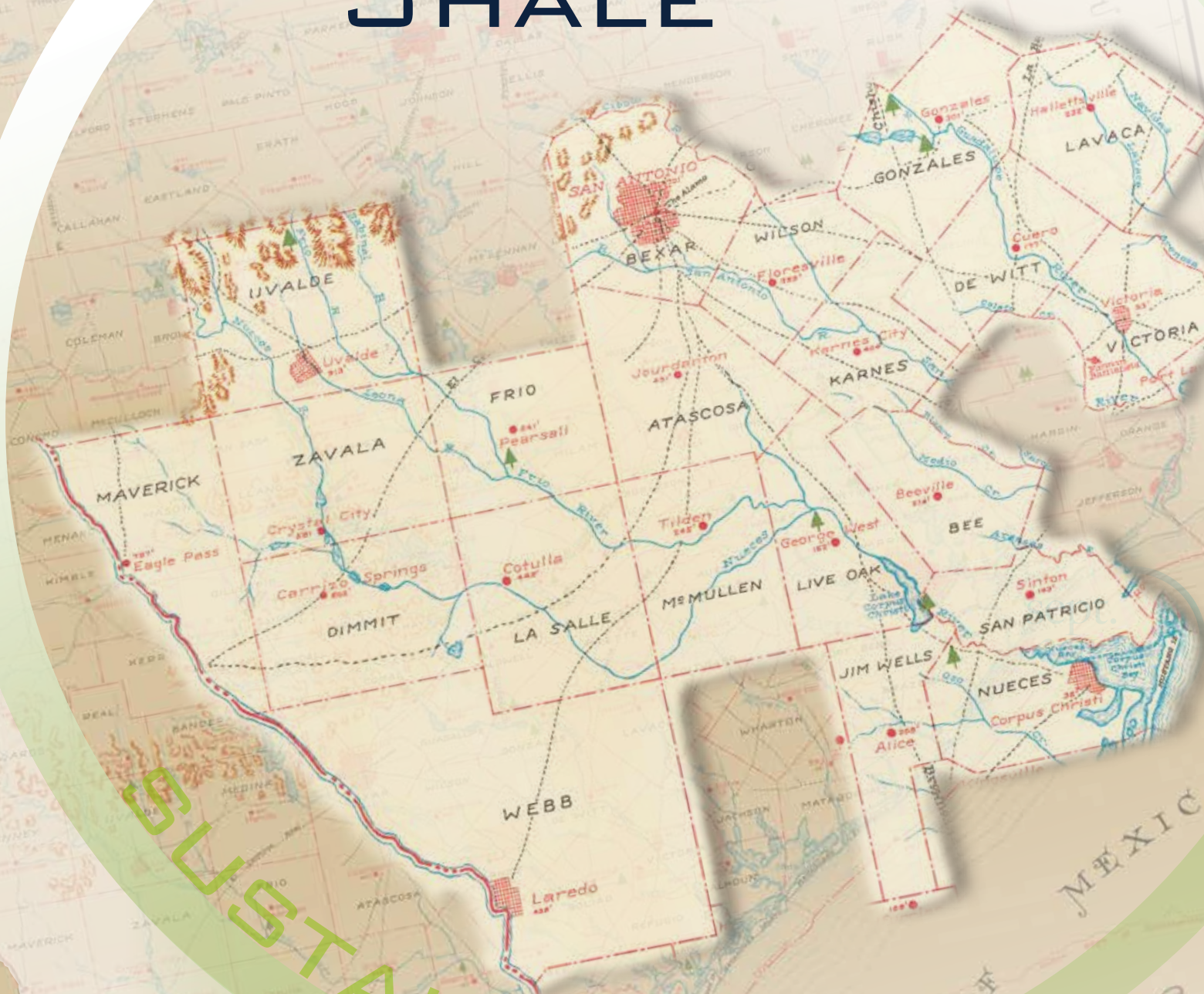
economic impact
of the

Eagle Ford Shale



SUSTAINABILITY

Institute for **Economic** Development

Center for **Community** and **Business Research**
The University of Texas at San Antonio

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Principal investigator: Thomas Tunstall, Ph.D.

Lead investigator: Javier Oyakawa, M.A., MSc.

Researchers: Gina Conti, Maricela Diaz-Wells, Jason Hernandez, Yongsun Lee, Vincent Loeffelholz, Neeraj Ravi, John Rodriguez, Feihua Teng, Carelli Torres, Hector Torres, Binbin Wang, John Zhang

GIS specialist: Hisham Eid

Review assistance: Chris Clark

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This report is available online at http://ccbr.iedtexas.org/

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1 EXECUTIVE SUMMARY

This latest economic impact report on the Eagle Ford represents the 4th installment in the series. Communities throughout South Texas continue to experience tremendous growth and stand to benefit from significant economic impacts as a result of natural gas, oil, and condensate development in the Eagle Ford Shale. Overall, oil and condensate production in the Eagle Ford has grown from 581 barrels per day in 2008 to over 1.1 million barrels per day as of June 2014. Natural gas production now tops 4 billion cubic feet per day. The Eagle Ford Shale continues to exceed expectations and currently attracts the most capital investment of any shale field in the U.S.

This study assesses the economic impact of the Eagle Ford Shale for 2013, including direct, indirect and induced impacts in the 21 counties directly and indirectly involved in production. Lavaca County has been added to the geographical scope of this year's study. Also provided is an analysis of economic impacts of related businesses such as construction projects, manufacturing investments, as well as upstream, midstream and downstream impacts.

Of particular note is the aspect of community sustainability. The ongoing activity - driven by energy companies and related industries - presents South Texas community leaders with a rare opportunity to ensure the long-term viability of their cities, towns and counties. As the natural gas, oil, and condensate production in the Eagle Ford continues to increase, the challenges facing community leaders are more critical than ever. Investments in infrastructure - roads, water, wastewater, K-12 education, medical facilities, etc. - are the key components that will provide the necessary foundation to ensure future sustainability of communities in South Texas.

To address infrastructure investment, community leaders should be engaged with state legislators to develop systematic solutions to ensure that rural areas benefit from revenue sources such as the Economic Stabilization Fund.[1] Cities and counties that do not collect the two percent sales tax allowed by state law should consider doing so as well. The impact of Eagle Ford is far-reaching, but it will be up to community leadership to seize the opportunity.

Estimates of overall economic impact for the 21-county area in 2013 top $87 billion, up from $61 billion in 2012. For 2023, the 21-county impact is estimated to exceed $137 billion, far higher than the $89 billion forecast for 2022 that we reported in the March 2013 economic impact study. The rationale for the upward revisions (as mentioned above) is due to the way the Eagle Ford continues to exceed expectations in terms of production. In addition, new manufacturing projects associated with the natural gas renaissance in the U.S., as well as new processing, refining and port facilities are factors driving increases in the economic impact statistics.

Scope

This study examines the 15 core counties where activity is most prevalent in the Eagle Ford Shale. These counties are:

- Atascosa
- Bee
- DeWitt
- Dimmit
- Frio
- Gonzales
- Karnes
- La Salle
- Lavaca
- Live Oak
- Maverick
- McMullen
- Webb
- Wilson
- Zavala

[1] The Texas Economic Stabilization Fund (ESF) is more commonly referred to as the Rainy Day Fund. The balance is expected to top $7 billion by the 2015 legislative session. Oil and gas severance taxes are currently providing the bulk of the funding for the ESF.

Additionally, this study examines 6 neighboring counties where significant activity, not including extraction, is occurring. These counties are:

- Bexar
- Jim Wells
- Nueces
- San Patricio
- Uvalde
- Victoria

2013 Total estimated economic impacts

For 2013, the oil and gas industry in the Eagle Ford is estimated to have generated total impacts of nearly $72 billion in the core 15-county area, supporting almost 115,000 full-time equivalent jobs, while contributing just over $2 billion both to local governments and to the state government. The CCBR calculated that 3,311 wells were completed and actively producing in 2013.

The 21-county area, which includes the 15 core counties and 6 surrounding counties, is estimated to have generated over $87 billion in economic output, employed nearly 155,000 people, and provided over $2.2 billion to both the local governments and to the state government.

Table 1-1

	Economic impact	Direct	Indirect	Induced	Total
Core 15-county area	Output	$61,470,280,412	$7,941,100,117	$2,418,234,050	**$71,829,614,579**
	Employment, full-time	42,607	52,333	19,375	**114,315**
	Payroll	$2,027,428,721	$1,539,076,337	$584,718,872	$4,151,223,930
	Gross regional product	$30,448,269,805	$4,333,962,004	$1,542,827,867	$36,325,059,676
	Local government revenues				$2,025,968,804
	State revenue, including severance taxes				$2,028,406,113
Core and neighboring 21-county area	Output	$70,725,115,021	$12,896,817,708	$4,135,496,654	**$87,757,429,382**
	Employment, full-time	51,652	71,648	31,684	**154,984**
	Payroll	$2,707,017,870	$2,036,271,899	$896,394,413	$5,639,684,182
	Gross regional product	$32,992,259,490	$7,199,851,186	$2,640,560,616	$42,832,671,293
	Local government revenues				$2,218,877,342
	State revenue, including severance taxes				$2,214,664,000

Source: IMPLAN. Elaboration CCBR.

Gonzales, Texas was founded in 1825 and is most commonly known as the birthplace of the Texas revolution.

Photo courtesy of the Houston Museum of Natural Science

2023 Total estimated economic impacts

For 2023, the core 15-county area is estimated to have an economic output of over $106 billion, employ nearly 151,000 workers, and contribute approximately $3.8 billion to both local and state government.

The 21-county area is estimated to generate over $137 billion in economic output, provide 196,660 full-time equivalent jobs, and supply over $4 billion to both local governments and to the state.

Table 1-2

	Economic impact	Direct	Indirect	Induced	Total
Core 15-county area	Output	$90,168,212,826	$10,893,464,660	$5,332,379,266	**$106,394,056,752**
	Employment, full-time	36,785	71,309	42,699	**150,793**
	Payroll	$6,311,816,751	$2,035,342,931	$1,289,319,720	$9,636,479,402
	Gross regional product	$52,608,595,765	$5,805,086,021	$3,402,243,230	$61,815,925,016
	Local government revenues				$3,741,688,868
	State revenue, including severance taxes				$3,774,006,283
Core and neighboring 21-county area	Output	$110,576,454,317	$19,363,931,284	$7,488,598,501	**$137,428,984,102**
	Employment, full-time	38,767	99,786	58,107	**196,660**
	Payroll	$6,718,204,896	$3,432,856,335	$1,927,647,160	$12,078,708,391
	Gross regional product	$57,330,415,830	$10,686,840,880	$4,777,170,284	$72,794,426,994
	Local government revenues				$4,073,239,614
	State revenue, including severance taxes				$4,098,369,070

Source: IMPLAN. Elaboration CCBR.

2013 and 2023 Output impacts by county

Table 1-3 compares 2013 to the forecasted 2023 economic output. Overall, the core 15-county area is expected to increase economic output by 53%. If including the neighboring 6-county area, the regional economic output is expected to grow by 61% by 2023.

Table 1-3

	County	2013*	2023*
Core 15-county area	Atascosa	$3,309,321,673	$5,888,831,097
	Bee	$382,452,255	$1,473,241,220
	DeWitt	$4,947,708,860	$7,288,946,345
	Dimmit	$8,552,982,031	$12,341,837,612
	Frio	$684,849,735	$1,016,801,803
	Gonzales	$7,463,132,427	$11,369,005,382
	Karnes	$10,964,709,282	$16,752,660,184
	La Salle	$9,001,341,991	$13,574,778,927
	Lavaca	$1,607,274,019	$2,661,190,775
	Live Oak	$6,954,129,494	$8,646,546,519
	Maverick	$175,394,311	$260,171,485
	McMullen	$8,276,163,149	$12,518,235,902
	Webb	$5,008,394,112	$7,051,104,091
	Wilson	$1,444,745,649	$2,109,895,697
	Zavala	$661,926,101	$1,036,509,227
	Total 15-county†	**$69,434,525,089**	**$103,989,756,266**
Core and neighboring 21-county area	Bexar	$3,238,996,650	$4,400,871,930
	Jim Wells	$105,224,783	$159,539,643
	Nueces	$11,830,469,550	$24,313,461,300
	San Patricio	$282,179,425	$1,300,532,507
	Uvalde	$107,169,636	$173,153,748
	Victoria	$363,774,759	$687,368,223
	Total 21-county†	**$85,362,339,892**	**$135,024,683,617**

**Includes direct, indirect, and induced impacts.*

†The summation of the individual counties impacts is smaller (16 percent smaller for the employment impacts, mostly due to induced impacts) than when the impacts are taken for the group as a whole. This happens due to differences of the individual counties industry compositions. In several cases there are industries that exist at the regional level but not at the individual county level. When estimating the impacts, the total amount of jobs, for example, is attributed to the whole region when the industry exists in only a few counties. Therefore, when analyzing the individual county, only the corresponding amount of dollars for the particular county is taken into consideration, not the whole amount for the region. It could be said. either way, that the individual counties underestimate the impacts in the region or that the aggregate impacts overestimates the impacts.

Source: IMPLAN. Elaboration CCBR.

2 INTRODUCTION

This edition of the Economic Impact of the Eagle Ford Shale is the fourth such study by the University of San Antonio Institute for Economic Development. Previous economic impact reports were released in 2011, 2012, and 2013.[2]

Texans know all too well the cyclical nature of the oil and gas industry. The positive impacts from energy production must be balanced against the need to diversify local economies and to create attractive, livable communities that will endure into the next century - and beyond. Toward that end, our work at the Institute for Economic Development spans several programs and is integrated across the UTSA academic disciplines with the mission of implementing economic development extension practices and making them a reality.

UTSA's Center for Urban and Regional Planning headed by Dr. Richard Tangum in the College of Architecture regularly consults with communities across South Texas on planning, design, environmental, housing and development issues. Dr. Francine Romero in the College of Public Policy, in conjunction with the Institute's Rural Business Program has been working to strategically develop municipal governments in the Eagle Ford Shale and West Texas regions, both of which are experiencing unprecedented demands for services and infrastructure.

Because of the huge influx of workers in South Texas, UTSA's Dr. Lloyd Potter, the State Demographer for Texas is developing revised population projections for counties impacted by the Eagle Ford yet to be included in the official data. The Eagle Ford Shale Community Development Program at the UTSA Institute for Economic Development is working with communities to promote sustainable economic progress through an innovative "strategically-sequenced" approach, which addresses the life-cycle implications of shale oil and gas development.

UTSA has also established the Water Institute of Texas (WIT) within the Civil and Environmental Engineering Departments led by Dr. Tom Papagiannakis, which tap the considerable faculty expertise in water-related research – a particularly timely issue for Texas. WIT will conduct research on the various factors related to water sustainability and their effect on the health and economic development of Texas and the Southern U.S.

Dr. Les Shephard at UTSA's Sustainable Energy Research Institute is examining the implications of the Eagle Ford in relation to the critical intersection of the world's two most important resources - energy and water.

The Eagle Ford presents significant opportunities for small business, and to help capitalize on these, UTSA's Institute for Economic Development maintains a network of ten field centers and two specialty centers to provide advising services and business training. The Small Business Development Center network stretches across South Texas and includes all of the counties impacted by the Eagle Ford Shale, as well as many in West Texas.

The economic impact of the Eagle Ford Shale has the potential to transform cities, towns and counties in South Texas by providing the resources to ensure community sustainability. This is a theme echoed and continually reinforced by the Eagle Ford Shale Consortium led by Leodoro Martinez. We hope this report provides an actionable resource that can be used to make long-term sustainability in the Eagle Ford - and throughout rural Texas - a reality.

[2] Halaby, D., Oyakawa, J., et al. (2011). *Economic impact of the Eagle Ford Shale.* UTSA Institute for Economic Development.
Tunstall, T., Oyakawa, J., et al. (2012). *Economic impact of the Eagle Ford Shale.* UTSA Institute for Economic Development.
Tunstall, T., Oyakawa, J., et al. (2013). *Economic impact of the Eagle Ford Shale.* UTSA Institute for Economic Development.

Gonzalez

Gonzales was founded in 1825 and is most commonly known as the birthplace of the Texas revolution. In 1831, Mexican authorities gave the Gonzales settlers a cannon to protect against frequent Comanche raids. When the political situation in Mexico deteriorated and several states revolted, the authorities asked for the cannon to be returned. The citizens of Gonzales essentially responded with the phrase that forms the city's identity: "Come and Take It."

The city is situated due east of San Antonio, south of IH-10 along U.S. Hwy 183. As the birthplace of the Texas revolution, the spirit of independence there is infectious. The city is managed by Allen Barnes, and its economic development director is Carolyn Gibson.

Before activity in the Eagle Ford got underway, Gonzales had already taken steps to diversify its economy. Adam's Extract opened a modern 90,000 square foot facility in Gonzales in 2002. It is one of the oldest continuing operating companies in Texas, and last year celebrated its 125th birthday. The city is also home to facilities for Tyson's Chicken, Buddy's Natural Chicken, Southern Clay Products, Land O' Lakes, Purina Feed, and Jim H. Wilson Rail Car Dismantling. Gonzales is one of the top three poultry, egg and pecan producers out of 254 counties.

The Gonzales downtown is undergoing a significant revitalization process. Hotel Alcade was recently purchased and plans include a transformation of the old landmark to a luxury property. With several landmarks, significant open space, an impressive county courthouse and many two and three story buildings, Gonzales is well-positioned to transform itself for the long-term.The official population is about 7,200, but like a lot of communities in the Eagle Ford, the number of actual residents is almost certainly higher these days.

3 NARRATIVE

3.1 Opportunities for economic diversification in the Eagle Ford

The oil and gas activity associated with the Eagle Ford Shale presents a tremendous opportunity for South Texas. However, it's just that - an opportunity. Texas has had over a thousand ghost towns, by some accounts, and it is clear that the state does not need any more. What is needed for South and West Texas communities, like those in the Eagle Ford and Permian Basin, are theories of economic development that look beyond merely job growth. Economic development should include improving the quality of life, environmental stewardship, development of high quality infrastructure, and development of a local workforce. It is this foundation that will enable rural communities in Texas to accomplish perhaps their most important mission: diversification of local economies beyond oil and gas exploration and production.

For South Texas, the potential options for diversification include things like higher margin agricultural products such as olives and olive oil processing, spinach and other food processing, geothermal energy, tourism, hunting, outdoor recreation, water recycling and desalination, and wine-making. The prospects for some of these industries are highlighted below.

Olives and olive oil processing

The U.S. imports nearly 300,000 tons of olive oil annually and produces only about 12,000 tons. Production of olive oil in Texas has risen from nothing in 2002 to approximately 54 tons in 2012. The number of olive trees in central and South Texas is rising rapidly, from around 250,000 in 2012 to an anticipated 1,500,000 in 2013. There are four olive oil pressing plants in Texas, with others planned in the future. Olives and olive oil are a higher-margin agricultural growth industry, and olive oil consumption in the U.S. has been increasing because of research that consistently demonstrates its health benefits.

Geothermal energy

Alternative fuel sources that have a smaller carbon footprint than fossil fuels are increasingly attractive. One such source is geothermal energy, which is generated from hot water and steam that lies deep below the earth's surface. Geothermal is more reliable than wind or solar energy because it is continual in nature. There are several sites in South Texas that are viable for geothermal exploration. This presents a growth opportunity for a green energy source. This industry could employ several types of high-skilled positions and could be a feasible industry for the transition of similarly skilled labor force in the event of a slowdown in gas and oil production.

Water recycling and reclamation

Given the impacts of the current drought combined with projected substantial population increases for Texas, opportunities to provide water from non-traditional sources, such as recycling and desalination, are likely to increase. Such water projects are applicable to both potable and non-potable uses. Water recycling and desalination can decrease the diversion of freshwater from sensitive ecosystems, as well as lakes and aquifers in Texas. Here again, many job openings will require high-skilled technical experts who can often work remotely. Water is a particularly critical issue for growth, as evidenced by the fact that the Texas legislature approved a constitutional amendment to authorize $2 billion for reservoir, wells, and conservation projects.

Tourism

Texas has been a strong draw for tourists and other types of visitors. In the 2013 edition of this study, it was estimated that the then-core 14 counties of Eagle Ford Shale area generated over $1 billion in visitor spending.[3] Many historic sites in South Texas relating to Texas Independence, Spanish settlements, and the early days of cowboys are a few examples for which local communities could capitalize.

In addition to industry diversification examples, there are other opportunities based on emerging trends. If a robust, affordable broadband infrastructure can be put in place, there are prospects for distance learning, re-shoring of jobs previously outsourced overseas, telemedicine, and attracting knowledge workers who prefer the lifestyle associated with smaller communities. Rural communities have traditionally lagged metropolitan areas in terms of income, which has been an impediment to job growth. Improvements in information and communication technologies (ICT) in rural areas would be expected to improve the prospects for new residents to earn an economic livelihood there.

Educational opportunities in rural areas tend to be limited. As a result, emerging distance-learning opportunities present real prospects for sustainability. Research has demonstrated that rural areas without access to institutions of higher education have a much harder time attracting educated workers and building their human capital stock. In addition, re-shoring of many previously outsourced job functions or expanding the U.S. trade surplus in services could become more feasible in rural areas with improved ICT. And finally, with increased cost pressures likely as a result of healthcare reform, telemedicine offers significant opportunities to expand delivery networks and increase efficiency to non-metro areas.

While communities in South and West Texas may not be able to actively implement the above strategies, community leaders can begin to plan for identified opportunities. In this way, they are positioned to adapt quickly and absorb possible negative impacts in the event of declined oil and gas production.

3.2 Natural gas, crude oil and condensate export considerations

The unexpected increase in shale natural gas, oil, and condensate[4] production in the U.S. has upended many previously held assumptions. In the case of natural gas, billions of dollars have been spent on import facilities because U.S. production was expected to remain on a long-term decline curve. Now many of those same facilities are being converted to export natural gas - with billions more to be invested as a result.

In the case of crude oil and condensate, the story is similar. U.S. production has increased so fast that previous expectations have been turned on their head. Refiners along the Gulf Coast and the Midwest had ramped up to process heavier crude oil. However, the Keystone XL pipeline, which was intended to bring heavy crude from Canada, has been put on hold. This heavy crude oil must be processed through specially optimized facilities that are not well-suited for refining lighter crudes. The primary locations for refineries in the U.S. that have optimal capacity to process light crude oil, such as those produced from shale, are along the East Coast.

Although the U.S. is awash in light crude oil, it cannot be exported.[5] A ban on crude oil export was initiated in 1975 during the Arab Oil Embargo. Because crude oil cannot be exported, the recent increase in U.S. production of lighter petroleum (WTI - West Texas Intermediate) has caused it to sell at a discount to the Brent (North Sea crude) price. Prior to the rapid increase in unconventional oil and gas production in the U.S., WTI historically sold at a slight premium to Brent.

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[3] Tunstall, T., Oyakawa, J., Eid, H., Abalos, R., Wang, T., Calderon, E. and Melara, K. (2013). *Economic Impact of the Eagle Ford Shale.* University of Texas at San Antonio Institute for Economic Development.

[4] Condensate is also known as wet gas or ultralight oil, and can resemble petroleum in appearance or be virtually clear. Like crude oil, it is liquid at room temperature and is measured in barrels (as opposed to natural gas, which is measured in cubic feet). Condensate is technically defined as light crude oil with an API gravity between 50-120 degrees. West Texas Intermediate (WTI) or light sweet crude, by contrast, typically has an API gravity of between 30 and 45 degrees, which is characteristic of shale oil. Heavier crudes have API gravities of less than 30 and are supplied by countries such as Mexico, Canada, Venezuela, Columbia, Ecuador and those in the Middle East.

[5] One notable exception is the export of crude oil from the U.S. to Canada dependent upon obtaining a license and under the condition that it be used there. Natural gas can be freely exported to any country that has a free-trade agreement with the U.S. In 2013, for example, the U.S. exported over 650 billion cubic feet of natural gas to Mexico. In addition, over 20 companies have applied for permission to export natural gas to countries that do not have a free-trade agreement with the U.S.

In contrast to the ban on crude oil export from the U.S., there has never been a similar ban on the export of refined products. The definition of refined products has traditionally consisted of petroleum processed through distillation towers that convert crude oil into finished products. However, because of the recent increase in condensate production in the Eagle Ford, some companies have begun processing ultralight crude oil using splitters, which are less expensive than distillation towers in a refinery. Splitters process condensate into naphtha and distillates that can be exported without restriction.

Still another method of processing petroleum is the use of stabilizers to remove volatile natural gas liquids and remove contaminants. Originally this process was used to make sure crude oil would meet pipeline and tanker transport specifications. However, the U.S. Commerce Department recently ruled that stabilizers - in addition to refinery distillation towers and splitters - also fall into the category of processed oil. To date, only Pioneer Natural Resources and Enterprise Products Partners have been granted the required private ruling by the Commerce Department's Bureau of Industry and Security needed to export processed condensate. However, ten other companies have reportedly applied as well.

Lifting the ban on oil export would likely bring WTI back to parity with Brent crude prices and enable shipment to European refiners that are better suited to process lighter crudes. Such exports of lighter crudes from the U.S. could readily be substituted with the heavier crudes from Canada that are more optimal for much of the refinery capacity along the Gulf Coast.

3.3 Rural Texas transitions

Years ago, Texas was a predominantly rural state. Populations of cities and counties in the late 1800s and early 1900s were much more evenly distributed. If we look back to the 1860s, we would note that nearly 60% of the U.S. workforce consisted of farmers. In 1900, it was still about 40% of all workers. Now of course, only 2% or less of the U.S. workforce is employed in agriculture. As a result, fewer people live in rural areas, and the fastest growing geographies in Texas are now the larger cities. This shift in the distribution of the state's population has implications important to the Eagle Ford Shale area (and West Texas as well) in terms of legislative representation.

Let's take a specific example. In 1890, approximately 18,000 people lived in Gonzales County. There were a little over 37,000 people living in San Antonio and just fewer than 50,000 in Bexar County. By 2000, San Antonio had over one million residents, and Bexar County boasted over 1.3 million – increases of 2500% or more. Yet, in 2000, how many people lived in Gonzales County? About 18,000 – the same number as in 1890.

This is indicative of the growth occurring in the larger cities like San Antonio, Houston, Dallas-Fort Worth and Austin. And yet what often goes unnoticed is that both Texas Senate and House seats are apportioned by population. Unlike the U.S. Senate, where every geography (state) has retained two votes since statehood, the Texas Senate is population proportional. So as communities in South and West Texas lose ground to the larger cities in terms of population growth, they lose not only House but also Senate seats as well.

In 1900, Bexar County, for example, only contained 31% of the population in the Eagle Ford region, which meant that almost 70% of people lived in the other parts of the Eagle Ford area. By 2010, however, Bexar County's share of the 20 county Eagle Ford Shale population had doubled to 61%. With that growth, comes a greater political voice in terms of more State Representatives and Senators for cities like San Antonio, and less for rural counties in the Eagle Ford.

Some of the most dramatic population shifts have occurred since the end of World War II, when agricultural mechanization began to systematically decrease the number of people employed on farms. From 1950 to 2010, DeWitt, Dimmit, Gonzales, Karnes, La Salle, and McMullen Counties all lost between 6-40% of their population. In that same period, San Antonio and Bexar County increased over 200%. Many counties in West Texas now being impacted by the Cline and other shale discoveries have seen similar population decreases since the 1950s.

The reality of Texas politics is that all parts of the state are in constant competition for the limited highway funding available. Dallas-Fort Worth, Austin and Houston, for example, have their own issues with regard to roads. While South and West Texas are seeing the impacts in the form of road deterioration from large numbers of 18-wheelers, the big cities struggle with increasing congestion because of rapidly growing populations. Both groups make a good case for increased highway funding, but the more populated cities and counties have a much greater political voice than in the past simply because

they have more State Senators and Representatives. Given the shift in political clout to the larger cities in Texas, it will be important for the communities in South and West Texas to work together to make their case to the Texas Legislature.

Billions of dollars in severance taxes are being generated from exploration and production activity in South and West Texas. When the next legislative session convenes in 2015, Texas is expected to have approximately $7 billion in the Economic Stabilization Fund, also known as the Rainy Day Fund.

Rural Texas also provides important agricultural products, wind energy, hunting, recreation and tourism, among others. So in addition to serving the needs of the large urban areas, Texas legislators should take care to make sure rural Texas is served also.

Of course, beyond legislative remedies, rural communities across Texas must seize the opportunity to reinvent themselves. The predominant family farm system that was characteristic of rural Texas in the late 19th and early 20th century has changed because of technological progress that requires fewer people in traditional agriculture. But the population of Texas is growing (nearly 47 million people estimated by 2060 – up from 26 million currently), and this trend presents opportunities for rural areas to grow also if they can establish an infrastructure that attracts new residents, visitors and businesses. The chance to do just that is now possible due to recent shale oil and gas wealth. So the question is: how will rural Texas – with the help of the state legislature – transform itself in the coming decades to capitalize on the shale oil and gas opportunity?

3.4 U.S. natural gas renaissance

The use of unconventional extraction techniques and the corresponding abundance of low-cost natural gas are starting to have a clear impact on economic activity in the U.S. We can see this effect across several key areas including electricity production, vehicle fuel, manufacturing, and export.

According to the Energy Information Administration, natural gas will account for 35 percent of total electricity generation in 2040, while coal generation will drop to 32 percent. This is due in part to the low cost of natural gas relative to coal, and the fact that generating electricity from natural gas is a much cleaner process. Today, about 40 percent of the electricity in the U.S. is generated from coal.

Some interesting developments are taking place with transportation as well. Many local fleets - both in the public and private sector - are converting to natural gas, which is a less costly fuel than gasoline or diesel at current prices. Natural gas vehicles also emit less CO_2, which has positive implications for air quality.

Adoption of natural gas vehicles has been slow. There is still ample opportunity for passenger and freight vehicles to convert to natural gas, but some important obstacles must first be overcome. For example, conversion packages for existing gas-powered vehicles to run on natural gas are expensive. In order to drive costs down, we will need to see more assembly line vehicles developed that run on natural gas. This is starting to happen with pick-up trucks, vans and small passenger vehicles designed to run on compressed natural gas (CNG). GM and Chrysler have started producing pick-up trucks and vans, while Honda manufactures a sedan. One key drawback of running smaller vehicles, like the Civic, on CNG is that the required fuel tank is very large relative to gasoline tanks, so it takes up a large portion of the trunk area. Chesapeake and 3M are working to develop a smaller CNG fuel tank using advanced materials and newer technology, so we may see progress in this area in the near future.

Another issue impeding more widespread use of natural gas vehicles is the lack of public refueling stations. There are only a handful spread throughout Texas, most of which are in the larger cities. Refueling station solutions are more straightforward for those fleets that are centrally located. One station site, generally a private station, is sufficient to support a return-to-base fleet operation. A private (home) refueling station may be suitable for private passenger vehicles as well, but home refueling stations are expensive. GE and Eaton Corp are addressing this issue by exploring low-cost solutions. Private passenger vehicles would still require public stations for travel distances outside of their home range, similar to the way over-the-road or regional truck operations would require a network of stations along given routes. Until more publicly available fueling solutions are implemented, and until more lower-cost assembly-line natural gas vehicles are produced, adoption is likely to remain slow. Under the Texas Emissions Reduction Plan, the State of Texas has started to address these issues with grant

programs aimed at converting medium- and heavy-duty vehicles and building public refueling stations. ANGA has recently funded a CCBR study to examine the economic benefit of these grant programs.

Low-cost natural gas in the U.S. is having a significant impact on manufacturing activity. The ready availability of natural gas liquids enables the development of products such as PVC, plastics, resins, textiles, and synthetic rubber. The types of projects planned or underway include natural gas processing plants, fractionation capacity projects, ethane and propone projects for products like fertilizer, and others. The impact is pervasive across the Eagle Ford and beyond.

Finally, there is the increasing prospect for export of natural gas. The U.S. already exports natural gas to countries where free trade agreements are in place, such as Mexico. The permitting process to other countries is now underway as well. Europe, for example, pays about $11-12 per thousand cubic feet, compared with about $4 in the United States. Japan pays around $17. While opponents of natural gas export claim that it would cause prices to rise to 2000-2010 levels of between $8 and $12, our research at the Institute for Economic Development suggests that the long-term range is likely to be between $4 and $7, with or without export.

These developments in the U.S. would have been unthinkable as recently as five years ago. In fact, at that time, several facilities along the Gulf Coast were spending billions of dollars developing facilities to import natural gas. Since then, the tables have turned. Independent producers in the U.S. have pioneered unconventional extraction techniques for natural gas (and oil) that will eventually be adopted in other parts of the world. Since the techniques were developed here, the skills and technology involved in unconventional extraction represent yet another export opportunity for the U.S.

3.5 Economic impact of the Eagle Ford Shale in Mexico

South Texas has seen extraordinary economic activity as a result of the Eagle Ford Shale. Yet, it is interesting to note that the Eagle Ford formation continues well into Mexico, near Monterrey and over to the Gulf Coast. However, the production activity literally stops at the border at the Rio Grande. In the Texas part of the Eagle Ford, nearly 9,000 wells have been completed to date. In Mexico, there have been only a handful of test wells.

