

**WSLCA CONFERENCE
JANUARY 2020**

OIL AND GAS AND SUSTAINABILITY

**Thomas Tunstall, Ph.D.
Senior Research Director
Institute for Economic Development
The University of Texas at San Antonio
thomas.tunstall@utsa.edu**

UNIVERSITY OF TEXAS AT SAN ANTONIO INSTITUTE FOR ECONOMIC DEVELOPMENT

- SMALL BUSINESS DEVELOPMENT CENTERS - SBDC (79 COUNTIES IN SOUTH, WEST AND CENTRAL TEXAS)
- PROCUREMENT TECHNICAL ASSISTANCE CENTER (TEXAS)
- JP MORGAN CHASE VETERAN'S PROGRAM (TEXAS)
- SOUTHWEST TRADE ADJUSTMENT ASSISTANCE CENTER (TX, OK, LA)
- SBDC NATIONAL INFORMATION CLEARINGHOUSE (NATIONAL)
- MINORITY BUSINESS CENTER (NATIONAL)
- COMMUNITY AND BUSINESS RESEARCH (NATIONAL, INT'L)
- INTERNATIONAL TRADE CENTER (MEXICO, CENTRAL/SOUTH AMERICA, CARIBBEAN, NORTH AFRICA)

UTSA INSTITUTE FOR ECONOMIC DEVELOPMENT

RESEARCH AT THE INSTITUTE FOCUSES ON RESEARCH PROJECTS THAT HELP BUSINESS AND POLICYMAKERS PLAN FOR A DYNAMIC FUTURE:

- **ECONOMIC IMPACT STUDIES**
- **COMMUNITY DEVELOPMENT STUDIES (I-35, SH 130)**
- **EB-5 IMMIGRANT INVESTOR REGIONAL CENTER IMPACT STUDIES**
- **ANALYSIS ON VARIOUS TOPICS:**
 - EAGLE FORD SHALE
 - SAN ANTONIO MISSIONS
 - SOUTH TEXAS MEDICAL CENTER
 - UNIVERSITY OF TEXAS SYSTEM
 - TARGETED INDUSTRY RECRUITMENT / WORKFORCE ANALYSIS
 - REPURPOSING OF MILITARY BASES FOR COMMERCIAL USE

UTSA INSTITUTE FOR ECONOMIC DEVELOPMENT

AS THE RESEARCH ARM OF UTSA'S INSTITUTE FOR ECONOMIC DEVELOPMENT WE ARE DEDICATED TO SERVING:

- ECONOMIC DEVELOPMENT CORPORATIONS (E.G., SA EDF)
- CITY, STATE AND FEDERAL GOVERNMENTS
- WORKFORCE DEVELOPMENT BOARDS
- BUSINESSES
- ASSOCIATIONS
- OTHER COMMUNITY STAKEHOLDERS

**IN THEORY,
THERE IS NO DIFFERENCE
BETWEEN THEORY AND
PRACTICE;
IN PRACTICE,
THERE IS.**

**- OVERHEARD AT A COMPUTER SCIENCE
CONFERENCE — IMPROPERLY ATTRIBUTED TO
YOGI BERRA**

**HISTORY DOESN'T
REPEAT ITSELF.
BUT IT DOES
RHYME.**

MARK TWAIN

UTSA – EMERGING TIER 1 UNIVERSITY

CALIFORNIA: 9 TIER 1 UNIVERSITIES

(POPULATION 38 MILLION)

1. STANFORD UNIVERSITY (1900)
2. UNIVERSITY OF CALIFORNIA, BERKELEY (1900)
3. CALIFORNIA INSTITUTE OF TECHNOLOGY (1934)
4. UNIVERSITY OF SOUTHERN CALIFORNIA (1969)
5. UNIVERSITY OF CALIFORNIA, LOS ANGELES (1974)
6. UNIVERSITY OF CALIFORNIA, SAN DIEGO (1982)
7. UNIVERSITY OF CALIFORNIA, SANTA BARBARA (1995)
8. UNIVERSITY OF CALIFORNIA, DAVIS (1996)
9. UNIVERSITY OF CALIFORNIA, IRVINE (1996)

NEW YORK: 6 TIER 1 UNIVERSITIES

(POPULATION 19 MILLION)

1. COLUMBIA UNIVERSITY (1900)
2. CORNELL UNIVERSITY (1900)
3. UNIVERSITY OF ROCHESTER (1941)
4. NEW YORK UNIVERSITY (1950)
5. UNIVERSITY AT BUFFALO, THE STATE UNIVERSITY OF NEW YORK (1989)
6. STONY BROOK UNIVERSITY-THE STATE UNIVERSITY OF NEW YORK (2001)

TEXAS: ONLY 3 TIER 1 UNIVERSITIES

(POPULATION 27 MILLION)

1. UNIVERSITY OF TEXAS AT AUSTIN (1929)
2. RICE UNIVERSITY (1985)
3. TEXAS A&M UNIVERSITY (2001)





COUNTIES INCLUDED IN STUDY AREA

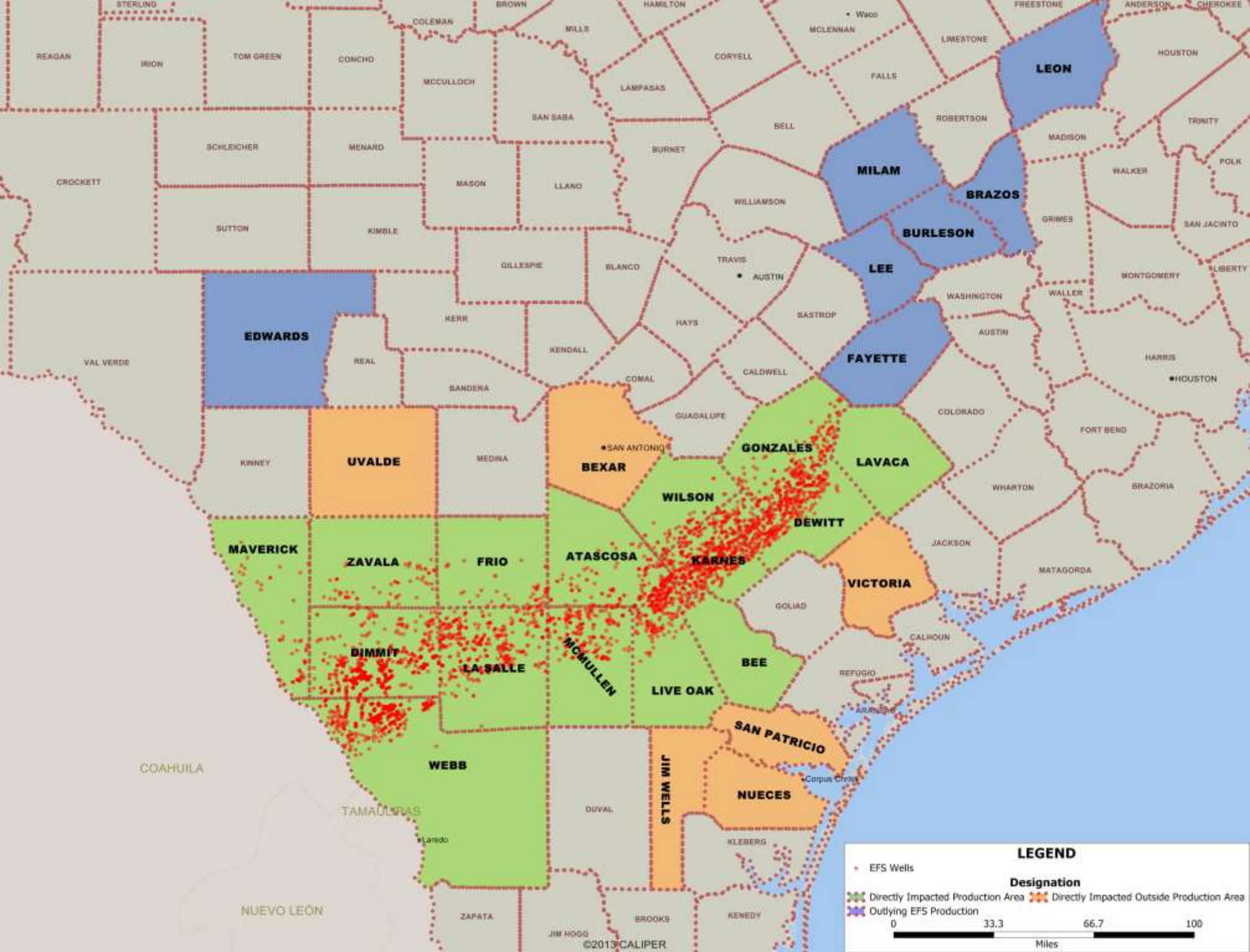
■ PRODUCING COUNTIES:

- ATASCOSA
- BEE
- DEWITT
- DIMMIT
- FRIO
- GONZALES
- KARNES
- LA SALLE
- LAVACA
- LIVE OAK
- MAVERICK
- McMULLEN
- WEBB
- WILSON
- ZAVALA

ADJACENT COUNTIES:

- BEXAR
- JIM WELLS
- NUECES
- SAN PATRICIO
- UVALDE
- VICTORIA

Counties not included in the analysis are
Leon, Milam, Brazos, Burleson, Lee, Fayette, Lavaca, Edwards, Houston, and Wood



Eagle Ford Economic Reports

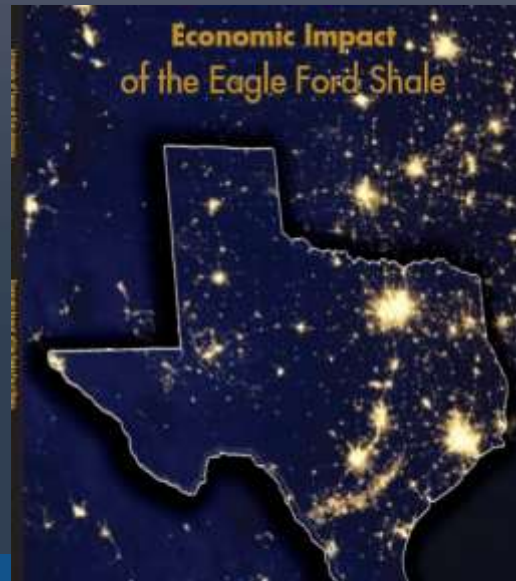


Economic Impact of the Eagle Ford Shale

February 2011

Prepared by:

Center for Community and Business Research
The University of Texas at San Antonio
Institute for Economic Development



Institute for
Economic
Development
Center for Community
and Business Research
The University of Texas at San Antonio

UTSA The University of Texas at San Antonio

Economic Impact of the Eagle Ford Shale Business Opportunities and the New Normal

JUNE 2017

OCTOBER 2012

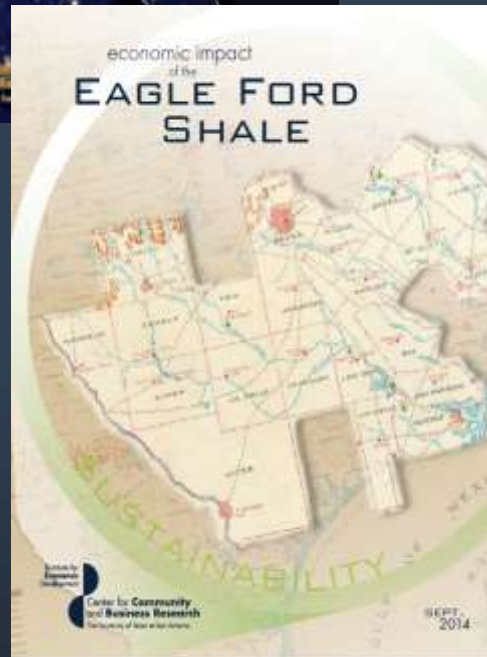
Workforce Analysis for the Eagle Ford Shale



Prepared by:
Center for Community and Business Research
The University of Texas at San Antonio
Institute for Economic Development

Institute for
Economic
Development
Center for Community
and Business Research
The University of Texas at San Antonio

economic impact of the EAGLE FORD SHALE



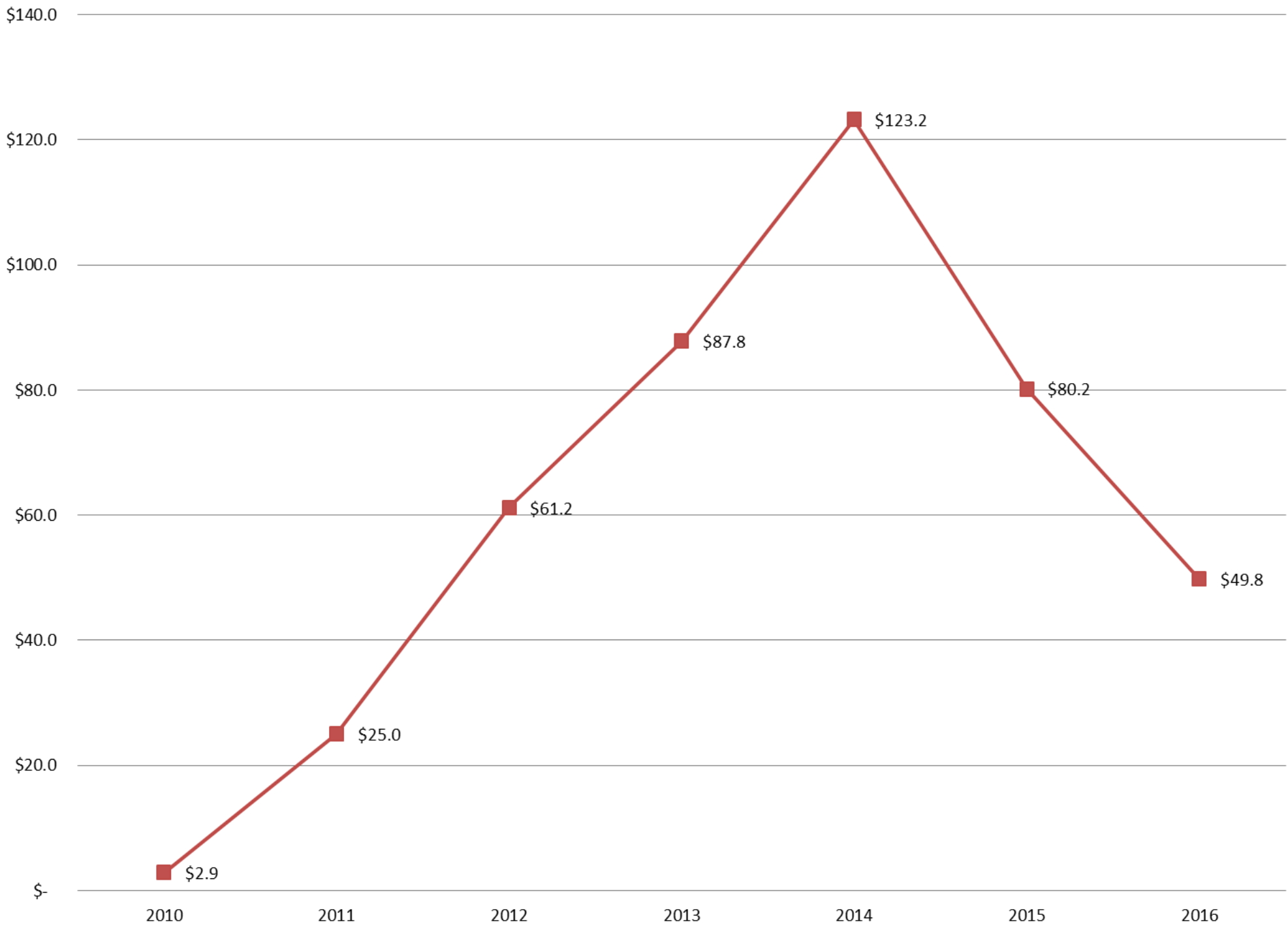
Institute for
Economic
Development
Center for Community
and Business Research
The University of Texas at San Antonio

SEPT
2014

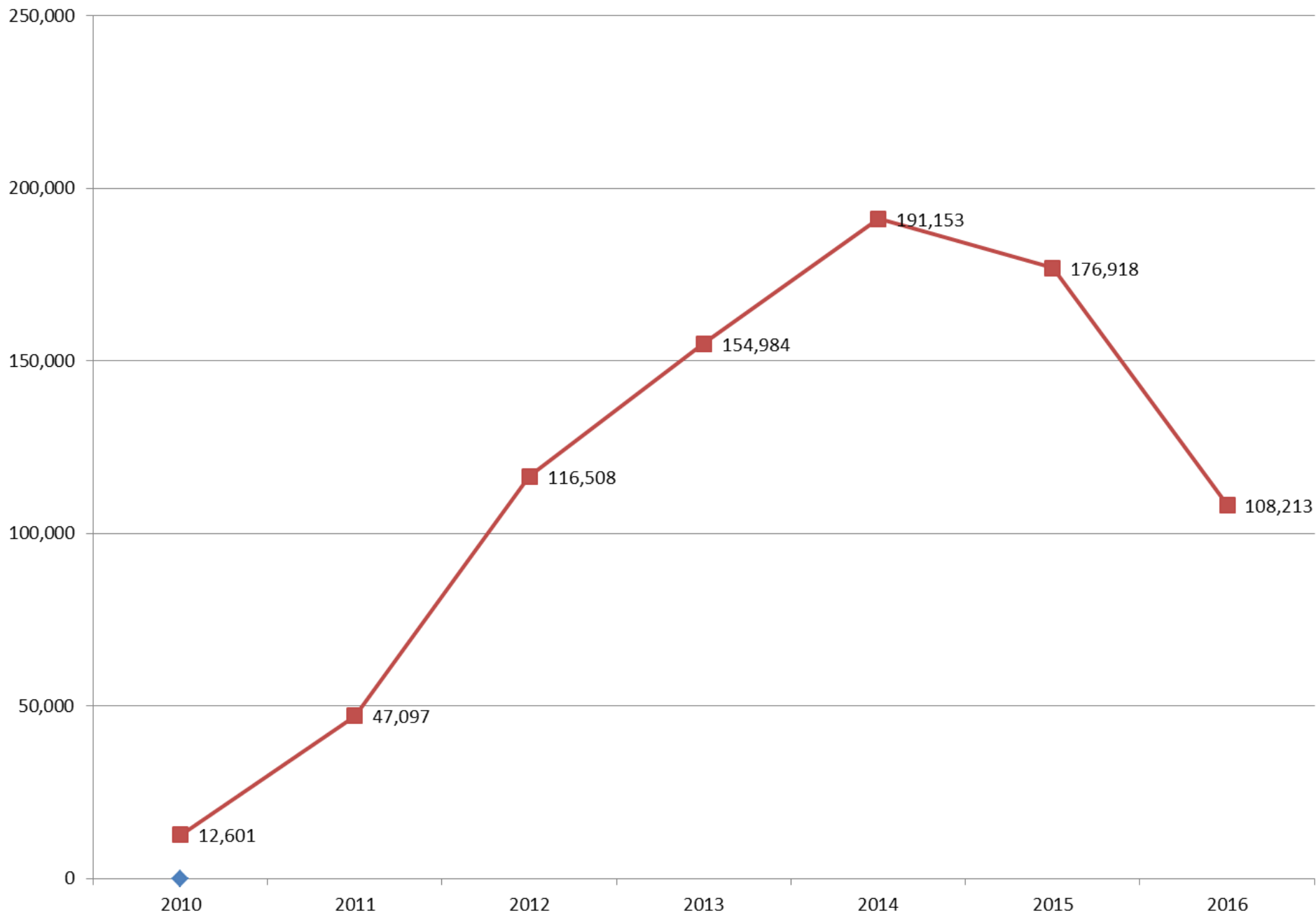
SCOPE OF STUDY
2014-2016

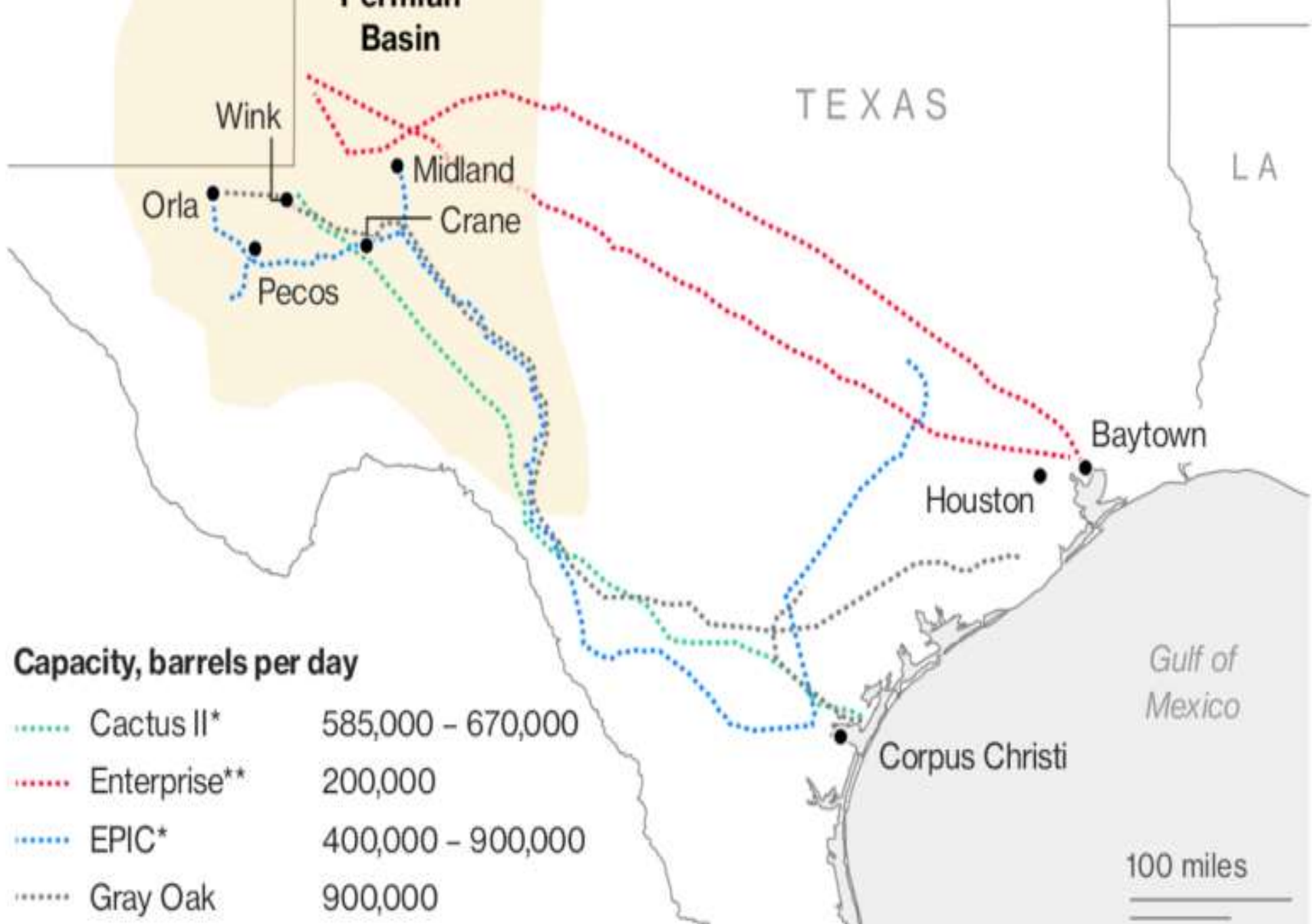
Institute for
Economic
Development
Center for Community
and Business Research
The University of Texas at San Antonio

