

# **The Offshore Mancos Play in the San Juan Basin: Productive Carrier Beds within the Mancos Petroleum System**

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## **Abstract**

Historically, the Offshore Mancos play of the San Juan Basin has produced oil from noncommercial to marginally commercial reservoirs formed by dark-gray marine shale with thin beds and laminae of fine-grained sandstone of limited permeability. During the last decade drilling with horizontal wells has resulted in substantially increased production. However, placement of the Offshore Mancos play within the Mancos total petroleum system has been poorly understood. Here, the Offshore Mancos play is interpreted as a carrier bed play within the Mancos total petroleum system.

Unconventional reservoirs of the Offshore Mancos play are stratigraphically equivalent to updip conventional reservoirs deposited nearer to the shoreline and are also equivalent to downdip source rocks matured to peak oil generation. Offshore Mancos facies include a proximal facies to the southwest, a medial facies, and a distal facies to the northeast. Oil production has been obtained from the proximal and medial facies.

Mancos shales contain oil generative kerogens that are within the upper oil window near conventional reservoirs in the south and have been matured to peak oil generation downdip of and to the northeast of the Offshore Mancos reservoirs. Uniform API gravities of light sweet produced oils that transcend thermal maturity variations of Mancos shales indicate that oils generated in downdip mature source rocks migrated updip through the carrier bed sandstones of the Offshore play and into the conventional reservoirs. Residual oil saturations are consistent with the concept of migrating oils moving updip through only a small number of interconnected pathways within a carrier bed.

## **Summary**

1. Mancos C strata produce oil & gas from conventional marine bar reservoirs along the southwest flank of the basin and from thinner offshore sands to the northeast.

2. The offshore Mancos C can be divided into three lithofacies:
  - a) **proximal offshore facies**: fine- grained sandstone dominant over shale
  - b) **medial offshore facies**: about equal amounts of interlayered sandstone and shale
  - c) **distal offshore facies**: shale dominant over minor thin very fine-grained sandstone laminations
3. Maximum permeability is in the conventional marine bar reservoirs
4. Mancos C shales have sufficient TOC to be source rocks. TOC increases to northeast with shale content. Kerogens dominantly oil-prone
5. Thermal maturity increases northward with increasing depth. Mancos C shales have attained peak oil generation and peak expulsion northeast of the marine bar play.
6. Oil appears to have migrated updip (southwest) through the medial and proximal facies into the marine bar reservoirs as indicated by the thermal maturity of Mancos shales and distribution of oil API gravity.
7. The productive sandstones in the proximal and medial offshore Mancos facies are carrier beds within the Mancos total petroleum system.

#### **References cited:**

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#### **This presentation based on:**

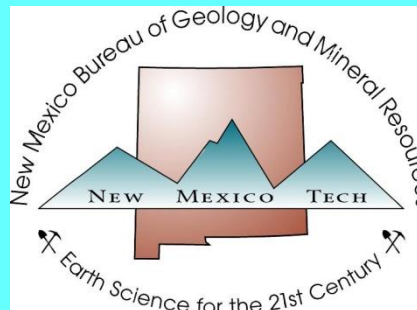
Broadhead, R.F., 2021, The offshore Mancos play in the San Juan Basin as a component of the Mancos total petroleum system: AAPG Bulletin, v. 105, p. 1765-1777.

# **The offshore Mancos Play in the San Juan Basin: *productive carrier beds within the Mancos total petroleum system***

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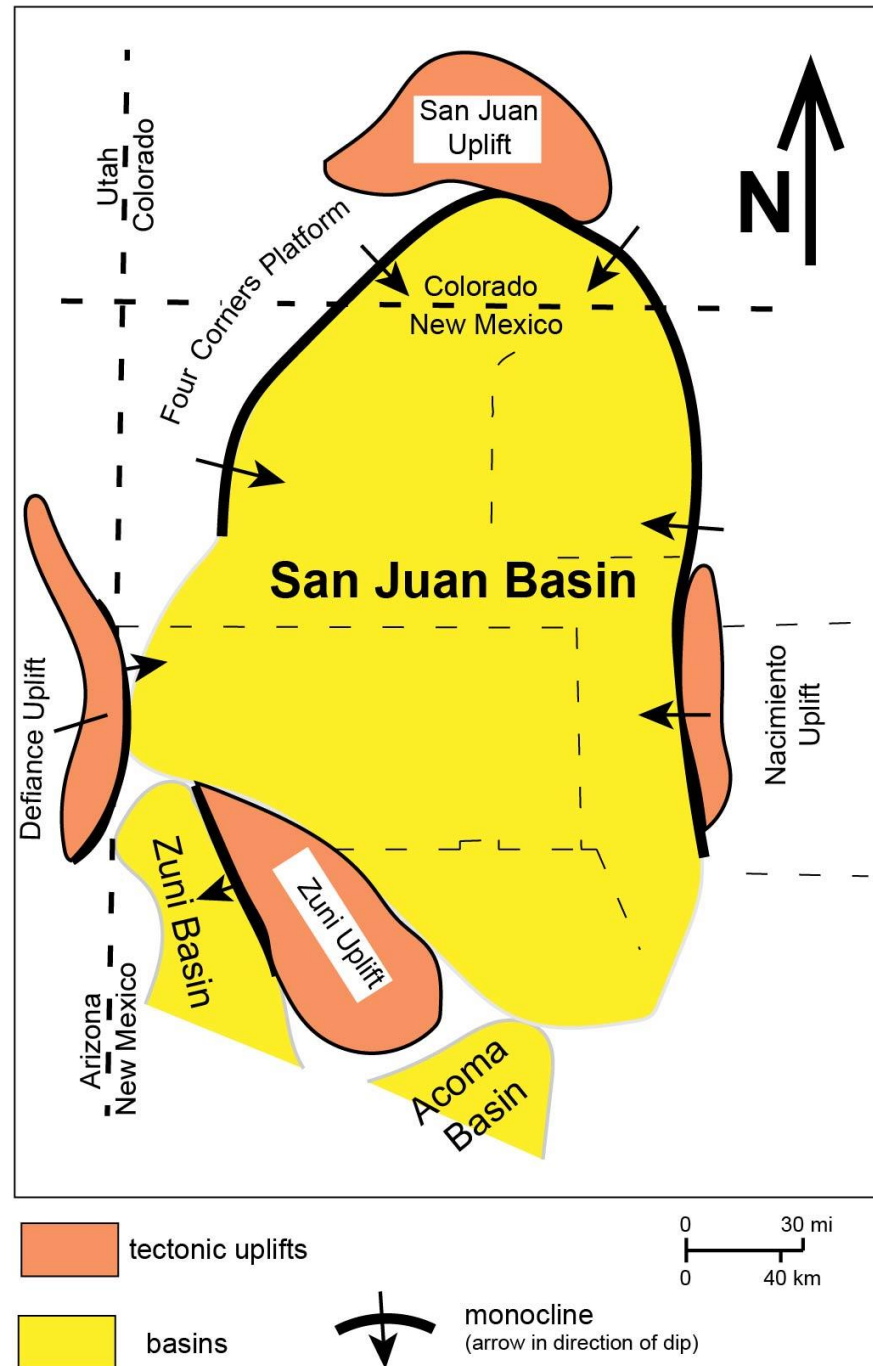
# Late Cretaceous paleogeography