It has been 76 years since Mexico nationalized its oil industry. In the intervening years, the state-owned oil monopoly PEMEX has had exclusive rights to explore and produce oil in the country.

Around 2004, oil production in Mexico peaked at around 3.4 million barrels per day, and has been declining steadily since - down to 2.5 million barrels per day currently. In fact, if current trends continue unabated, Mexico would likely become a net importer of oil in a few years.

Mexico already imports refined products and natural gas from the United States. In 2013, for example, Mexico imported over 650 billion cubic feet of natural gas from the U.S., up from 333 billion cubic feet in 2010. All of this happens while Mexico sits on top of huge untapped reserves of oil and natural gas.

There are some encouraging signs on the horizon however. Last year, the Mexican government amended its constitution with the expectation of energy reforms that would allow companies other than PEMEX greater access to the country's oil and gas.

The Eagle Ford production activity in Texas is well-established, with annual well completions now averaging over 3,000 per year. The question on the table has become whether Mexico can replicate that activity on its side of the border. Several issues must first be addressed.

It is almost certainly the case that infrastructure in Mexico is not as well developed as in Texas. Pipelines, roads, and rail have served to facilitate the production process in the US by enabling raw materials and capital equipment to be brought into South Texas, as well to ensure storage, transportation, and refining activities (both midstream and downstream).

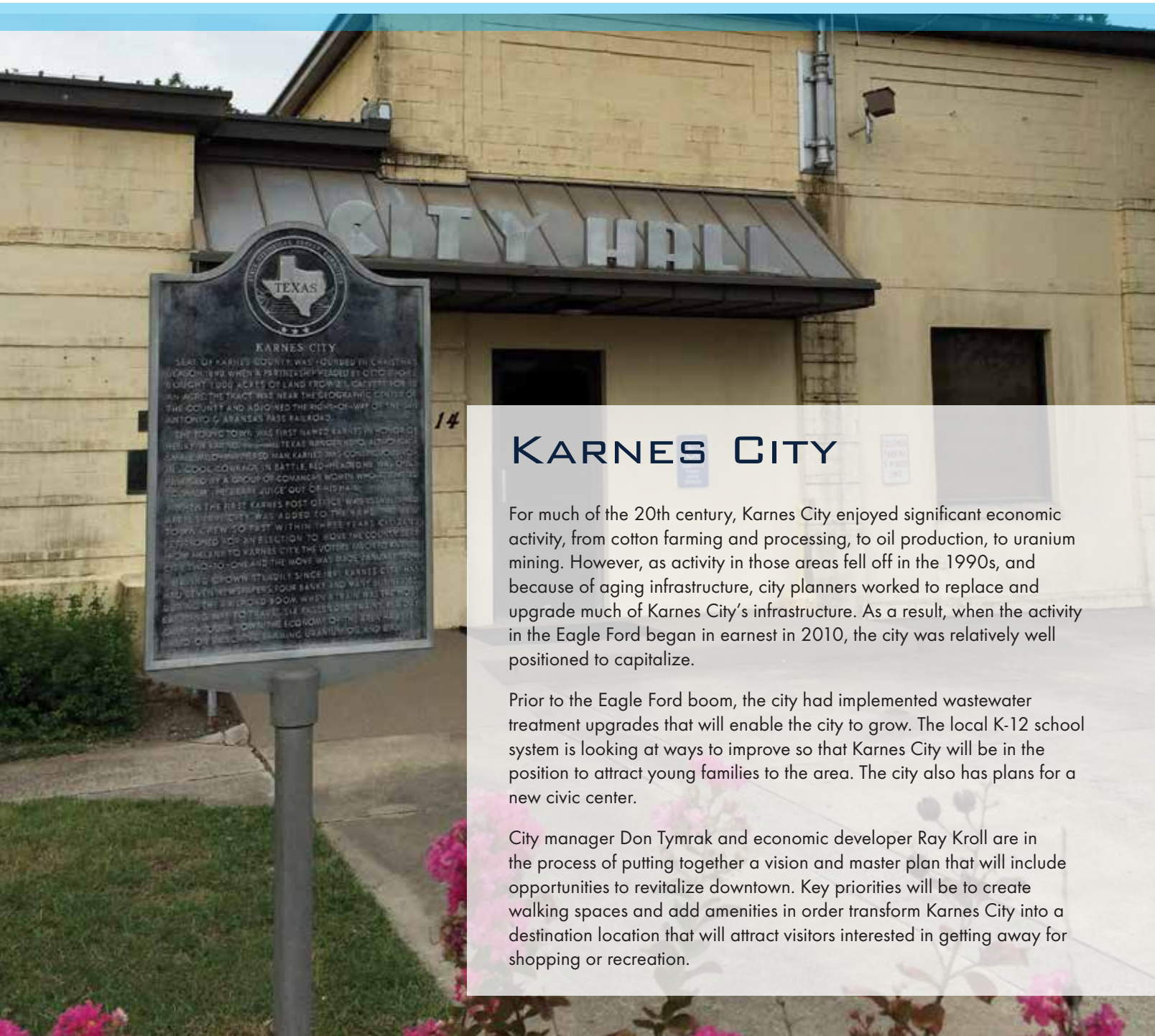
Further, due to the ongoing drug violence in Mexico, particularly in the border areas, security remains a key concern.

It is worthwhile to note that while there is shale oil and gas deposits located all over the world, the only country in which significant production is taking place is right here in the United States, much of it in South and west Texas. While other

countries are looking at tapping into their own shale oil and gas reserves the way Mexico is, the bulk of the expertise required to do so will almost certainly have to come from the US. Thus, the prospect for shale oil and gas exploration and production in Mexico (and other countries) represents an export opportunity for US companies that pioneered the unconventional techniques in use now. In the near term, there may be a shortage of suitably skilled engineers, geologists, and other experts, because the high level of activity in the U.S. currently limits supply.

Beyond the U.S. and Mexico, unconventional shale oil and gas exploration is having a significant impact on global markets. The U.S. produces more oil than it imports for the first time in nearly 25 years. Texas has produced more crude oil recently than it has in 30 years, largely the result of increased production coming from South and west Texas, in the Eagle Ford Shale and Permian Basin.

Businesses and producers in the Eagle Ford Shale are in a prime position to take advantage of the shale boom in Mexico because of their proximity to our Southern neighbor. As energy reform in Mexico continues, there will clearly be opportunities for stakeholders on both sides of the border to benefit.



Karnes City

For much of the 20th century, Karnes City enjoyed significant economic activity, from cotton farming and processing, to oil production, to uranium mining. However, as activity in those areas fell off in the 1990s, and because of aging infrastructure, city planners worked to replace and upgrade much of Karnes City's infrastructure. As a result, when the activity in the Eagle Ford began in earnest in 2010, the city was relatively well positioned to capitalize.

Prior to the Eagle Ford boom, the city had implemented wastewater treatment upgrades that will enable the city to grow. The local K-12 school system is looking at ways to improve so that Karnes City will be in the position to attract young families to the area. The city also has plans for a new civic center.

City manager Don Tymrak and economic developer Ray Kroll are in the process of putting together a vision and master plan that will include opportunities to revitalize downtown. Key priorities will be to create walking spaces and add amenities in order transform Karnes City into a destination location that will attract visitors interested in getting away for shopping or recreation.

3.6 Variability and estimates

It is important to note the variability that comes with all estimates when it comes to forecasts regarding crude oil and natural gas in terms of future production. This variability is due to many factors, such as well production decline, lifespan, drainage areas, geologic extent, and technological improvement as referenced in the EIA Annual Energy Outlook 2014.

Energy Information Administration

To understand how this variability can affect forecasts, the same EIA report presents a chart that shows the difference between their own 2013 and 2014 reference cases for crude oil production between 2005 and 2040 in the Eagle Ford Shale. The 2014 projections are more than double the daily production numbers that the 2013 report presents, upping them from around 0.7 million barrels per day to over 1.5 million barrels per day by 2015.

This is attributable to two factors. First, there is significant variability in the number of drilling rigs in play. For example, according to Baker Hughes, there were fewer oil rigs deployed in the second quarter of 2014 than in the year-ago quarter. At the same time, and to the second point, efficiency in oil rig production is constantly improving, albeit unevenly. According to the EIA's March 2014 Drilling Productivity Report, Eagle Ford Shale rig efficiency has been increasing much faster than expected.

Also, the revised projections show that oil production will plateau, then drop from its peak around the year 2020. The EIA compares this to the plateau in their 2013 projections, which remained at its peak until closer to 2025 before dropping off.

This is important for several reasons.

The 2014 estimate shows a much faster drop in production, from its 1.5 million bbl/d peak to about 0.8 million bbl/d by 2030, a 50 percent drop. The EIA 2013 estimate showed a drop from a peak of about 0.7 million bbl/d to around 0.4 million bbl/d, a decrease nearing 40 percent.

Of course, despite of the more-sudden-than-expected drop off from peak production, the numbers in the 2014 estimate are still higher in the short, medium, and long run.

Apart from the standard variability mentioned earlier, the EIA gives another reason for this substantial change: the lack of available data - both in terms of oil production from tight fields, and in regard to drilling data from the Eagle Ford Shale specifically. As the EIA indicates, most wells in the Eagle Ford have been producing for less than three years, thus providing little historical data to evaluate.

Center for Community and Business Research

The variability of data from official government sources obviously affects the projections that CCBR has published in the past.

When it comes to economic analysis that is performed on future trends regarding oil and gas production, key inputs used are the number of oil rigs that will be utilized in the future, as well as their comparative efficiency. This can be seen in the section title Future Activity / Projections (2022) in the March 2013 edition of the Economic Impact of the Eagle Ford Shale,[6] where the entire section is based on the moderate scenario, based on a middle-of-the-road projection of oil rigs in play in the Eagle Ford.

As the data behind these scenarios changes, so too must the scenarios, which is why every year the latest data is incorporated into the economic analyses done by CCBR, along with latest projections that are released by EIA and the Texas Railroad Commission.

[6] Tunstall, T., Oyakawa, J., Eid, H., Abalos, R., Wang, T., Calderon, E. and Melara, K. (2013). *Economic Impact of the Eagle Ford Shale*. University of Texas at San Antonio Institute for Economic Development.

4 METHODOLOGY FOR THE EAGLE FORD SHALE IMPACT STUDY

Due to the absence of timely and accurate official data, economic impact studies have been providing, with varying levels of success, employment growth estimates in the areas impacted by the energy developments.[7] These economic impact studies can be used in economic-demographic type of models for population projection and detailed employment forecasts, as explained in Murdock and Ellis (1991).

The study of rural areas impacted by natural resources is abundant and in recent years has addressed shale gas and oil developments in new areas, like in the Bakken and the Eagle Ford shale. During the 1970s and 1980s, several studies on rural development natural resource dependence focused on the problems associated with this type of growth. As a result of those studies, a framework known as "the boomtown model" (Gilmore, 1976) emerged. The model shows that, on the one hand, the boom phase produces rapid increases in employment and population. On the other hand, it also brings a number of negative effects in community life.

The boomtown model has received some criticism, and the effects of this type of growth are more likely to be determined by a larger number of factors than initially thought, like community size and its relative isolation. These factors will likely appear in communities affected by the Eagle Ford Shale. Larger and more established counties and diversified communities will attract the largest population influx (as is happening in San Antonio and Bexar County) even when rural and isolated areas (like McMullen County) are closer to the wells. Some studies have shown that construction workers related to the initial stages of these projects (like drilling and completion of wells) are more likely to take longer commutes than the more long-term type production workers. These long-term workers are more likely to take residency in the communities closer to the active wells (Jacquet, 2011).

Another line of research, also emphasizing the negative impacts of the boomtown growth, is the so-called "resource curse" model. A study argues (Kay, 2011) that the literature on the "resource curse," is related mostly to countries and not to regional economies within the United States - only some of the causes explaining the "curse" can be applied to communities in the U.S. For example, a case that does not apply to county areas is the so-called "Dutch disease" which affects terms-of-trade and relative prices through the exchange rate. The consensus is that the resource curse is not an inevitable path and that government policies could reduce its negative impacts.

For rural areas where mining and oil and gas industries activities play a central role, models with exogenous shocks to the labor market have been suggested. Studies on the impacts of large projects, as in Leistritz et al. (1981), showed the importance of these researches. A different but related research program was the North Dakota Economic-Demographic Assessment Model (NEDAM) by Leistritz et al. (1982). This tool modeled the impacts of large resource projects in rural areas. By obtaining supply of labor (using a cohort-component model) and demand for labor (using an economic input-output model) they developed a matching algorithm for supply and demand, and they assumed the existence of in-migration when there is a shortage of jobs or out-migration when there is a surplus of jobs.

4.1 The number of direct jobs per well

In a Pennsylvania report, Considine et al. (2009) presented an economic impact study of the Marcellus Shale. The authors used the well-known input-output software and database IMPLAN, and estimated the direct, indirect, and induced impacts using expenditures information from oil and gas companies. The study assumed lease and royalty payments as direct

[7] This chapter is based on three papers, Oyakawa, J. (2014, March), Oyakawa, J. (2014, June), and Oyakawa, J. (2014, forthcoming).

impacts, which played a very important role in their estimation of the jobs impacted by the natural gas industry. Almost 69 percent of the direct expenditures correspond to those payments. To forecast future production the authors used a regression with drilling activity as a function of the Henry Hub (gas) price.

Critical studies have called the attention on several assumptions made in the Marcellus Shale reports, Kinnaman (2011) and Kay (2011). Among several issues, a critical one is the number of direct jobs per well.

The North Dakota Department of Mineral Resources (Strom Center, n.d.) estimated the amount of jobs needed by oil wells with horizontal drilling and found that "direct and indirect jobs" needed amount to 13 to 15 full-time-equivalent (FTE) jobs. Their definitions of direct and indirect jobs are different from the usual input-output modeling definitions and must be taken carefully for economic impact studies. The research also indicated that up to three FTEs are needed for a new well in the Bakken Shale (this means that one job can take care of only 0.33 wells).

A study by Brundage et al. (2011) calculated the number of direct jobs in the natural gas industry when using horizontal drilling and fracturing stimulation. The study showed that a large proportion of the total industry workforce in the shale will be required during the well drilling phase, while a small proportion will be required during the production phase. As the amount of producing wells increases over time, the relative importance of production jobs increases as well.

Based on interviews and analysis of data from different sources, Brundage et al. (2011) found that in the Marcellus Shale, in multi-well pads, an initial well could require nearly 13 FTE jobs. Additional wells in the same pad did not require as many jobs, but rather only about 10 FTE. This is because the site was already prepared, short pipelines for gas transportation to storage facilities were already in place on-site, and the rigs are were already working in the pad, in addition to other factors that increase efficiency and lower expenditures.

In the current EFS research, the number of FTE jobs are calculated to be within the parameters of the Marcellus study (Brundage et al., 2011): between 9 and 13 FTE jobs for the wells. In this EFS study, these jobs were allocated to three different sectors: oil and gas extraction, drilling activities, and support for oil and gas activities.

Table 4-1

Pennsylvania statewide workforce assessment		
Activity	**Single well**	**Additional well**
Pre-drilling	2.41	0.65
Drilling	10.49	8.81
Production	0.19	0.19
Nat gas processing	0.2	0.2
	13.29	9.85

Source: Brundage et al. (2011b)

4.2 Economic impact versus economic contributions

Figures included in an economic impact study should be limited to cases that constitute new dollars being brought into the region, or dollars kept in the regional economy that would otherwise leak out. On the contrary, "economic contribution analysis" shows how money circulates in the economy due to the presence of the industry (or firm) under study. In this sense, economic contribution analyses are always positive. Even more, these studies do not discriminate between "local" and "non-local" expenditures.

Despite criticism, it should be pointed out that input-output models can be used to obtain crowding-out effects.[8] In the end a net gain or net loss of employment can be estimated. A different line of research deals with net economic benefits and usually it is confused with the term economic impacts. But the term "economic benefit" should be used for another type of studies like cost-benefit analysis, which measures changes in economic efficiency and social welfare using metrics like consumer surplus, equivalent variation, or compensating variation, among others (Watson, et al., 2007).

[8] When incumbent industries lose workers to the high-paying jobs in the energy industries.

4.3 Direct impacts by industry

To estimate the economic impacts of the Eagle Ford Shale, it is important to clearly define the direct impacts to be included. It is necessary to understand how and which industries enter in the direct impacts.

For a particular well, activities like construction, drilling, hydraulic fracturing, and completion only occur once before oil or gas production can take place. On the contrary, extraction (production) represents the regular operations of the well and, therefore, it is a recurring activity for years to come. To estimate the direct impacts, it is necessary to have an understanding of how many jobs are needed per well, which is not an easy task. Combining the costs of drilling and completion per well with the values of output per worker translates into the number of workers needed per well. In the case of extraction, the value of one year of oil production and the output per worker in this industry translates into the number of workers supported per well.

For the current CCBR study, for the three relevant industries, values of output per worker were based on historic data from Harris County, where Houston is located, and from Dallas County. These values were then calibrated in order to keep the total number of workers per well within a reasonable range of the Marcellus study (Brundage, 2011). Harris and Dallas counties provide output per worker values significantly higher than those in South Texas.

4.4 Final demand and industry output

When estimating the impacts of the three industries (oil and gas extraction, drilling for oil and gas, and support activities for oil and gas operations) in the Eagle Ford Shale, it is necessary to measure changes in output. In input-output models there is a subtle but important distinction between changes in output and changes in final demand (Steinback, 2004).

Usually, economic impact studies use changes in final demand as opposed to changes in total demand to avoid counting the output produced but used by other local companies avoiding double counting the intermediate demand of the good or service under study. In the case of oil and gas output in rural areas, all the production is for export to other areas, therefore, the use of changes in the industry output is justified because all of its production is for non-local companies. For these purposes, input-output settings have to be modified in order to have zero intermediate sales of the good under study in the local area. The IMPLAN Group uses a specific methodology for this purpose, where intermediate sales are excluded.

To obtain the quantity of oil and gas produced, it is necessary to estimate the number of wells involved, those that were drilled, completed, and are active producing wells. The number of new wells is used to estimate the total number of jobs supported by the shale for a particular year because the number of jobs per well multiplied by the number of wells results in the total amount of jobs involved. Private data providers have provided assistance to identify and count these wells together with the data from the Texas RRC. The number of wells that have been completed in a particular year multiplied by the cost of drilling and completing a well results in the amount of capital expenditures specific for the Eagle Ford Shale. Drilling and completion expenditures data can be obtained from oil and gas firms or from specialized reports providing estimates for different companies in the area.

Based on estimates of well productivity over time, a decline curve shows future production for a typical well (for oil or gas). The CCBR economic impact studies for the EFS modified an equation used in Considine (2009) for the decline curves of the Marcellus Shale. The parameters in the formula are calibrated to correspond to initial production (IP) values from oil or gas wells in the EFS. These productivities were multiplied by the number of wells to obtain production over the years during the lifespan of the wells. Information about the EFS by private providers is helpful to uncover the characteristics of several wells developed by different companies.

4.5 Royalties, lease bonuses and the "wealth effect"

In the present study on the EFS, only five to ten percent of the lease and royalty payments are new spending in the input-output model for the years under analyses. These payments are treated as payments to households, not to firms and, therefore, they generate induced impacts instead of direct impacts.[9]

4.6 Induced impacts

Even though they are very difficult to gauge, induced impacts help to depict a better picture of the total effects of the event under study. A previous CCBR's study, Oyakawa et al. (2012b), showed the occupational impacts of the Eagle Ford Shale for 15 counties with active drilling. When including the induced impacts, a group of occupations that is not usually associated with oil and gas activities (but generally associated with household expenditures) shows up in the list of the top 35 occupations. These jobs, which are associated with entrepreneurial efforts by small business owners include retail sales persons, cashiers, food workers, waiters and waitresses, registered nurses, among others.

For the induced impacts, the study used only a percentage of the wages earned by workers when extracting oil or gas (38 percent), when drilling (36 percent), and when supporting oil and gas activities (38 percent) to be spent locally. This procedure takes into account the fact that the majority of these workers are non-locals and they have a "transient" status. The percentages correspond to the share of "permanent" workers from the TWC data (plus an additional number of workers based on recent official employment growth) with respect to the totals calculated using FTE per well for that year.

By the year 2023, the total amount of wages earned is assumed to be spent in the local economy as over time more local workers get to work in these industries.

4.7 Multiregional Impacts

In traditional economic impact studies, only one region can be studied at a time, but with a new feature in IMPLAN it is possible to use multiregional analyses for the EFS and its surrounding areas. This is important for Bexar County, for example, that without active drilling is benefiting from the EFS and becoming a regional headquarters for several firms operating in the EFS area.[10] The development of multi-regional input-output analysis has always been hindered by the lack of good estimates of the flows of goods and services between regions.

4.8 Forecast methodology

To forecast the future impacts of the Eagle Ford Shale, two methods for projecting future production of oil and gas as function of the number of rigs were developed. This provides the basis for forecasting future rig activity in the 15 counties under study as a function of price forecasts made by the Energy Information Agency (EIA).

For the first method, decline curves to estimate oil and gas production per well were employed using a modified equation from Considine et al. (2009), which have been used previously to make estimates for the Barnett Shale. Below are some of the steps taken:[11]

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[9] The CCBR study by Halaby et al. (2011) used this assumption and has been maintained in the subsequent studies.

[10] This feature is also important when estimating the individual impacts for the active drilling counties. For the individual counties, the impacts not only calculate the activity within the boundaries of the county but also the impacts from the rest of the active drilling counties in the EFS on the individual counties, as a multiregional analysis. This has been used in the CCBR's studies since Halaby et al. (2011).

[11] In the current CCBR's study, different from previous versions, the calculation of the number of old wells has been critical to the calculation of the number of "production jobs" following Brundage et al. (2011)

1. The following two equations were used to forecast gas or oil production per well:

$$G(t)=K * t^{(-0.585)}$$

$$O(t)=M * t^{(-0.65)}$$

   Where:

   For gas (G), *K* is the initial production for the well, it was calibrated at 147.850 mmcf of gas. For the impacts, casinghead gas provides additional production per well but these amounts are calculated as a result of oil production;

   For oil (O), *M* is the initial production of 18.993 thousand barrels of oil per month. For the impacts, condensate production adds more barrels of oil equivalent production to the wells in the area.

   t is the number of months in production for each well.

   The future production of condensate was assumed to be a proportion of the oil produced, using percentages obtained from the production values of 2013.

   The future production of casinghead (or associated) natural gas was assumed to be a proportion of the oil produced using percentages obtained from the 2013 production values.

   In a departure from previous CCBR studies, the decline curve for oil was modified to show a much steeper decline over time, as this profile seems to better fit forecasts of oil production when compared to forecasts made by private providers of oil statistics.[12]

2. Prices for three different scenarios – moderate, low, and high – were obtained from the Energy Information Agency (EIA).

3. Each scenario is associated with different amounts of gas or oil reserves. The EIA estimated 2012 proved reserves of 16.2 trillion cubic feet of gas and 3.4 billion barrels of oil in the Eagle Ford Shale.[13] It is very likely that for 2013 these reserves will increase significantly, given the ongoing drilling activity in the area. Therefore, a high price scenario is associated with larger reserves, while a low price scenario is associated with smaller reserves of gas or oil.

4. For each scenario, a forecast for the number of rigs was developed that included differences in the number of wells per rig for each scenario.[14] For the moderate scenario, based on 2012 data, 14 wells per rig were assumed. For the low price scenario,[15] 10 wells per rig were assumed, and 18 wells per rig were assumed for the high price scenario. In 2013, the average number of wells per rig was 13.

In the second method,[16] the study used a time series model to estimate the effects of the prices of oil and gas in drilling activity in the EFS area. Prices for three different scenarios (moderate price, low price, and high price) were obtained from the EIA. For each scenario, the study forecasted the number of rigs and assumed different number of wells per rig for each scenario to take account of changes in productivity. For the moderate scenario, based on 2011 data, 14 wells per rig were used. For the low and high price scenarios, 10 and 18 wells per rig were used for each case, respectively, based on experts' opinions and on other studies.

Structural change tests (CUSUM and CUSUMSQ) were implemented to find out whether there were structural breaks in the time series. These tests helped determine the existence of structural changes from June 2009 through November 2010. The results show the price of gas as having a negative relationship with the number of rigs developed: when the price of gas

[12] For example, Hart Energy.
[13] Energy Information Agency U.S. Crude Oil and Natural Gas Proved Reserves, 2012 (April 2014), at http://www.eia.gov/naturalgas/crudeoilreserves/pdf/uscrudeoil.pdf
[14] The number of rigs was taken from Baker Hughes. The historical data provided rig per district, not per county. Some adjustments were made to calculate the number of rigs for the 15 counties included in the study.
[15] Based on communications with UTSA College of Engineering and literature review
[16] This section follows Oyakawa (2008) methodology on cointegration and unit root tests.

has decreased, drilling activity in the Eagle Ford has increased. They also showed that when the price of oil has increased, drilling activity also has increased.[17]

To avoid a spurious regression problem, it was necessary to find out whether the variables followed a stationary process. Standard Augmented Dickey-Fuller (ADF) tests were used to find out whether the variables have unit roots. The results indicated that the variables were integrated of order one. Because the order of the integration was the same for all variables, the author implemented some cointegration tests.

The Johansen cointegration test, using the trace statistics and the maximum eigenvalue, showed two cointegrating relationship among the variables, for the study, the one having rigs as a dependent variable was chosen.

The final estimate included the price of oil, the price of gas, and a dummy variable (D):

$$Ln(R_t) = \beta_0 + D_t + \beta 1 * Ln(POIL_t) + \beta_2 * Ln(PGAS_t) + D_t * \beta_1 * Ln(POIL_t) + \mu_\tau$$

Table 4-2

Parameter Estimates					
Variable	**DF**	**Estimate**	**Standard Error**	***t* Value**	**Approx. Pr > |*t*|**
Intercept	1	1.8918	1.1910	1.59	0.1181
lnPoil	1	0.8347	0.2633	3.17	0.0025
lnPgas	1	-0.6775	0.1644	-4.12	0.0001
DmlnPoil	1	-0.0548	0.0273	-2.01	0.0497

All the parameter estimates were significant at the five percent level, with the exception of the intercept.

And:

R is the number of rigs in districts 1 and 2 from the definitions of the Texas Railroad Commission. This information came from the Baker Hughes web site;

POIL is the WTI price of oil;

PGAS is the Henry Hub price of gas;

D is a structural parameter shifter that takes values of 1 or 0 (dummy variable); and

μ is the error term.

4.9 RV parks and man camps

There are no accurate means to determine the number of RV parks in the 15-county Eagle Ford Shale area development. There is no centralized data source to determine the number of RV parks or the number of septic tank permits. The Texas Commission for Environmental Quality (TCEQ) does not conduct nor store such records. The responsibility rests on local governments. While some counties manage and record inspections, others such as DeWitt, Live Oak, Webb, and Wilson administer only to unincorporated parts, leaving cities and towns jurisdiction over their own area.

Adding to this ambiguity, the documented RV parks are those who applied for septic tank permits. Some, as noted by Helen Hernandez (Special Projects Coordinator) of Karnes County, have created RV parks on existing residential property, thus

[17] This is explained in Gilmer et al. (2012).

having no need for a septic tank inspection. Some of the other data was collected contacting the chamber of commerce, economic development corporations, and appraisal districts of their respective counties. The data for Webb and Wilson counties were obtained through internet research.

Estimates show Karnes County has the most RV parks in the Eagle Ford Shale development area with 75. The caveat, according to Karnes County Special Projects Coordinator Helen Hernandez, is that some RV parks reside in residential property. As a result, the count may not be accurate.

Septic Inspector Rex Newman reported 47 RV parks for Atascosa County. Jose Alcala of the Middle Rio Grande Development Council reported for the following counties: Dimmit, La Salle, Maverick, and Zavala. DeWitt County, serviced by the Environmental Division of the Victoria City-County Health Department, was reported to house 28 RV parks with 622 units. Like Dimmit County, Frio has 23 RV parks.

Richard Dockery of Three Rivers indicated the city has 50 RV parks with 4 man camps (1000 units). These were rough estimates given by phone. With George West (14), this brings the tentative total to 64 RV parks in the city. Mattie Sadovsky, District Clerk for McMullen County, reported 13 RV parks. Keith Arnold, Director of the Chamber of Commerce for Bee County observed four camps.

The totals for Webb and Wilson counties were taken from an internet search. In both cases, RV parks were under jurisdiction of the local municipal governments.

The table below shows the number of RV parks and man camps based on the research. In several cases an approximate number of units per county was not available. Based on average units-per-camp from the counties with approximates (nearly 24 units per camp), final estimates for each county were calculated. A total estimate of 7,600 units is obtained.

Table 4-3

RV Parks and man camps in the Eagle Ford area			
County*	**Since 2010**	**Units**	**Estimated units****
Atascosa	47	Unknown	1,117
Bee	4	Unknown	95
DeWitt	28	622	622
Dimmit	23	670	670
Frio	23	Unknown	547
Gonzales	13	Unknown	309
Karnes	75	Unknown	1,783
La Salle	8	570	570
Live Oak	64	800	800
Maverick	3	70	70
McMullen	13	Unknown	309
Webb	5	Unknown	119
Wilson	6	Unknown	143
Zavala	8	454	454
Total	**320**		**7,608**

*The original study did not include Lavaca county.
**Unknown number of units were calculated assuming 23.7 units per park

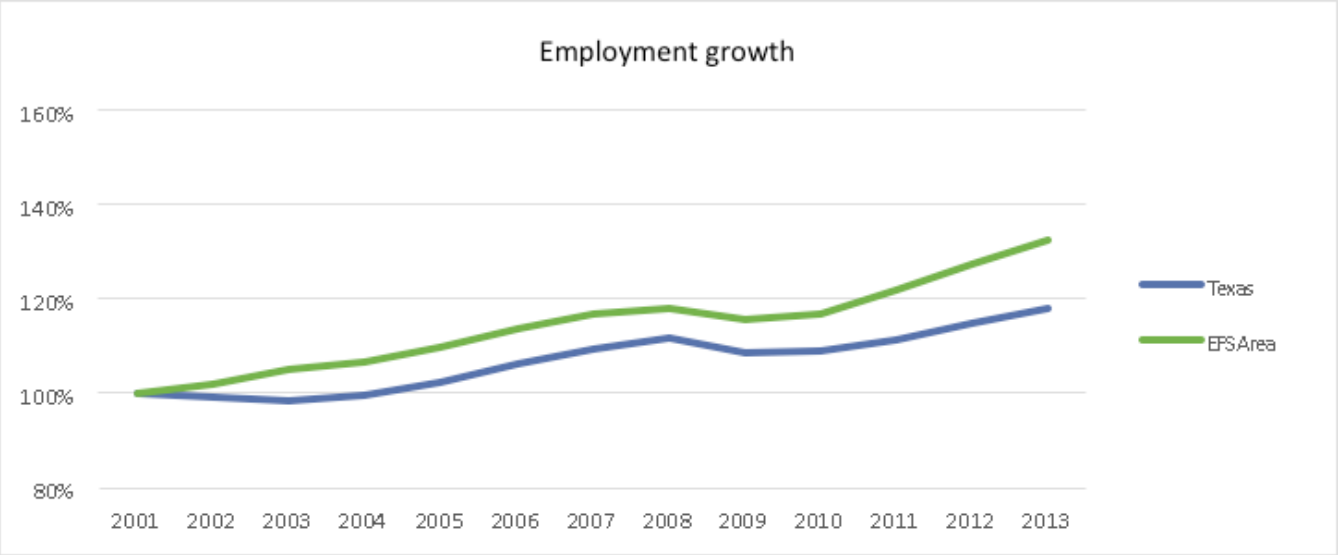
5 DEMOGRAPHICS AND ECONOMIC INDICATORS

5.1 Employment growth

5.1.1 Employment growth by year

Both the core 15-county Eagle Ford Shale region and the state of Texas have seen an increase in employment growth in the last decade. The growth rate for Texas was slightly higher until 2009, when the Eagle Ford Shale began to accelerate employment creation. Although jobs were lost following the 2008 financial crisis, as of 2013 the 15-county area has increased employment by seven percent over the last seven years, while Texas has seen a six percent increase in the same time frame.

FIGURE 5-1



Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.1.2 Employment growth by county

Employment changes in the Eagle Ford Shale region have been mostly positive since 2010, with only Zavala County experiencing employment losses. Five counties have seen double-digit employment gains in this time frame: McMullen, Dimmit, La Salle, Live Oak, and Frio, with growth in these counties ranging from nearly 35 percent to 10 percent.

The counties with the slowest growth, excluding Zavala's negative trend, are Lavaca, Wilson, and Maverick, with none grossing over 1.5 percent growth.

