

TEXAS OIL AND GAS
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Texas has produced more oil and natural gas than any other state and today is still the largest producer. Oil and natural gas are found in virtually every part of the state. No state or any other worldwide region has been as heavily explored or drilled for oil or natural gas as Texas. Currently (August 2003) 151,605 oil wells and 66,951 gas wells are actively producing in Texas.

Texas Oil Production

Texas was not the first state to produce oil, but Texans were not far behind. Drilling for oil in Texas occurred in 1866 at Oil Springs, near Nacogdoches, East Texas, less than a decade after Colonel Edwin Drake's 1859 Titusville, Pennsylvania, well brought the U.S. into the age of oil. Oil had been found before in Texas, but it was either when it leaked to the surface or when folks were drilling for water. Then, in 1894, the beginnings of the Texas age of oil occurred with the first major discovery, Corsicana field, East Texas. The first true boom came with the 1901 Spindletop field of the Texas upper Gulf Coast Basin. Afterward, a multitude of discoveries occurred. The largest oil field in Texas, as well as in the U.S. Lower 48 states, the East Texas oil field was discovered in 1930. Annual Texas oil production increased and peaked in 1972 at 1,263 million barrels (MMbbl) (fig. 14). Production declined rapidly thereafter.

Although oil production in Texas is mature and in decline, significant opportunities for incremental recovery exist through advanced exploration and production technologies. On average, recovery rate for major oil reservoirs in Texas has been 35 percent. Technology plays a pivotal role in increasing recovery rate, improving economics, and assisting in exploration of complex oil reservoirs. Through application of technology in an increasingly complex and mature resource base, oil production decline in Texas can be stabilized and arrested.

Texas Natural Gas Production

Historically, natural gas in Texas was discovered as a byproduct of oil. The form of natural gas that is in contact with crude oil in the reservoir is termed *associated gas*, and in earlier years it was wastefully flared and vented off without being produced. As oil exploration and discoveries increased in Texas, annual natural gas production rose steadily and peaked also in 1972 at 9,603 billion cubic feet (Bcf) (fig. 15). However, since the early 1980's, unlike oil production, Texas gas production has maintained a steady production level as the result of several large field discoveries, such as Newark, East, field, as well as a multitude of smaller fields that required application of advanced exploration and development technologies. Texas natural gas production levels were maintained through an increasing number of producing wells, which are at an all-time high. *Nonassociated gas*, which is natural gas that is not in contact with or dissolved in crude oil in the reservoirs, exceeds associated gas in volume. Moreover, new exploration activity and discoveries are currently natural gas and not oil.

U.S. Perspective

Through application of advanced technologies, incremental oil recovery from mature oil fields maintains Texas as the leading state in oil production. Even though production has been declining over the last few decades, Texas still produces more oil and natural gas than any other state in the U.S. In terms of 2002 oil and natural gas production, Texas produced 20 percent (368 MMbbl) and 26 percent (5,038 Bcf), respectively, of the U.S. total. Indeed, if Texas were a nation, it would rank as a top 10 producer. In terms of proved oil and natural gas reserves, Texas comprises 22 percent (5,015 MMbbl) and 24 percent (44,297 Bcf), respectively, of the U.S. total. *Reserves* are the estimated quantities that analysis of geological and engineering data demonstrates with reasonable certainty to be recoverable in future years from known reservoirs, under existing economic and operating conditions.

Economic Impact

The impact of oil and natural gas production on the economy of Texas, although not as great as in the past, remains an important source of economic benefits in terms of economy, jobs created, and taxes. According to the Texas Comptroller's input-output model of the Texas economy, total economic value of oil and natural gas production in Texas is 2.91 times its wellhead value. Additionally, 19.1 jobs are assumed to be created per million dollars of wealth created at the wellhead. Assuming oil and natural gas prices of \$30/bbl and \$5/Mcf and 2002 annual production of 368 MMbbl and 5,038 Bcf, wellhead value is greater than \$36 billion. Natural gas wellhead value is currently double that of Texas oil. In terms of economic value trickled down through the Texas economy and jobs created, this figure equates to over \$105 billion and 691,993 jobs. Severance, ad valorem, and indirect taxes provide additional economic benefits in Texas of more than \$6 billion. The leasing of State- and University-owned lands, moreover, provides royalty and leasing revenue to increase Permanent University and School Funds, important sources of revenue for public education in Texas.

