CHEROKEE PLATFORM & NEMAHA FAULT ZONE
OKLAHOMA

Suzanne M. Rogers
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• Structure
• Stratigraphy
• Oil & Gas Production
• Summary
• References
• Suggested Reading
Creeko Platform & Nemaha Uplift

• Faulted areas comprised of nearly vertical faults
• Displacement varies from next to nothing to several hundred feet or more
• Regional Dip: west-southwest from eastern portion of Platform to Nemaha Uplift
Mississippi Structure Map
(From Rogers, 2001, Fig. 8)
Subsurface Minerals Group
Gingerich 17-1
SW NW SE, Section 17-28N-1E

D.H. Mikkelson
Perez 1
SE NE, Section 23-28N-1E

Arbuckle, perfs 3220’-3422’
IPF 160 BO, 150 MCF, 10,000 BW

c. 12-10-05, TD 3422’

Miss

About 480’ displacement at Cherokee

c. 3-7-75, TD 3800’

D & A

Top of Cherokee

Top of Cherokee
STRUCTURE MAP

TOP OF MISSISSIPPIAN

(From Rogers, 2001, Fig. 8)
Atlantic Richfield
RM Hartley 67
S/2 NW NW NW Sec. 18-22N-3W
Garfield

Slats Honeymoon Drlg
L.E. Crews #1
NE NE SE, Sec 19-22N-3W
Garfield Co.

c. 4-10-79, TD 4700’
IPP Arbuckle 72 BO, 63 MCF

c. 12-9-57, TD 5958’
D & A
Downthrown side: approx 200’
Mississippi Chat
Displacement is 1270’ on Arbuckle
STRUCTURE MAP

TOP OF MISSISSIPPIAN

(From Rogers, 2001, Fig. 8)
NW ANTELOPE STRUCTURE

Mississippi Chat cum: 2.3 BCF & 715,755 BO
to date including unit production
Nemaha Uplift

Wilzetta Fault

C-C’

From Gay, 2003, as taken from Gatewood, 1983
Displacement is approx 220’ on top of Hunton
STRATIGRAPHY

• Same basic stratigraphic column

• Unconformities abound from Top of Cherokee to TD

• Penn sands trend from N/NE to S/SW – source to N/NE
<table>
<thead>
<tr>
<th></th>
<th>Permian</th>
<th>Wolfcampian</th>
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<td>Pennsylvanian</td>
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<td>Endicott</td>
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<td>Tonkawa</td>
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<td>Stratigraphic Column</td>
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<td><strong>Pennsylvanian</strong></td>
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<td>Missourian</td>
<td>Perry Gas</td>
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<td>Cottage Grove</td>
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<td>Layton</td>
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<td>Cleveland</td>
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<td>Des Moinesian</td>
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<td>Oswego</td>
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<td>Prue</td>
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<td>Skinner-north platform</td>
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<td>Senora - south platform</td>
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<td></td>
<td>Red Fork</td>
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<td></td>
<td>Bartlesville</td>
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<td></td>
<td>Booch in south platform</td>
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</tbody>
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Sentinel Petroleum, Inc.
Flash #1
NE NE, Section 23-15N-1E
Logan County, OK

Oswego
Top Of Cherokee
Prue Sand
Verdigris

c. 4-15-99, TD 5200’
IPP Prue 20 BOPD, 4 BW
Cum to date: 30,816 BO
Schermerhorn Oil Co.
Tune 3
NW NW NW, Section 24-27N-1E
Kay County, OK

Top of Cherokee

Verdigris Lime

Skinner

Pink Lime

Red Fork

c. 6-3-56, TD 3708’
IPF Skinner 243 BOPD, NW
no cum available
Sentinel Petroleum, Inc.
Deer #1
SE SE SW, Section 34-10N-8E
Seminole County, OK

c. 5-27-83, TD 2079’,
IPF 230 BOPD, 115 MCFD, NW
Cum to 184,413 BO, 58,707 MCF
Current: 5 BOPD, 20 BW
Garfield Resources
Mighty Mouse #1
SE SE NE, Section 9-18N-4E
Payne County, OK

