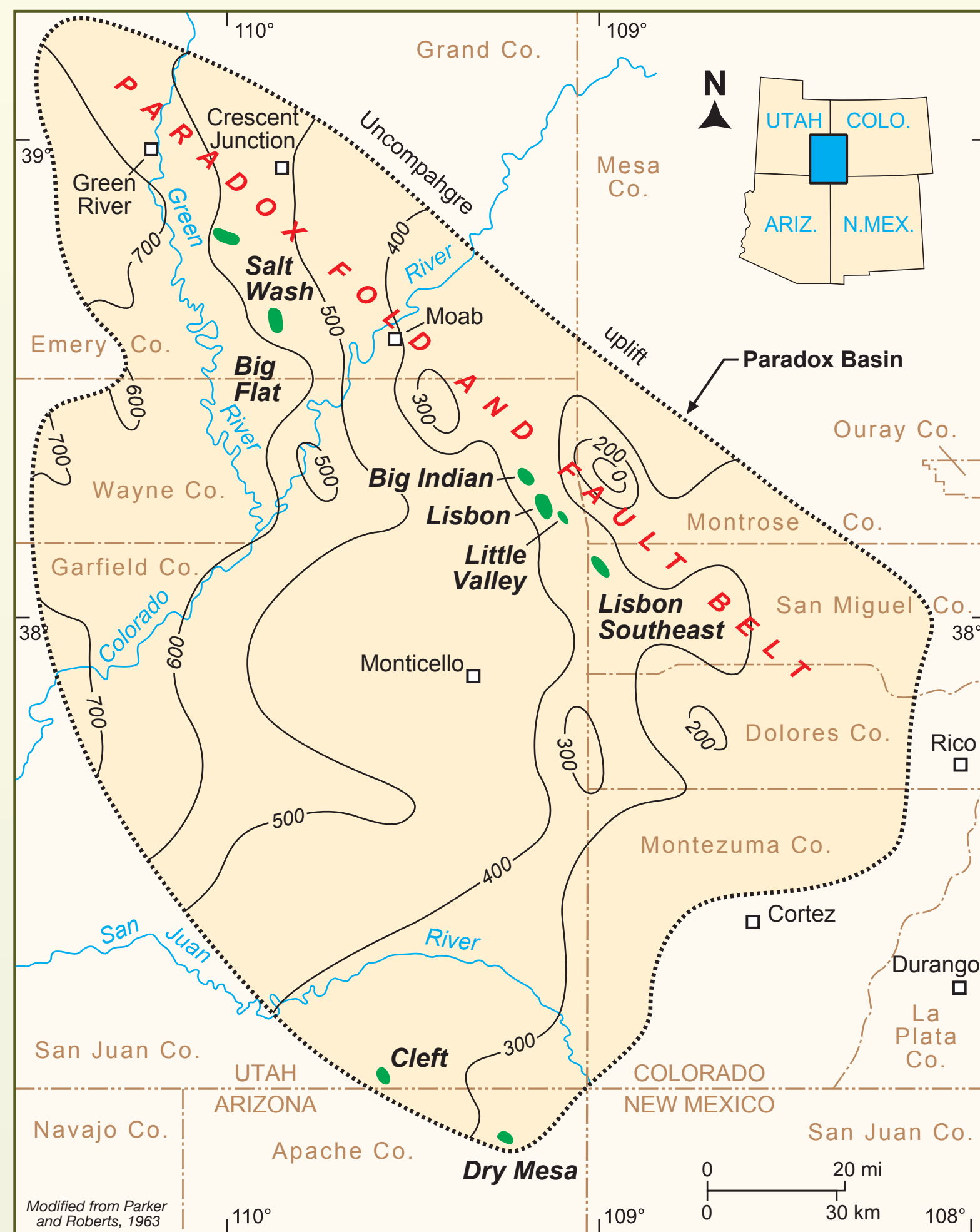
