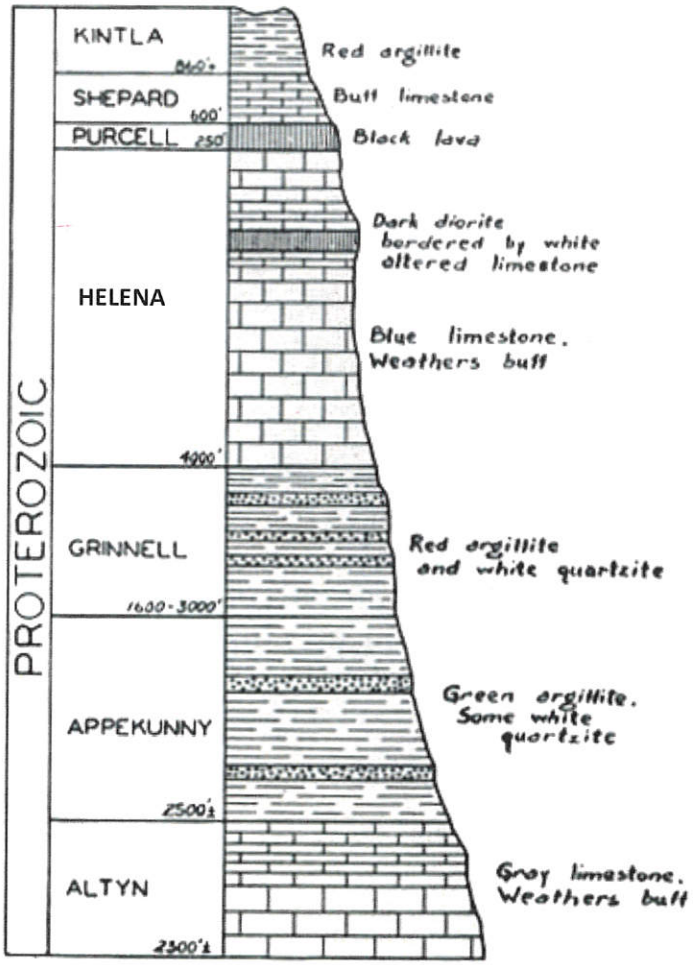
The Belt Supergroup



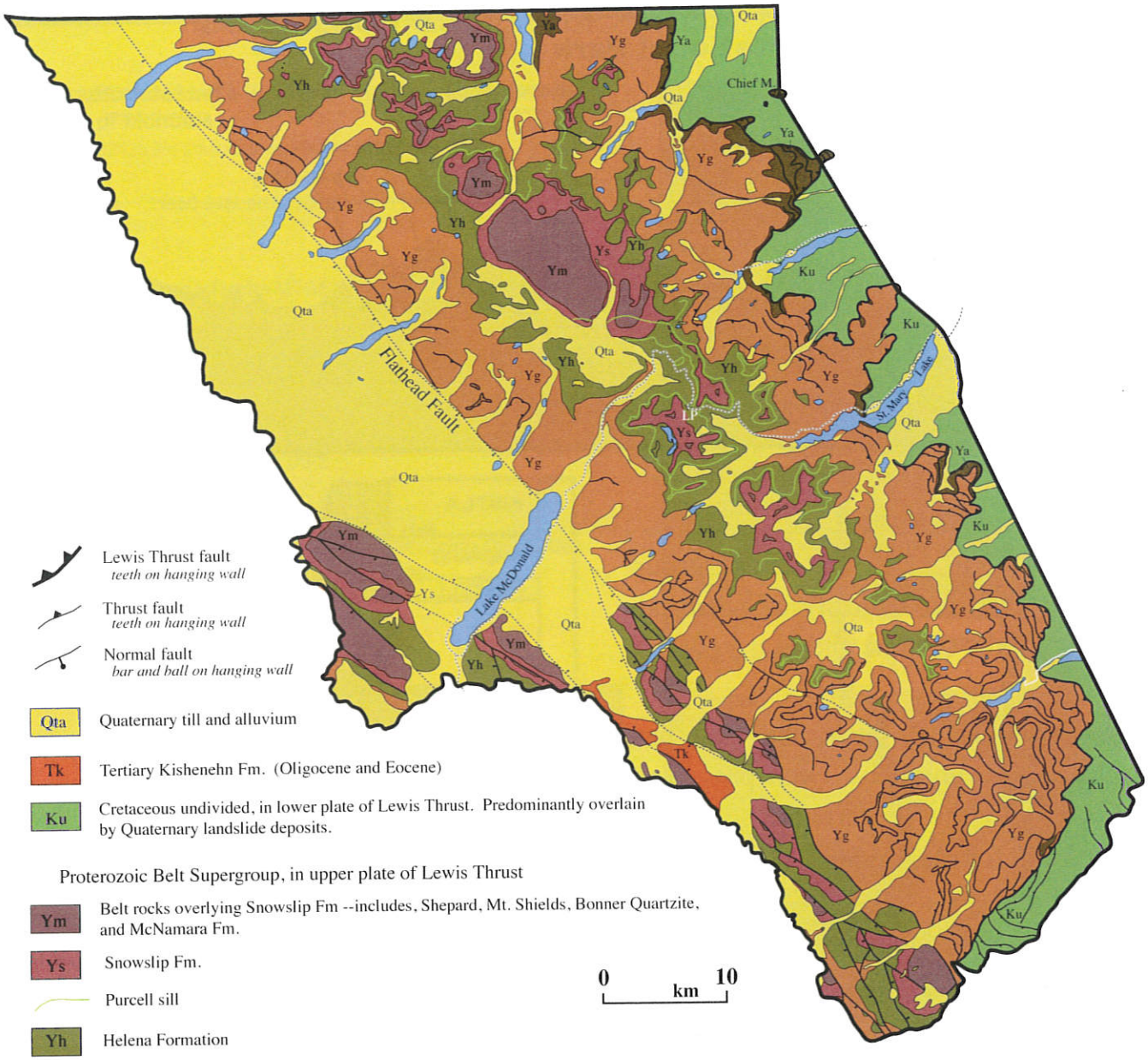
The rocks of the Belt Supergroup comprise the vast majority of what can be found at the surface within the park.

