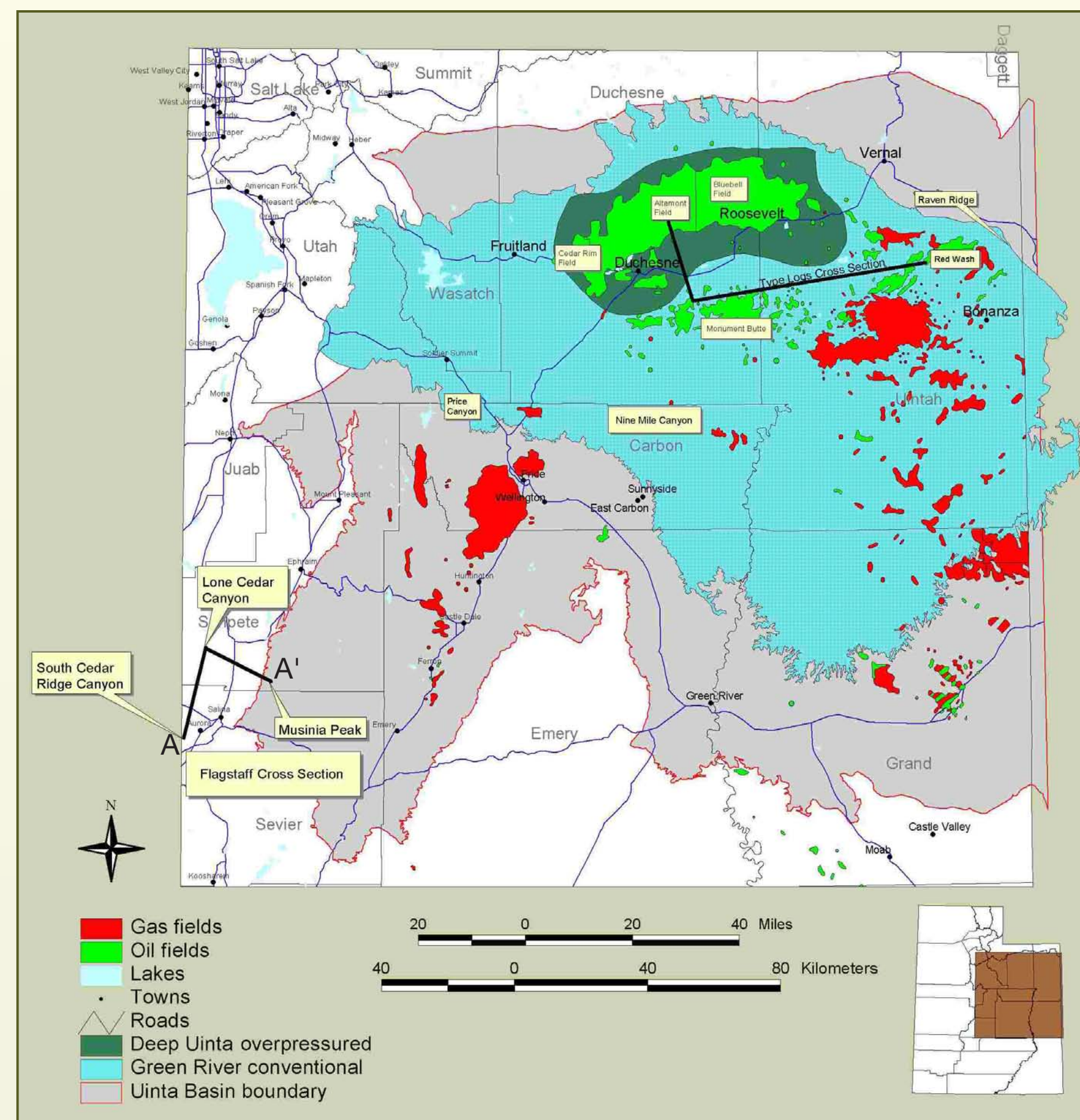