Table 5-1

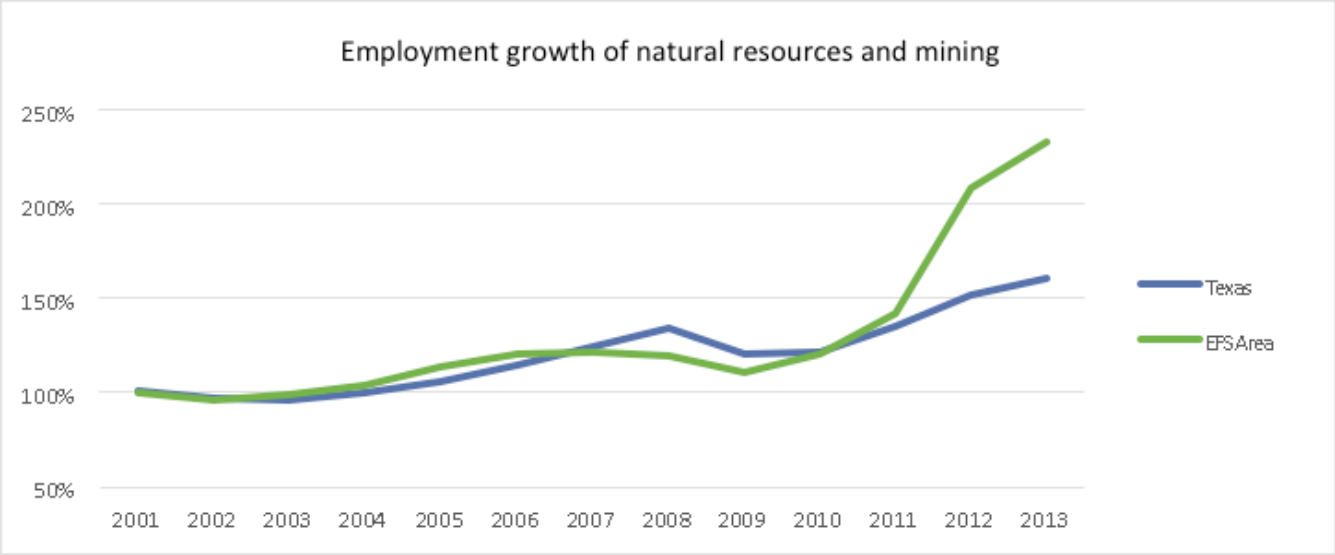
Employment change by county in 15-county Eagle Ford Shale region										
	Total employment				Annualized % change			% change, ranked		
	2001	2006	2010	2013	2001-2006	2006-2010	2010-2013	2001-2006	2006-2010	2010-2013
Atascosa	9,193	9,169	9,346	13,012	-0.05	0.48	11.66	15	12	5
Bee	8,444	8,450	8,758	9,924	0.01	0.90	4.25	13	8	10
DeWitt	6,868	6,936	6,518	7,386	0.20	-1.54	4.26	12	17	9
Dimmit	2,696	2,693	3,083	5,727	-0.02	3.44	22.93	14	4	2
Frio	4,019	4,206	4,859	6,085	0.91	3.67	7.79	9	2	7
Gonzales	5,882	6,570	6,415	6,768	2.24	-0.60	1.80	7	14	14
Karnes	4,011	3,856	3,716	4,769	-0.79	-0.92	8.67	16	15	6
La Salle	1,262	1,621	1,827	3,252	5.13	3.04	21.19	1	5	3
Lavaca	5,556	6,221	5,909	5,768	2.29	-1.28	-0.80	6	16	16
Live Oak	2,862	2,917	3,015	4,420	0.38	0.83	13.60	11	9	4
McMullen	251	203	256	572	-4.16	5.97	30.73	17	1	1
Maverick	11,320	14,052	16,188	16,906	4.42	3.60	1.46	2	3	15
Webb	70,559	84,507	85,404	92,809	3.67	0.26	2.81	3	13	12
Wilson	5,383	6,250	6,490	7,064	3.03	0.95	2.87	4	6	11
Zavala	2,727	2,846	2,952	2,553	0.86	0.92	-4.73	10	7	17
EFS	141,033	160,497	164,736	187,015	2.62	0.65	4.32	5	10	8
Texas	9,350,770	9,922,313	10,182,150	11,036,121	1.19	0.65	2.72	8	11	13

Source: Bureau of Labor Statistics

5.1.3 Natural resource and mining employment growth by year

Employment in the natural resources and mining super-sector has seen a steady increase in the past decade, increasing by 13 percent in Texas and by almost 50 percent in the Eagle Ford Shale region.

FIGURE 5-2



Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

Chuck's Bar and Dancehall – Cotulla, TX

5.1.4 Per capita personal income by county

The income per person in the Eagle Ford Shale region has increased by approximately 40 percent since 2001, outpacing Texas' income growth by almost ten percent.

In terms of absolute personal income, McMullen easily ranks first with an average income exceeding $64,000 per year. Live Oak and DeWitt counties rank in second and third, respectively. The counties with the lowest per capita incomes are Zavala, Maverick, and Webb.

Table 5-2

Per capita personal income in 15-county Eagle Ford Shale region										
	Per capita personal income				Annualized % change			% change, ranked		
	2001	2006	2010	2012	2001-2006	2006-2010	2010-2012	2001-2006	2006-2010	2010-2012
Atascosa	$20,739	$25,668	$29,571	$33,474	4.36	3.60	6.39	9	14	9
Bee	$16,278	$20,211	$25,660	$29,368	4.42	6.15	6.98	7	8	8
DeWitt	$21,783	$26,213	$33,837	$40,560	3.77	6.59	9.48	13	7	7
Dimmit	$16,007	$20,686	$27,920	$39,074	5.26	7.79	18.30	2	1	3
Frio	$16,555	$19,264	$25,037	$30,541	3.08	6.77	10.45	15	6	5
Gonzales	$24,751	$25,276	$31,411	$33,852	0.42	5.58	3.81	17	9	15
Karnes	$16,297	$20,202	$26,705	$32,176	4.39	7.23	9.77	8	2	6
La Salle	$17,088	$18,262	$24,138	$33,551	1.34	7.22	17.90	16	3	4
Lavaca	$24,032	$29,925	$35,752	$40,173	4.48	4.55	6.00	6	11	12
Live Oak	$18,627	$24,601	$30,521	$44,017	5.72	5.54	20.09	1	10	2
McMullen	$32,197	$39,318	$39,767	$64,826	4.08	0.28	27.68	11	17	1
Maverick	$12,930	$16,143	$21,160	$22,324	4.54	7.00	2.71	5	5	17
Webb	$17,072	$21,339	$24,097	$26,120	4.56	3.09	4.11	4	15	14
Wilson	$23,297	$28,164	$33,251	$37,471	3.87	4.24	6.16	12	13	10
Zavala	$11,537	$14,907	$19,664	$21,129	5.26	7.17	3.66	3	4	16
EFS	$17,979	$22,081	$26,288	$29,613	4.20	4.46	6.14	10	12	11
Texas	$29,681	$35,474	$38,103	$42,638	3.63	1.80	5.78	14	16	13

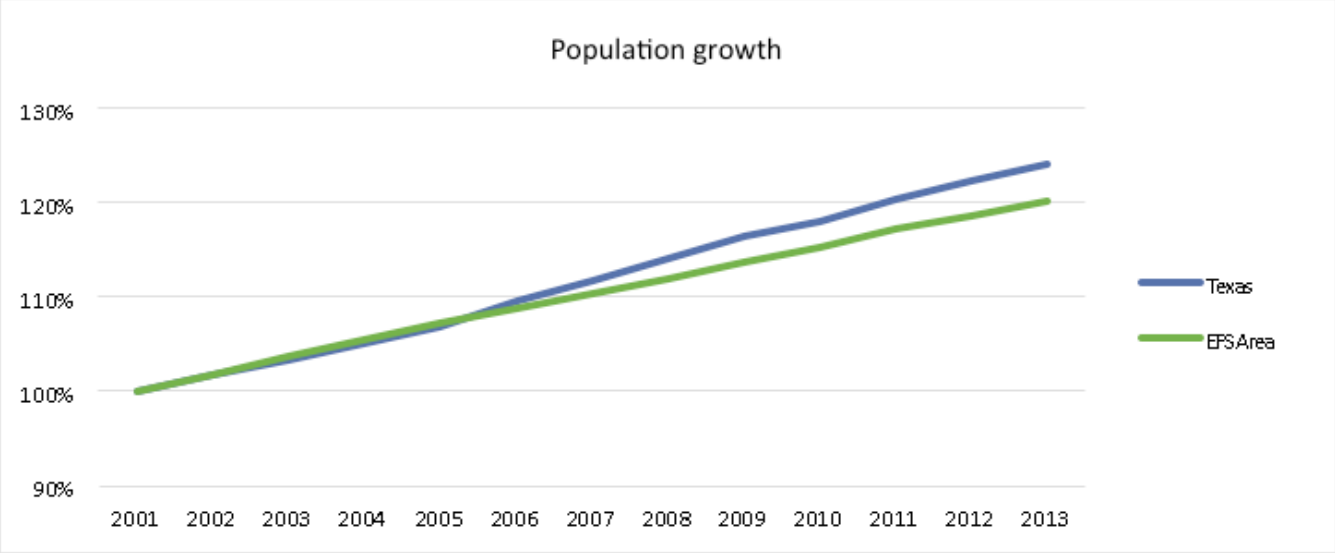
Source: Bureau of Economic Analysis

5.2 Population Growth

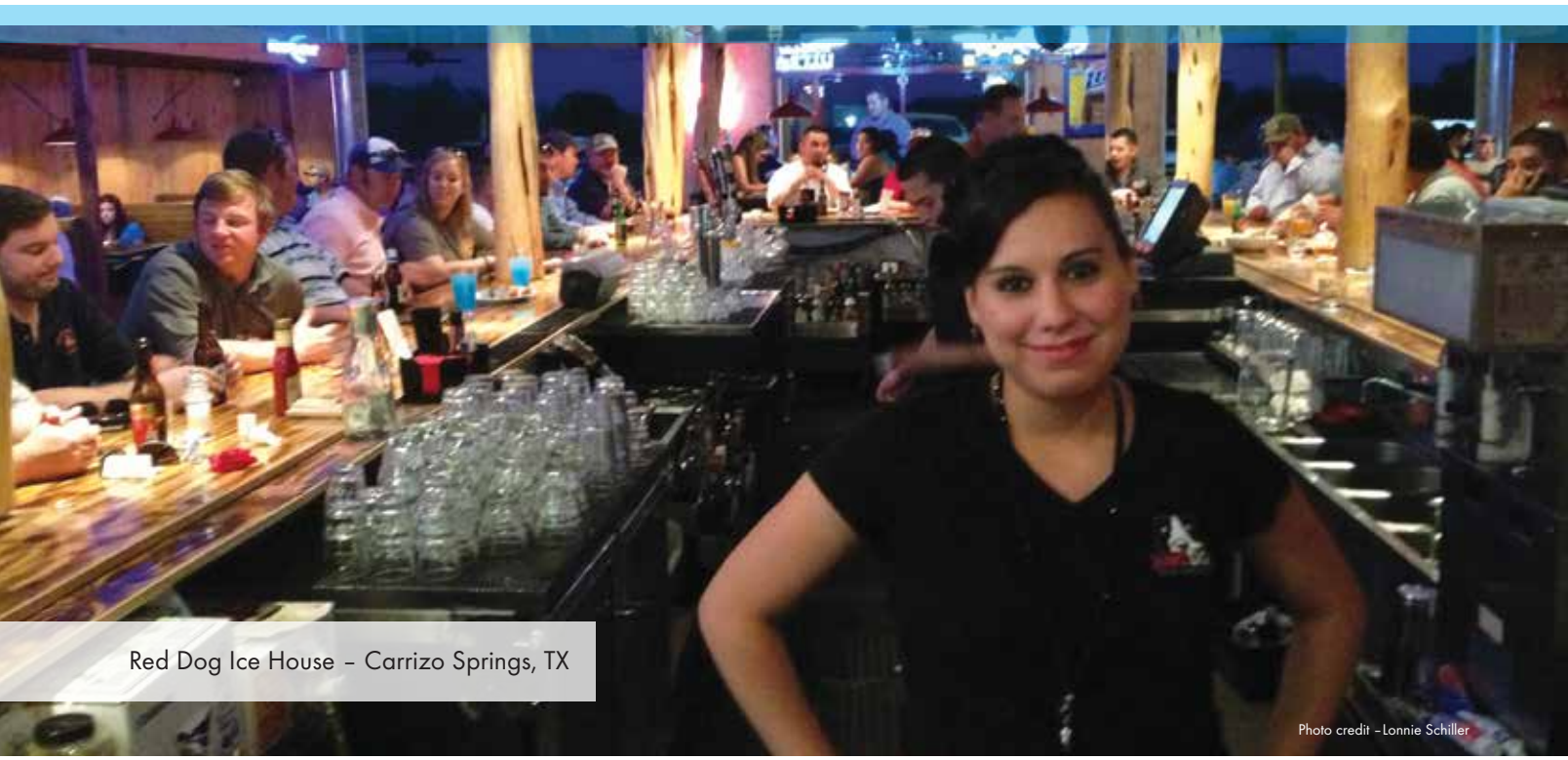
5.2.1 Population growth by year

Population growth in the Eagle Ford Shale region has not matched the population boom that Texas has seen, though it has been increasing at a steady pace. The population growth in the core 15-county Eagle Ford Shale area was essentially identical to that of the state of Texas until 2005, when the state of Texas's growth rate accelerated. Since 2005, employment in the Eagle Ford Shale region has grown by 19 percent, while the state of Texas has grown by 22 percent.

FIGURE 5-3



Source: Census Bureau



Red Dog Ice House – Carrizo Springs, TX

Photo credit – Lonnie Schiller

5.2.2 Population growth by county

Between 2010 and 2013, the counties that experience the largest growth were Dimmit, La Salle, and Atascosa. At the same time, Live Oak, Lavaca, and Gonzales counties experienced the least amount growth, barely exceeding half a percent.

Table 5-3

Population in 15-county Eagle Ford Shale region										
	Total population				Annualized % change			% change, ranked		
	2001	2006	2010	2013	2001-2006	2006-2010	2010-2013	2001-2006	2006-2010	2010-2013
Atascosa	39,828	43,059	44,968	47,093	1.57	1.06	1.59	6	7	8
Bee	31,695	31,977	31,871	32,799	0.18	-0.09	0.97	11	15	12
DeWitt	20,066	20,108	20,055	20,503	0.04	-0.01	0.67	13	13	15
Dimmit	10,030	9,972	10,028	10,897	-0.12	0.06	2.92	14	12	1
Frio	16,315	16,720	17,199	18,065	0.49	0.73	1.62	9	8	6
Gonzales	18,714	19,633	19,811	20,312	0.96	0.22	0.84	8	9	14
Karnes	15,340	14,985	14,834	15,081	-0.47	-0.27	0.57	15	16	16
La Salle	5,934	6,549	6,882	7,369	1.99	1.26	2.29	3	6	3
Lavaca	18,958	19,181	19,242	19,581	0.23	0.11	0.55	10	10	17
Live Oak	12,071	11,559	11,548	11,867	-0.86	-0.06	0.96	16	14	13
McMullen	819	765	712	764	-1.35	-1.95	2.62	17	17	2
Maverick	47,594	50,951	54,462	55,932	1.37	1.58	1.02	7	4	11
Webb	200,347	229,307	251,284	262,495	2.74	2.21	1.60	2	2	7
Wilson	33,408	39,007	43,089	45,418	3.15	2.42	1.91	1	1	4
Zavala	11,596	11,642	11,709	12,156	0.08	0.08	1.35	12	11	10
EFS	482,715	525,415	557,694	580,332	1.71	1.44	1.42	5	5	9
Texas	21,319,622	23,359,580	25,242,683	26,448,193	1.84	1.86	1.70	4	3	5

Source: Census Bureau

5.2.3 Per capita retail sales by county

Per capita retail sales growth in the Eagle Ford Shale is exceeding Texas' growth by 14 percent in the period between 2010 and 2012. McMullen County led this growth with an increase of 177 percent. Karnes, Atascosa, DeWitt, and La Salle counties experienced much more moderate growth rates in comparison to McMullen County, between 40 and 62 percent. Still, these growth rates appear aggressive relative to historical trends.

Even the counties with the least amount of growth, Maverick, Lavaca, Webb, and Wilson counties, appear to be thriving with per capita retail sales growth rates above 10 percent, surpassing Texas growth rate by 2 to 7 percent.

Table 5-4

Per capita retail sales in 15-county Eagle Ford Shale region										
	Per capital retail sales				Annualized % change			% change, ranked		
	2002	2006	2010	2012	2002-2006	2006-2010	2010-2012	2002-2006	2006-2010	2010-2012
Atascosa	$11,398	$14,797	$16,357	$38,702	6.74	2.54	53.82	10	12	3
Bee	$11,702	$14,079	$15,568	$25,629	4.73	2.54	28.31	15	11	8
DeWitt	$14,125	$17,700	$18,067	$38,506	5.80	0.51	45.99	12	15	4
Dimmit	$7,726	$11,639	$50,103	$70,582	10.79	44.04	18.69	5	2	11
Frio	$7,881	$11,365	$29,847	$40,624	9.58	27.30	16.67	8	3	12
Gonzales	$26,225	$45,074	$50,757	$91,998	14.50	3.01	34.63	3	10	6
Karnes	$10,425	$12,288	$17,319	$45,665	4.20	8.96	62.38	16	6	2
La Salle	$9,984	$18,383	$28,687	$56,934	16.49	11.77	40.88	2	4	5
Lavaca	$22,522	$28,215	$25,686	$32,676	5.80	-2.32	12.79	13	17	15
Live Oak	$10,016	$14,085	$285,189	$421,259	8.90	112.13	21.54	9	1	10
McMullen	$7,204	$14,338	$21,689	$166,652	18.77	10.90	177.20	1	5	1
Maverick	$10,330	$15,269	$16,383	$19,795	10.26	1.78	9.92	7	13	16
Webb	$19,933	$24,692	$23,703	$30,524	5.50	-1.02	13.48	14	16	14
Wilson	$7,054	$11,919	$13,812	$18,081	14.01	3.75	14.42	4	9	13
Zavala	$20,041	$5,104	$5,934	$10,631	-28.96	3.84	33.85	17	8	7
EFS	$15,624	$20,209	$27,588	$40,907	6.64	8.09	21.77	11	7	9
Texas	$43,102	$64,235	$67,702	$78,635	10.49	1.32	7.77	6	14	17

Source: Bureau of Economic Analysis and Texas Comptroller of Public Accounts

5.3 Selected demographics and economic indicators by county

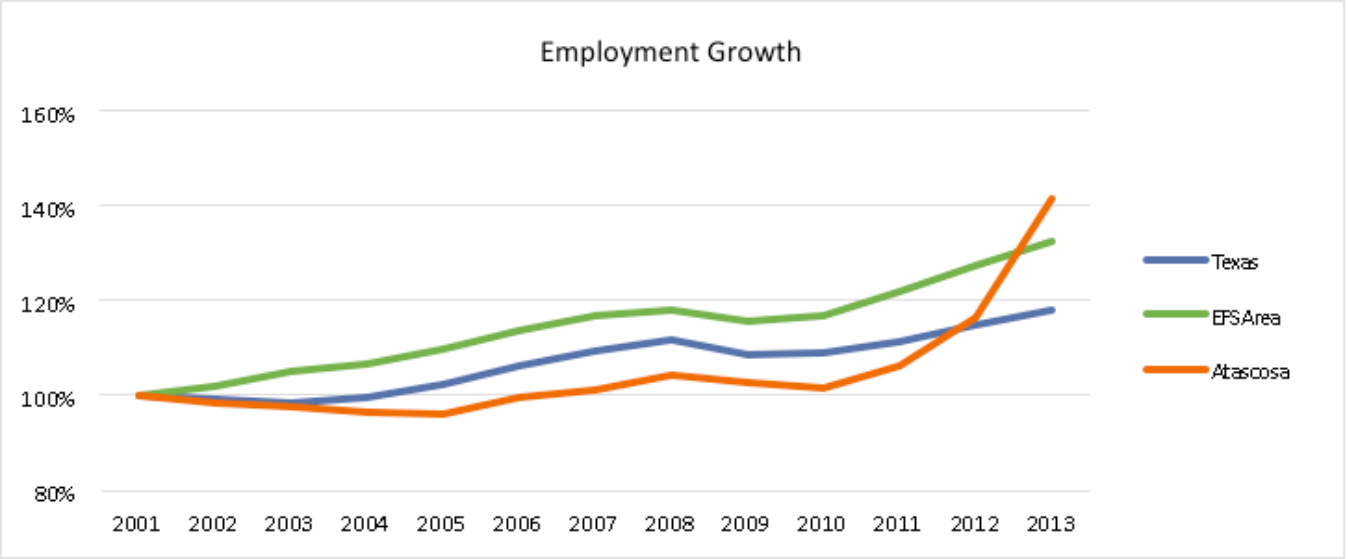
The impact of the Eagle Ford Shale activity varies across counties. Below are highlights from selected counties. The complete analysis that includes all of the counties can be found in the report appendices online at http://ccbr.iedtexas.org/. The indicators use 2001 as the base year for each county, which are shown alongside the Eagle Ford Shale region and Texas as a whole for comparison purposes.

5.3.1 Atascosa

5.3.1.1 Job growth comparison

Atascosa County has experienced significant job growth as a result of Eagle Ford Shale energy production as can been seen in Figures 6-3 and 6-4. From 2011 to 2013, employment in Atascosa County went from 9,760 to 13,012. In 2013 alone, employment increased 21.6 percent.

FIGURE 5-4

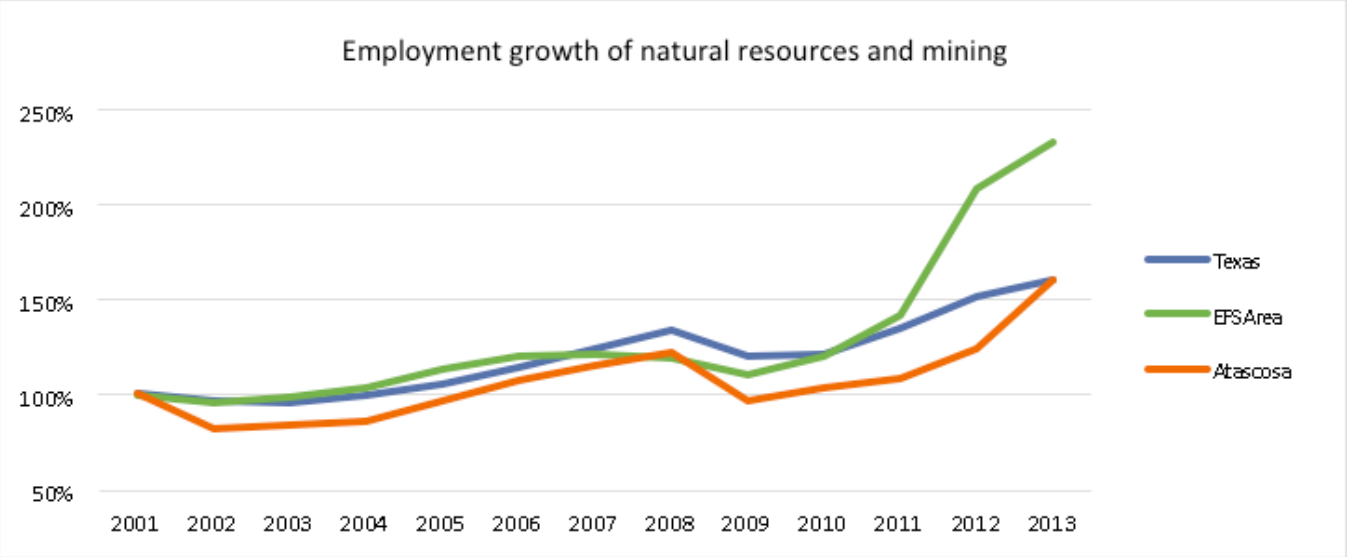


Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.1.2 Natural resource and mining employment growth comparison

Texas, the Eagle Ford Shale area as a whole, and Atascosa County have all seen increases in energy-related employment since the Great Recession. From 2011 to 2013, energy-related employment in Atascosa County grew from 960 to 1,425. Last year alone, energy-related employment in Atascosa County grew nearly 30%.

FIGURE 5-5



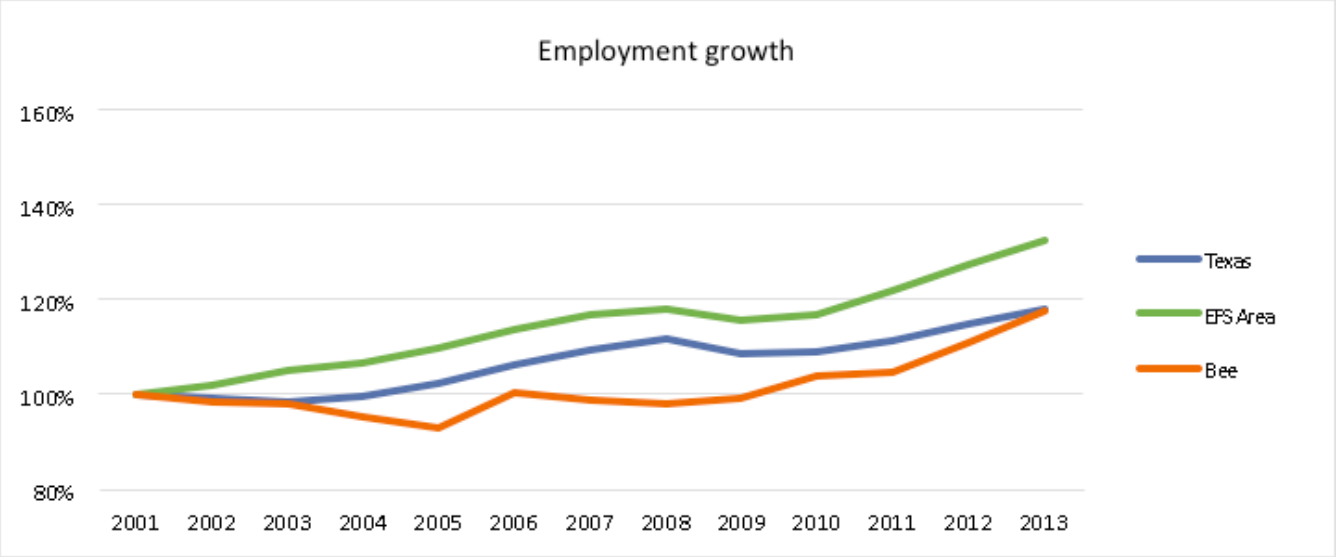
Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.2 Bee

5.3.2.1 Job growth comparison

Bee County employment growth has been steady at around six percent annual growth in 2012 and 2013.

FIGURE 5-6

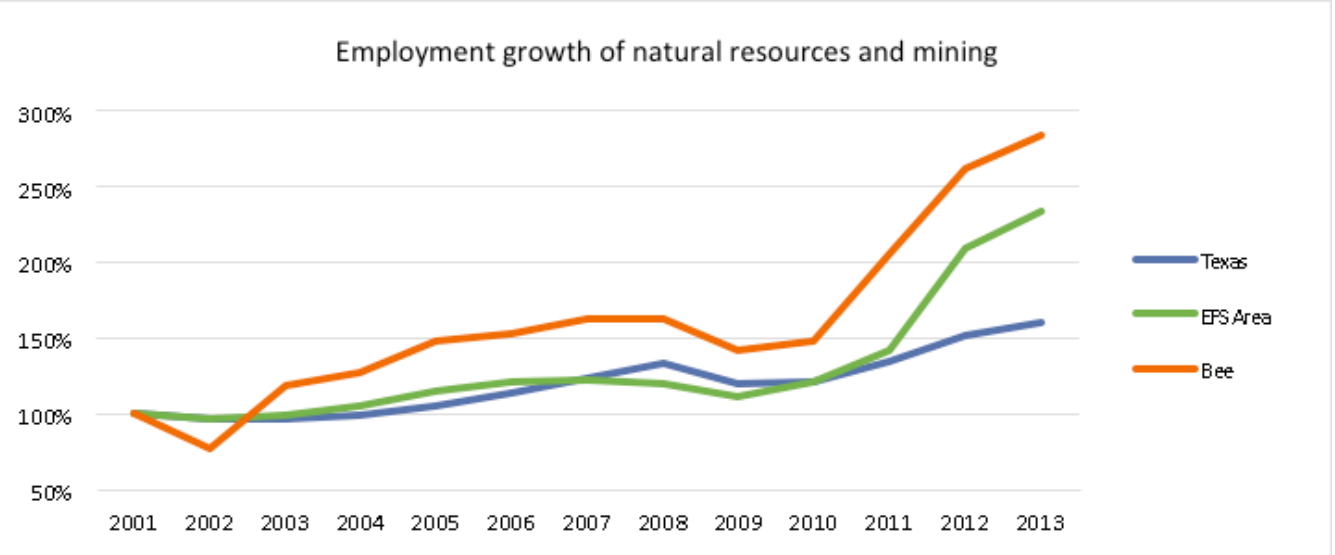


Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.2.2 Natural resource and mining employment growth comparison

Bee County's increase in NRM employment began accelerating quickly in 2011 at 38.7 percent. In 2011 to 2013, energy-related employment grew from 638 to 883. In 2012 the increase was 14.7 percent and in 2013 the increase was 29.4 percent.

FIGURE 5-7



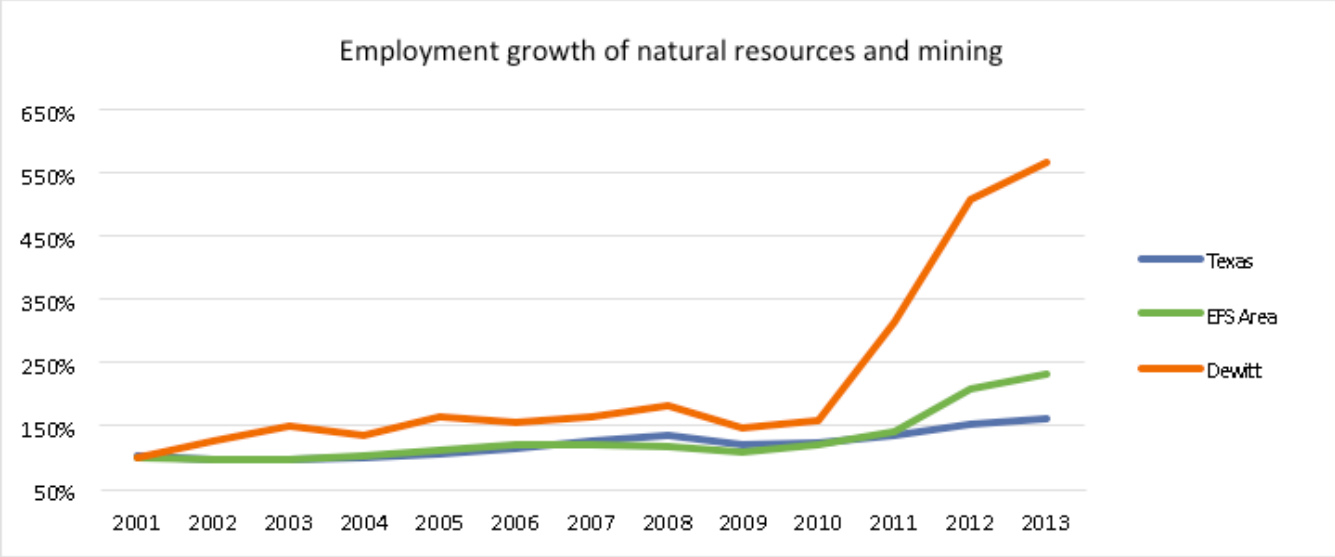
Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.3 DeWitt

5.3.3.1 Natural resource and mining employment growth comparison

DeWitt County energy-related employment nearly doubled in 2011, and then increased another 61.5 percent in 2012.

FIGURE 5-8



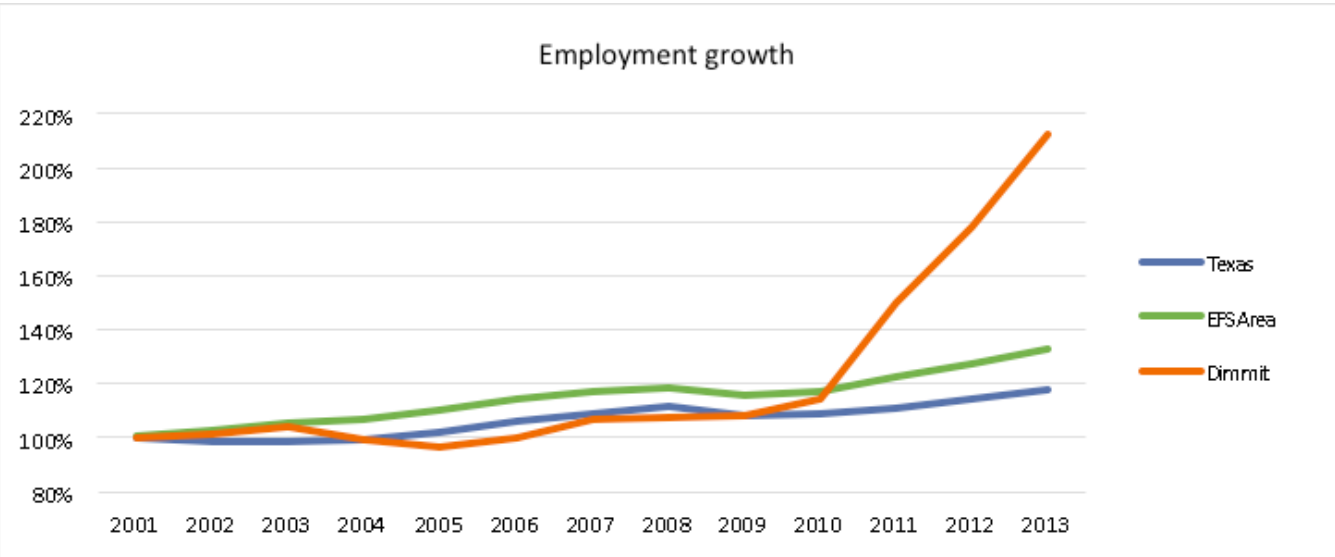
Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.4 Dimmit

5.3.4.1 Job growth comparison

Dimmit County job growth accelerated rapidly in 2011 at 31.4 percent. Annual job growth remained strong at 18.4 percent in 2012 and 19.4 percent in 2013.

