## MAPPING GAS CHEMISTRY

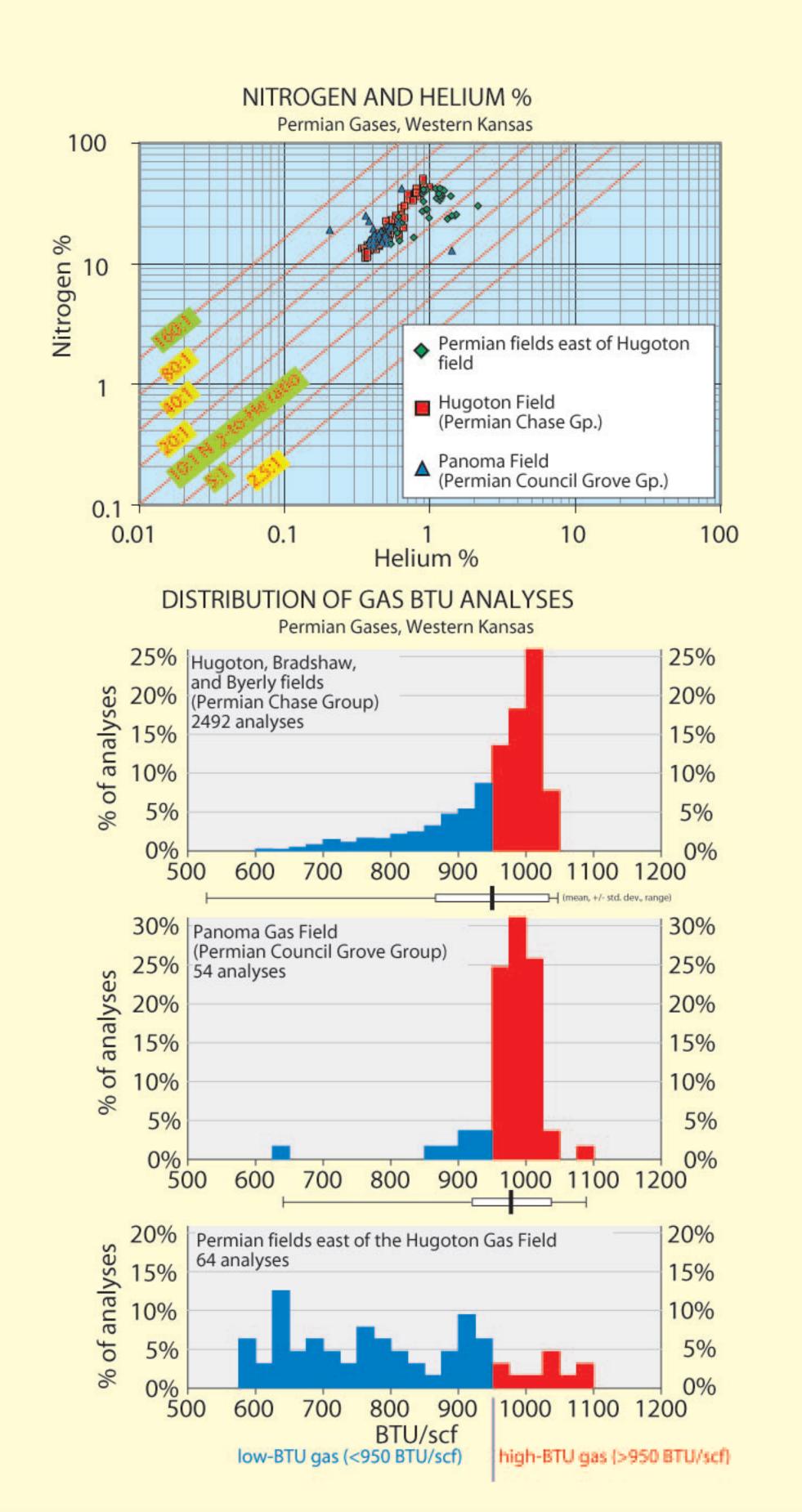
Mapping of gas chemistries for the six subdivisions of the stratigraphic section (see Panel 3) defines several low-BTU gas plays that can be explored and possibly developed utilizing new upgrading technologies. Space does not allow maps for all the stratigraphic intervals to be shown, so only some specific examples are presented. Summary maps for the western, central, and east-central parts of Kansas show where low-BTU gases have been sampled and areas where low-BTU gas plays may be.

