



Oil Boom in Eagle Ford Shale Brings New Wealth to South Texas

By Robert W. Gilmer, Raúl Hernandez and Keith R. Phillips

The oil boom's impact on jobs, income and spending in the region has been profound.

Oil and natural gas activity is booming again in South Texas. The 2008 discovery of the Eagle Ford Shale play has breathed new life into industry in the region, where many mature and declining fields have operated for more than 40 years. Perhaps the largest discovery of new oil reserves in the United States since Prudhoe Bay, Alaska, in 1968, the Eagle Ford Shale extends over 23 South Texas counties (see map).¹

Its southern edge begins near Laredo and trends northeast toward Austin, producing large quantities of natural gas. The northern edge—the formation is about 50 miles wide—follows a similar trend but produces oil. A central zone is rich in condensates, also called natural gas liquids, valuable to the refining and petrochemical industry on the Texas Gulf Coast.

The race to exploit these new South Texas reserves began in late 2008 and is primarily

the result of recent advances that unlocked the secret of extracting natural gas and oil from shale. This new technology—along with favorable prices, existing infrastructure and ready access to the Gulf Coast refining and petrochemical complex—created the Eagle Ford Shale boom. Rapid oilfield development has brought new jobs, rising income and growing wealth to this historically low-wage, low-income area.

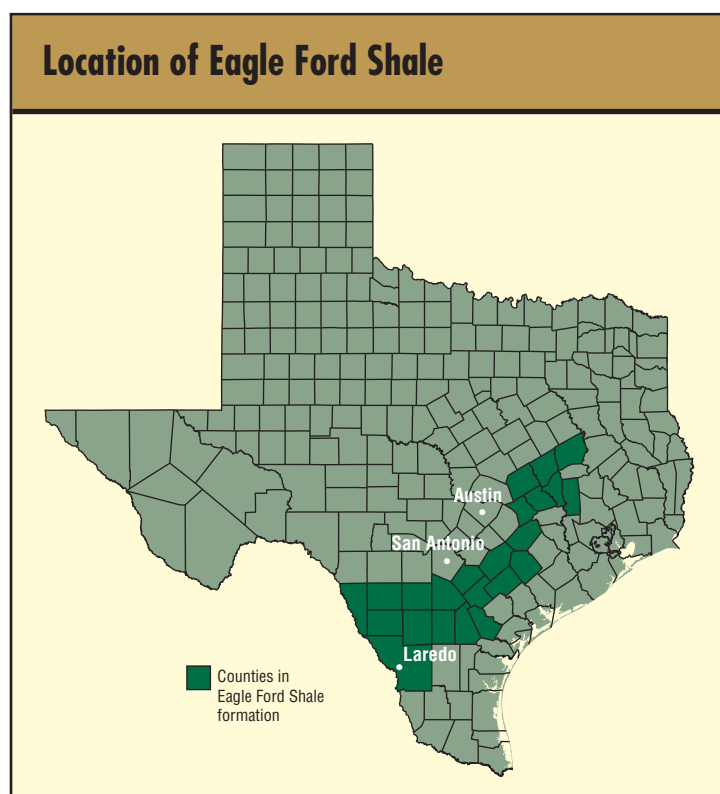
The Eagle Ford's scale and speed of development proved so robust that they quickly overwhelmed previous efforts to comprehensively measure the economic impact.² Recent data suggest that the oil boom's impact on jobs, income and spending in the region has been profound.³

Big Trends Speed Development

Behind the Eagle Ford's emergence lies the convergence of important trends—new technology, a new era of plentiful and inexpensive natural gas and a global economic expansion that pushed the price of oil past \$100 per barrel. Eagle Ford's development, beginning in late 2008, was interrupted by the recession and a sharp decline in energy prices. It was back on track by 2010, growing at a rapid pace.