FIGURE 5-9

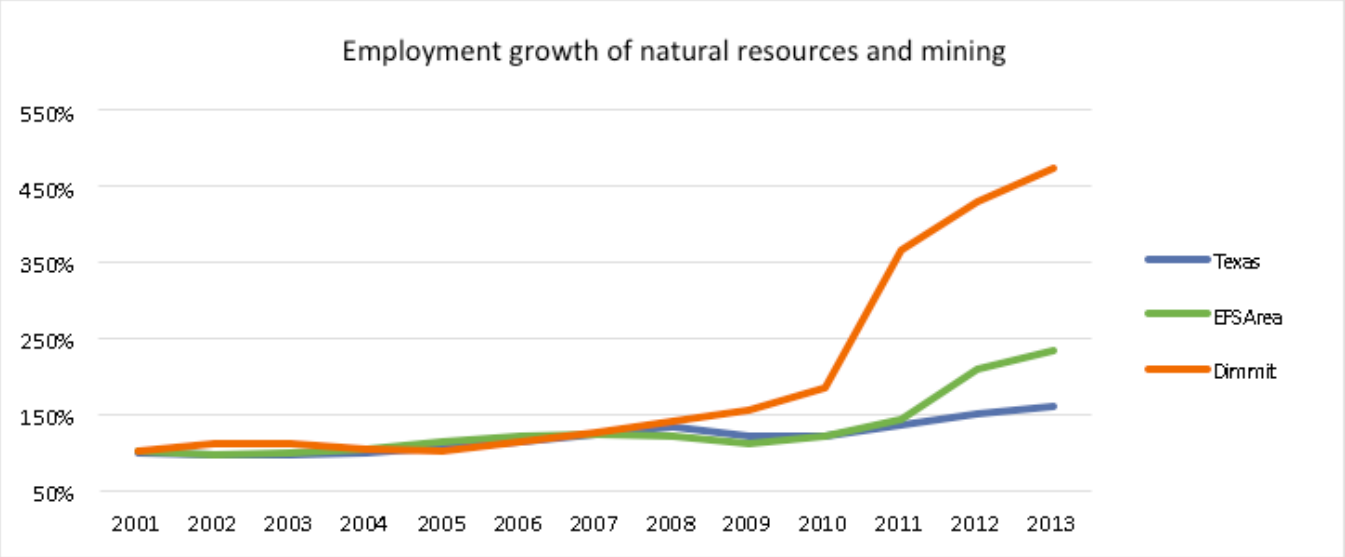


Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.4.2 Natural resource and mining employment growth comparison

In 2011, Dimmit County energy-related employment nearly doubled from 602 to 1,187. By 2013 that number had grown to 1,533, an increase of ten percent over the previous year.

FIGURE 5-10



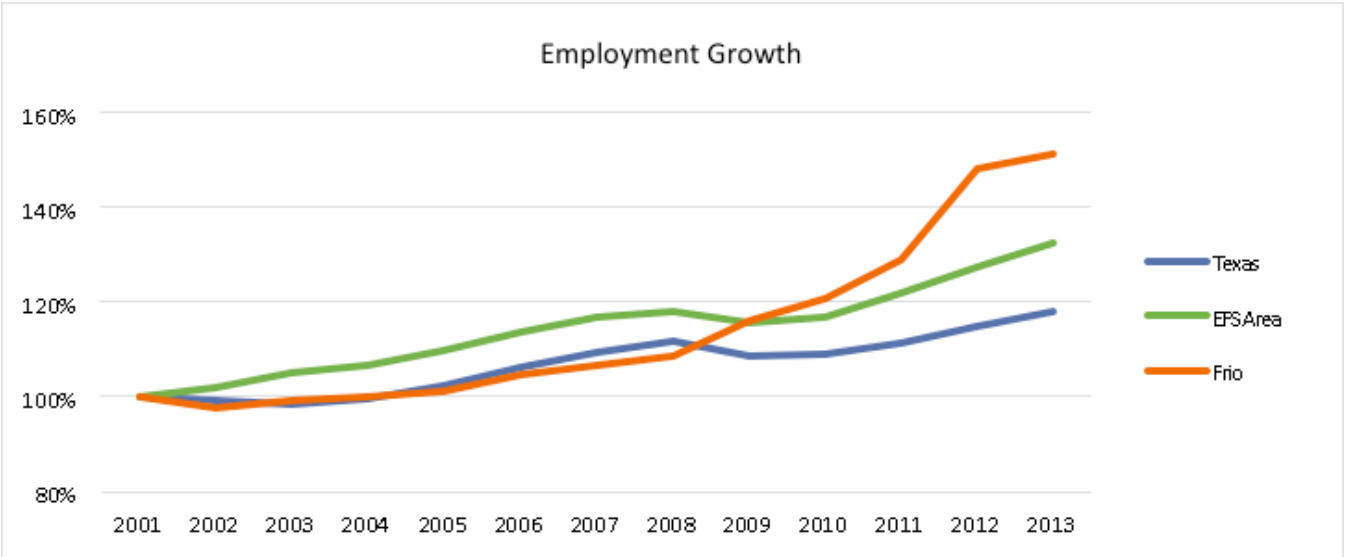
Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.5 Frio

5.3.5.1 Job growth comparison

Frio County overall job growth increased 6.8 percent in 2011 and 14.7 percent in 2012 and has since remained steady.

FIGURE 5-11



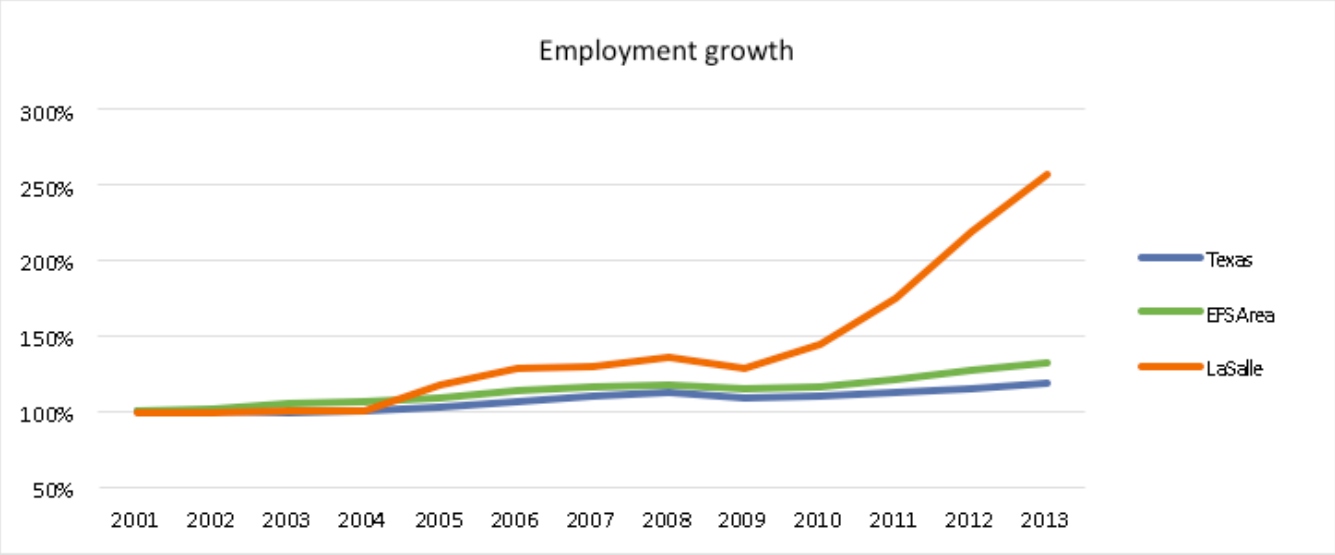
Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.6 Karnes

5.3.6.1 Job growth comparison

Karnes County had seen declining employment until 2011, when job growth went from 3,716 to 4,769 in 2013.

FIGURE 5-12

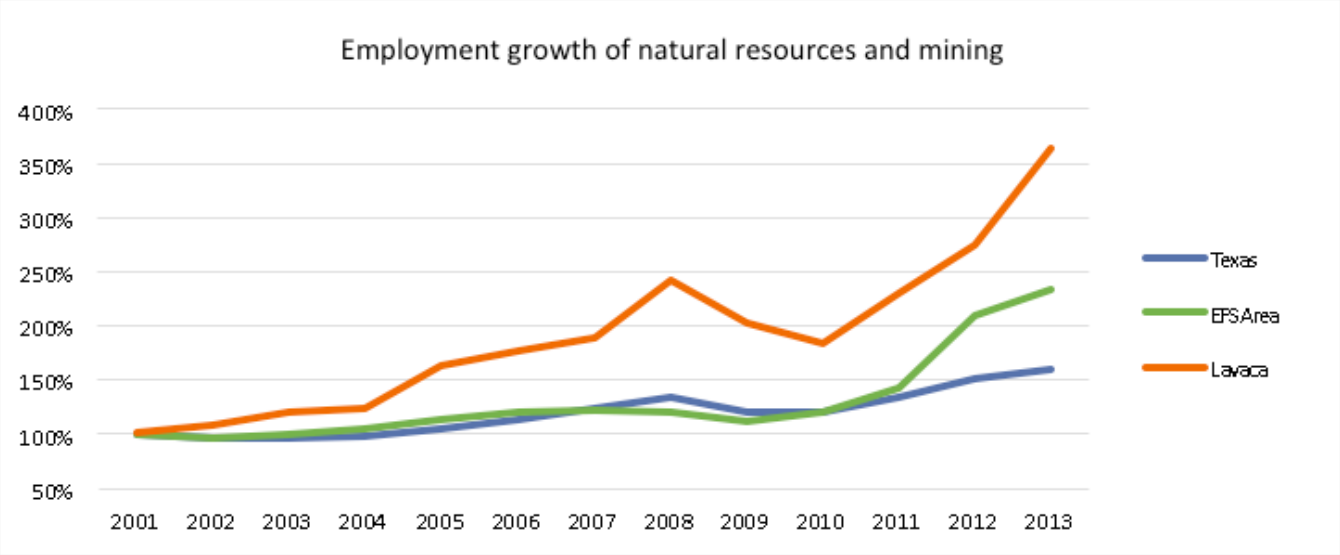


Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.6.2 Natural resource and mining employment growth comparison

Karnes County had significantly higher energy-related employment growth starting in 2010 at 24.2 percent. In 2011 energy-related employment grew at a 50 percent rate. In 2012, the increase was 57.7 percent, and in 2013 energy-related employment grew another 45.9 percent.

FIGURE 5-13



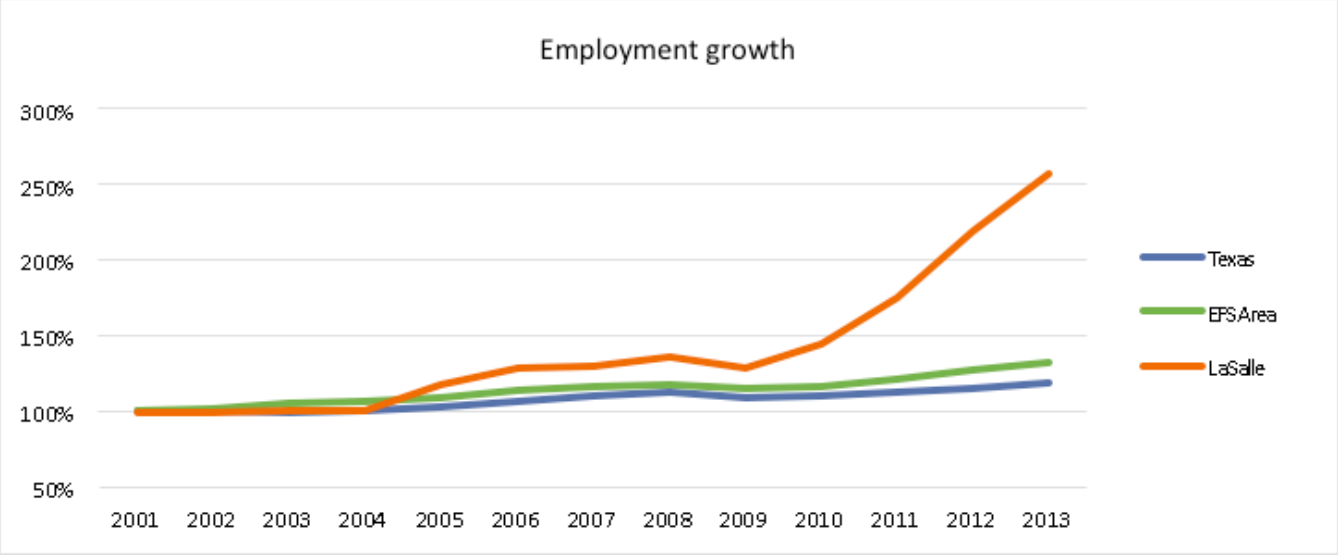
Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.7 La Salle

5.3.7.1 Job growth comparison

La Salle has seen steady overall job growth since 2010 when it was 12.7 percent. In 2011 the growth rate was 21.5 percent. In 2012 job growth in La Salle County was 25 percent and in 2013 it was 17.1 percent. In 2009, total employment in La Salle County was down to 1,621, but by 2013 it had grown to 3,252.

FIGURE 5-14



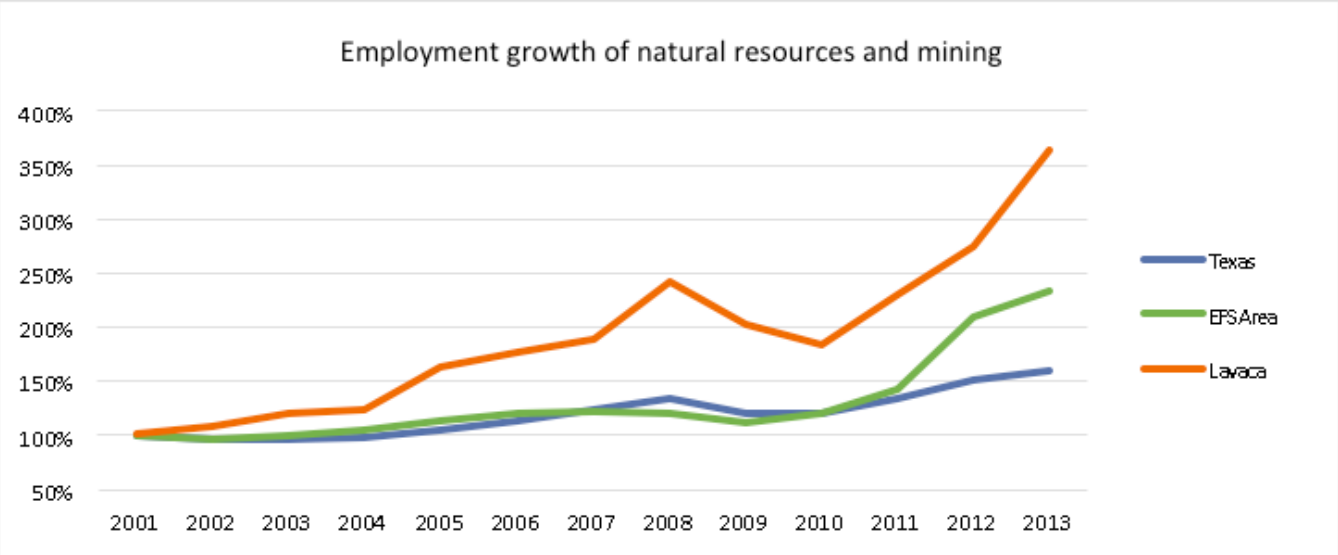
Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.8 Lavaca

5.3.8.1 Natural resource and mining employment growth comparison

Lavaca County saw an increase in energy-related employment of 180 jobs between 2010 and 2013, recovering 60 jobs that were lost between 2008 and 2010. It is evident that there has been a significant growth in natural resources and mining jobs over the years. In fact, 2013 shows that there were 3.6 times more than 2001.

FIGURE 5-15



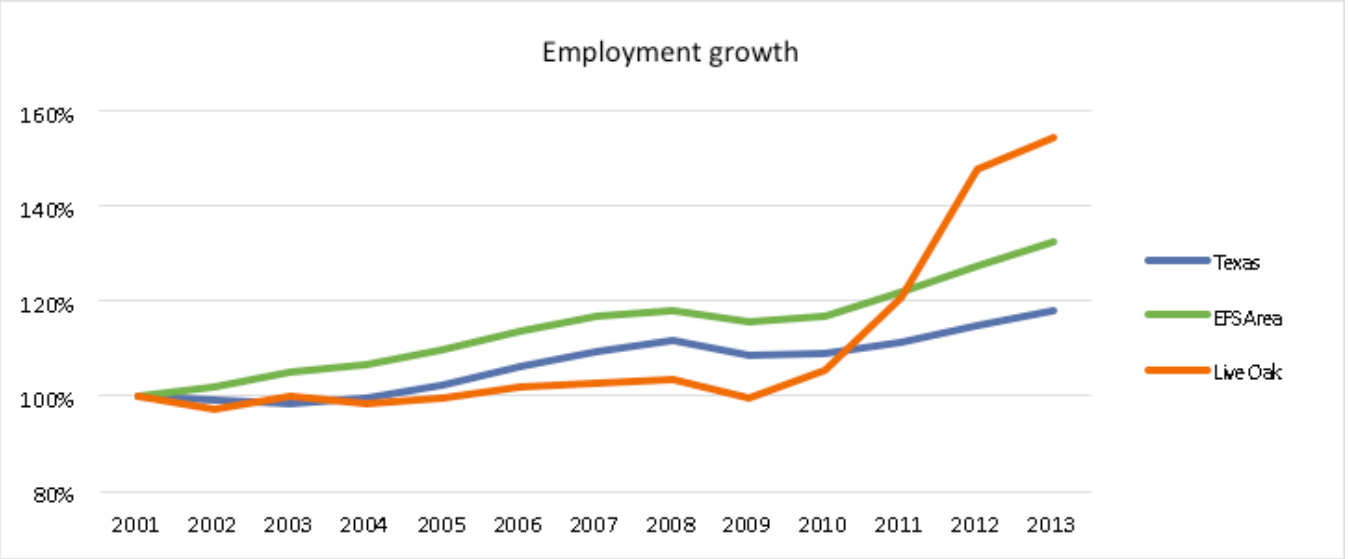
Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.9 Live Oak

5.3.9.1 Job growth comparison

Live Oak County experienced moderate to no job growth until 2009. In 2013, there were nearly 1,600 more jobs (1.5 times more) than in 2009, half of which appeared in 2012.

FIGURE 5-16



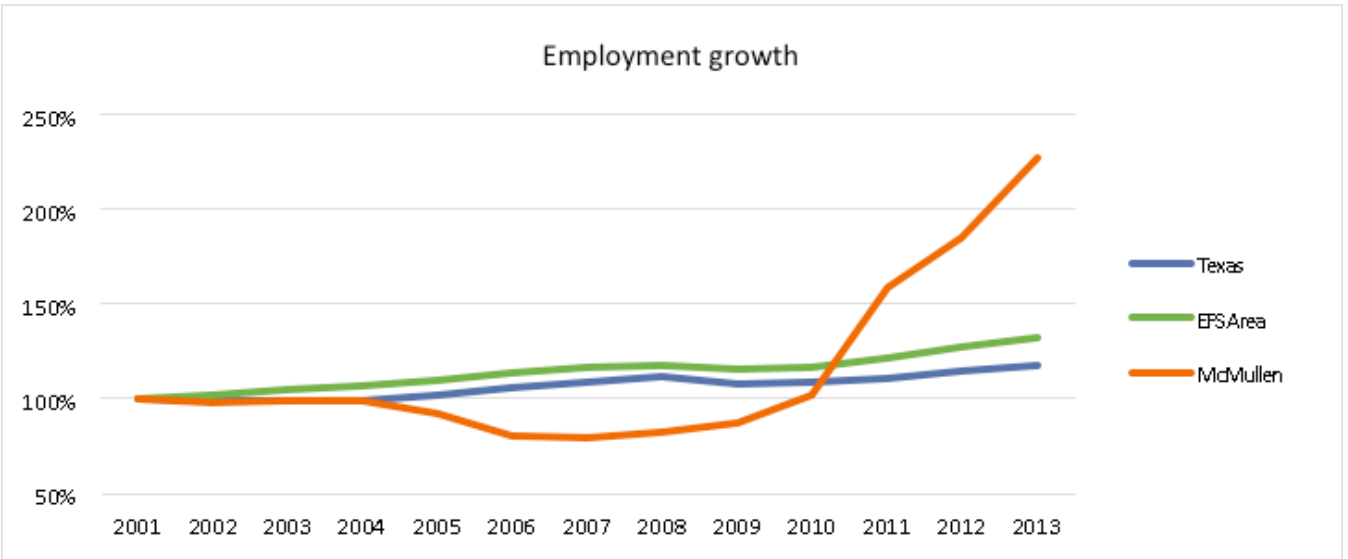
Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

5.3.10 McMullen

5.3.10.1 Job growth comparison

McMullen County experienced a decline of 20 percent during the recession but in 2010, resumed the number of pre-recession jobs. Between 2010 and 2013, McMullen County saw an increase of more than 300 jobs, more than doubling the jobs since 2001.

FIGURE 5-17



Source: Texas Workforce Commission, Quarterly Census of Employment and Wages

Pleasanton

Pleasanton is located in Atascosa County on U.S. Highway 281 near IH-37, about 20 miles south of San Antonio. Pleasanton was the county seat from its founding in 1858 until 1910, at which time it was moved to nearby Jourdanton. Officially the city's population is 8,200 but city manager Bruce Pearson thinks that it is more like 13,000. It is known as the birthplace of the Cowboy. Like many communities, there is a shortage of housing in Pleasanton.

Pleasanton has access to ample water supplies - approximately twice its current usage of 1.2 million gallons per day has been permitted. With some cities in Texas literally running out of water, Pleasanton is well positioned for growth.

Renovation of downtown buildings for the library and civic center, which face Highway 281 were completed in February. The city is also planning a park expansion, playing field improvements, and walking paths.

The activity in the Eagle Ford has had its impact on city staffing. City Manager Bruce Pearson estimates that 30% of its workforce has left for the oilfield. The city manager's office has been developing more systematic approaches to capacity building of staff. Job descriptions have been re-written, and incentives along with clearly-defined pay levels have been established for education, licensing and certification of city staff.

Housing is in short supply, so in order to address the issue, 130-150 lots are slated for development in the $50,000 to $120,000 price range. In the last phase of one of Pleasanton's subdivisions, there are 66 lots where the houses are expected to sell for between $190,000 and $260,000. At least two other subdivisions are being developed, along with multi-family apartments, and a possible 101-unit condominium project.

6 Oil and Natural Gas Production

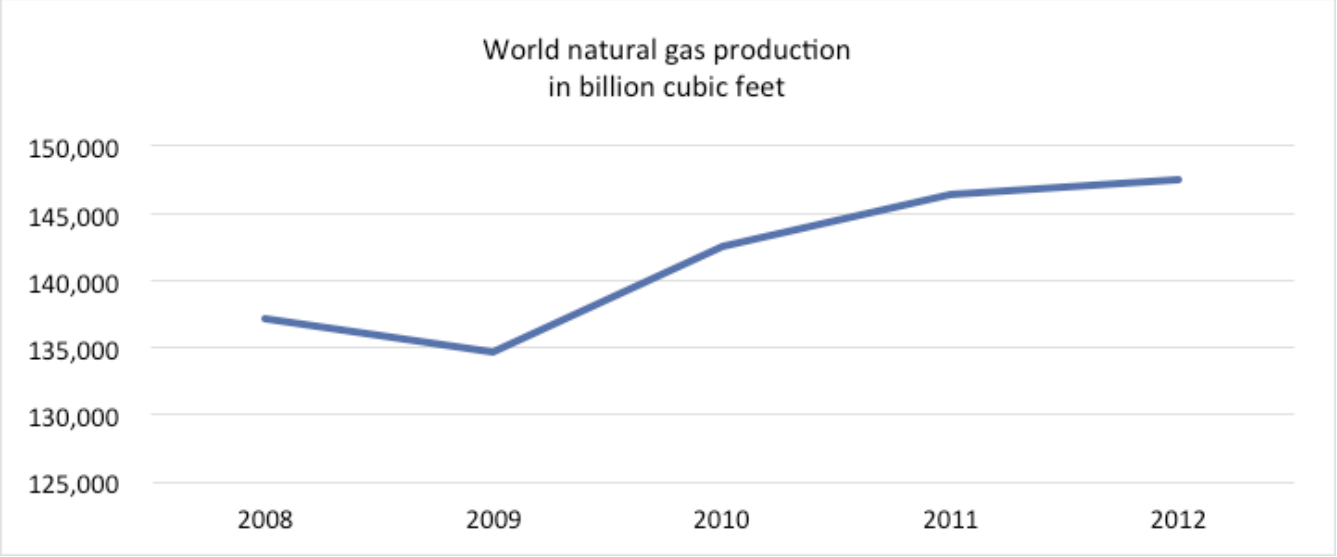
The last five years have seen substantial increases in oil and gas production in the United States, much that fueled by production in Texas.

6.1 World

6.1.1 Natural gas

World natural gas production has increased by approximately seven percent since 2008. However, overall global growth has slowed in the last few years. Year-over-year growth was less than one percent between 2011 and 2012.

FIGURE 6-1



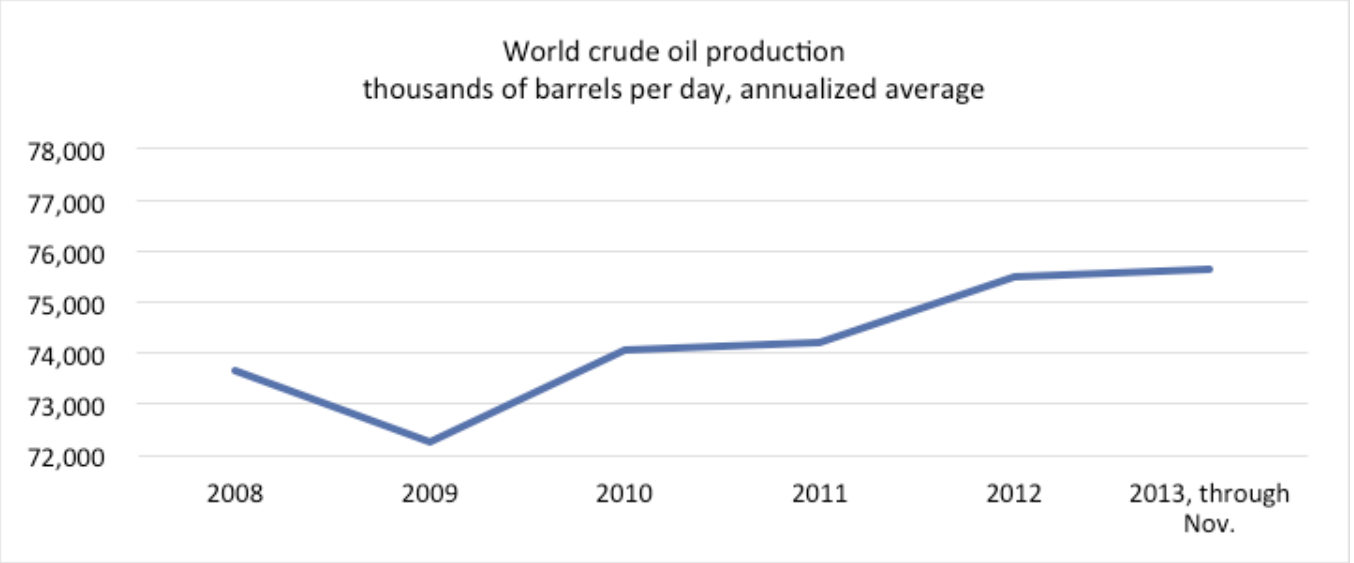
Source: Energy Information Administration, International Energy Statistics

6.1.2 Crude oil

World crude oil production has been relatively flat, increasing by only two percent in the last five years, from an average of 73,661 thousand barrels per day in 2008, to 75,647 thousand barrels per day in the second half of 2013.

According to the Energy Information Administration, OPEC production decreased by 900,000 barrels in 2013, though that amount was offset by production in the United States, as is shown in the section below.[18]

FIGURE 6-2

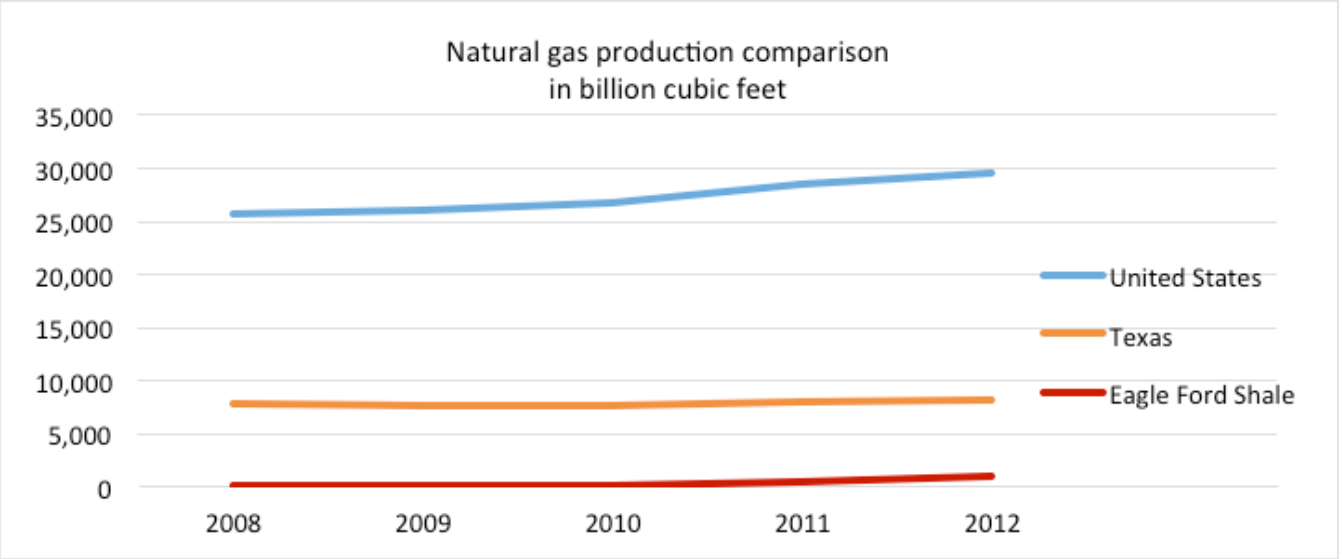


Source: Energy Information Administration, February 2014 Monthly Energy Review

6.2 U.S., Texas, and Eagle Ford Shale

6.2.1 Natural gas

FIGURE 6-3

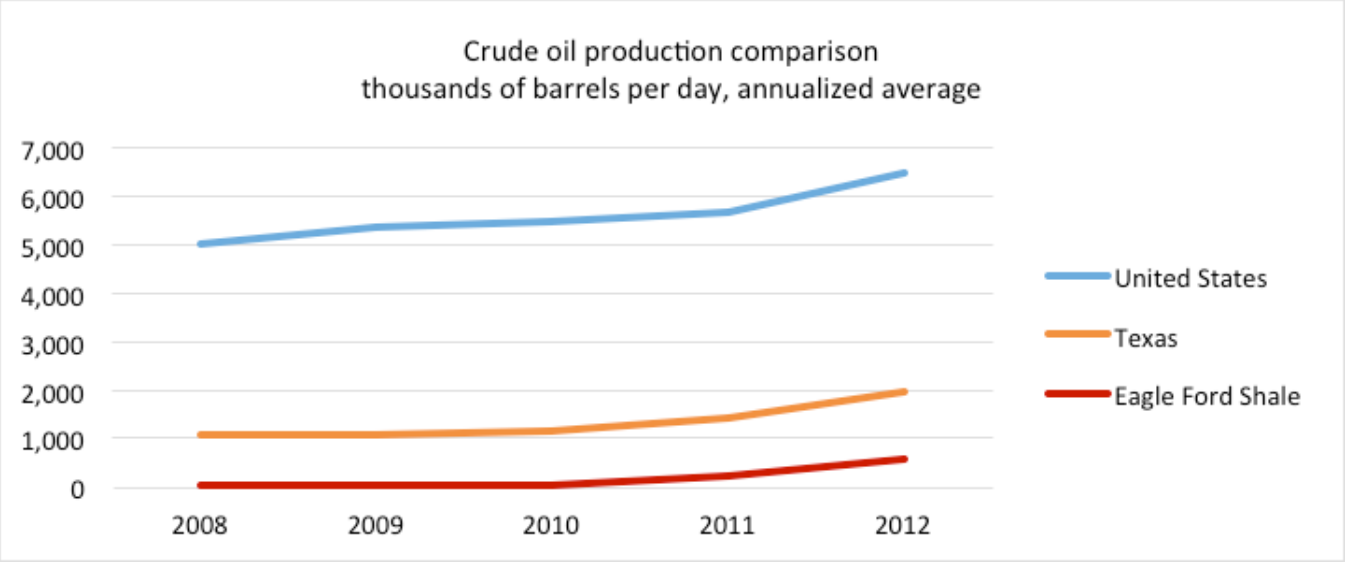


Source: Energy Information Administration, DI Desktop

[18] Energy Information Administration. U.S. crude oil production growth contributes to global oil price stability in 2013. January 9 2014.