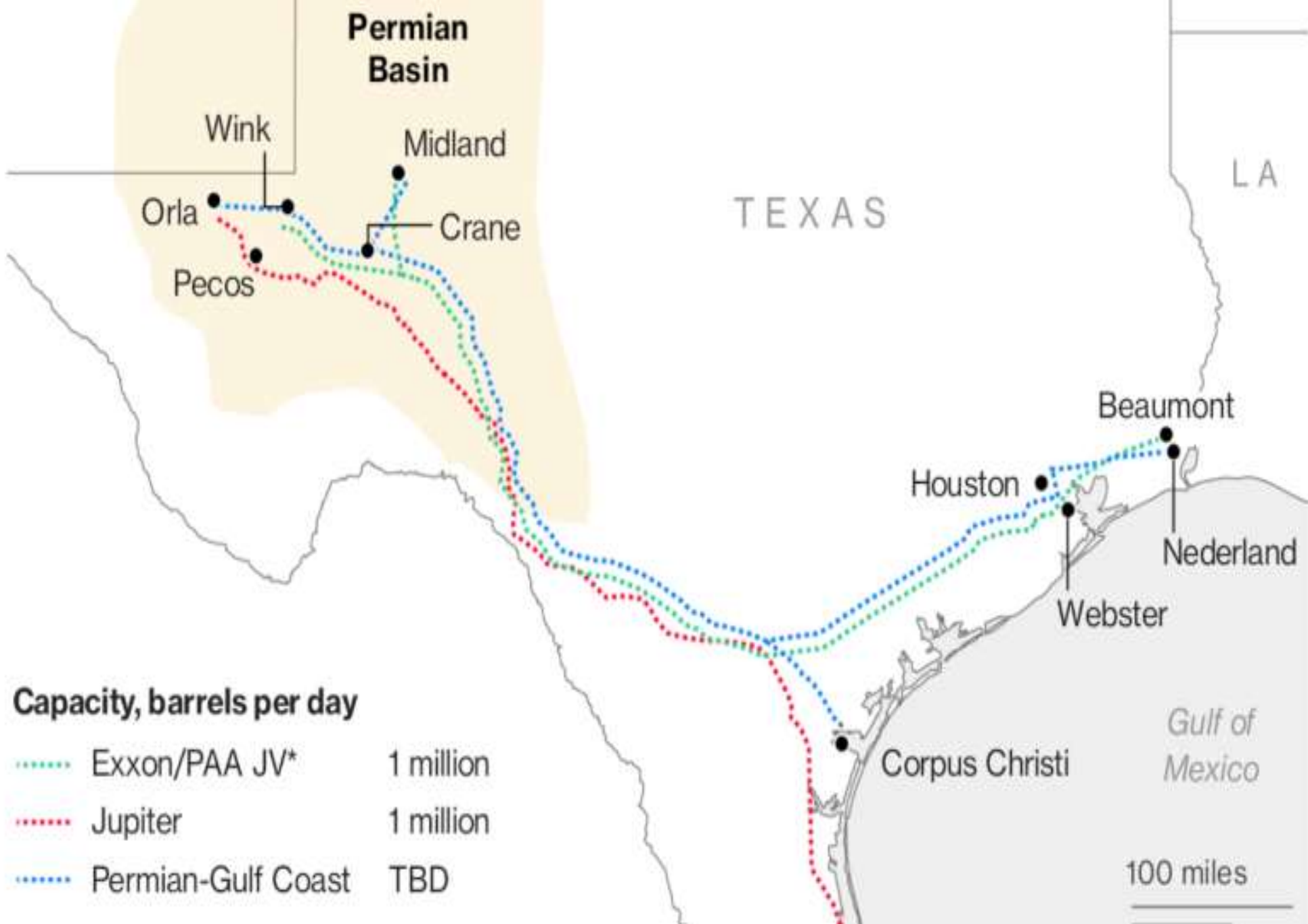
Economic Impact (billions)



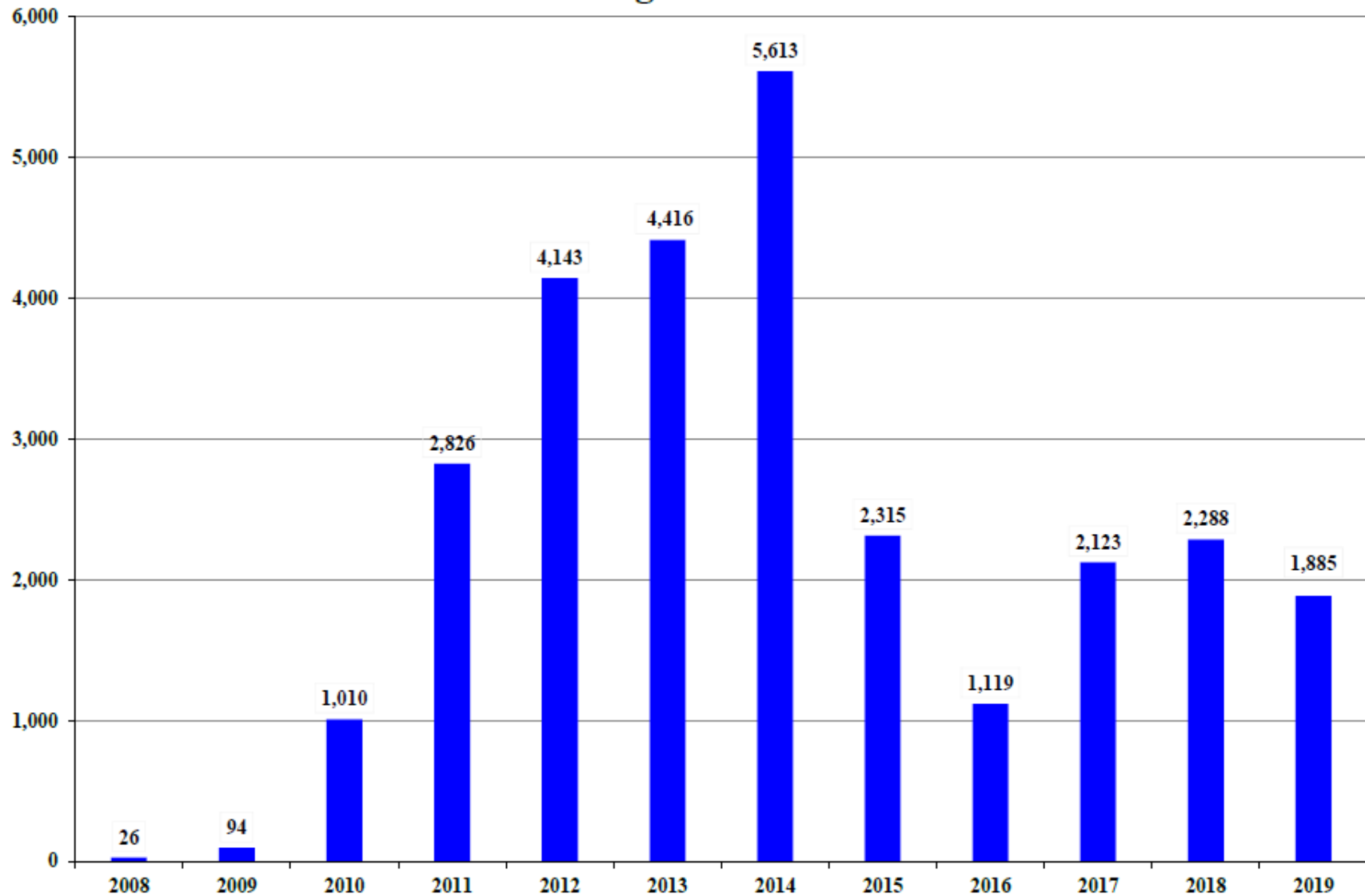
Job Supported







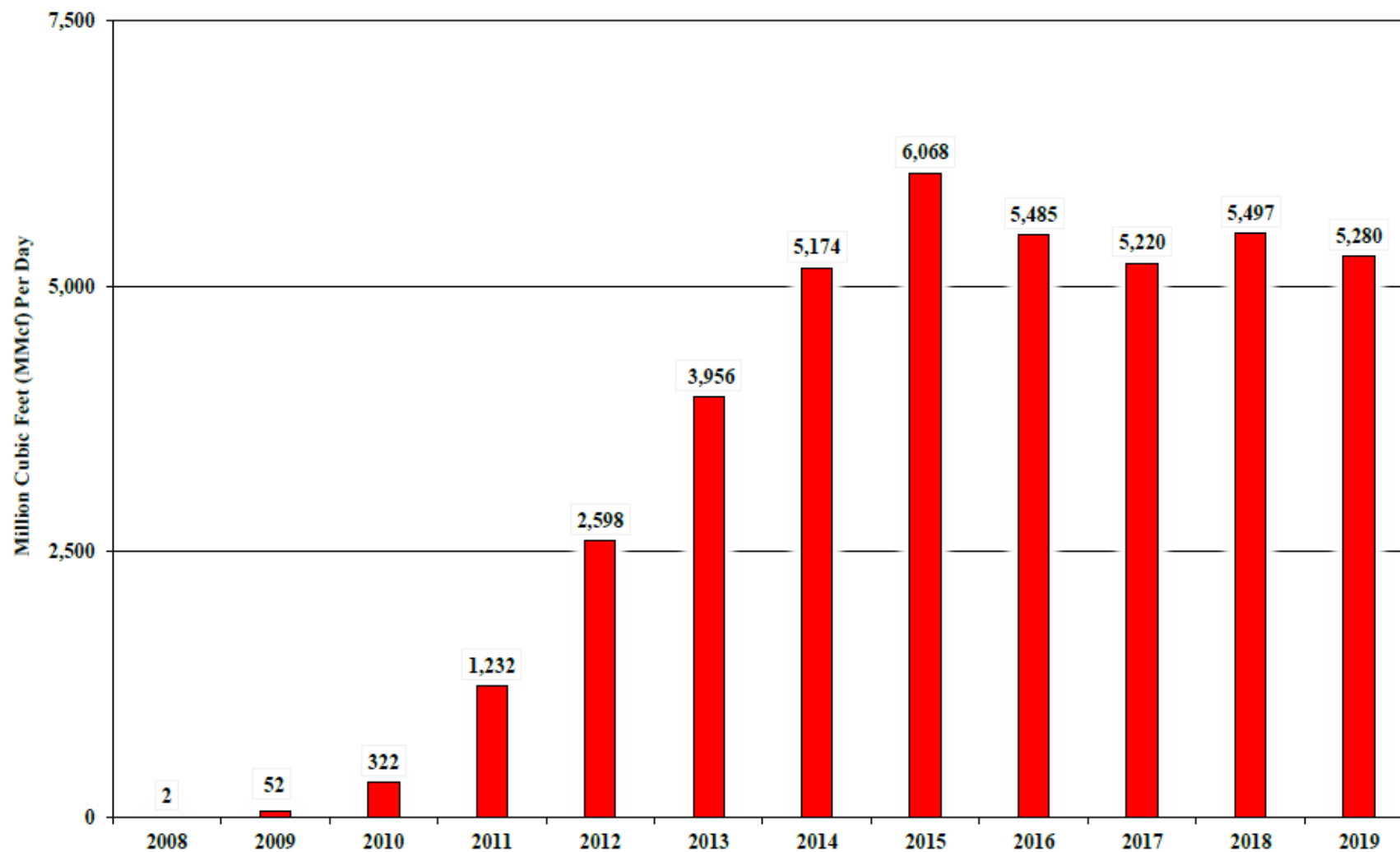
Texas Eagle Ford Shale Drilling Permits Issued 2008 through November 2019



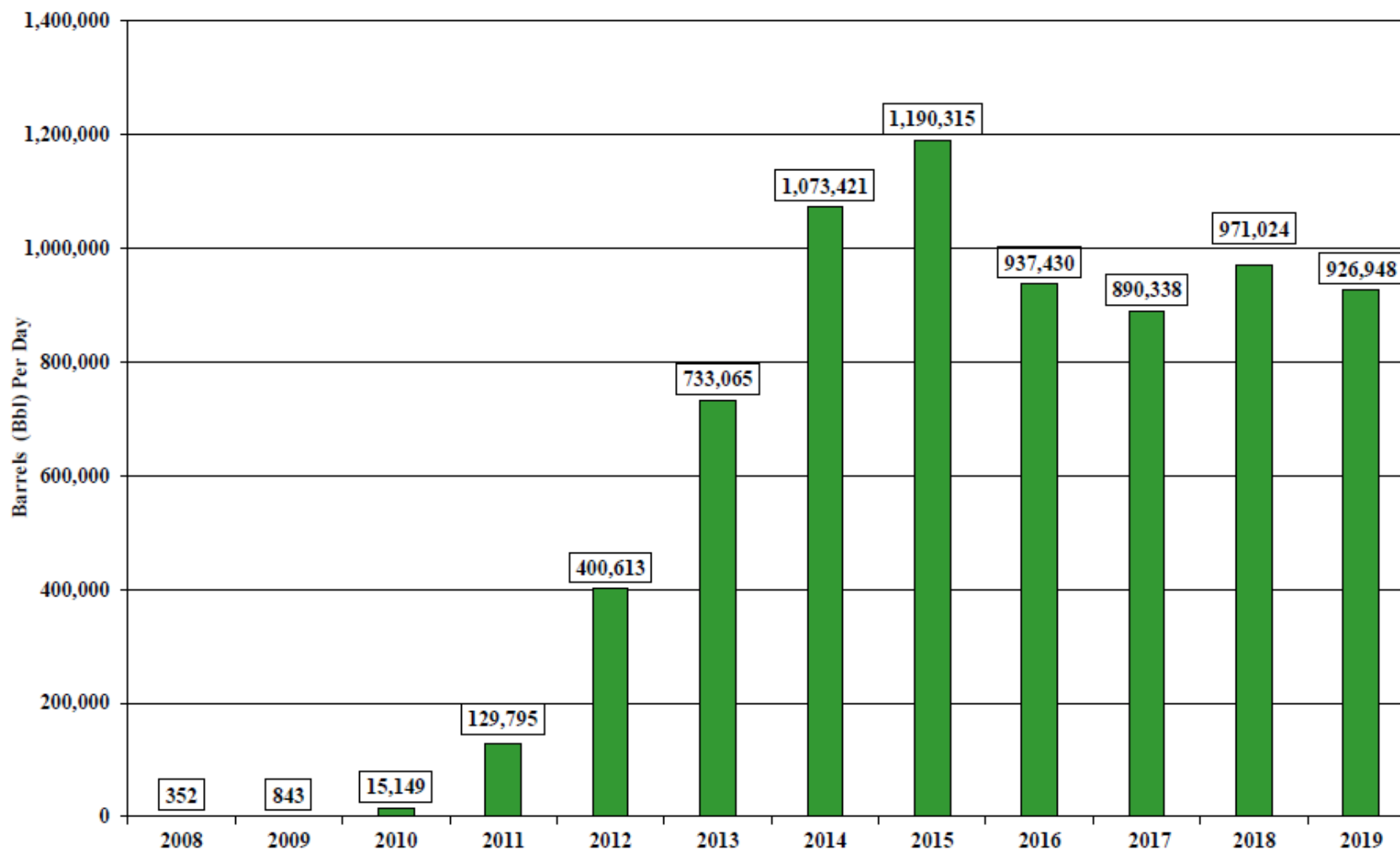
12/11/2019

Source: Texas Railroad Commission DrillingPermitQuery(Includes New Drill & ReEnter Permits)

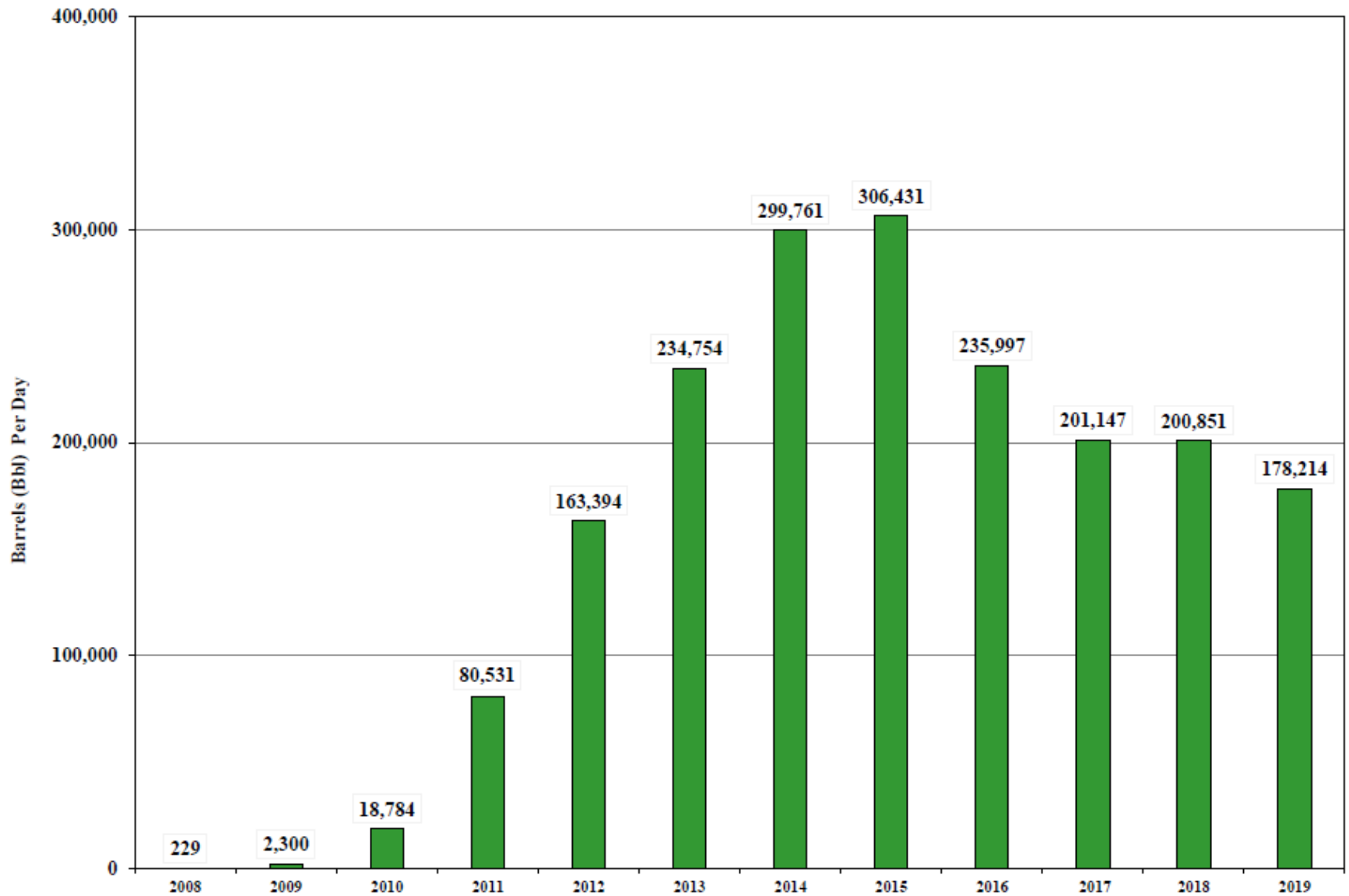
Texas Eagle Ford Shale Total Natural Gas Production 2008 through September 2019



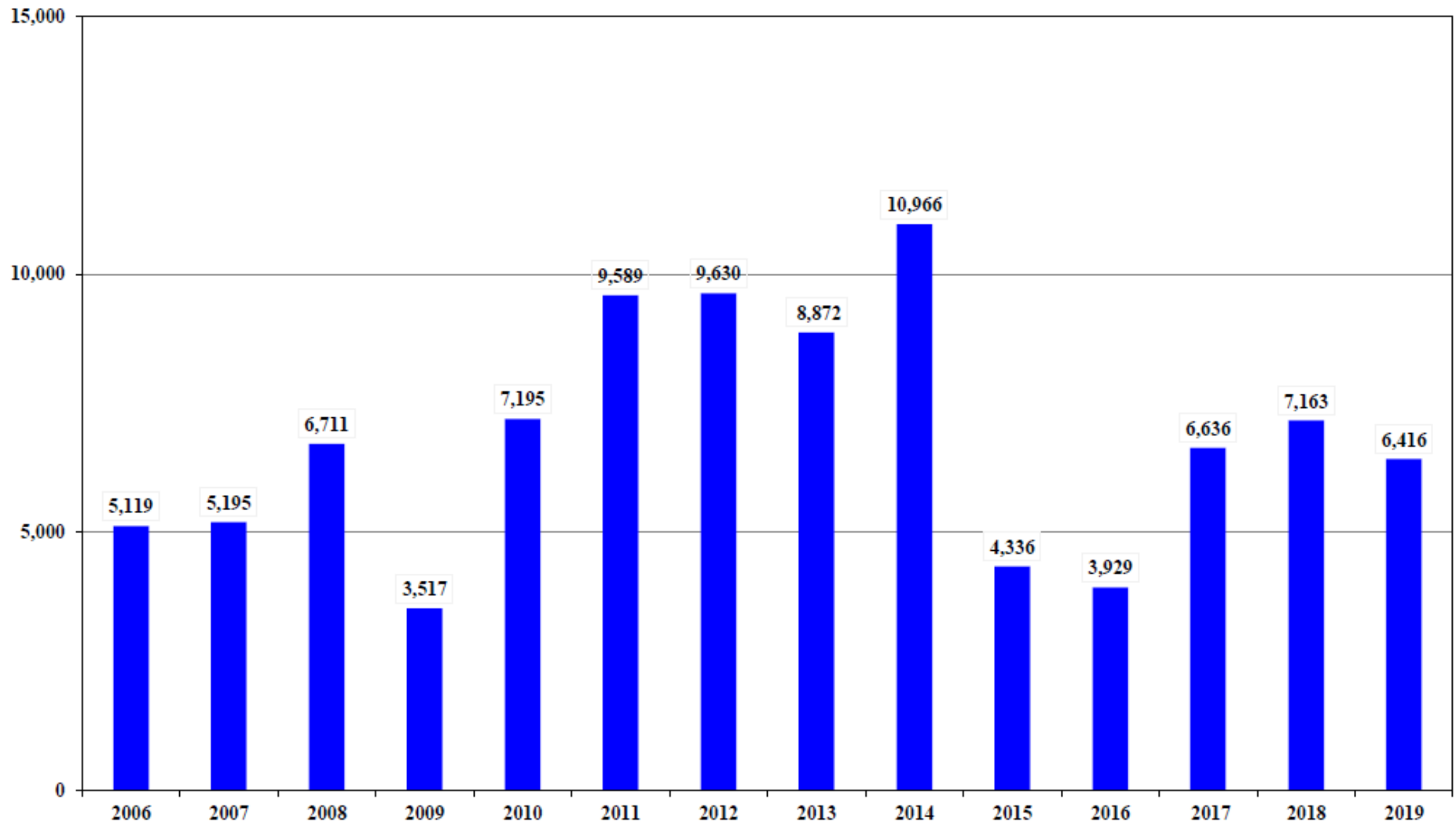
Texas Eagle Ford Shale Oil Production 2008 through September 2019