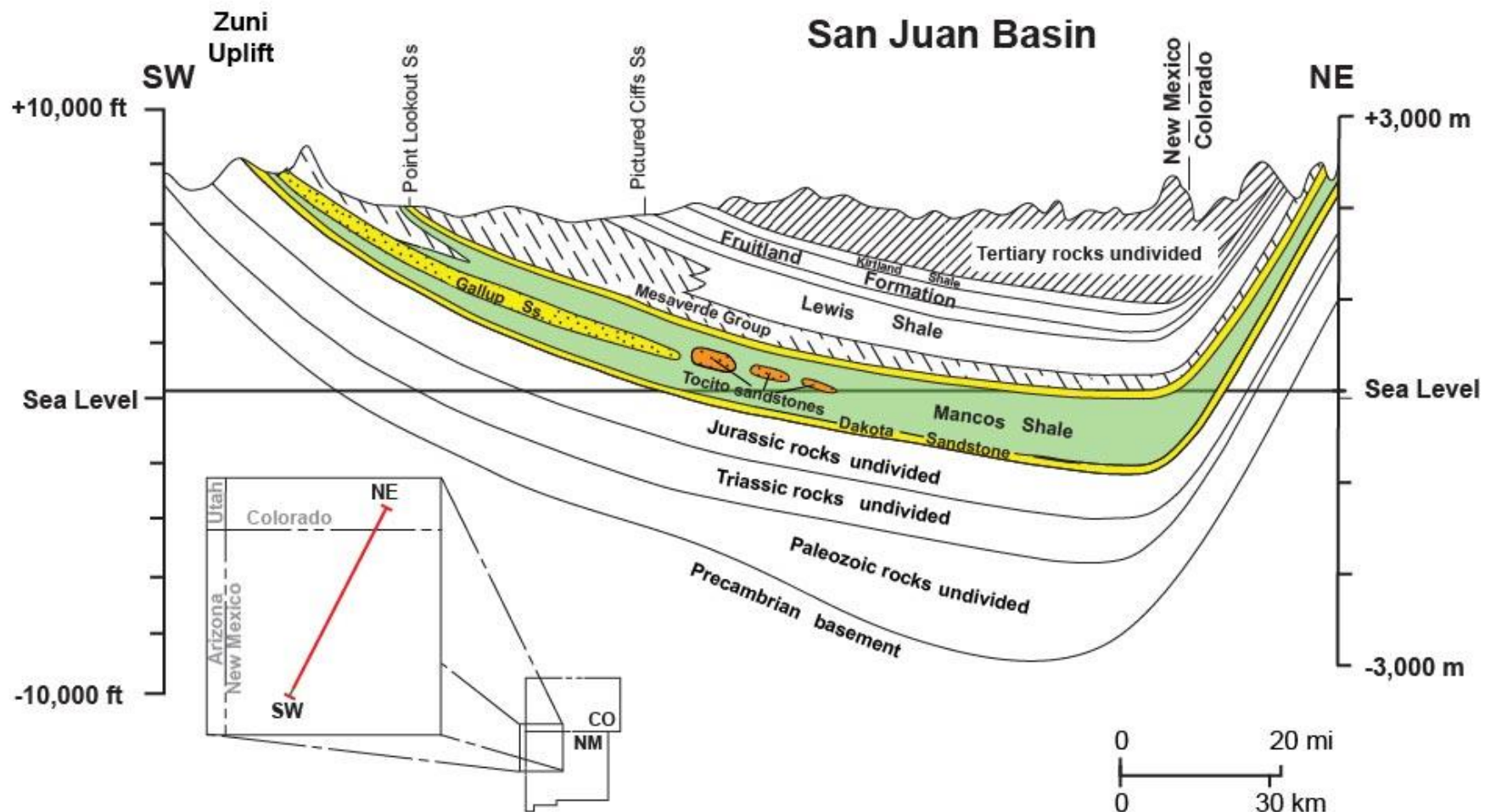


Courtesy Colorado Plateau Geosystems

# San Juan Basin present day

Modified from Stone et al (1983)