Thousands of feet thick, the Belt has provided a uniquely well-preserved window into the Proterozoic world to researchers for more than 100 years.

In the cross section above, the formation names used in the Livingstone range (west) are slightly different than those used in the Lewis range (east), though the layers of rock are easily correlated using distinctive marker units and are, in most cases, lithologically very similar.



Glacier National Park, Montana



Lewis Thrust fault
teeth on hanging wall

Thrust fault
teeth on hanging wall

Normal fault
bar and ball on hanging wall

Qta Quaternary till and alluvium

Tk Tertiary Kishenehn Fm. (Oligocene and Eocene)

Ku Cretaceous undivided, in lower plate of Lewis Thrust. Predominantly overlain by Quaternary landslide deposits.

Proterozoic Belt Supergroup, in upper plate of Lewis Thrust

Ym Belt rocks overlying Snowslip Fm --includes, Shepard, Mt. Shields, Bonner Quartzite, and McNamara Fm.

Ys Snowslip Fm.

Purcell sill

Yh Helena Formation

Yg Appekunny, Grinnell, and Empire Formations. Includes the Prichard Fm. on the west side of the park.

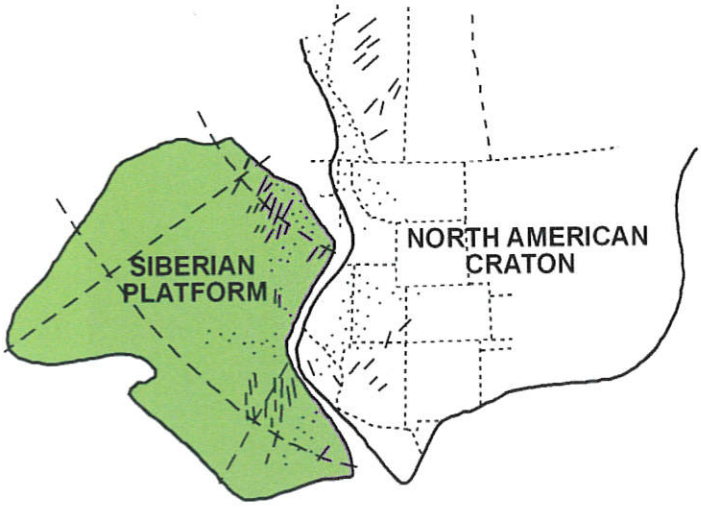
Ya Altyn Dolomite. Includes Waterton Fm., near north end of the park.

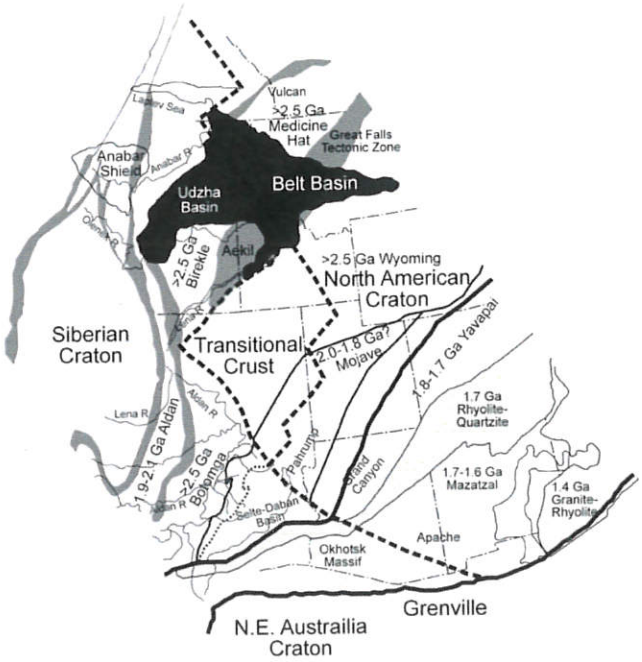
Modified from Whipple, USGS I-1508-F
by Marli Bryant Miller, University of Oregon

1914 USGS Relief Map

Relief map of the same area shown to the left, higher elevations are shown in browns. Note how well the topographic highs correlate with the distribution of the Belt Supergroup.