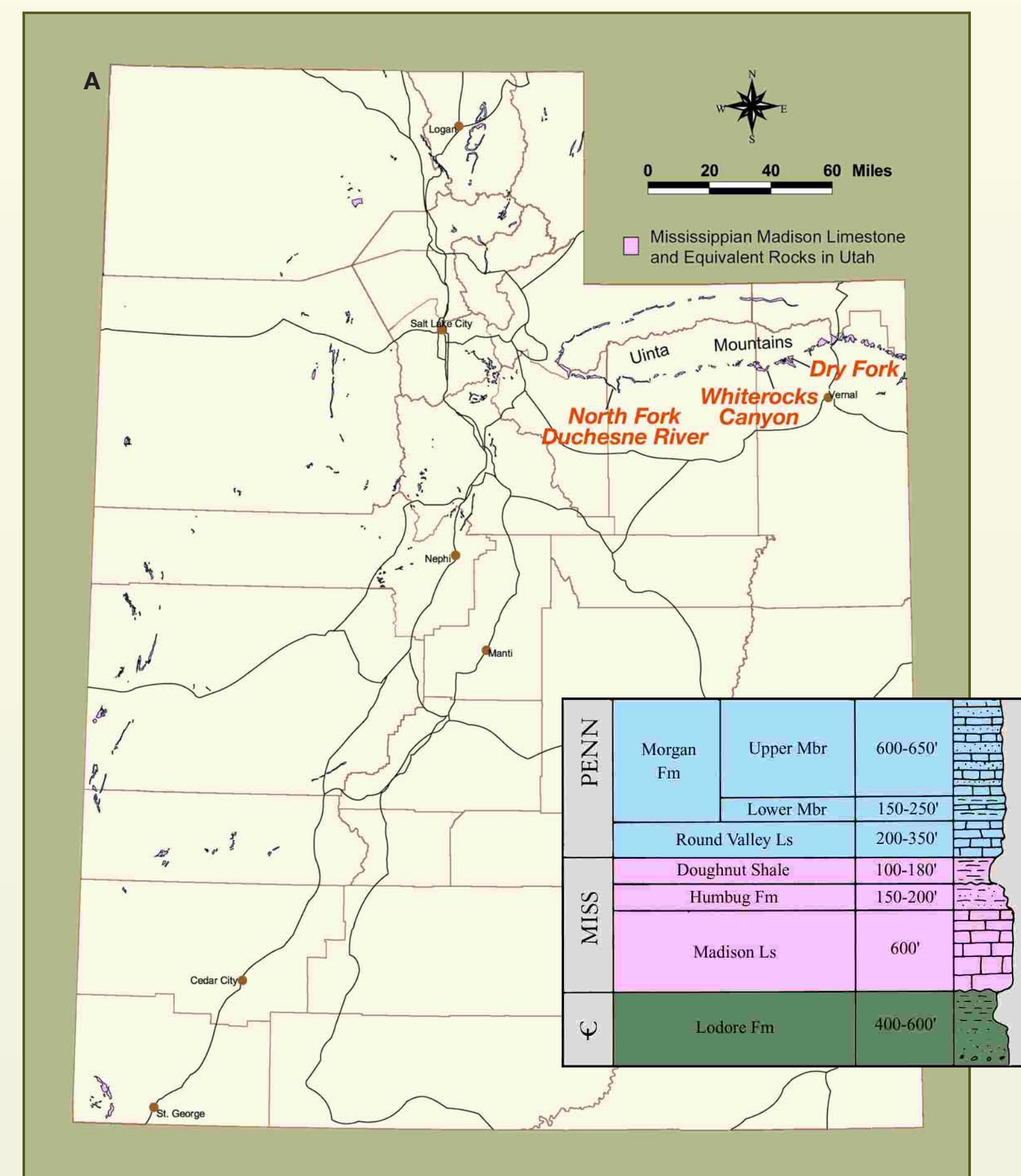