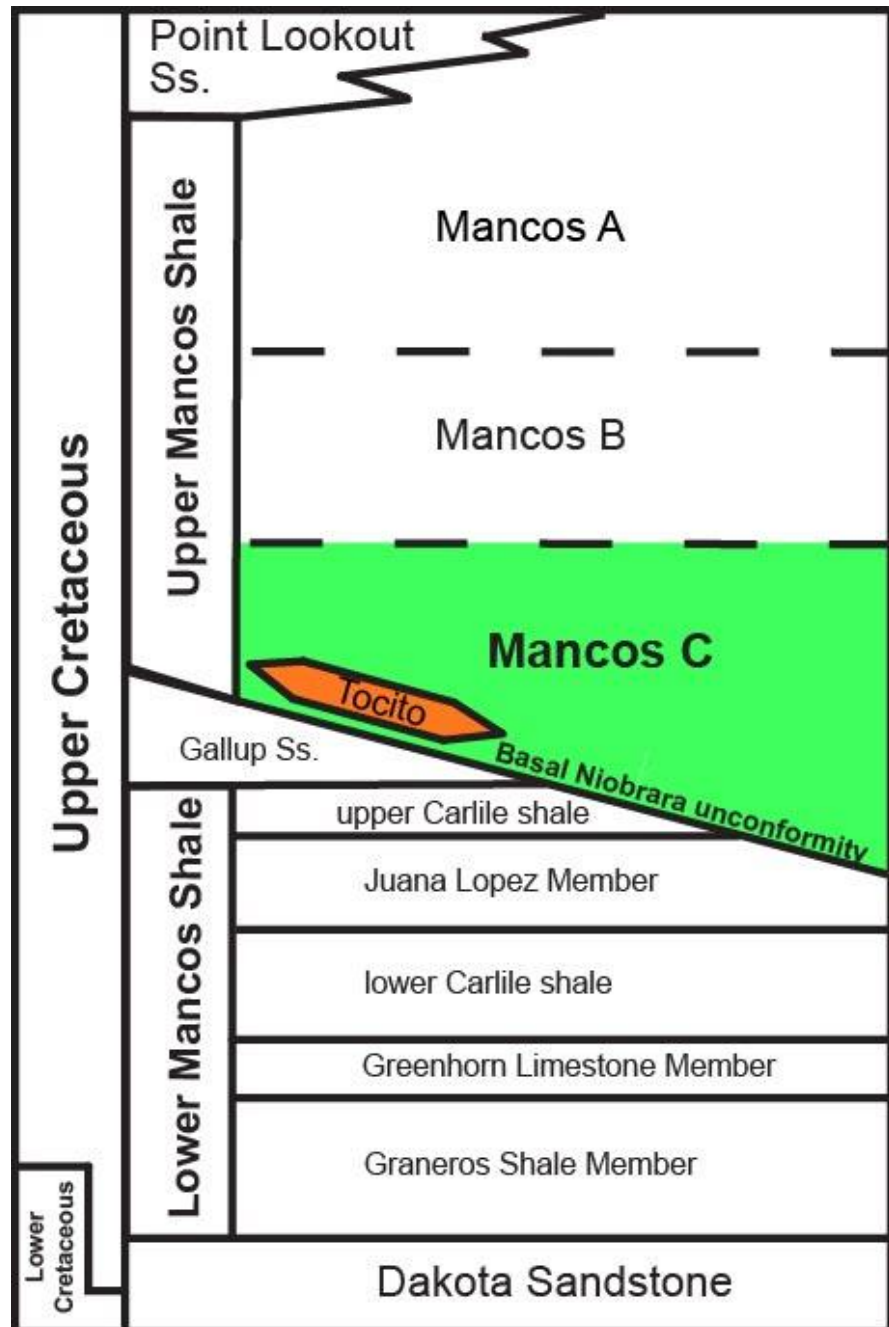


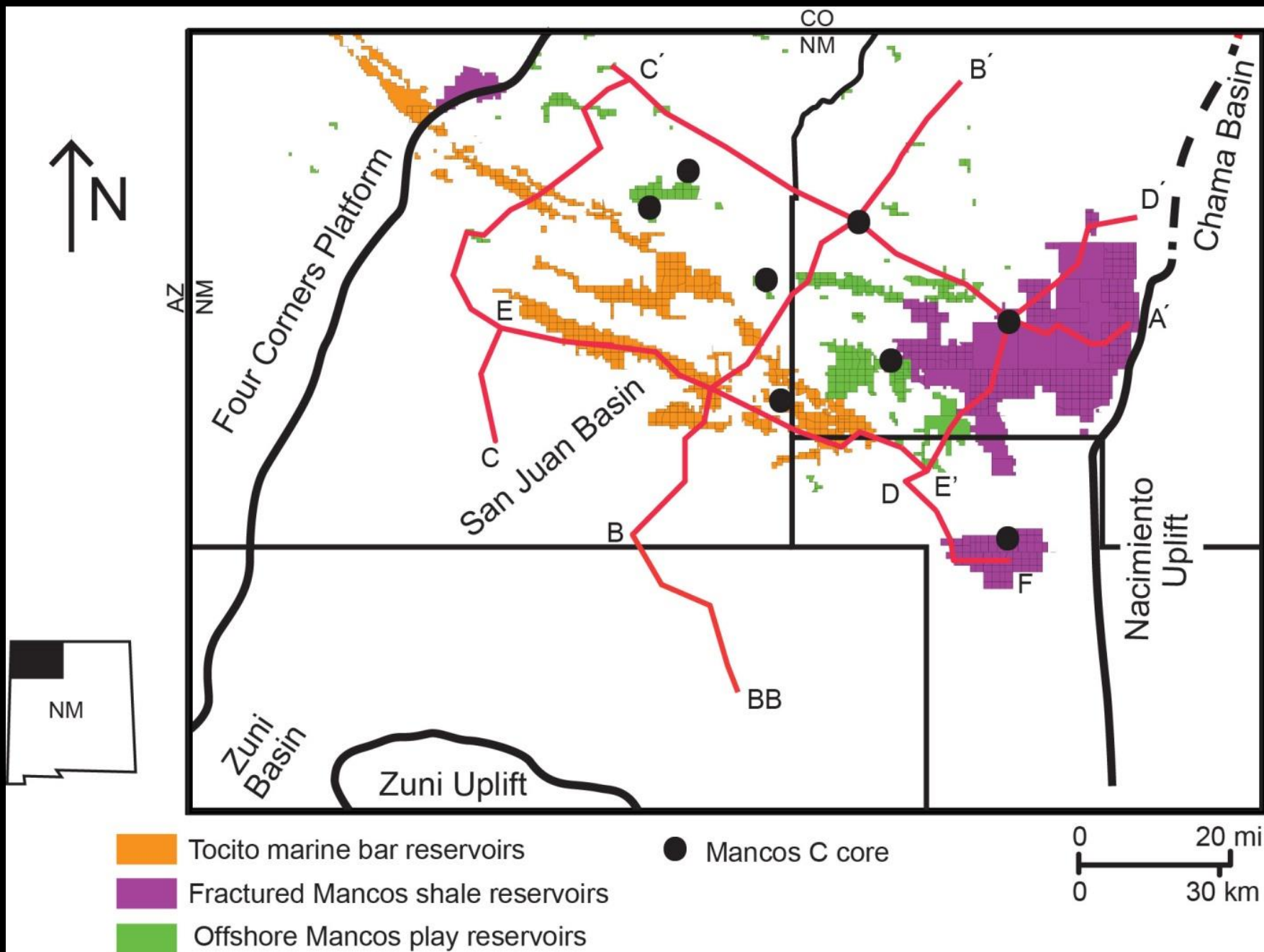


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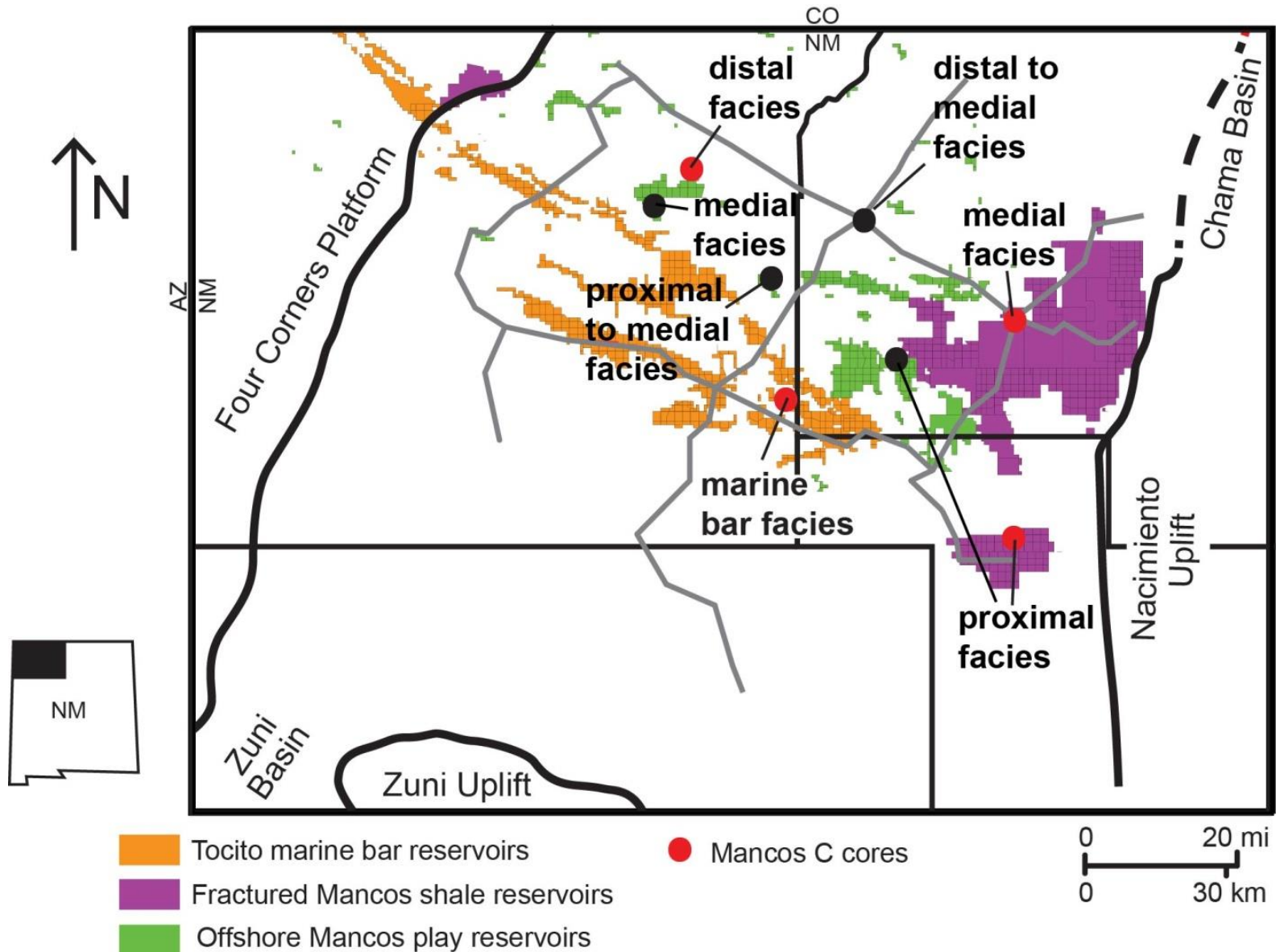
# Mancos Shale stratigraphy







# Cores & facies



# Marine bar Mancos facies ("Tocito")

Mesa Petroleum No. 5 South Blanco 25 Fed. Sec. 25 T24N R8W San Juan Co., NM

Lybrook Gallup oil pool





