OKLAHOMA 2007 DRILLING HIGHLIGHTS

by Dan T. Boyd, Oklahoma Geological Survey

This article is the third in an ongoing series summarizing drilling activity in Oklahoma. The first article was published in the Winter 2005 issue of the Oklahoma Geology Notes (V. 65, No. 4) and the second article was published in the Shale Shaker, V. 57, No. 6 (May/Jun 2007).

Regardless of spud or completion date, the wells discussed here were recorded prior to January 1, 2008. Because much activity is not registered until months or years afterward, a reasonably complete compilation of the activity for a given year cannot be completed before the third or fourth quarter of the following year, by which time it is old news. For this reason notable 2007 wells recorded after January 1, 2008 will not appear in this report, but those from 2006 recorded in 2007 are included. Significant wells completed in 2007, but registered in 2008, will appear in next year's report.

The data presented here were supplied by IHS Inc (IHS), formerly Petroleum Information/Dwights LLC dba IHS Energy Group, all rights reserved. Without this excellent database this report could not have been completed. All cartography was done by Russell Standridge of the Oklahoma Geological Survey.

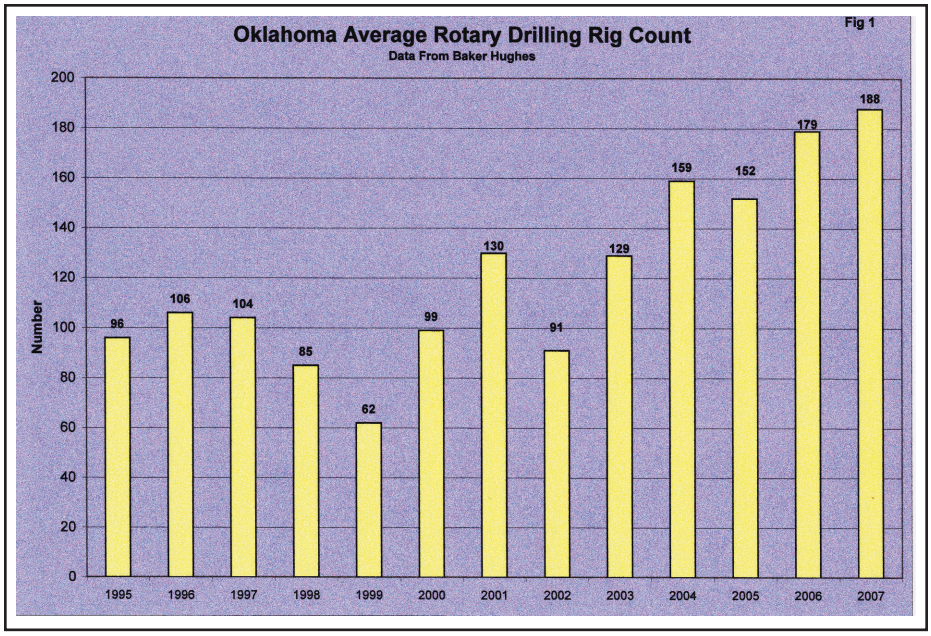

Figure 1: *Oklahoma Average Rotary Drilling Rig Count from 1995 through 2007. Data from Baker Hughes, 2008.*

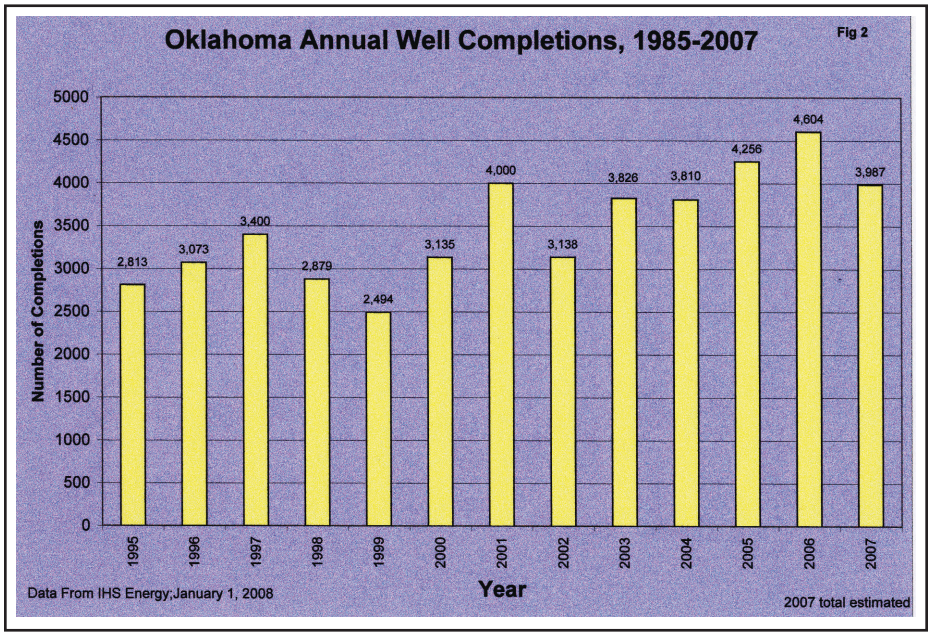

Figure 2: *Oklahoma Annual Well Completions from 1995 through 2007. Data from IHS Energy, 2008.*

General Activity

The number of working drilling rigs is a basic measure of oil and gas activity in any area. The Baker Hughes Company has tracked monthly rotary drilling rig counts for many years and has compiled these into annual averages for regions all over the world. According to Baker Hughes (2008) the average number of active drilling rigs in Oklahoma for 2007 was 188; up from the 2006 average of 179. Since 2004 the average number of active drilling rigs has remained above 150, reflecting the highest level of sustained activity since the 'boom' years that ended in the mid-1980s (Figure 1).

Well completion data compiled by IHS (2008) mirror the working rig count. These show that 1999 represents the modern low in terms of drilling activity. Since that time activity has followed the price of natural gas, with the last major drop for both occurring in 2002. Through January 1, 2008 IHS registered a total of 2,240 completions for 2007. This compares to 2,841 completions registered for 2006 and 2,392 registered for 2005 at the same time. If reporting delays are roughly equal, the final number in 2007 should be about 600 less than 2006. The 3,987 completions shown adds the same proportion of completions to the 2007 year-end total as that seen in 2006. The drop in the projected number of completions in 2007, despite a higher average rig count, may be due to fewer of the fast-drilling coalbed methane (CBM) wells and more of the slower-drilling horizontal Woodford Shale wells. This would tend to increase the

average rig-time per well, and may explain the drop in completion numbers (Figure 2).