## <sup>8</sup> WESTERN KANSAS The giant Hugoton Gas Field (25.2 tcf cumulative production; 7600 active wells) dominates this region. Its main reservoirs are carbonates in the Permian Chase Group. Council Grove-Group reservoirs,

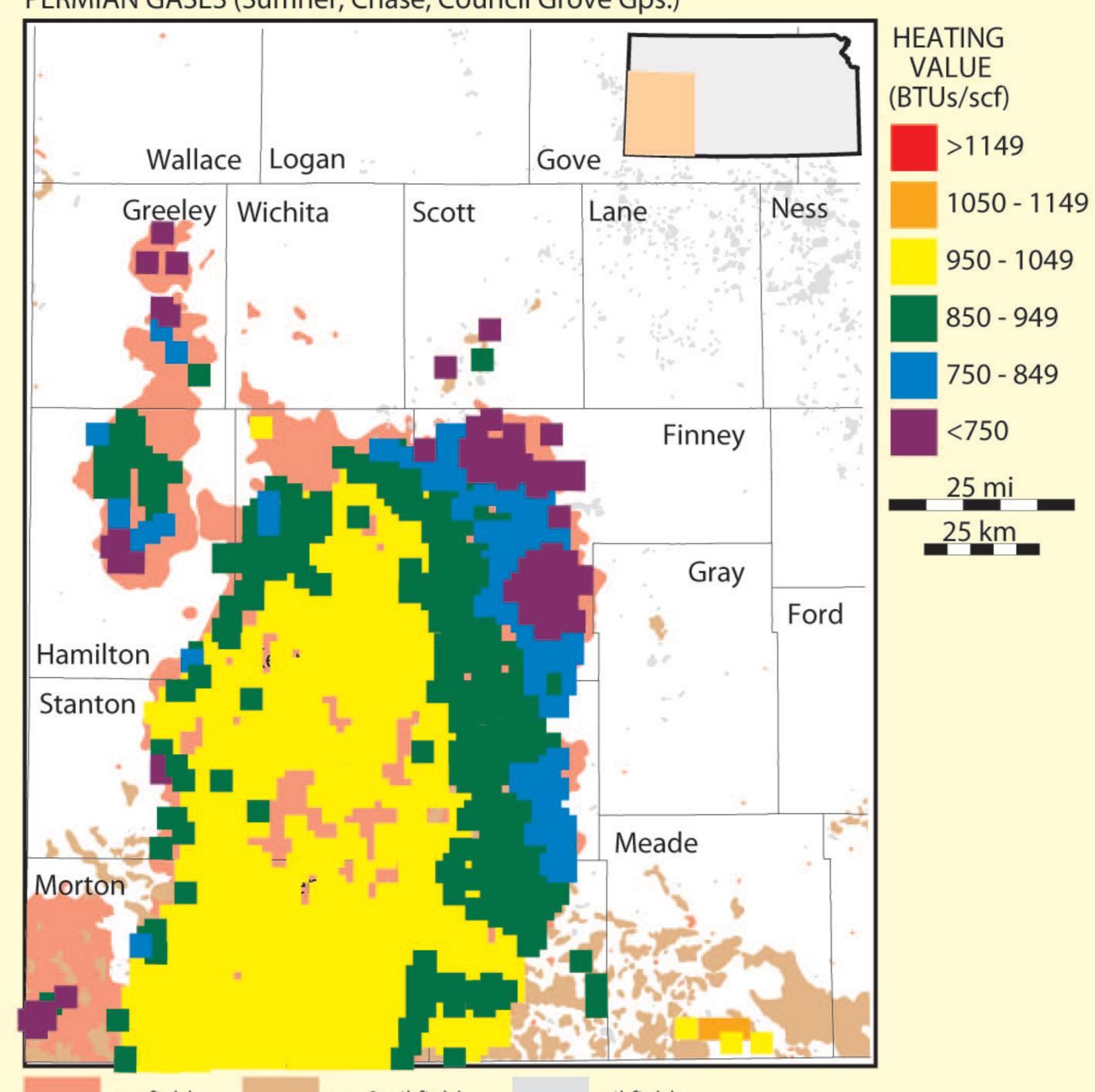
underlying the Chase Group, compose the giant Panoma Gas Field (3.0 tcf cumulative production; 2400 active wells). Locally, Pennsylvanian and Mississippian siliciclastic and carbonate reservoirs underlie these two giant fields.

Low-BTU gas is present on the eastern side of the Hugoton Field (see right). Low-BTU gas composes 15% of the Hugoton Field and 7% of the Panoma Field (M. Dubois, KS Geol. Survey, personal communication).

