



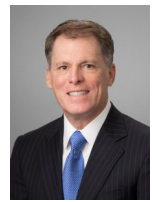
# Weekly E&P Update

October 3, 2023

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## Water Usage in Hydraulic Fracturing

By Steve Hendrickson  
President of Ralph E. Davis Associates



A [recent article](#) in the New York Times draws attention to the amount of water used in hydraulic fracturing. Although the report was accurate concerning certain aspects, it omitted important context that led readers to erroneous conclusions. First, let's look at the facts regarding the volume of water used in fracturing.

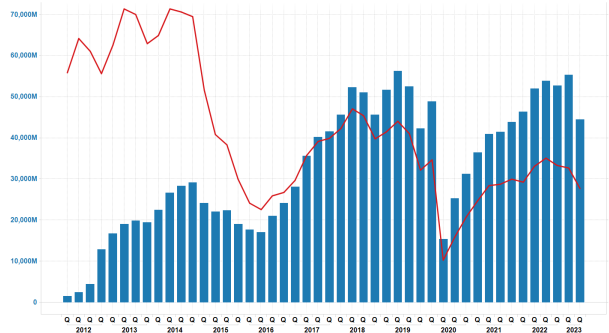
The article relied on [FracFocus](#) data to estimate the water used. FracFocus is a data registry managed by the Ground Water Protection Council (GWPC). The authors correctly noted that well operators make data submissions voluntarily, so not all wells are included. Nevertheless, it accounts for a very high percentage of wells that are fracked. Also, GWPC does not error-check the data or provide a consistent naming format, so it can be quite messy to analyze.

I downloaded the latest data from FracFocus (over 6 million records) and was able to validate NYT's claim that the amount of water used in the average frac job has increased from approximately 2.5 million gallons in 2012 to about 16 million gallons today (about a six times increase). The article didn't describe what's driving the increase. Still, there are three primary reasons that the amount of water per well would go up: longer wellbores, closer cluster spacing, or more water per cluster (to generate longer fracs).

A review of horizontal wells drilled in the US since 2012 (per Enverus) indicates that the average well length has increased about 1.6 times. Although most wells don't report their cluster spacing, the limited data in Enverus and our anecdotal knowledge indicates that cluster spacing has gone from around 75-100 feet down to 40-50 feet, which would account for an approximate doubling of the amount of water needed. The rest of the per-job increase is likely due to larger individual fracs, especially as operators have been "up-spacing" to use fewer wells in each unit to maximize capital efficiency.

Interestingly, although the amount of water per job has increased, the total amount of water used is about what it was a few years ago because the number of new wells has declined significantly. Even so, fewer new completions have been sufficient to keep US oil and gas production at or near record levels. The graph shows the total gallons of water reported in blue and the number of frac jobs in red since 2012.

I mentioned earlier that the article also omitted important context. Although the amount of water used in hydraulic fracturing sounds like a lot, it is a tiny fraction of what is used for other purposes. The IPAA [published a paper](#) in response to the NYT article that provides much greater detail. Here are a few key quotes from their response -



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(Source: FracFocus)

- "Fracking uses roughly 0.1 percent of the total water consumed in the United States annually – and that hasn't changed in more than a decade despite increased production and longer laterals."
- "Innovations in recycling and reuse have greatly reduced the amount of freshwater used in fracking."
- "Fracking has enabled environmental progress in the United States"

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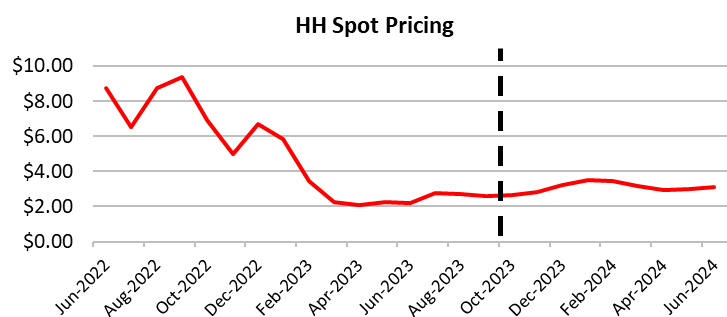
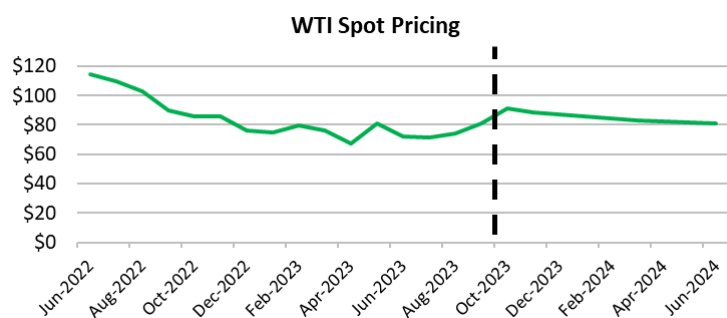
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## NYMEX FUTURE PRICING



## MONDAY'S MARKET CLOSE

### **NYMEX WTI CRUDE OIL FUTURES as of October 2, 2023 Close (\$/bbl)**

Period	Current	WoW Change	Last Week	1 Yr Ago
2023	\$88.00	(\$0.94)	\$88.93	\$73.06
2024	\$80.81	(\$0.80)	\$81.60	\$67.08
2025	\$75.01	(\$0.40)	\$75.40	\$63.57
2026	\$71.29	(\$0.05)	\$71.34	\$60.97
2027	\$68.42	\$0.30	\$68.12	\$58.80

### **NYMEX HH NATURAL GAS FUTURES as of October 2, 2023 Close (\$/MMBtu)**

Period	Current	WoW Change	Last Week	1 Yr Ago
2023	\$3.04	\$0.08	\$2.96	\$5.44
2024	\$3.34	(\$0.06)	\$3.40	\$4.74
2025	\$3.93	(\$0.03)	\$3.96	\$4.58
2026	\$4.02	\$0.01	\$4.01	\$4.45
2027	\$3.96	(\$0.02)	\$3.98	\$4.32