The price of natural gas is by far the most important factor controlling drilling activity in Oklahoma. A wellhead price in 1999 of $2.06/MCF was the principal factor that pushed activity in that year to the lowest level in recent history. Prices doubling only two years later (to $4.02/MCF) more than doubled the number of active rigs and added nearly 4,000 new completions. The last major drop in the average annual price for natural gas occurred in 2002, when a decline to $2.94/MCF produced a pronounced slump in that year's activity. Since 2003 prices have been near or above $5.00/MCF, and this has had a corresponding effect on drilling. The average 2007 wellhead gas price in Oklahoma through August was $6.36/MCF. Because the Henry Hub Spot price range in the first half of the year has been similar to that seen in the second half, it is projected that the 2007 natural gas price for Oklahoma will be roughly flat with 2006 (Oklahoma Corporation Commission, 2007) (Figure 3).

Years of gas-focused drilling activity have resulted in a fundamental shift in hydrocarbon production in the State from oil, to one in which, on a barrel of oil equivalency to 6 mcfg, 81% of production is in the form of natural gas. This trend continues, with completions in 2007 registered through January 1, 2008 being 66% gas and 23% oil. Three out of four successful completions were made in gas reservoirs, and with more than a 90% success rate, drilling for both oil and gas continues to be overwhelmingly developmental in nature. Dry holes, which comprise all plugged and abandoned wells, including those junked for mechanical reasons, accounted for only 9% of drilling in 2007 (Figure 4).

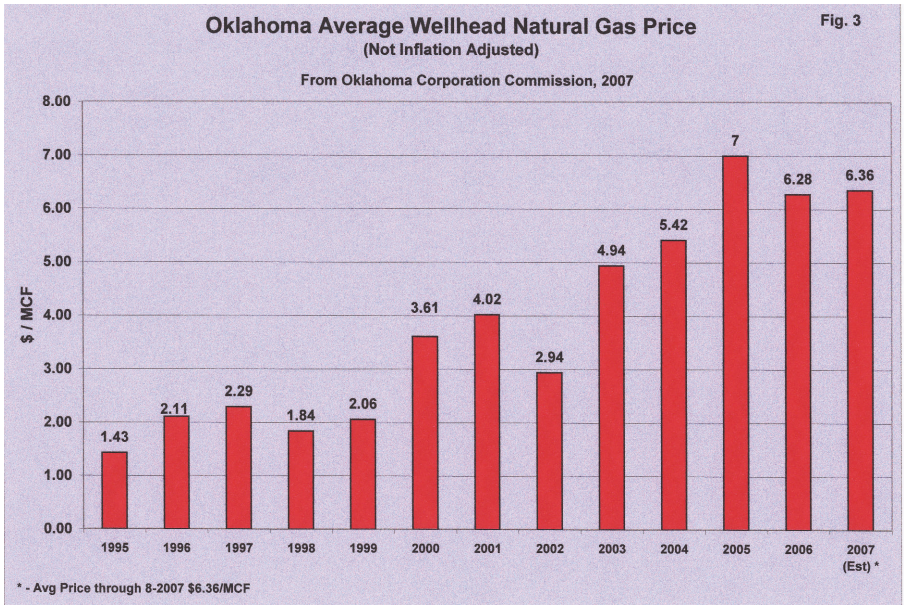

Figure 3: *Oklahoma Average Wellhead Natural Gas Price from 1995 through 2007 (not inflation adjusted). Data from Oklahoma Corporation Commission, 2007.*

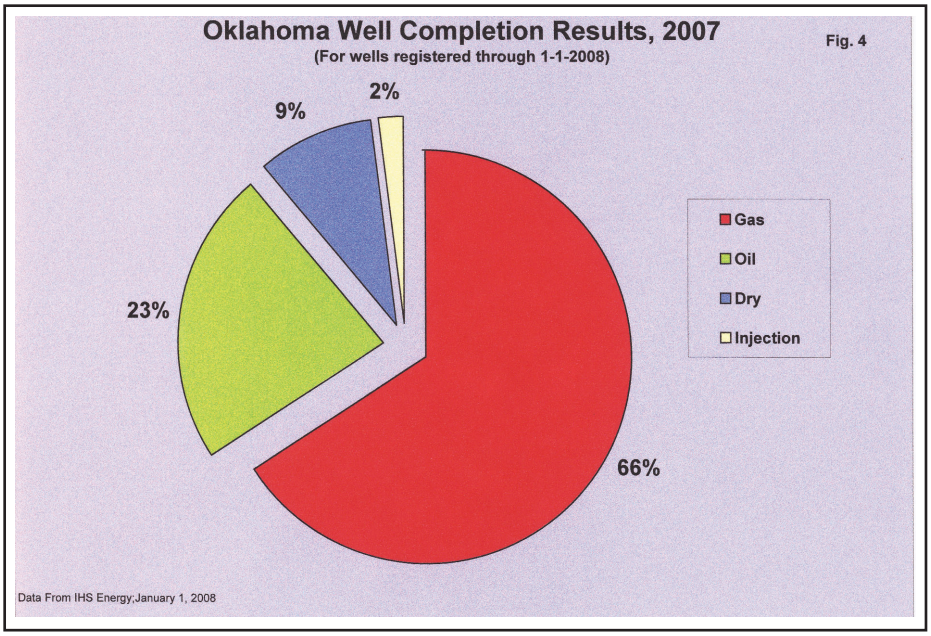

Figure 4: *Oklahoma 2007 Well Completion Results (for wells reported through January 1, 2008). Data from IHS Energy, 2008.*

Coalbed Methane

Although waning, the most active play in the State continues to be coalbed methane (CBM). Cardott, 2008, reported that at the beginning of 2008 there were about 5,000 CBM completions in Oklahoma, 197 of which have been registered thus far for 2007 (IHS, 2008). This level of activity is 40% below what was reported last year at this time for 2006. If reporting delays remain constant, 2007 CBM completions should total about 323 by this time next year; a major drop from the 543 completions that are registered for 2006 (Figure 5). As in past years, the bulk of 2007 activity is contained within well-established areas of CBM production, suggesting that the decline in drilling is due to continued development of the most prospective areas (Figure 6).

Cumulative Statewide CBM production stands at 429 BCF, with daily production (~180 MMCFPD) representing about 4% of all gas production. The average well in the play now produces 52 MCFPD; a decrease from 63 MCFPD/well last year (IHS, 2008). Reduced drilling, combined with rapid initial declines, has diminished CBM production about 10% in each of the last two years. It is now clear that, as a play, Oklahoma coalbed methane reached its peak in early 2006 at about 225 MMCFPD. Because there are now thousands of wells producing in the play, future CBM drilling can only influence the rate of decline (Figure 7).