The Belt "Seaway"

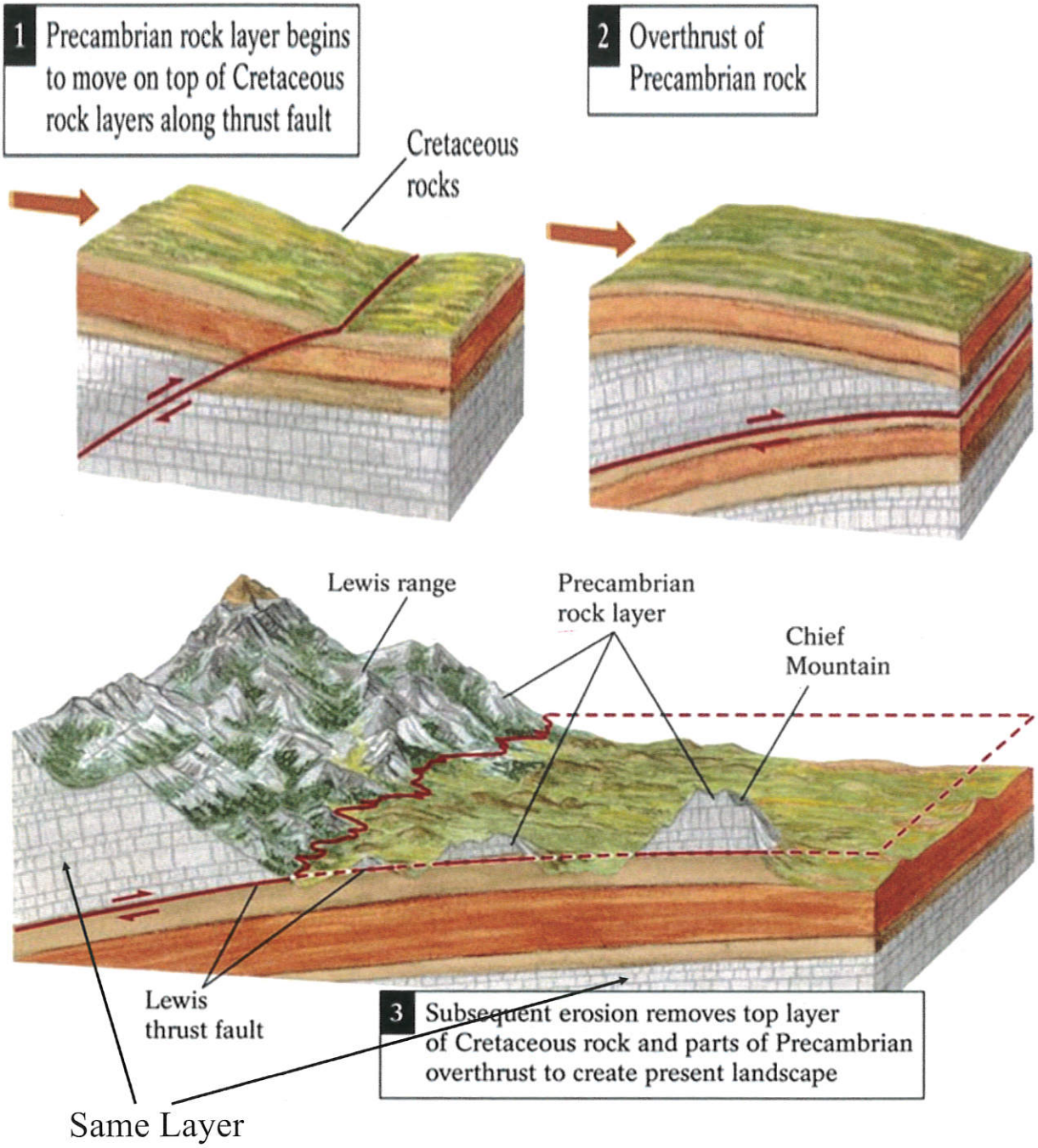




From ~1.7 billion years ago until possibly as recently as 700 million years ago, the Siberian platform and North American craton were joined (Evans, et al., 2016), and a large epicratonic seaway covered much of modern day Washington, Idaho, Montana, and western Canada.

The rocks of the Belt, Purcell, and Windermere supergroups, stretching from southern Montana to the Yukon, are the remnants of this billion-year connection.