## INDUSTRY METRICS—QUICK SNAPSHOT

	<b>Current</b>	<b>Last Week</b>	<b>WoW Change</b>	<b>%Change</b>
Crude Oil Near-Month Price (\$/bbl)	\$90.82	\$90.55	\$0.27	0.3%
Natural Gas Near-Month Price (\$/MMBtu)	\$2.96	\$2.66	\$0.30	11%
Weekly Upstream-Deal Transaction Value (\$MM)	\$61.00	\$32.00	\$29.00	91%
Weekly Number of Upstream-Deal Transactions	1	3	(2)	(67%)
Current Total US Rig Count	623	630	(7)	(1%)
US Field Crude Oil Production (MMbbl/day)	12.9	12.9	0	-
US Field Dry Natural Gas Production (Bcf/day)	106.1	105.8	0.3	0.3%
Commercial Crude Oil Stocks-Excluding SPR (MMbbl)	416	418	(2)	(0.5%)
Natural Gas Stocks-Working Gas Underground Storage (Bcf)	3,359	3,269	90	3%
Total Drilled But Uncompleted Wells (DUC-Last Month)	4,749	4,749	0	-

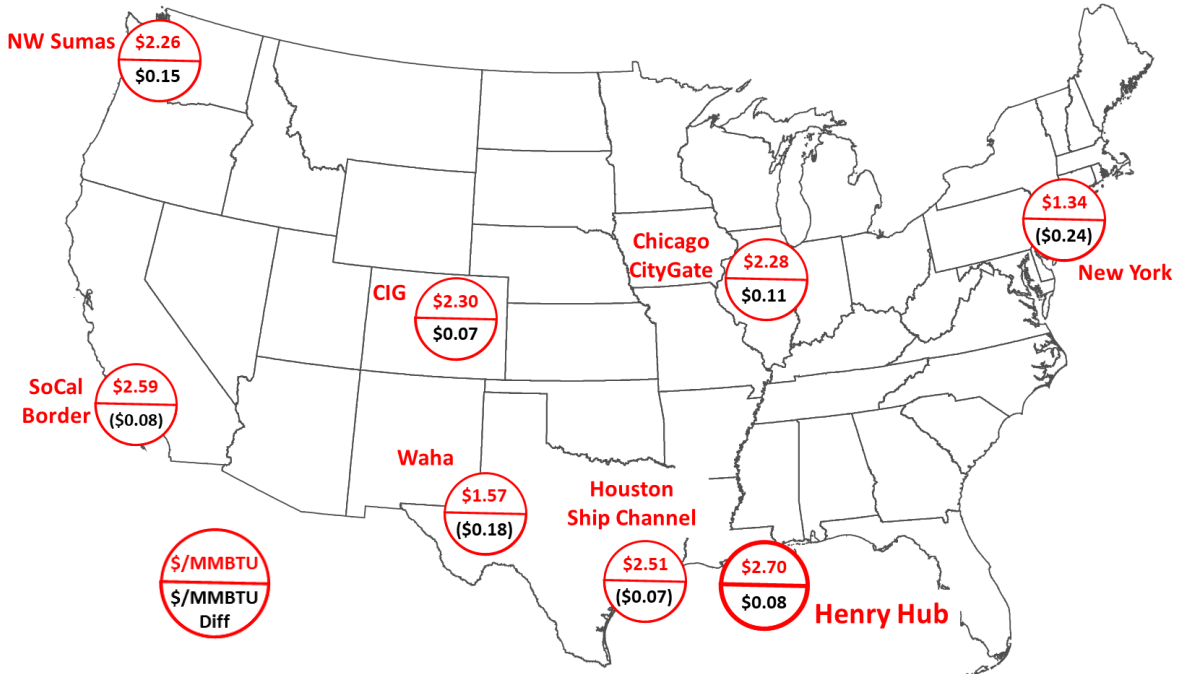
\*Source—Energy Information Administration, United States (EIA)

\*Source—Baker Hughes North America Rotary Rig Count & PLS M&A Database

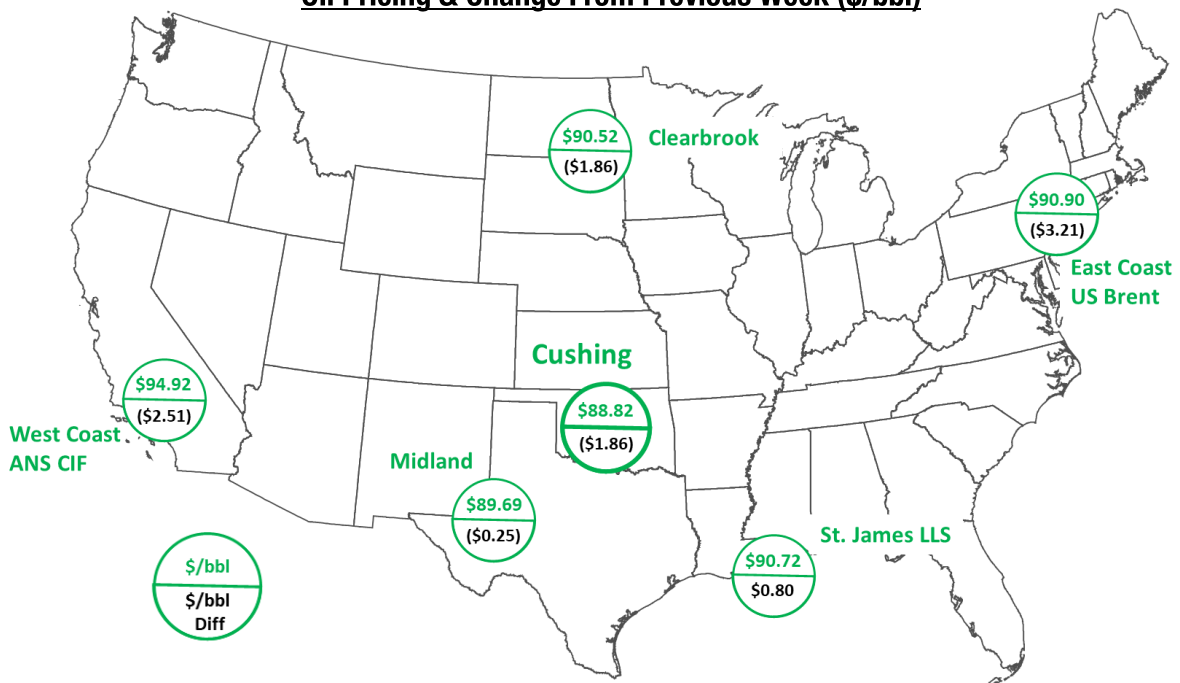


**US COMMODITY PRICES CONTINUED**

**Natural Gas Pricing & Change From Previous Week (\$/MMBtu)**



**Oil Pricing & Change From Previous Week (\$/bbl)**



\*Source—Bloomberg LP





## **SELECTED INDUSTRY HEADLINES**

### **US Plans Sharp Reduction in Offshore Oil and Gas Auctions**

The Biden administration recently unveiled a plan to phase down oil and gas auctions in federal waters with the release of a long-awaited leasing schedule that includes a maximum of three sales in the Gulf of Mexico through 2029.