Texas Eagle Ford Shale Condensate Production 2008 through September 2019



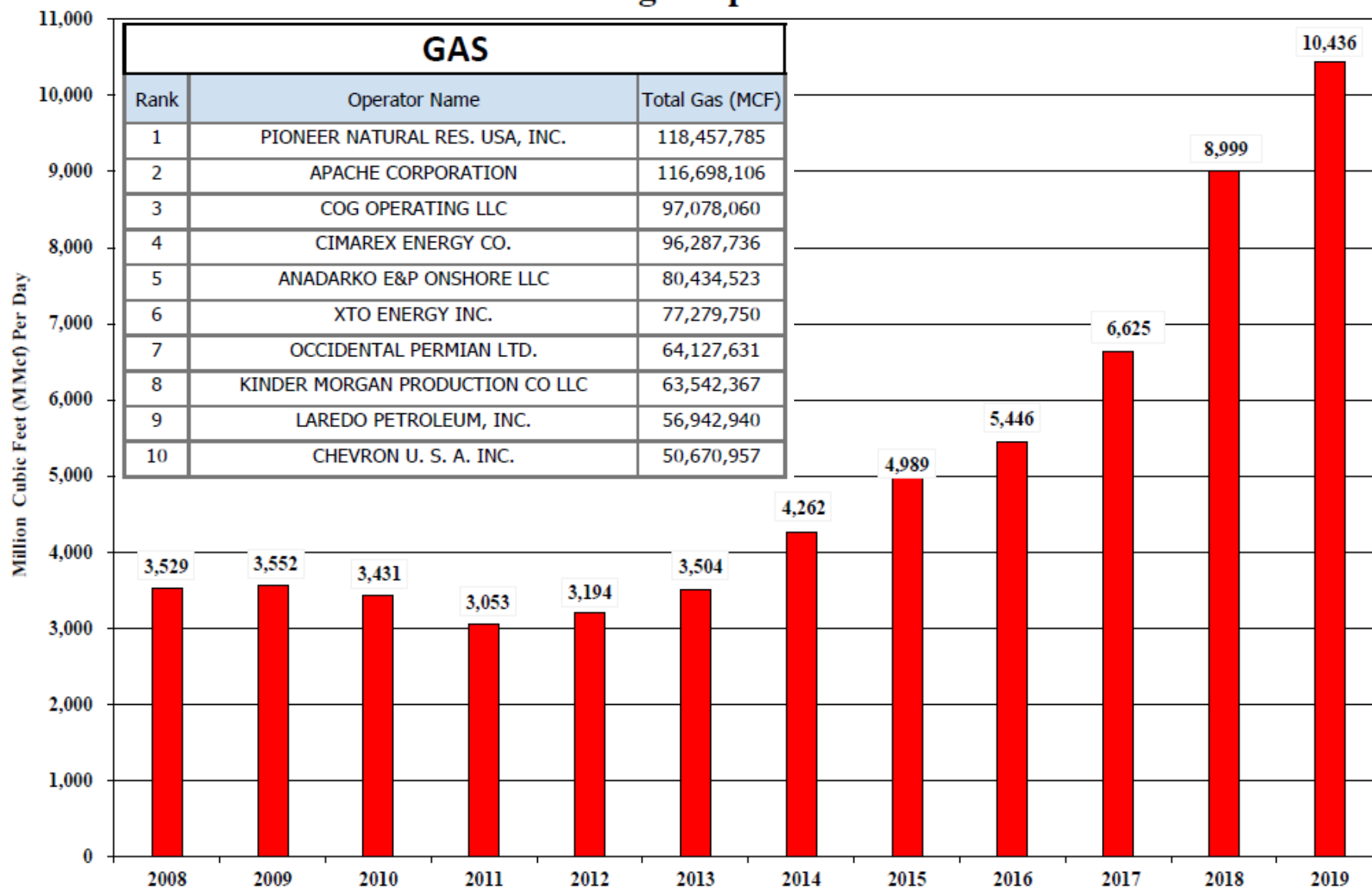
**Texas Permian Basin
(District 7C, 08, & 8A)
Drilling Permits Issued
2006 through November 2019**



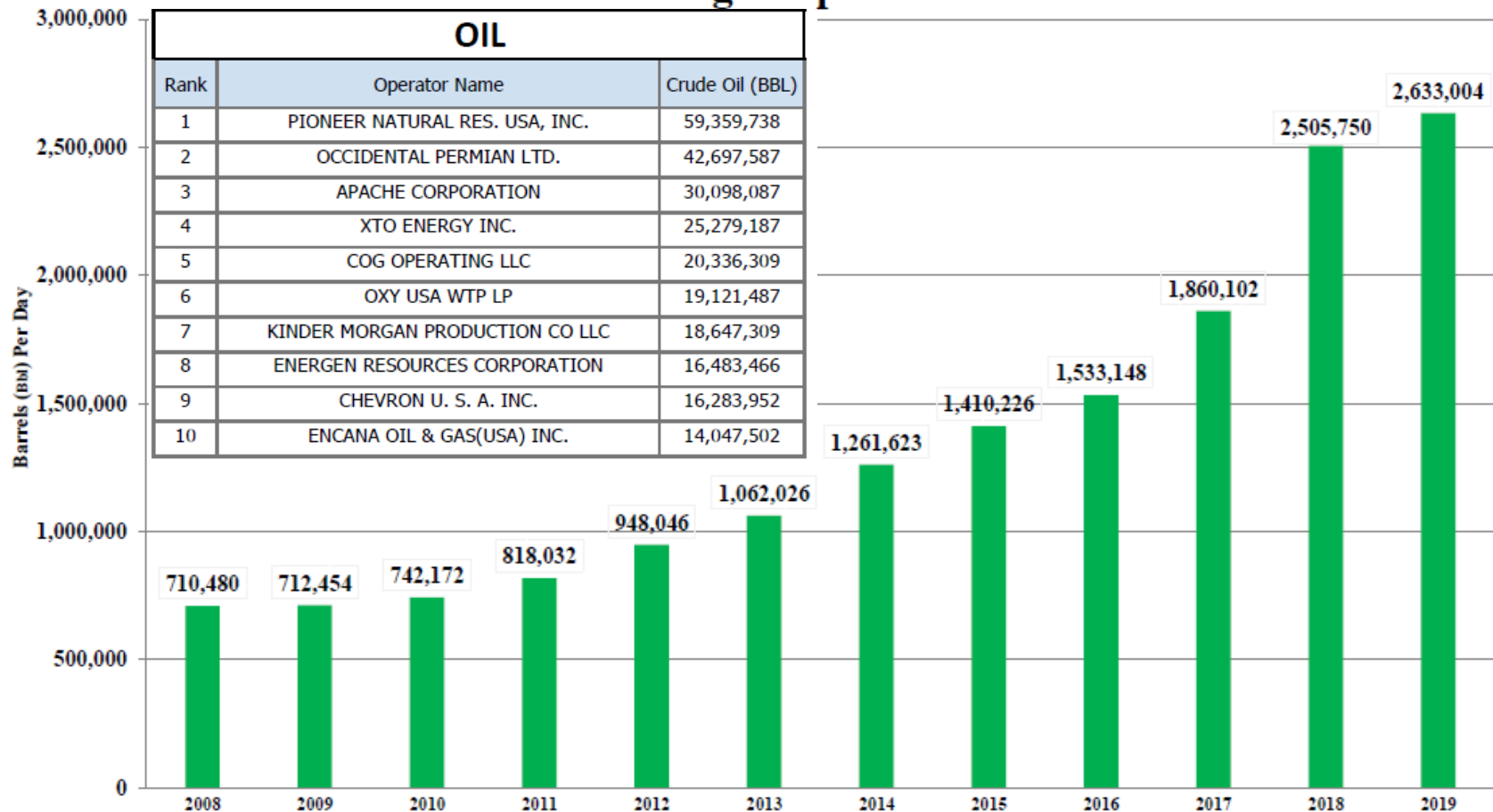
Texas Permian Basin

Total Natural Gas Production

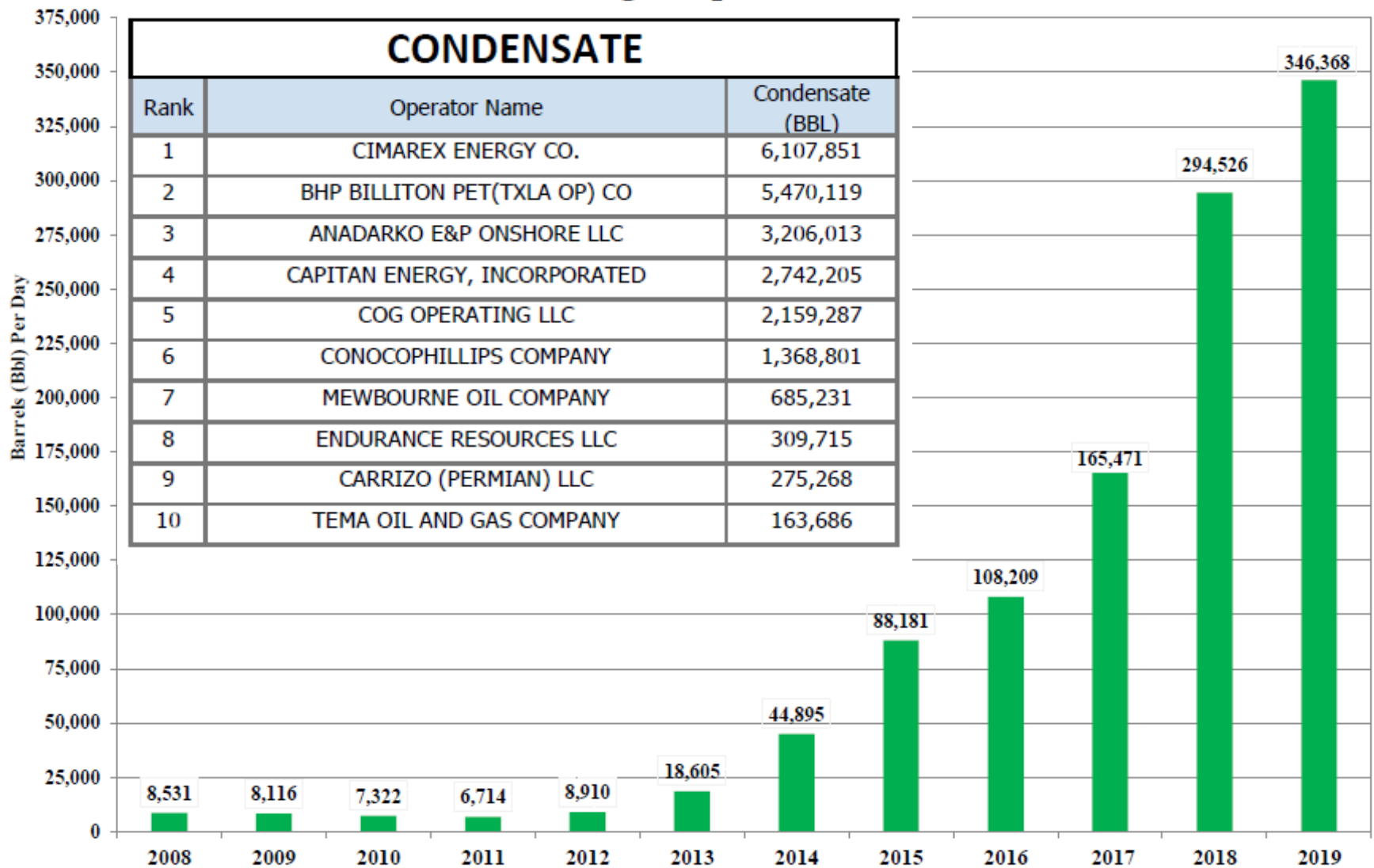
2008 through September 2019



Texas Permian Basin Oil Production 2008 through September 2019



Texas Permian Basin Condensate Production 2008 through September 2019



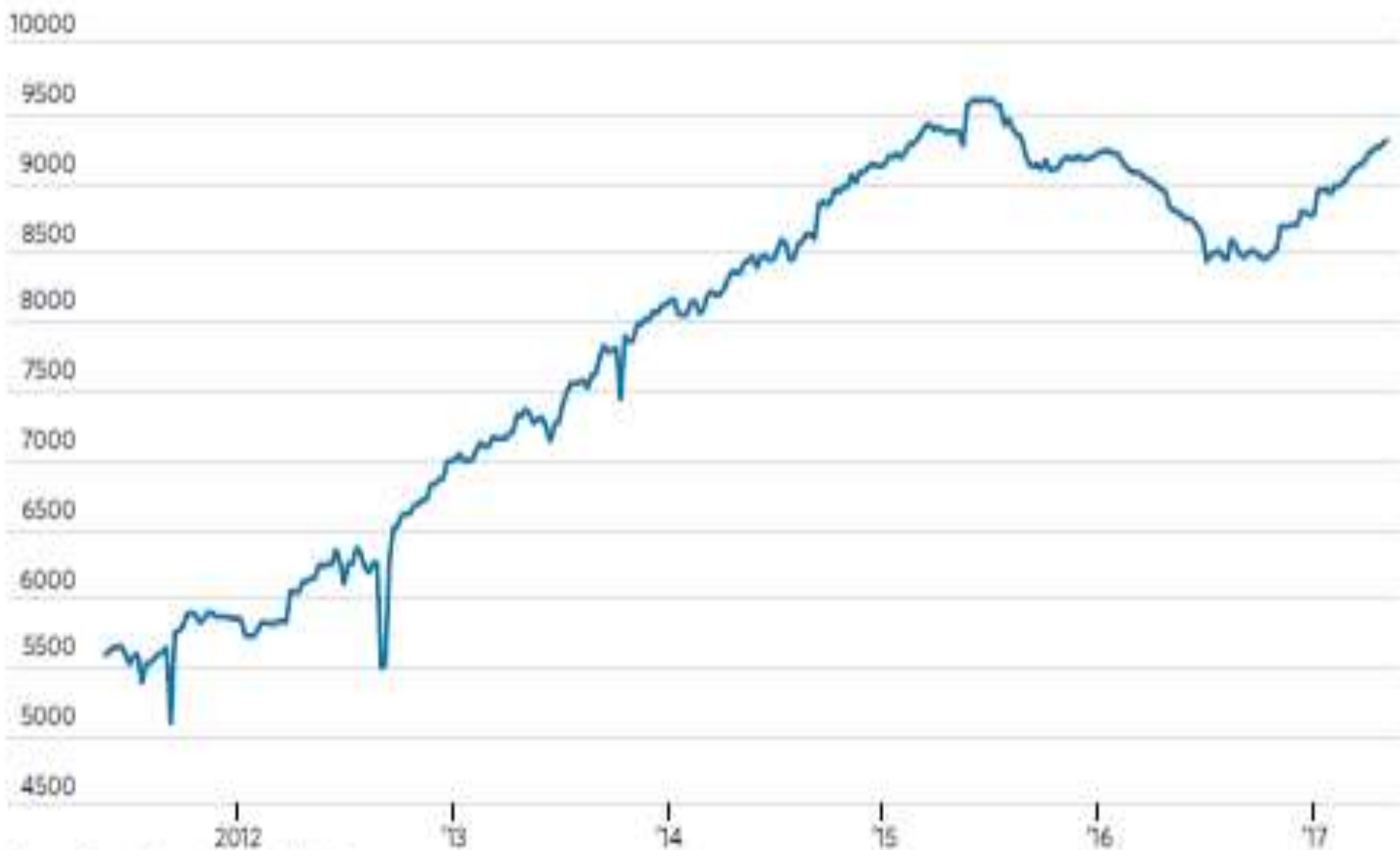
HOW MUCH OIL AND CONDENSATE HAS EAGLE FORD PRODUCED TO-DATE?

3,239,242,240 BARRELS

(OVER 3 BILLION BARRELS)

Going for the Record

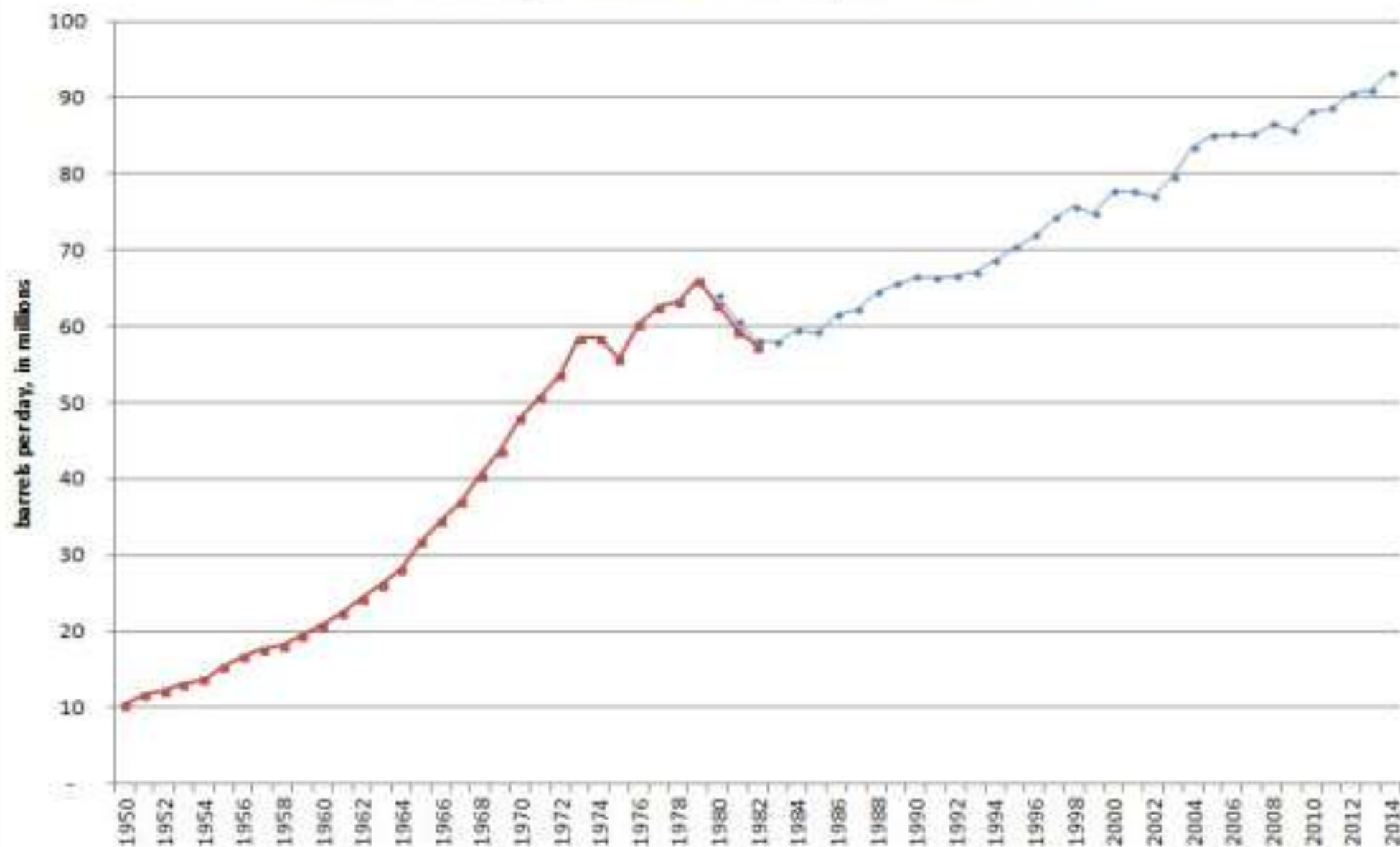
U.S. production of crude oil and condensate, thousand barrels a day



Source: Energy Information Administration

THE WALL STREET JOURNAL

Worldwide production of oil, 1950 to 2014



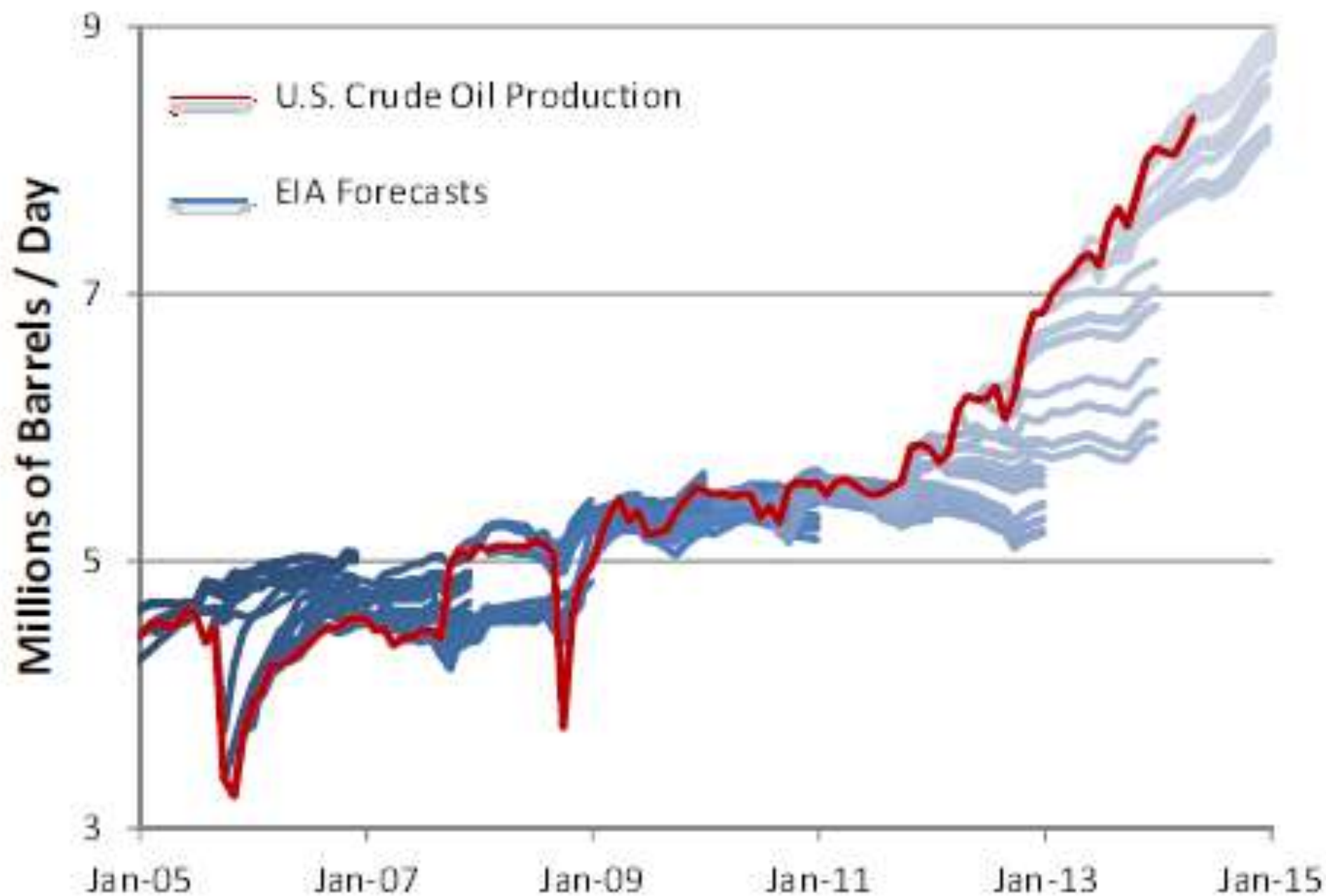
graph by outrunchange.com.

data from 1950 to 1982 from Earth Policy Institute: http://www.earth-policy.org/datacenter/pdf/book_wote_energy_oil.pdf