6.2.2 Crude oil

FIGURE 6-4



Source: Energy Information Administration, DI Desktop

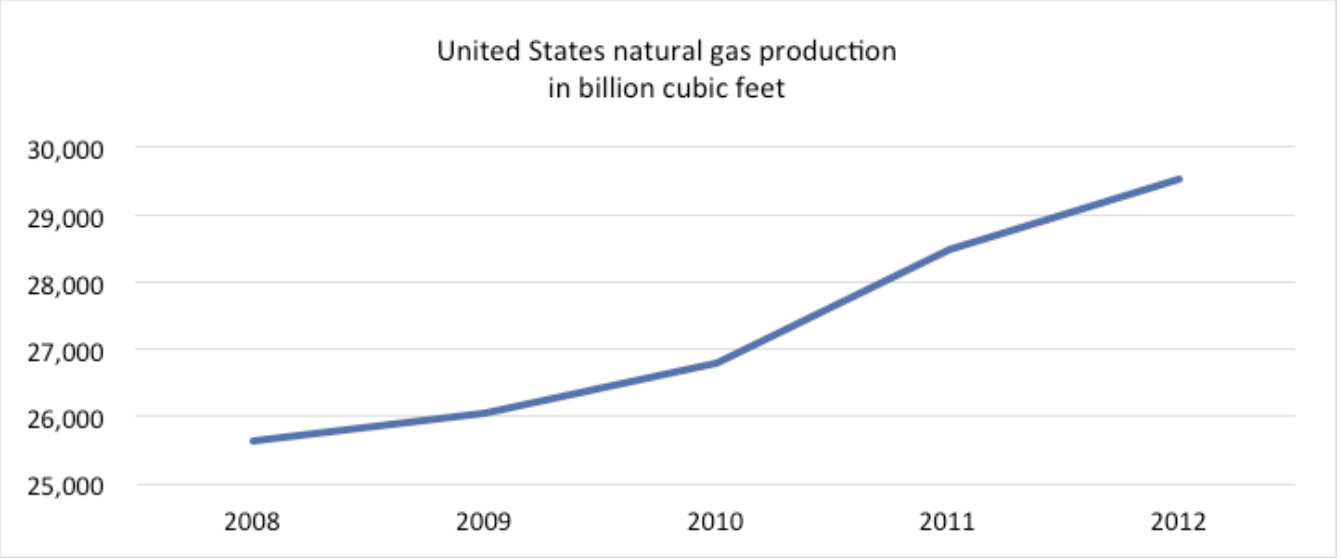
6.3 United States

6.3.1 Natural gas

Natural gas production in the United States has outpaced global production, increasing by about 13 percent since 2008.

It is worth noting that natural gas production in the United States increased year-over-year for 2012, by 1,063 billion cubic feet (bcf), while global production increased by only 1,056 bcf.

FIGURE 6-5



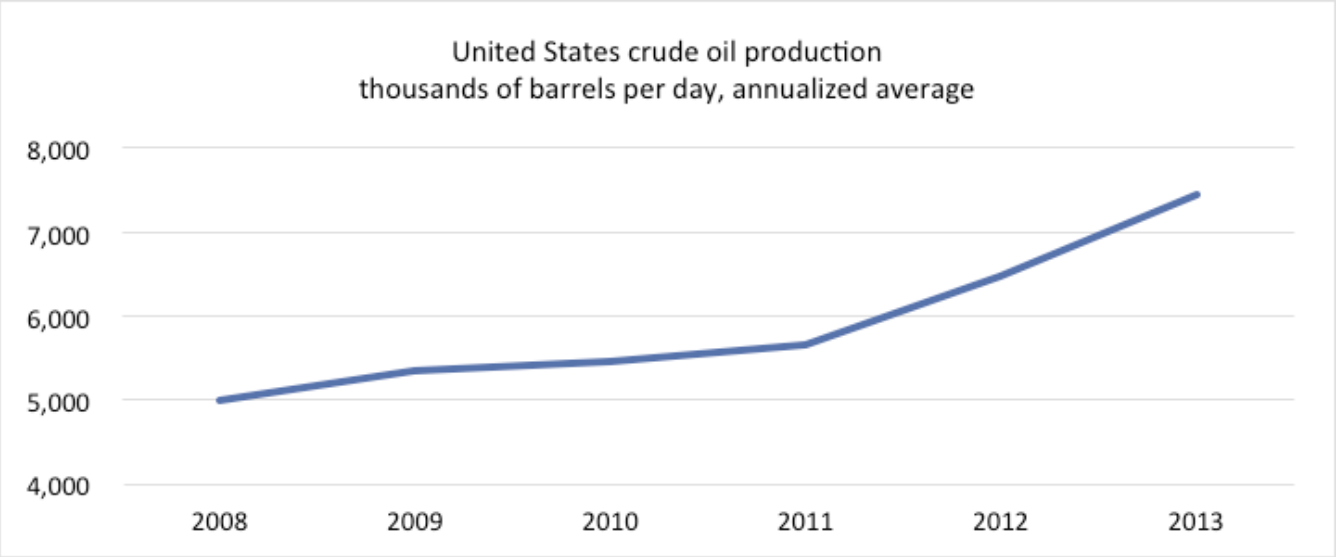
Source: Energy Information Administration's International Energy Statistics

6.3.2 Crude oil

In the United States, increased production in fields such as the Bakken, the Permian Basin, and the Eagle Ford Shale has contributed to a nearly 50 percent jump in production between 2008 and the end of 2013, averaging 14 percent year-over-year increases since 2011.

As the Energy Information Administration noted, for 2013 "domestic crude oil production increased 1.0 million bbl/d—rising more than the combined increases in the rest of the world—to reach its highest level in 24 years. This increase marked the largest observed annual increase in U.S. history."

FIGURE 6-6



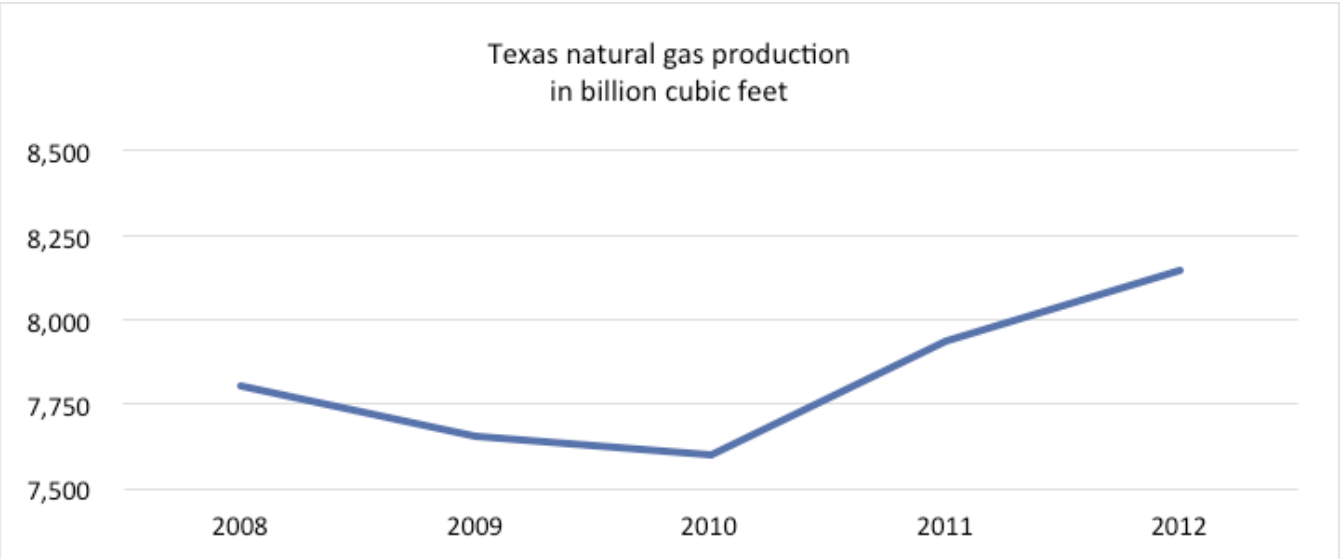
Source: Energy Information Administration, February 2014 Monthly Energy Review

6.4 Texas

6.4.1 Natural gas

Natural gas production in the Texas has fluctuated over the last five years, but has been on a steady increase since 2010. Natural gas production in Texas accounts for around 31 percent of total U.S. production.

FIGURE 6-7



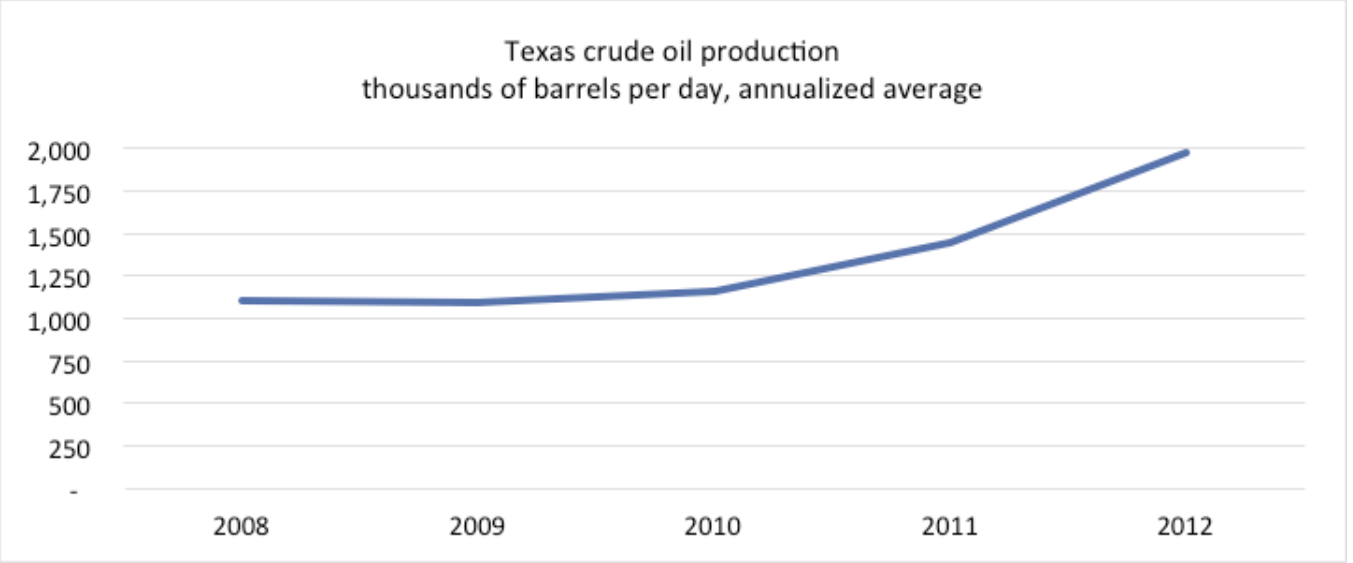
Source: Energy Information Administration's Natural Gross Withdrawals and Production Report

6.4.2 Crude oil

Oil production in Texas accounts for about 27 percent of all crude oil production in the U.S.

Mirroring the trend in the U.S. as a whole, crude oil production in Texas has increased significantly over the last five years. From 2008 to 2013, oil production went from around 1,100,000 barrels per day (bbl/d) to around 2,000,000 bbl/d.

FIGURE 6-8



Source: Energy Information Administration Petroleum and Other Liquids' Crude Reserves and Production Database

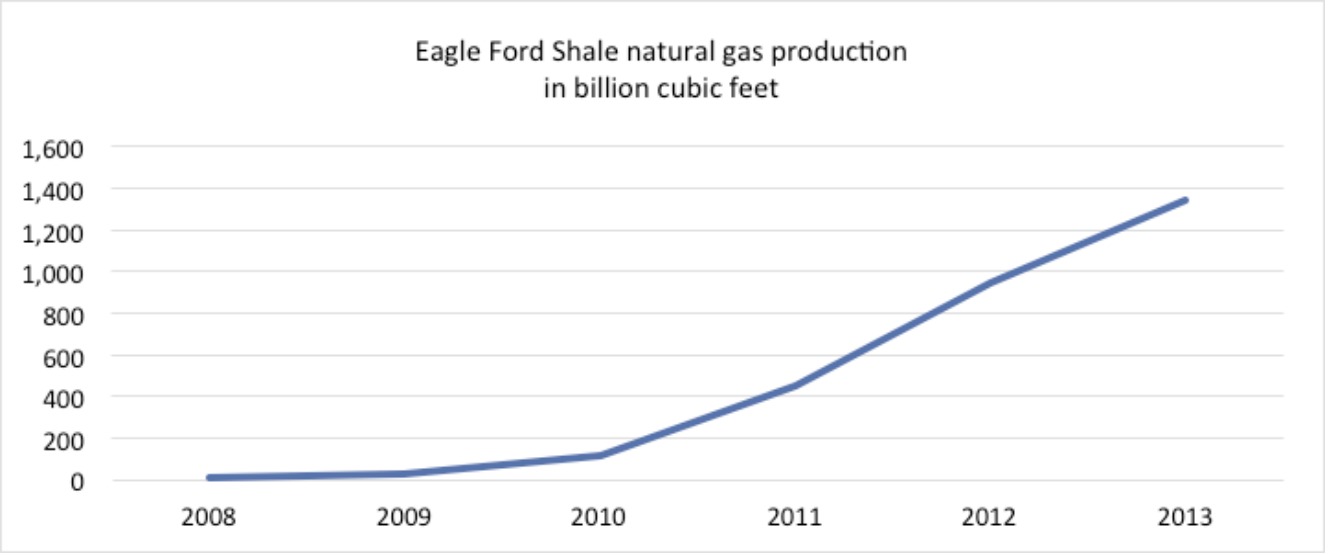
6.5 Eagle Ford Shale

6.5.1 Natural gas

Natural gas production in the Eagle Ford Shale, like oil production, began at near-zero in 2008 but surged by 2013 to almost 1,350 bcf.

By 2012, the last year for which comparable statistics are available, the Eagle Ford Shale was producing more than 940 bcf annually, accounting for a tenth of the total production in Texas. Natural gas production increased by 42 percent in 2013.

FIGURE 6-9



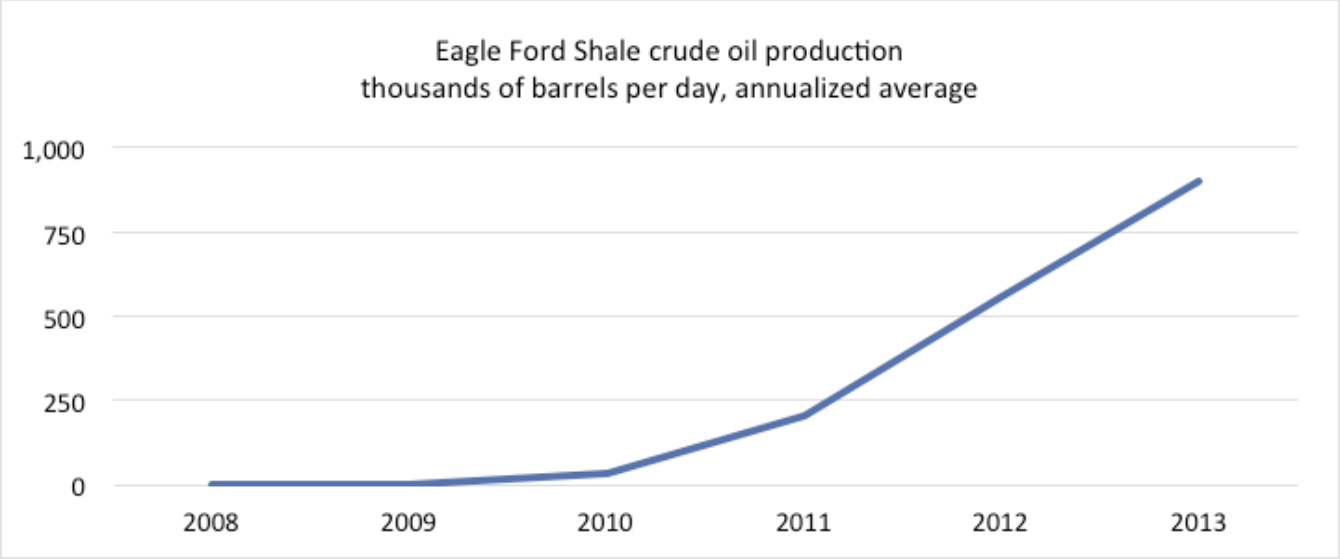
Source: DI Desktop

6.5.2 Crude oil

Much of crude oil production increases came from the Eagle Ford Shale. Starting at near zero in 2008, production has quickly ramped to over 900,000 bbl/d in 2013.

Part of this can be attributed to the sheer number of oil rigs operating in the region: out of 831 drilling rigs operating in Texas at the end of November 2013, 226 were in the Eagle Ford Shale region according to Baker Hughes. Additionally, data from the EIA shows that efficiency per rig is improving by approximately 14 bbl/d month-over-month, from 438 bbl/d to 452 bbl/d.[19]

FIGURE 6-10



Source: DI Desktop

[19] Energy Information Administration's Drilling Productivity Report, February 2014. http://www.eia.gov/petroleum/drilling/pdf/dpr-full.pdf

6.5.3 Production of crude and natural gas by county

Production of crude oil and natural gas for each of the 15 counties in the Eagle Ford Shale is shown below. Note that production for crude oil is measured in total annual production, not in barrels per day as shown in the charts in the previous section.

Table 6-1

Natural gas production by county for 2013				
County	**Directional production**	**Horizontal production**	**Vertical production**	**Total production**
Atascosa	-	9,925,276	-	9,925,276
Bee	-	6,470,296	-	6,470,296
DeWitt	169,005	183,798,053	-	183,967,058
Dimmit	-	191,472,851	1,518	191,474,369
Frio	19,675	3,018,960	14,920	3,053,555
Gonzales	-	52,381,777	23,987	52,405,764
Karnes	-	175,271,610	36,128	175,307,738
La Salle	-	203,547,522	85,426	203,632,948
Lavaca	-	5,487,512	-	5,487,512
Live Oak	-	80,161,211	49,207	80,210,418
Maverick	-	2,215,988	1,343	2,217,331
McMullen	-	100,627,446	10,645	100,638,091
Webb	-	368,601,051	17,371,625	385,972,676
Wilson	-	1,431,741	-	1,431,741
Zavala	-	1,193,667	3,058	1,196,725
Total	**188,680**	**1,385,604,961**	**17,597,857**	**1,403,391,498**

Source: DI Desktop

Table 6-2

Crude oil production by county for 2013				
County	**Directional production**	**Horizontal production**	**Vertical production**	**Total production**
Atascosa	-	12,398,569	-	12,398,569
Bee	-	138,286	-	138,286
DeWitt	67,254	45,954,260	-	46,021,514
Dimmit	-	41,083,627	6,279	41,089,906
Frio	1,167	2,511,026	1,209	2,513,402
Gonzales	-	41,417,761	26,782	41,444,543
Karnes	-	76,981,992	21,252	77,003,244
La Salle	-	50,345,340	106,693	50,452,033
Lavaca	-	3,915,378	-	3,915,378
Live Oak	-	14,834,066	12,201	14,846,267
Maverick	-	215,975	276	216,251
McMullen	-	30,388,873	26,874	30,415,747
Webb	-	15,347,037	897,671	16,244,708
Wilson	-	3,593,810	-	3,593,810
Zavala	-	3,609,257	10,054	3,619,311
Total	**68,421**	**342,735,257**	**1,109,291**	**343,912,969**

Source: DI Desktop

6.5.4 Associated gas production

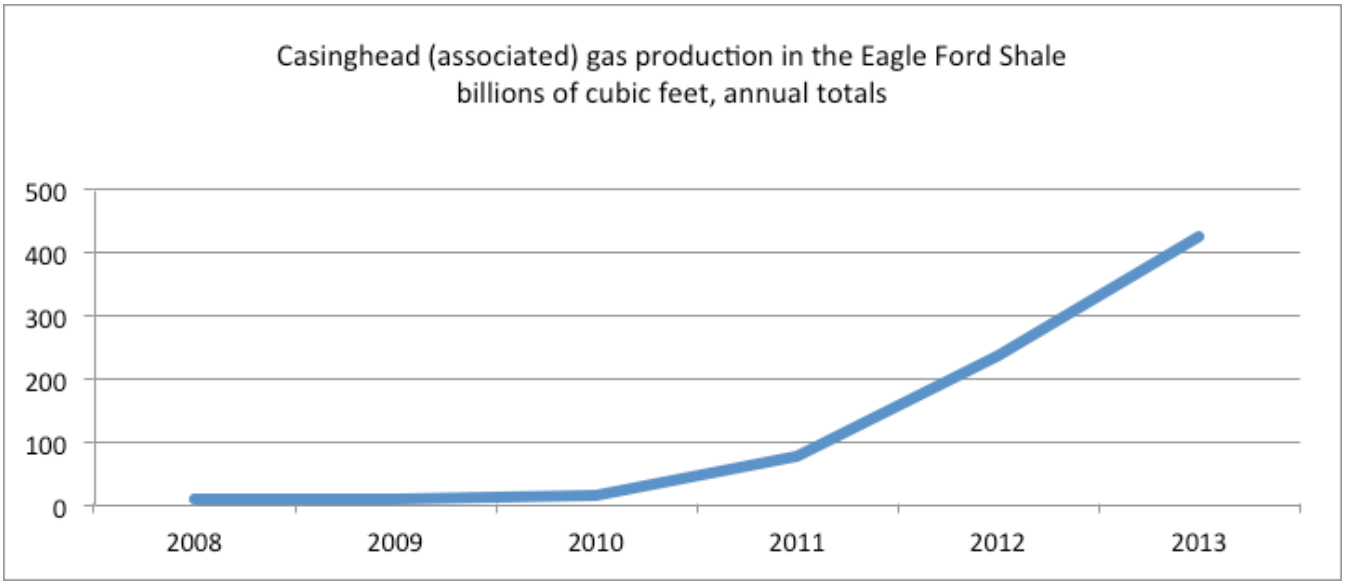
Associated gas, also known as casinghead gas, is natural gas that is produced as a by-product of the production and extraction of crude oil.

In the past, this gas was burned off in a process known as "flaring", which occurred because pipeline infrastructure was not be in place, for safety reasons, or for production testing.

However, because of local regulations and the increased accessibility to distribution networks, much of the natural gas that would have previously been flared in Texas is now captured. It is then either used on-site or sold in the market. Texas has a 0.8 percent flare rate,[20] compared to North Dakota's 29 percent.[21] This is largely due to the existing infrastructure for transport to storage or refineries.

As crude oil production in Texas has increased, so has the volume of associated natural gas that is produced in tandem.

FIGURE 6-11



Source: Texas Railroad Commission, General Production Query

As a result of these factors, associated gas is becoming a significant percentage of the total gas production in Texas.

According to an EIA report, associated gas production from oil wells in the Eagle Ford Shale recently overtook gas production from dedicated natural gas wells. This is a trend that seems likely to continue. According to the EIA's Drilling Productivity Report, while oil rig efficiency (measured as the increase in barrels per day month-over-month) is increasing by almost 1.3 percent, gas rig efficiency (in thousands of cubic feet month-over-month) is only increasing by around 0.2 percent.

6.5.5 Wells by type

6.5.5.1 Directional, horizontal, vertical wells by county

The section below shows that horizontal wells still dominate the drilling landscape in the Eagle Ford Shale, with directional wells and horizontal wells making up a very small fraction of total drilling activity.

[20] Texas Railroad Commission, (2014). Flaring regulation. Available at http://www.rrc.state.tx.us/about-us/resource-center/faqs/oil-gas-faqs/faq-flaring-regulation/
[21] Salmon, R., Logan, A., (July 2013). Flaring up: North Dakota natural gas flaring more than doubles in two years. Available at http://www.ceres.org/resources/reports/flaring-up-north-dakota-natural-gas-flaring-more-than-doubles-in-two-years

Table 6-3

Directional wells per county in 2013					
County	**Completed wells**	**Completed wells with first production**	**First production wells**	**Last production wells**	**Adjusted completed wells**
Atascosa	0	0	0	0	0
Bee	0	0	0	0	0
DeWitt	3	0	0	3	3
Dimmit	0	0	0	0	0
Frio	1	1	1	1	1
Gonzales	0	0	0	0	0
Karnes	0	0	0	0	0
La Salle	0	0	0	0	0
Lavaca	0	0	0	0	0
Live Oak	1	0	0	0	1
Maverick	0	0	0	0	0
McMullen	0	0	0	0	0
Webb	0	0	0	0	0
Wilson	0	0	0	0	0
Zavala	0	0	0	0	0
Total	**5**	**1**	**1**	**4**	**5**

Source: DI Desktop

Table 6-4

Horizontal wells per county in 2013					
County	**Completed wells**	**Completed wells with first production**	**First production wells**	**Last production wells**	**Adjusted completed wells**
Atascosa	125	101	140	344	152
Bee	3	3	3	21	3
DeWitt	174	145	220	664	217
Dimmit	306	292	557	1351	487
Frio	24	22	25	110	26
Gonzales	272	268	357	799	337
Karnes	429	361	512	1383	528
La Salle	358	332	587	1372	490
Lavaca	38	30	40	79	47
Live Oak	135	119	164	386	160
Maverick	0	0	6	35	6
McMullen	328	318	465	903	436
Webb	112	73	282	914	286
Wilson	43	41	50	114	51
Zavala	24	23	37	102	29
Total	**2371**	**2128**	**3445**	**8577**	**3255**

Source: DI Desktop

Table 6-5

Vertical wells per county in 2013					
County	**Completed wells**	**Completed wells with first production**	**First production wells**	**Last production wells**	**Adjusted completed wells**
Atascosa	1	0	0	0	1
Bee	0	0	0	0	0
DeWitt	2	0	0	0	2
Dimmit	7	2	2	2	7
Frio	0	0	0	1	0
Gonzales	1	0	0	4	1
Karnes	0	0	0	4	0
La Salle	5	0	1	1	6
Lavaca	3	0	0	0	3
Live Oak	1	1	1	3	1
Maverick	0	0	0	2	0
McMullen	3	0	1	1	4
Webb	25	23	24	27	26
Wilson	0	0	0	0	0
Zavala	0	0	1	5	0
Total	**48**	**26**	**30**	**50**	**51**

Source: DI Desktop

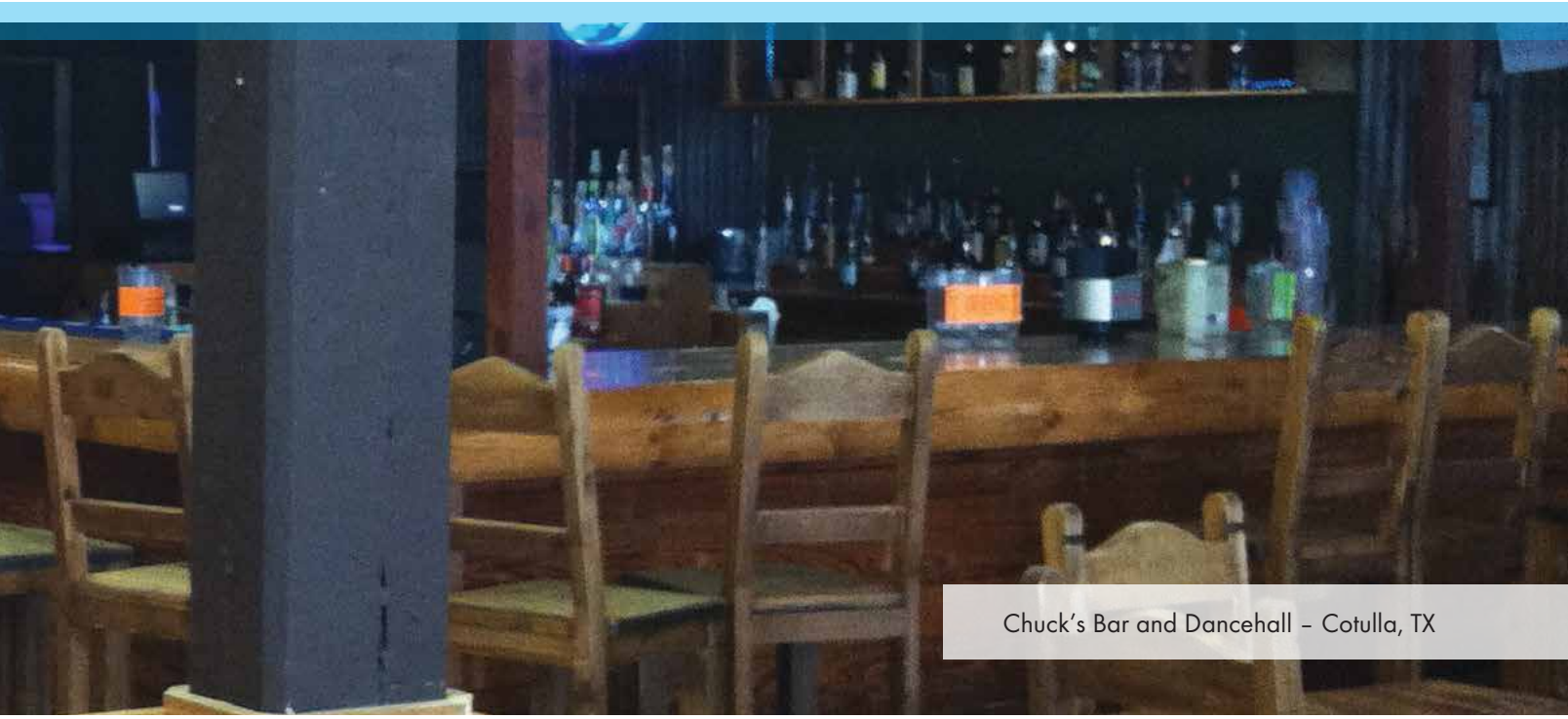
6.5.5.2 Oil, gas, and injection wells by county

The table below also shows that oil wells continue to dominate the landscape, with three oil wells to each gas well in the Eagle Ford Shale.