### **US Interior Department Plans Three Offshore Oil, Gas Lease Sales Over Next Five Years**

The US Interior Department recently issued its long-awaited five-year offshore oil and gas leasing plan, which contemplates only three auctions, to the chagrin of the oil industry.

### **Oil Prices Fall 2% to 3-Week Low on Strong US dollar, Profit Taking**

Oil prices fell about 2% recently to a three-week low as a higher-priced Brent contract expired, the U.S. dollar strengthened and traders took profits, concerned about forecasts of rising crude supplies and pressure on demand from high interest rates.

### **Oil Prices Near \$100 per Barrel Raise Questions Over Demand Destruction**

Supply cuts from heavyweight crude producers have helped drive oil prices near \$100 per barrel — fueling some to consider the potential for future demand destruction.

### **Oil Mixed Amid Macroeconomic Concerns But Set to End Quarter up 30%**

Oil prices were mixed recently in a volatile trading session due to macroeconomic concerns and profit taking, but were set to rise about 30% in the quarter as OPEC+ production cuts squeezed global supply.

### **Oil, Gas Drilling Dips To February 2022 Low As Oil Prices Hover Near 2023 Highs**

The total number of active drilling rigs in the United States fell by 7 recently, after falling 11 last week to a low not seen since February 2022, according to new data from Baker Hughes published Friday.

### **Natural Gas Futures Continue to Climb as Market Prepares to Digest Potentially Plump EIA Print**

Riding positive momentum from the previous session, natural gas futures continued to advance recently as traders shrugged off a potential increase in the Lower 48 storage surplus from the latest government inventory data.

### **Appalachian Gas Production Sinks as In-Basin Prices Dip Below \$1**

Natural gas production in the Appalachian Basin is coming under pressure as waning autumn demand in the Northeast pushes prices there to their lowest since last November.

### **Fusion Experiments Shatter Previous Energy Records**

The National Ignition Facility (NIF) at the Lawrence Livermore National Laboratory achieved a groundbreaking ignition, producing more energy than what was put in, and later replicated this achievement.

### **Shale Poised for Big Role in Long-term LNG Demand**

A global LNG supply gap will begin to open up in the 2030s, according to a McKinsey & Co. analysis but the U.S. might lose its competitive edge if red tape, particularly around pipeline permitting, isn't addressed.

### **Texas Regulator Opposes Biden's Plan for Offshore Wind Farms in Gulf of Mexico**

Railroad Commissioner Wayne Christian sent a letter to Texas Governor Greg Abbott and Land Commissioner Dawn Buckingham voicing his opposition to the installation of offshore wind farms in the Gulf of Mexico.

### **No Energy Transition Unless Tech Can Make It Cost Competitive: BlackRock**

There will be no energy transition unless we can find new technologies that bring down the cost of renewables, BlackRock CEO Larry Fink told Bloomberg's Dani Burger recently



## **SELECTED RECENT TRANSACTIONS**

### **1979 Royalties, LP Announces Northern Midland Basin Minerals & Royalty Acquisition From Peacemaker Royalties**

1979 Royalties, LP a subsidiary of Endeavor Energy Resources, announced it has closed the acquisition of oil & gas mineral and royalty interests from Peacemaker Royalties, a portfolio company of EnCap Investments, in the Midland Basin for \$61 million in cash.

### **W&T Offshore Acquires Eight Oil, Gas Producing Assets in Gulf of Mexico**

W&T Offshore, Inc. has completed the acquisition of working interests in eight shallow water oil and gas producing assets in the central and eastern shelf region of the Gulf of Mexico from an undisclosed private seller.

### **Santos to Divest Half of Working Interest in 148 Leases at Alaska North Slope**

Australian oil and gas major Santos said recently it would divest half of its working interest in 148 exploration leases in the Langiappe area on the Alaska North Slope in a farm-down agreement with two U.S.-based companies.

### **Momentum Minerals Operating II, LP Closes Permian Basin Mineral and Royalty Acquisition**

Momentum Minerals has closed the acquisition of a Permian Basin mineral and royalty package from Post Oak Crown Minerals, LLC and Post Oak Legacy Assets I, LLC, both of which are affiliates of Post Oak Energy Capital, LP

### **Vital Energy acquires Permian Basin Assets from Henry, Maple and Tall City**

Vital Energy has signed agreements valued at about \$1.17 billion to expand its acreage in the Permian Basin, where dealmaking is gathering pace as drillers tap the largest U.S. oil patch to quickly replenish their depleting reserves.

### **Magnolia Oil & Gas Announces Bolt-On Asset Acquisition in Giddings**

Magnolia Oil & Gas Corporation announced recently that the Company has entered into a definitive purchase agreement to acquire certain oil and gas producing properties including leasehold and mineral interests in Giddings for \$300 million, subject to customary purchase price adjustments.

### **Viper Energy Partners LP, A Subsidiary Of Diamondback Energy, Inc., Announces Acquisition**

Viper Energy Partners LP, recently announced it has entered into a definitive purchase and sale agreement to acquire certain mineral and royalty interests from affiliates of Warwick Capital Partners and GRP Energy Capital in exchange for approximately 9.02 million Viper common units and \$750 million of cash, subject to customary adjustments.

### **Phoenix Capital Group Purchases Assets in North Dakota**

Phoenix Capital Group, a leading oil and gas mineral rights acquisition company, has announced the purchase of roughly 2,530 net acres of land in Mountrail County, North Dakota valued at roughly \$9 million.

### **Crescent Energy to Acquire Additional Interests in its Operated Western Eagle Ford Position**

Crescent Energy Company recently announced that it has entered into a definitive purchase agreement to acquire incremental working interest in its operated Western Eagle Ford assets for total consideration of \$250 million in cash, subject to customary purchase price adjustments.