# Proximal offshore Mancos facies

Samuel Gary Oil Producers No. 16 San Isidro 11 Sec. 11 T20N R3W Sandoval Co., NM  
Rio Puerco Mancos oil pool





# Medial offshore Mancos facies

Amoco No. 14 Jicarilla A118 Sec. 36 T26N R3W Rio Arriba Co., NM  
Ojito Northeast Gallup oil pool



1 ft



# Distal offshore Mancos facies

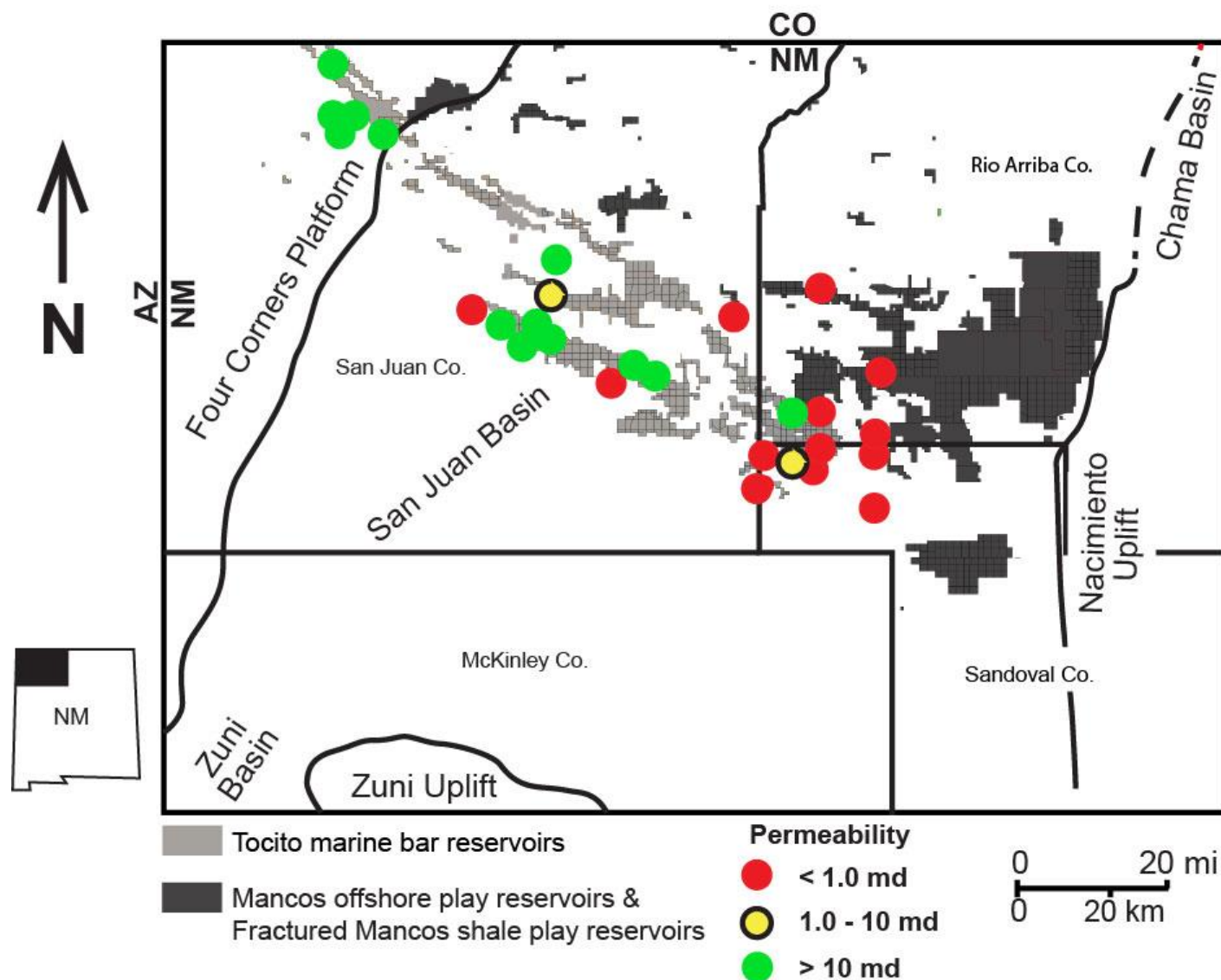
Amoco No. 1 Romero A Sec. 27 T29N R10W San Juan Co., NM