Table 6-6

Vertical wells per county in 2013				
County	**Oil wells**	**Gas wells**	**Injection wells**	**Total**
Atascosa	152	0	1	153
Bee	0	3	0	3
DeWitt	158	64	0	222
Dimmit	294	199	1	494
Frio	27	0	0	27
Gonzales	336	1	1	338
Karnes	438	90	0	528
La Salle	408	87	1	496
Lavaca	50	0	0	50
Live Oak	107	55	0	162
Maverick	6	0	0	6
McMullen	401	39	0	440
Webb	92	220	0	312
Wilson	51	0	0	51
Zavala	29	0	0	29
Total	**2549**	**758**	**4**	**3311**

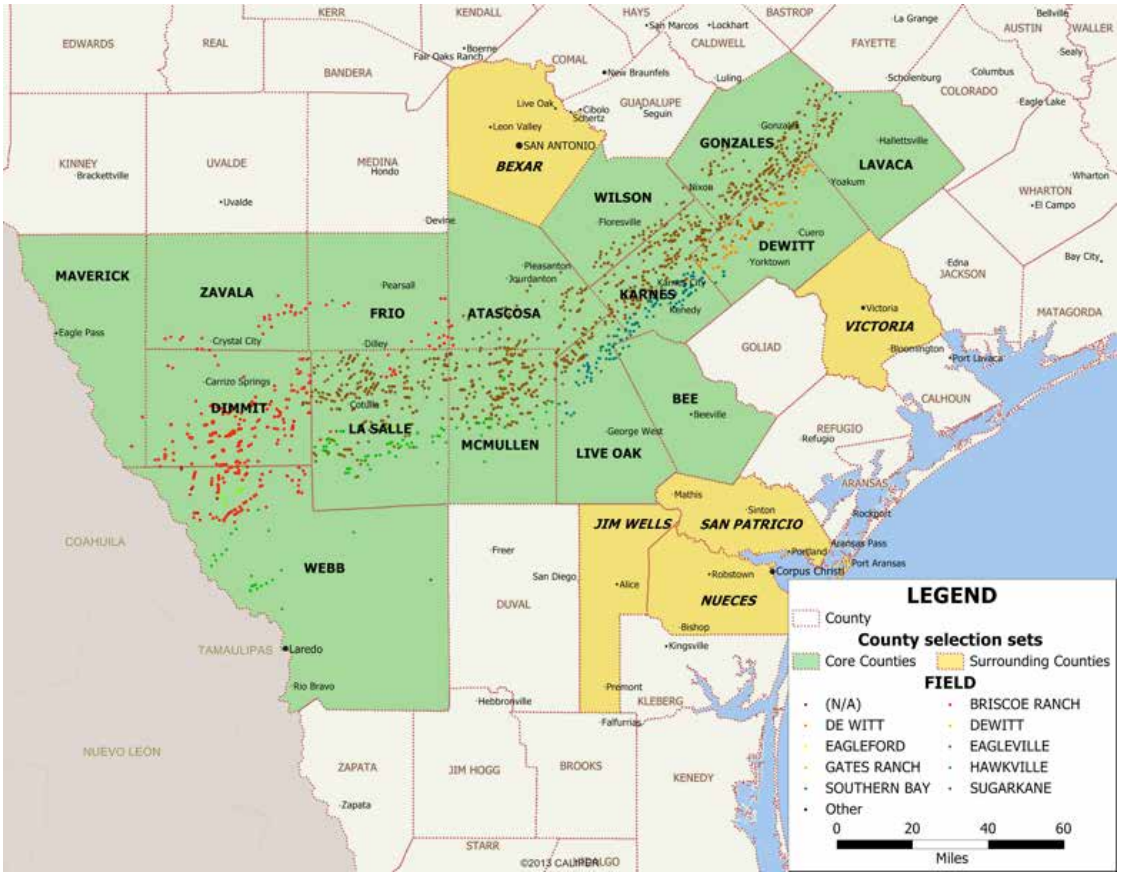
Source: DI Desktop



Chuck's Bar and Dancehall – Cotulla, TX

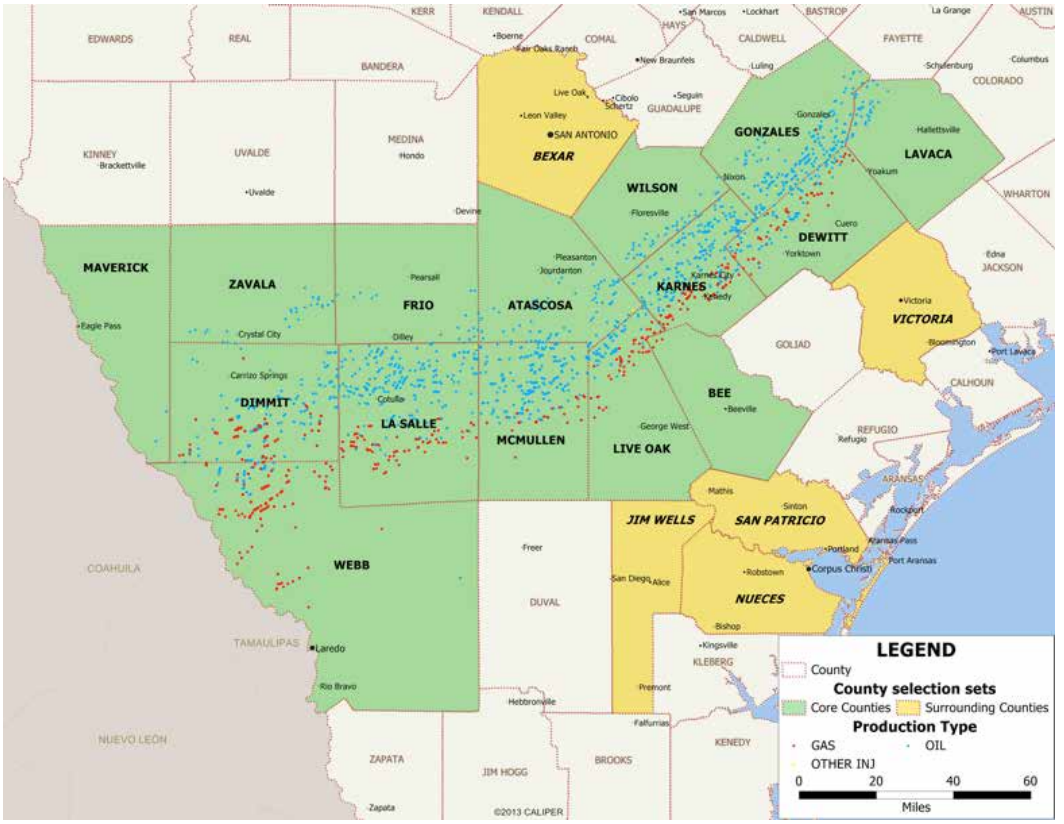
6.5.5.3 Regional well maps

FIGURE 6-12



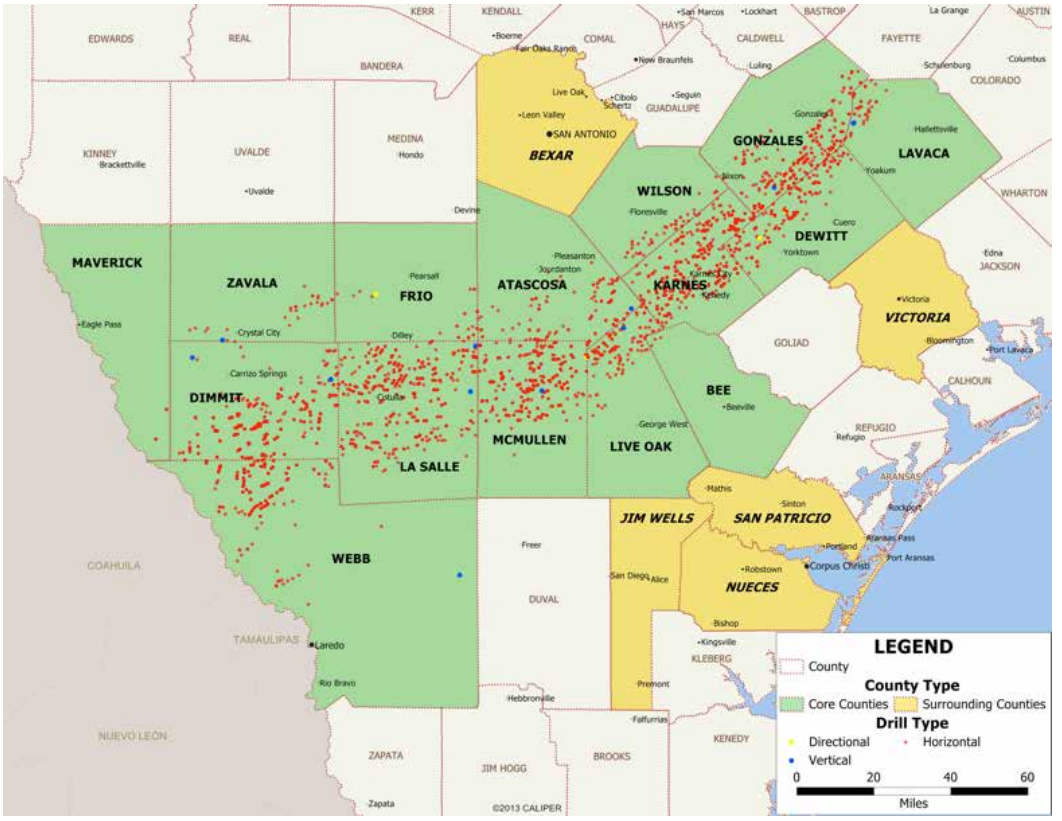
Source: DI Desktop, Texas Railroad Commission

FIGURE 6-13



Source: DI Desktop, Texas Railroad Commission

FIGURE 6-14



Source: DI Desktop, Texas Railroad Commission

6.5.5.4 Top ten operators of 2013

To estimate the impacts of drilling and completion activities in the Eagle Ford Shale region, two industries were analyzed: Drilling Oil and Gas Wells (NAICS 213111) and Support Activities for Oil and Gas Operations (NAICS 213112).

FIGURE 6-15

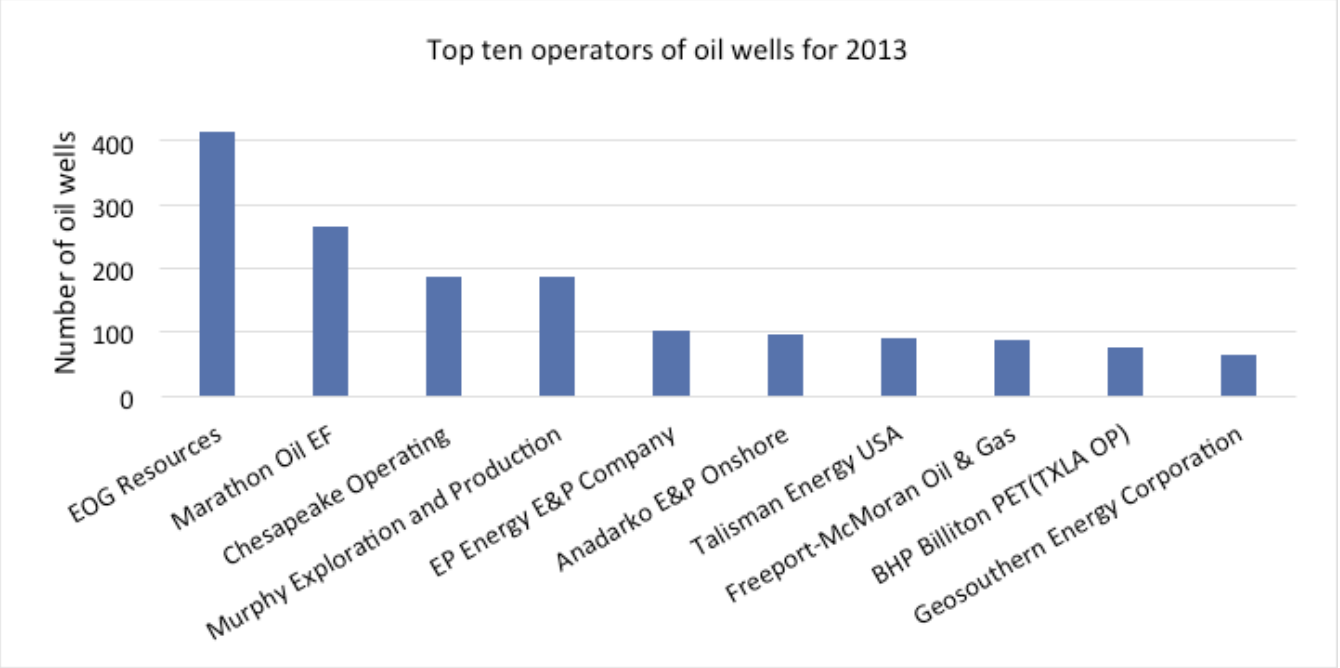
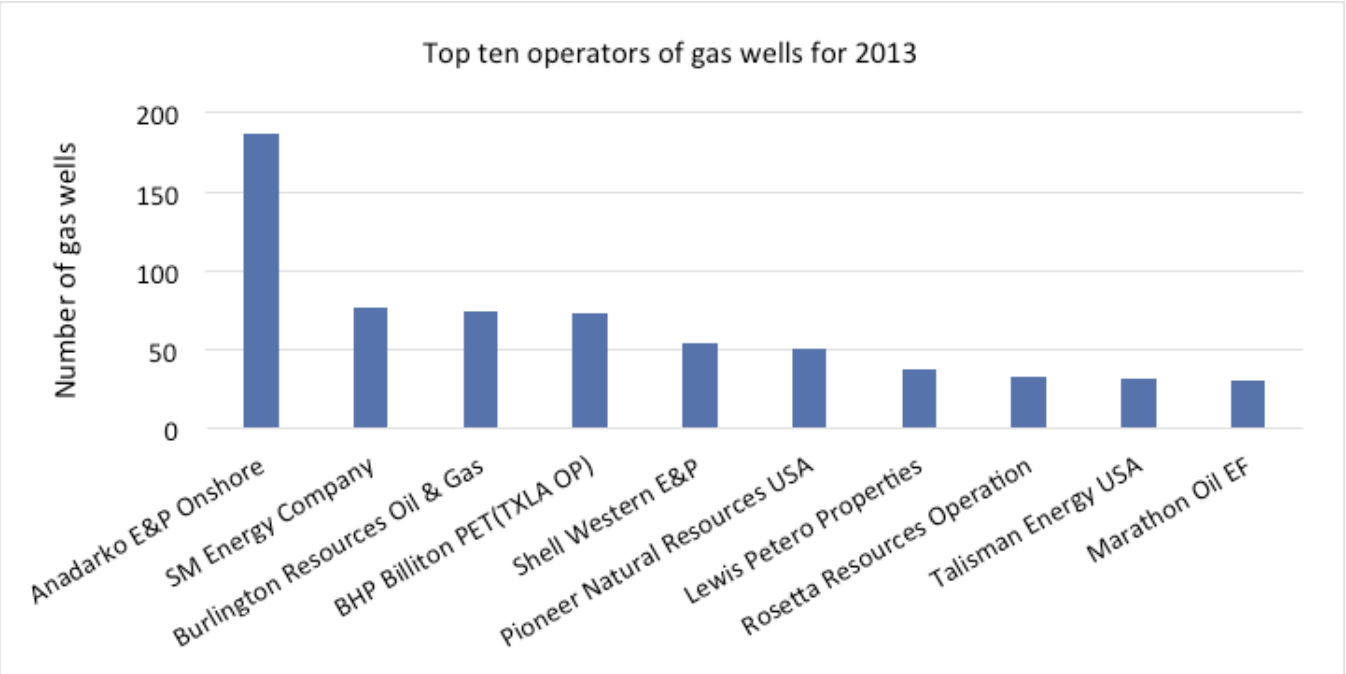


FIGURE 6-16



Source: Shale Experts

Drilling and completion activities had an estimated total impact of nearly $22.3 billion in output (revenues) in 2012 and more than $9.9 billion in gross regional product (value added), and supported roughly 46,500 full-time jobs.

Table 6-7

Top ten operators of oil wells		Top ten operators of gas wells	
Operator	**Well count for 2013**	**Operator**	**Well count for 2013**
1. EOG Resources	415	1. Anadarko	187
2. Marathon Oil EF	266	2. SM Energy	76
3. Chesapeake Energy	188	3. Burlington Resources Oil & Gas	74
4. Murphy E&P	186	4. BHP Billiton	73
5. EP Energy	102	5. Shell Western E&P	54
6. Anadarko	97	6. Pioneer Natural Resources	50
7. Talisman Energy USA	91	7. Lewis Petro Properties	37
8. Freeport-McMoran Oil & Gas	89	8. Rosetta Resources Operation	32
9. BHP Billiton	77	9. Talisman Energy USA	31
10. Geosouthern Energy Corporation	65	10. Marathon Oil EF	30

Source: Shale Experts

Table 6-8

Top ten operators by acreage	
Operator	**Acres**
1. EOG Resources	639,000
2. Chesapeake Energy	430,000
3. Lewis Energy	430,000
4. BHP Billiton	332,000
5. Anadarko	200,000
6. EP Energy	157,000
7. Pioneer Natural Resources	150,000
8. SM Energy	149,000
9. Sanchez Energy	138,000
10. Forest Oil	91,000

Source: Shale Experts, Capital Expenditures

Texas Olive Ranch

In the course of our work at the University of Texas' Institute for Economic Development, our programs have encouraged community leaders to foster diversification, which includes specialty agriculture. On the west side of the Eagle Ford, southeast of Carrizo Springs and not far from the Mexican border is a little town called Asherton. On the outskirts, you can find an example of higher margin agricultural diversification in the form of olive groves and olive oil processing under the auspices of the Texas Olive Ranch.

Texas leads the country in production of farm and ranch products such as cotton, cattle, hay, sheep and goats. Much of the agricultural activity in Texas has typically focused on commodity crops such as cotton, corn, grain sorghum, and wheat. The history of these commodities is long and storied, as every 4th and 7th grade student in Texas knows. However, there are opportunities in agriculture in the state that extend beyond these traditional commodity crops.

For example, growing populations in Texas and the attendant increases in commercial and residential development have created a market for higher margin nursery products such as bedding plants, foliage plants, sod, and woody landscape plants. Nursery crops are attractive to grow in Texas because they are sensitive to long-distance transportation costs. The types of specialty crops that can be grown in the U.S. vary by region, but in Texas the categories include peaches, pecans, spinach, grapes (for wine making), mushrooms - and, of course, olives.

Most of us may not be aware that the U.S. imports nearly 300,000 tons of olive oil annually, and produces only about 12,000 tons, so the opportunity for growth would seem clear. Production of olive oil in Texas has risen from nothing in 2002 to approximately 54 tons in 2012. The number of olive trees in Central and South Texas is rising rapidly, from approximately 250,000 in 2012 to an estimated 1,500,000 trees covering 3000 acres in 2013. There are four olive oil pressing plants in Texas, with others planned in the future. Olives and olive oil are a higher-margin agricultural growth industry, and olive oil consumption in the U.S. has been increasing because the growing popularity of the Mediterranean Diet.

The Texas Olive Ranch in Asherton boasts about 40,000 trees that were planted eight years ago. The ranch grows arbequina and arbosana Spanish olives, as well as Greek koroneiki olives.

The climate in much of South Texas is suitable for growing olive trees, among others. Olive trees grown in Texas begin bearing fruit in 3-5 years. Olives do not require large amounts of water, but they do typically benefit from slow drip irrigation. In fact, the trees can be damaged by receiving too much water - a nice problem to have these days in Texas.

Olives can be harvested by hand or by machine. The Texas Olive Ranch uses a harvester (which is actually a modified grape harvester) that runs along the groves and removes the olives from the trees without damaging them. Once the olives have been collected, the leaves, dirt and twigs are removed.

Olive trees are very hardy – as they are drought, disease and fire resistant. They can live for over 1000 years. To keep the trees manageable, growers will typically top-off the taller branches so that they remain at a constant height.

Olive oil production is a time and heat sensitive process. In order to get the best flavor and highest quality, the olives are pressed into oil as soon as possible. The Texas Olive Ranch runs its equipment at night in order to minimize the impact of the Texas sun.

The entire olive including the seed is processed through modern grinders, which is a comparatively fast and gentle technique. More traditional methods employ mill stones to crush the olives into paste and tend to produce higher temperatures. Another feature of traditional methods for producing cold pressed olive oil includes the use of hemp mats. The olive paste is layered between several mats to

create what looks like a stack of giant pancakes. A hydraulic press is then used to squeeze the oil from the pulp. This contrasts with more modern methods to separate the oil from the pulp by using a centrifuge, after which it is filtered. The discarded pulp can be used for fertilizer, animal feed, or even as a specialty ingredient for restaurants or food processers.

The oil is then stored in containers where the remaining sediment is allowed to settle at the bottom. Once this occurs, the oil is transported to San Marcos, where it is bottled and then ready for market. When the end-of-season processing is complete, the machines are thoroughly cleaned until the next harvest.

Even though they are produced domestically, the Texas Olive Ranch products carry a relatively high price point, which is a function of the high quality of the oil. However, the International Olive Oil Council does not enforce standards as rigidly as labeling often implies. A report released in August 2013 from the U.S. International Trade Commission indicated that current standards for extra virgin olive oil are largely unenforced, which results in a wide range of oil qualities marketed as such. As a result, U.S. consumers that may not be aware of the differences and will tend to gravitate toward less costly olive oil products, which are often mislabeled and adulterated. In fact, much of the olive oil that is labeled as an Italian product actually originates in Spain and is then exported to Italy to be blended with oil from other parts of the world prior to export to the U.S.

In order to get traction in the marketplace, Texas Olive Ranch uses several methods for marketing their olive oil. One is farmers markets, where the oil is sold directly to the public. The company also relies on distribution arrangements with companies like Whole Foods and HEB. The product is marketed under the Texas Cowgirl brand, and is available in several varieties, including Rattlesnake, which is flavored with cracked pepper and chipotle chili - the first of its kind. True to Texas form, there is also a Mesquite Smoke Infused Olive Oil variety as well.

Texas Olive Ranch is now planning to expand operations to the Victoria area, where the weather looks even more accommodative to growing olive trees. Jim Henry, CEO is planning to spend $5 million on the project that will cover 380 acres with 300,000 trees.

7 Development

7.1 The multiplier effect in Texas

It is worthwhile to note that all of the recent oil and gas activity in Texas benefits residents to a much greater extent that other states. While the more obvious signs may be the direct production of oil and gas, the economic impact to Texas (and corresponding job impact) extends much farther. The unexpected oil and gas boom that has come about as a result of unconventional extraction techniques is reverberating across the state.

Starting with the upstream advantages, in 2012, UTSA's Institute for Economic Development estimated that $22 billion in economic output came from drilling and completion alone in the Eagle Ford, supporting over 46,000 full-time jobs. Not surprisingly, as an oil and gas state, Texas maintains a large supply of workers familiar with drilling and extraction operations.

The East Texas Oilfield was discovered in 1930 and is the largest find to date in the lower 48 states in terms of oil produced (Prudhoe Bay in Alaska is larger). The Permian Basin in West Texas (and part of New Mexico) has been producing for decades, since 1923. It contains many fields with separate designations and geological strata. Overall, the Permian Basin is considered to be the largest oil producing basin in North America. Both East and West Texas geographies - producing since the 1930s - have resulted in a robust indigenous workforce for oil and gas that have driven secondary impacts such as the development of Houston as a worldwide energy hub.

The economic impacts of upstream activities are invariably associated with where the oil and gas is located, whether they be in Texas, Pennsylvania or Saudi Arabia. But part of this benefit relies on the assumption that the local workforce in any given area has the requisite skill sets. Otherwise workers have to be imported, at least for a period of time.

In fact, this is exactly what is happening in parts of the Eagle Ford. Even now, there is so much activity that the existing South Texas workforce simply cannot supply all of industry's needs. However that situation is steadily changing for the better. From UTSA and Alamo Community Colleges, to Coastal Bend College, Victoria College, Texas A&M International University and many others, two and four year colleges across South Texas are developing programs to train new workers.

Midstream activity, which includes essentially all of the transportation and storage mechanisms, is one way the economic impact to Texas is amplified, regardless of where production takes place. This includes not only pipelines, but rail and truck transport as well. Midstream also includes storage facilities.

In Cushing, Oklahoma, for example, there is still inadequate pipeline capacity to move all of the oil coming from the Bakken field in North Dakota to refineries along the Gulf Coast. Fortunately, Cushing has extensive storage facilities which are now brimming with North Dakota oil - at least until it can be moved out. The Port of Corpus Christi also has substantial storage facilities, which is used to hold Eagle Ford and Permian oil until either the Gulf refineries are ready to process it, or until it can be shipped by barge to Houston or elsewhere where refineries have available capacity. In the Eagle Ford, midstream development produced about $2.4 billion in economic output supporting nearly 17,000 full-time jobs in 2012.

Finally there are downstream activities. Texas has some of the most comprehensive refining capabilities in the world. The U.S., for example, now exports more refined products than it has since 1949 - in large measure because of the significant recent production here. And because of the availability of low-cost natural gas and extensive port facilities, locations along the Gulf Coast such as Corpus Christi and Houston are seeing many large scale projects either underway or in the planning stages. Reports suggest that along the coast (stretching into Louisiana) nearly $100 billion in new projects are slated - a direct result of the resurgence in energy activity associated with unconventional extraction techniques. So Texas benefits not only from recent discoveries in South and West Texas, but also from the Barnett in the DFW area, the Haynesville in East Texas and Northern Louisiana, and the Bakken in North Dakota, literally anywhere in the U.S. and beyond. If the Keystone

XL pipeline receives approval, Texas will benefit from that oil production also since many of the refineries along the Gulf Coast have been designed to accommodate the heavier crude from Canada.

Texas benefits economically from all aspects of oil and gas production. From upstream exploration and production activities, to midstream storage and transport, to refining, processing and manufacturing opportunities, the impact reaches across the state. The result is not only direct jobs, but many indirect jobs related to legal, accounting, administrative, retail, dining, construction, welding, supervisory, trucking, electrical and others that magnify the economic benefits. With regard to the multiplier effects from energy production, Texas benefits up, down and in-between.

7.2 Projects related to the Texas oil and natural gas boom

Since 2006, natural-gas production in the U.S. has soared. The U.S. now produces more than 25 trillion cubic feet of natural gas a year, the most in the country's more than 100-year history of gas exploration and production. As a result, billions of dollars are being invested in the U.S. economy.

Natural gas production is part of the emerging foundation that is supporting the re-shoring of manufacturing and bringing newcomers to the U.S. The closing gap in cost of currency value between the Chinese yen, which is increasing, and the U.S. dollar, which has stayed relatively the same, has made U.S. labor more competitive. In addition, manufacturing has become much more automated, so costs have been further reduced. There have also been growing issues with quality control and timely delivery of goods made in China. Re-shoring to the U.S. gives manufacturers greater control over quality and delivery while still remaining competitive. Added to these benefits are the proximity to the U.S. market and a low-cost, politically stable, abundant supply of natural gas that can be used as feedstock for manufacturing processes.[22]

In particular, international manufacturers are becoming more interested in leveraging these resources regionally. Austria-based Voestalpine Group and Chinese-based Tianjin Pipe Corp., two steel manufacturers, are building facilities in Corpus Christi worth $1.8 billion[23] and M&G Group, an Italian manufacturer will spend $900 million to build a plastic soft drink bottle facility.[24] The manufacturer Tenaris[25] broke ground late last year on their new $1.5 billion seamless pipe facility in near Bay City, Matagorda County.[26] Johannesburg-based (South African) Sasol is planning to invest $21 billion in Lake Charles, Louisiana to build an ethane cracker and gas-to-liquids (GTL) 3,000 acre energy complex.[27]

In fact, Louisiana expects some 66 industrial projects, estimated to be worth $90 billion, to be breaking ground within the next five years.[28] Included in these facilities are liquid natural gas (LNG) export facilities. The Third District of Louisiana already houses three of the seven LNG export facilities in the U.S. and is scheduled to open two more facilities, both of which are under construction and one of which will be built by Cheniere Energy and will be the first non-free-trade agreement LNG export facility in the U.S. Eight more entities are awaiting permits to begin constructing more LNG export facilities.[29]

Cheniere Energy has another LNG plant and export facility project underway in Corpus Christi Bay, San Patricio County, which is expected to cost up to $12 billion and take four years to complete. The project is scheduled to break ground in early 2015.[30] However, Oxy Chem is already building a $75 million propane export facility in Ingleside (San Patricio County).[31] Other Corpus Christi dock improvements include up to $650 million for the construction of condensate splitters by Magellan Midstream Partners and Castleton Commodities International.[32,33] The Port expects to see about $22 billion in construction.[34]

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[22] Lee, Don. (May 13, 2014). *After decades of exodus, companies returning production to the U.S.* Los Angeles Times.
[23] *Eagle Ford Gas Draws Steelmakers to Texas' Coastal Bend.* (March 28, 2014). Rigzone.
[24] Hill, Patrice. (April 12, 2013). *Shale Oil Find Fuels Boom in US Business.* DownstreamToday.com.
[25] A subsidiary of an Argentine-Italian group Techint. Tenaris is a Luxembourg-based manufacturer.
[26] *Tenaris breaks ground on new U.S. seamless pipe mill in Bay City, Texas.* (September 9, 2013). World Oil.
[27] *Are We Underestimating America's Fracking Boom? Check Out Sasol's Energy Complex in Lake Charles, La.* (May 27, 2014). Wall Street Journal.
[28] Ibid
[29] Boustany, Charles. (August 14, 2014). *U.S. Further Along on Gas Exports.* Wall Street Journal.
[30] Interview with Jim Gray, City Manager, City of Ingleside. (August 2014).
[31] Ibid
[32] *Texas Companies Investing Billions at Corpus Christi.* (n.d.). Blue Toad.
[33] Nowlin, Sanford. (March 31, 2014). *Magellan Midstream is spending $250 million on condensate splitter.* San Antonio Business Journal.
[34] Murtaugh, Dan. (April 10, 2014). *Eagle Ford's Exports Spur Boom at Port of Corpus Christi.* Bloomberg.

Outbound shipments of Eagle Ford Shale crude and condensate through the Port of Corpus Christi rose more than 60% year-over-year, from 341,824 b/d in June 2013 to 551,934 b/d in June 2014.[35] As a result, The Corpus Christi Port Authority is trying to gather funds to widen and deepen the channel.[36]

Also experiencing robust port activities, Houston estimated that the port users would spend around $35 billion on expansion projects between 2012 and 2015. The Port of Houston Authority plans to spend $100 million to dredge and widen the Houston Ship Channel in support of the port expansions. The port authority and Army Corps of Engineers in nearby Freeport completed an $11 million feasibility to study to find what is needed to support the growth of the oil and gas industry.[37]

BOSTCO, majority owned and operated by Kinder Morgan, is investing $54 million to expand its newly operating terminal in the Houston Ship Channel to include additional storage, extra pipeline, deep-water vessel access and high speed loading capabilities.[38] Also on the Houston Ship Channel, Intercontinental Terminals, an affiliate of the Japanese-based company Mitsui & Co, is building a $150 million ten tank terminal with ship docking facilities.[39] Oiltanking Partners invested $44 million in its Houston terminal expansion to increase LPG import/export capacities[40] and recently announced plans to invest in nearby Beaumont, another $340 million into a terminal expansion project to include storage, pipelines, and dock infrastructure.[41]

Investments along the Texas and Louisiana coasts may be valued at more than $110 billion, according to the Baytown-West Chambers County Economic Development Foundation.[42] In addition, two ship builders (Pennsylvania- and Florida-based) are investing nearly $900 million to build 6 oil tankers, which will likely transport Eagle Ford crude from Texas ports to east coast refineries for processing.[43]

Other companies like NuStar Energy, and Kinder Morgan Energy and Double Eagle, who partnered in a 50/50 joint venture, are building pipeline infrastructure to increase throughput capacities to supply Corpus Christi and Houston markets.[44] Net Midstream plans to build a 124-mile pipeline to Mexico from Nueces County – if run at capacity, it will more than double the exports to Mexico. Mexico is investing $8 billion to expend its pipeline infrastructure, focusing on the central and northern industrial cities with intentions on fueling the network with U.S. natural gas.[45]

The shale revolution is attracting U.S. firms, and additional foreign investment, back home. According to the American Chemistry Council, the petrochemical industry estimates $71 billion of infrastructure investments, which would lead to an additional $67 billion in increased industry output and approximately 1.8 million direct, indirect, and payroll-induced jobs between now and 2020. ExxonMobil Chemical and Chevron Phillips have already started construction to expand their ethane cracker facilities in the Houston Area, which could add up to about $10 billion.[46] Enterprise Products Partners is another Houston Area investment with plans to spend $4 billion in its petrochemical facility.[47] The Netherlands-based OCI plans to invest $1 billion in its Beaumont-area chemical facility to include methanol and gasoline.[48] Air Liquide, a French affiliated company, will supply oxygen to support the OCI's methanol production, investing over $120 million to retrofit its plant with a new Air Separation Unit (ASU).[49] Another methanol plant development includes an $800 million joint venture between Celanese and Mitsui, a Japan-based firm, to build a new methanol production plant in Clear Lake, which is expected to be operational in 2015.[50] India's Reliance Industries plans to invest $2 billion its U.S. shale assets - they have secured liquefaction and export capabilities with a North American port and have ordered six Very Large Ethane Carriers (VLECs) with which to transport liquid ethane to be used as feedstock in their cracker facilities.[51]

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[35] *June 2014 numbers show continuing upward trend.* (July 25, 2014). Port of Corpus Christi.
[36] Ibid
[37] Gronewold, Nathaniel. (April 17, 2014). *Oil Boom: Huge expansion on tap for a port that's bursting with energy goods.* Energywire.
[38] *Kinder Morgan to Spend $54 M to Expand Upcoming Houston BOSTCO Facility.* (June 6, 2013). TankTerminals.com
[39] Bay Area Houston Economic Partnership. (March 2014). *Hot Projects in Bay Area Houston.* Bayareahouston.com
[40] Daugherty, Deon. (March 6, 2013). *Oiltanking Partners plans $44 million Houston Ship Channel expansion.* Bizjournals.com
[41] Oiltanking Partners. (June 11, 2014). *Oiltanking Partners Announces Crude Oil Expansion Project in Beaumont, Texas.* Oiltankingpartners.com
[42] Ibid
[43] Sussman, Anna Louie. (July 1, 2014). *U.S. Oil tankers built on spec face choppy waters as export ban eases.* Reuters.
[44] Nowlin, Sanford. (December 26, 2013). *Kinder Morgan and Double Eagle connect Gardendale to Texas Coast.* San Antonio Business Journal.
[45] Dukes, R.T. (February 25, 2014). *Net Midstream Plans Eagle Ford Pipeline To Mexico from Nueces County.* Eagleforshale.com
[46] Gronewold, Nathaniel. (April 17, 2014). *Oil Boom: Huge expansion on tap for a port that's bursting with energy goods.* Energywire.
[47] Ibid
[48] Shauk, Zain. (November 21, 2013). *Nation's largest methanol plant planned for Texas.* Fuel Fix.
[49] *Major investment in the U.S.: Air Liquide expands its relationship with OCI N.V. in Beaumont, Texas.* (July 21, 2014). Airliquid.com.
[50] *Haynes and Boone Advises Celanese in $800 Million Methanol Joint Venture.* (February 26, 2014)
[51] Riaz, Saleha. (August 22, 2014). *Reliance to source ethane from its U.S. shale plays.* Shale Energy Insider.