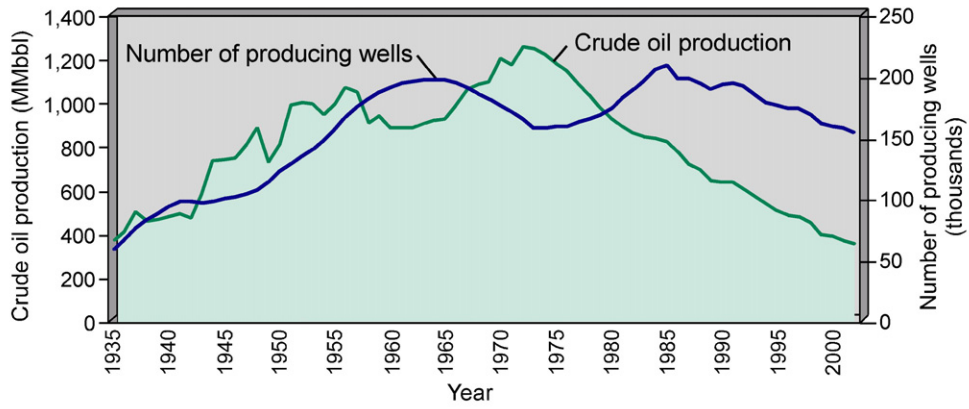


Figure 14. Texas historical oil production.

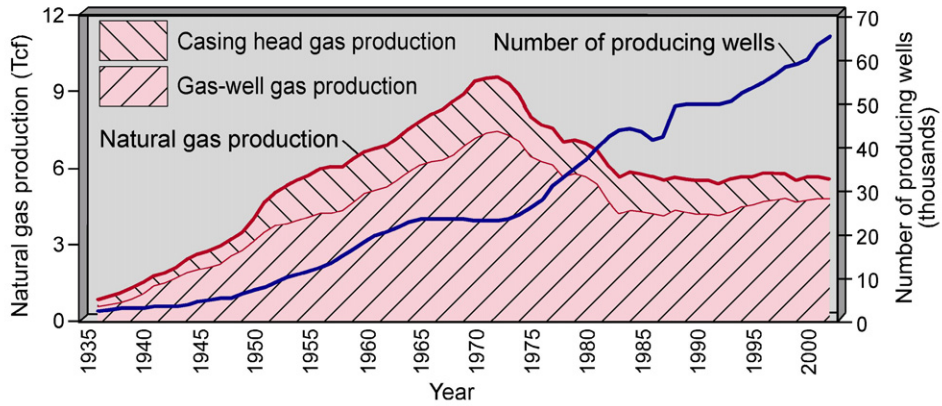


Figure 15. Texas historical gas production.

GIDDINGS OIL AND GAS FIELD

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Giddings field, the largest field in a 10- to 20-mile-wide trend (figs. 1, 16), extends from Mexico through Central Texas and into northwest Louisiana. The primary producing reservoir is the Austin Chalk (Upper Cretaceous, 85–90 million years old), with secondary production from the Taylor (Upper Cretaceous) and deeper Buda and Georgetown Formations (Lower Cretaceous, 98–105 million years old). Today the Austin Chalk outcrops at the surface along a belt that runs from Del Rio on the Texas-Mexico border, northeast through San Antonio, then north through Austin, Waco, and Dallas. The Chalk then dips gently (2°) to the southeast into the subsurface. In Giddings field, the Austin Chalk reservoir ranges in burial from 5,500 ft TVD in Milam County to over 15,000 ft TVD in Austin County.