CBM wells in Oklahoma are located in two geologic regions: the Arkoma basin

and the Cherokee platform. About 2/3rds of the drilling in 2007 targeted the Hartshorne Coal in the Arkoma Basin, mostly as horizontal wells. A variety of coals produce on the Cherokee platform, but the most popular in 2007 were the Mulky, Nuyaka, and Riverton; the bulk of these completed in vertical wells (IHS, 2008). The most active CBM operators in 2007, based on completions registered thus far, are Amvest Osage, El Paso, Panther Energy, and Penn Virginia.

Woodford Shale

Oil from the Woodford Shale is being developed in several places in Oklahoma, but the largest impact that this formation is having on activity and production in the State is in the gas play. If completion trends continue, Woodford gas will eclipse coalbed methane as the most active play in the State in 2008. This play continues to grow, with the main fairway in the western Arkoma Basin expanding and several satellite areas of production and activity being established around it. Concentrations of Woodford gas production and drilling activity are shown in Figure 8.

Since early 2004 about 290 Woodford gas wells have been put on production, about 2/3rds of these are horizontal wells. Cumulative production for the play stands at 59 BCF, with the average well producing about 660 MCFPD, a per-well rate that is double last year's. 123 gas wells have been registered thus far as 2007 completions, with most activity continuing to be located in a broad trend extending from western McIntosh through western Atoka Counties (Figure 8). Satellite production along the Ozark uplift and the northern flank of the Ardmore Basin began in 2007. Newfield Exploration is the most active operator in the play, at last report operating 140 horizontal wells and 13 drilling rigs.

The following are Woodford gas wells that are considered significant. These are designated in Figure 8 by the letters <A> through <I>.

In a play in which production drops to a fraction of the initial potential, often in as little as a few weeks, Newfield

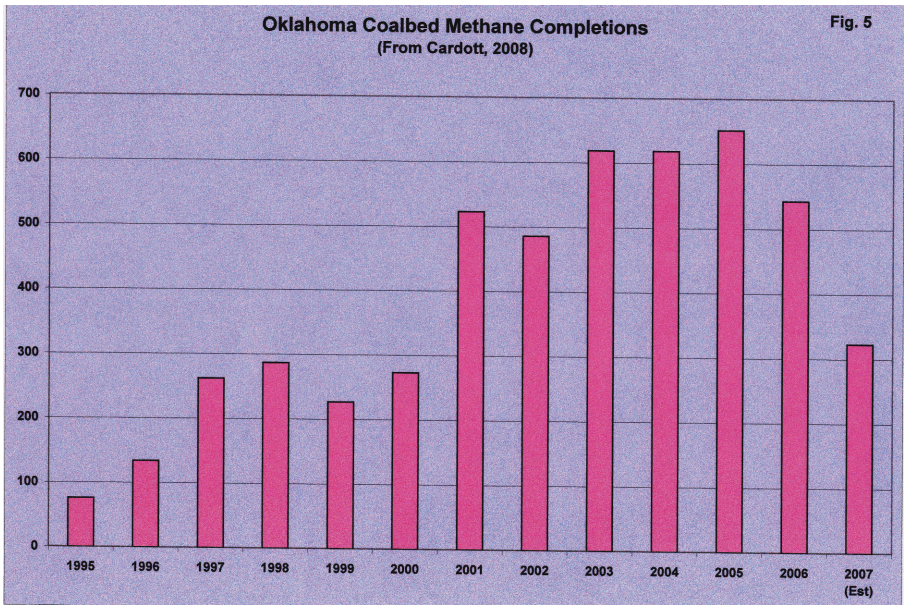

Figure 5: *Oklahoma Coalbed Methane Completions from 1995 through 2007. Data from Cardott, 2008.*