The number of drilling permits issued annually in Eagle Ford counties for new oil and natural gas wells since 2007 (when 1,254 permits were issued) is shown in Chart 1. By 2011, the number of permits issued had more than doubled, with oil-directed permits accounting for 52 percent of the total, up from 20 percent four years earlier. Since 2007, Eagle Ford counties have increased production of natural gas by 24 percent, oil by 80 percent and condensate by 541 percent.⁴

Eagle Ford offers a choice of well-defined zones producing dry gas, oil and natural gas liquids.⁵ Initial large-scale commercial production was of natural gas, following the pattern set in the 1990s in the Barnett Shale near Fort Worth. The first commercial application of horizontal drilling and hydraulic fracturing to shale occurred in the Barnett, where



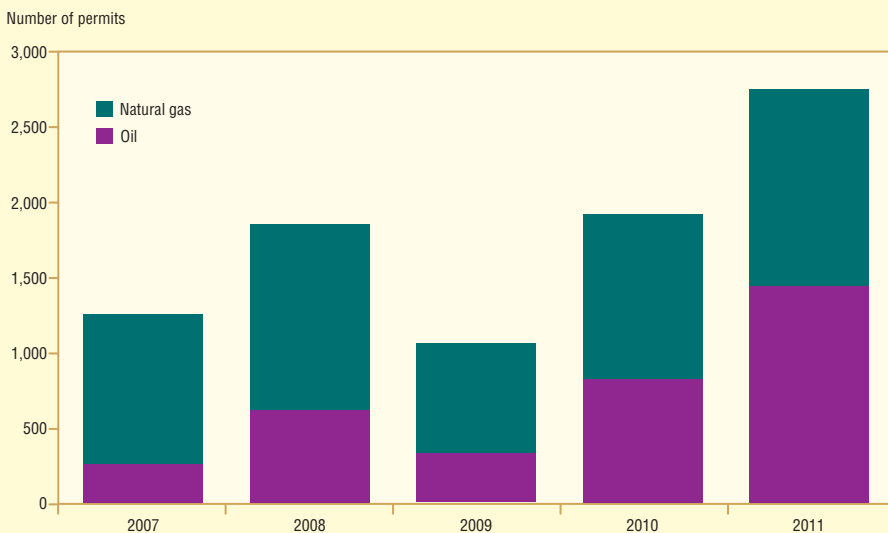
annual natural gas production grew from experimental levels in 2000 to nearly 2 trillion cubic feet by 2011. Commercial production quickly spread to other rich shale plays—the Haynesville on the Texas–Louisiana border and the Marcellus in New York, Pennsylvania and West Virginia. The first Eagle Ford well, drilled in La Salle County in 2008, flowed 7.6 million cubic feet of natural gas per day, among the highest initial flow rates in the region and equivalent to about 1,300 barrels of oil.

In little more than a decade, shale gas development has provided a new and optimistic picture of future U.S. natural gas supplies. The amount of natural gas sent to market peaked previously in 1973; recent shale gas production led sales to new record levels by 2011. Reserves of natural gas are also approaching a new record. If natural gas prices average about \$6 per thousand cubic feet, production is likely to be sustained for many years. While \$6 per thousand cubic feet is a relatively low price, representing the energy equivalent of \$35 per barrel of oil, it is still significantly higher than recent gas prices.

When domestic drilling collapsed in 2008–09 with the economic crisis, the rig count fell more than 50 percent. Drilling has since returned to precrisis levels, but the mix of rigs has changed. One important factor reshaping the environment was a powerful incentive to shift drilling from natural gas to oil or condensate. Condensate is a mix of hydrocarbons that turn into liquids from natural gas as the gas exits the well and pressure falls. Some of these liquids follow the price of natural gas (such as ethane), and others the price of oil (such as propane). From 2007 to 2011, condensate averaged \$48.30 per barrel, oil \$81.56 per barrel and natural gas the equivalent of \$30.53 per barrel. In first quarter 2012, condensate was \$55.17, oil \$102.88 and natural gas \$3.95 per thousand cubic feet, or the equivalent of \$22.91 per barrel.⁶

While the price of natural gas declined steadily after 2008, oil markets took a different path. Rising oil prices are attributed to a variety of causes, including low interest rates and a weaker dollar, but the primary factor is the growth of emerging markets such as Brazil, China and India. As these developing nations quickly snapped back from global recession, oil demand increased and prices returned to high levels, while natural gas—a domestic product—languished at low levels. Eagle Ford Shale producers quickly and easily moved from natural gas to more valuable oil or condensate. From late February 2010 to late

Chart 1
Oil and Natural Gas Drilling Permits Climb in Eagle Ford Counties



NOTE: These are new-well permits net of cancellations, withdrawals and repair.
SOURCE: Texas Railroad Commission.

February 2012—as the Eagle Ford rig count grew to 225 from 42—the number of rigs targeting oil or natural gas liquids increased to 175 from six.