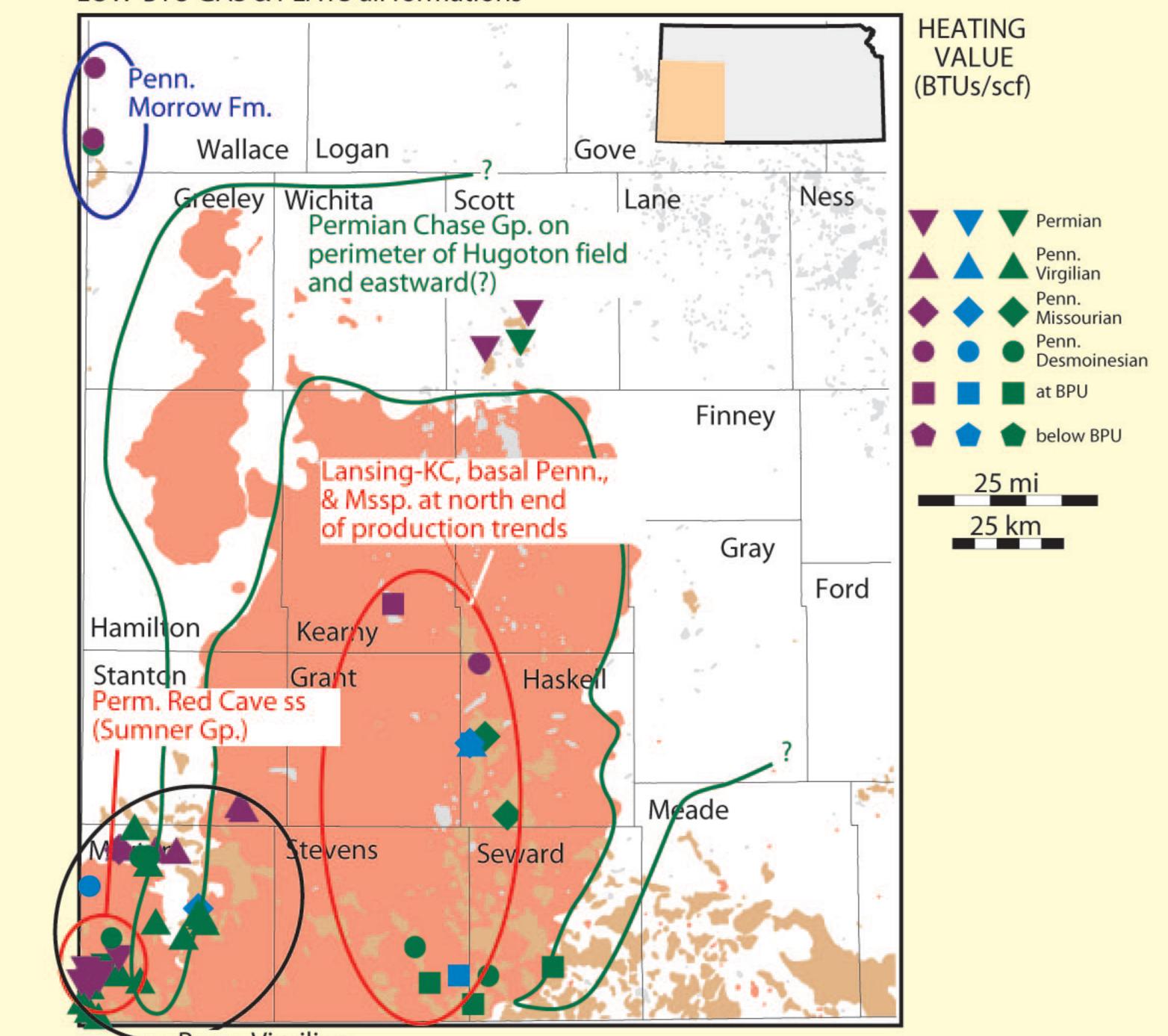
Hugoton and Panoma gases are nearly similar, but differences in N<sub>2</sub>, He, and BTU content (see below) of other Permian gas fields to the east indicate the gas in these other fields likely has a separate origin.