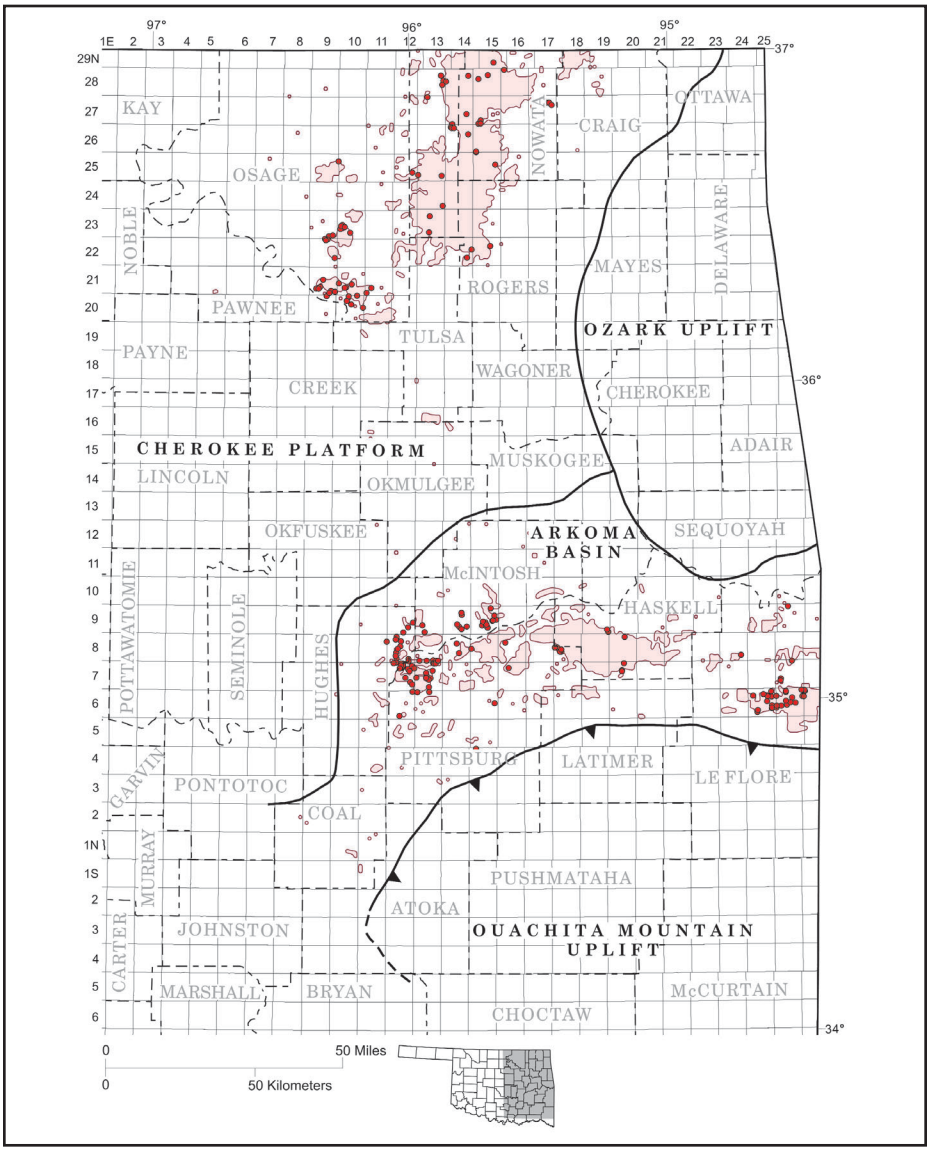

Figure 6: *Map of 2007 Oklahoma Coalbed Methane Activity. Map shows geologic provinces and areas of previous coalbed methane production overlain by 2007 completions. Areas and activity are from IHS Energy, 2008. Major geologic province boundaries are modified from Northcutt and Campbell, 1995.*