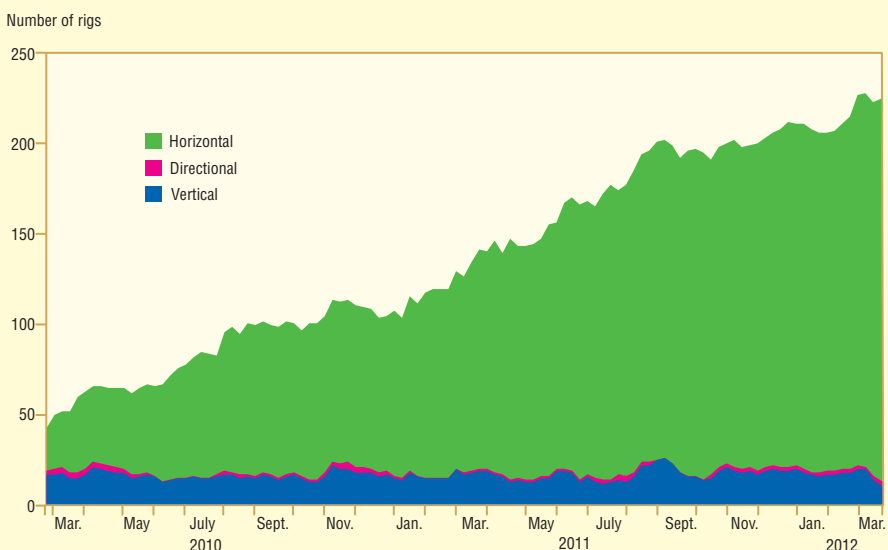
The application of horizontal drilling and hydraulic fracturing for production of oil and natural gas liquids (such as ethane, butane and propane) also altered the character of the rig count. Oil's high price helped spur this transfer of technology from shale gas to

liquids from shale. Of the 225 rigs working in Eagle Ford counties in late March 2012, 213 were drilling horizontally (*Chart 2*).

Effects of Oilfield Development

Oilfield development affects the Eagle Ford region's economy through several channels: lease payments, drilling, pipeline and other infrastructure construction, royalties and the purchase of local goods and services.

Chart 2
Horizontal Drilling Dominates in Eagle Ford Counties



NOTE: Data are weekly.
SOURCE: Baker Hughes.

Lease payments are made to reserve the mineral rights on a specific property, usually stated as a fixed amount per acre, giving the leasing company the right to test, explore or produce hydrocarbons. A University of Texas at San Antonio (UTSA) study completed in late 2010 assumed 4.6 million acres were leased in Eagle Ford counties at \$1,200 per acre.⁷ It seems likely that the lease rate has since increased because of the region's continuing success. There are reports of lease rates as high as \$20,000 per acre in the hottest-producing areas, but the average of 23 counties is difficult to estimate. Lease rates vary not just by location, but also by when they were signed.⁸ Conservatively estimating \$1,500 per acre and 5 million acres produces a remarkable \$7.5 billion in compensation since 2007.

Most studies assume that the bulk of these one-time payments—perhaps as much as 95 percent—is converted to savings and wealth. If only 5 percent is spent, however, it constitutes a \$375 million injection into the regional economy.⁹

Drilling Expenditures Rise

To estimate drilling expenditures, we assume that 90 percent of new drilling permits approved by the Texas Railroad Commission in the 23 counties result in active exploration.¹⁰ Expenditure per well is estimated at \$6.5 million for horizontal drilling, \$2.5 million for directional drilling and \$1.5 million for vertical drilling. These expenditures rise from \$1.8 billion in 2007 to \$14.6 billion in 2011 (*Chart 3*).

It is difficult to determine how much of the \$14.6 billion is local and how much is spent outside the region. Many project costs are incurred at company headquarters in Dallas, Houston or San Antonio—geology, geophysics, engineering, finance, personnel and accounting—and will have little effect on the South Texas economy. A number of sophisticated services will never be housed in the area, but expertise will be regularly imported from other Texas cities. Workers will visit the region and spend at local restaurants and hotels, but their employers won't likely relocate their payrolls to South Texas. Some spending leaving the region today could become locally established over time. Because these 23 counties produced oil and gas before the Eagle Ford boom, the solid base of oil service companies in the area will likely continue expanding.

Existing South Texas oil and gas pipelines, gathering systems, gas processing plants

and other infrastructure were quickly overcome by new Eagle Ford development. Oil and condensate are moved by truck and rail to market until infrastructure can catch up. Pipeline companies such as Enterprise Product Partners, Energy Transfer Partners, Kinder Morgan and NuStar are committing billions of dollars to gather and transport Eagle Ford production to the Gulf Coast. An updated, May 2012 UTSA study estimates total pipeline development and other hydrocarbon-related construction at \$775 million in 2011.