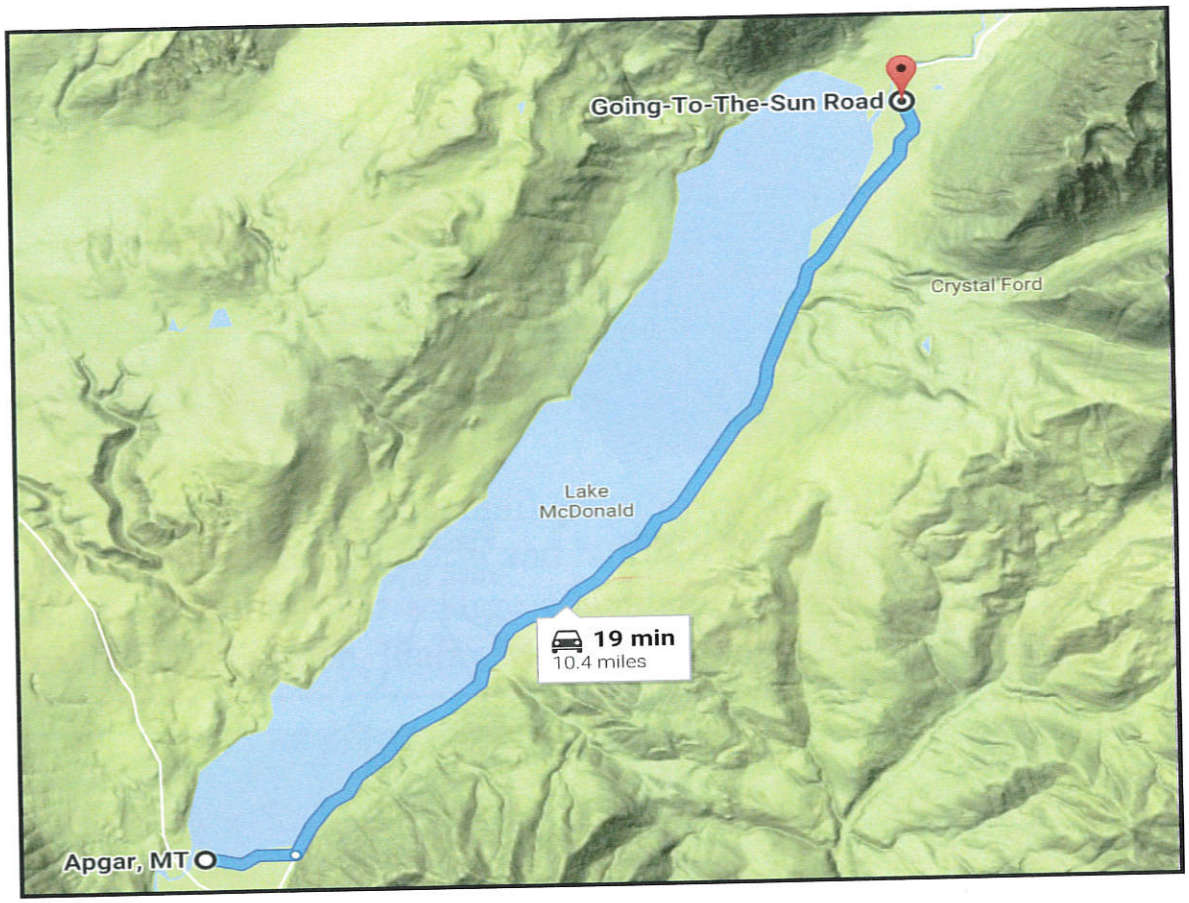
The Lewis Thrust



As the Farallon Plate was subducted beneath North America approximately 72-58 million years ago, the Lewis Thrust, as well as many other thrust faults in the region, were created.

STOP 2 — McDONALD CREEK

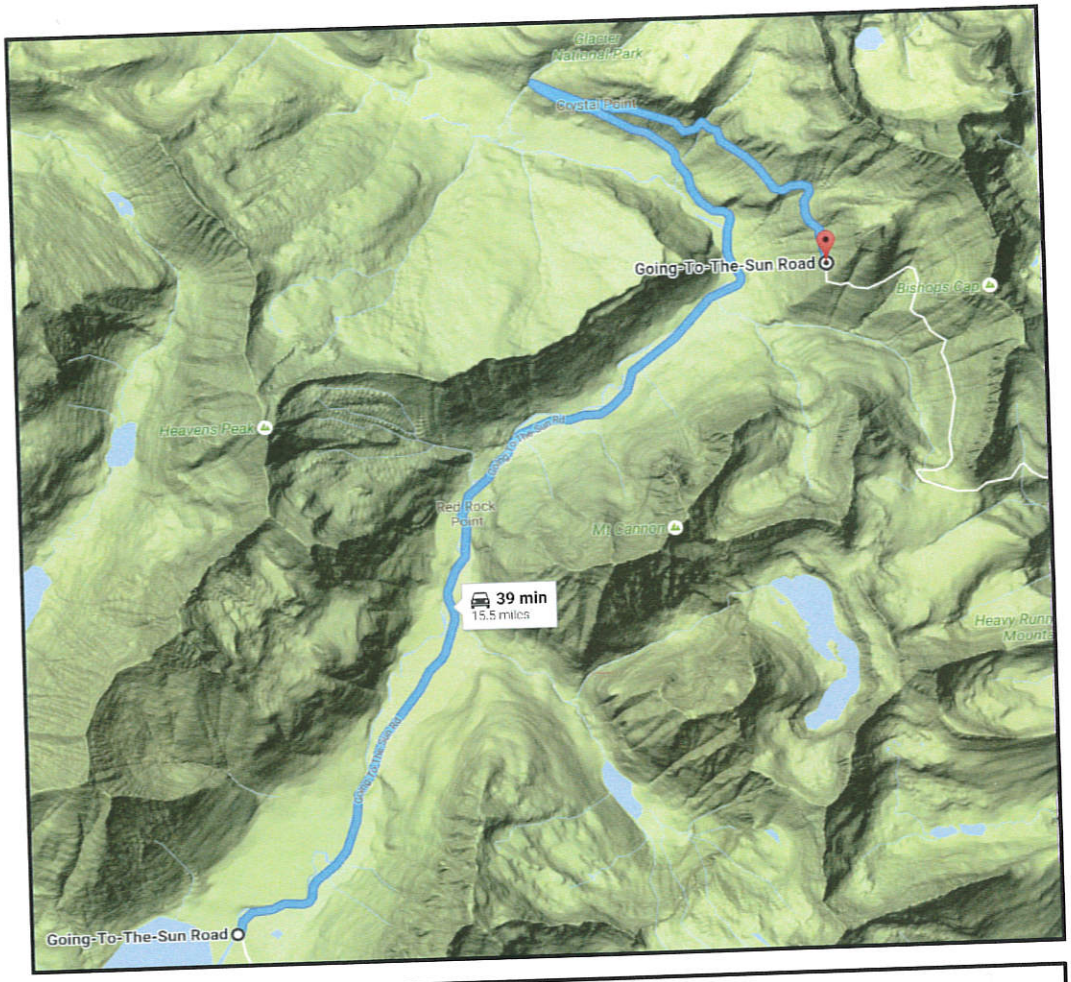
DEEP-WATER DEPOSITS OF THE PRICHARD FORMATION