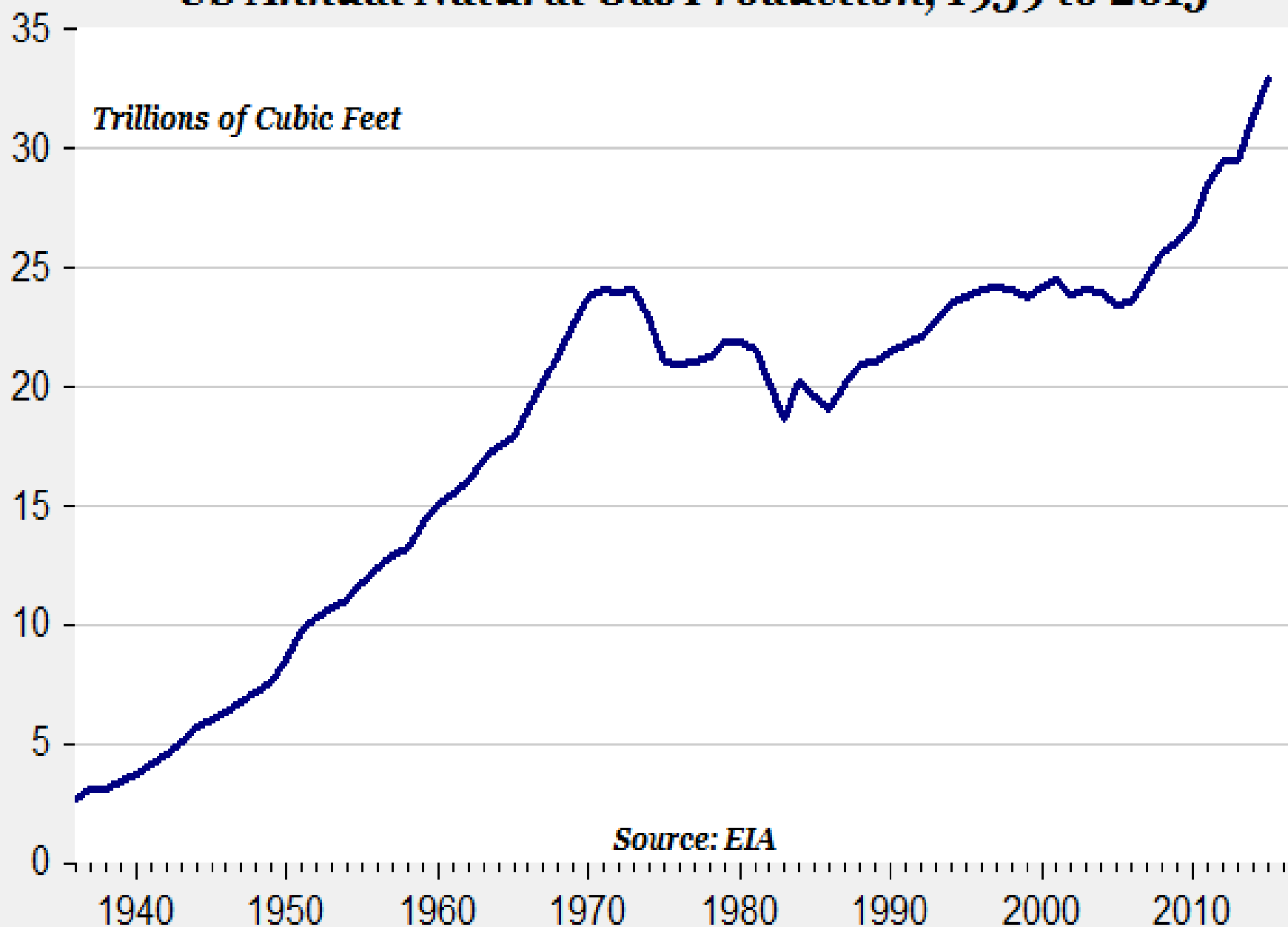
data from 1980 onward from U.S. Energy Information Administration:

https://www.eia.gov/cfapps/lpdbproject/iedindex3.cfm?tid=5&pid=53&aid=1&cid=ww_&syid=1980&eyid=2014&unit=TBPD

Panel B: EIA Forecasts of U.S. Crude Oil Production



US Annual Natural Gas Production, 1939 to 2015

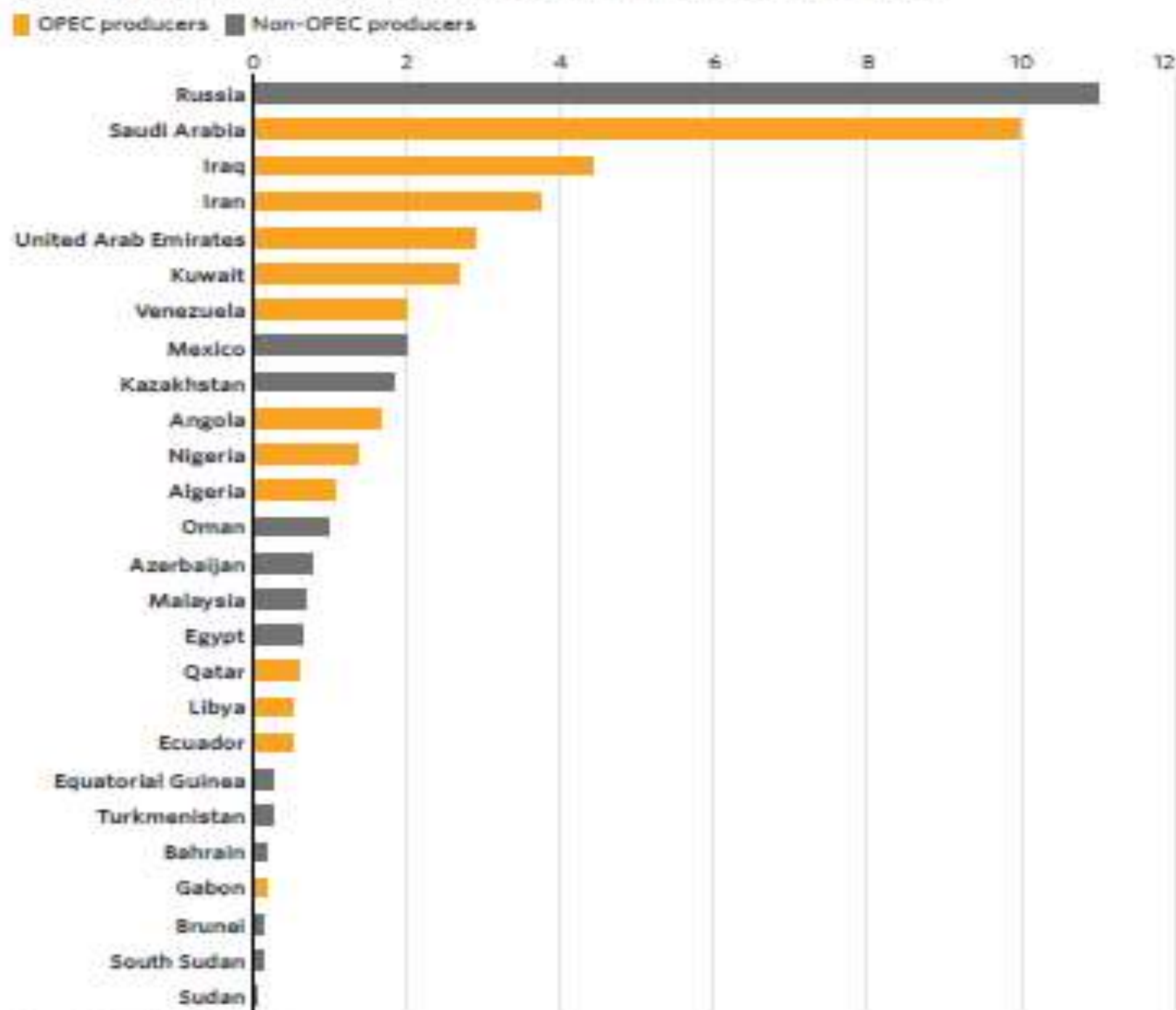




**IF OPEC DOES CONTINUE
THE OIL PRODUCTION CUTS,
THE BIGGEST BENEFICIARIES
WILL BE IN TEXAS AND NOT
THE PERSIAN GULF.**

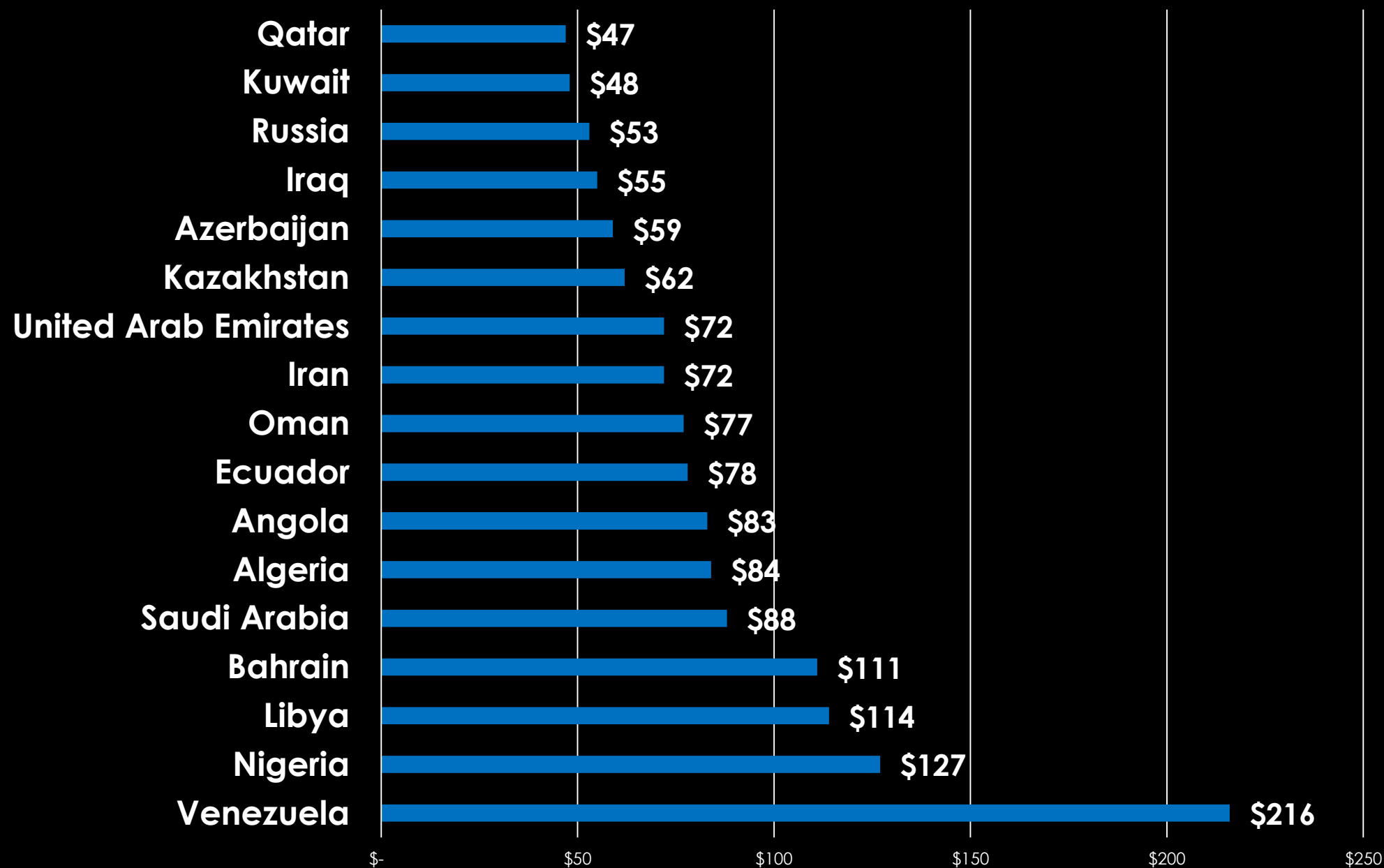
Heard on the Street, Wall Street Journal May 12, 2017

Average daily crude-oil production in April, in millions of barrels a day



Source: International Energy Agency

Fiscal breakeven oil price in U.S. dollars, 2018



HOW MANY COMPANIES DOES IT TAKE TO PRODUCE 75% OIL OUTPUT?

- **U.S. – 77** (SIMILAR NUMBERS FOR THE UK AND CANADA)
- RUSSIA – 4
- CHINA – 3
- BRAZIL – 1
- IN SAUDI ARABIA, IRAN, MEXICO AND KUWAIT **ONE** STATE PRODUCER ACCOUNTS FOR NEARLY 100% OF TOTAL OUTPUT

U.S. is now the world's swing producer. **OPEC's New Revelation: There is No Minister of Shale!**

Wireframe glimpse of the Shah Deniz 2 platforms in Azerbaijan

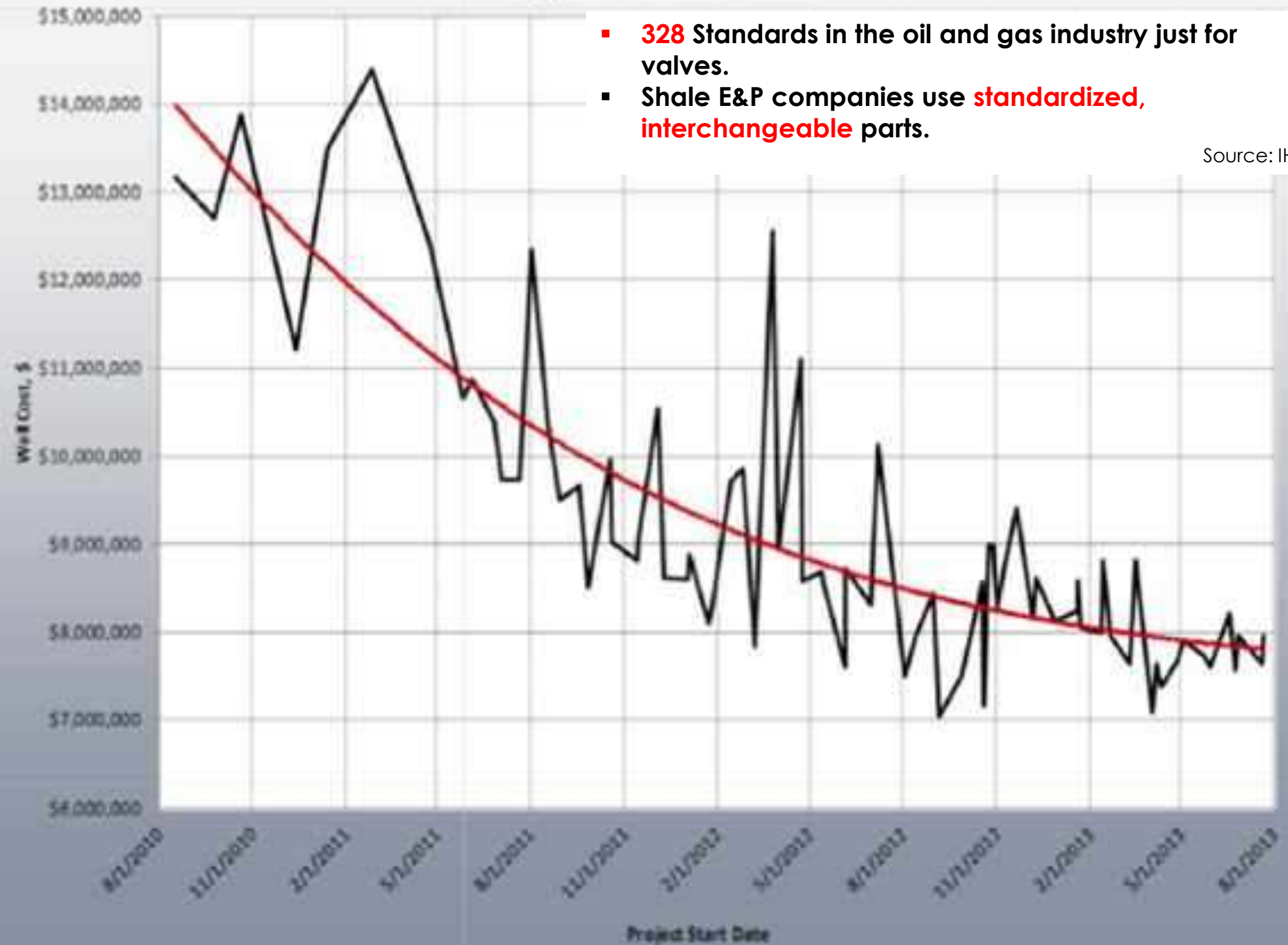




Eagle Ford Well Costs

- **328** Standards in the oil and gas industry just for valves.
- Shale E&P companies use **standardized, interchangeable** parts.

Source: IHS





Crude Oil U.S. Imports from OPEC Countries (000 Barrels)



Shale oil and gas have the potential to dramatically alter world energy markets

map of basins with assessed shale oil and gas formations, as of May 2013



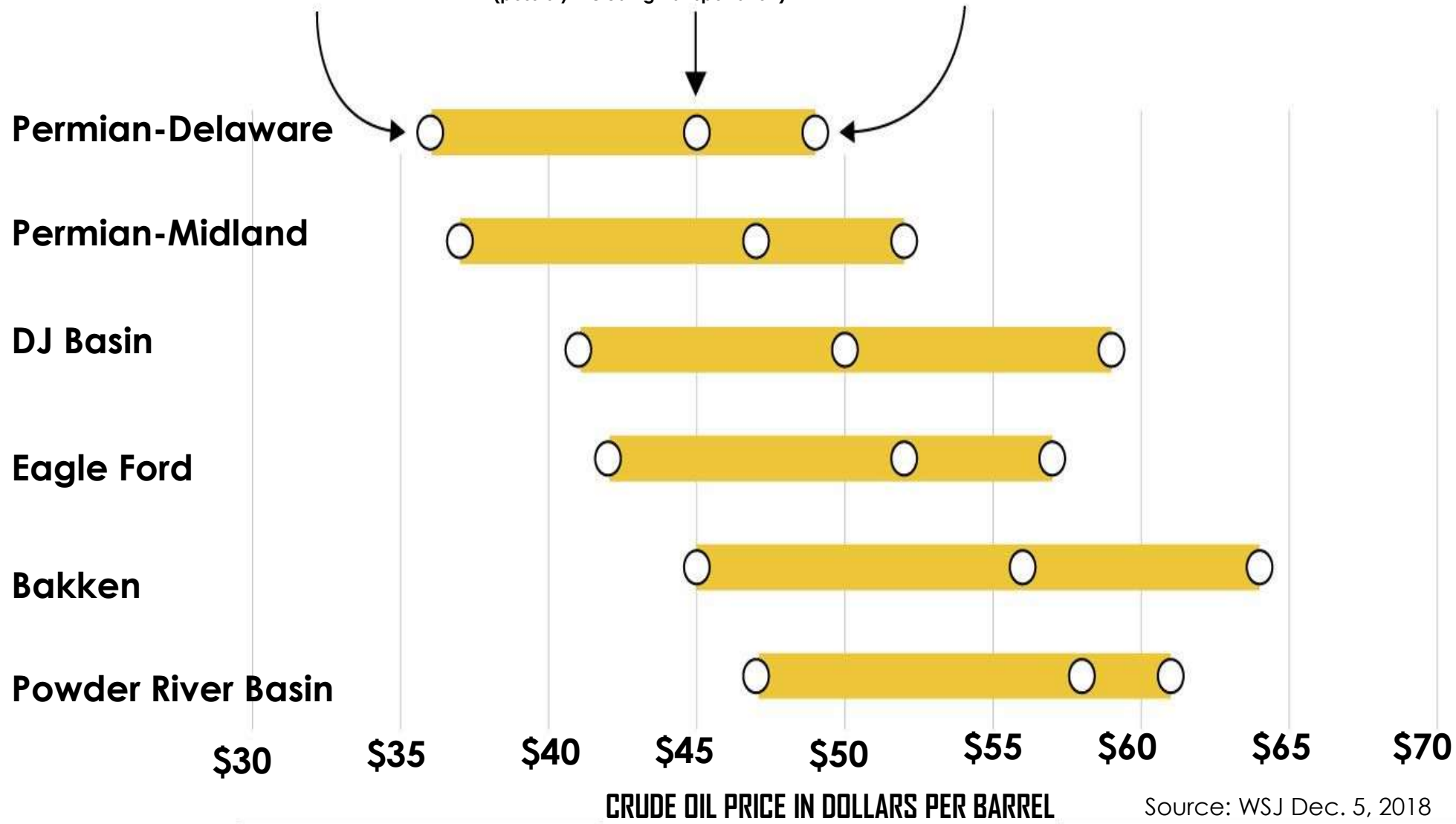
Source: United States: EIA and USGS; Other basins: ARI

PRICE CITED FOR AN INDIVIDUAL WELL TO HAVE A 10% PROFIT MARGIN

Break-even price often cited by industry

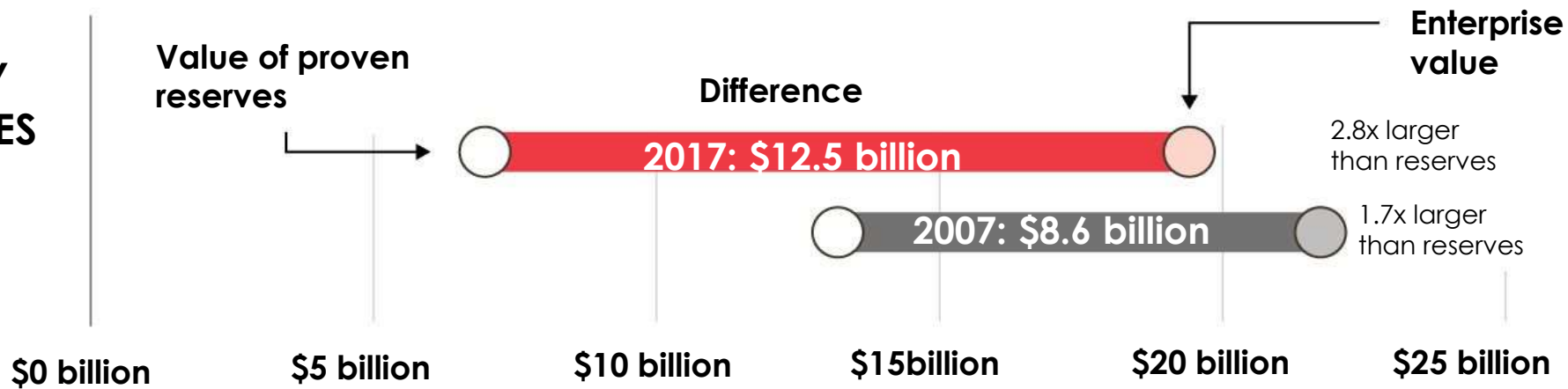
Price when overhead and other costs are included
(possibly including transportation)

Price when the cost of land is included

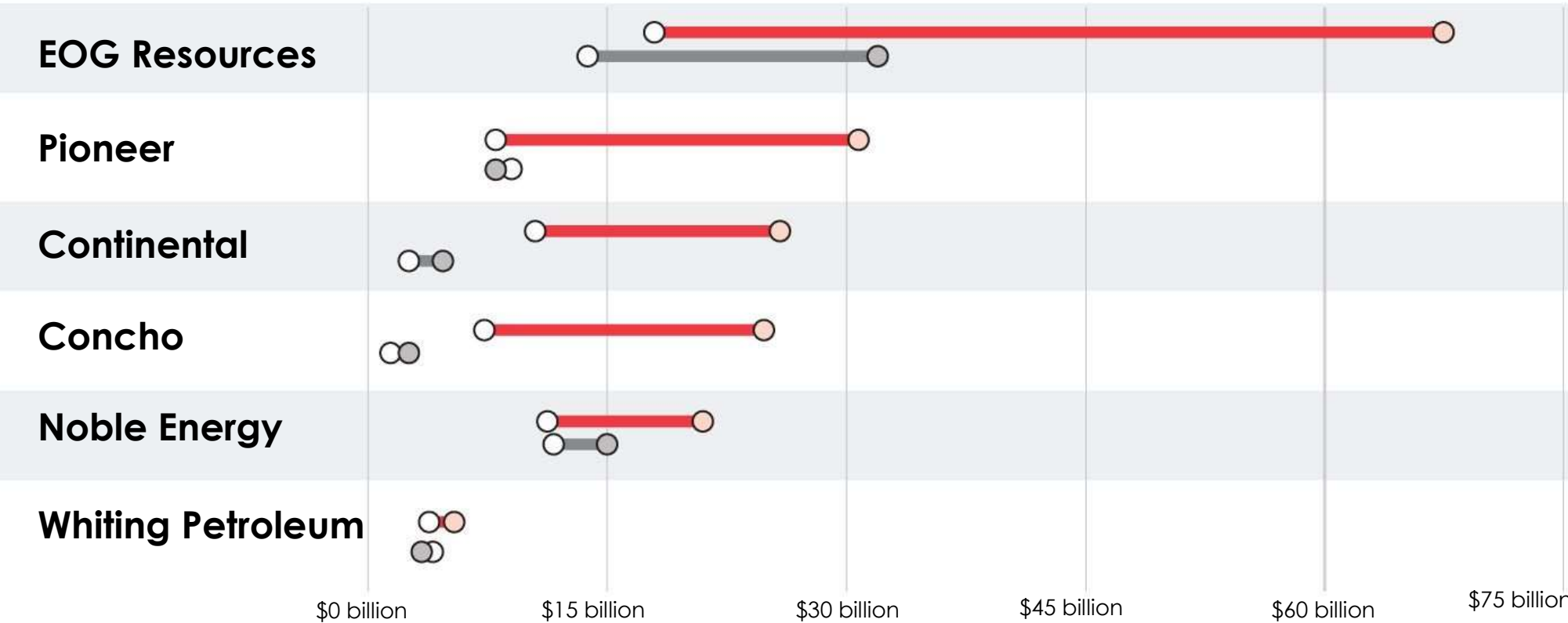


Source: WSJ Dec. 5, 2018

INDUSTRY AVERAGES



SELECTED COMPANIES



Building an Oil Factory

Instead of drilling wells on an ad hoc basis, Liberty Resources is developing a 96-well North Dakota development called Stomping Horse in a methodical manner to reduce costs. The company has built a "utility corridor" that connects and services the well pads, reducing the need for heavy truck traffic and long runs of pipeline to isolated units.