C. 8-27-84, TD 4185’
IPF Red Fork 700 BOPD, 500 MCFD, 80 BW
Tested Bvl: 5 MCFD & Viola 3 BIPD, 10 MCFD & 60 BWPD
Cum thru June 2011: 84,584 BO
Petroleum Resources
28-3 Mills
SE SW NE, Section 28-21N-9E
Osage County, OK

c. 3-18-86, TD 2840’
IPP Bartlesville 47 BOPD, trace gas, 94 BW
2 wells made 4,046 BO
Production should be verified at Pawhuska
Lower Red Fork Fluvial Dominated Deltaic Sands
Kay County

(From Andrews, 1997, Plate 1)
<table>
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<tr>
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<tr>
<td><strong>Pennsylvanian</strong></td>
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<td>Atokan</td>
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<td>Absent - north platform</td>
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<td>Gilcrease &amp; Dutcher - south platform</td>
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<tr>
<td><strong>Mississippian</strong></td>
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<td>Osagean</td>
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<td>Mississippi Chat</td>
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<td>Mississippi Lime</td>
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Sentinel Petroleum, Inc.
Thlocco #4 (aka Berryhill #1)
NE SW SW, Sec. 6-9N-9E
Seminole County, OK

c. 1-25-85, TD 3355’
IPF 35 BO, 40 MCF, 10 BW
Cum: 99,254 BO & 258,553 MCF
(inc enhanced recovery oil)
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</table>
George Wallace  
Osage 9-1  
SE SW, Section 9-25N-11E  
Osage County, OK

c. 2-25-74, TD 2163’  
IP Arbuckle, COF 7000 MCFD  
Cum not reported on IHS, verify in Pawhuska
C & H #3, SE SE, Sec 25-24N-1W, Noble Co., Ok

IPF: 6 BOPD, 275 MCFD, 50 BWPD
Cum: 4546 BO & 255,023 MCF
(From Rogers, 2001, Fig. 3)
Osage-Davis Bros.24-5-6 1C
NE NE NE, Sec 6-24N-5E, Osage Co., OK

(From Rogers, 2001, Fig.7)
Stratigraphic Column

Cambrian

Ordovician

Silurian

Devonian

Woodford

Hunton
Subcrops to southwest

Sylvan
Subcrops to southwest

Viola
Subcrops to southwest

Wilcox

Arbuckle
(From Derby et al, 2002, Fig 2, & Northcutt, 2000, Fig 6)
New Dominion LLC
Stevens #1, SE NW, Section 7-15N-2E, Lincoln County

High Resolution Induction
Density/Neutron

c. 6-23-2000, Hunton, perfs: 4938’-5034’
IPP 165 BOPD, 556 MCFD, 701 BWPD
Cum: 143,739 BO & 1,344,026 MCF
Craig Elder O & G LLC
Keith Starks #1-1, SE SW, Section 1-15N-1E, Logan County

Array Induction

Density/Neutron

c. 2-25-2001, Hunton, perfs:4896’-5004’
IPP 97 BOPD, 666 MCFD, 1833 BWPD
Cum: 25,605 BO & 416,665 MCF
Stratigraphic Column

Cambrian

Ordovician

Silurian

Devonian

Woodford

Hunton
Subcrops to southwest

Sylvan-subcrops to southwest

Viola - subcrops to southwest

Wilcox

Arbuckle
Marjo Oil
Gibbens #2, formerly Rhoades Oil Gibbens #2
SE NW NE, Section 24-15N-3W
Logan County, OK
c. 10-21-93 by Marjo, TD 6880’
D & A in Arbuckle
Subsurface Minerals
Arnold 17-1
N/2 SE SW, Section 17-28N-1E
Kay County, OK

c. 1-25-2007 in Arbuckle
TD 3420’
D & A
Ross L. Mayo, Inc
Marian B. Scott #1
SW NW SW, Section 32-29N-2E
Kay County, OK