Armenta Gallup oil pool



1 ft

# Maximum permeability Mancos C sandstones

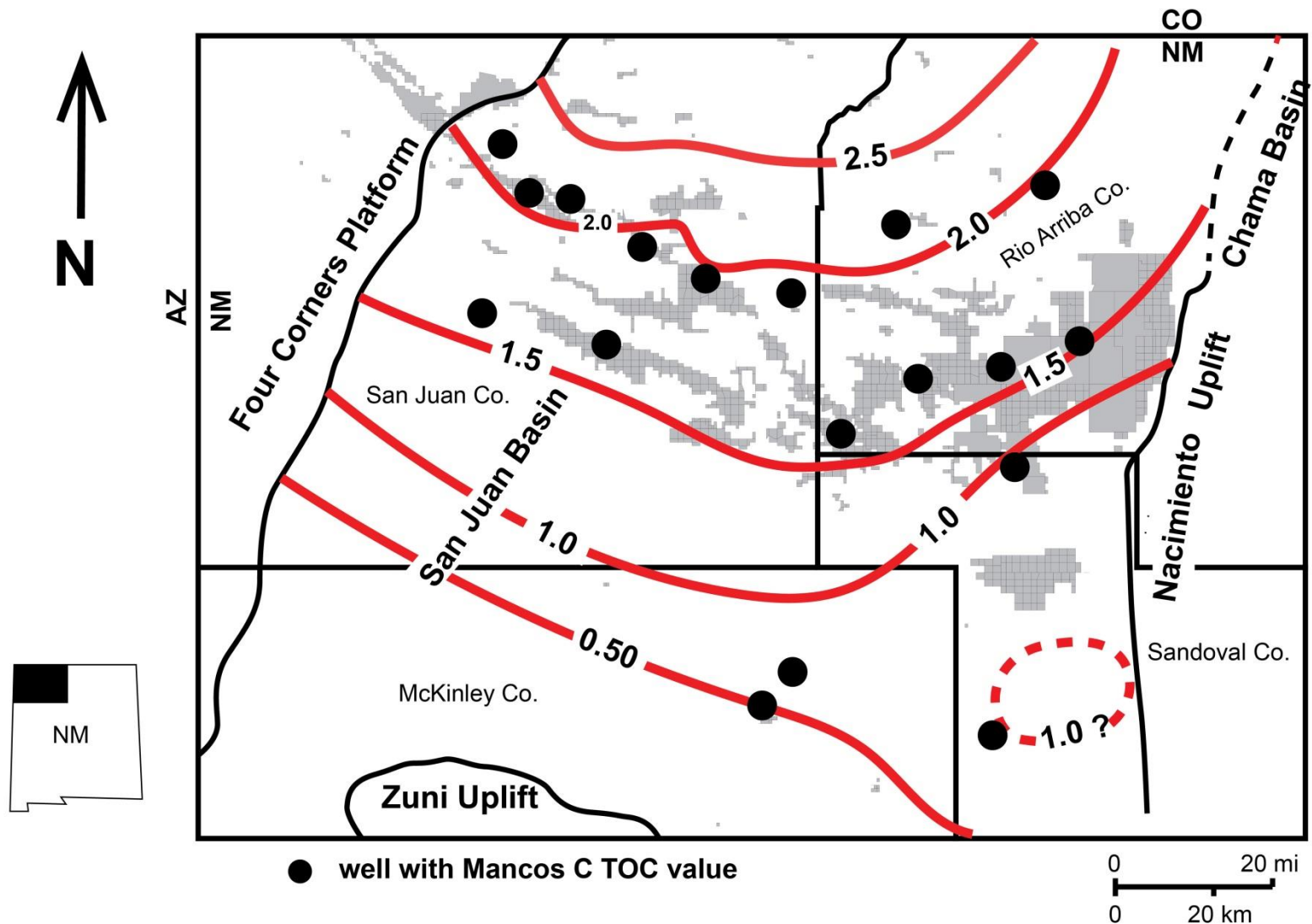




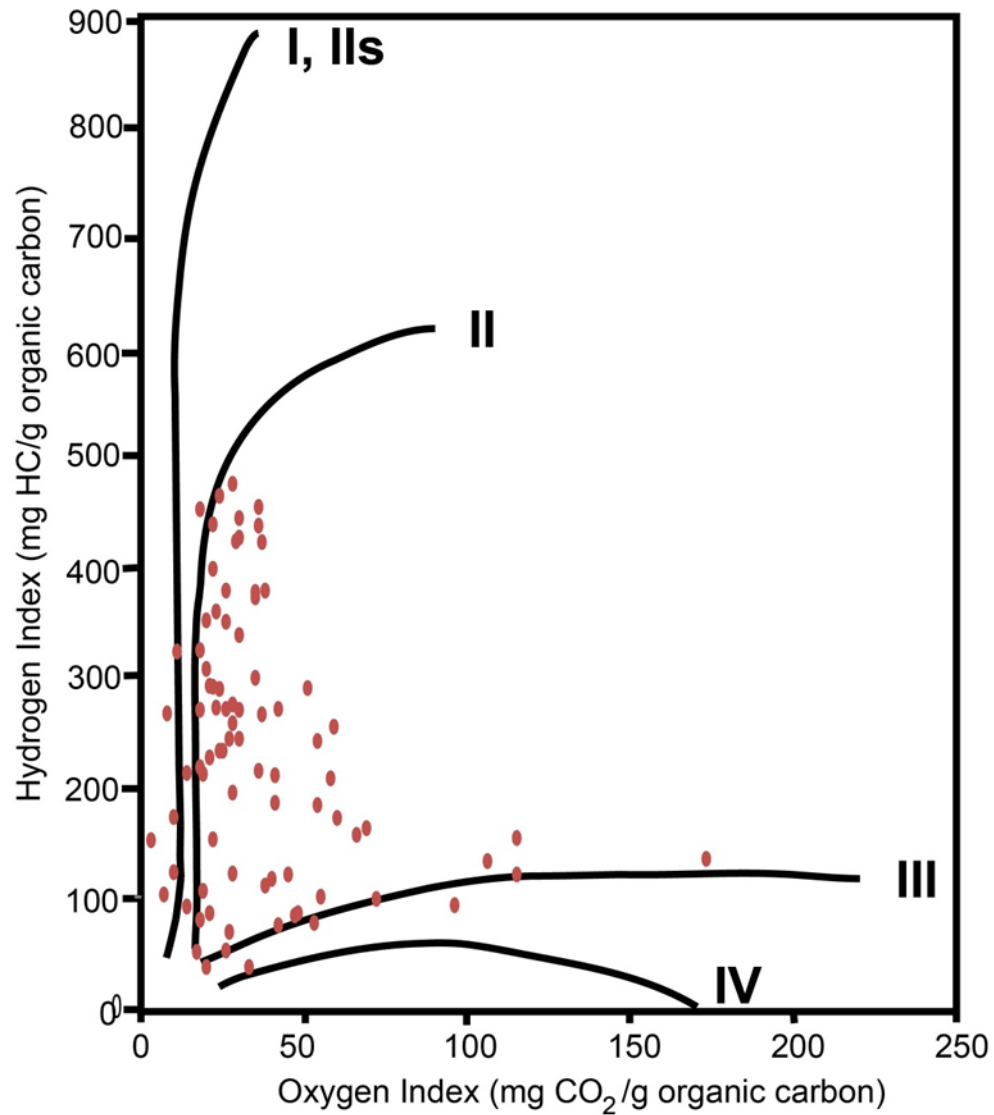
# **Mancos C source rocks**

- Total organic carbon
- Organic matter type
- Thermal maturity