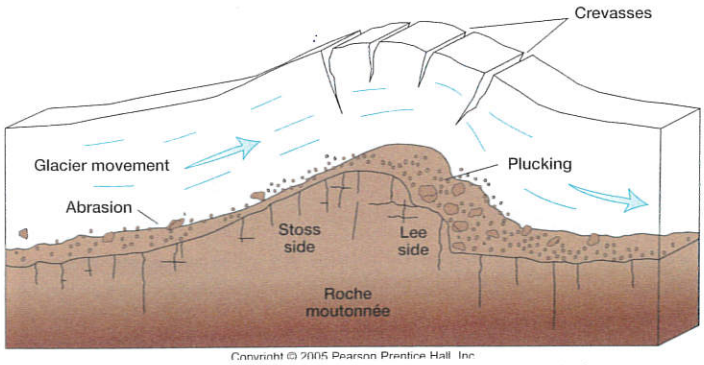
McDonald Creek

STOP 3 — BIRD WOMAN FALLS

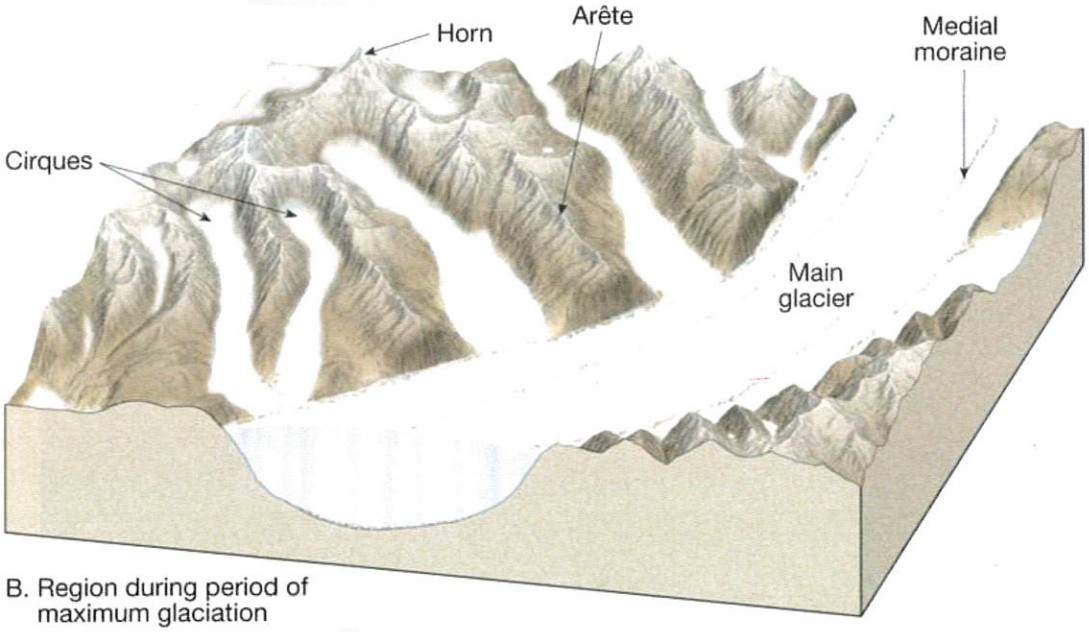
GLACIAL FEATURES



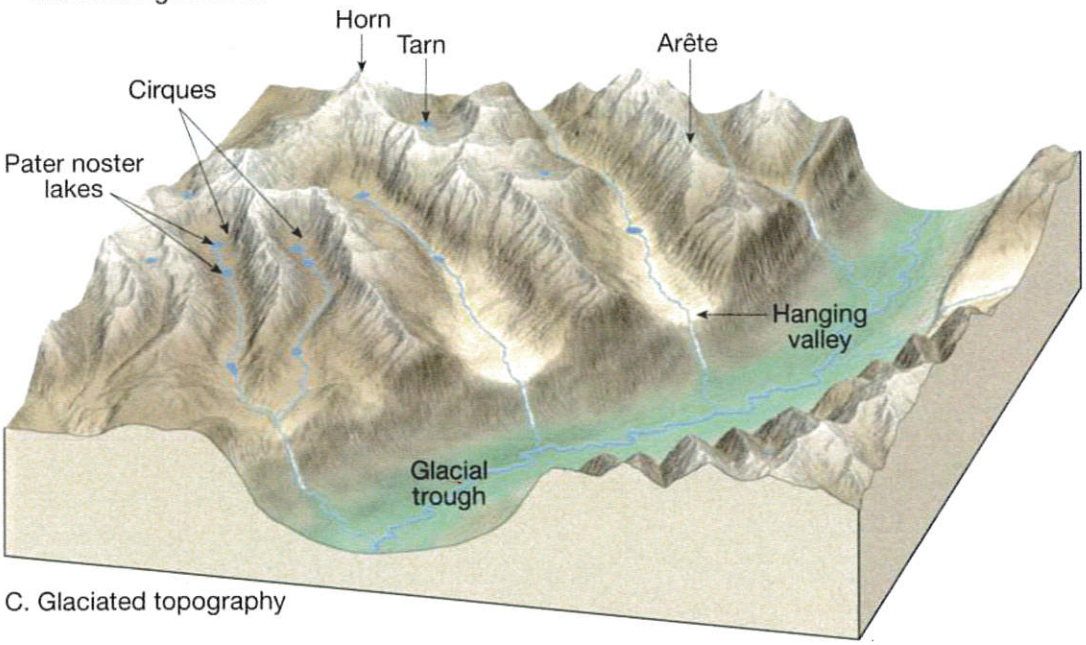
Mountain Glaciers and Erosion



As glaciers flow, they erode the underlying landscape by scouring and plucking away the rock, creating U-shaped valleys. Differential erosion rates of small tributary mountain glaciers and the main, valley glacier create hanging valleys like Bird Woman Falls.



B. Region during period of maximum glaciation



C. Glaciated topography

STOP 4 — LOGAN PASS

LUNCH | VISITOR'S CENTER | OPTIONAL HIKE TO HIDDEN LAKE OVERLOOK