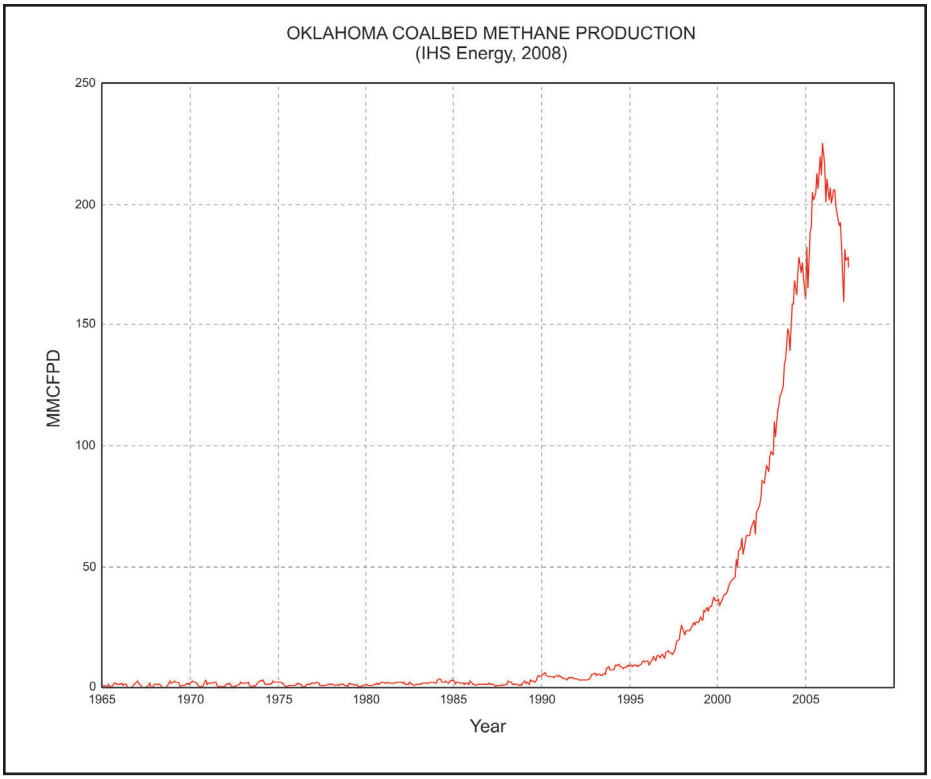

Figure 7: *Oklahoma Coalbed Methane Production. Data from IHS Energy, 2008.*

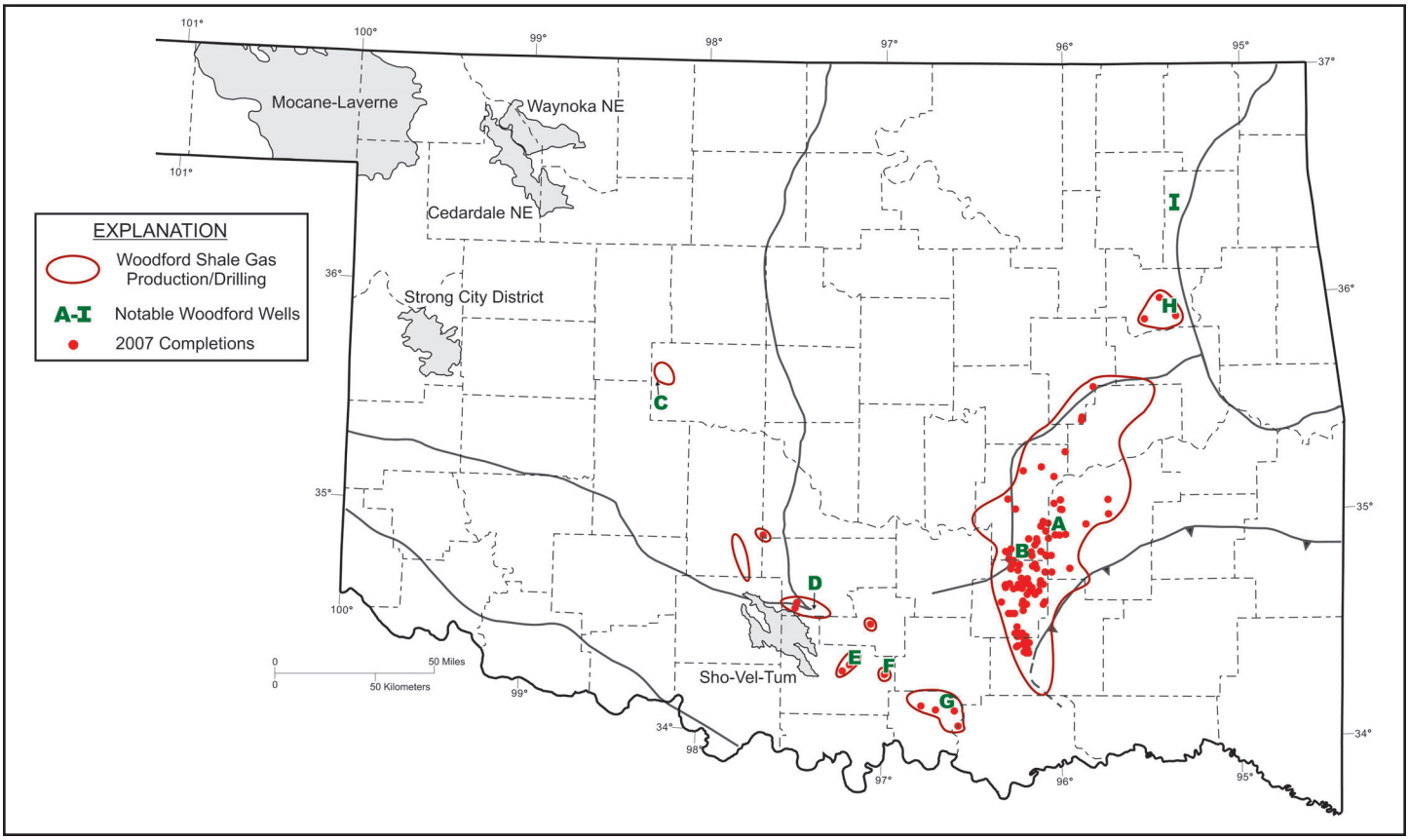

Figure 8: *Map of Oklahoma showing 5 fields with the most active 2007 development (exclusive of coalbed methane) and areas of production and drilling activity in the Woodford Shale gas play. 2007 completions are shown with dots. Letters show the location of notable wells discussed in the text. Field outlines are from Boyd, 2002.*

Exploration has drilled a horizontal Woodford well that appears to be bucking the trend. Their #4H-22 Sherman Ellis <A> (Sec. 22-5N-12E) was completed with a reported 5-stage fracture stimulation from 8,500-11,042 ft. After an initial potential of 11,200 MCF + 435 BWPD, in it's first two months of production the well produced at an average rate of about 10 MMCFPD. In another development, indicative of the fine tuning of drilling and completion techniques in horizontal Woodford gas wells, Newfield drilled an extra-long 4,366 ft lateral on their #3H-22 Tollett <B>

(Sec. 27-4N-10E). This well, after a nine-stage fracture stimulation, had an initial potential of 12 MMCFPD.

There have been many attempts to expand the Woodford Shale gas play in 2007, and success in any of these could dramatically increase the play's prospective acreage. At this writing Devon is drilling their Hancock #-1-36H in western Canadian County <C> (Sec 36-13N-10W) on the Anadarko Shelf. This is the first of five horizontal wells that they plan to drill in this area.

The first horizontal Woodford production was reported in 2007 on the Arbuckle Uplift when Cimarex Energy completed a well in southern Garvin County <D> (Sec.8-1N-2W) in Eola-Robberson Field. The Hamilton Heirs #4-8H had an initial potential of 1.53 MMCF + 67 BO + 40 BWPD from perforations from 6,960-8,730 ft MD.

In the Ardmore Basin, Chesapeake has drilled a horizontal Woodford well in Springer Field <E> (Sec.12-3S-1E) that offsets three vertical Woodford-Sycamore wells. Its initial potential was 1.6 MMCFPD and it is being offset in Section 13. Also in the Ardmore Basin, two townships east, BNK has drilled a vertical <F> (Sec. 26-3S-3E) and a horizontal (Sec. 35-3S-3E) Woodford gas well in Baum North Field. These wells had initial potentials of 900 MCF and 2.2 MMCFPD respectively, and have led to the drilling of three more wells in the area. Further south <G> (Sec.21-5S-6E), but still in the Ardmore Basin, Range Production completed a vertical Woodford gas well (#1-21 Davy Jones) with an initial potential of 217 MCF + 60 BWPD. Located two miles southwest of Madill Field, this is a sparsely drilled area that may lead to a spate of horizontal Woodford wells.

In another expansion of Woodford production, Coronado Great Plain and Resource Development Technology LLC have moved to the flanks of the Ozark Uplift R.D.T drilled 9 (~1,000 ft) vertical Woodford wells in <H> 17N-18E with IP's ranging from 6 to 54 MCFPD. Coronado drilled the first horizontal well in Wagoner County in this township with their Cannon #1-27 <H> (Sec. 27-17N-18E), which was drilled to a measured depth of 4,364 ft and a TVD of 778 ft. Test results are not yet available for this well. Coronado, in their most recent vertical well (McCullough 17-2) located just south in Sec. 17-16N-18E, obtained an initial potential of 210 MCFPD from perforations between 784 ft and 810 ft. Coronado has an additional 11 vertical and one horizontal well drilling within 2 miles of this well. About 35 miles north <I> (Sec. 21-22N-18E), in Mayes County, Coronado has drilled yet another horizontal Woodford well (#21-2H Mitchell-Webster) that at this writing is the northernmost well in the Woodford gas play.

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Coal and shale gas dominated activity and highlights in the eastern part of the State, while conventional reservoirs were most important in the western part. The top five reservoirs for 2007 based on completions registered through 1-1-2008 were the: Chester (156), Oswego (129), Woodford and Hartshorne Coal (both with 124), Morrow (92) and Mississippian (81). All but the Woodford and Hartshorne were concentrated on the Anadarko Shelf. From a field development standpoint, gas drilling in the Anadarko basin and shelf were again the most important in 2007. The top five fields based on completions registered through January 1, 2008 were: Cedardale NE (100), Mocane-Laverne (70), Strong City District (69), Sho-Vel-Tum (68), and Waynoka Northeast (48) (Figure 8).

Hundreds of companies drilled wells in 2007, but Chesapeake Operating continues to be by far the most active operator. Their dominance in Oklahoma is vividly illustrated in Figure 9. Based on completions registered through January 1, 2008, Chesapeake accounted for about 18% of all wells drilled. Their 405 completions are scattered through almost every region of the State, and are about 6 times greater than the second-ranked operator, Apache. In 2007 Chesapeake drilled more wells in Oklahoma than the next nine operators combined.

Horizontal drilling is by far the most important drilling/completion technique to be recently applied in the State. Its use has made formerly unproductive areas and reservoirs profitable and revitalized reservoirs that have been producing for decades. It now represents 15-20% of State drilling activity and is a common thread running through many of the notable wells listed here. In addition to increased wellbore exposure to low permeability reservoirs, horizontal drilling is also useful in dewater-