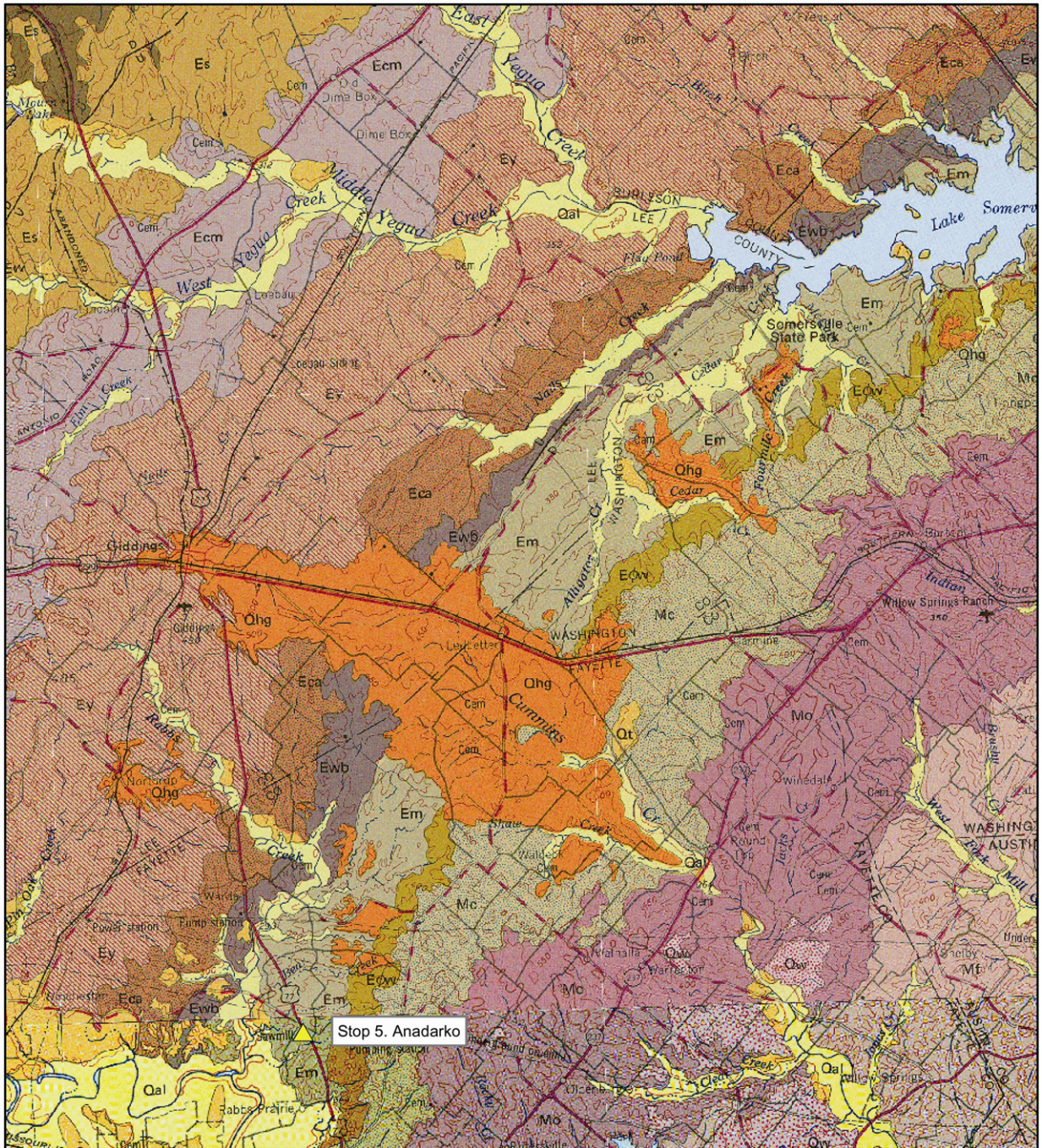
The Austin Chalk (as well as the Buda and Georgetown) is a fractured carbonate reservoir, with limited matrix porosity (1–5%) and permeability (0.003–0.03 md). The Austin Chalk in Giddings field, ranging from 150 to 750 ft in thickness, consists of interbedded chalk and marl (limestone with shale). It was deposited in a low-energy, open-marine setting, where very fine calcium carbonate debris could settle slowly to the seafloor. Most hydrocarbon production in the Austin Chalk comes from an extensive network of fractures. Localization of these fracture networks is controlled by bending of the formation in areas with a gentle southeast dip. Clean chalk beds fracture when bent, whereas the marl/shale beds will not. Local disturbance by salt domes also influences fracture development.

The updip (northwest) limit of Giddings field is defined by the burial depth of the Eagleford Shale. This shale was deposited between the Austin Chalk and underlying Buda/Georgetown rocks. The Eagleford Shale contains carbon-rich layers that serve as the hydrocarbon source, when buried to sufficient depths. Where it is not buried deep enough to generate oil and gas (northwest of Giddings field), the Cretaceous reservoirs are not productive. The downdip (southeast) limitation is primarily technology. As depth to the reservoir increases, temperature and pressure increase such that current drilling and LWD (logging while drilling) technology is insufficient to drill economic horizontal wells.

Anadarko Petroleum's cumulative production from the Central Texas Giddings field is 461 MMboe (barrels of oil equivalent) out of a total field production of 1,279 MMboe. Anadarko's 461 MMboe equals 36% of the field total. Anadarko's 461 MMboe comprises 200 MMbbl oil and 1.6 Tcf natural gas (44% oil; 56% natural gas).

Anadarko's Central Texas production is 168 MMcfd of natural gas, 16,738 bopd and 27,500 bwpd. Total well count is 1,210 (810 oil and 400 natural gas wells). Anadarko is the largest producer in Giddings field, with approximately 45% of total production.