The hike to Hidden Lake Overlook is along a sloping boardwalk with a few stairs. It's worth walking up the path at least far enough to see the spectacular mud cracks in the massive boulders of the Snowslip Formation. There is also a good chance of spotting yellow-bellied marmots and mountain goats.

Optional Hike to Hidden Lake

STOP 5 — LUNCH CREEK

MOLAR TOOTH STRUCTURES & STROMATOLITES

The Helena Formation, mostly carbonate, features molar tooth structures and stromatolites that are both visible in the road cut. The best stromatolites in the park are cross-sectional views atop the outcrop, which is a short, uphill hike through the brush.

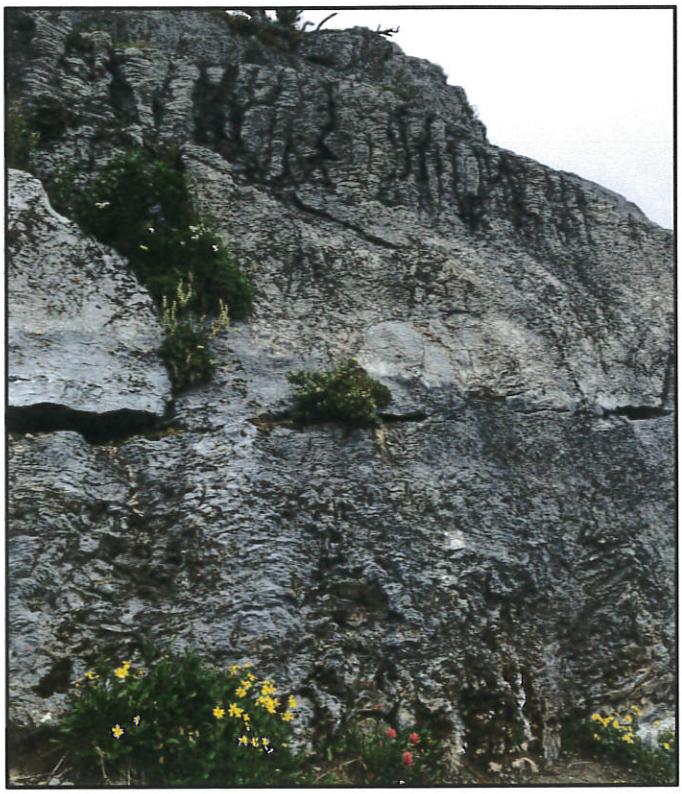
Classic molar tooth structures may be telltale signs of methane production (and escape) in ancient sediments.

