WRENCH FAULTS, STRUCTURE AND PRODUCTION IN THE PERMIAN BASIN

Jerry N. Cox
Synterra Exploration – Roswell, New Mexico

Corporate and research geologists have, over the years, proposed wrench fault tectonics as a mechanism for creating structural deformation in the Permian Basin. Most working petroleum geologists seem to accept the theory but do little to incorporate the concept into the hunt for new prospective areas. This paper is presented to demonstrate evidence of strike-slip faulting associated with various producing fields. Much of the terminology used to describe structural variations in different fields is taken from Christie-Blick and Biddle's excellent 1985 paper titled "Deformation and Basin Formation Along Strike-Slip Faults". Whereas Christi-Blick and Biddle's paper was oriented towards basins and ranges formed in major structural provinces, this paper is oriented on the more "micro" scale of producing oil fields.

Wrench faults are difficult to recognize in the subsurface – in fact, some would say it's impossible. However, there is evidence if one looks for it. In order to recognize this evidence, it is necessary to map in detail a very large number of fields until patterns become apparent and the geologist acquires a "feel" for faulting and structural styles. When these fields are put into a regional setting, producing trends and faults begin to make sense.

Seismic cannot image a fault that has only lateral movement involved. Fortunately, most strike-slip faults have at least some vertical movement which a geophysicist can recognize if he is working with good information. It is essential to work with a good geophysicist who understands wrench fault tectonics.

To illustrate the presence of these faults, producing fields are shown across the Basin where structures are the result of restraining bends, releasing bends, en echelon folds, en echelon faults, rotated fault blocks, flower structures and block faulting. Sometimes terminology can become mixed when compression forces change direction over time.

This paper gives a brief discussion of each of the above structural types and a representative field for each type. These examples are covered in varying amounts of detail because of time restraints. In addition, production is tied together with regional maps which are necessary to establish credibility of interpretation both locally and regionally.

The following is a list of representative fields under each type of structure. Those fields discussed with some detail are shown with an asterisk (*).

Restraining Bend – West Yucca Butte*
Brown-Bassett ??

Releasing Bend – Hobbs*

En Echelon Fold – Russell*

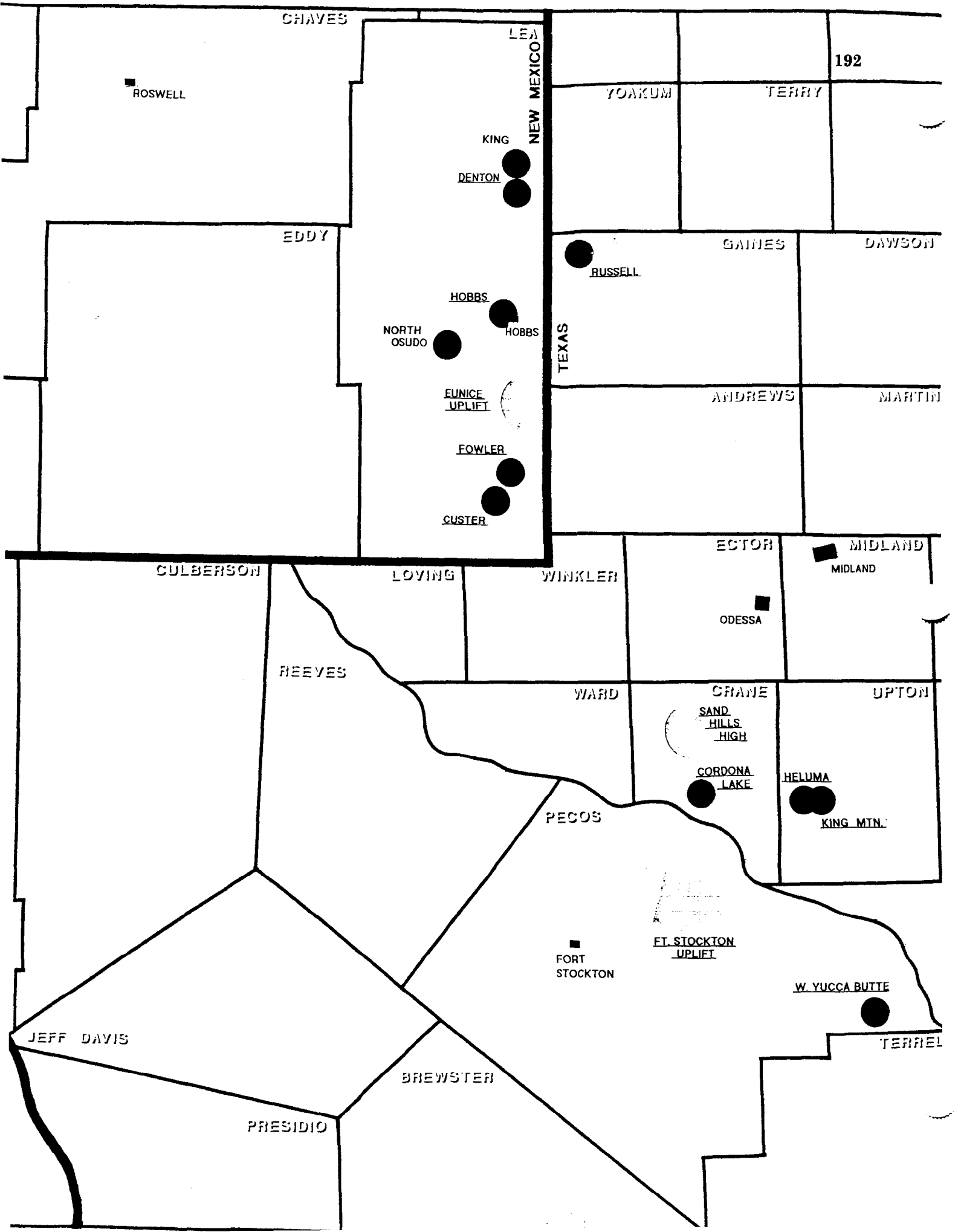
En Echelon Faults – Cordona Lake*
Bar-Mar*
Jax
Kite

Rotated Fault Block – King
Denton*
North Osudo

Flower Structures – Jones Ranch
North Russell
South Knowles
Fowler*
Block 16
Heluma
King Mountain

Block Fault Structures – Gladiola
South Denton
Knowles
Brunson – Eunice Uplift*
Custer*
Crosby
Justis
North Justis
Keystone
Kermit
Sheffield
Sand Hills High*
Fort Stockton Uplift*

In summary, if these basement controlled faults can be located in producing fields and be logically placed into a regional pattern, a map can be made which makes sense – at least to some people. Structures are not where you find them – they're where they are supposed to be - - -and all structures have not been found, only the easy ones.


CHAVES
LEA
NEW MEXICO
192
ROSWELL
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TERRY
KING
DENTON
EDDY
GAINES
DAWSON
RUSSELL
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HOBBS
NORTH OSUDO
TEXAS
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ANDREWS
MARTIN
FOWLER
CUSTER
ECTOR
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CULBERSON
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UPTON
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