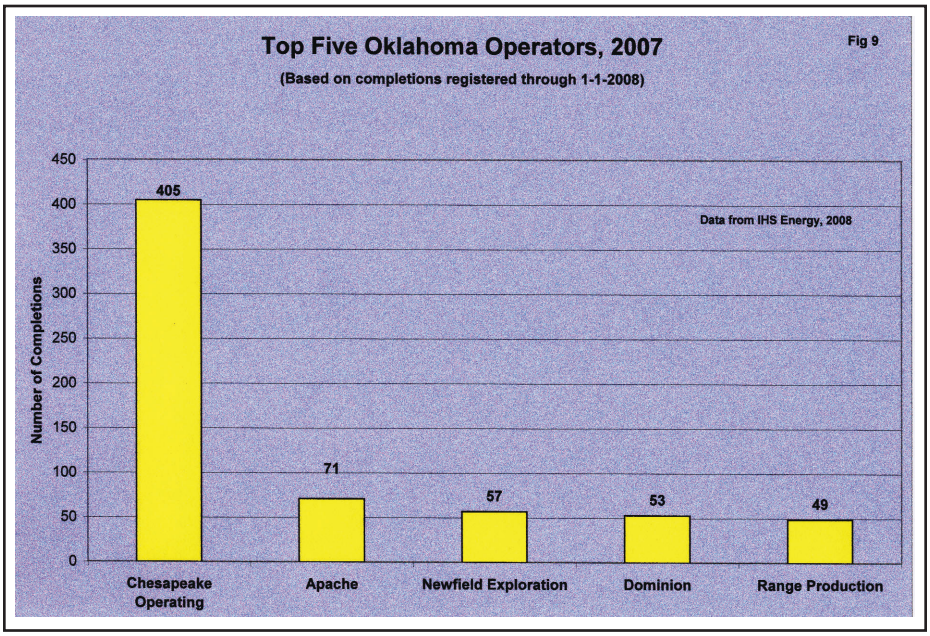

Figure 9: *Top 5 operators in Oklahoma in 2007, based on the number of completions registered through January 1, 2008. Data from IHS Energy, 2008.*

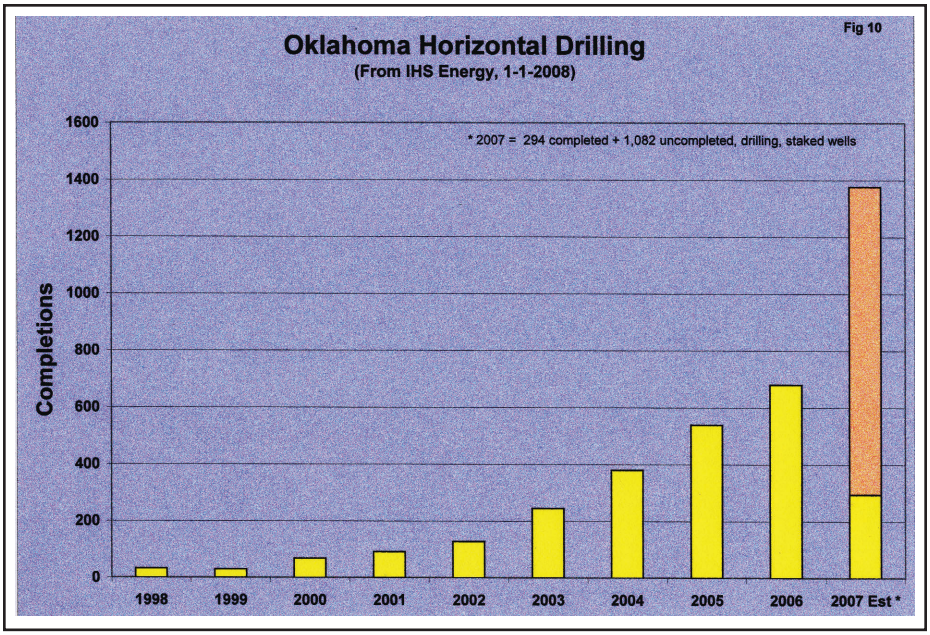

Figure 10: *Oklahoma Horizontal Completions from 1998 through 2007. All uncompleted/drilling/staked wells applied to 2007 total. Data from IHS Energy, 2008.*

ing dual porosity oil reservoirs. Dewatering is the process by which reservoir pressure is reduced in fields with natural water support through aggressive water production. This production triggers associated gas expansion in poorer (unswept) parts of the reservoir, forcing oil into the natural and/or induced fracture system and ultimately into the wellbore.

Due to reporting delays, the 2007 total shown in Figure 10 includes all horizontal wells listed as staked or drilling, but not yet completed. Although some of these will not be drilled and some will appear in other year's drilling totals, the majority should be registered as completed in 2007. This should insure that the steady increase in horizontal drilling will continue.

Significant Wells in 2007

The following is a list of what are, or may become, significant wells for 2007 in Oklahoma. It is based on a review of wells described in the IHS *EnergyNews on Demand* Midcontinent activity reports that were released online throughout 2007. An initial list of 104 possibilities compiled from these publications was distilled to a total of 15 potentially significant wells. Such a listing is necessarily subjective, and may miss wells that could eventually become noteworthy. Due to confidentiality issues, wells that may be notable for technical reasons will probably be missed. For instance, those that confirm some new type of trapping style or proved the benefit of a new completion technique will be difficult to identify until information is disseminated years later.

Such subtleties aside, the wells shown here are of two general classes; those that establish significant production more than one mile from existing production in the same reservoir, which is the standard to be considered a discovery, and those that are notable for other reasons. The latter include rank wildcats, major play expansions, or new production types and/or completion techniques. The following are wells reported as completed in 2007 that are considered significant (Figure 11).

1) Sec. 23-26N-20W (Harper County): Patron Energy LLC has begun a Hunton dewatering program on the Anadarko Shelf between Cedardale and Lovedale Fields in the southeastern part of 26N-20W. The central water disposal well, the #1-23 Carter, was spudded in November 2006 and is projected to 9,800 ft as a vertical hole in the Arbuckle. At last report there were 10 horizontal Hunton producers drilling in the surrounding sections with two additional staked locations.

2) Sec. 4-27N-14W (Woods County): Chesapeake made a vertical Hunton discovery 6 miles northeast of the nearest Hunton producer. The Mackey #1-4, which was perforated from 5,714-5,726 ft, had an initial flowing potential of 475 BO + 567 MCFPD with no water on an 18/64 in. choke and a FTP of 856 psi. The well produced about 22 MBO in its first two months, with no reported gas, and averaged 475 BOPD in its last reported month. This area was relatively unproductive prior to 2005, when Avalon and Chesapeake began a large-scale drilling program. Since that time, in an area where previously there was one productive well, there are now 10 producers, 20 drilling wells, and 3 staked locations.