# PERMIAN GASES (Sumner, Chase, Council Grove Gps.)



## LOW-BTU GAS & PLAYS all formations



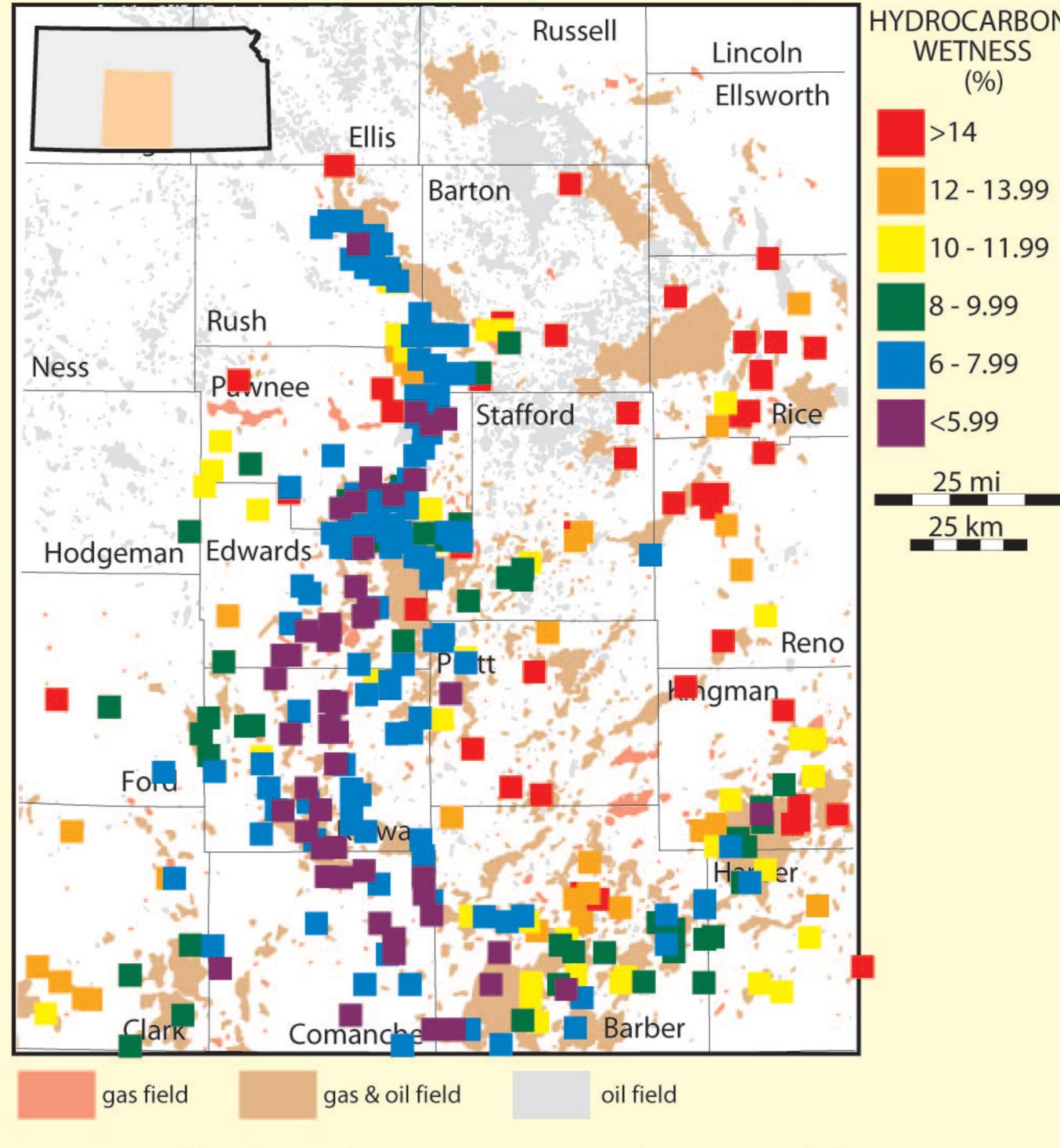
Wabaunsee & Shawnee (Topeka Ls.) in Greenwood Gas Area

## **CENTRAL KANSAS**

Gas analyses along the basal Pennsylvanian angular unconformity are selected to illustrate trends in gas chemistry. The main structural features are the Central Kansas uplift and the south-plunging Pratt anticline. The petroleum in this region is inferred to have migrated northward long distance from the Anadarko basin in Oklahoma (Rich, 1931; Price, 1980). Porous zones along the basal Pennsylvanian angular unconformity constitute the regional carrier bed (Walters, 1958).