### **Dorchester Minerals, L.P. Completes Acquisition of Mineral and Royalty Interests**

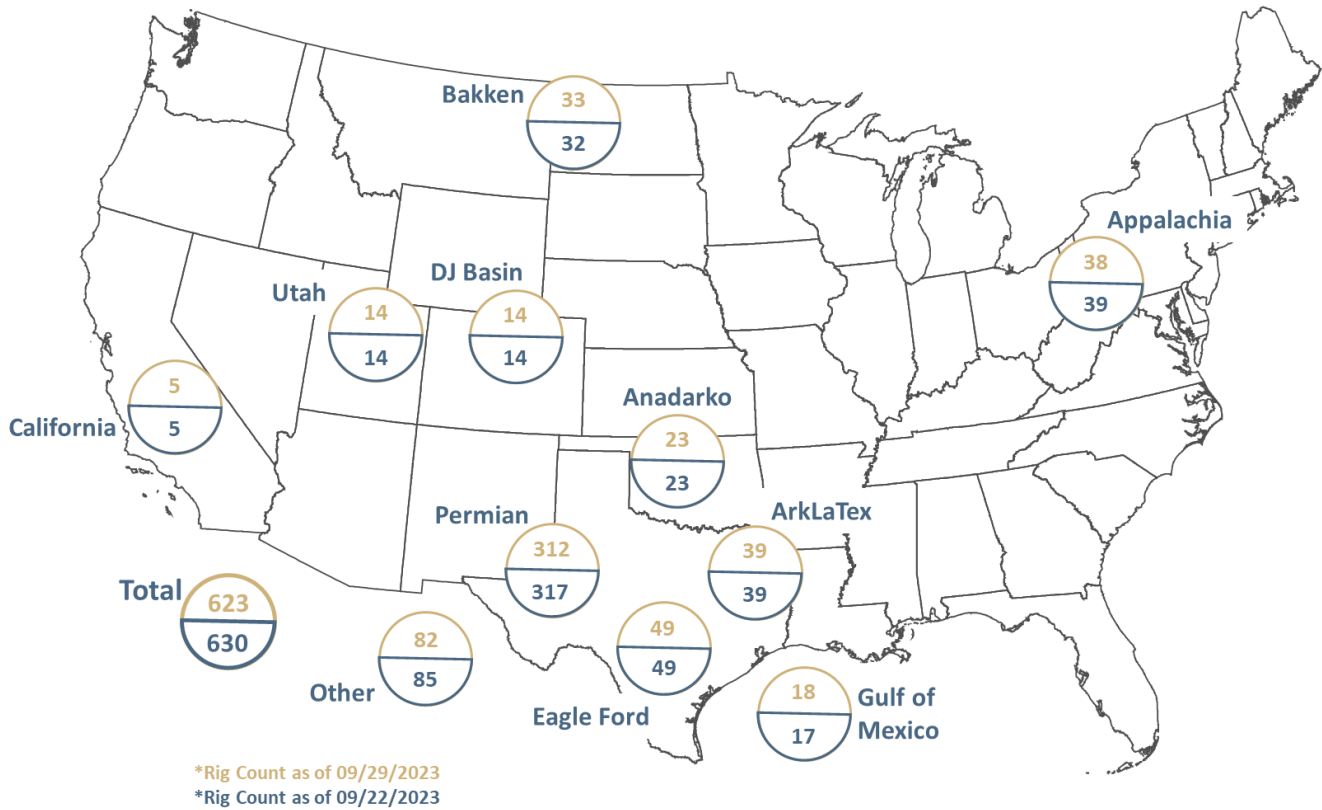
Dorchester Minerals, L.P. announced that it has completed an acquisition of mineral and royalty interests totaling approximately 3,355 gross acres and 568 net royalty acres located in three counties in Texas.

### **Permian Resources To Buy Earthstone In \$4.5 bln Deal**

Permian Resources said it would buy Earthstone Energy in an all-stock transaction valued at about \$4.5 billion, including debt, boosting the shale producer's presence in the Delaware Basin.