About ½ mile to the north, the Chesapeake Howell #1-33H (Sec 33-28N-14W) is the first horizontal Mississippian well in Woods County and is a horizontal twin to a vertical Avalon well. The horizontal well had an initial flowing potential of 467 BO + 750 MCF + 720 BWPD against the vertical well's potential of 62BO + 685 MCF + 582 BWPD. In about 3 months the horizontal well has produced 14,595 BO (no reported gas) and averaged 235 BOPD in its latest

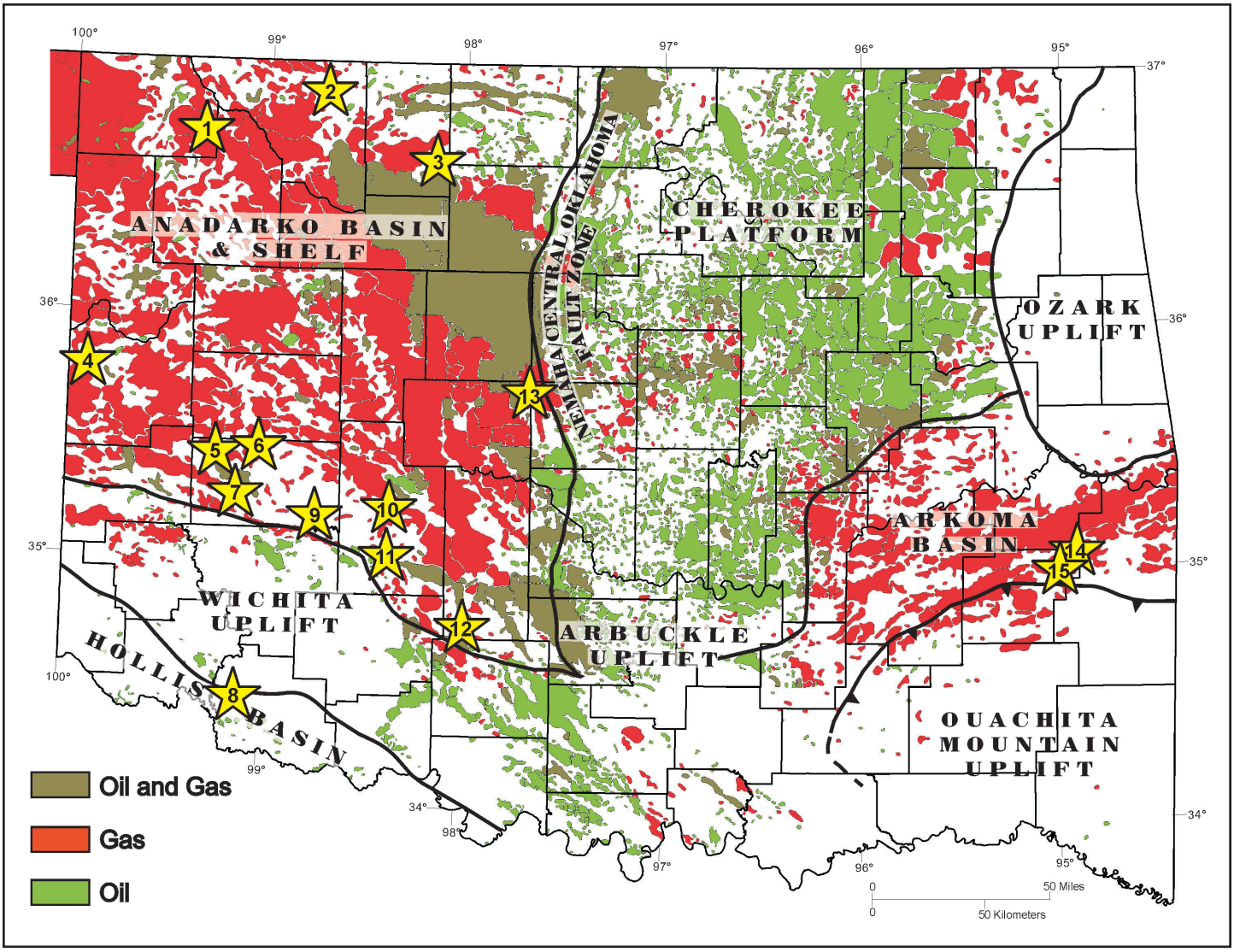

Figure 11: *Map of Oklahoma oil and gas fields, distinguished by GOR, showing location of significant wells reported for 2007. Modified from Boyd (2002). Major geologic provinces boundaries modified from Northcutt and Campbell (1995).*

month. The vertical well in 8 months produced 6,140 BO + 14 MMCF and averaged 5 BOPD in its latest month.

3) Sec. 2-24N-9W (Alfalfa County): In another Hunton dewatering operation, Chesapeake is drilling a vertical Arbuckle disposal well and four horizontal wells radiating from the same surface location. The first of these, the Johnnie Davis #1-34H, had an initial pumping potential of 216 MCF + 10,262 BWPD from an open-hole completion between 8,160-12,700 ft MD. At last report the other three producing wells had yet to be completed.

4) Sec. 4-14N-25W (Roger Mills County): B&W Operating completed their #1-4 Magpie discovery in a sparsely drilled area about 2 miles north of Reydon Field and 2 miles south of Hamburg Field. Drilled to a TD of 16,575 ft, the Springer was perforated from 16,348-354 ft and flowed initially at a rate of 1,837 MCF + 240 BWPD. Flowing tubing pressure was 8,100 psi on a 8/64 in. choke. In 7 months on line the well has made about 250 MMCF and in its last full month averaged just under 1 MMCFPD.

5) Sec. 29-11N-19W (Washita County): Cimarex Energy made a Des Moines / Atoka discovery with their Patricia # 1-29 well late in 2006. A total of three zones were tested with initial potentials of: Des Moines (14,314-316 ft) 4,049 MCFPD, Atoka (14,930-948 ft) 225 MCFPD, and another Atoka zone (15,820-931 ft) 1,275 MCFPD. In its first 11 months on production the Patricia has made 1.7 BCF and in its last month was producing at a rate of 1.5 MMCFPD. Cimarex has since drilled a successful confirmation well immediately to the northwest (#1-30 Spitz) and Chesapeake another two in the sections to the south.

6) Sec. 10-11N-18W (Washita County): Chesapeake completed the first horizontal well in Washita County early this year in the Des Moinesian Granite Wash. Their #2-10H Walton was completed from 13,079-15,364 ft MD with an initial potential of 3,766 MCF + 317 BC + 83 BWPD. Flowing tubing pressure was 4,278 psi on a 16/64 in. choke. In its first 9 months of production this well has made about 900 MMCF and continues to flow at a rate of 2.1 MMCFPD. Chesapeake is especially active in this play, with 11 horizontal wells drilling and one staked location, all within 2 miles of the Walton well.