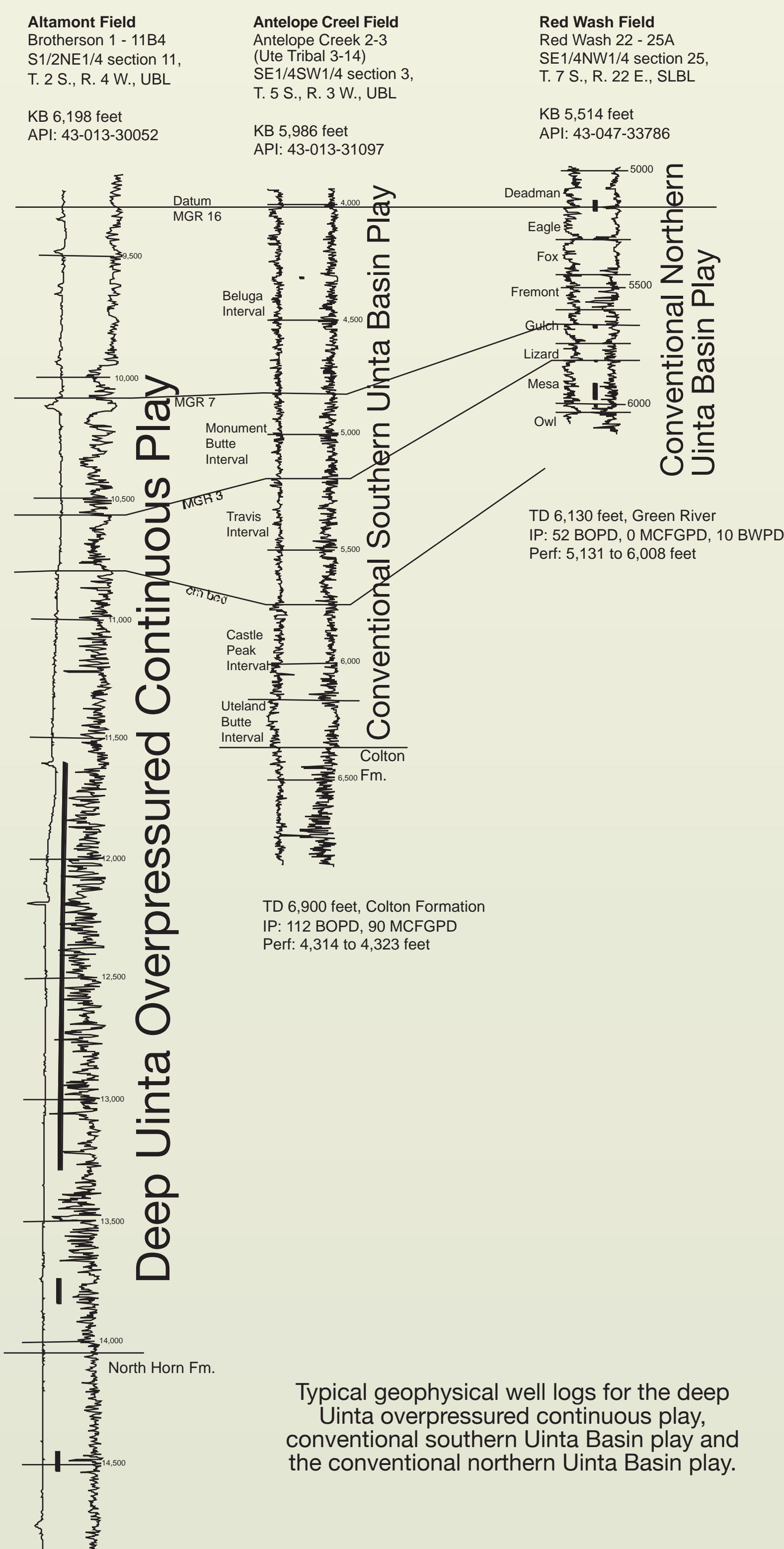