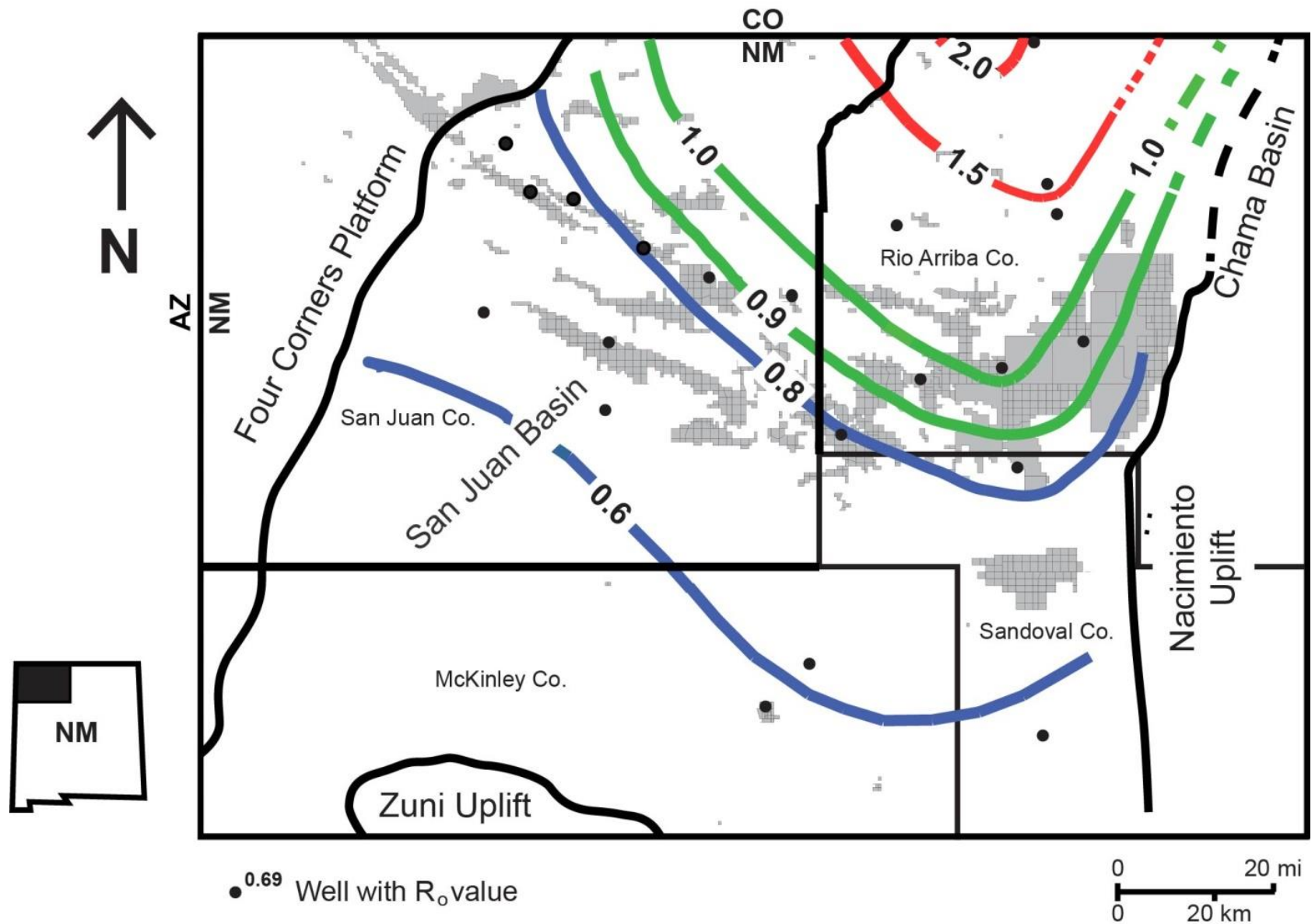
# Mancos C Total Organic Carbon



# Mancos C



# Mancos C Vitrinite Reflectance

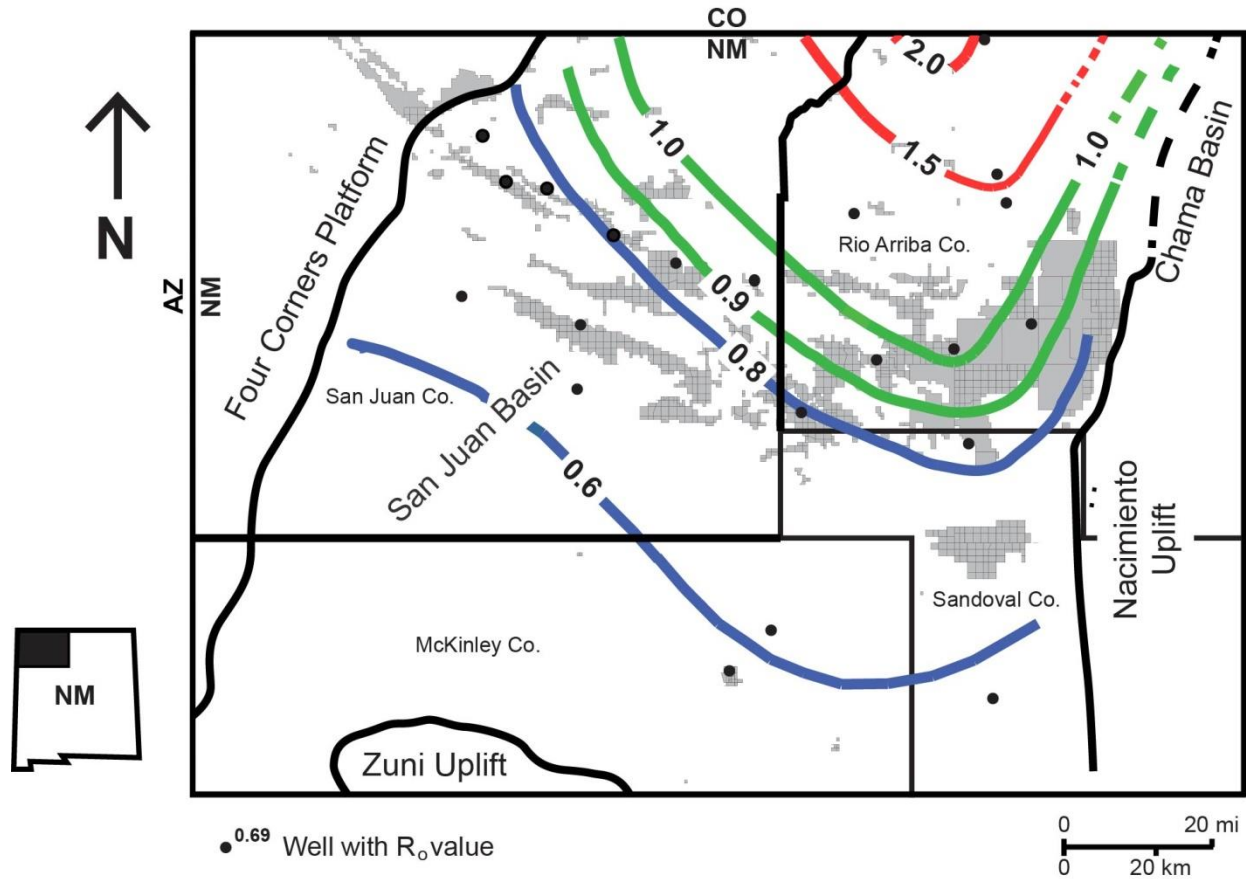


**Did the oil migrate updip through the medial and proximal facies from mature shales downdip?