Downstream, Valero Energy Corp. is investing in refinery upgrades. Valero plans to spend $730 million on its Houston and Corpus Christi refineries to equip them to handle more South Texas light sweet crude.[52]

One last project worth mentioning is the $110 million oil and gas technology research facility that General Electric is planning to build in Oklahoma.[53]

Table 8-1 lists the projects highlighted above, along with the estimated investments. The number of projects as a result of crude, natural gas and condensate mining in Texas is long and growing. This list is by no means comprehensive.

Table 7-1

Company	Project	Investment	Location
Manufacturing Projects			
Voestalpine Group	Hot briquetted iron manufacturing facility	$750 million	Nueces County
Tianjin Pipe Corp.	Seamless steel pipe manufacturing facility	$1 billion	Nueces County
M&G Group	Plastic packaging manufacturing facility	$900 million	Nueces County
Tenaris	Seamless steel pipe manufacturing facility	$1.5 billion	Brazoria County
Sasol	Energy complex	$21 billion	Louisiana
Chevron Phillips	Ethane cracker facility expansion	$6 billion	Brazoria County
ExxonMobil Chemical	Ethane cracker facility expansion	Multi-billion	Harris, Chambers counties
Enterprise Products Partners	Petrochemical facility expansion	$4 billion	Chambers County
OCI	Methanol and gasoline facility expansion	$1 billion	Jefferson County
Air Liquide	Air separation unit addition	$120 million	Jefferson County
Celanese and Mitsui	Methanol production plant	$800 million	Harris County
Reliance Industries	Liquid ethane export	$2 billion	U.S.
Port Projects			
Cheniere Energy	LNG plant and export facility	$12 billion	San Patricio County
Oxy Chem	Propane export facility	$75 million	San Patricio County
Magellan Midstream Partners LP	Construction of condensate splitter	$250 million	Nueces County
Castleton Commodities International	Construction of condensate splitter	$250 - $400 million	Nueces County
Corpus Christi Port Authority	Widen and deepen channel		Nueces County
Port of Houston Authority	Dredge and widen channel	$100 million	
Freeport Port Authority and Army Corps of Engineers	Feasibility study to support oil and gas boom	$11 million	Brazoria County
BOSTCO	Storage, pipeline, deepwater access	$54 million	Harris County
Intercontinental Terminals	Tank terminal and ship dock facilities	$150 million	Harris County
Oiltanking Partners	LPG capacity expansion; storage, pipeline and dock infrastructure	$490 million	Harris, Jefferson Counties
NuStar Energy	Petroleum dock	$185 million	Nueces County
Kinder Morgan Energy and Double Eagle Pipeline	Barrel storage facility and 10 mile pipeline	$100 million	La Salle County
Other Projects			
Philly Tankers	Oil tankers	$625 million	Pennsylvania
Seabulk Tankers Inc.	Oil tankers	$250 million	Florida
General Electric	Oil and gas technologies research facility	$110 million	Oklahoma
Net Midstream	Pipeline infrastructure		Nueces County to Mexico
	Pipeline infrastructure	$8 billion	Mexico
Valero Energy Corp	Crude distillation tower	$730 million	Nueces County

[52] Nowlin, Sanford. (January 28, 2014). *Valero spending $730 million so two Texas refineries can process more Eagle Ford crude.* San Antonio Business Journal.
[53] Marks, Jay F. (April 3, 2013). *General Electric to build energy research center in Oklahoma.* News OK.

7.3 Midstream

Midstream developments are those related to the transportation of extracted products to the location of the refinery operation. Most midstream developments consist of pipeline projects. Following is a list of crude oil, natural gas liquid, refined product, and full oil-well stream pipeline projects of over 10 miles in length that began construction in 2013 in the Eagle Ford Shale.

7.3.1 Pipeline projects by type

The following pipelines are designed to either bring together the products of various drill sites into a central location (gathering lines) or to move this product from a central location to a processing or refining facility.

Table 7-2

Crude oil pipeline projects		
Operators	**Projects**	**Counties**
Plains Pipeline	Aguila Vado Gathering System	Dimmit, La Salle
Plains Pipeline	Aguila Vado Gathering System	Frio, La Salle
Koch Pipeline Company	Midway to Ingleside	San Patricio
Harvest Pipeline Company	Gardendale/Asherton Lateral	Dimmit, La Salle
Eagle Ford Field Services	Victoria Express Pipeline	DeWitt, Victoria
Double Eagle Pipeline	Double Eagle – Three Rivers to Goebel	Live Oak
Double Eagle Pipeline	91	7. Lewis Petro Properties
Double Eagle Pipeline	Double Eagle – Gardendale	La Salle, Live Oak, McMullen
Double Eagle Pipeline	Double Eagle – TCP	Live Oak, McMullen
Double Eagle Pipeline	Double Eagle – Karnes to Three Rivers	Bee, Karnes, Live Oak
Kinder Morgan Crude and Condensate	Karnes County Lateral	DeWitt, Karnes

Source: Texas Railroad Commission, New Pipeline Construction Report (PS-48, 2013)

Table 7-3

Natural gas liquid pipeline projects		
Operators	**Projects**	**Counties**
Texas Pipeline	Falcon NGL	La Salle, Webb

Source: Texas Railroad Commission, New Pipeline Construction Report (PS-48, 2013)

The following pipelines transport processed products from refineries to shipping terminals or distribution centers.

Table 7-4

Refined product pipeline projects		
Operators	**Projects**	**Counties**
Texstar Midstream Utility	Tierra Pipeline	Bee, San Patricio
Texstar Midstream Utility	Equistar to Trafigura	Nueces

Source: Texas Railroad Commission, New Pipeline Construction Report (PS-48, 2013)

The following is designed to move full oil-well stream, which is the full production stream from a crude oil well.

Table 7-5

Refined product pipeline projects		
Operators	**Projects**	**Counties**
HPIP Gonzalez Holdings	Gonzalez CDF	Gonzalez

Source: Texas Railroad Commission, New Pipeline Construction Report (PS-48, 2013)

7.3.2 Pipeline projects by county

The following table breaks down the amount of new pipeline, laid in 2013, as well as the costs associated with the new construction per county.

Table 7-6

County	Miles of pipeline laid in 2013	Pipeline spending for 2013
Bee	31.7	$ 33,475,200
DeWitt	42.4	$ 83,831,398
Dimmit	33.5	$ 30,156,720
Frio	5.8	$ 6,108,960
Gonzalez	10.6	$ 14,924,800
Karnes	29.1	$ 59,466,600
La Salle	95.0	$ 84,841,680
Live Oak	40.6	$ 47,921,280
McMullen	33.7	$ 35,587,200
Nueces	17.8	$ 9,419,520
San Patricio	22.5	$ 56,707,200
Victoria	33.0	$ 25,749,246
Webb	31.0	$ 16,368,000
Total	427.0	$ 504,557,804

Source: Texas Railroad Commission, New Pipeline Construction Report (PS-48, 2013)

Costs are estimates, derived from individual press releases from the companies building the pipelines to estimations of total pipeline costs based on pipeline length and diameter (see Appendix at http://ccbr.iedtexas.org/).pendix).

7.4 Downstream

Downstream developments are those related to the refining and processing of crude, condensate, and natural gas. This section includes recent planned, in progress, or completed downstream developments in the Eagle Ford Shale region, organized by county.

7.4.1 Bee County

7.4.1.1 Lone Star Cryogenic processing plant

TexStar Midstream recently raised $675 million, which will be used for two projects: the Lone Star Cryogenic Processing Plant in Pettus, in addition to a pair of natural gas liquid (NGL) fractioners in Corpus Christi which are covered in more detail below in the section labeled Nueces County.

The Lone Star Cryogenic Processing Plant, which will have the ability to process up to 300 MMcf/d of rich gas, is expected to be operating in 2014. It is supported by an existing pipeline network of approximately 200 miles of 16" and 24" rich gas gathering lines, which extend through Dimmit, Frio, McMullen, Live Oak, and Bee counties, and approximately 60 miles of 20" residue lines tied into six major intra- and interstate pipelines.

7.4.1.2 Silver Oak plant

Teak Midstream is completing construction of a 200 MMcf/d, $110 million natural gas processing plant, also near Pettus. This facility, Silver Oak, is specially designed to refine gas from the Eagle Ford Shale, and will produce around 25,000 bbl/d of natural gas liquids.

Gary Conway, Vice President of Engineering and Operations for Teak Midstream, explained how the cryogenic processing facility uses its 18,500 horsepower compression units to produce natural gas: "This is the Ferrari of cryogenic plants. This is a state of the art facility designed for exactly what this gas is. The Eagle Ford gas is very rich in heavy hydrocarbon gas. This extracts that liquid, that value and gives it back to the producer and actually in turn back to the royalty owners and those who own that land," says Conway.

"These machines and this machinery and vessels actually produce the natural gas liquids by making the gas colder, therefore condensing those liquids out and we're able to take those liquid products and put them down a pipeline so they can be used in refineries and ethylene plants and fractionation downstream," says Conway.

Conway says it's actually a simple process. "It's not rocket science, but its engineering science. Taking basic principles of how natural gas reacts to pressure and temperature and basically putting the pots and pans and equipment around that to more efficiently make those engineering principles happen, to get the value chain of products that you're looking for," he said. "What these items do is just similar to your air conditioner in your car or in your home. You've got a compressor that takes a refrigerant, in this case its propane gas, it takes that refrigerant and drops it and then compresses it back up and that loop provides the cooling to assist in the cooling process to be able to condense liquids for the natural gas."

When it's complete, Conway says the Silver Oak processing plant will bring in an estimated $350,000 annually to Bee County in tax revenues. If all goes well, Teak is looking at the possibility of expanding the site by building another similar facility right next door.

7.4.2 La Salle County

7.4.2.1 Brasada gas plant

The Brasada gas plant was recently completed near Cotulla. This $100 million facility was built on 156 acres of land and is capable of processing as much as 400 million cubic feet of natural gas liquids each day.

More than 500 construction workers were employed at the site, but Anadarko will have 16 to 20 permanent employees running the plant, which is designed to extract ethane, butane, propane and other gases from the natural gas before it is transported to various markets through pipelines.

The facility, which was built by Anadarko and Western Gas Partners, processes natural gas only for Anadarko, though it is large enough to accommodate future growth, leaving open the possibility of processing third-party gas at some point.

Anadarko holds about 400,000 acres in Dimmit, La Salle, Maverick, and Webb counties, where natural gas liquids are abundant. All the company's acreage sits to the west of the Cotulla plant, and a pipeline network will bring the natural gas into the facility, as well as move it off site to market. From the plant, natural gas liquids will travel through a pipeline to a plant in Yoakum and to fractionation facilities in Mont Belvieu east of Houston. Gas also will go south to Corpus Christi, where it can be used in refining or hook into the network of interstate pipelines.

7.4.3 Live Oak County

7.4.3.1 Three Rivers Refinery

The Valero Three Rivers refinery, located approximately 70 miles south of San Antonio, originally opened in 1974 and was a relatively unimportant part of the company's operations until recently, when greater emphasis was placed on the extraction and production of oil and natural gas from Eagle Ford Shale operations.

As recently as a decade ago, Three Rivers moved about 75,000 bbl/d, all from outside sources. Since then, they have started to produce upwards of 108,000 bbl/d, most of it domestic. In fact, Three Rivers used to import 90 percent of its raw product from foreign markets. Now, 90 percent of the oil refined at the facility is extracted, produced, and refined domestically.

Due in part to their investments in the Eagle Ford Shale, and partly because their facilities are now capable of processing greater amounts of light sweet crude rather than the pricier petroleum feedstock that made up a large part of their business, Valero saw its 2013 fourth quarter earnings increase by 28 percent, while their operating costs decreased by 12 percent. At Three Rivers alone, decreased reliance on foreign sources of crude oil has allowed Valero to save $650,000 a day while raising their profits by 400 percent. Natural gas prices have saved the company over $1 billion since 2008.

Because of this, Valero announced in 2013 that they were spending approximately $730 million to expand their operations in the Eagle Ford Shale.

Valero's profits are going to more than just improving their existing infrastructure. Chairmen and former CEO, Bill Klesse, has explained that Valero's increasing role in South Texas is benefiting average people through the creation of jobs in infrastructure, as well as indirectly in related industries, such as hotels, restaurants, and offices.

These effects are apparent in areas near Three Rivers, such as the city of Cotulla. Cotulla Independent School District, for example, was once incredibly underprivileged: now they are among the wealthiest in the state, so much so that they have been obligated to donate $17 million through Texas' Robin Hood program.

Of course, not all changes have been for the best. Due to the large influx of workers to the area, rents in Cotulla have increased by around 300 percent. Mayor of Cotulla, Sam Garcia, concedes that while money has arrived quickly into the town, the emergence of so much upheaval has created a series of challenges for the small community, ranging from lack of water to increased air contamination from drilling activities.

7.4.4 Nueces County

7.4.4.1 TexStar fractioners

TexStar Midstream recently raised $675 million, which will be used for two projects: a pair of natural gas liquid (NGL) fractioners in Corpus Christi, and the Lone Star Cryogenic Processing Plant in Pettus, which was covered in the section above labeled Bee County.

TexStar built a pair of NGL fractioners, which it fully owns and controls, which provide approximately 60,000 billion bbl/d of natural gas liquids fractioning capacity and came online in December of 2013.

7.4.4.2 Magellan Midstream condensate splitter

Magellan Midstream will spend $250 million to build a condensate splitter, which is expected to be operational in the second half of 2016.[54] This project will be located at Magellan Midstream's Port of Corpus Christi terminal and will include adding one million barrel of storage, dock improvements, and two additional truck-rack bays, and pipeline connectivity between the terminal and the oil trading company Tafigura's nearby facility. The splitter will process 50,000 barrels per day of natural-gas condensate. If demand grows, the site can accommodate an additional splitter of the same size.

[54] Nowlin, Sanford. "Magellan Midstream is spending $250 million on condensate splitter." San Antonio Business Journal. Mar. 31, 2014.

7.4.4.3 Castleton Commodities International

Castelton Commodities International is planning to build a condensate splitter complex in Corpus Christi. Construction could start in November 2014 and operations could begin in June 2015. The complex will have two fractionation trains, each capable of processing 50,000 barrels per day.

7.4.5 Webb County

7.4.5.1 Reveille processing plant

In early 2013, Howard Midstream Energy announced that they would build a cryogenic natural gas processing plant that would process 200 MMcf of gas per day. This plant was designed to process gas from the Eagle Ford Shale, Olmos, and Escondido energy formations, and began operations in early 2014.

7.5 County Highlights

7.5.1 Atascosa

In 2013, much of the economic development in Atascosa has centered in Pleasanton. In order to service Eagle Ford clients in the shale region, Houston-based FlexSteel Pipeline Technologies, Inc. opened a 6,000 sq. ft. service center. The facility rests on two acres of land and supports four employees.[55] Pipe distributor ISCO Industries Inc. out of Louisville, Kentucky also opened a 4,000 sq. ft. facility in Pleasanton, supplying leak- and corrosion-resistant polyethylene pipe products.[56] In order to supply the millions of gallons of water required for the hydraulic fracturing process, the water-transfer firm RCW Energy Services opened an office in Pleasanton, a capital investment that increased its payroll in the area in addition to the allocation of new pipes, pumps, and storage equipment.[57]

Other projects were announced in 2013 demonstrated new opportunities for other firms. With the influx of new hires by oil, trucking, and pipeline companies for Eagle Ford projects, there is a subsequent demand for comprehensive background checks, including drug and alcohol testing, as a means to prevent on-field injuries. This need convinced Greenville, South Carolina-based ARCpoint Labs to open a new office in Pleasanton.[58] In November 2013 the Phoenix Hospitality Group announced the construction of a 70-acre, multi-family housing development, slated for completion in the second quarter of 2014.[59] H.E. Butts Grocery Co. announced an expansion to the Pleasanton location. Once completed in August 2014, the project would double the size of the existing store.[60]

7.5.2 Bee

Bee County also experienced an influx of capital investment. In addition to the nearly $41 million in well construction, the City of Beeville received new permits for the construction of 330 homes, totaling $75 million. Beeville received an additional 19 construction permits valued at $2.5 million dollars.[61]

7.5.3 DeWitt

In October 2013, Houston-based Kinder Morgan Energy announced a $74 million extension of its self-titled Kinder Morgan Crude Condensate (KMCC) pipeline from DeWitt County to Gonzales County. The majority of this project, approximately $65.8 million, would be based in DeWitt County.[62]

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[55] Nowlin, Sanford. "FlexSteel opens pipeline-supply facility in Pleasanton to service Eagle Ford clients." San Antonio Business Journal. Nov. 18, 2013.
[56] Nowlin, Sanford. "ISCO Industries opens pipe distribution facility South of San Antonio." San Antonio Business Journal. Nov. 22, 2013.
[57] Nowlin, Sanford. "RCW Energy pumps up capital spending in Eagle Ford, other Texas plays." San Antonio Business Journal. September 23, 2013.
[58] Aldridge, James. "ARCpoint Labs targeting Eagle Ford firms for employment screenings." San Antonio Business Journal. Jan. 8, 2013.
[59] Silva, Tricia Lynn. "Phoenix Hospitality Group broadens geographic reach." San Antonio, Business Journal. November 29, 2013.
[60] Thomas, Mike W. "H-E-B expanding store in Pleasanton." San Antonio Business Journal. August 1, 2013.
[61] Don Frizzell, Beeville Building Inspector, July 10, 2014.
[62] Gebrekidan, Salam. "Kinder Morgan to build an extension to Eagle Ford pipeline." Reuters. October 9, 2013.
Retrieved from: http://www.reuters.com/article/2013/10/09/us-kindermorgan-pipeline-eagleford-idUSBRE99813L20131009

Much of the housing development gains center around Cuero, Texas. In 2013, three motel units opened in the city: a 51-room America Best Value Inn ($2.7 million),[63] a 77-room Holiday Inn Express ($4.6 million),[64] and a 42-guest room Hotel Texas. Austin-based Cuero DMA Development Company, LLC constructed a $3.2 million, 60-unit apartment complex.[65] The City of Cuero also approved 35 housing permits for $4.5 million and four commercial permits valued at $6.2 million.[66]

ERF Wireless, a broadband provider based out of League City, Texas, upgraded its coverage in the Eagle Ford Shale area, particularly in Cuero. The year also saw the construction of new Chisholm Trail Heritage Museum.

7.5.4 Dimmit

St. Louis-operated Graybar opened two new branches in Asherton and Carrizo Springs, Texas in Dimmit County. Graybar is a national supply chain management and logistics provider.[67]

In 2013, 6 single-family homes were constructed valued at $5.8 million.[68]

7.5.5 Frio

The cities of Pearsall and Dilley in Frio County have benefited from the Eagle Ford Shale play development. Matrix Builder and 4th Dimension Builders, both based in Houston, completed $2.7 million and a $1.5 million commercial hotel projects, respectively. Other commercial developments include a $1.5 million office and storage facility and a $380,000 shopping strip.[69]

The influx of capital investments into Frio has led to the expansion of public infrastructure projects. The city of Pearsall announced the opening of a new 5,000 sq. ft. police station valued at $1.1 million,[70] $397,775 construction for the Frio County Community Center, and Pearsall ISD made a $1.85 million renovation to an elementary school.[71] The City of Dilley also instituted new public works projects. Dilley constructed a new $2.8 million Municipal Water Treatment system, a new $100,000 water well, $1.5 million for road pavement, and $800,000 renovation for sewer improvements.[72]

7.5.6 Karnes

Southcross Energy Partners extended their Bee Line pipeline into Karnes County at a cost of approximately $7.04 million.[73] Polk Operating, LLC opened a 200-acre oilfield recycling facility.[74] To capitalize on the growth in the Eagle Ford Shale, Laredo-based developed Hachar Investments constructed the Kenedy Business Park, a 29-lot development resting on 120 acres.[75] The county also saw the construction of 71 single-family homes at $12,845,710, and 12 three-to-four family housing units at $1,000,584.[76]

7.5.7 La Salle

The City of Cotulla announced a $9 million expansion to the Cotulla-La Salle County airport, adding 6,005 feet of runway, scheduled for completion in July 2014. Anadarko Petroleum Corp. completed a $100 million Brasada Gas Processing Plant with an operation capacity of 200 million cubic feet per day.[77] San Antonio-based logistics firm NuStar Crude Oil Pipeline LP proposed a two-phased upgrade to their pipeline system to haul crude product from their La Salle operations. Once completed, the projects would add 100,000 barrels to its system capacity.[78]

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[63] Nowlin, Sanford. "Two new hotels going up in Cuero to provide Eagle Ford lodging." San Antonio Business Journal. September, 18, 2013.
[64] Ibid.
[65] City of Cuero Regular City Council Meeting. January 22, 2013
[66] Randall Malik (October 21,2013)
[67] Aldridge, James. "Graybar expanding out to Eagle Ford Shale region." San Antonio Business Journal. March 8, 2013.
[68] Source: U.S. Census Bureau
[69] Trevino, Jose G. October 29, 2013.
[70] Robertson, Marc. "Pearsall breaks ground for new police station." Frio-Nueces Current. February 21, 2013.
[71] Trevino, Jose G. October 29, 2013.
[72] Perez, Noel. City Administrator for City of Dilley, TX. January 27, 2014.
[73] Hiller, Jennifer. "Southcross Energy Partners completes Eagle Ford pipeline." MySanAntonio.com. August 5, 2013.
[74] Thomas, Mike W. "Oilfield recycling facility being built to serve Eagle Ford Shale." San Antonio Business Journal. February 14, 2013.
[75] Nowlin, Sanford. "Kenedy Business Park opening in the heart of Eagle Ford Shale country." San Antonio Business Journal. July 19, 2013.
[76] Source: US Census Bureau
[77] Thomas, Mike W. "Anadarko completing construction on new Eagle Ford Shale gas plant." San Antonio Business Journal. April 1, 2013.
[78] Nowlin, Sanford/ "NuStar Energy looks for interest on new Eagle Ford pipeline." San Antonio Business Journal. July 26, 2013.

Worldwide Energy Consortium announced the construction of their Whitetail Refinery facility, a new $100 million located near Gardendale, Texas. Once online, the facility will have the capacity of 10,000 barrels per day and utilize the Gardendale Rail System for transportation.[79] The Lewis Energy Group also announced the construction of a new 250-acre, $11 million rail park in Encinal as crude companies turn to rail as a more efficient alternative to pipelines.[80]

7.5.8 Live Oak

Howard Midstream Energy Partners, LLC built a 260-acres railroad hub at the Live Oak Railroad near Three Rivers. Completed in May 2013, it handles trains used to haul hydraulic fracturing materials and product.[81]

Fifteen single-family homes were constructed at a cost of $1,664,100.[82]

7.5.9 Maverick

According to the U.S. Census Bureau, Maverick County saw the addition of new housing in the area. In 2013, 68 single-family homes were erected at a value of $5,460,245. Construction also included multifamily housing such as 10 two-family structures valued at $798,485, 4 three-to-four family homes valued at $180,000, and 31 five-or-more family housing structures valued at $2,071,391.[83]

7.5.10 McMullen

Energy firms continued to invest in McMullen County. Southcross Energy Partners invested $4.9 million for a 16-inch, 3.5-mile pipeline in McMullen County as part of this expansion of the Bee Line pipeline.[84] Another firm, Sanchez Energy, announced a two-phased development in the county. In 2013, Sanchez plans invest $420 million in the construction of 40 net wells with another $700 million slated in 2014 for 76 net wells.[85]

McMullen County expanded their public infrastructure to accommodate the influx of energy investments. The McMullen County Independent School District instituted the $18 million Phase III project for a new building and renovations for Mission High School. Calliham, Texas initiated the construction of a waste water treatment plant.

7.5.11 Webb

Capital investments in Webb County continued to center in Laredo, Texas. Howard Midstream Energy Partners, LLC, announced the construction of a new $50 million natural gas plant. Dallas-based AT&T Inc. added new towers to expand their LTE network outreach to Laredo.[86] Additionally, Laredo was the site for the new 7,300 sq. ft., $3.5 million South Texas Border Intelligence Center. Commissioned by the U.S. General Services Administration and built by Brasfield & Gorrie, the new administrative and communication office building is set house 20 government agencies from both the United States and Mexico.

Laredo was the center of other capital investments. According to the Laredo Development Foundation, the City of Laredo experienced $415 million in new building permits, including $119 million in new single-family housing, $29 million in new multi-family housing, $72 million in warehouses, and $43 million in new commercial permits.[87]

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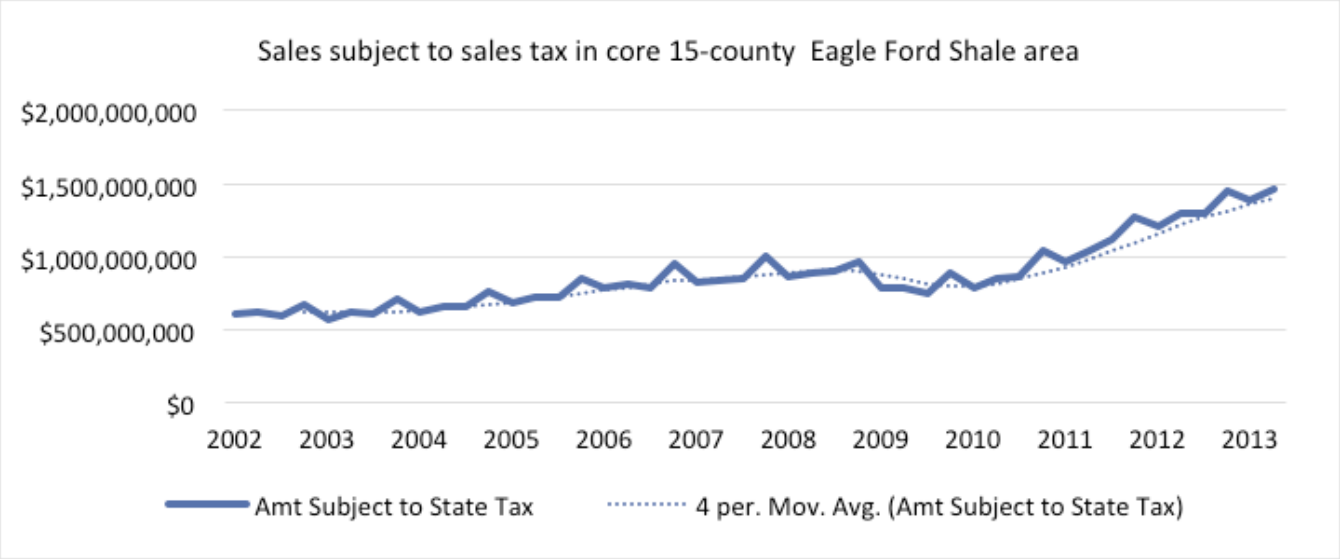
[79] Dukes, R.T. "La Salle County Refinery Planned Near Gardendale." EagleFordShale.com. May 20, 2013.
[80] Nowlin, Sanford. "Shale plays are driving rail usage by oil companies." San Antonio Business Journal. June 7, 2013.
[81] Hiller, Jennifer. "Howard Midstream plans new gas plant, rail hub." Fuelfix.com. February 11, 2013.
[82] Source: U.S. Census Bureau
[83] Ibid.
[84] Hiller, Jennifer. "Southcross Energy Partners completes Eagle Ford pipeline." MySA.com. August 5, 2013.
[85] Dukes, R.T. "Sanchez Energy Adds Eagle Ford Acreage in McMullen County from Rock Oil – $220 Million." Shalemarkets.com. September 9, 2013.
[86] Aldridge, James. "AT&T expands 4G LTE network to Laredo." San Antonio Business Journal. August 7, 2013.
[87] Laredo Development Foundation, "Laredo Economic Indicators." www.ldfonline.org April 11, 2014.

8 TAXES

8.1 Taxable sales by year

The amount that a county pays in state sales taxes is often a good indicator of the health of its overall economy. Below is a historical graph of the amount of total sales subject to sales tax for the Eagle Ford Shale region. The original values are indicated by the solid line, while the dotted line represents the four-quarter moving average.

FIGURE 8-1



Source: Texas Comptroller of Public Accounts

The taxable sales for the aggregate of the fifteen counties in the Eagle Ford Shale region follow the pattern of the national economy. It saw a steady increase from $600 million in 2002 to $960 million in 2008. This was followed by a small but steady decline until 2010 to $770 million. However, huge increases every quarter since then have seen the 15-county region's aggregate taxable sales grow to $1.4 billion. This more than doubles the taxable sales from eleven years ago.

8.2 Sales tax revenue by county

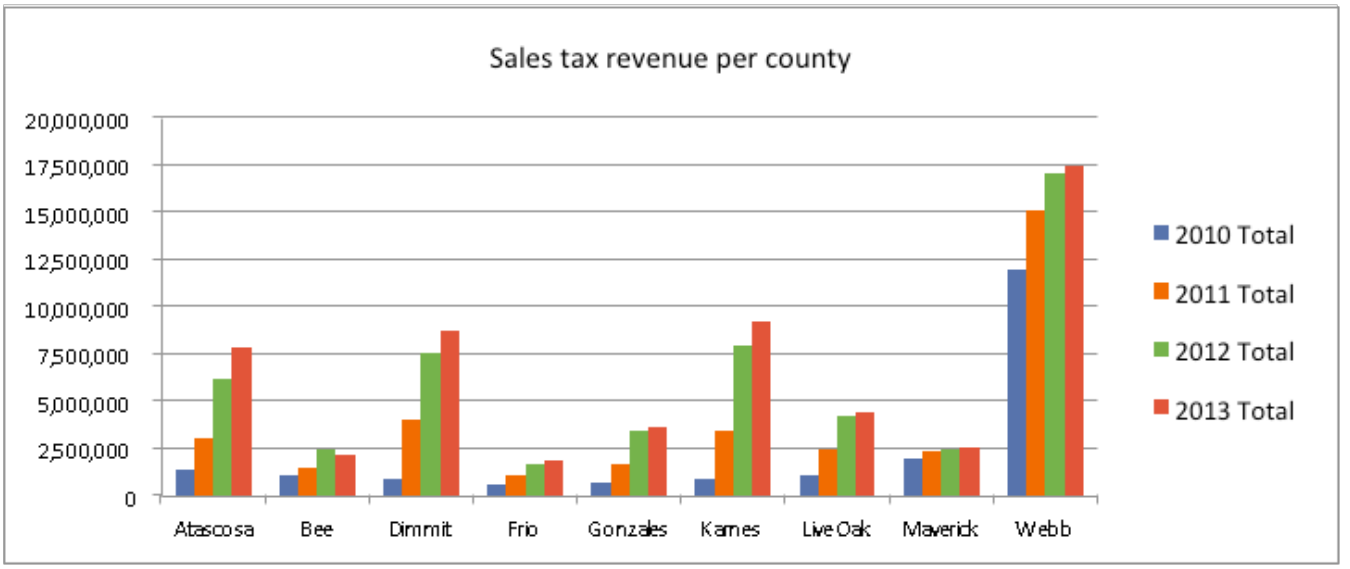
In the years since drilling began in the Eagle Ford Shale, each of the counties has reported notable increases in sales, and thus in sales subject to sales tax. Sales taxes collected in the Eagle Ford counties have increased substantially between 2010 and 2013. This has significantly expanded a major source of revenue for local communities.

Table 8-1

Sales tax revenue for the 15-county area					
	2010	**2011**	**2012**	**2013**	**Growth rate**
Atascosa	1,336,982	2,996,728	6,122,679	7,795,995	27.3%
Bee	1,076,401	1,432,354	2,484,842	2,112,029	-15.0%
DeWitt	This entity does not impose a sales tax.				
Dimmit	868,487	4,022,652	7,536,457	8,734,452	15.9%
Frio	529,933	1,042,626	1,701,652	1,870,955	9.9%
Gonzales	670,370	1,695,929	3,387,672	3,582,980	5.7%
Karnes	837,038	3,390,154	7,961,496	9,248,265	16.1%
La Salle	This entity does not impose a sales tax.				
Lavaca	This entity does not impose a sales tax.				
Live Oak	1,086,298	2,480,156	4,181,310	4,371,311	4.5%
Maverick	1,982,061	2,386,151	2,446,533	2,533,657	3.5%
McMullen	This entity does not impose a sales tax.				
Webb	11,916,236	15,133,459	17,077,576	17,417,612	1.9%
Wilson	This entity does not impose a sales tax.				
Zavala	This entity does not impose a sales tax.				
Total	**20,303,806.40**	**34,580,210.53**	**52,900,216.34**	**57,667,256.00**	**9.0%**

Source: Texas Comptroller of Public Accounts, Allocation Historical Summary

Figure 8-2



Source: Texas Comptroller of Public Accounts, Allocation Historical Summary

Note: counties not listed do not collect sales tax.

8.3 Property tax revenue

Property tax collections provide the largest source of revenue that local governments have available for providing education, transportation, and law enforcement. When local governments plan budgets, property tax revenues are considered to be a stable monetary source. However, increases in these revenues can take up to a year following development to take place.

While housing developments are currently under construction in various locations throughout Eagle Ford, there remains a substantial lag time for collecting property tax revenue on these homes. Despite these challenges, property taxes are expected to increase significantly as residents continue relocating to the 15-county area causing property values to rise.

Photo credit – Jose Alcala

Cotulla

Cotulla has been very active with Eagle Ford Shale activity since the beginning. The Middle Rio Grande Development Council was the basis for the formation of the Eagle Ford Shale Consortium, but its impact covers the entire region.