Nine Mile Canyon, Raven Ridge, Price Canyon, and the Wasatch and Gunnison Plateaus – Outcrop Analogs for the Tertiary Green River Formation Reservoirs, Uinta Basin



Location of the Uinta Basin showing the U.S. Geological Survey's Deep Uinta Overpressured Continuous Assessment Unit (deep Uinta overpressured continuous play) and Uinta Green River Conventional Oil and Gas Assessment Unit (conventional southern Uinta Basin play and conventional northern Uinta Basin play). Oil (green) in the Uinta Basin is almost entirely produced from the Green River Formation. Gas (red) in the Uinta Basin is produced from the shallower Tertiary Uinta Formation and deeper Tertiary Wasatch Formation, and Cretaceous, Jurassic and Triassic reservoirs.



TD 17,766 feet, Mesaverde Group
IP: 1,710 BOPD, 2,422 MCFGPD, 65 BWPD
Perf: 11,609 to 14,542 feet

DEEP UINTA OVERPRESSURED CONTINUOUS PLAY

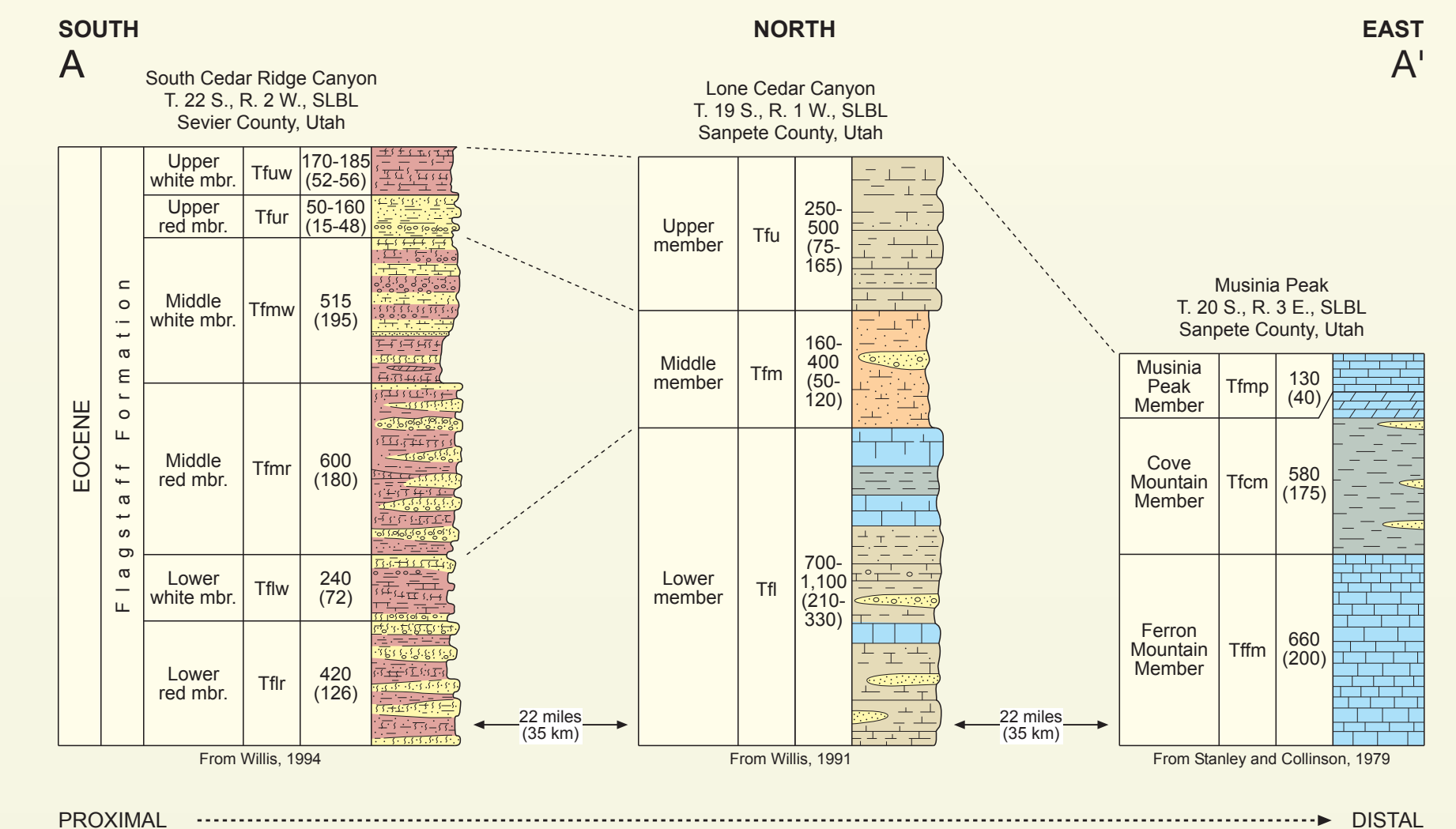
- Net pay - 50 to +300 ft (15-90 m), gross interval +3000 ft (+900 m)
- Original reservoir pressure - overpressured, gradient 0.5 to 0.8 psi/ft
- Depth - 8500 to 14,000 ft (2600-4300 m)
- Depositional environments – alluvial fan to fan delta, marginal lacustrine, and open lacustrine
- Lithology – interbedded sandstone, grainstone, marly muddy limestone to dolomitic mudstone, black organic-rich shale to gray-green silty shale
- Pore types – poor intergranular, dominantly fracture porosity
- Porosity – matrix averages 3 to 10%, enhanced by natural fracture systems
- Permeability - 1 to 10 md, significantly larger in fracture networks

GREEN RIVER FORMATION OUTCROP CHARACTERISTICS

Deep Uinta Overpressured Continuous Play



Proximal facies of the Flagstaff Limestone exposed along the east face of the Gunnison Plateau. At this location the Flagstaff is composed of sandstone and siltstone deposited as alluvial fans from the highlands to the southwest. Some of the sandstone appears to have been deposited in shallow lake water but there are no carbonates or lacustrine shales. This is an outcrop analog for the northernmost portion of the deep overpressured continuous play.



Lithologic cross section of the Flagstaff Limestone from the proximal facies in South Cedar Ridge Canyon to the distal facies at Musinia Peak.