7) Sec. 6-9N-18W (Washita County): JMA Energy

completed an Atoka Granite Wash well in late 2006 that lead to a successful confirmation well in 2007 and four new wells that were drilling at last report. The West Trust #1-6 was completed in the Atoka Wash from 14,770-15,338 ft with an initial potential of 2,563 MCF + 44 BO + 111 BWPD. This discovery was followed up by the Thomas #1-7 (Sec. 7-9N-18W) that produced 5,054 MCF + 217 BO + 3 BWPD on an initial test from 15,070-15,424 ft. The discovery well produced 260 MMCF in its first 10 months on line, but was at 400 MCFPD in its last month's production. However, the confirmation well has produced 854 MMCF in 5 months and continues to produce at a rate of 5.7 MMCFPD. The nearest Atoka production is from the Atoka lime, about 2.5 miles to the northeast.

8) Sec. 31-1S-18W (Tillman County): Deka Exploration drilled the first horizontal well in the Hollis-Hardeman Basin with their Mittie Nichols #1-31H. Completed in the Arbuckle from 6,350-6,400 ft, the well had an initial potential on pump of 95 BOPD with no reported water. In five months it has made about 5 MBO and produced 33 BOPD in its last month. This well offsets a 2005 vertical well that over 2.5 years has produced 8,600 BO from the Arbuckle. Although production here is modest, this area is very sparsely drilled, with the closest significant production located 8 miles to the southeast in Frederick South Field.

9) Sec. 14-8N-15W (Washita County): BP America made a discovery in another lightly drilled area in southern Washita County. The Prichard #1-14 was completed in the Morrow from 17,358-17,365 ft for an initial rate of 2,025 MCF + 30 BWPD. FTP was 628 psi on a 40/64 in. choke. At last report this well had not yet been put on line. Nearest production is from the Springer about 2 miles to the southeast. This discovery is being delineated by the BP Cristal #1-24 (Sec. 24-8N-15W) located immediately to the southeast.

10) Sec. 32-9N-11W (Caddo County): Crawley Petroleum has made a Springer discovery in their #1-32 Wild Rosie. Located 1.25 miles southwest of Marchand production in the Eakly-Weatherford Trend, the well was completed from 17,552-620 ft flowing 2.1 MMCF + 11 BWPD. At last report the well had produced 70 MMCF in its first month on line. The closest Springer production is a 1984 Anadarko Land & Exploration well located 2 miles southeast. Crawley has plans to delineate this discovery and has spaced the three surrounding sections (5, 6, and 31), presumably for future Springer tests.

11) Sec. 6-6N-11W (Caddo County): St. Mary Land & Exploration made an excellent Springer discovery in the #1-6ST Norma Jo. The well flowed from two zones between 20,608-21,410 ft at a rate of 9,442 MCF + 23 BWPD with an FTP of 7,000 psi on a 16/64 in. choke. In its first full month of production the well has made 130 MMCF. The closest Springer well is located 2.5 miles to the northwest and is a Sanguine well that had an IP of 2,825 MCFPD. This well has produced for 3 years, has made about 3.5 BCF, and in its last month was still producing 2.0 MMCFPD. St. Mary is drilling a delineation well to the southeast in section 7 (#1-7 Daryl) that was at a total depth of 20,624 ft at last report.

12) Sec. 19-3N-7W (Grady County): Ward Petroleum made what appears to be an excellent Springer discovery ½ mile southwest of a non-commercial Springer well in the same section. The Young #1-19 had an initial potential of 8.6 MMCF + 110 BWPD from perforations from 18,792-19,014 ft, and in its first full month produced 111 MMCF. The offset well, the Nortex Graham #1-19 (Sec.19-3N-7W), had an initial potential of 637 MCF and was abandoned after producing only 291 MMCF. Ward is in the process of following up this discovery with the drilling of a well in Sec. 24-3N-8W (Graham #1-24) that was spudded in June.

13) Sec. 30-14N-4W (Oklahoma County): Chesapeake completed the first of three horizontal Hunton wells in a part of Edmond West Field that began production in the mid-1940s. The initial potential on pump for the BA #3-30H well was 582 BO + 552 MCF + 1780 BWPD. This well has two laterals, each about 3,800' long. Chesapeake is drilling two more horizontal Hunton wells immediately to the northwest which are among 5 horizontal Hunton wells now drilling in Edmond West Field. These wells are operated by Avalon, Petrohawk, and Beta Operating companies.

14) Sec. 35-7N-22E (Latimer County): Mentioned in last year's report, BP America drilled the first horizontal Simpson test in Red Oak-Norris Field. The well in 8 months has produced 318 MMCF and in its last month was producing at a rate of just under 1 MMCFPD. Only the fourth Simpson well in the field, the Blair Unit #35-12 is located more than a mile northeast of a vertical Simpson well that produced an average of about 650 MCFPD in its first four months. The new horizontal well was completed with a slotted liner from 12,506-15,050 ft and tested at an initial rate of 2,937 MCFPD with no water reported.

15) Sec. 20-6N-22E (Latimer County): Another BP America horizontal well was completed in Red Oak-Norris Field this year that is notable because it is the first horizontal Red Oak Sandstone completion in the Arkoma Basin. Completed from a horizontal lateral from 8,121-10,897 ft, the Martin C Unit #10 had an initial potential of 4,233 MCFPD with no reported water. In its first three months of production the well made 297 MMCF, with a rate in the last month of 2.5 MMCFPD.

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Dan Boyd is a petroleum geologist with the Oklahoma Geological Survey, where he has been employed since 2001. Dan received his Master of Science degree in geology from the University of Arizona in 1978. He spent the first 22 years of his career as an exploration and development geologist in the petroleum industry. From 1978 through 1991 he worked on a variety of areas in the United States from Houston, Dallas, and Oklahoma City for Mobil Oil and Union Texas Petroleum. In 1991 he moved overseas, working in Karachi Pakistan for four years and Jakarta Indonesia for the following four. He returned with his family to the U.S. in 1999 with Arco (the successor to Union Texas) where, until Arco's sale to BP, he worked on the offshore Philippines from Plano, Texas. He now enjoys a more settled life in Norman, Oklahoma with his wife and two children. Dan is a history buff, amateur astronomer, and violinist in the OU Civic Symphony.

Since joining the Staff of the Oklahoma Geological Survey in 2001, Dan has been involved in updating the Oil and Gas Map of Oklahoma in 2002 and preparing and presenting several published reports on the history, status, and future outlook of the oil and gas industry in Oklahoma. He chaired the 2002 Symposium on Cherokee Reservoirs in the Southern Midcontinent and edited the attendant publication, OGS Circular 108. Dan also prepared and presented his report on the Morrow-Springer gas in Oklahoma for the 2005 Springer Gas Play Symposium. Dan recently prepared and presented, with others, the study on the Booch gas play in southeastern Oklahoma and the subsequent OGS Special Publication 2005-1.

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