## RIG ACTIVITY BY US REGION

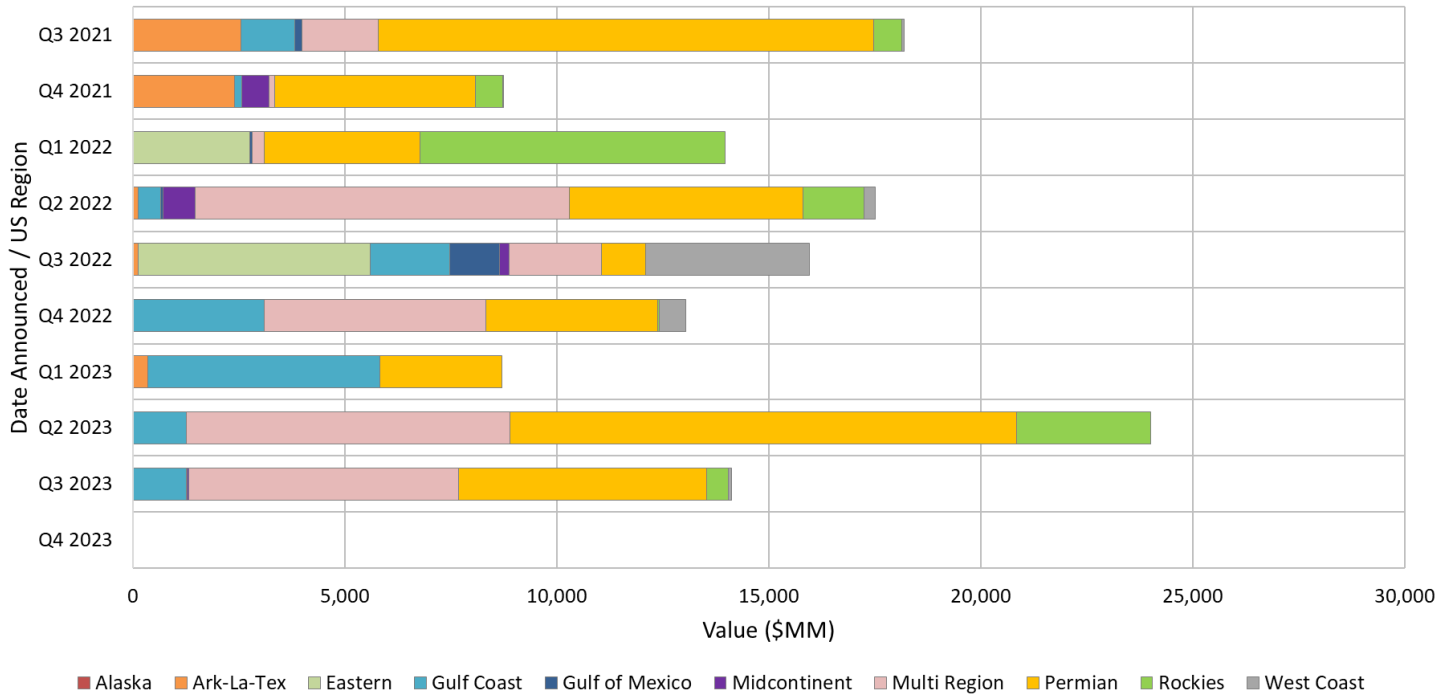


	Week Ending 09/29/2023			Week Ending 09/22/2023		Week Ending 09/30/2022
U.S. Rig Breakouts	Count	+/-	Count	+/-	Count	
Oil	502	(5)	507	(102)	604	
Gas	116	(2)	118	(43)	159	
Not Specified	5	0	5	3	2	
Directional	55	(1)	56	9	46	
Horizontal	553	(5)	558	(143)	696	
Vertical	15	(1)	16	(8)	23	
Land (Inc Others)	600	(8)	608	(145)	745	
Inland Waters	3	0	3	(1)	4	
Offshore	20	1	19	4	16	
<b>US Total</b>	<b>623</b>	<b>(7)</b>	<b>630</b>	<b>(142)</b>	<b>765</b>	