Anadarko Petroleum currently has 7 drilling rigs (31 new wells and 29 reentries are planned for 2004), 14 workover rigs running on a daily basis, and 110 fracture stimulations to be done in 2004. Anadarko Petroleum employs 85 full time employees and contracts 12,700 monthly hours of contract labor.



Map modified from *Geologic Atlas of Texas, Austin Sheet*,
 Bureau of Economic Geology, V. E. Barnes, Project Director (revised 1981)

Figure 16. (a) Geologic map of La Grange area showing location of the Anadarko field office (Stop 5).

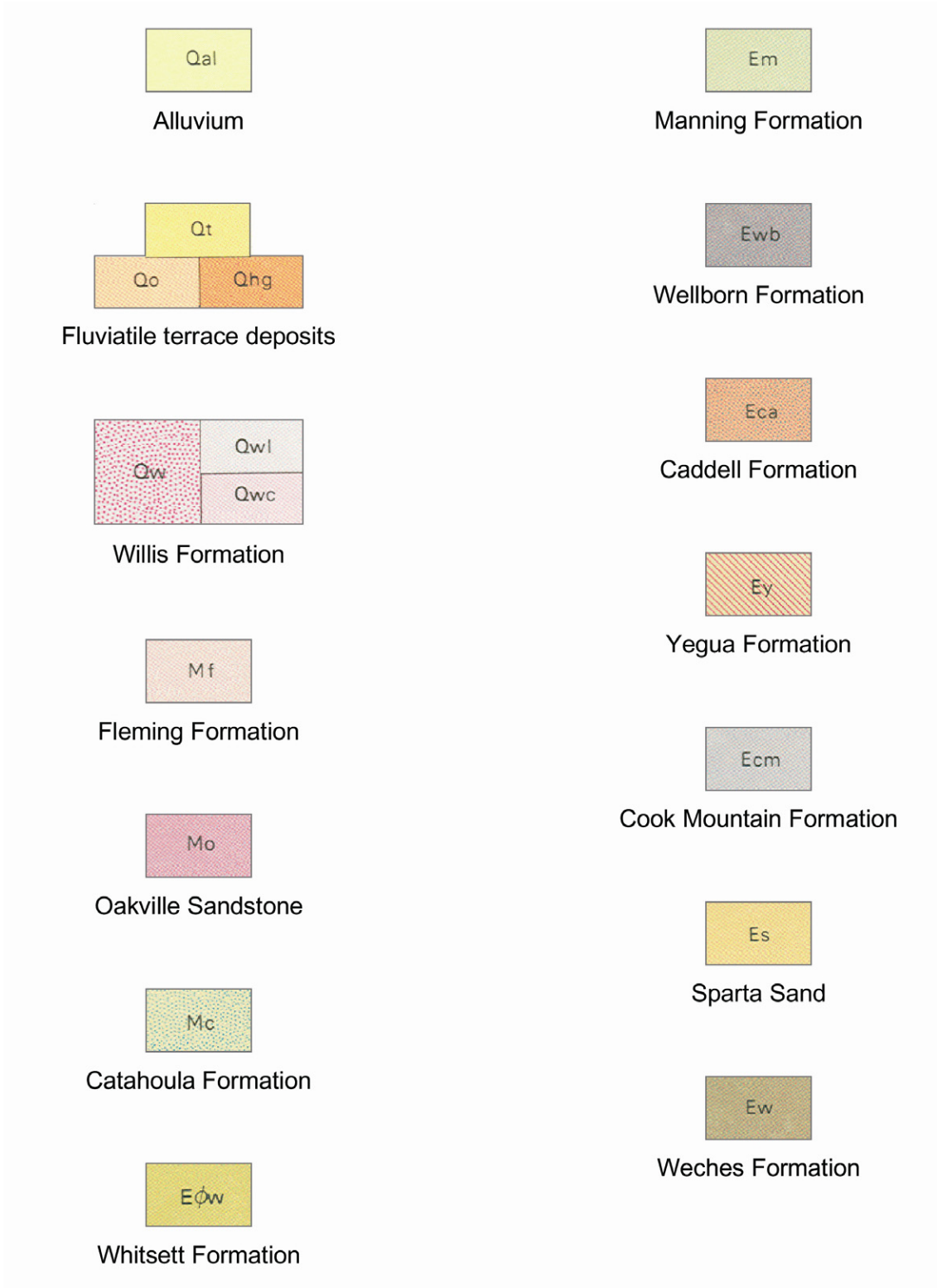


Figure 16. (b) explanation of geologic units depicted in fig. 16a.