SUBCROP & STRUCTURE MAP at basal Pennsylvanian unconformity

## HYDROCARBON WETNESS at basal Pennsylvanian unconformity



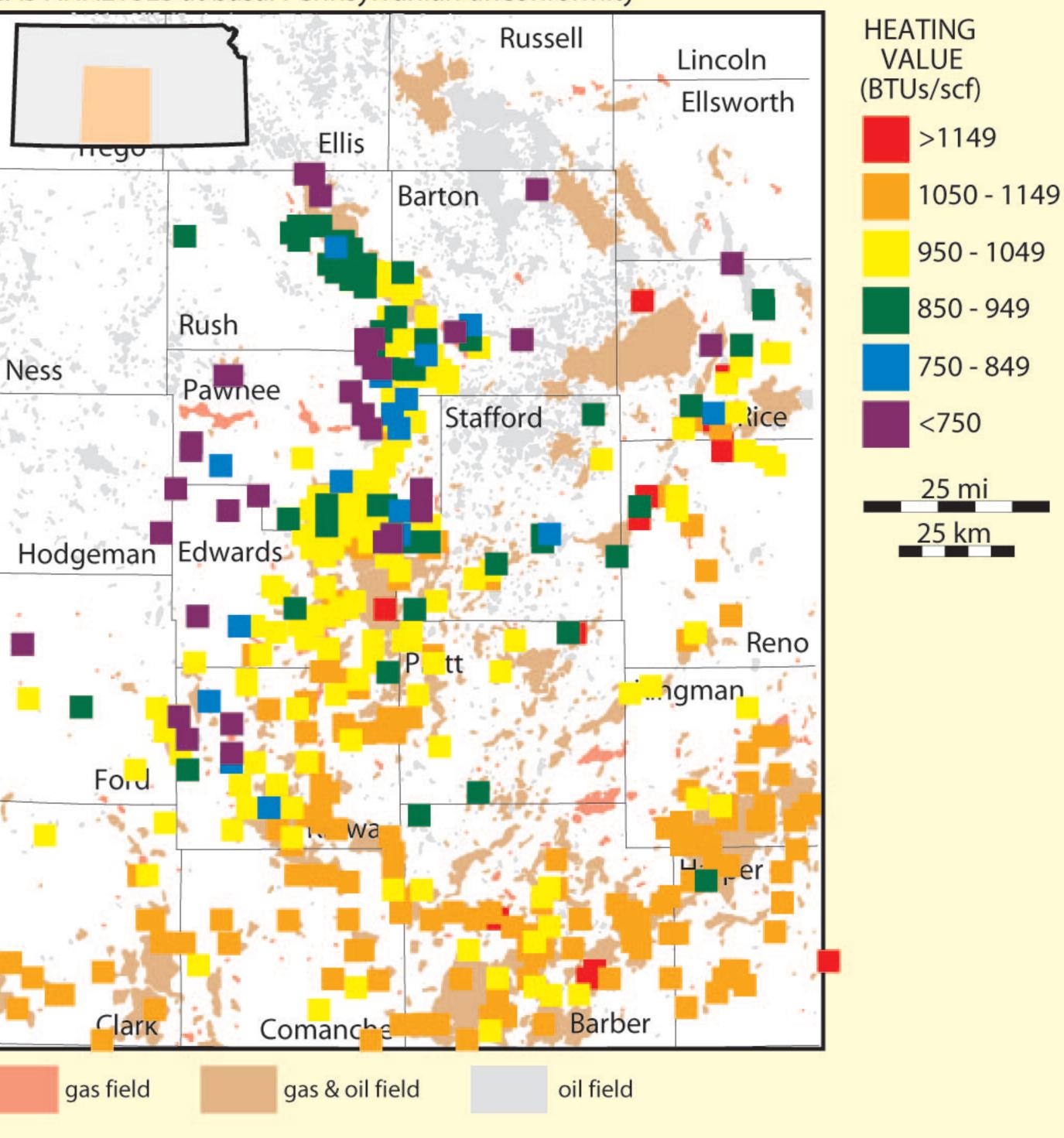
Mapping of hydrocarbon wetness reveals a zone of dry gas (blue and purple analyses) extending northward up the Pratt anticline. Flanking this zone of dry gas are areas of wetter gas in the Sedgwick basin and Hugoton embayment. The dry gas is inferred to be late-stage hydrocarbons that have migrated up the Pratt anticline, as their source rocks pass into gas-generating stages deep in the Anadarko basin to the south.