Mississippi

Woodford
Wilcox

Arbuckle

c. 6-24-93, TD 4200’ in Arbuckle
D & A
What this stratigraphy tells us:

• Area was subject to rise & fall of sea level, erosion & deposition & periods of tectonic activity from possibly as early as Cambrian through late Miss/early Penn time

• When prospecting you have to consider the history of the area & potential for porosity development
Suggested Rules of Thumb

- Tonkawa, Cleveland, Prue, Red Fork & Bartlesville will likely be productive with an Rt of 2.5 ohms (or greater).
- Skinner: generally requires a higher Rt to be productive.
- Tripolitic Miss Chat is better producer than Miss Chert. Arrowhead type sample indicates be careful.
- Mississippi has productive intervals below Chat
Types of Plays

• Structural: carbonate & sandstone
  – Ex: Mississippi and Wilcox

• Stratigraphic: carbonate w/ porosity/perm barrier – Ex: Oswego, Miss Chat, Miss Sandstone: fluvial dominated deltaic sands
  Ex: Skinner, Red Fork, Bartlesville

Coal bed methane: Nowata and Washington Counties in coal beds such as Rowe Coal
Oil & Gas Production

From Boyd, 2002
Production Summary

Cherokee Platform is a prolific producing region

Multiple Pay Zones: Kisner through Arbuckle

Oil, Gas, Water

Old Production (1920’s) to present day new discoveries

Cumulative production of old wells either in old data books or at OTC

Production data services have data from about 1970 to date

New methods, better exploration, less worry about produced water and by-passed pay all provide opportunities for tomorrow
Major Fields

- Burbank: stratigraphic
- South Ceres: shoestring sand lens
- Dilworth: structural
- Ponca City: structural
- Cushing: structural
- Carney: stratigraphic, dewatering
- Autwine: stratigraphic
- Braman: Structural
(From Rogers, 2001, Fig 1)
Indications of New Activity in Cherokee Platform

[Map showing drilling activity and SandRidge leases]

- **Yellow**: Drilling/drilled/producing Miss Horizontal
- **Red**: SandRidge leases
Drilling/drilled/producing Miss Horizontal SandRidge leases
SUMMARY

Tectonically active region

Major unconformities

Multiple pay zones at shallow depths (<5000’)

Developed areas with quality production

New techniques & exploration methods result in new development

Lots of oil & gas remaining
REFERENCES


Boyd, Dan, 2002, Map of Oklahoma Oil & Gas Fields, available online from OGS site.


Northcutt, Robert A., & Jock Campbell, Geologic Provinces of Oklahoma, available online


Suggested Reading for Oklahoma Cherokee Platform & Oklahoma Geology:

Davis, Harold G. III, Wrenching and Oil Migration, Mervine Field Area, Kay County, Oklahoma, Shale Shaker Digest XI, p. 145-158

McBee, William J., Nemaha Strike-slip Fault Zone, Search & Discovery Article #10055 (2003), AAPG


The Shale Shaker, published by the Oklahoma City Geological Society. Older issues through 2005 available on a set of 3 CDs from the OCGS office.

OGS Special Publications covering various reservoirs in Oklahoma including but not limited to the following:

- Oklahoma Geological Survey Special Publication 96-2: Fluvial Dominated Deltaic (FDD) Oil Reservoirs in Oklahoma: The Skinner & Prue Plays
- Oklahoma Geological Survey Special Publication 97-1: Fluvial Dominated Deltaic (FDD) Oil Reservoirs in Oklahoma: the Red Fork Play
- Oklahoma Geological Survey Special Publication 9706: Fluvial Dominated Deltaic (FDD) Oil Reservoirs in Oklahoma: The Bartlesville Play

OCGS Publications in the Shale Shaker, available on CD ROM, containing many good papers on various areas throughout Oklahoma up to 2005.