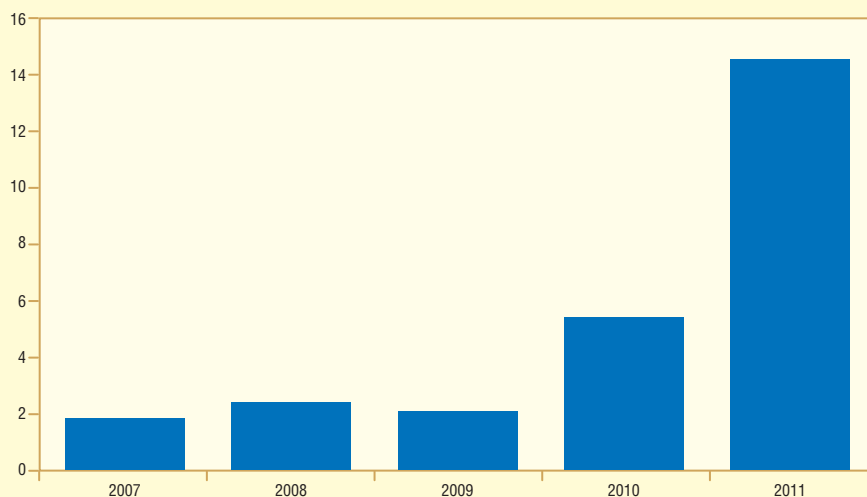
Once production is established on a lease, it remains in effect as long as the property produces oil and gas. The mineral rights owner is paid a royalty, or share (20–25 percent is common in Texas) of the value of the hydrocarbons produced. In our 23-county area—using Railroad Commission production records and applying market prices—oil, natural gas and condensate revenues grew from \$5.3 billion in 2007 to \$8.2 billion in 2011. Based on a 20 percent royalty, local payments increased by \$584 million in the 2007–11 period. This income can be unstable or unpredictable from year to year, and like lease payments, is often treated as an addition to wealth rather than an increase in income, with about 5 to 7 percent generating local spending.¹¹

Direct expenditures associated with drilling have a multiplier effect, as business-to-business or consumer-to-business spending continues through successive rounds. In addition to these indirect effects, rising

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Chart 3
Eagle Ford Estimated Drilling Expenditures Jump

Billions of dollars



SOURCES: Texas Railroad Commission; authors' calculations.

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local income can induce additional household spending. UTSA's Eagle Ford analysis found combined and induced output multipliers of 1.19, lower than the 1.3–1.5 typical of other studies.¹² Industries that stand out as the biggest winners from the combination of direct, indirect and induced spending are consistent across most studies—as well as in the Eagle Ford—and include oil exploration and services, construction, wholesale and retail trade, and real estate.

Impact on Jobs and Retail Sales

Since the Eagle Ford Shale discovery in 2008, drilling and exploration have had a strong positive economic impact in South Texas. Most of the 23 Eagle Ford counties are rural, with a history of cattle ranching, hunting and some traditional oil and gas drilling. For the five counties where the job growth rate has been the strongest—McMullen, Dimmit, La Salle, Live Oak and Lee—seasonally adjusted retail sales grew at an annual rate of 55.1 percent, or \$100.9 million, from first quarter 2010 to third quarter 2011. For the entire 23-county area, seasonally adjusted retail sales increased at a 15.4 percent annual rate, or \$580.7 million. During this period, comparable retail sales rose 7.2 percent in the U.S. and 6 percent in Texas.

This strong retail sales growth in the Eagle Ford counties has led to sharply increased state sales tax payments. For the 23 counties, retail sales tax revenue advanced at an annual rate of 9.3 percent, or by \$8