**

**Or did it get expelled from the interbedded shales, migrate into the interlayered sandstones and just stay there without significant updip migration?**

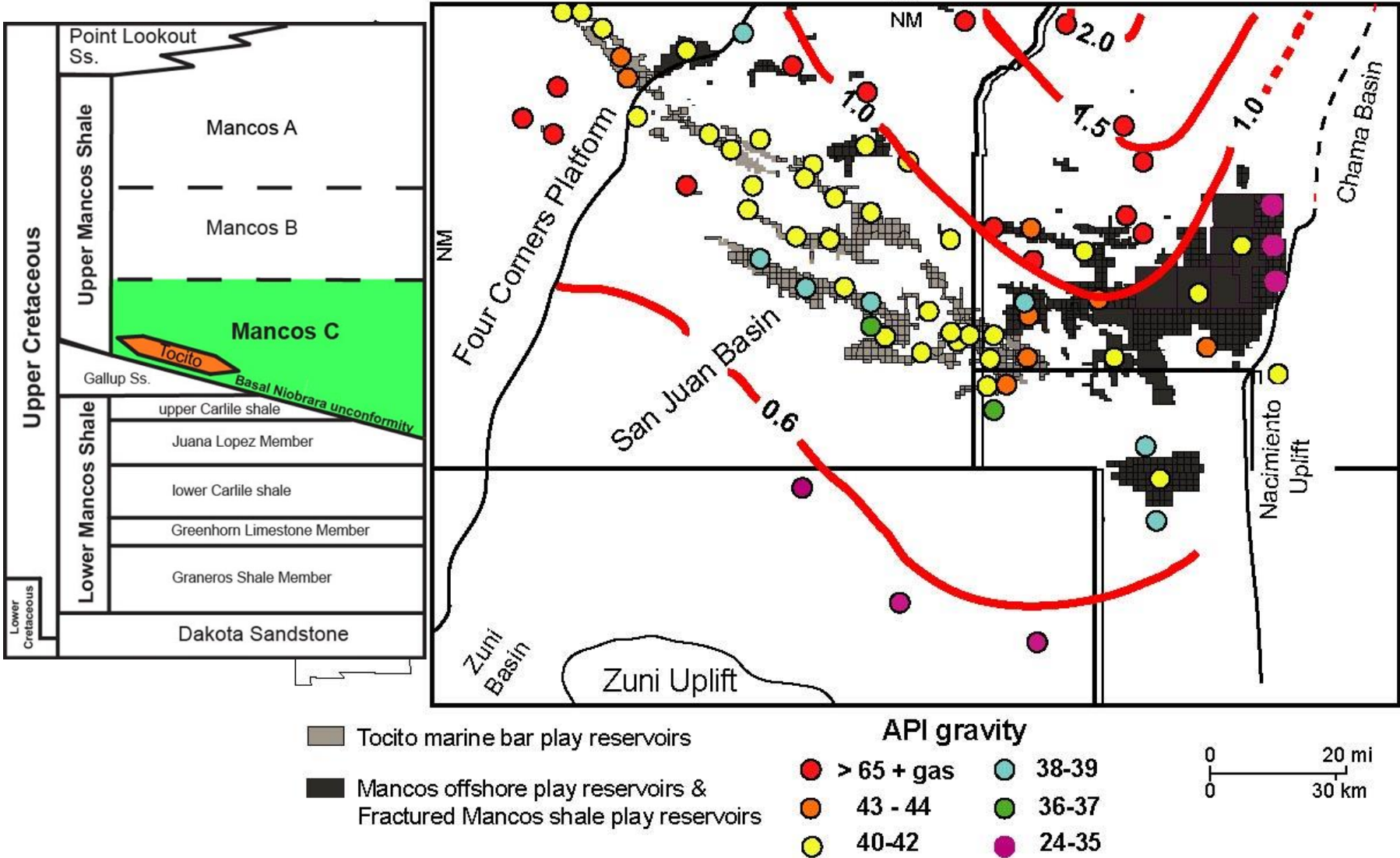
**Lets look at  $R_o$ , API gravities of Mancos C oils, and ROS**