Not surprisingly, and similar to several other counties in the Eagle Ford, Cotulla's sales tax revenues have been increasing steadily. In 2009, sales taxes totaled $445,022. By 2012 they had risen to $2,200,00 annually.

The city is working on street improvements, with plans to spend between $1.2 and $1.6 million over a dozen streets in the downtown area. As part of a downtown revitalization effort, the city plans to restore the historical Cotulla Motor Company that runs along Main Street and will be used for city administrative offices. Phase II of the project calls for a new retail center nearby on Front Street with historically compatible one and two story heights. The modular format will encourage business diversity, which is adaptable to changing economic conditions.

One of Cotulla's biggest challenges is developing capacity of city staff. City employees are encouraged to attend training and to obtain certifications in order to increase the level of professionalism that is essential for a fast-growing city.

One issue concerning long-term sustainability is the fact that there are 19 hotels or motels either planned or already completed. Perhaps the most likely strategy, according to city manager Larry Dovalina is to make Cotulla a staging point for truckers headed to and from Mexico. Cotulla is about an hour's drive from the border in Laredo and now boasts at least two competitive truck stops that help ensure competitive fuel prices. As trade with Mexico continues to increase, Cotulla is potentially well-positioned to capitalize on that growth.

9 Economic Impacts

To quantify the impact of the Eagle Ford Shale, we focused on six classifications of oil and gas industry establishments, defined by the North American Industry Classification System (NAICS):

- Oil and gas (NAICS 211)
- Drilling and oil and gas wells (NAICS 213111)
- Support activities for oil and gas operations (NAICS 213112)
- Oil and gas pipelines and related structures construction (NAICS 237120)
- Oil refineries (NAICS 324110)
- Petrochemicals (NAICS 32511)

We measured six types of economic activity:

- Output: measure of business sales revenue
- Employment: number of full-time equivalent jobs
- Payroll: employee earnings (salaries and wages)
- Gross regional product: value of goods and services (employee earnings plus local business profits)
- Local government revenues: property taxes, sales tax, intergovernmental transfers, and other miscellaneous receipts
- State revenues: corporate taxes, excise taxes, severance taxes...

Impacts are provided for the three sectors of the oil and gas industry:

- Upstream: impacts related to the drilling, completion, and extraction of oil, gas and condensate
- Midstream: impacts related to the transportation of extracted products to the location of the refinery operation, includes pipeline construction
- Downstream: impacts related to the refining and processing of the transported products

The core 15-county area includes Atascosa, Bee, DeWitt, Dimmit, Frio, Gonzales, Karnes, La Salle, Lavaca, Live Oak, Maverick, McMullen, Webb, Wilson, and Zavala. Lavaca County was not included in the previous edition of this study. The neighboring 6-county area includes Bexar, Jim Wells, Uvalde, Victoria, Nueces, and San Patricio. All counties together represent the core and neighboring 21-county area.

We deduced the revenues for oil and gas extraction during 2013 using price information from the Energy Information Administration (EIA). Using the revenues as an input to IMPLAN,[88] we derived direct, indirect and induced impacts for the oil and gas (NAICS 211) economic sector.

[88] The Center for Community and Business Research uses IMPLAN, software used for economic impact studies that offers linkages to various U.S. or international data at various geographic levels.

The CCBR analysis uses a standard definition of ***direct*** impacts, which consist primarily of the actual production and employment by the firms operating directly in the shale – those outlined by the six NAICS codes above. Yet, clearly jobs supported by the Eagle Ford Shale show up in other areas. ***Indirect*** impacts, for example, include the operational and personnel expenditures made by suppliers – the inter-industry transactions (or exchanges) that follow-on from the direct economic activity. In addition, the ***induced*** impacts include income flows created when workers spend money at stores, restaurants, and for housing in the impacted counties.

9.1 Total economic impacts summary

In 2013, the total economic output for oil and gas activities in the core 15-county area is estimated to have been nearly $71.8 billion, which supported 114,315 jobs and generated revenues of more than $2 billion in each of the local and state governments. Forecasted for 2023 is a total economic output of $106.4 billion, which is anticipated to support 150,793 jobs and generate revenues nearly $3.7 billion in each of the local and state governments.

Table 9-1

	Economic impact*	2013	2023
Core 15-county area	Output	**$71,829,614,579**	**$106,394,056,752**
	Employment, full-time	**114,315**	**150,793**
	Payroll	$4,151,223,930	$9,636,479,402
	Gross regional product	$36,325,059,676	$61,815,925,016
	Local government revenues	$2,025,968,804	$3,741,688,868
	State revenue, including severance taxes	$2,028,406,113	$3,774,006,283
			**Includes direct, indirect, and induced impacts.*

Source: IMPLAN. Elaboration CCBR.

9.2 Low, moderate, high estimates for 2023

Due to the uncertainty in the future of oil and gas, three forecasts were prepared to show the impacts given low, moderate, or high prices of oil and gas. The forecasts were prepared using Energy Information Agency (EIA) oil and gas price estimates. The moderate scenario is used throughout the study. Inflation is not considered so as to present an "apples to apples" comparison with 2013.

Table 9-2

	Economic impact*	Low estimate	Moderate estimate	High estimate
Core 15-county area	Output	$37,105	$106,394	$230,734
	Employment, full-time	55,328	150,793	361,974
	Payroll	$3,174	$9,636	$20,806
	Gross regional product	$19,561	$61,816	$139,539
	Local government revenues	$1,131	$3,742	$8,849
	State revenue, including severance taxes	$1,131	$3,774	$8,854
				$ millions, 2013 dollars
				**Includes direct, indirect, and induced impacts.*

Source: IMPLAN. Elaboration CCBR.

9.3 2013 Total estimated economic impacts

In 2013, the core 15-county area produced $71.8 billion in revenue and supported 114,315 jobs. Of those jobs, 37% were direct, 46% indirect, and 17% induced. Impacts were also assessed to include the direct, indirect, and induced impacts of the six neighboring counties. The core and neighboring 21-county area produced an output of nearly $87.8 billion and supported 154,984 full-time jobs. Of those jobs, 33% were direct, 46% indirect, and 21% induced. The CCBR calculated that 3,311 wells were completed and actively producing in 2013.

Table 9-3

	Economic impact*	Direct	Indirect	Induced	Total
Core 15-county area	Output	$61,470,280,412	$7,941,100,117	$2,418,234,050	**$71,829,614,579**
	Employment, full-time	42,607	52,333	19,375	**114,315**
	Payroll	$2,027,428,721	$1,539,076,337	$584,718,872	$4,151,223,930
	Gross regional product	$30,448,269,805	$4,333,962,004	$1,542,827,867	$36,325,059,676
	Local government revenues				$2,025,968,804
	State revenue, including severance taxes				$2,028,406,113
Core and neighboring 21-county area	Output	$70,725,115,021	$12,896,817,708	$4,135,496,654	**$87,757,429,382**
	Employment, full-time	51,652	71,648	31,684	**154,984**
	Payroll	$2,707,017,870	$2,036,271,899	$896,394,413	$5,639,684,182
	Gross regional product	$32,992,259,490	$7,199,851,186	$2,640,560,616	$42,832,671,293
	Local government revenues				$2,218,877,342
	State revenue, including severance taxes				$2,214,664,000

Source: IMPLAN. Elaboration CCBR.

Opportunities for Economic Diversification in Rural Texas: Nature Tourism and Wildlife Photography

Prospects for economic diversification range from hunting, recreation, tourism (which includes cultural, nature, heritage/historical, recreational), alternative energy production such as geothermal or wind, water desalination and others. One of the subsets of tourism - nature tourism - holds particular promise for the Eagle Ford area, not least of which because it promotes environmental stewardship.

The Images for Conservation Fund (ICF) maintains an active interest in the sustainability of the Eagle Ford Shale using nature photography to foster art, education, wildlife conservation, economic development and natural history. In the process of helping to develop a diversified industry, the organization will also encourage private landowners to restore, preserve, conserve and enhance wildlife habitat at the same time.

There are several advantages to both landowners and the environment for such programs. Leases can be sold year-round (as opposed to hunting leases, which are seasonal). Wildlife diversity is increased because photographers value all types

9.4 2023 Total estimated economic impacts

The projected output estimate for 2023 for the core 15-county area is $106.4 billion and is expected to support 150,793 jobs. Of those jobs, 25% are estimated to be direct, 47% indirect, and 28% induced. Similar to the 2013 estimate, impacts were also assessed to include the direct, indirect, and induced impacts of the six neighboring counties. The core and neighboring 21-county area is expected to produce output of nearly $137.4 billion and support 196,660 full-time jobs. Of those jobs, 20% are estimated to be direct, 51% indirect, and 29% induced.

Table 9-4

	Economic impact*	Direct	Indirect	Induced	Total
Core 15-county area	Output	$90,168,212,826	$10,893,464,660	$5,332,379,266	**$106,394,056,752**
	Employment, full-time	36,785	71,309	42,699	**150,793**
	Payroll	$6,311,816,751	$2,035,342,931	$1,289,319,720	$9,636,479,402
	Gross regional product	$52,608,595,765	$5,805,086,021	$3,402,243,230	$61,815,925,016
	Local government revenues				$3,741,688,868
	State revenue, including severance taxes				$3,774,006,283
Core and neighboring 21-county area	Output	$110,576,454,317	$19,363,931,284	$7,488,598,501	**$137,428,984,102**
	Employment, full-time	38,767	99,786	58,107	**196,660**
	Payroll	$6,718,204,896	$3,432,856,335	$1,927,647,160	$12,078,708,391
	Gross regional product	$57,330,415,830	$10,686,840,880	$4,777,170,284	$72,794,426,994
	Local government revenues				$4,073,239,614
	State revenue, including severance taxes				$4,098,369,070

Source: IMPLAN. Elaboration CCBR.

of wildlife, not just game animals. There is less liability and risk than with hunting. There are also opportunities for value-added activities such as lodging, food service, education, teaching workshops, and professional guides. Nature photography leases can be marketed globally or locally.

Photographing exotic wildlife and local flora is one example of nature tourism that can be developed in rural Texas. Such strategies are more incremental than transformational to be sure, but over an extended period of time can have a significant, positive impact to the environment. Ensuring that local economies in South and West Texas avoid becoming overly dependent on shale energy in this era of unconventional oil and gas production will be essential to the sustainability of the region over the long run.

Photo credit: John Hendrickson Pro-Tour 2006

9.5 Estimated economic impacts for neighboring 6 counties

9.5.1 Bexar

Table 9-5

	Economic impact*	2013	2023
Core 15-county area	Output	$3,238,996,650	$4,400,871,930
	Employment, full-time	13,919	19,332
	Payroll	$48,898,748	$1,008,581,996
	Gross regional product	$1,850,337,294	$2,594,275,552
	Local government revenues	$62,251,734	$85,655,652
	State revenue, including severance taxes	$60,165,489	$82,700,509
			*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.5.2 Jim Wells

Table 9-6

	Economic impact*	2013	2023
Core 15-county area	Output	$105,224,783	$159,539,643
	Employment, full-time	329	440
	Payroll	$18,406,755	$26,300,918
	Gross regional product	$49,735,057	$75,024,343
	Local government revenues	$3,162,312	$5,017,471
	State revenue, including severance taxes	$3,113,080	$4,946,562
			*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.5.3 Nueces

Table 9-7

	Economic impact*	2013	2023
Core 15-county area	Output	$11,830,469,550	$24,313,461,300
	Employment, full-time	22,986	20,755
	Payroll	$1,263,650,613	$1,172,001,111
	Gross regional product	$4,183,007,505	$7,354,890,222
	Local government revenues	$108,937,116	$201,020,516
	State revenue, including severance taxes	$104,903,356	$197,561,269
			*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.5.4 San Patricio

Table 9-8

	Economic impact*	2013	2023
Core 15-county area	Output	$282,179,425	$1,300,532,507
	Employment, full-time	1,487	2,136
	Payroll	$88,476,602	$135,336,237
	Gross regional product	$132,695,070	$393,959,952
	Local government revenues	$2,966,784	$6,999,740
	State revenue, including severance taxes	$2,699,259	$6,610,505
			*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.5.5 Uvalde

Table 9-9

	Economic impact*	2013	2023
Core 15-county area	Output	$107,169,636	$173,153,748
	Employment, full-time	548	876
	Payroll	$14,574,328	$22,180,530
	Gross regional product	$68,067,082	$110,711,880
	Local government revenues	$2,293,176	$3,424,346
	State revenue, including severance taxes	$2,252,513	$3,359,816
			*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.5.6 Victoria

Table 9-10

	Economic impact*	2013	2023
Core 15-county area	Output	$363,774,759	$687,368,223
	Employment, full-time	1,399	2,327
	Payroll	$54,453,207	$77,828,196
	Gross regional product	$223,769,607	$449,640,029
	Local government revenues	$13,297,415	$29,433,021
	State revenue, including severance taxes	$13,124,189	$29,184,126
			*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.6 Output impacts by county

Table 9-11

	County	2013*	2023*
Core 15-county area	Atascosa	$3,309,321,673	$5,888,831,097
	Bee	$382,452,255	$1,473,241,220
	DeWitt	$4,947,708,860	$7,288,946,345
	Dimmit	$8,552,982,031	$12,341,837,612
	Frio	$684,849,735	$1,016,801,803
	Gonzales	$7,463,132,427	$11,369,005,382
	Karnes	$10,964,709,282	$16,752,660,184
	La Salle	$9,001,341,991	$13,574,778,927
	Lavaca	$1,607,274,019	$2,661,190,775
	Live Oak	$6,954,129,494	$8,646,546,519
	Maverick	$175,394,311	$260,171,485
	McMullen	$8,276,163,149	$12,518,235,902
	Webb	$5,008,394,112	$7,051,104,091
	Wilson	$1,444,745,649	$2,109,895,697
	Zavala	$661,926,101	$1,036,509,227
Neighboring 6-county area	**Total 15-county†**	**$69,434,525,089**	**$103,989,756,266**
	Bexar	$3,238,996,650	$4,400,871,930
	Jim Wells	$105,224,783	$159,539,643
	Nueces	$11,830,469,550	$24,313,461,300
	San Patricio	$282,179,425	$1,300,532,507
	Uvalde	$107,169,636	$173,153,748
	Victoria	$363,774,759	$687,368,223
	Total 21-county†	**$85,362,339,892**	**$135,024,683,617**

**Includes direct, indirect, and induced impacts.*

†The summation of the individual counties impacts is smaller (16 percent smaller for the employment impacts, mostly due to induced impacts) than when the impacts are taken for the group as a whole. This happens due to differences of the individual counties industry compositions. In several cases there are industries that exist at the regional level but not at the individual county level. When estimating the impacts, the total amount of jobs, for example, is attributed to the whole region when the industry exists in only a few counties. Therefore, when analyzing the individual county, only the corresponding amount of dollars for the particular county is taken into consideration, not the whole amount for the region. It could be said. either way, that the individual counties underestimate the impacts in the region or that the aggregate impacts overestimates the impacts.

Source: IMPLAN. Elaboration CCBR.

9.7 Employment impacts by county

Table 9-12

	County	2013*	2023*
Core 15-county area	Atascosa	5,682	11,104
	Bee	1,186	1,817
	DeWitt	9,407	11,528
	Dimmit	11,749	15,131
	Frio	1,261	1,472
	Gonzales	11,561	15,293
	Karnes	16,729	21,709
	La Salle	8,818	9,605
	Lavaca	2,388	3,534
	Live Oak	5,097	5,667
	Maverick	420	570
	McMullen	9,109	10,148
	Webb	9,870	14,746
	Wilson	2,060	2,990
	Zavala	914	1,173
Neighboring 6-county area	**Total 15-county**	**96,251**	**126,487**
	Bexar	13,919	19,332
	Jim Wells	329	440
	Nueces	22,986	20,755
	San Patricio	1,487	2,136
	Uvalde	548	876
	Victoria	1,399	2,327
	Total 21-county	**136,919**	**172,353**

**Includes direct, indirect, and induced impacts.*

Source: IMPLAN. Elaboration CCBR.

9.8 Payroll impacts by county

Table 9-13

	County	2013*	2023*
Core 15-county area	Atascosa	$177,918,606	$631,315,247
	Bee	$53,765,072	$88,748,188
	DeWitt	$309,255,027	$648,631,543
	Dimmit	$553,408,552	$1,316,673,814
	Frio	$53,196,389	$99,819,890
	Gonzales	$372,298,548	$967,439,857
	Karnes	$594,032,620	$1,477,408,888
	La Salle	$382,211,072	$1,096,829,815
	Lavaca	$84,249,728	$198,283,841
	Live Oak	$239,141,112	$469,912,521
	Maverick	$14,435,739	$27,791,273
	McMullen	$342,758,744	$1,005,114,128
	Webb	$346,095,528	$791,473,781
	Wilson	$69,005,516	$170,401,733
	Zavala	$29,732,766	$83,261,636
Neighboring 6-county area	**Total 15-county**	**$3,621,505,019**	**$9,636,479,402**
	Bexar	$48,898,748	$1,008,581,996
	Jim Wells	$18,406,755	$26,300,918
	Nueces	$1,263,650,613	$1,172,001,111
	San Patricio	$88,476,602	$135,336,237
	Uvalde	$14,574,328	$22,180,530
	Victoria	$54,453,207	$77,828,196
	Total 21-county	**$5,109,965,272**	**$12,078,708,391**

**Includes direct, indirect, and induced impacts.*

Source: IMPLAN. Elaboration CCBR.

9.9 Gross county products impacts by county

Table 9-14

	County	2013*	2023*
Core 15-county area	Atascosa	$1,771,550,771	$3,705,021,012
	Bee	$140,177,849	$312,956,945
	DeWitt	$2,391,086,909	$3,986,170,579
	Dimmit	$4,529,120,000	$7,627,780,141
	Frio	$379,882,245	$647,869,504
	Gonzales	$3,916,207,378	$6,904,417,141
	Karnes	$5,940,743,870	$10,279,041,482
	La Salle	$4,755,839,700	$8,359,845,527
	Lavaca	$671,553,776	$1,194,047,741
	Live Oak	$2,299,749,323	$3,419,538,257
	Maverick	$98,429,958	$161,461,943
	McMullen	$4,374,488,207	$7,748,975,377
	Webb	$2,602,820,326	$4,269,081,389
	Wilson	$658,851,176	$1,134,604,852
	Zavala	$376,346,211	$678,075,065
Neighboring 6-county area	**Total 15-county**	**$34,906,847,699**	**$61,815,925,016**
	Bexar	$1,850,337,294	$2,594,275,552
	Jim Wells	$49,735,057	$75,024,343
	Nueces	$4,183,007,505	$7,354,890,222
	San Patricio	$132,695,070	$393,959,952
	Uvalde	$68,067,082	$110,711,880
	Victoria	$223,769,607	$449,640,029
	Total 21-county	**$41,414,459,314**	**$72,794,426,994**

**Includes direct, indirect, and induced impacts.*

Source: IMPLAN. Elaboration CCBR.

9.10 Local government revenue impacts by county

Table 9-15

	County	2013*	2023*
Core 15-county area	Atascosa	$103,510,395	$212,293,996
	Bee	$5,840,710	$13,273,948
	DeWitt	$134,695,469	$246,479,833
	Dimmit	$253,410,370	$466,399,160
	Frio	$20,102,760	$37,059,777
	Gonzales	$233,555,038	$444,790,036
	Karnes	$326,805,068	$635,470,751
	La Salle	$252,022,120	$480,888,713
	Lavaca	$39,629,565	$74,810,774
	Live Oak	$92,264,092	$163,216,710
	Maverick	$5,561,268	$9,802,241
	McMullen	$240,070,469	$459,234,488
	Webb	$132,210,152	$239,884,702
	Wilson	$38,067,952	$72,157,888
	Zavala	$20,636,672	$39,191,105
Neighboring 6-county area	**Total 15-county**	**$1,898,382,100**	**$3,741,688,868**
	Bexar	$62,251,734	$85,655,652
	Jim Wells	$3,162,312	$5,017,471
	Nueces	$108,937,116	$201,020,516
	San Patricio	$2,966,784	$6,999,740
	Uvalde	$2,293,176	$3,424,346
	Victoria	$13,297,415	$29,433,021
	Total 21-county	**$2,091,290,637**	**$4,073,239,614**

**Includes direct, indirect, and induced impacts.*

Source: IMPLAN. Elaboration CCBR.

9.11 State revenue impacts by county

Table 9-16

	County	2013*	2023*
Core 15-county area	Atascosa	$103,732,940	$212,046,069
	Bee	$5,741,873	$13,133,127
	DeWitt	$134,793,055	$246,532,446
	Dimmit	$253,511,105	$465,702,695
	Frio	$20,102,760	$37,116,489
	Gonzales	$234,208,219	$445,461,349
	Karnes	$327,794,740	$636,764,921
	La Salle	$252,914,705	$480,888,713
	Lavaca	$39,658,615	$74,775,214
	Live Oak	$92,328,694	$163,236,147
	Maverick	$5,542,495	$9,773,489
	McMullen	$240,786,122	$459,514,416
	Webb	$132,034,053	$239,049,890
	Wilson	$38,104,154	$72,139,927
	Zavala	$20,636,672	$39,313,874
Neighboring 6-county area	**Total 15-county**	**$1,901,890,202**	**$3,774,006,283**
	Bexar	$60,165,489	$82,700,509
	Jim Wells	$3,113,080	$4,946,562
	Nueces	$104,903,356	$197,561,269
	San Patricio	$2,699,259	$6,610,505
	Uvalde	$2,252,513	$3,359,816
	Victoria	$13,124,189	$29,184,126
	Total 21-county	**$2,088,148,088**	**$4,098,369,070**

**Includes direct, indirect, and induced impacts.*

Source: IMPLAN. Elaboration CCBR.

9.12 Upstream, midstream, and downstream impacts

Impacts are provided for the three sectors of the oil and gas industry:

- Upstream impacts relate to the drilling, completion, and extraction of oil, gas, and condensate
- Midstream impacts relate to the transportation of extracted products to the location of the refinery operation, and includes pipelines and their construction
- Downstream impacts relate to the refining and processing of the transported products

9.12.1 Upstream: drilling and completion impacts

Table 9-17

	Economic impact*	2013
Core 15-county area	Output	$25,655,174,635
	Employment, full-time	57,294
	Payroll	$1,967,594,908
	Gross regional product	$10,678,302,030
		*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.12.2 Upstream: extraction impacts

To estimate the impacts of the extraction activities of oil and gas, the sector with NAICS code 211, Oil and Gas Extraction was chosen. This industry code includes Crude Petroleum and Natural Gas Extraction, as well as Natural Gas Liquid Extraction.

Table 9-18

	Economic impact*	2013
Core 15-county area	Output	$38,885,767,880
	Employment, full-time	47,086
	Payroll	$1,778,352,433
	Gross regional product	$23,970,470,762
		*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.12.3 Midstream: pipeline construction impacts

Pipeline infrastructure in the Eagle Ford Shale has been developing in tandem with the increases in exploration and production of natural gas and crude oil, though it has yet to match the needs of the production phase of drilling. As such, companies are still scrambling to add pipelines to move product from production sites to refineries without the use of trucks or rail.

Table 9-19

	Economic impact*	2013
Core 15-county area	Output	$590,325,422
	Employment, full-time	4,115
	Payroll	$172,613,138
	Gross regional product	$247,715,118
		*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.12.4 Downstream: refinery operation impacts

Table 9-20

	Economic impact*	2013
Core 15-county area	Output	$4,779,560,834
	Employment, full-time	1,523
	Payroll	$82,203,037
	Gross regional product	$931,205,805
		*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.13 Downstream development

9.13.1 Land leases

Based on information provided by one firm and extrapolating that value using the estimated amount of royalties found in the study and the payments made by the individual firm, nearly $67 million in the form of lease payments were estimated in 2013. Only five percent of those payments was taken into account for the 2013 impacts; this translated to a total output of S1.9 million as shown in the table below.

Table 9-21

	Economic impact*	2013
Core 15-county area	Output	$1,952,779
	Employment, full-time	18
	Payroll	$466,652
	Gross regional product	$1,244,871
		*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

9.13.2 Royalties

For this study, royalties were estimated at 20 percent of the total revenues from oil and gas operations. These royalties serve as an important source of income to the owners of mineral producing property. Based on the value of oil and gas produces, nearly $6.8 billion in royalty payments were made in 2013. Similar to lease payments, these are treated as increases in wealth. However, royalties are considered a more permanent change in wealth. Based on studies on permanent versus temporary changes, this study assumes that these more permanent changes in wealth will have a larger effect on consumption expenditures. For that reason, ten percent of total royalty payments are assumed to be a base for inclusion in the impacts. These payments translate into a total output impact of $390 million, nearly three thousand jobs, more than $93 million in payroll compensation, and nearly $249 million in gross regional product.

The assumption that only ten percent of royalties are spent implies that 90 percent of total payments are saved. The peer-reviewed literature on savings rates by oil and gas lease/royalty owners is limited, at least in part because it is difficult and expensive to administer surveys to mineral-rights owners about their spending patterns.

One established way to estimate the impacts of these payments is to treat these lease payments not as income but as a sudden increase in wealth. Based on a study by Y. Mehra, only five percent of lease payments are included in the impact analysis as money that would be expended in the area as a direct result of these payments, referred to as the" wealth effect."

However, it is very possible that the assumption that even 90 percent of royalty payments are saved is too high an estimate. If so, it would mean that the economic output numbers presented below are understated, and that the actual economic impact is greater than reported here.

Table 9-22

	Economic impact*	2013
Core 15-county area	Output	$390,555,884
	Employment, full-time	3,064
	Payroll	$93,330,351
	Gross regional product	$248,974,219
		**Includes direct, indirect, and induced impacts.*

Source: IMPLAN. Elaboration CCBR.

9.13.3 Right-of-way payments

Lack of gathering and transmission pipelines in Eagle Ford continues to hinder further development of the formation. Without adequate pipelines to transport these products, companies must hire specialized trucks and drivers. As a result, midstream companies are now spending significant amounts to develop pipeline infrastructure to move products to refineries and processing plants. These pipelines pass through large areas of private land, necessitating compensation to the landowners for the rights to transport their product through the land. This compensation is referred to as right-of-way payments and translates into expenditures in the same way that lease payments do.

Table 9-23

	Economic impact*	2013
Core 15-county area	Output	$5,396,881
	Employment, full-time	42
	Payroll	$1,289,682
	Gross regional product	$3,440,441
		**Includes direct, indirect, and induced impacts.*

Source: IMPLAN. Elaboration CCBR.

9.13.4 Processing plants

Table 9-24

	Economic impact*	2013
Core 15-county area	Output	$1,520,880,263
	Employment, full-time	1,172
	Payroll	$55,373,729
	Gross regional product	$243,706,429
		*Includes direct, indirect, and induced impacts.

Source: IMPLAN. Elaboration CCBR.

El Camino Real de los Tejas

Running across a large portion of the Eagle Ford Shale is the El Camino Real de los Tejas trail, which led to the founding of Texas. The Camino Real was the road the Spanish settlers used to travel north from Mexico City, through Monterrey, Laredo, San Antonio, Nacogdoches, and ultimately Nachitoches in Northern Louisiana, spanning approximately 2580 miles in all. Conversely, the road was also the avenue used by Anglo and African American migration to Texas. The trail covers 40 counties in Texas and 2 parishes in Louisiana. The network of the route that became the Camino Real was based on established American Indian trails.

Literally translated, El Camino Real de los Tejas means The Royal Road of the Tejas Indians. The road's original purpose was to connect Mexico City with Los Adaes in Northern Louisiana (now known as Robeline). Los Adaes was the first capital of Texas beginning in 1721 and for the next 50 years thereafter. The Camino Real Trail also includes the Alamo and the San Antonio Missions.

In 2004, the Camino Real was designated as part of the National Trails System by Congress and part of the National Trails System. The trail is managed in cooperation with the El Camino Real de los Tejas National Historical Trail Association, a non-profit organization that works closely with the U.S. National Parks Service. The association is in the process of attempting to purchase sections and has developed a comprehensive management plan for the administration of the trail.

Throughout its long history, the lands along the Camino Real became home to a variety of ethnic groups beyond the more than 60 tribes indigenous to the region. These settlers included the Spanish, French, Mexicans, African Americans, Anglos, and various other Europeans. In fact, El Camino Real is responsible for much of the diversity of Texas as we know it. Yet there is limited public awareness of the trail.

Industry Diversification: Water in Texas

Sustainable communities are dependent upon available sources of water for a variety of uses including agriculture, municipal needs and energy production. In recent years, the long drought has brought the subject of water to the forefront of planning discussions. The water industry in the U.S. is growing rapidly and offers communities like those in South Texas another opportunity for diversification.

Clearly, Texas faces significant challenges with regard to water supply in the coming years. With or without the drought, with or without the use of water for hydraulic fracturing, Texas was already going to have water issues because of projected population increases.

In November 2013, voters approved Proposition 6, which enabled the state to create a State Water Implementation Fund for Texas, and State Water Implementation Revenue Fund for Texas that will be used to help finance water-related projects. These will be managed by the Texas Water Development Board.

Texas has 16 regional water planning groups and 4,300 water authorities spread throughout the state. Coordination will be a critical issue. Toward that end, the Water Accelerator will identify critical needs and provide incentives for technology development through the use of collaborative, real-time networks that include water authorities, institutes for research and higher education, and the private sector.

AccelerateH2O
Texas Water Technology Accelerator

Areas of focus for the Texas Water Accelerator include:

- Desalination and brine by-product reuse
- Brackish purification, reuse
- Water-Energy Nexus
- Agriculture supply, irrigation
- Treatment, monitoring, safety
- Infrastructure, operations, maintenance
- Conservation
- Transport, distribution and logistics
- Integration of information technology components (big data, apps, mobile)
- Advanced manufacturing and production sustainability

In order for Texans to continue to enjoy robust economic growth, the state will have to develop water strategies that are sustainable. This will require a combination of waste-avoidance (leaks, agricultural application techniques), new sources of drinking water, and new technologies. These represent opportunities for communities in the Eagle Ford and South Texas.

10 Final Comments on the Eagle Ford

The overall Eagle Ford Shale oil and condensate production has grown from 581 barrels per day in 2008 to over 1.1 million barrels per day as of June 2014. Natural gas production is now in excess of 4 billion cubic feet per day.

Before the end of 2014, oil production alone (not including condensate) in the Eagle Ford is expected to cross the 1 million barrel per day mark. In fact, it seems likely that production in the Eagle Ford may overtake the Bakken in North Dakota soon, and possibly even West Texas, at least for a period of time.

So while oil, condensate and gas production in the Eagle Ford continues to increase as we had forecast, the challenges that come with all of this activity are more critical than ever. Infrastructure - roads, water, wastewater, K-12 education, medical facilities - are the keys that will ensure future sustainability of communities in South Texas.

Community leaders should also be sensitive to the aesthetics of their towns and counties. Creating attractive, livable communities will serve as the foundation for economic diversity - perhaps the most important aspect of long-term sustainability.

Diversification into tourism, recreation, higher-margin agriculture such as olives and olive oil production, as well as water desalination appear to be some of the more attractive options. The ability of small towns to draw knowledge workers may hold promise as well. At the end of the day, we hope that the preceding pages have provided some insight useful to all Texans about constructive approaches for community sustainability against the backdrop of a new and unexpected resurgence of energy production in Texas.

10.1 Suggestions for further research

With ongoing activity in the Eagle Ford and an environment in a state of constant change, there is always more to know. Below are current and proposed topics by CCBR and UTSA's Institute for Economic Development that seek to address important issues in South and West Texas that include:

- Strategies and plans for regional and community sustainability
- Better measures and tracking of quality of life and environmental stewardship
- Workforce analysis, training and attraction
- Additional opportunities for investment and economic diversification
- Comprehensive situation analysis that will assess the current and future projected supply and demand for health services in the Eagle Ford region
- Studies to address water supply and usage for the next 100 years

11 About the Center for Community and Business Research

The Center for Community and Business Research (CCBR) is one of twelve centers within the University of Texas at San Antonio's Institute for Economic Development. Each center is specifically designed to address different economic, community, and small to medium sized business development needs. CCBR conducts regional evaluation, assessment, and long-term applied research on issues related to community and business development. CCBR serves the needs of economic development agencies, workforce development boards, businesses, associations, city, state and federal governments and other community stakeholders in search of information to make better informed decisions.

CCBR develops, conducts, and reports on research projects that shed light on how organizations, communities, or the economy work. This is done through the use of various techniques including, but not limited to:

- Economic Impact Analyses
- Feasibility Studies and Market Analysis
- Surveys of Business and Community Organizations
- Community Development Studies
- Interdependent Critical Infrastructure Analysis
- Transportation Studies
- Economic Development Corporation/Department Analysis and Evaluation
- Monitoring and Evaluation
- EB-5 Regional Center Studies
- Analysis of Secondary Data
- Report Writing and Presentation

For more information about CCBR or the Institute for Economic Development, please contact (210) 458-2020.

The mission of the Institute for Economic Development is to provide ongoing consulting, training, technical, research and information services in tandem with University-based assets and resources and other state, federal and local agencies, to facilitate economic, community and business development throughout South and West Texas, and the Border Region.

Working together to build the economy one business at a time.

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