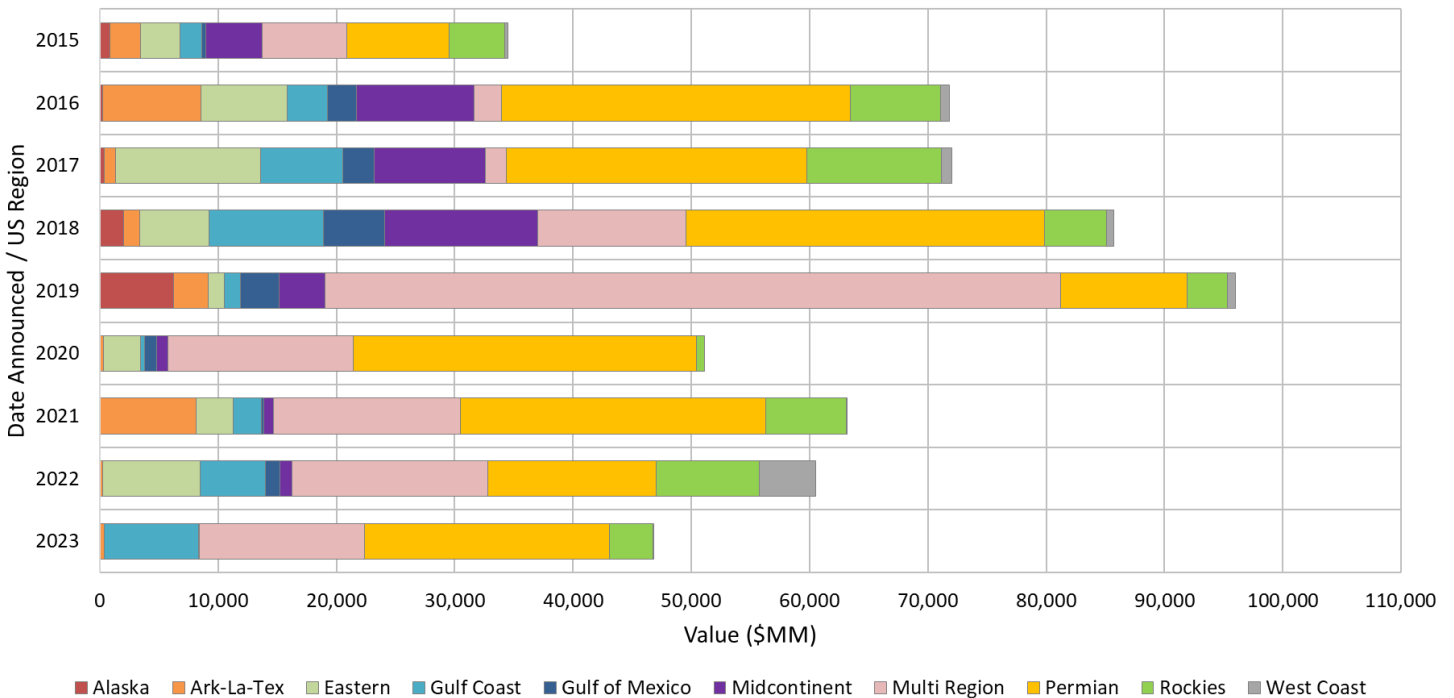
\*Source—Baker Hughes Weekly Rig Counts



## DEAL VALUE BY US REGION (BY QUARTER)



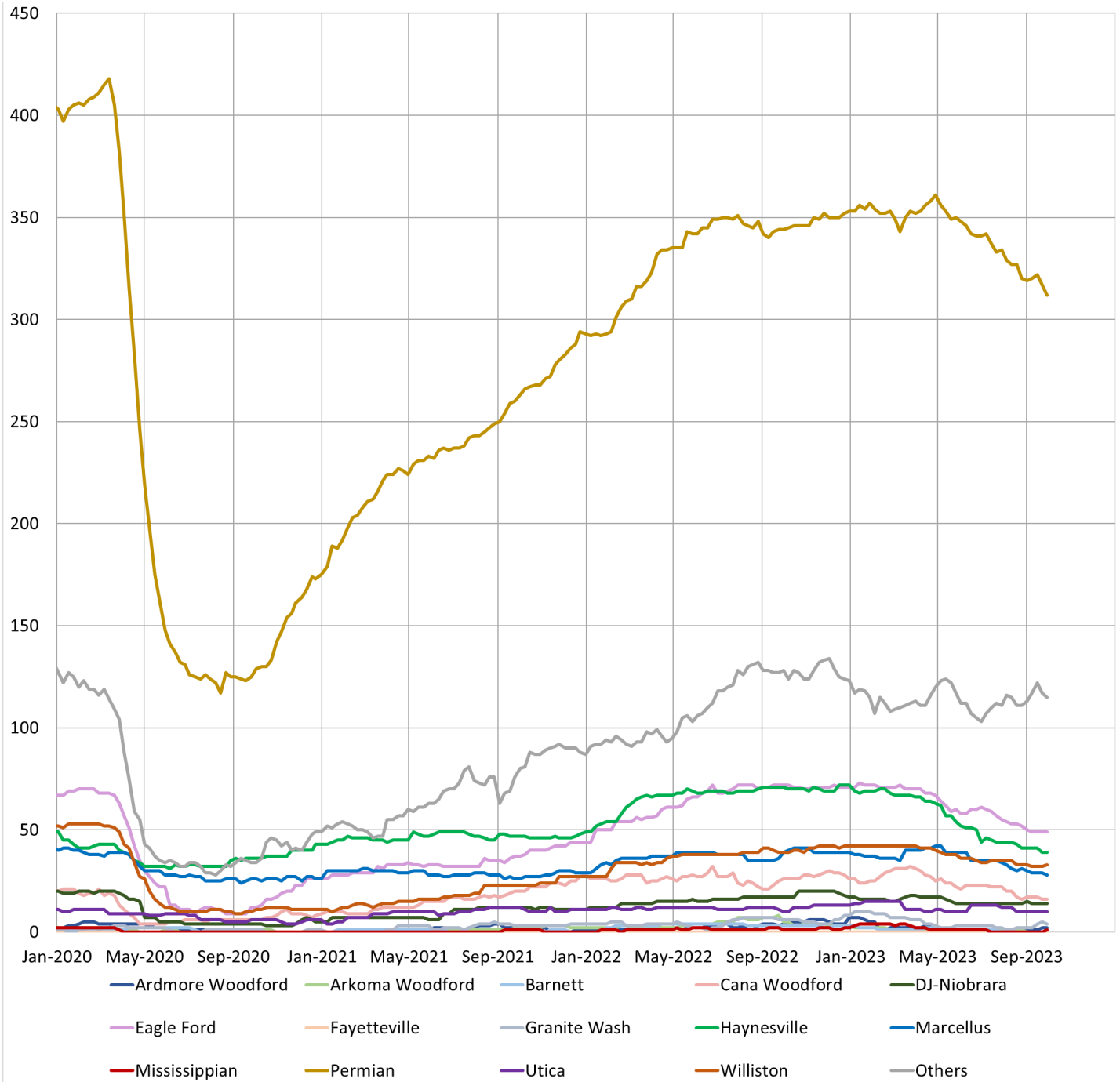
## DEAL VALUE BY US REGION (BY YEAR)



\*Source—PLS M&A Database (Charts exclude terminated deals)