# Mancos C Vitrinite Reflectance

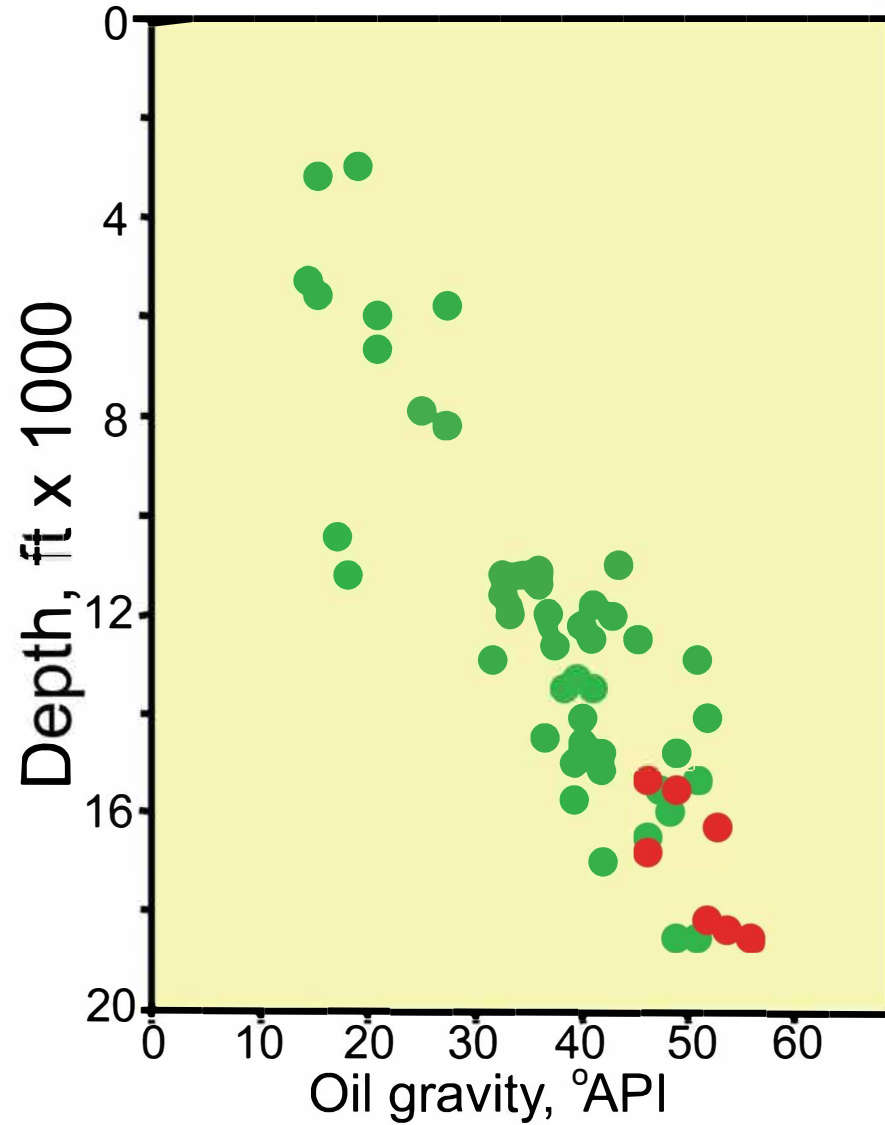




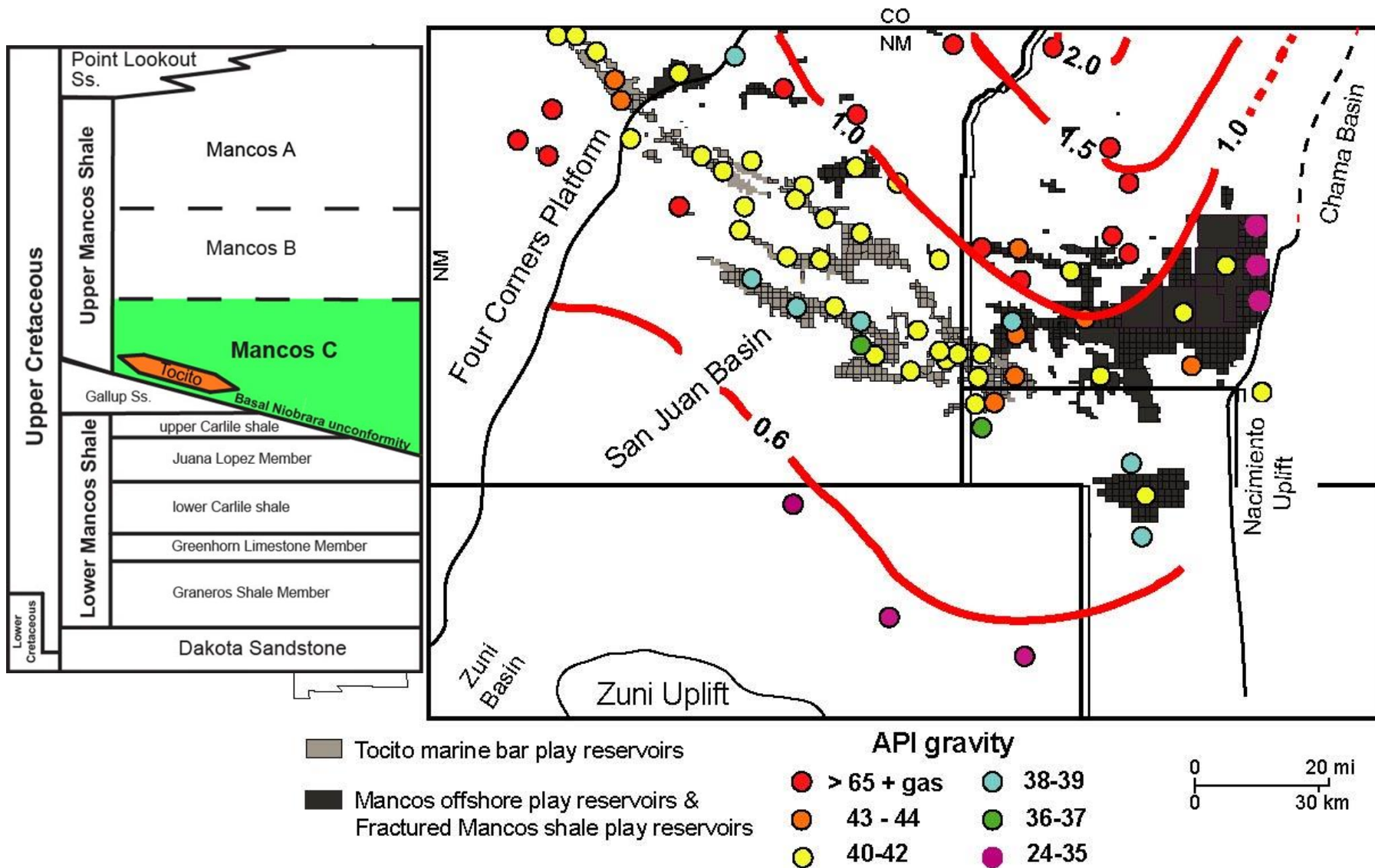
# R<sub>o</sub> & API Gravities - Mancos C oils



# API oil gravity vs depth Smackover Fm (Jurassic), Alabama



# R<sub>o</sub> & API Gravities - Mancos C oils



# Maximum Residual Oil Saturation Mancos C sands