Sandstone beds in the proximal facies of the Flagstaff Limestone in South Cedar Ridge Canyon. This is an outcrop analog for the northernmost portion of the deep overpressured continuous play.



Marginal lacustrine facies of the Flagstaff Member in Price Canyon. The outcrop is composed of interbedded red and gray shale, sandstone, and some carbonate. This is an outcrop analog for medial portion of the deep overpressured continuous play.



Distal facies of the Flagstaff Limestone exposed in Manti Canyon on the Wasatch Plateau. The outcrop is composed of lacustrine limestone and shale overlying the North Horn Formation (red beds). This is an outcrop analog for the southern portion of the deep overpressured continuous play.

CONVENTIONAL SOUTHERN UINTA BASIN PLAY

- Net pay - 25 to 50 ft (8-16 m)
- Original reservoir pressure – normal gradient (0.40 to 0.45 psi/ft), near the oil bubble point
- Depth – 4500 to 6500 ft (1400-2000 m)
- Depositional environments – fluvial deltaic, marginal lacustrine, open lacustrine, and cut and fill valley gravity-flow deposits
- Lithology – reservoirs are dominantly sandstone, some grainstone and dolomitic mudstone
- Pore types – intergranular with some fracture porosity
- Porosity – 10 to 15%
- Permeability – 1 to 50 md

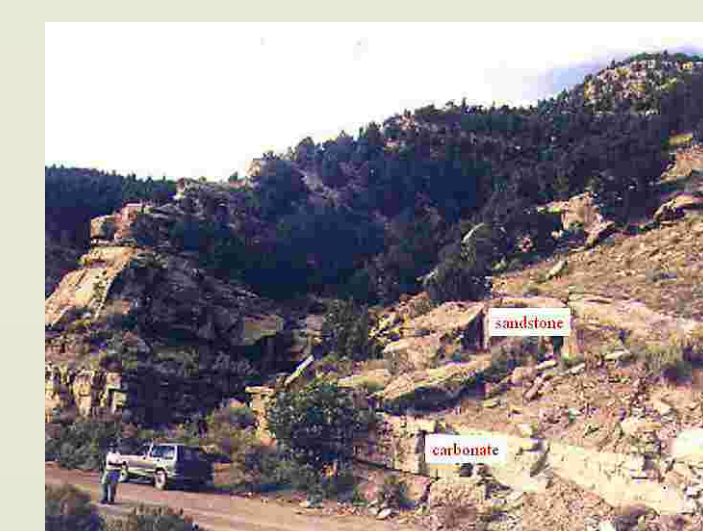
CONVENTIONAL NORTHERN UINTA BASIN PLAY

- Net pay - 25 to 150 ft (8-48 m)
- Original reservoir pressure – normal
- Depth – 4500 to 6500 ft (1400-2000 m)
- Depositional environments – wave- dominated shoreface and marginal lacustrine, sediment gravity-flow deposits, and some braidplain facies
- Lithology – reservoirs are dominantly sandstone, some grainstone
- Pore types – intergranular with some fracture porosity
- Porosity – 10 to 20%
- Permeability – 50 to 500 md, average 25 md

Conventional Southern Uinta Basin Play



Minnie Maud Canyon near the western divide into Nine Mile Canyon. The Uteland Butte interval (dominantly lacustrine carbonate) and Castle Peak interval (interbedded shale and channel sandstone with some carbonate) of the Green River Formation, overlain and intertongue with the alluvial Colton Formation at this location. The Uteland Butte and Castle Peak intervals are productive in the Monument Butte area in the conventional southern Uinta Basin play.



A portion of the Castle Peak interval of the Green River Formation in Nine Mile Canyon composed of lacustrine carbonate overlain by distributary channel deposits that are reservoirs in the Monument Butte area in the conventional southern Uinta Basin play.



Green River Formation at the junction of Gate and Nine Mile Canyons. The outcrop is composed of interbedded distributary channel sandstone deposits, carbonate grainstone and marlstone, and shale. Numerous lake level cycles (90 to 110 ft thick) are exposed here. Overall the exposure represents a deepening of the lake resulting in deposition of the Mahogany shale found at the top of the cliffs. The outcrop is a good analog for the oil productive Monument Butte interval (lower portion of the exposure) and Beluga interval (upper deepening portion of the exposure). The Monument Butte interval is the primary productive interval in the Monument Butte field area in the conventional southern Uinta Basin play.

Conventional Northern Uinta Basin Play



Green River Formation and underlying Wasatch Formation exposed along Raven Ridge. The outcrop is a good analog to sandstone reservoirs in the Red Wash field in the conventional northern Uinta Basin play.



Organic-rich shale, good oil source rock in the Green River Formation at Raven Ridge in the conventional northern Uinta Basin play