# Pawnee Camb.-Ord. Arbuckle Gp.

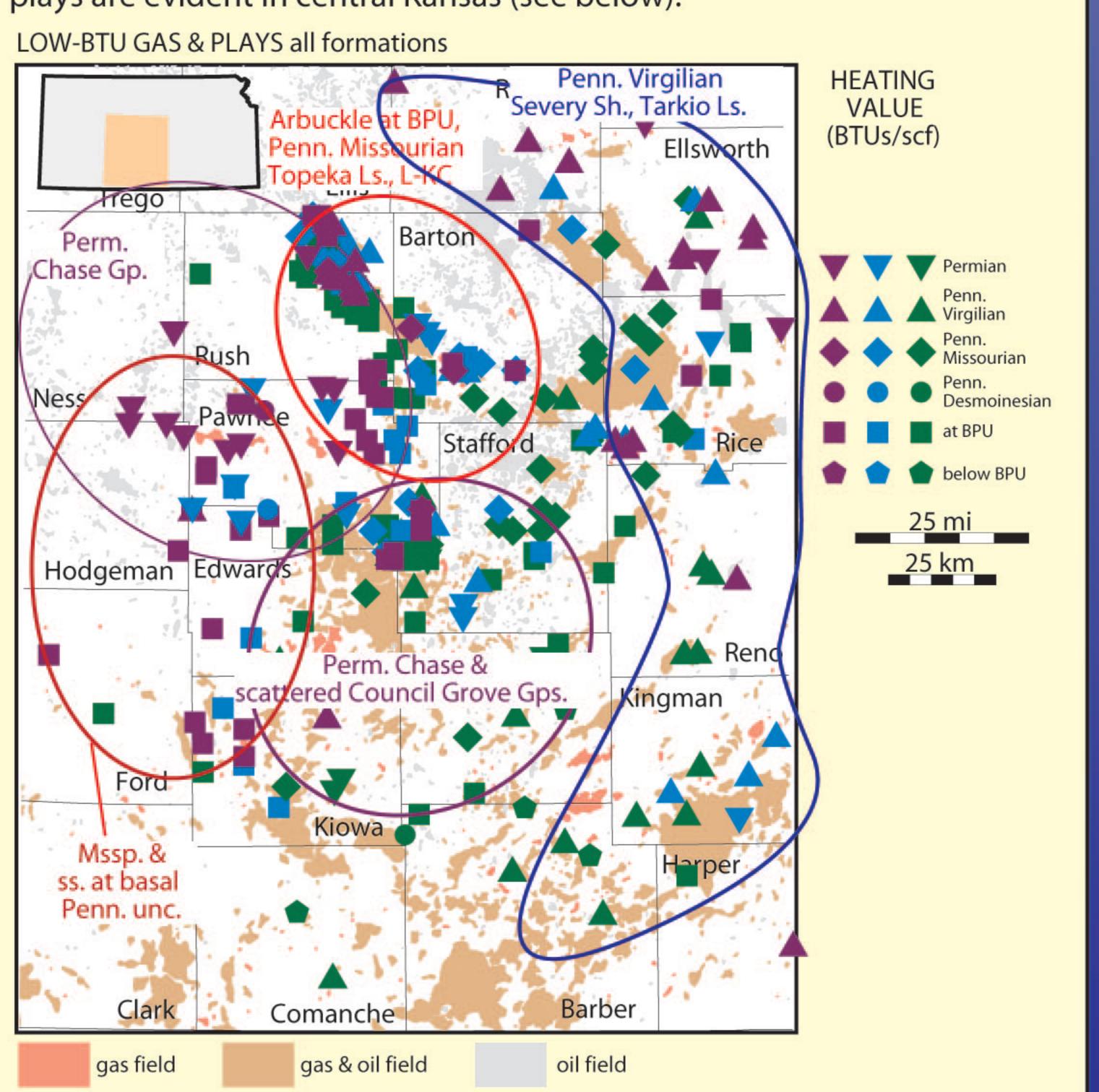
The Cambrian-Ordovician Arbuckle Dolomite and small inliers of Precambrian rocks subcrop beneath Pennsylvanian strata on the Central Kansas uplift. Oil production dominates the Central Kansas uplift, but gas production becomes more prevalent farther southward. Gas-oil ratios also increase southward and deeper into the Anadarko basin.

Although gases along the basal Pennsylvanian angular unconformity have a median  $N_2$ -to-He ratio of 15:1, regardless of the amount of hydrocarbons present, mapping of the ratio indicates that it decreases onto the Central Kansas uplift. This either ts a dilution of a preexisting gas with N<sub>2</sub> and hydrocarbons derived from the Anadarko basin, or an addition of helium possibly from basement rock subcrops on the Central Kansas uplift. Helium content exceeds 3% on the western part of the Central Kansas uplift.

