

PRODUCTIVE LOWER WILCOX DISTRIBUTARY CHANNEL SANDS OF THE HALLETTVILLE EMBAYMENT, LAVACA COUNTY, TEXAS

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ABSTRACT

Four lower Wilcox sands produce oil and gas with condensate beneath the old Hallettsville Field, Lavaca County, Texas. The sands are distributary channel deposits of a deltaic suite laid down within an arcuate basin called the Hallettsville embayment. The channels are named Renger and Golsch (gas bearing), and Hathaway and Orsak (oil bearing) after the names of wells first penetrating them.

The study area covers 60 square miles (fig. 1) and includes the Valentine and Menking Fields on the west, Kinkler Field on the north, Word Field on the south, and overlies the Hallettsville-Charlie Daubert-Jansky Fields. Within this area a total of 180 wells penetrate the upper and middle Wilcox. Of these, 117 go through the lower Wilcox, and 36 continued into the Edwards. One has reached the Sligo.

The study is based primarily on inferences drawn from numerous electric log jam-correlation cross-sections, and the structure and isopach maps made from the data network, tied together with 104 miles of CDP seismic data. Four wells were conventionally cored, slabbled and sampled. They include 162 feet from the Howell Allen No. 2, 93 feet from the Howell Allen No. 3, 120 feet from the Howell Mary Golsch G. U. No. 4, and 31 feet from the Guadalupe Thomas Grahmann No. 1. Petrographic and paleontologic data come from 34 thin sections, 18 SEM photomicrographs, 18 x-ray diffraction analyses, 12 micropaleontological samples, and 18 palynological samples.

Seismic data are critical to understanding both structural and stratigraphic relations in the study area. Interpretation of these data reveal: (1) Cretaceous depositional topography, (2) structures and faulting, and (3) channel limits and maximum sand axes. Exploring for the channel sands requires recognition of its seismic signature of basal scour, reflection amplitude change and drape over the anomaly, i. e., a seismic "football".

Structure within the study area results primarily from faulting and compaction above the depositional topography of the underlying Cretaceous carbonate shelf margins. Normal faults occur at the Edwards and Sligo shelf edges and continue upward as low angle slide surfaces into the overlying Cretaceous and lower Wilcox clastics to form the concave reentrant of the Hallettsville embayment. Compaction of the Cretaceous lagoonal mudstones, and the westward-thickening wedge of overlying Cretaceous clastics caused northwest dip, which counteracted the regional southeast tilt to form a relatively flat surface during lower Wilcox deposition within the embayment area.

The lower Wilcox stratigraphic section ranges from 800 to 1600 feet in thickness. It is bounded by an unconformity at the base and by a marker lignite bed (the Holik) at the top. It includes primarily the low resistivity (+/- 1 ohm) Lavaca Shale which is the envelope surrounding the four productive channel sands.

The lower Wilcox sediments are predominantly mudstones and siltstones deposited adjacent to the narrow ribbons of channel sand. The sands range from a feather edge to 120 feet thick in the Hallettsville embayment and up to 200 feet thick at its southeast margin. They are moderately sorted, fine grained sands with quartz as the dominant framework grain mineral. Although the channel environment is up to 2000 feet wide, it includes multiple cycles 30 to 60 feet thick and 300 to 600 feet wide.

The sands make good reservoir rock with average porosities of 18 to 25 percent and permeabilities from 20 to 50 millidarcies (by routine whole core analyses). Visible pore space averages 15 percent and includes a primary and secondary (mainly leaching of feldspar, chert, and rock fragments) pore system, in a ratio of two to three. Clay minerals of authigenic origin average 10.5 percent (by XRD) and 14 percent by thin section count. They are primarily kaolinite and chlorite.

Neither the foraminifera nor the palynomorph assemblages from the 30 samples are diagnostic of age or environment. A poor arenaceous fauna occurs in seven samples and suggest restricted marine. There are many reworked Late Cretaceous forms in most of the samples.

Production from thick channel sand wells is prolific; often the overbank/interbedded channel completion is greatly enhanced by hydraulic fracturing into communication with a nearby massive sand. The Howell Mary Golsch No. 4 has produced 2.48 billion cubic feet (BCF) of gas and 107,354 barrels of condensate from 12/1/83 to 1/1/86. Total production from the four-well Golsch channel is 3.6 BCF and 162,583 barrels of condensate. In the Hathaway channel, the discovery well, Howell City of Hallettsville No. 1, has produced 66,729 barrels of oil and .2 BCF of gas since July, 1984. There are seven wells in the field and total production is 270,940 barrels of oil and .7 BCF of gas. At this time the Orsak and Renger channels are one-well fields; each was completed in early 1975 and have not yet been successfully offset.