## RIG ACTIVITY BY US REGION

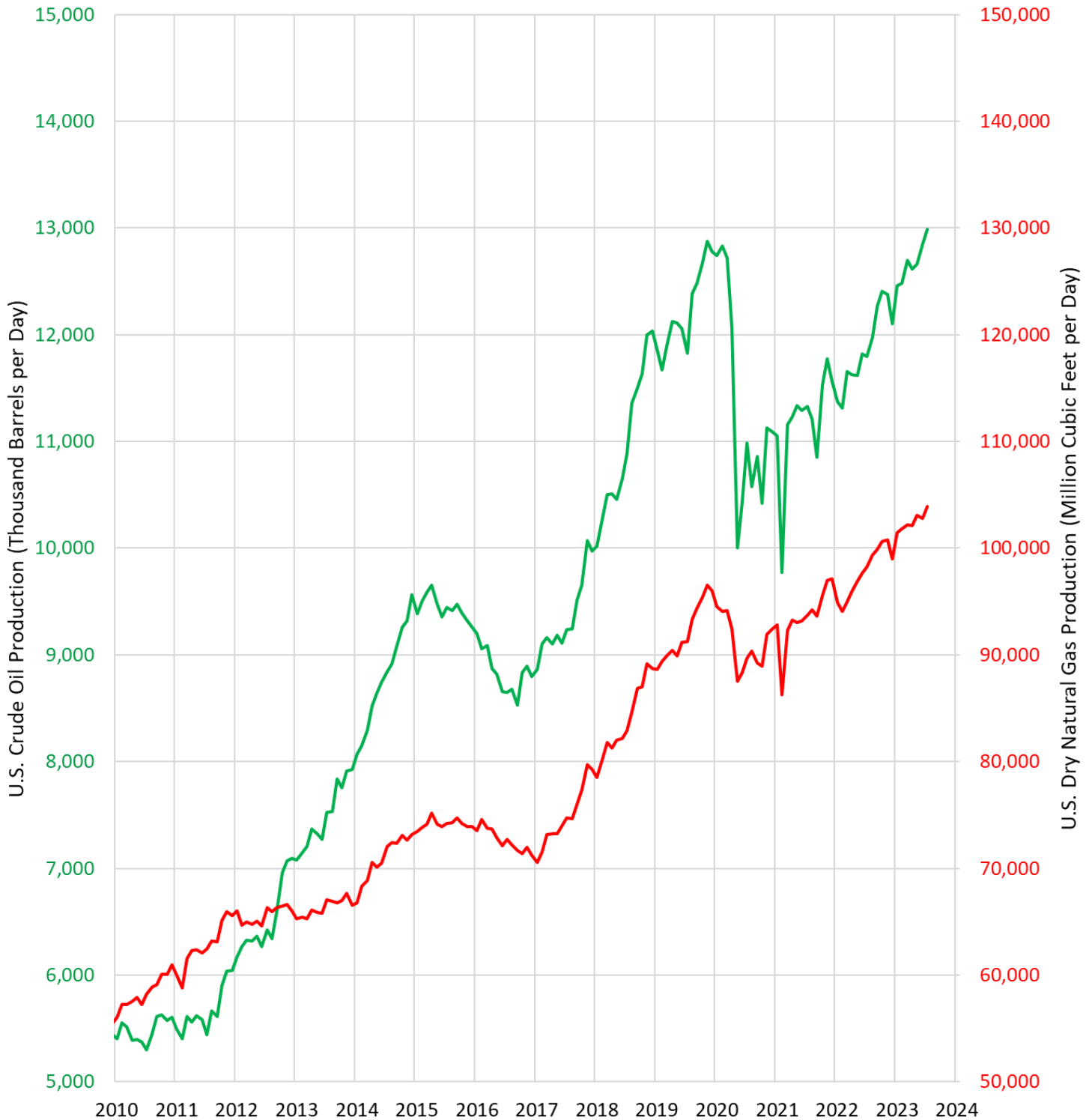


\*Source—Baker Hughes Weekly Rig Counts





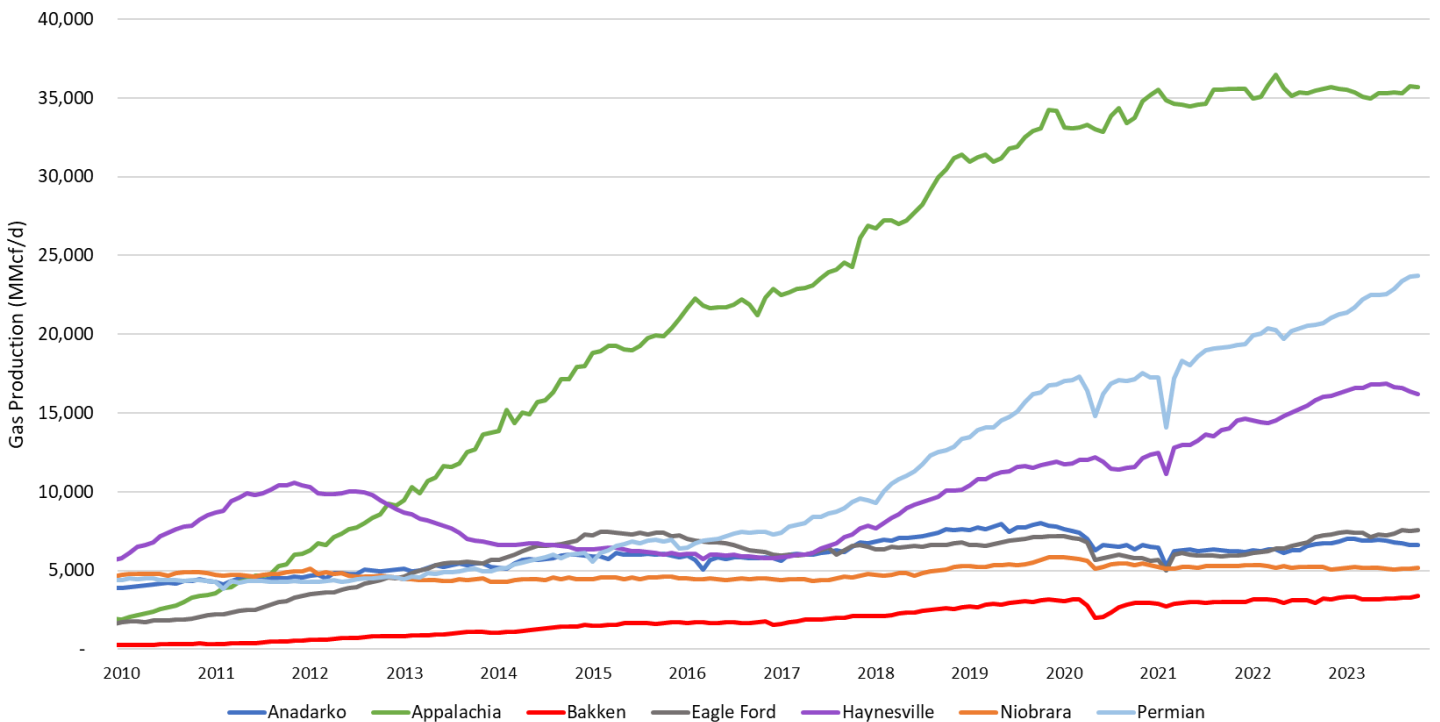
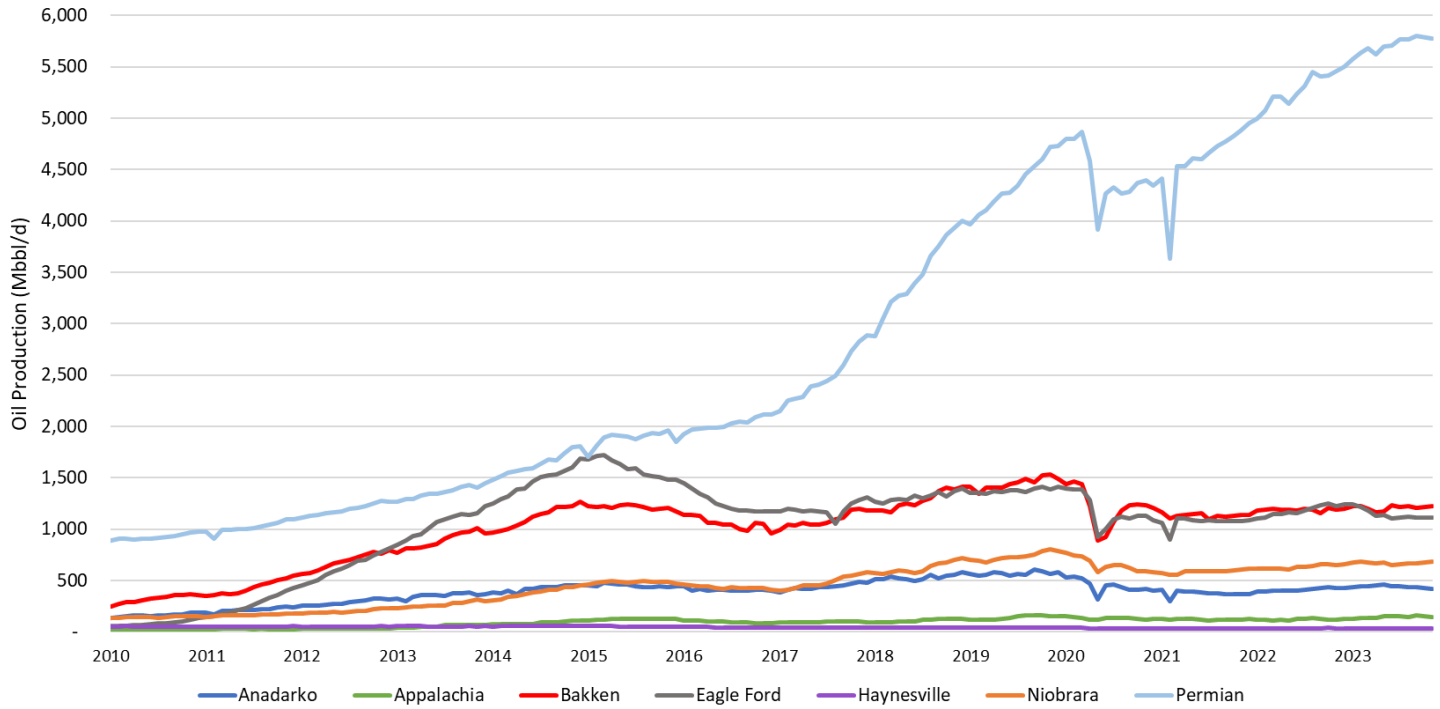
**US DAILY CRUDE (MMbbl) & DRY NATURAL GAS PRODUCTION (MMcf)**