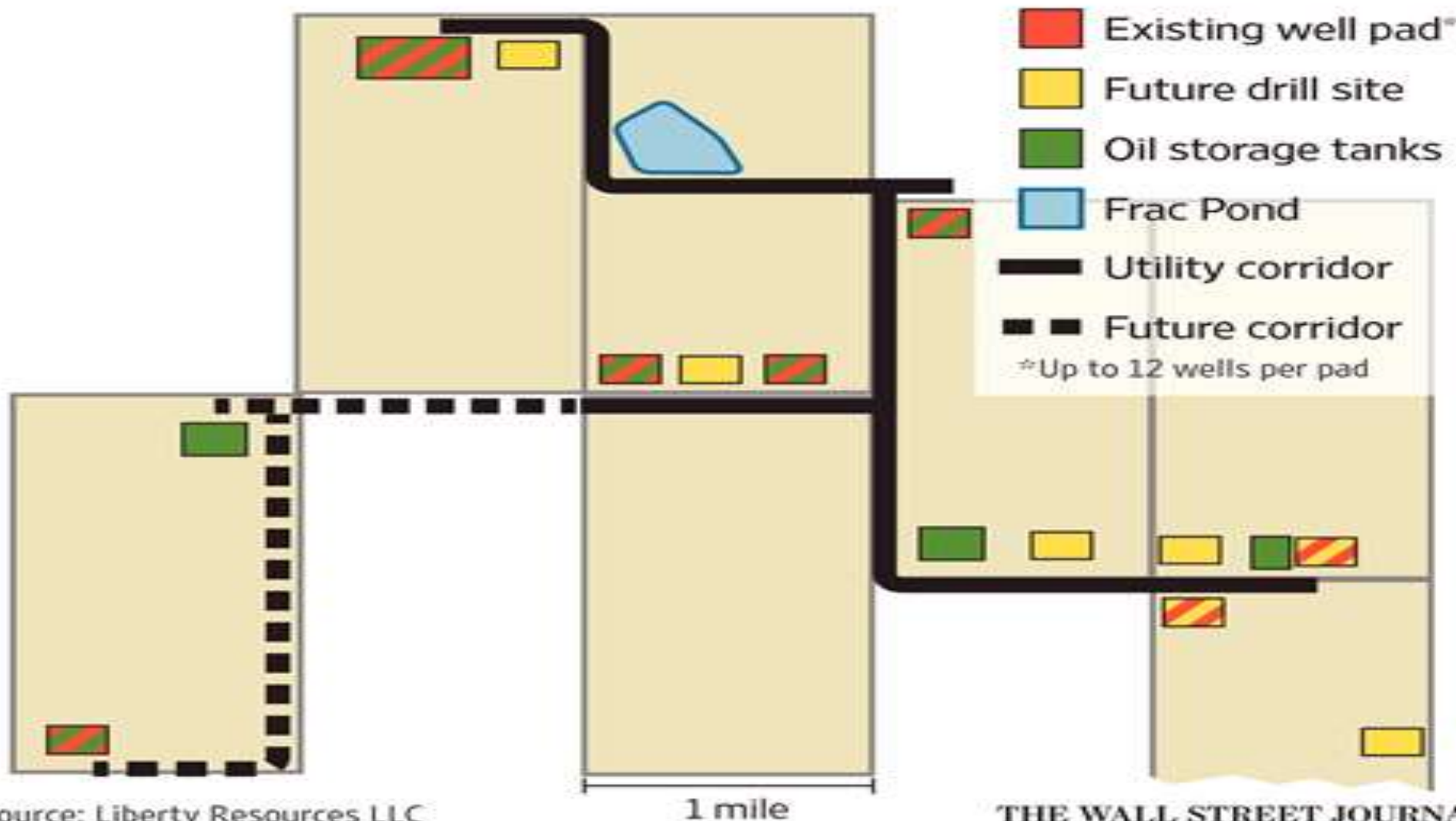


◆ **A network** of 16-inch pipe will collect the natural gas for sale; a 6.5-inch oil pipeline will gather the oil.

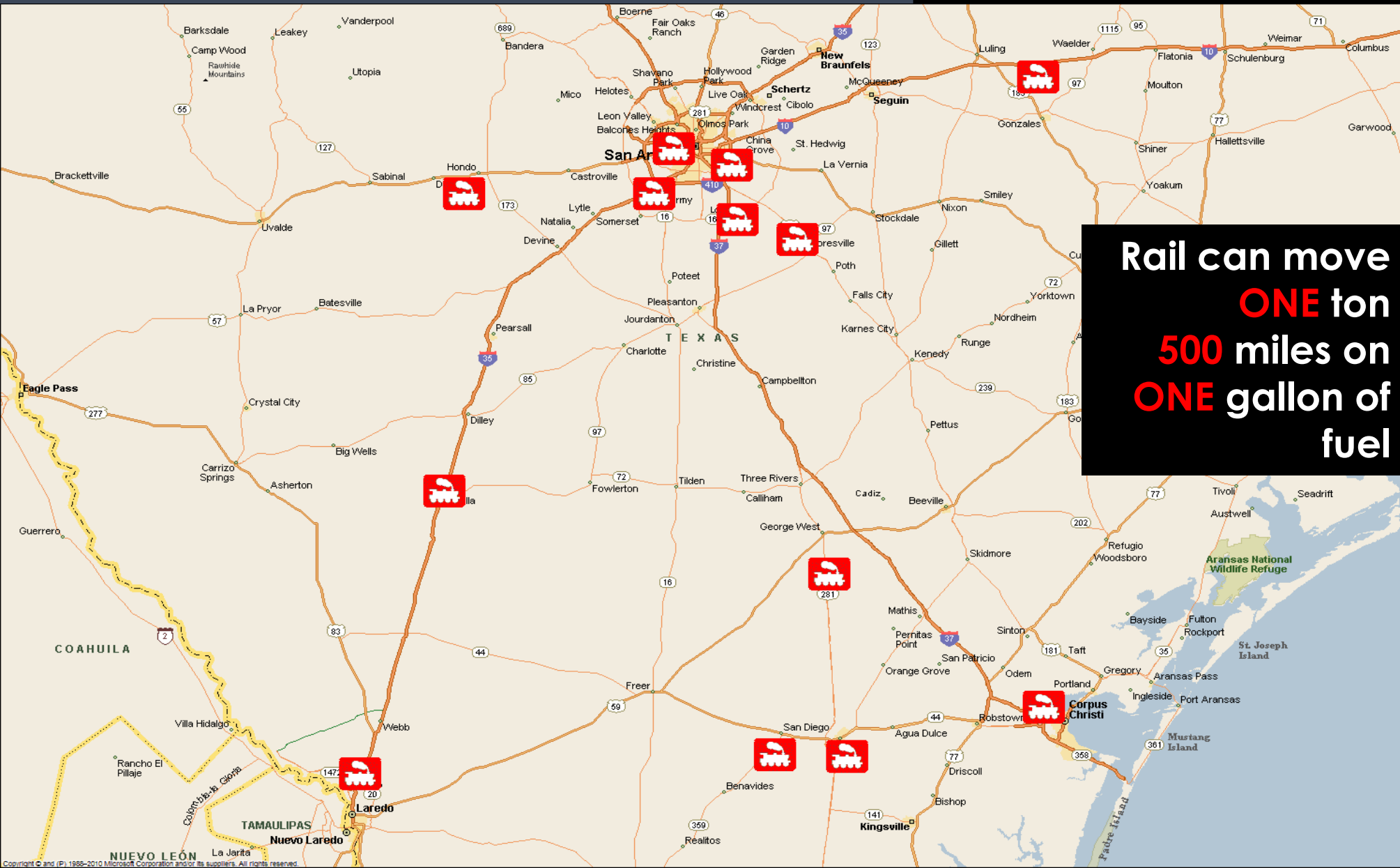
◆ **Natural gas** will also be captured and piped around the project to power drilling rigs and other equipment.

◆ **Water for hydraulic-fracturing** operations in the 96 wells will come from a single "frac pond" connected by pipeline to the well pads.

◆ **A saltwater disposal** well will take wastewater via pipeline from oil-extraction operations.



NEW AND EXPANDED RAIL PROJECTS IN THE EAGLE FORD



**Rail can move
ONE ton
500 miles on
ONE gallon of
fuel**

Gardendale Railroad 2009- La Salle County Status : Abandoned



Gardendale Railroad-2013 La Salle County

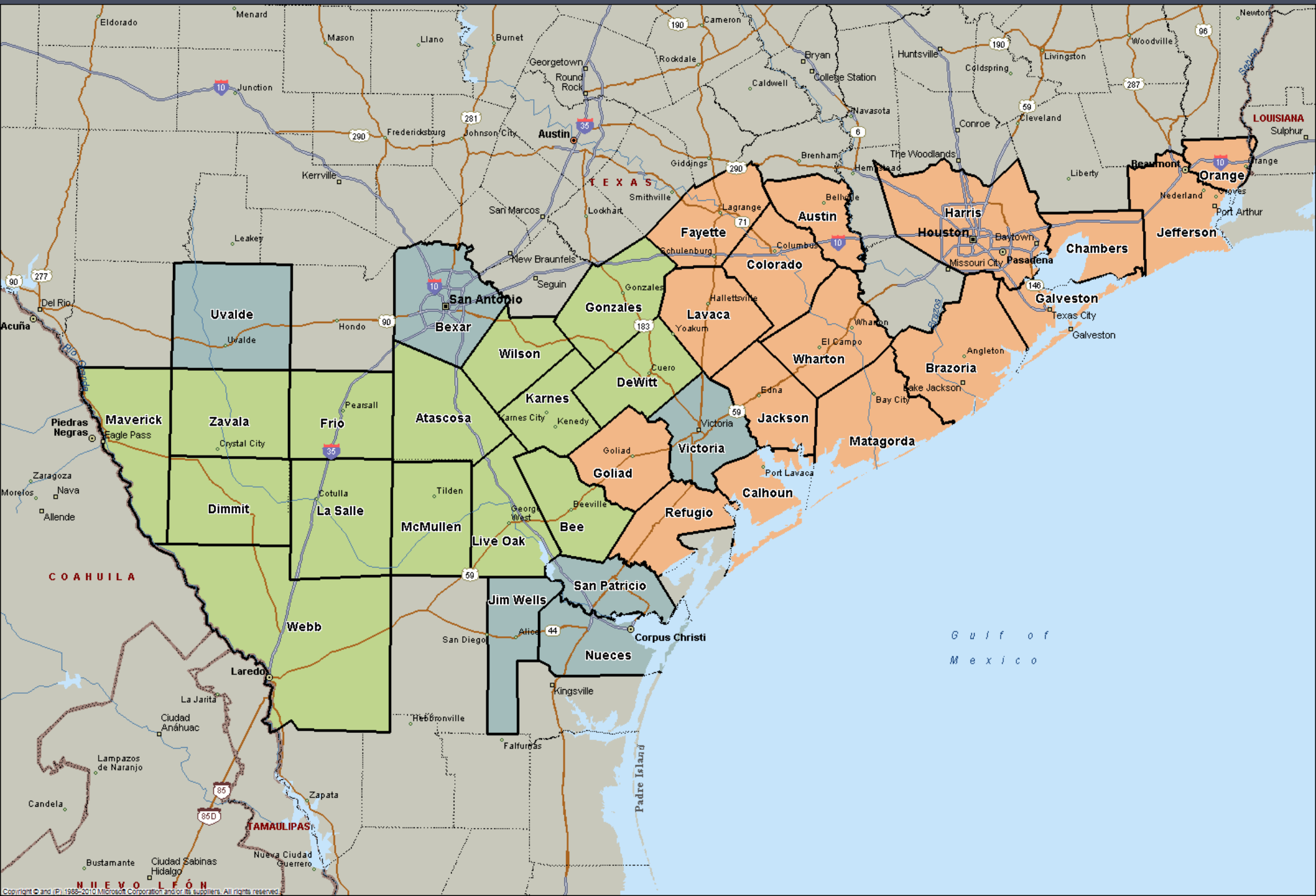


Gardendale Rail Spur near Cotulla

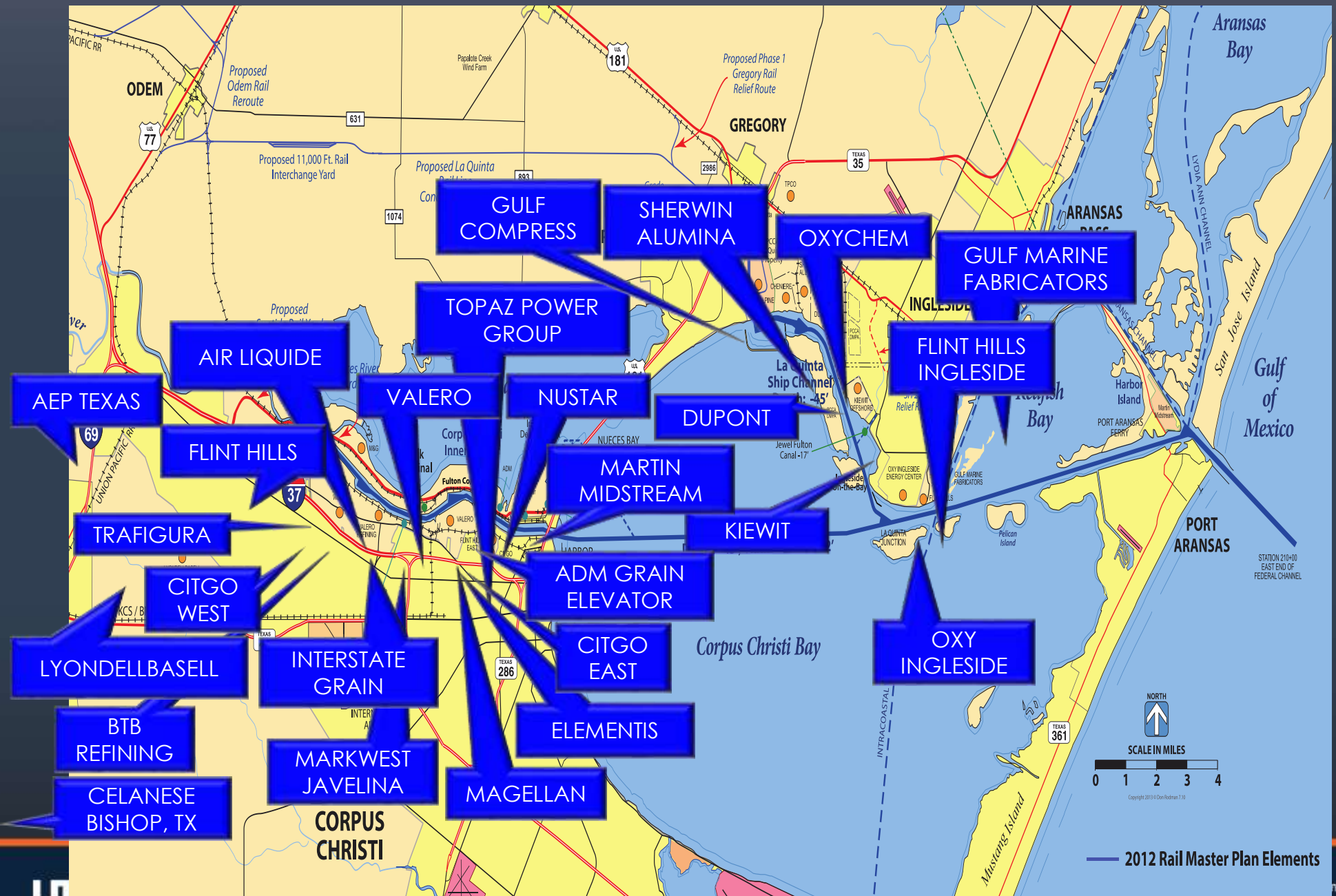


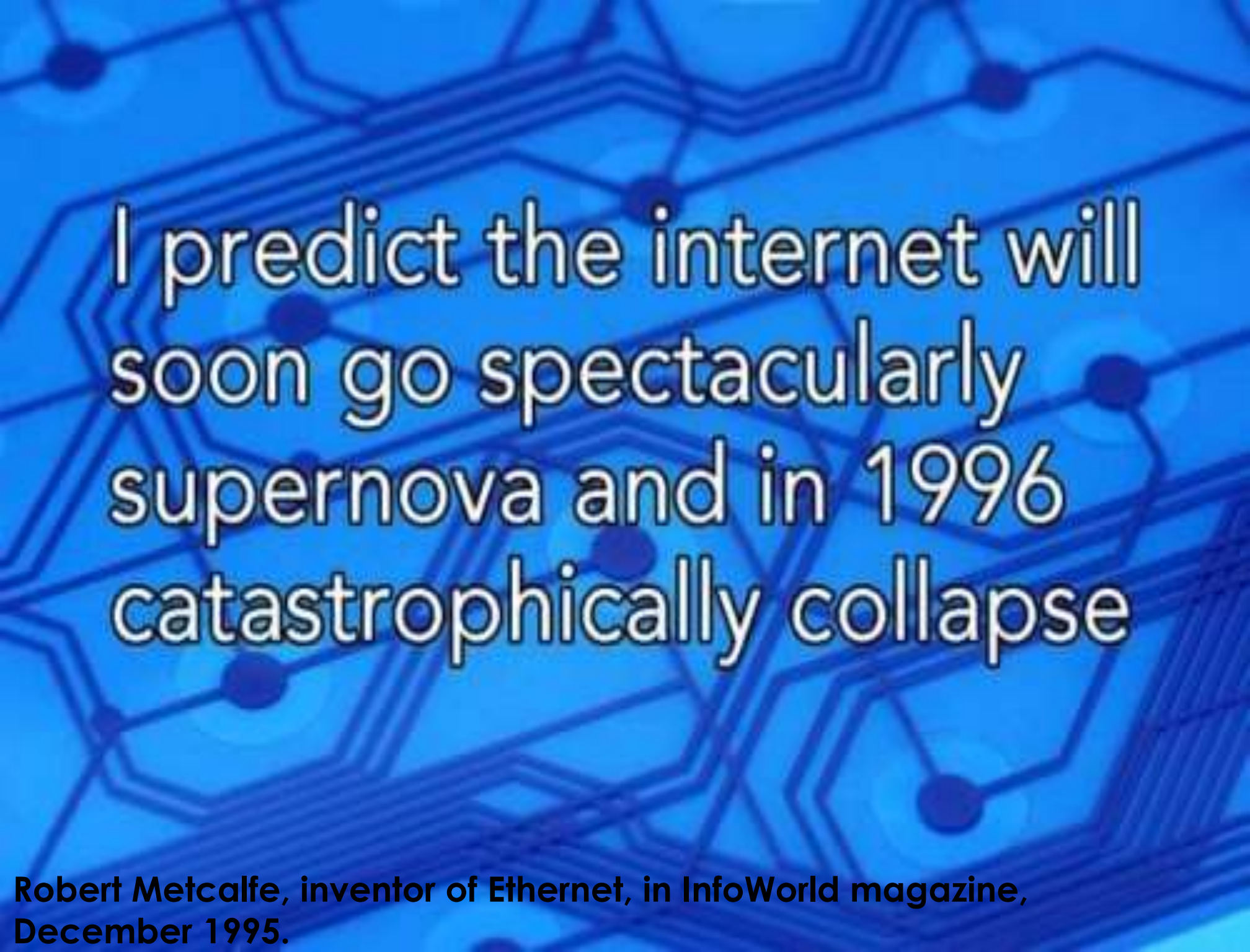


GULF COAST IMPACTS



Port of Corpus Christi TODAY





I predict the internet will
soon go spectacularly
supernova and in 1996
catastrophically collapse

Robert Metcalfe, inventor of Ethernet, in InfoWorld magazine,
December 1995.

**There's no chance that the iPhone is going
to get any significant market share.
No chance**



Microsoft CEO Steve Ballmer, 2007.

NOT THERE YET

Notable past predictions of peak oil that didn't turn out

1885 The state geologist of Pennsylvania warns that the “amazing exhibition of oil” is only a “temporary and vanishing phenomenon.” And John Archbold, John D. Rockefeller’s partner in Standard Oil, sells some company shares at a discount, fearing that oil will run out.



2005

Energy tycoon T. Boone Pickens tells a conference of alternative-fuel advocates:



"Global oil [production] is 84 million barrels [per day]. I don't believe you can get it any more than 84 million barrels. I don't care what

Abdullah, Putin or anybody else says about oil reserves or production. I think they are on decline in the biggest oil fields in the world today."

> In 2013, global oil production will top 90 million barrels a day.