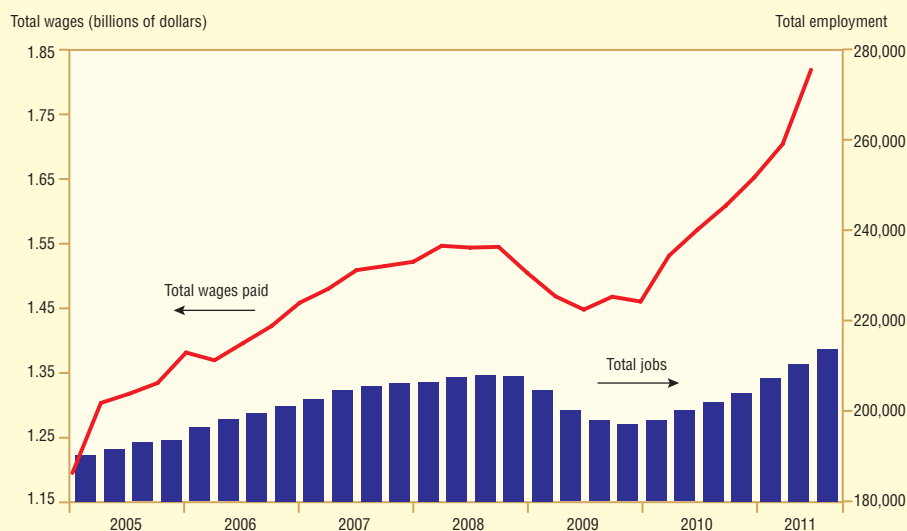
million, from first quarter 2010 to third quarter 2011. While these 23 primarily rural counties account for only 2.9 percent of Texas retail sales, they are responsible for about 5 percent of the increase in state sales tax revenue since early 2010.

Surging drilling activity has brought strong employment and wage growth to most of the counties in the Eagle Ford. Counties located above oil and condensate deposits, such as Dimmit, La Salle and McMullen, have experienced the greatest increase in employment and average weekly wages. Job growth was strong from 2005 to 2008, likely fueled by rising natural gas prices even before the Eagle Ford Shale play began (*Chart 4*).

Jobs in the region sank with the recession amid sharply dropping energy prices in 2009. From a low during first quarter 2010 to third quarter 2011, jobs grew at an annual rate of 5.9 percent, reaching 2.9 percent above the previous peak value. By comparison, during the same period, jobs statewide increased 2.4 percent and remained 0.01 percent below the previous high. Generally, Eagle Ford counties represent about 2 percent of all Texas jobs. Since the beginning of 2010, the 15,773 net new jobs account for 6.9 percent of the state's net gain during the period. While recent activity is impressive, more growth may lie ahead to meet demand. The scale of development has surpassed the capacity of local industry. Hotels, restaurants and gasoline stations are jammed with outside managers, crews and technicians. As the Eagle Ford matures and the local service industry expands, many outside workers may become local residents and employees.

Average weekly wages have grown markedly in most Eagle Ford counties. Weekly wages in Dimmit County increased the most from first quarter 2010 to third quarter 2011, at an annual rate of 35.8 percent, from \$555 to \$880. Live Oak County pay rose 25.5 percent, from \$585 to \$823, and in McMullen County, wages climbed 25.1 percent, from \$635 to \$890. Once again, counties located above natural gas liquids and oil deposits experienced more significant average weekly wage increases than other Eagle Ford counties. For the 23 counties, the average annualized growth rate in the weekly wage during this period was 14.6 percent. By comparison, average weekly wages rose 6.8 percent in Texas, from \$875 to \$966, and 6.3 percent in the U.S., from \$870 to \$953. Given the strong growth in employment and average weekly wages in the Eagle Ford, seasonally adjusted total

Chart 4
Employment and Total Wages Accelerate in Eagle Ford Counties



SOURCE: Bureau of Labor Statistics.

wages paid in its top five counties increased at an annual rate of 63.4 percent during this period, while the entire 23-county area saw a 25 percent increase.

Robust Growth to Continue

The data clearly indicate that the surge in Eagle Ford Shale drilling has already produced sharp gains in economic activity across the region. This is no surprise to those living and working in the area—news reports in recent months have noted housing shortages, frequent waits for tables at restaurants, traffic, road damage and grocery store shelves picked clean.

It is difficult to estimate how activity will change over the next several years. Sharply dropping natural gas prices in the past year have redirected drilling to areas with oil and condensates and away from dry gas regions. As long as oil prices stay above \$70 per barrel, drilling activity probably will remain strong; at less than \$70, drilling activity likely would begin falling off, industry contacts suggest. Energy prices are difficult to predict. However, the billions of dollars that large energy companies are committing to expand infrastructure for delivering hydrocarbons to the Texas Gulf Coast signal anticipation of strong production from this region for many years to come.

Gilmer is a senior economist and vice president at the Federal Reserve Bank of Dallas, Hernandez is an intern in the Bank's San Antonio Branch and Phillips is a senior economic policy advisor at the San Antonio Branch.