\*Source—Energy Information Administration, United States (EIA)



## HISTORICAL PRODUCTION OF SELECTED US SHALE REGIONS



\*Source—Energy Information Administration, United States (EIA)



## **UPCOMING EVENTS**

### **October 2023**

<a href="#"><u>Hart Energy—A&amp;D Strategies and Opportunities Conference</u></a>	October 3	Dallas, TX
<a href="#"><u>Qnect On Demand</u></a>	October 5	Houston, TX
<a href="#"><u>37th Annual CITGO - MDA Corporate Golf Challenge</u></a>	October 8-9	Houston, TX
<a href="#"><u>2023 National Conference of Bankruptcy Judges (NCBJ)</u></a>	October 11-14	Austin, TX
<a href="#"><u>Tulsa Octoberfest</u></a>	October 19-22	Tulsa, OK
<a href="#"><u>Small Steps Golf Classic</u></a>	October 30	Houston, TX
<a href="#"><u>Digital Wildcatters—FUZE</u></a>	October 30-31	Houston, TX

### **November 2023**

<a href="#"><u>IPAA Annual Meeting</u></a>	November 6-8	San Antonio, TX
<a href="#"><u>AICPA Oil &amp; Gas Conference</u></a>	November 8-10	Las Vegas, NV
<a href="#"><u>Accounting and Financial Reporting Conference</u></a>	November 16	Tulsa, OK
<a href="#"><u>OSU Oil and Gas Accounting Conference</u></a>	November 17	Tulsa, OK
<a href="#"><u>Boys &amp; Girls Club 8th Annual Sporting Clays Tournament</u></a>	November 17	Houston, TX
<a href="#"><u>IPAA Texas Hold'Em Tournament</u></a>	November 30	Houston, TX

\*Denotes an Opportune Sponsored Event



## **ABOUT RALPH E. DAVIS ASSOCIATES**

Ralph E. Davis Associates LLC (RED) is an industry-leading petroleum engineering and geosciences firm committed to satisfying the individual needs of clients. We accomplish this by holding ourselves to the highest standards of integrity and professionalism to deliver honest, direct and actionable insights to help clients achieve their strategic objectives. We distinguish ourselves by combining reservoir engineering, geoscience evaluation techniques and advanced data analytics with economic analyses to provide our clients with individual, customized solutions.

Banks, bondholders, private equity firms, financial institutions and law firms around the world trust in RED's diverse services and unrivaled upstream oil and gas expertise to deliver comprehensive solutions that help clients make informed decisions. We add value to every engagement by employing a team approach, leveraging Opportune LLP's experienced bench of experts in transactional due diligence, tax advisory, investment banking, restructuring and valuation.

We offer technical and economic analyses to deliver our clients a complete, independent, accurate and detailed assessment of the value of their assets. We apply a robust set of technical capabilities to assist our clients. Our capabilities include:

- Reservoir engineering and geosciences
- Economic forecasting and reporting
- Data analytics and geospatial analysis

## **KEY CONTACTS**



Steve Hendrickson is the President of Ralph E. Davis Associates, an Opportune LLP company. Steve has over 35 years of professional leadership experience in the energy industry with a proven track record of adding value through acquisitions, development and operations. Steve is a licensed professional engineer in the state of Texas, and holds an M.S. in Finance from the University of Houston and a B.S. in Chemical Engineering from The University of Texas at Austin. He recently served as a board member of the Society of Petroleum Evaluation Engineers (SPEE) and is a registered FINRA representative.



John Beaird is Vice President of Ralph E. Davis Associates, an Opportune LLP company. John has 39 years of oil and gas management, reservoir engineering, and petroleum economics evaluation experience. Recent relevant experience includes the Permian, Western Gulf, Tx-La-Miss Salt, Mid-Continent, Denver-Julesburg, Wind River, Williston Basin, and Appalachian Basins. John is a registered Petroleum Engineer in the State of Texas and holds a B.S. in Petroleum Engineering from Louisiana Tech University. He is also an active member of the Society of Petroleum Evaluation Engineers (SPEE).



Yvonne Trujillo is a Senior Petroleum Engineer at Ralph E. Davis Associates, an Opportune LLP company. Yvonne has over 25 years experience in the oil and gas industry with extensive expertise in reserves engineering, SEC and PRMS/SPE reporting and economics and asset evaluation in conventional and unconventional reservoirs in the U.S. Lower 48. Yvonne earned a B.S. in Mechanical Engineering at Simon Bolivar University in Caracas, Venezuela and an M.S. in Petroleum Engineering at the University of Houston.



David Edwards is a Petroleum Engineer at Ralph E. Davis Associates, an Opportune LLP company. David has over three years of reserves engineering experience in conventional and unconventional reservoirs. Before RED, David was a Petroleum Engineer at a lower middle market A&D advisory firm where he handled the technical processes for marketed assets. He began his career with an operator in Dallas, where he contributed to its engineering, operations, and A&D teams. David holds an M.B.A. from The University of Texas Permian Basin and a B.S. in Petroleum Engineering from The University of Oklahoma.