# Mississippian Madison Limestone, Uinta Mountains – Outcrop Analog for the Mississippian Leadville Limestone Reservoir, Paradox Basin



Location of reservoirs that produce oil (green) and gas and condensate (red) from the Mississippian Leadville Limestone, Utah and Colorado. Thickness of the Leadville is shown; contour interval is 100 ft (modified from Parker and Roberts, 1963). The Leadville Limestone play area is dotted.

## MADISON LIMESTONE OUTCROP CHARACTERISTICS



A – Location of Mississippian rock outcrops in Utah equivalent to the Leadville Limestone. B – Stratigraphic column of a portion of the Paleozoic section along the south flank of the Uinta Mountains (modified from Hintze, 1993).



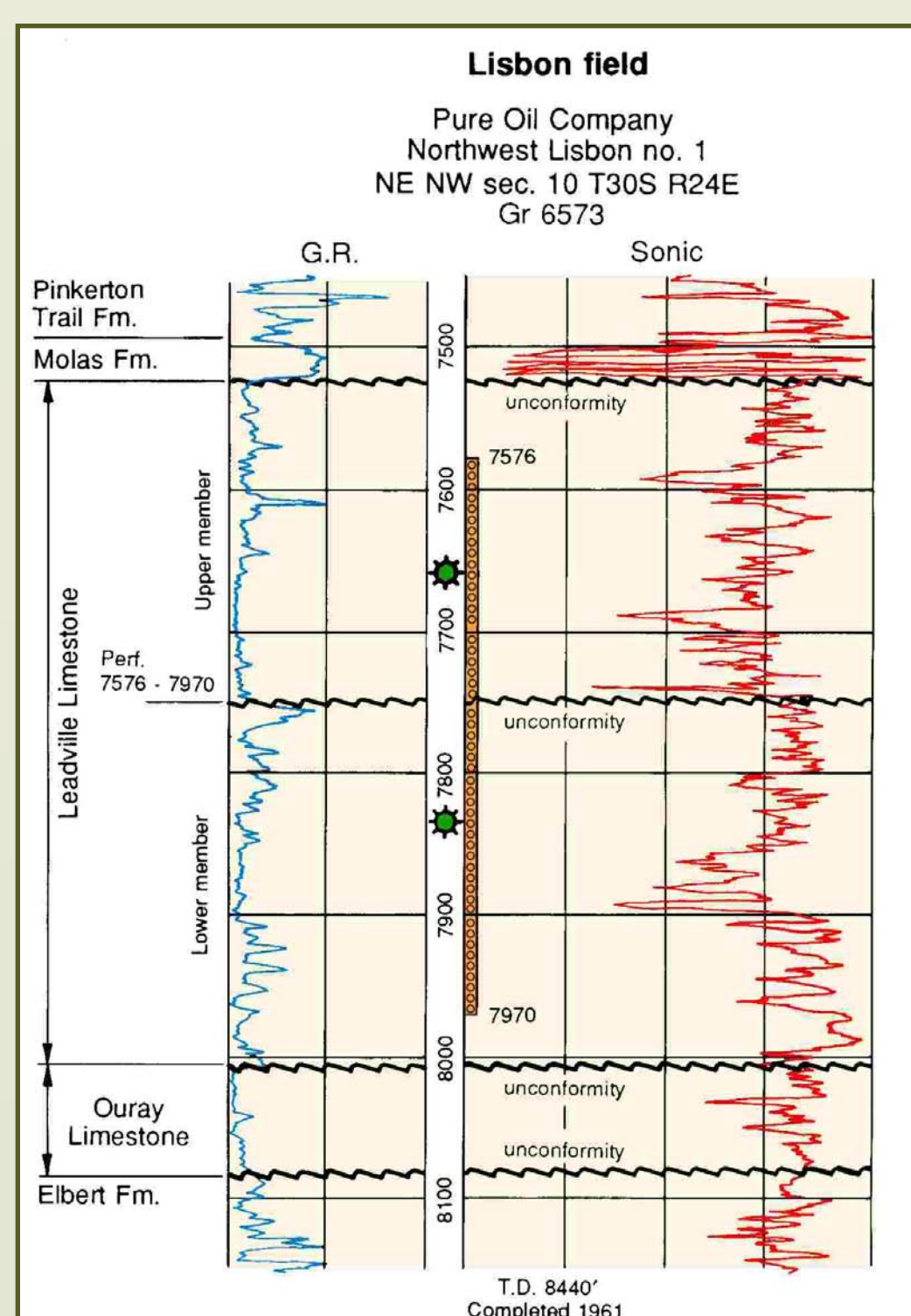
Mississippian Desert Limestone (Madison equivalent) forming a jagged, vertical cliff, North Fork of the Duchesne River. Note the cavernous nature of the outcrop.