STROMATOLITES

Stromatolites form a wide variety of shapes. The prominent fossil stromatolite reef of the Helena Formation features conical *Conophyton* and columnar, branching *Baicalia*:

Baicalia

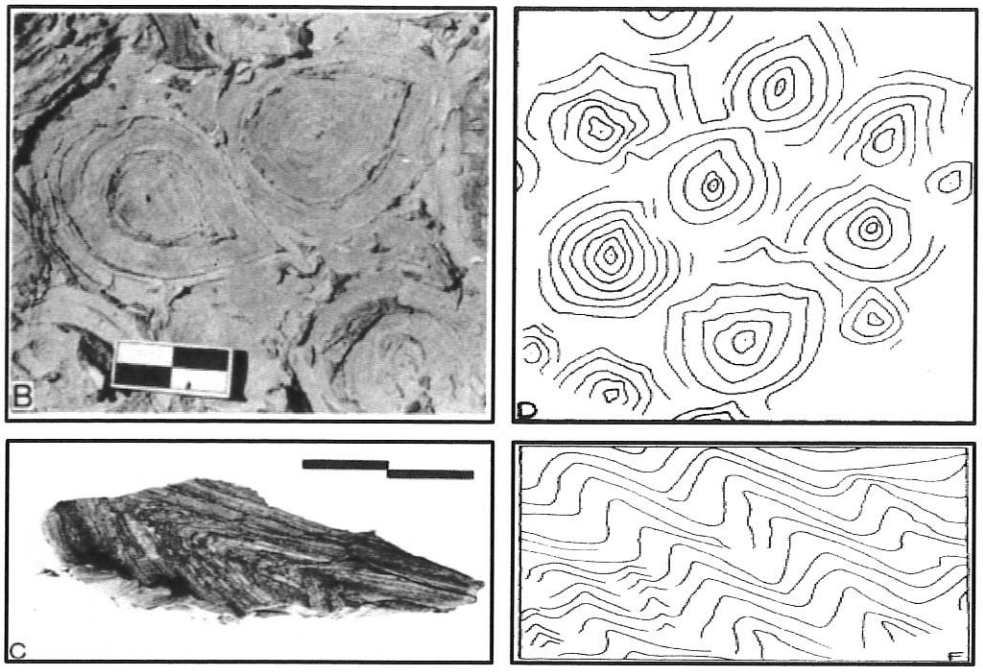
Conophyton



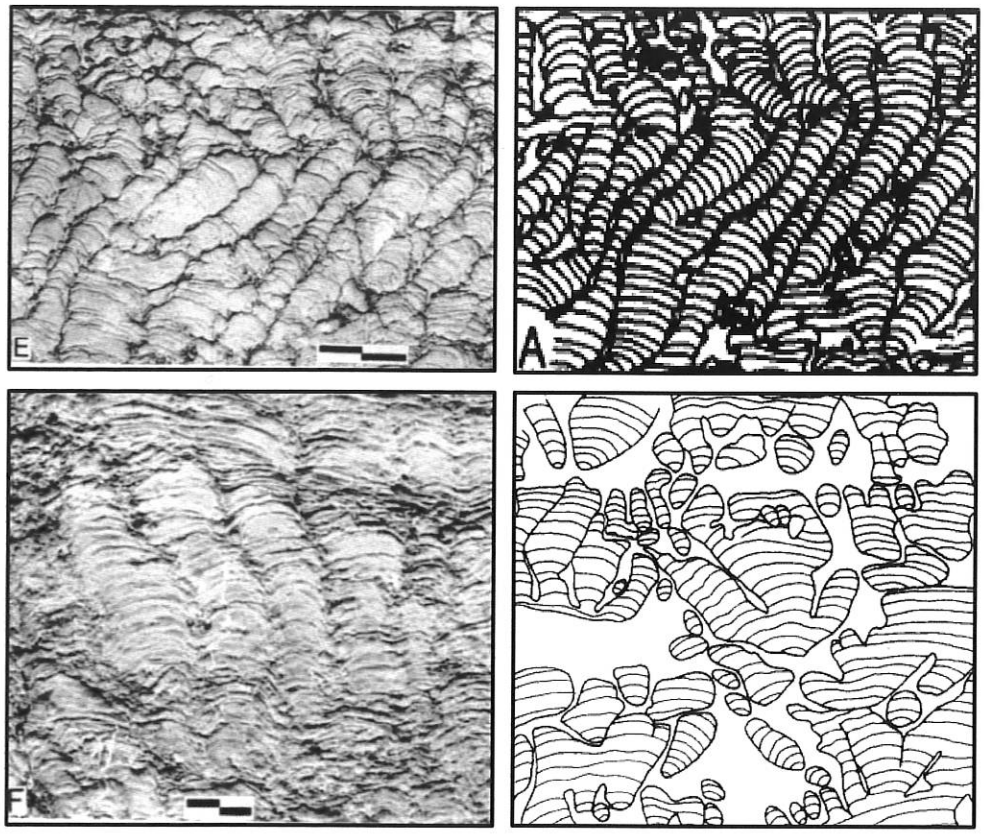
The best cross sections of *Conophyton* are atop the road cut:

Plan-view cross section

Side-view cross section



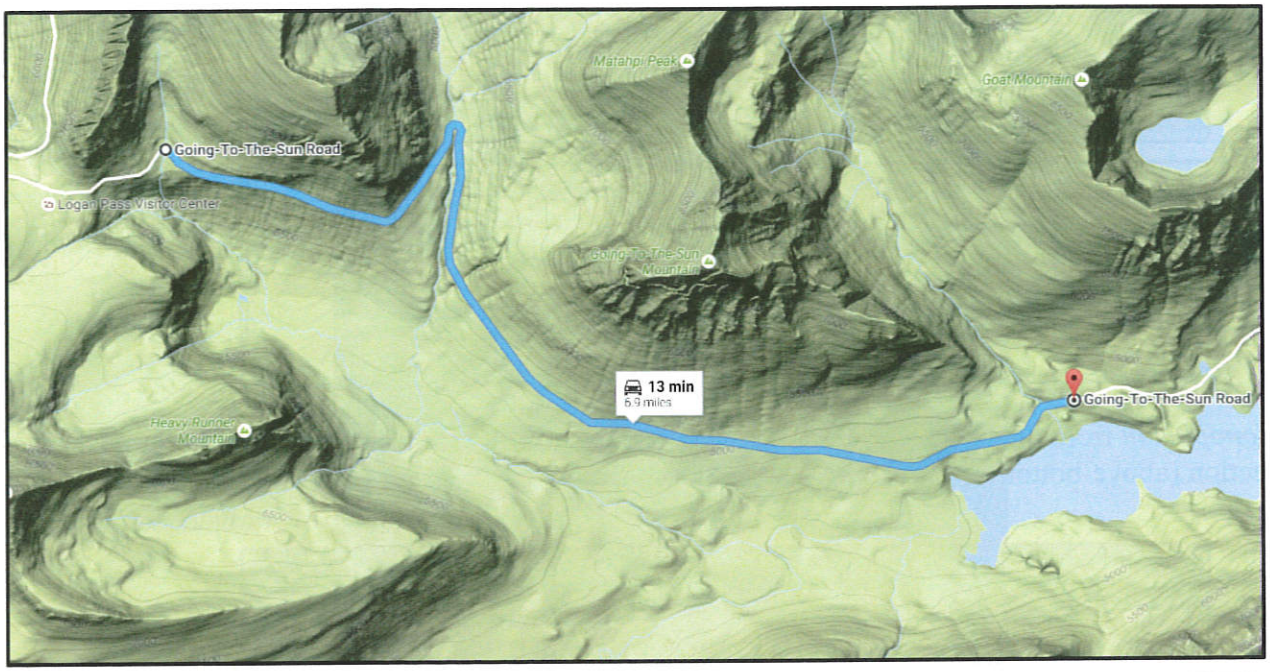
Conophyton from the Helena and interpretive sketches in plan view (above-top) and cross-section (above-bottom) from Horodyski RJ, 1983, Precambrian Research

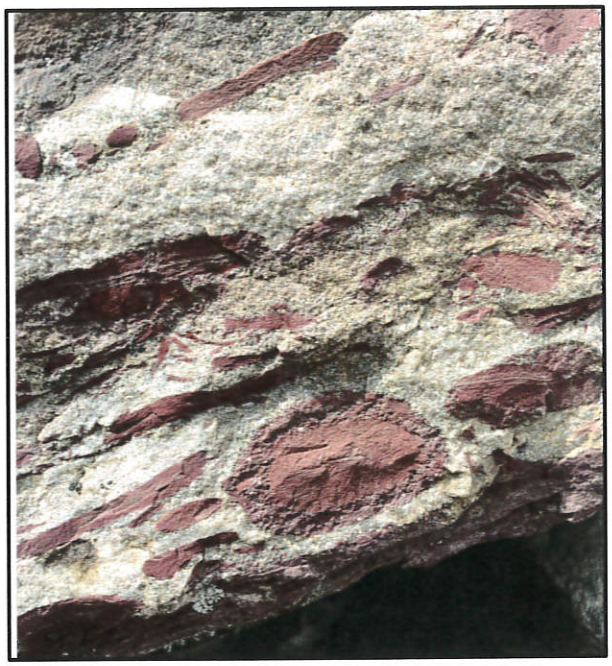


Columnar *Baicalia* stromatolites, again from the Helena Formation on the left and the interpretive sketches of Horodyski on the right.

STOP 6 — GRINNEL ROAD CUT

SHALLOW-WATER DEPOSITS





Outcrops of the Grinnell Formation are filled with mud cracks, ripple marks (left), rip-up clasts (right), and other "snapshots" of a shallow deposition.

STOP 7 — ST. MARY LAKE

WILD GOOSE ISLAND VIEW — ICONIC PARK LANDSCAPE

This iconic view along Going-to-the-Sun Road features Wild Goose Island against a backdrop of the park interior. At the overlook a mile to the west (turnout visible across the lake in this photo), the road cuts through the dull green argillite of the Appenkunny Formation, which was deposited in deep, likely anoxic waters.