## GAS ANALYSES at basal Pennsylvanian unconformity



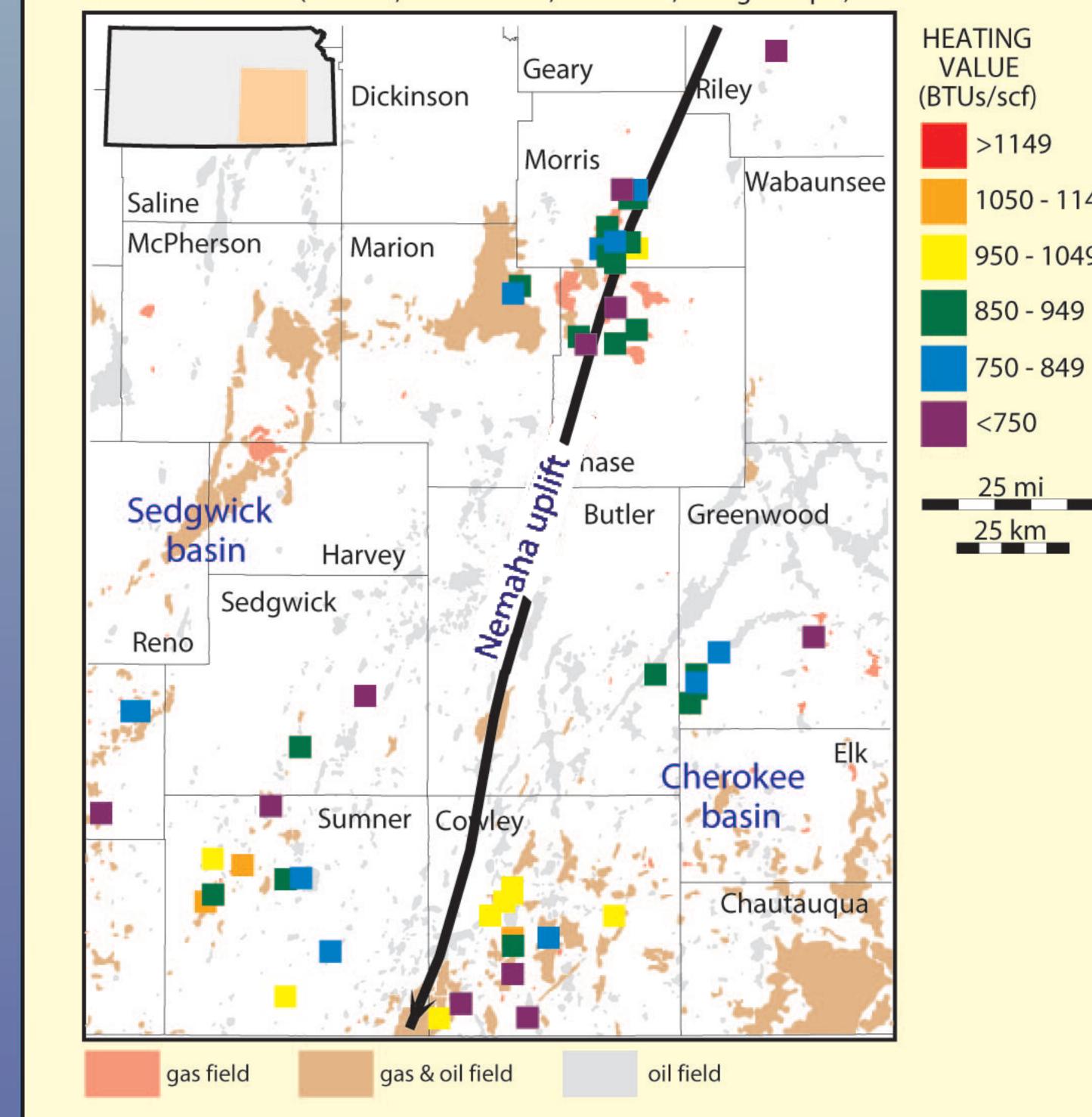
Heating values of gases along the basal Pennsylvanian unconformity increase with increasing depth. This is due to wetter gases and lesser percentages of noncombustible gases off the flanks of the Pratt anticline. An area of low-BTU gas is present off the western flank of the Pratt anticline. Several low-BTU gas plays are evident in central Kansas (see below).