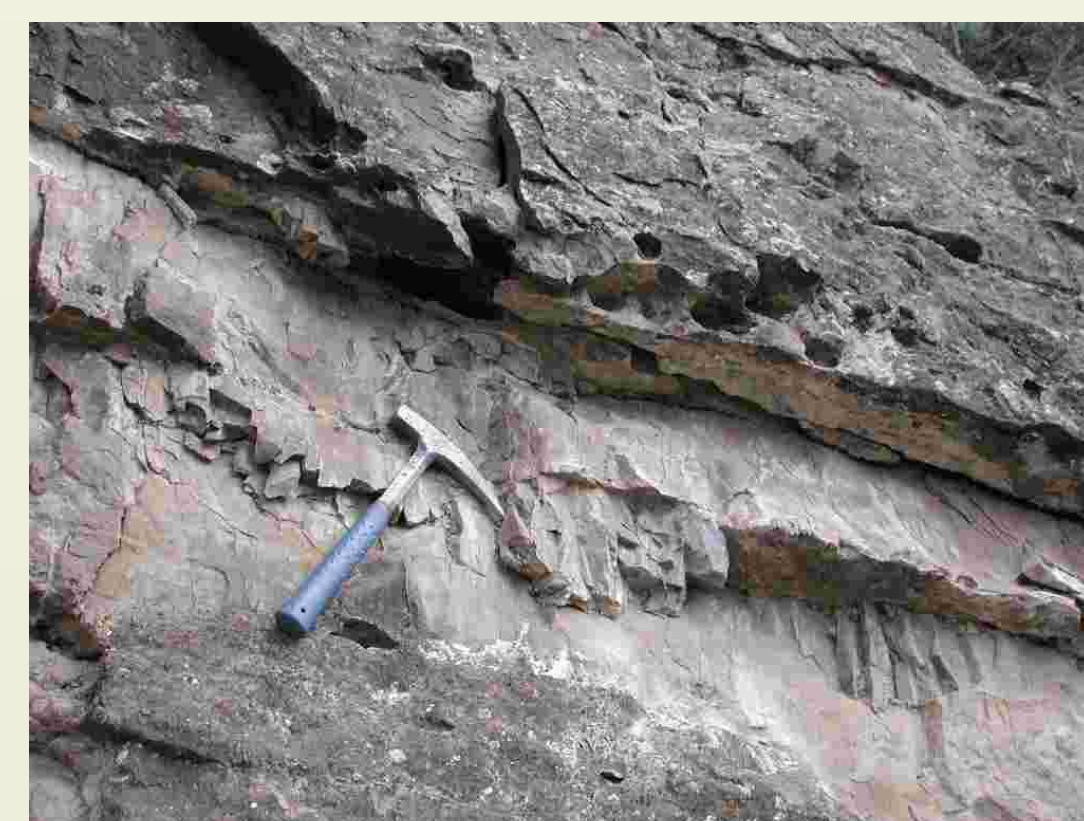
Typical Madison Limestone exposure of light to dark gray, medium bedded, fine to coarse crystalline, limestone and dolomite containing fractures, stylolites, and crinoid hash, Whiterocks Canyon.

## LEADVILLE LIMESTONE RESERVOIR CHARACTERISTICS

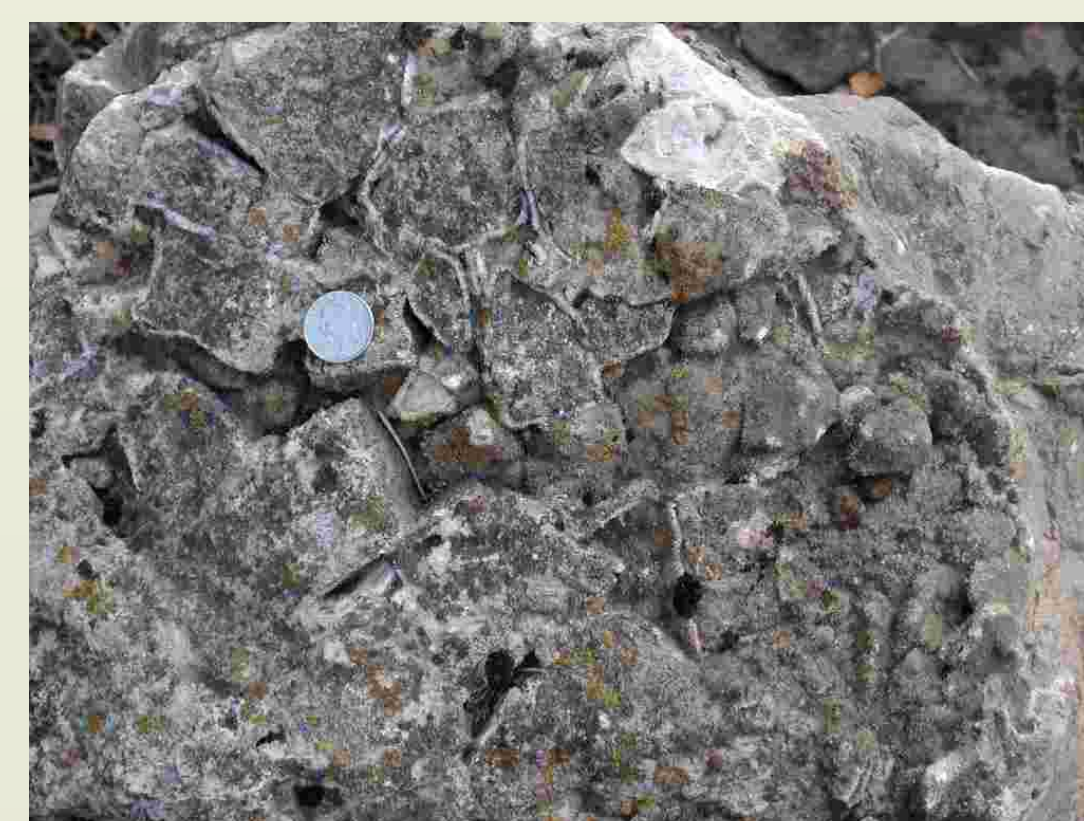
- Net pay – 27 to 225 ft (8-69 m)
- Depositional environments – shallow marine, subtidal, supratidal, intertidal, local buildups or mounds
- Carbonate fabrics - mudstone, wackestone, packstone, grainstone, boundstone (limestone and dolomite)
- Pore types – intercrystalline, moldic, vugs
- Porosity - averages 6-8%, enhanced by natural fracture systems
- Permeability – less than 1 md to 1100 md, averaging 22 md
- Solution breccia and karstified surfaces are common; local cavernous zones