OIL PRICE PREDICTION HALL OF FAME

WHY OIL PRICES WON'T FALL BELOW \$100 A BARREL

CHAD SHOOP, THE SOVEREIGN INVESTOR DAILY - SEPTEMBER 1, 2014

OIL WON'T DROP BELOW \$100 IN 2014, IRAN SAYS

MOHSEN QAMSARI, DIRECTOR FOR INTERNATIONAL AFFAIRS AT THE NATIONAL IRANIAN OIL COMPANY – MAY 24, 2014

OIL PRICES WON'T FALL BELOW \$100

PETROLEUM POLICY INTELLIGENCE – JULY 23, 2012

OPEC WON'T LET CRUDE OIL FALL BELOW \$100

RAFAEL CORREA, PRESIDENT OF ECUADOR – SEPTEMBER 27, 2008

OIL PRICES WON'T DROP BELOW \$100

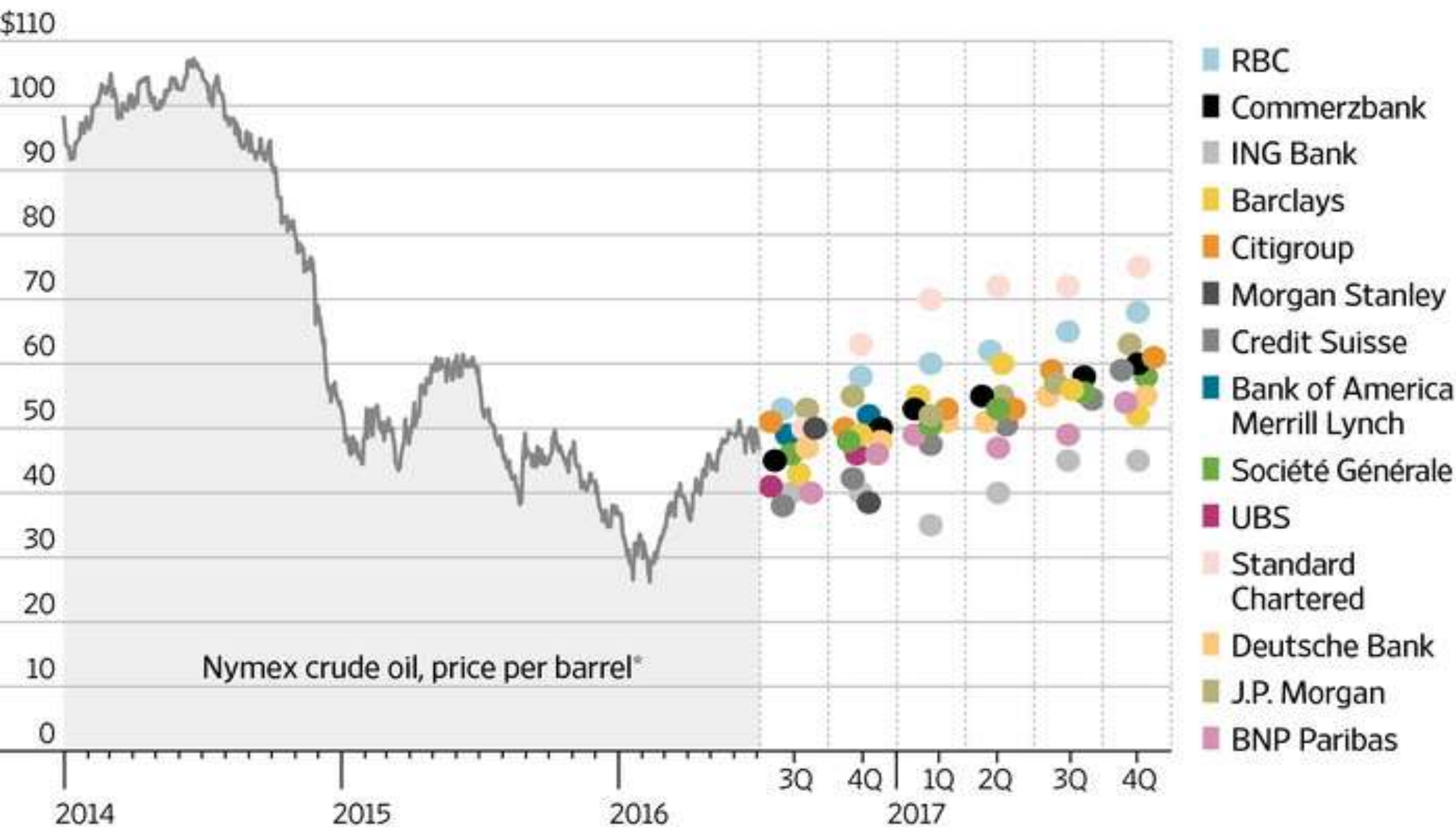
YUSUF BIN AHMED KANOO GROUP MANAGING DIRECTOR KHALID MOHAMMED KANOO – MAY 27, 2008

PICKENS SAYS OIL WON'T GO BELOW \$100

AUGUST 14, 2008

Looking Ahead at Oil Prices

Where investment banks surveyed in June see the price per barrel of U.S. crude-oil futures in the next few quarters



*Through July 5

Source: WSJ Market Data Group (Nymex crude prices); the companies

THE WALL STREET JOURNAL.

**“THE OIL PRICE DROP CAME AS
A SURPRISE. IT CAPTURED MY
COUNTRY IN A STATE IN WHICH
WE WERE NOT SUFFICIENTLY
DIVERSIFIED.”**

ANGOLAN FINANCE MINISTER ARMANDO MANUEL

IMF ANNUAL MEETINGS

OCTOBER 6-11, 2015

LIMA PERU



PLUMMETING PRODUCTION



BOOMTOWNS BUSTING

When oil and gas companies slash jobs and production, it has a trickle-down effect on the local economy. Hotels, restaurants and other small businesses that depend on oil and gas workers start seeing a dip in revenue, which has an impact on the state budget as a whole. Unemployment rates are creeping up, too.

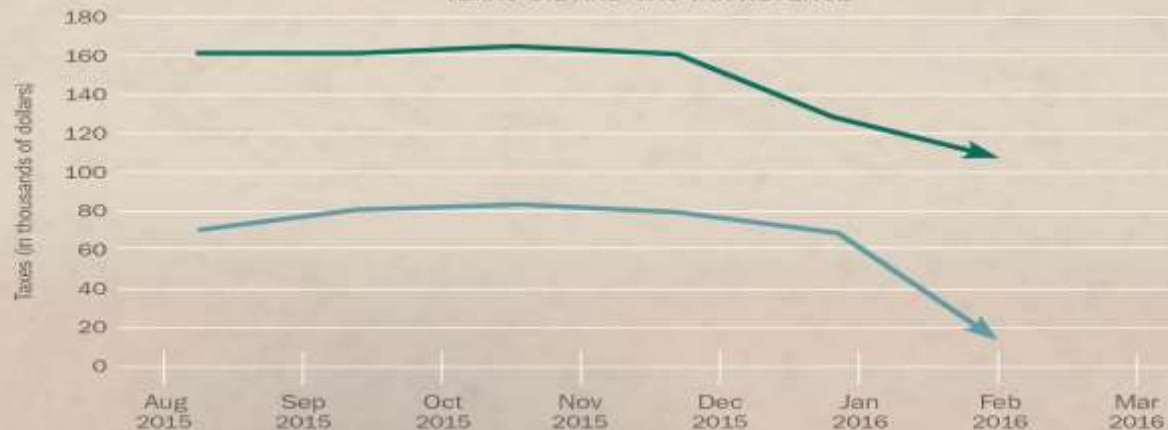


TAKING STOCK

The oil and gas industry fuels the state budget primarily through sales and production taxes. The budget currently has a \$4 billion surplus, but if oil prices remain low, Texas might need to dip into its Rainy Day Fund.

- Oil Production/Regulation Taxes
- Natural Gas Production Tax

TEXAS OIL AND GAS TAX REVENUE



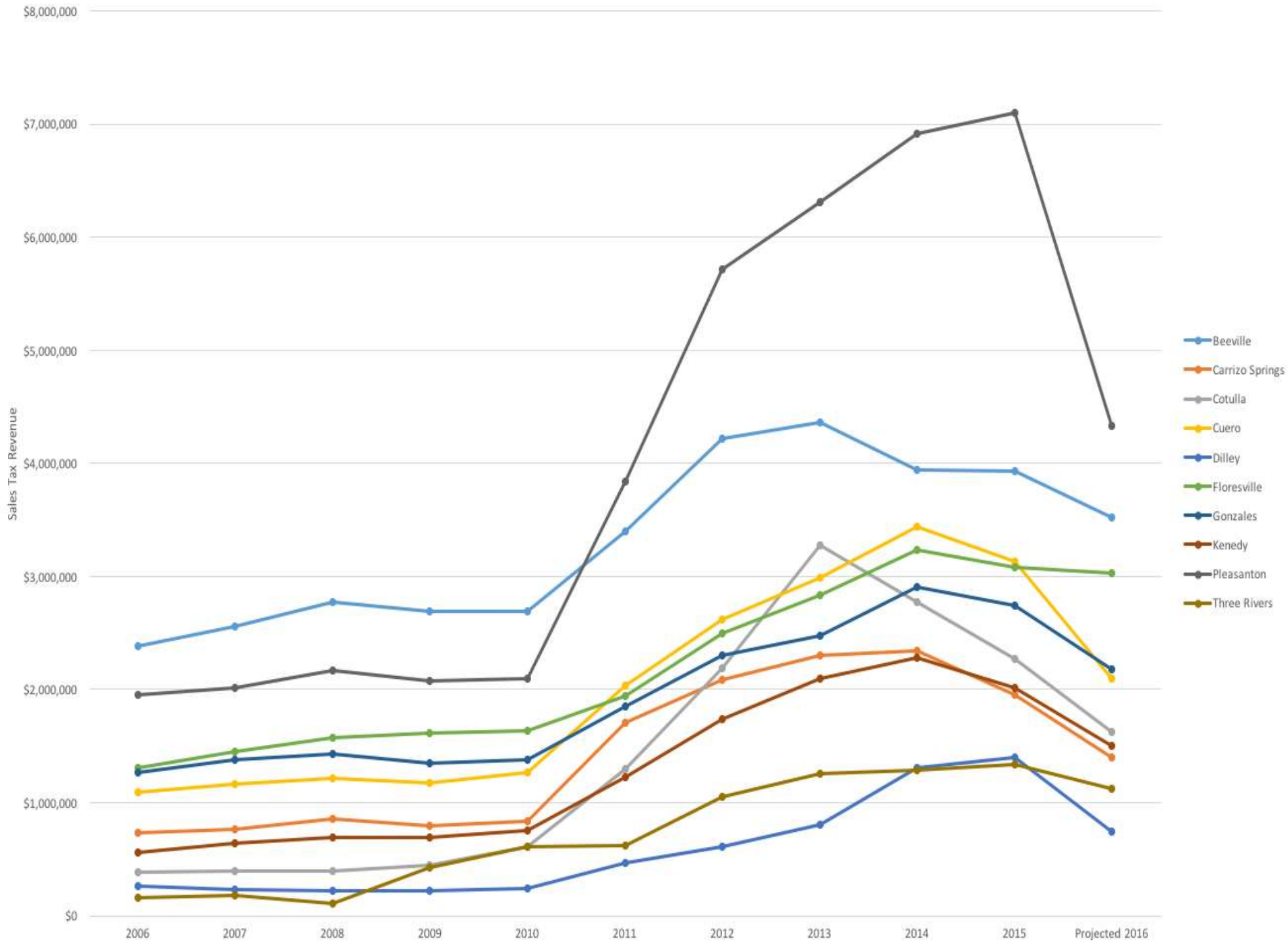
Change in hotel revenues in top oil-producing counties

These 10 counties were Texas' top oil producers when prices peaked in mid-2014. Once rumbling with activity, their hotels have seen the steepest drop in revenues amid the drilling slowdown.

County	2015 revenues	2014 revenues	Percent change
Karnes	\$16.9 million	\$23.4 million	-27.6%
La Salle	\$15.4 million	\$26 million	-40.6%
DeWitt	\$9 million	\$14.9 million	-39.2%
Gonzales	\$7 million	\$11.9 million	-40.9%
McMullen	\$2.1 million	\$2.6 million	-20.4%
Andrews	\$5.6 million	\$8.6 million	-34.7%
Ector	\$80.6 million	\$108.7 million	-25.8%
Upton	\$749,000	\$1.1 million	-29.2%
Martin	\$2.6 million	\$3.6 million	-26.3%
Dimmit	\$9.5 million	\$13 million	-27.0%

- Data from [Source Strategies Inc.](#)

Sales Tax Figures Through The Years



MEDIUM-LONG TERM STRATEGIES FOR SUCCESS

- LOOK FOR **OPPORTUNITIES TO DIVERSIFY** THE LOCAL ECONOMY (**DESTINATION LOCATIONS**)
- **REDISCOVER YOUR COMMUNITY'S HISTORY** AND ARCHITECTURE AS A TOOL FOR ECONOMIC DEVELOPMENT (**WHY WAS THE CITY FOUNDED IN THE FIRST PLACE?**)
- SEIZE THE OPPORTUNITY TO IMPLEMENT **FORM-BASED ZONING THAT EMPHASIZES MIXED-USE**, FLEXIBILITY, LIVABILITY AND SUSTAINABILITY
- **FORGE LINKAGES, ALLIANCES** AND ENGAGE OTHER EFS COMMUNITIES, HIGHER EDUCATION INSTITUTIONS
- IDENTIFY **BEST PRACTICES** FROM OTHER SHALE PLAYS
- **WORK WITH ELECTED REPRESENTATIVES** AT THE MUNICIPAL, COUNTY, STATE AND NATIONAL LEVELS ON INFRASTRUCTURE PLANNING

LOOKING BEYOND EAGLE FORD: BASICS OF SUSTAINABLE INFRASTRUCTURE

(KEY TO ATTRACTING NEW RESIDENTS, VISITORS AND INDUSTRY)

- BETTER TRANSPORTATION OPTIONS
- IMPROVED MEDICAL FACILITIES
- AFFORDABLE BROADBAND NETWORKS
- MORE HOUSING OPTIONS
- ADEQUATE WATER AND POWER SUPPLY, IMPROVED WASTE MANAGEMENT
- BETTER QUALITY K-12 AND VOCATIONAL EDUCATION
- IMPROVED AESTHETICS, ELIMINATION OF BLIGHT, LAND RECYCLING (BULLDOZING DERELICT HOUSES, CLEANING UP JUNKYARDS; RENOVATION AND/OR REPURPOSING OF HISTORICAL BUILDINGS)
- BRANDING: IDENTITY, GATEWAYS
- LIVABILITY: PUBLIC AMENITIES THAT IMPROVE THE DESIRABILITY OF THE COMMUNITY AND QUALITY OF LIFE (LAKES, PARKS, HIKE/BIKE TRAILS, WALK-ABLE NEIGHBORHOODS)

WHY WOULD SOMEONE WANT TO LIVE IN OR VISIT YOUR COMMUNITY?

CITY OF GONZALES



COME AND TAKE IT



CITY OF COTULLA





KARNES CITY



CITY OF CUERO



CITY OF GONZALES



CITY OF GONZALES



COME AND TAKE IT

THE CITY OF GONZALES, TEXAS EMBRACES THESE CORE VALUES

Teamwork • Efficiency
Integrity • Accountability
Innovation
Professionalism • Excellence
Community • Service

VISION STATEMENT

Achieving unified community growth through excellent service with integrity while preserving our heritage.

CORE VALUES

Are what support the vision, shape the culture and reflect what the CITY VALUES.







PLEASANTON





COTULLA



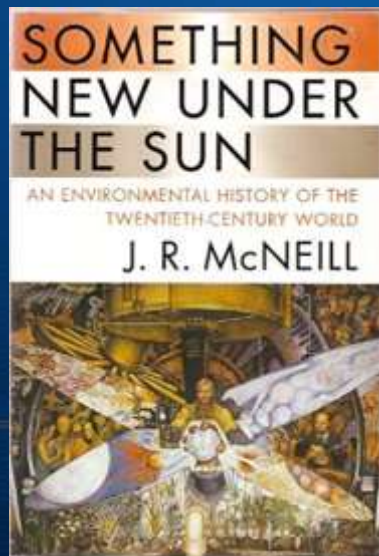
Chuck's Bar and Dancehall - Cotulla, TX



Conservation Fund

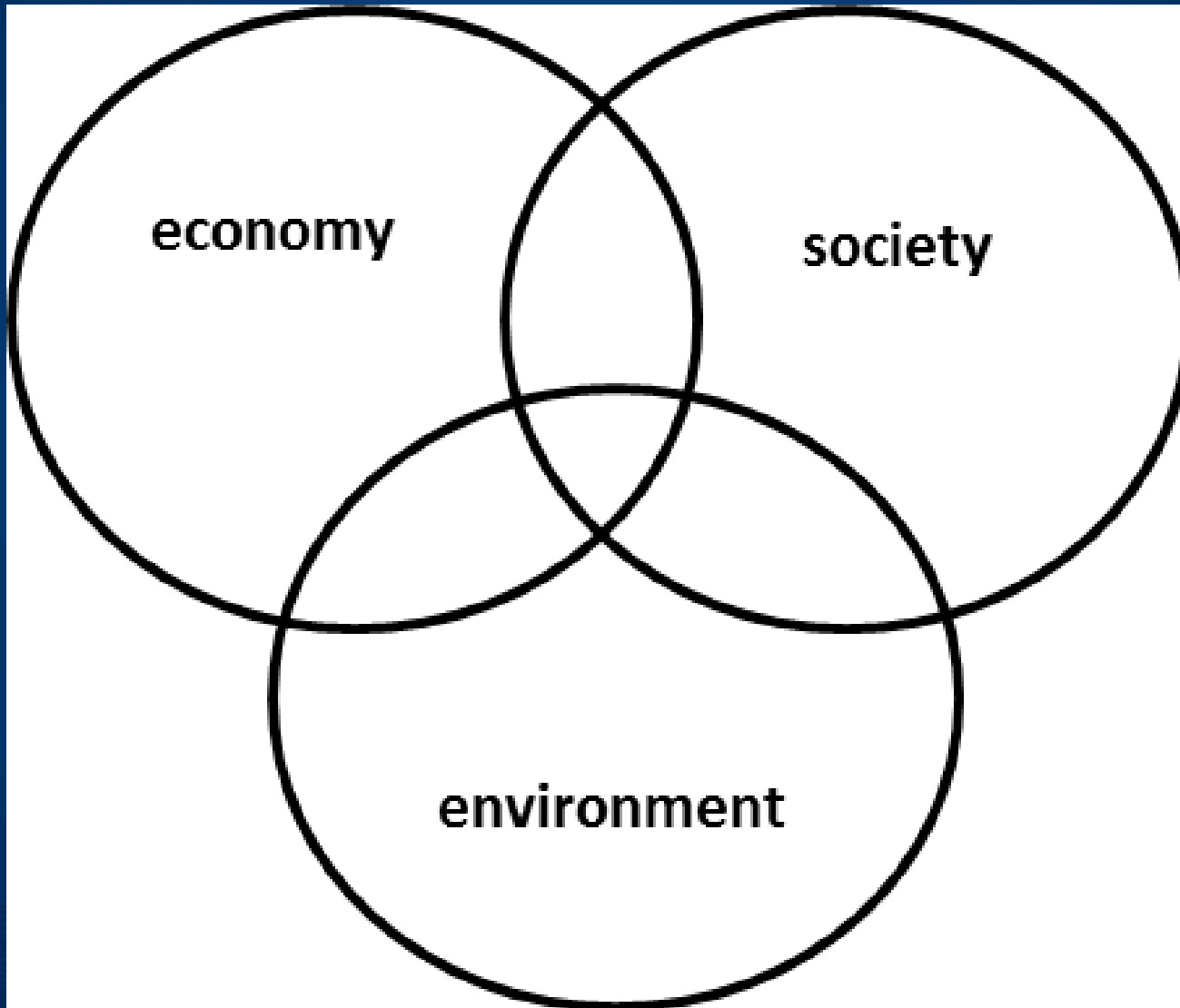
Photo credit - Tom Ulrich Pro-Tour 2008

While economists [from about 1880 to 1970] ignored nature, ecologists pretended humankind did not exist. Rather than sully their science with the uncertainty of human affairs, they sought out pristine patches in which to monitor energy flows and population dynamics. Consequently, they had no political, economic - or ecological - impact