## 10 EAST-CENTRAL KANSAS

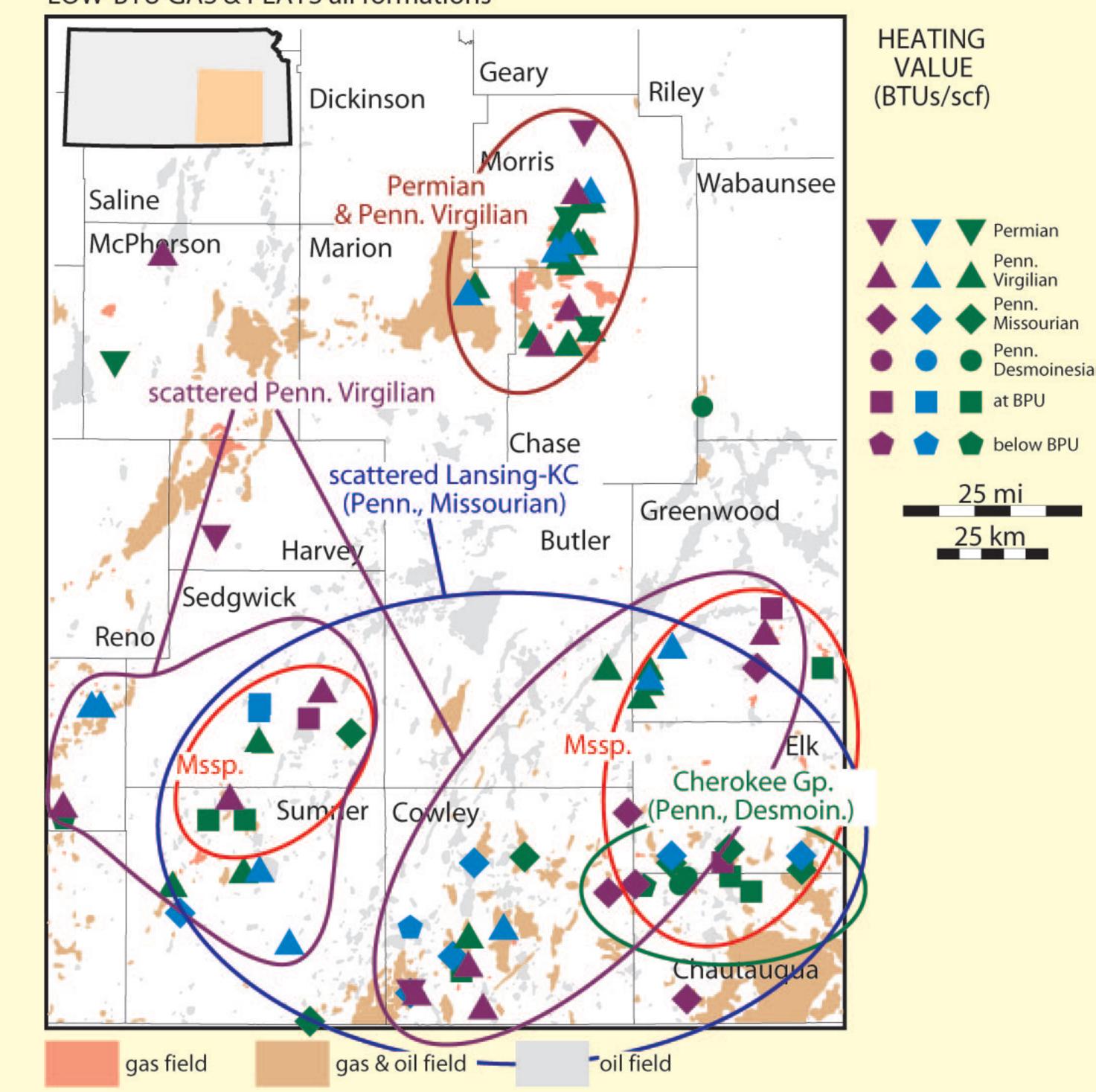
Fewer gas analyses are available in eastern Kansas because many of these fields are old and depleted.

## VIRGILIAN GASES (Admire, Wabaunsee, Shawnee, Douglas Gps.)



Several shallow (<800 ft depth) gas fields in Morris and Chase counties pay out from porous Virgilian carbonates. Scattered low-BTU gases are present farther south in Sedgwick, Sumner, and

## LOW-BTU GAS & PLAYS all formations



Sparse gas analyses in east-central Kansas indicate that scattered areas of low-BTU gas are present, however, the trends and geologic habitat of these gases are difficult to interpret. Extensions of the plays shown below are possible.