Typical gamma ray-sonic log of the Leadville Limestone, Lisbon field discovery well, San Juan County, Utah.



Vugs and fractures in limestone and dolomitic units, Whiterocks Canyon.



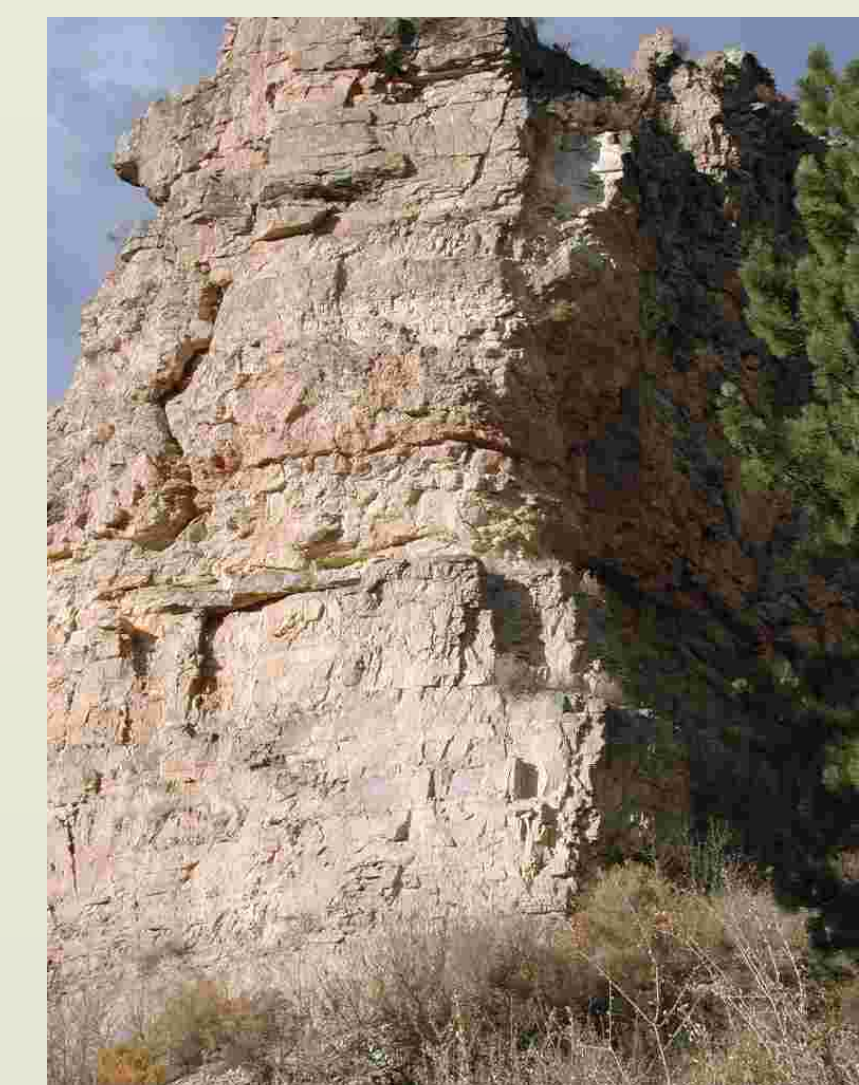
Close-up of small-scale, calcite-filled rectilinear fractures in limestone matrix, Whiterocks Canyon.



Possible small-scale carbonate buildup or mud mound (outcrop is approximately 10 ft [3 m] high), Dry Fork Canyon.



Close-up of open and calcite-filled vugs in limestone matrix, Whiterocks Canyon.



A combination of interbedded limestone and dolomite, containing fractures and zones of solution breccia and vugs, results in a heterogeneous stratigraphic section, Dry Fork Canyon.