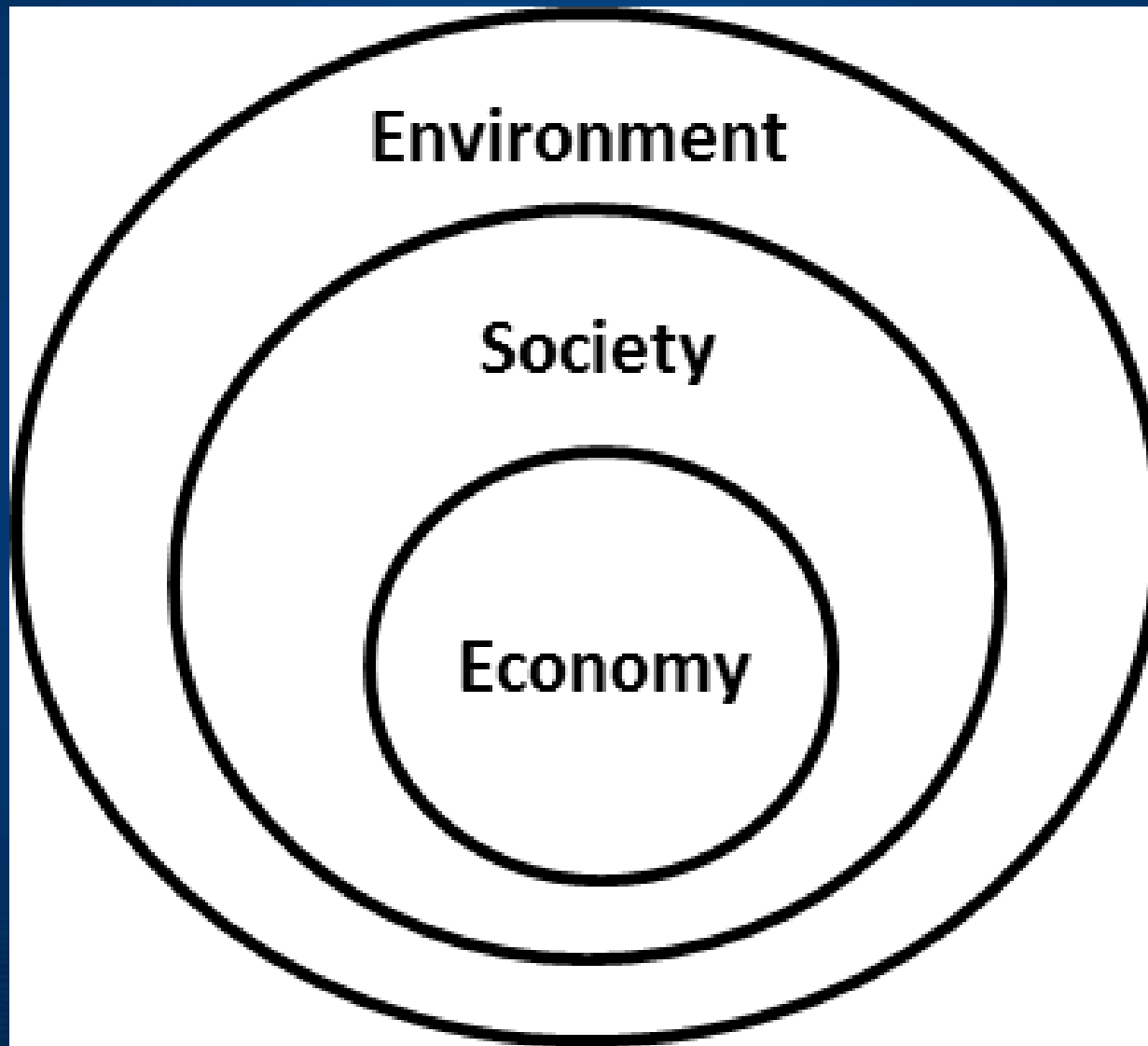


J. R. McNeill 2000: 336
*An Environmental History
of the Twentieth-Century World*

Partial Sustainability



Sustainability



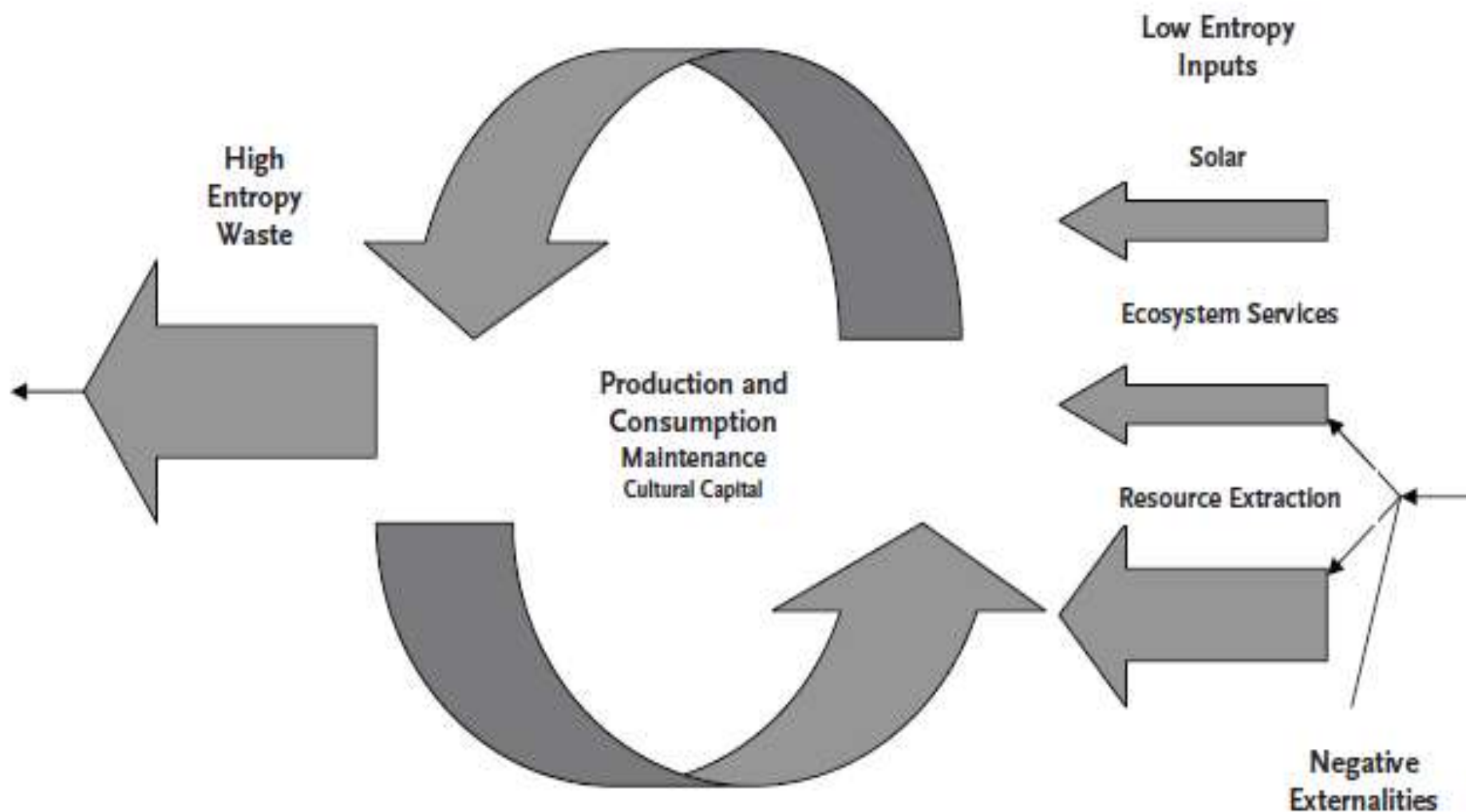


Figure 1:
Less Sustainable Economy Based on Maximizing Throughput

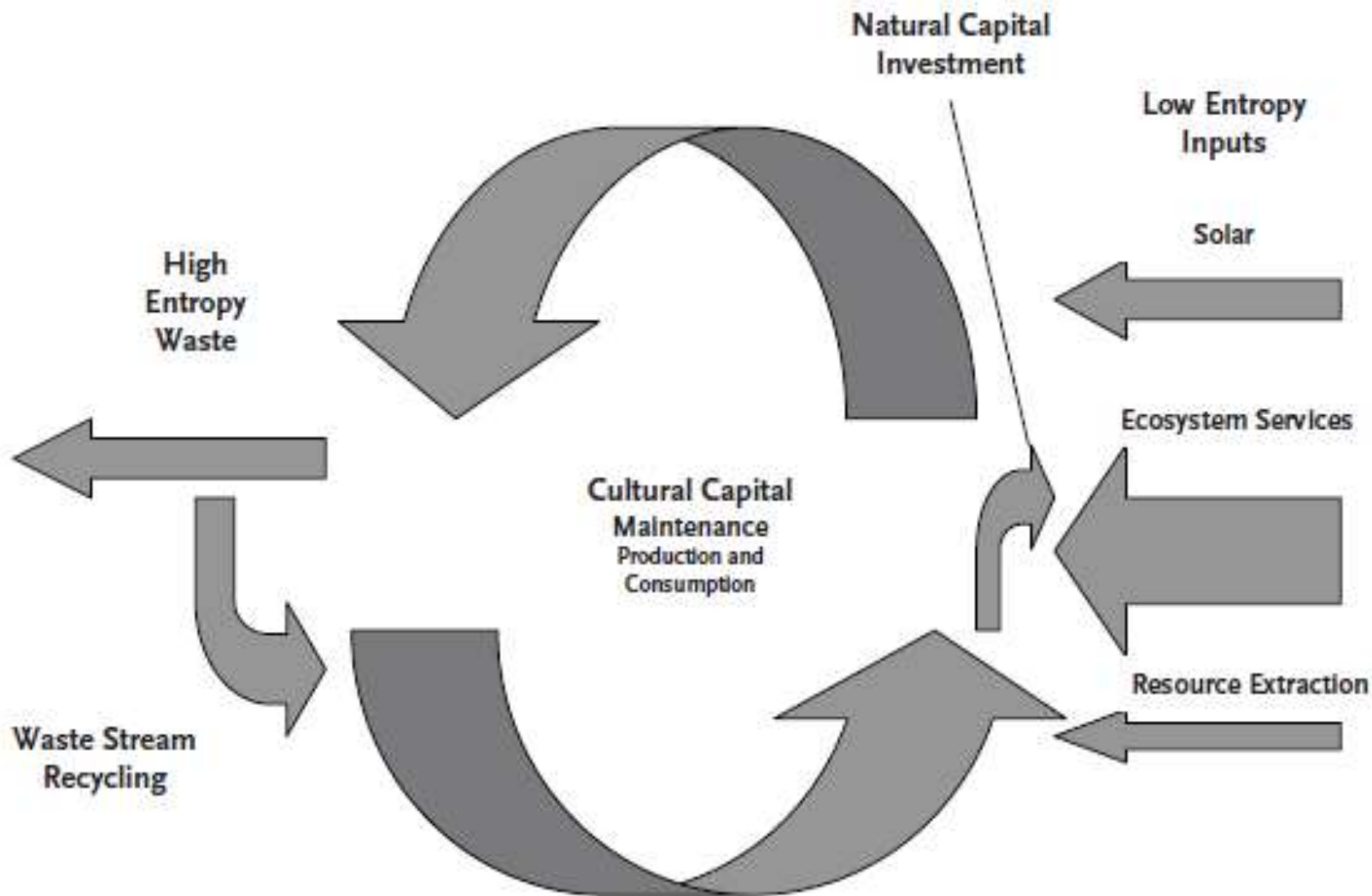


Figure 2:
More Sustainable Economy Based on Minimizing Throughput

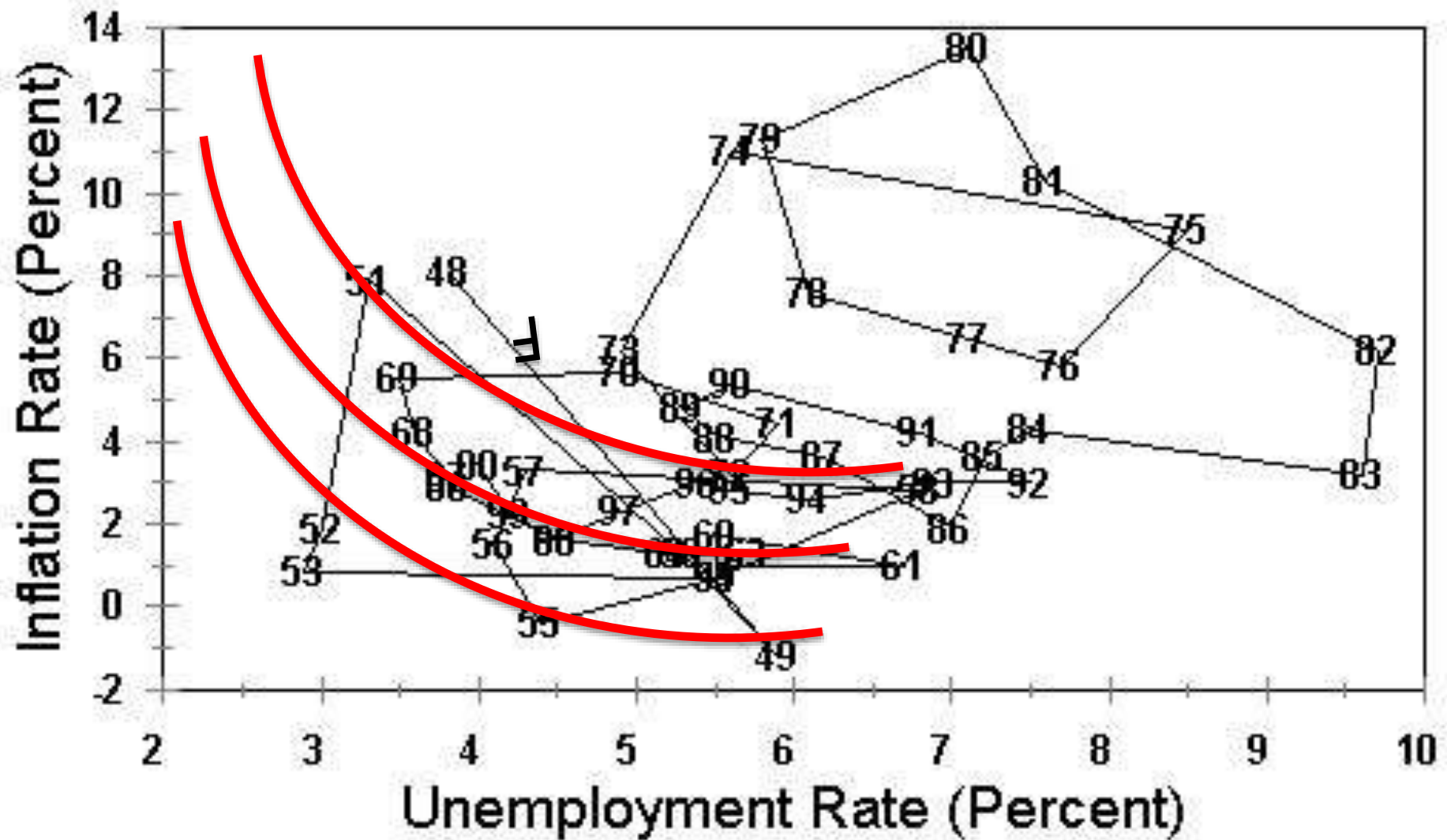
Economic Policy

- Neoclassical economic theory, which has come to dominate much of the policymaking world, reduces the factors of production to labor and capital
- A fuller picture of the drivers of the economy in the 21st century that includes more interdisciplinary and comprehensive approaches to understanding and monitoring would better benefit policymakers
- Part of the dilemma is related to the role of the history of economic thought as opposed to economic history - two different subjects

Flawed Economic Theory

- Rational Expectations
- Scarcity
- Efficient Market Hypothesis
- Phillips Curve
- Unemployment Rates vs. Labor Market Participation Rate
- Privatized Gains, Socialized Losses (doing God's Work)
- Externalities (Environmental Sink)

Complete History



**REMEMBER WHEN THE PHILLIPS
CURVE FIT THE ACTUAL DATA**



**PEPPERIDGE FARM
REMEMBERS**

Environmental Sink

- Recent work suggests that the most important environmental issue that nations will face in the future is not availability of non-renewable natural resources, but rather the environmental sink - the ability of the earth to absorb waste and regenerate renewable resources (or ecosystem services)
- A closely related issue is what level of ecosystem services can be consumed at or below the regeneration rate of renewable natural capital

Neoclassical theory postulates:

Capital is Homogeneous

Natural Capital = Manufactured Capital

???





Macroeconomic Policy Failures

- For publicly-held corporations, Fed-induced financial engineering encourages cheap borrowing that could be used for investment
- Instead of capital spending on research and development, the bulk of this debt has been used to fuel stock buybacks and dividend payments
- From the end of the Great Recession through 2016, corporations paid out more than 100% of earnings to shareholders, with the difference made up from inexpensive borrowing, selling assets, tapping cash reserves or through layoffs
- The change in culture has caused Nobel prize winner Edmund Phelps to openly question whether senior executives now care more about building their dream homes than building their companies

Rethinking MSV

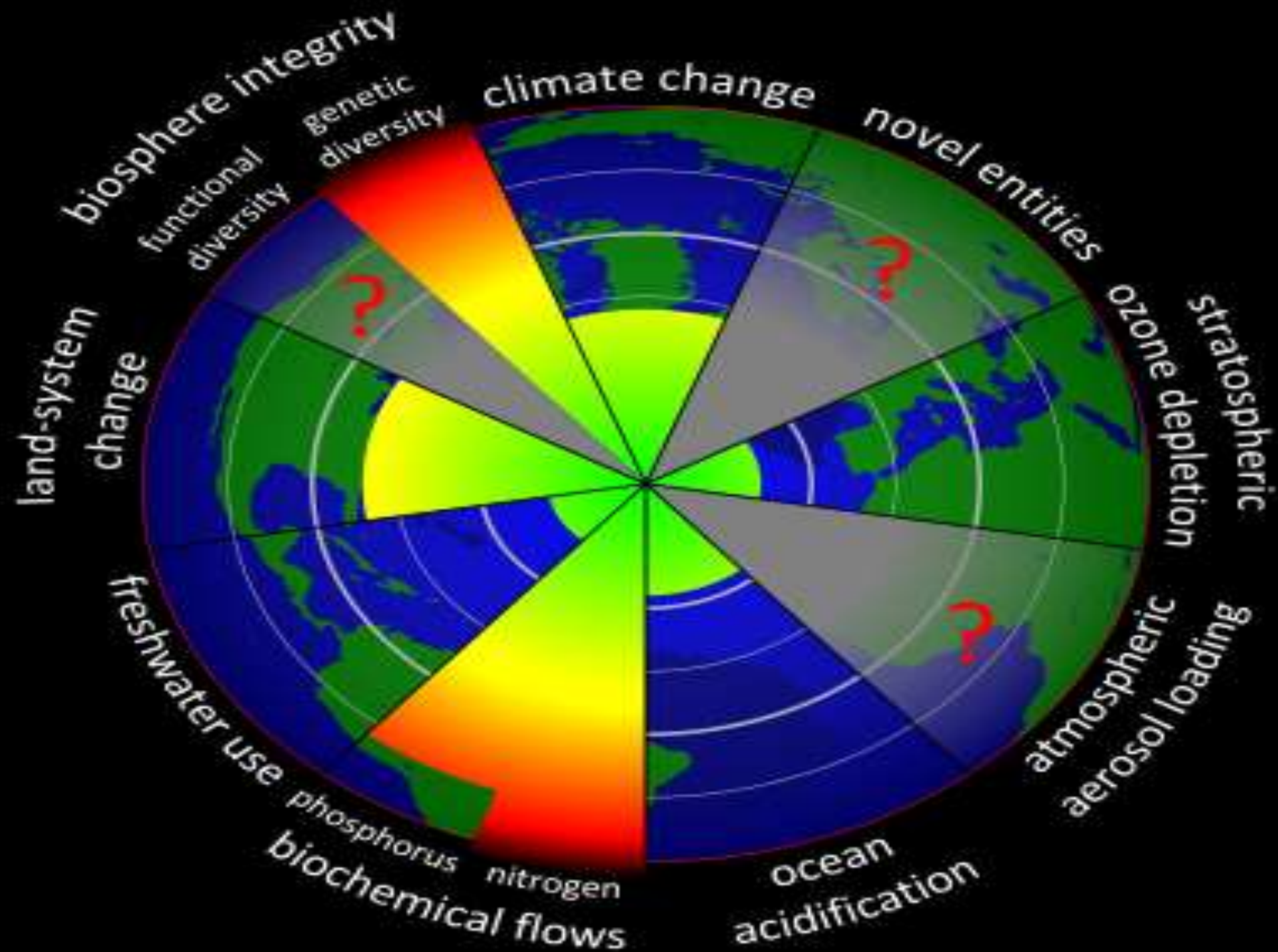
- One of the most dubious schools of thought that emanates from economic principles combines agency, property rights and finance theory into a model of the business firm (MSV: Jensen and Meckling 1976)
- Since the popularization of the theory of maximizing shareholder value (MSV) took hold in the 1980s and 1990s many corporations jettisoned almost all other considerations
- MSV represented a significant shift in corporate culture

Johnson and Johnson's Credo, for example, was formulated in 1943 and begins with their first responsibility, which is to the doctors, nurses and patients, mothers and fathers and all others who use their products. In other words, their customers. J&J's suppliers and distributors are mentioned next, along with a reference to their opportunity to make a fair profit. Then employees. Then communities. Only at the end of the credo are the stockholders mentioned, where they are promised a fair return.

Fundamental Planetary Boundaries

(intrinsic, non-negotiable limits)

- Climate change
- Biodiversity loss
- Excess nitrogen and phosphorus production
- Stratospheric ozone depletion
- Ocean acidification
- Global consumption of freshwater
- Change in land use for agriculture
- Air pollution
- Chemical pollution
- Plastics pollution



Atmospheric Carbon Dioxide Levels Over the Past 400,000 Years



Environmental Early Warning Indicators

- In the case of decreasing biodiversity, signals can be presaged by loss and displacement of slowly replicating and weakly competitive “canary” species with slowly replicating but strongly competitive “keystones”
- Collapse of keystone species can result in their replacement by weakly competitive but fast-replicating “weedy” species
- Taken to an unpalatable extreme, one might imagine a planet populated largely by highly adaptive species such as rats, sharks, skunks, cockroaches and crows
(species most able to co-exist with humans)













Market Failure



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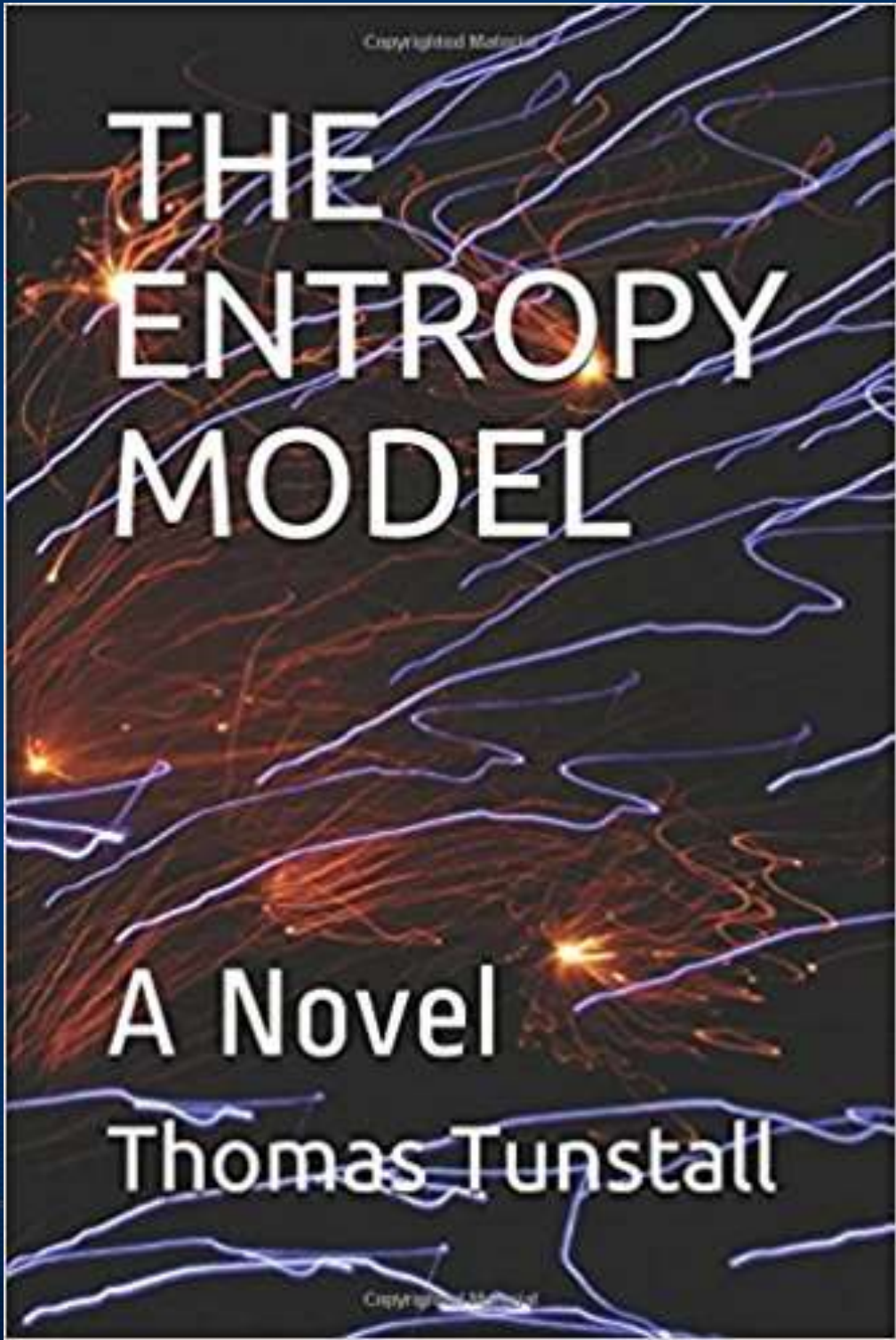
Jobs of the Future

- Rebuilding the aging US infrastructure as proposed by the Trump administration will create jobs, but only maintains current living standards
- Many people will be employed to maintain sufficient regenerative capacity in ecosystem services necessary to provision a global population of 10 billion or more
- Ample opportunity for increases in research and development into nascent areas such as fusion power and gene therapy – long-term strategies



GETTY IMAGES





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THE ENTROPY MODEL

A Novel
Thomas Tunstall

Copyrighted Material

Five Key Components of Modern Economic Development

1. Job growth
2. Quality of life
3. Environmental stewardship
4. High-quality infrastructure
5. Development of skilled local workforce

In short — Sustainability!