Notes

¹ Totals represent all new-well drilling permits originating in the 23-county region, net of cancellations, withdrawals and repair. The 23 counties were selected after consultation with the Texas Railroad Commission regarding the commission's currently published map. The commission considers the map a better guide to exploration activity than the current 24-county list published to describe Eagle Ford Shale. Additionally, the list has changed several times in the past, according to the commission. Most of the activity is concentrated in a handful of counties, and other studies of the region will remain broadly comparable.

² For example, a study of the Eagle Ford completed in late 2010 and published in early 2011 estimated that new Eagle Ford production in 2011 would amount to 8.7 million barrels of oil and 117 billion cubic feet of natural gas. The actual numbers for 2011 were 30 million barrels of oil and 243 billion cubic feet of natural gas. See "Economic Impact of the Eagle Ford Shale," Center for Community and Business Research, University of Texas at San Antonio Institute for Economic Development, February 2011. UTSA released an update to this study in May 2012. A similar example of studies that needed to be repeated

to catch up with very rapidly moving events can be seen in "The Pennsylvania Marcellus Natural Gas Industry: Status, Economic Impacts and Future Potential," by Timothy J. Considine, Robert Watson and Seth Blumsack, Pennsylvania State University, July 20, 2011, Table 2, p. 11.

³ There are many issues beyond the scope of this article, such as environmental impacts; implications for state and local finances; the spillover of local impacts onto San Antonio or Texas Gulf Coast cities, including Corpus Christi and Houston; and speculation on how far oil shale can move the U.S. toward energy self-sufficiency.

⁴ This includes natural gas production from gas wells or associated with oil wells.

⁵ For a current map of the Eagle Ford production zones, see www.eia.gov/oil_gas/rpd/shaleusa9.pdf on the U.S. Energy Information Administration website. For a map with shale drilling activity, see www.rrc.state.tx.us/eagleford/index.php on the Texas Railroad Commission website.

⁶ Recent wellhead prices for natural gas have fallen to near \$2 per thousand cubic feet as a result of an extremely warm winter that limited demand for heating in the large Midwest and Northeast markets. Natural gas in storage was 65 percent above normal levels going into the spring, strongly pressuring natural gas prices. Over the longer term, natural gas prices will move past the weather to focus on fundamental demand growth and cost recovery. A price of \$4 is often cited as necessary to recover the cost of drilling, and \$6 to recover all corporate overhead and provide an adequate rate of return on capital.

⁷ See note 2, "Economic Impact of the Eagle Ford Shale," p. 15. The 2012 update to the UTSA study estimated only \$150 million in lease payments were made in 2011, as the amount of available land diminished sharply.

⁸ One recent list of only the 28 largest leaseholders in the area put the leased total above 5 million acres. See "After Shaky Start, South Texas Eagle Ford Shale Soars to Top Play," by Rachael Seeley, *The Oil Daily*, Nov. 9, 2011.

⁹ This is just an application of the marginal propensity to consume from wealth. Most studies of the U.S. find values that range from 4 to 7 cents per dollar. Typical is "Perspectives on the Household Saving Rate," by William G. Gale and John Sabelhaus, *Brookings Papers on Economic Activity*, no. 1, 1999, pp. 181–224. For an application to this problem, see "The Economic Impact of the Haynesville Shale on the Louisiana Economy in 2008," Loren C. Scott & Associates, April 2009.

¹⁰ These permits are restricted to those for new drilling directed to oil and gas, less canceled and withdrawn permits, and excluding sidetrack permits for borehole repair operations.

¹¹ This may be especially true in the Eagle Ford Shale, where initial production is prolific the first year, then quickly falls by 80 to 90 percent before stabilizing. This is good for the economics of the wells—offering producers a quick return on investment—but it may mean that leaseholders should use caution when predicting future income from royalties.

¹² See note 2, "The Pennsylvania Marcellus Natural Gas Industry: Status, Economic Impacts and Future Potential," p. 16. Considine, Watson and Blumsack cite oilfield development multipliers of 1.34 for spending in Louisiana, 1.43 for New Mexico and 1.55 for Oklahoma. For the Marcellus Shale, they found a much higher multiplier of 2.

The billions of dollars that large energy companies are committing to expand infrastructure for delivering hydrocarbons to the Texas Gulf Coast signal anticipation of strong production from this region for many years to come.