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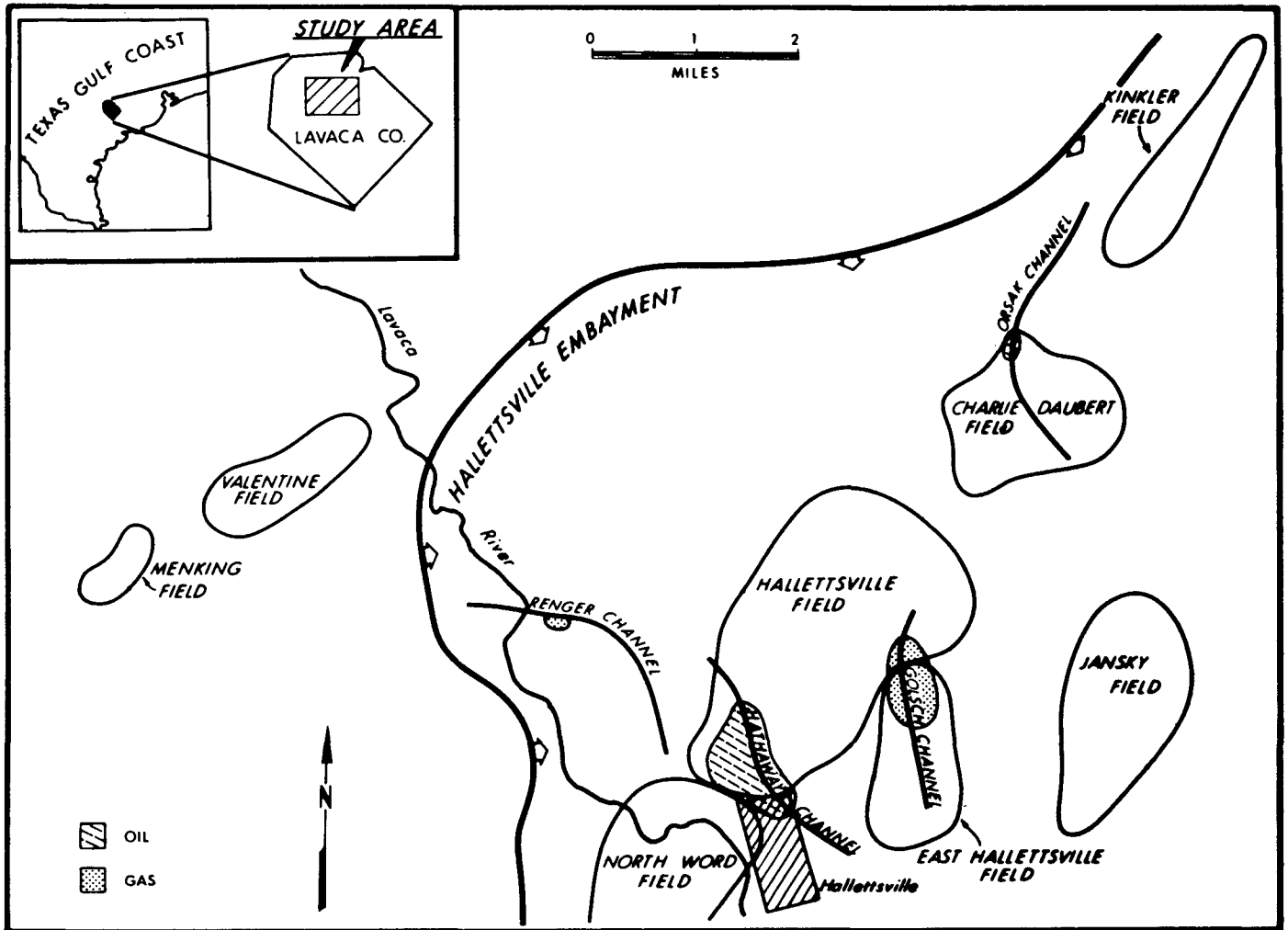


Figure 1. Index map of study area showing Hallettsville embayment, associated fields, and distributary channels.