QUALITY OF LIFE COMPONENTS

- SOCIAL RELATIONSHIPS AND CULTURE
- PUBLIC SAFETY AND CRIME RATES
- INDEPENDENCE AND PERSONAL AUTONOMY
- HEALTHCARE SERVICES
- WATER AND AIR QUALITY
- SOLID WASTE AND WASTEWATER TREATMENT
- ELECTRICITY
- TELECOMMUNICATION INFRASTRUCTURE
- EMPLOYMENT OPPORTUNITIES
- HOUSING OPTIONS
- SCHOOLS AND EDUCATION
- BANKING SERVICES
- EASE OF TRAVEL
- ANIMAL AND DESTRUCTIVE INSECT CONTROL
- PUBLIC TRANSPORT
- VARIETY OF RESTAURANTS
- CULTURAL EVENTS
- SPORTS AND LEISURE ACTIVITIES
- RETAIL VARIETY
- RELIGIOUS OPTIONS
- CLIMATE
- RECREATION
- AESTHETICS
- PHYSICAL ACTIVITY

PUBLIC AMENITY MENU

(ONGOING MAINTENANCE WILL BE REQUIRED)

- **INFORMATION CENTERS**
- **MUSEUMS**
- **ACTIVITY CENTERS**
- **RECREATIONAL FACILITIES**
- **TOWN HALLS**
- **OPEN SPACES / GREENSCAPES**
- **CHURCH YARDS**
- **PUBLIC PLAYGROUNDS (INCLUDING ADULT)**
- **SPORT FIELD AND FACILITIES**
- **LIBRARIES**
- **PUBLIC RIGHTS-OF-WAY / FOOTPATHS**
- **NATURE RESERVES / STATE PARKS**
- **PUBLIC PARKS**
- **COUNTRY PARKS**
- **FOUNTAINS / REFLECTING POOLS**
- **CAFES / SITTING AREAS**
- **TOWN SQUARES**
- **FISHING AREAS**
- **Mowing and Landscaping**
- **Flowers and Trees**
- **Litter Removal**
- **Bike Paths**
- **Lakes / Waterfronts**
- **Wide Sidewalks**
- **Outdoor Gathering Places**
- **Scenic Views**
- **Public Open Spaces**
- **Escalators**
- **Public Bathrooms**
- **Colleges and Universities**
- **Hospitals / Clinics**
- **Public Velodromes / Skate Parks**
- **Bridle Ways / Stables**
- **Community Centers**
- **Amphitheatres**
- **Dance Halls**

GPI Components

- Personal Consumption

- Income Distribution Index (crime, worker productivity, reduced investment)

- Weighted Personal Consumption

- Value of Household Work and Parenting

- Value of Higher Education

- Value of Volunteer Work

- Services of Consumer Durables

- Services of Highways and Streets

- Cost of Crime

- Loss of Leisure Time

- Cost of Underemployment

- Cost of Consumer Durables

- Cost of Commuting

- Cost of Household Pollution Abatement

- COST OF AUTOMOBILE ACCIDENTS

- COST OF WATER POLLUTION

- COST OF AIR POLLUTION

- COST OF NOISE POLLUTION

- LOSS OF WETLANDS

- LOSS OF FARMLAND

- LOSS OF PRIMARY FORESTS

- DEPLETION OF NON-RENEWABLE ENERGY RESOURCES

- CARBON DIOXIDE EMISSIONS DAMAGE

- COST OF OZONE DEPLETION

- NET CAPITAL INVESTMENT

- NET FOREIGN BORROWING















**THE FUTURE AIN'T
WHAT IT USED TO
BE**

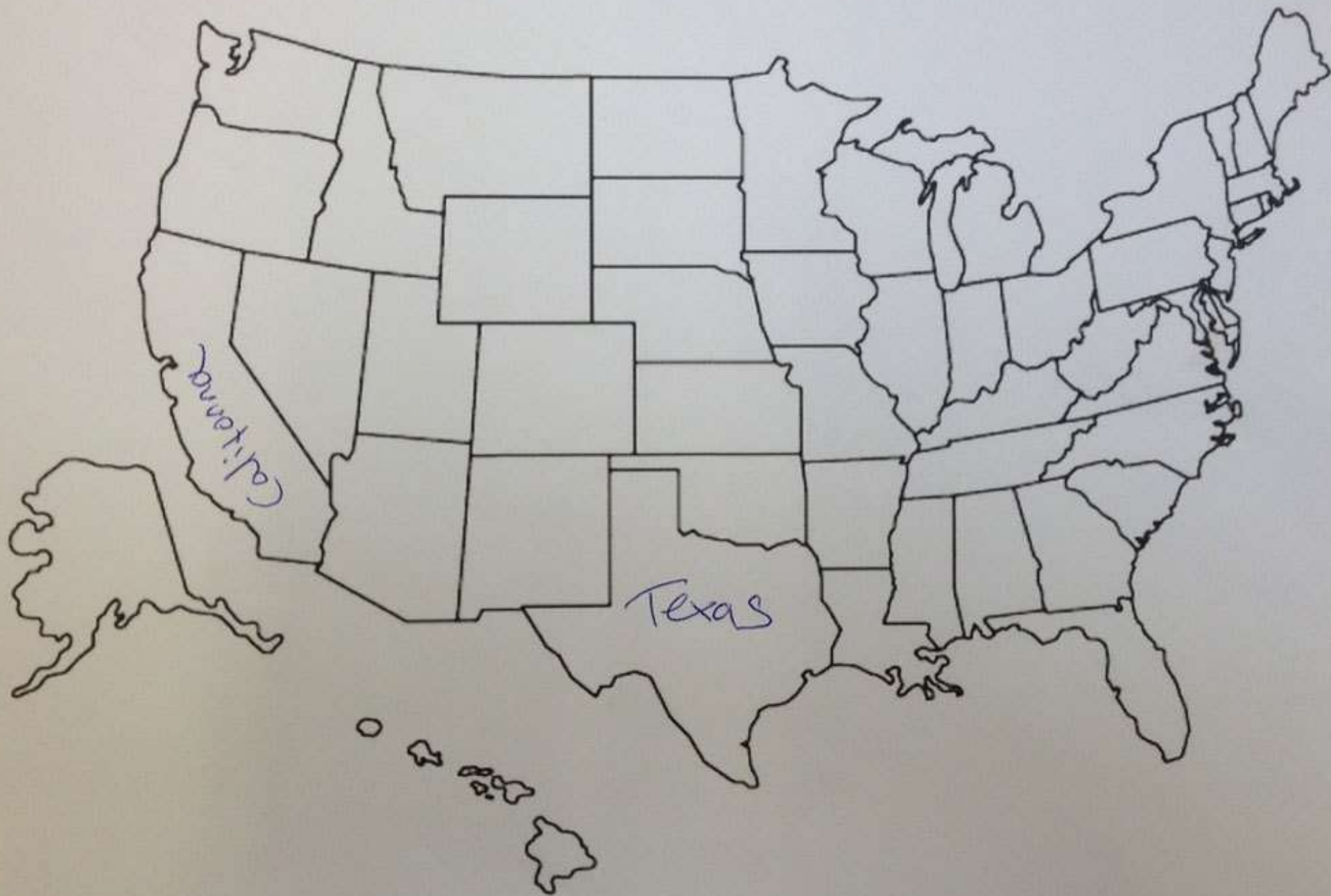
- YOGI BERRA

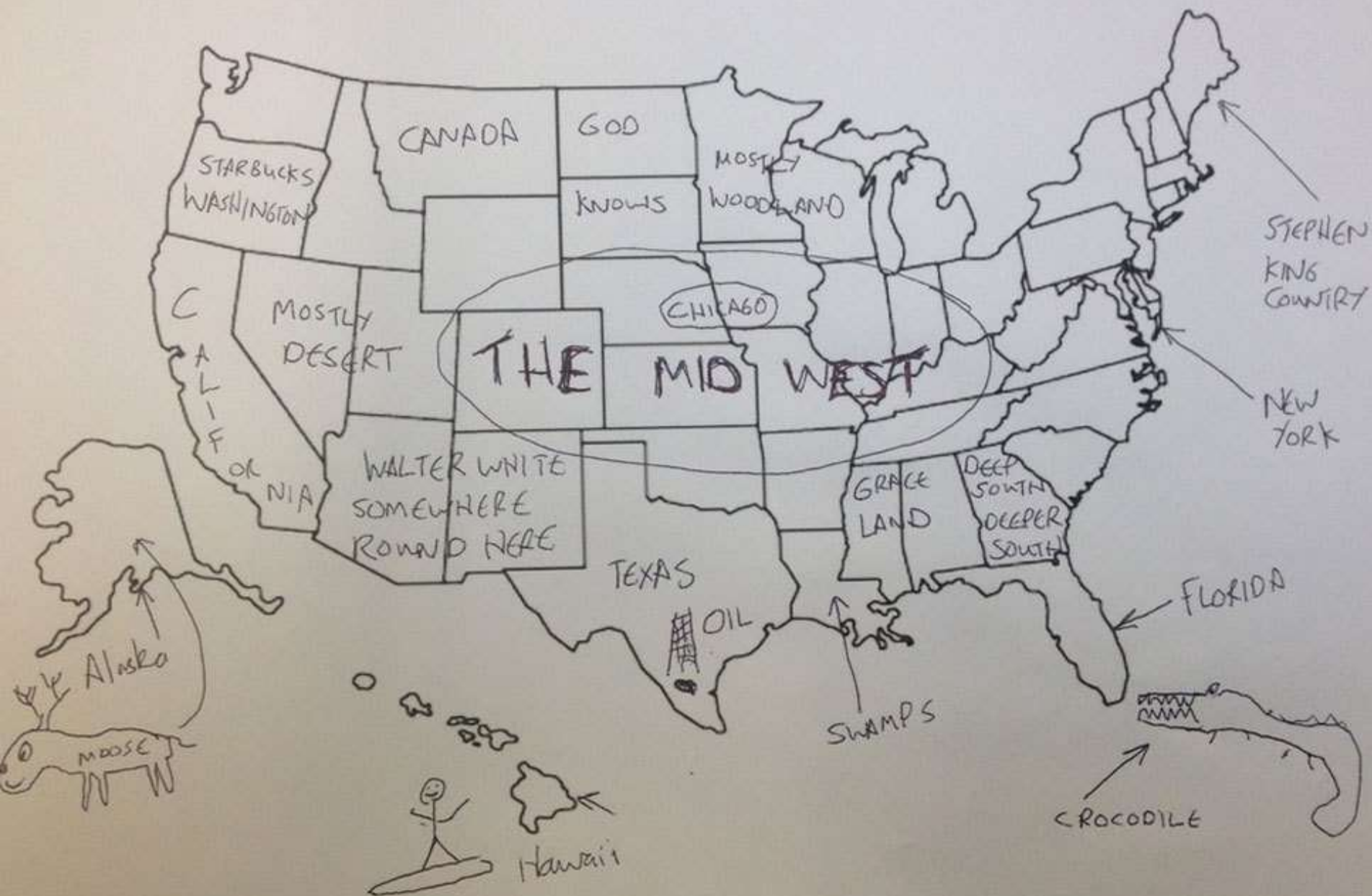


“We have the greatest history of *any* state in the union—there’s nothing to compare to it. That’s not Texas brag. **More books have been written about Texas than any state in the union. In fact, there are more books about Texas than all the rest of the states combined.** And it’s not because we have so many history professors in Texas. It’s that we have such a diverse and colorful history.”

James Perry Bryan, Jr.
from Texas Monthly August 2015

I've been to a lot of places, but I've never been in Cahoots. Apparently you can't go alone, you have to be in Cahoots with someone. I've also never been in Cognito, either. I hear no one recognizes you there. I have, however, been in Sane. They don't have an airport, you have to be driven there. I have made several trips.









NO ONE KNOWS
THESE ONE

PAUL
(I SHOULD
KNOW & MANY
MORE, WHAT
WITH MY JOB
& O ALL)

MINNESOTA
OR
WYOMING?

ONE OF THESE
IS INDIANA /
VIRGINIA /
KENTUCKY /
TENNESSEE

CALIFORNIA

ARIZONA

NEW
MEXICO

COLORADO

KANSAS

NORTH
DAKOTA

SOUTH
DAKOTA

TEXAS

MISSISSIPPI

ALABAMA

FLORIDA

NEW
YORK

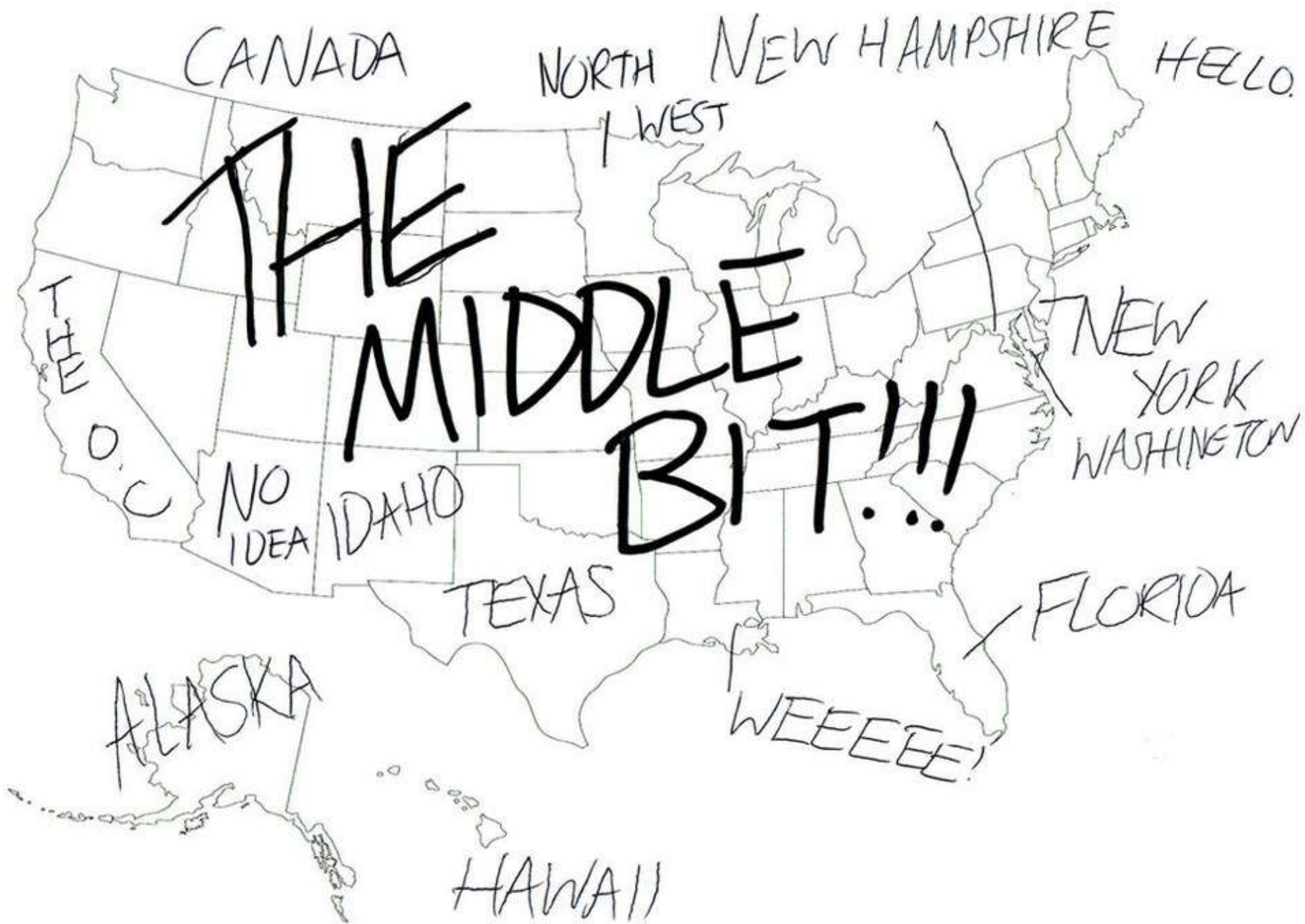
NEW
JERSEY

MASSACHUSETTS

MAINE

ALASKA





Alaska be up there ↗

Sparkling
vampire state.
Washington?

Sorry, no idea
about this one

A vowel state.
Ohio?

Square 1

Dakotas

Chicago

Detroit

New England

NYC

DC

Whatever

Vegas

Utah

Square 2

Kansas?

The river.
Missypissy?

Virginias
and Carolinas

Cali

Dunno, but this
must be the
one when the
bordermaker
broke his ruler

Is this where
your government
hides aliens?

A straighter
copy of Florida

South Whatever
(also zombies)

TEXAS

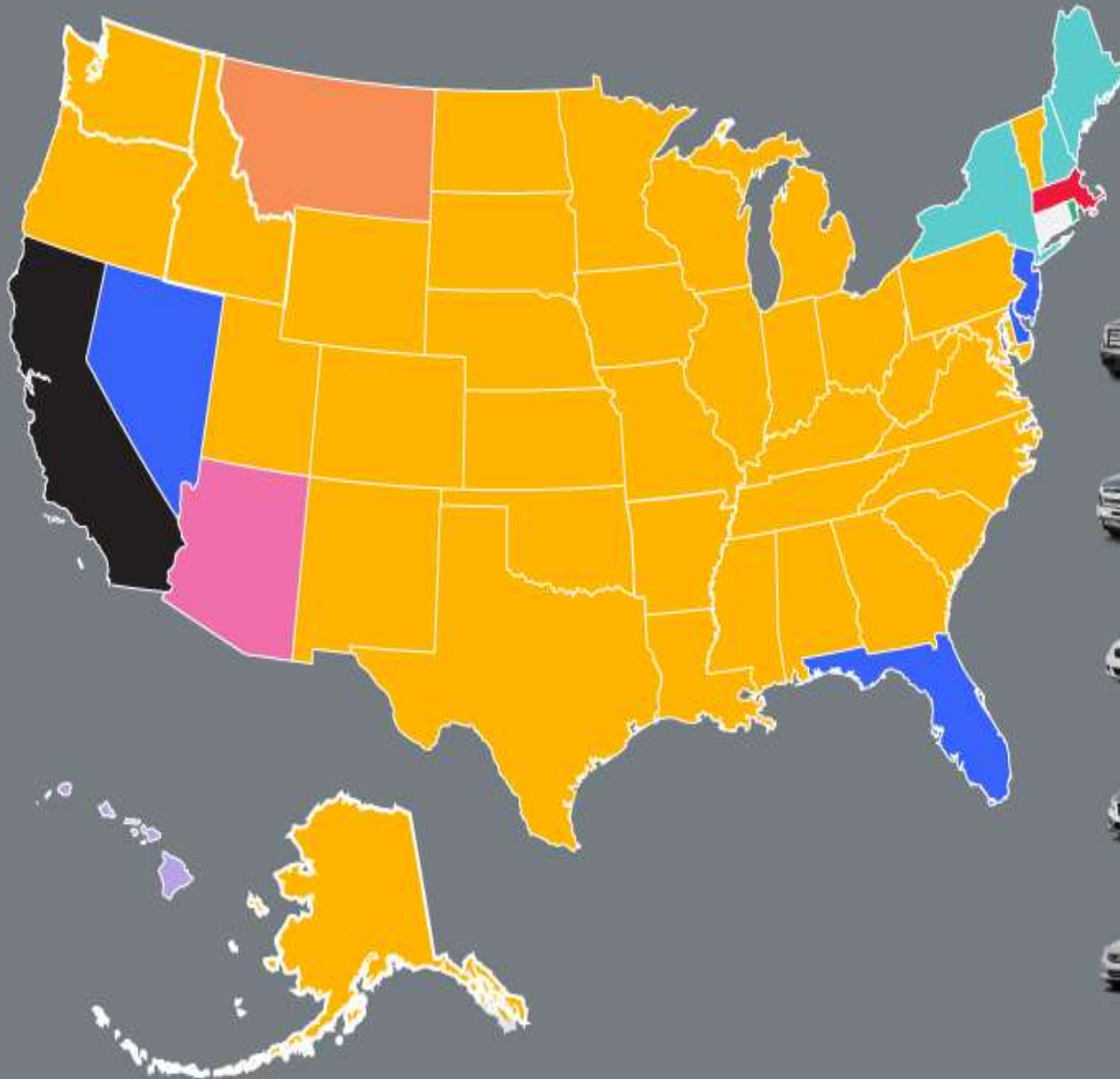
French guys with
hurricanes, right?

Florida

Hawaii be down there ↙



MOST POPULAR VEHICLE BY STATE



Ford F-150



Dodge Grand Caravan



Chevrolet Silverado



Dodge Ram 1500



BMW 3 Series



Jeep Grand Cherokee



Nissan Altima



Mercedes-Benz C



Honda Accord



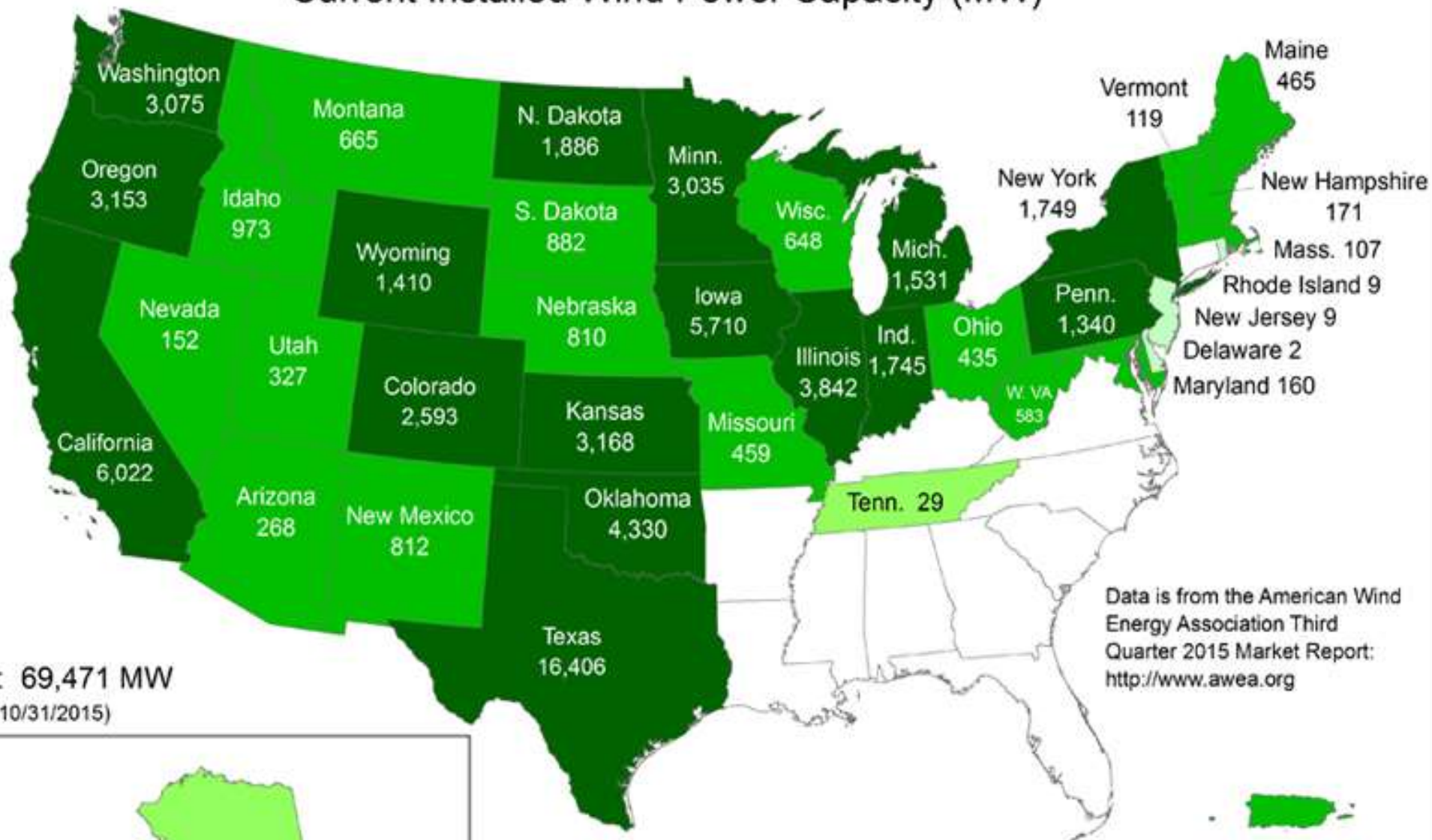
Honda CR-V

IT'S SO HOT IN TEXAS

A photograph of a wind farm in a dry, brown field under a clear blue sky. Several white wind turbines are visible, with the largest one in the foreground on the right. The turbines are arranged in a line receding into the distance.

WE'VE INSTALLED FANS OUTSIDE

Current Installed Wind Power Capacity (MW)



Data is from the American Wind Energy Association Third Quarter 2015 Market Report: <http://www.awea.org>

Total: 69,471 MW
(As of 10/31/2015)

Wind Power Capacity

Megawatts (MW)



U.S. Department of Energy





Only in Texas!



A large, dark, and ominous tornado funnel cloud is shown descending from a stormy sky. The funnel is wide at the top and tapers as it descends, with a bright, hazy base where it meets the ground. The sky is filled with dark, heavy clouds, and the overall atmosphere is one of danger and severity.

Tornado warning in Texas!

**All residents advised to go to Cowboys Stadium
No chance of a touchdown there!**

**Only Texas could turn defeat into a legend ... and a song,
and a tourist attraction, and a major motion picture.**





TEXAS IS THE
FINEST PORTION
OF THE GLOBE
THAT HAS EVER
BLESSED MY VISION.

SAM HOUSTON 1833



TEXAS

**"THERE ARE ONLY TWO
STATES IN AMERICA: TEXAS
AND NOT TEXAS."**



AIN'T TEXAS



THANK YOU!

WSLCA Conference Oil and Gas and Sustainability

January 2020

Principal Investigator: Thomas Tunstall, Ph.D.

Lead Investigator: Javier Oyakawa, M.A., M.Sc.

Researchers: Monique Long, Ph.D., Emily Stone, Ph.D., Sheryllynn Roberts, Ph.D., Amanda Martinez, Gina Conti, Joshua Ramirez, Kaleb Stutts, Karina Juarez, Lictor Prianti Leal, Michael Brennan, Paulina Rodriguez, Sean Greszler, Zhenglian Xie, Anandsai Chinthamreddy, Gaurav Pippalla

Thomas Tunstall, Ph.D.
Research Director
UTSA Institute for Economic Development
thomas.tunstall@utsa.edu

THANK YOU

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