

Development of a 3-D Virtual-Reality Geographic Information System Database for North Louisiana — Primary Purpose: Coalbed Methane Resource Delineation

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EXTENDED ABSTRACT

The Energy Institute of the University of Louisiana at Lafayette in conjunction with the U.S. Geological Survey and the Louisiana Geological Survey at Louisiana State University is engaged in investigations to evaluate the coalbed methane (CBM) resources of the Wilcox Group of North Louisiana. The effort is divided such that the Energy Institute is mapping the stratigraphy of the Wilcox from about 31 degrees north latitude (the East-West trending boundary between Louisiana and Mississippi) north to the Arkansas border. The U.S. Geological Survey and the Louisiana Geological Survey are concentrating on tracking the drilling of CBM wells and on obtaining coal quality, gas contents, production rates (gas and water), gas chemistry and water chemistry from these wells.

Figure 1 illustrates how we have broken up the study region into separate projects, some completed and some in progress. The completed studies of Coates *et al.* (1980) [see also Coates (1979)], Kinsland *et al.* (2003) [contributions to this publication also available as Zeosky (1982) and Smith (1984)], Rogers (1983) and Kull (2005) along with the soon-to-be-completed study by S. Comegys will be reanalyzed and incorporated into our regional synthesis by R. Ball, utilizing common horizons (where practical). The studies by K. Brahm, C. Guidry and E. Dew will be incorporated into this synthesis as they are completed. The ongoing studies are mapping coal prospectivity (Fig. 2), utilizing a log analysis technique applied to digitized well logs which was developed by Kull (2005), and Kull and Kinsland (2006). M. LaGrange is mapping the groundwater table and the fresh/saltwater interface over the whole study area to better understand the flow of waters within the coals.

The end result of these studies is to be a 3-D virtual-reality geographic information system with digitized well-logs and correlation horizons within the Wilcox, viewable in true 3-D. Only selected well logs are being digitized in the study area. Three criteria are being applied to determine the logs to be digitized and utilized in mapping: (1) distribution of the wells, in which uniform coverage is sought; (2) depth of the wells, in which the wells must penetrate the lower Wilcox, and where choices exist the deepest wells are chosen and completely digitized; and (3) information on the logs, whereby gamma ray, sonic and density tools are better discriminators between carbonates and coals. Portions of this correlated well-log 3-D virtual-reality database will be presented in true viewable 3-D in the Louisiana Immersive Technology Enterprise facility at the University of Louisiana at Lafayette.

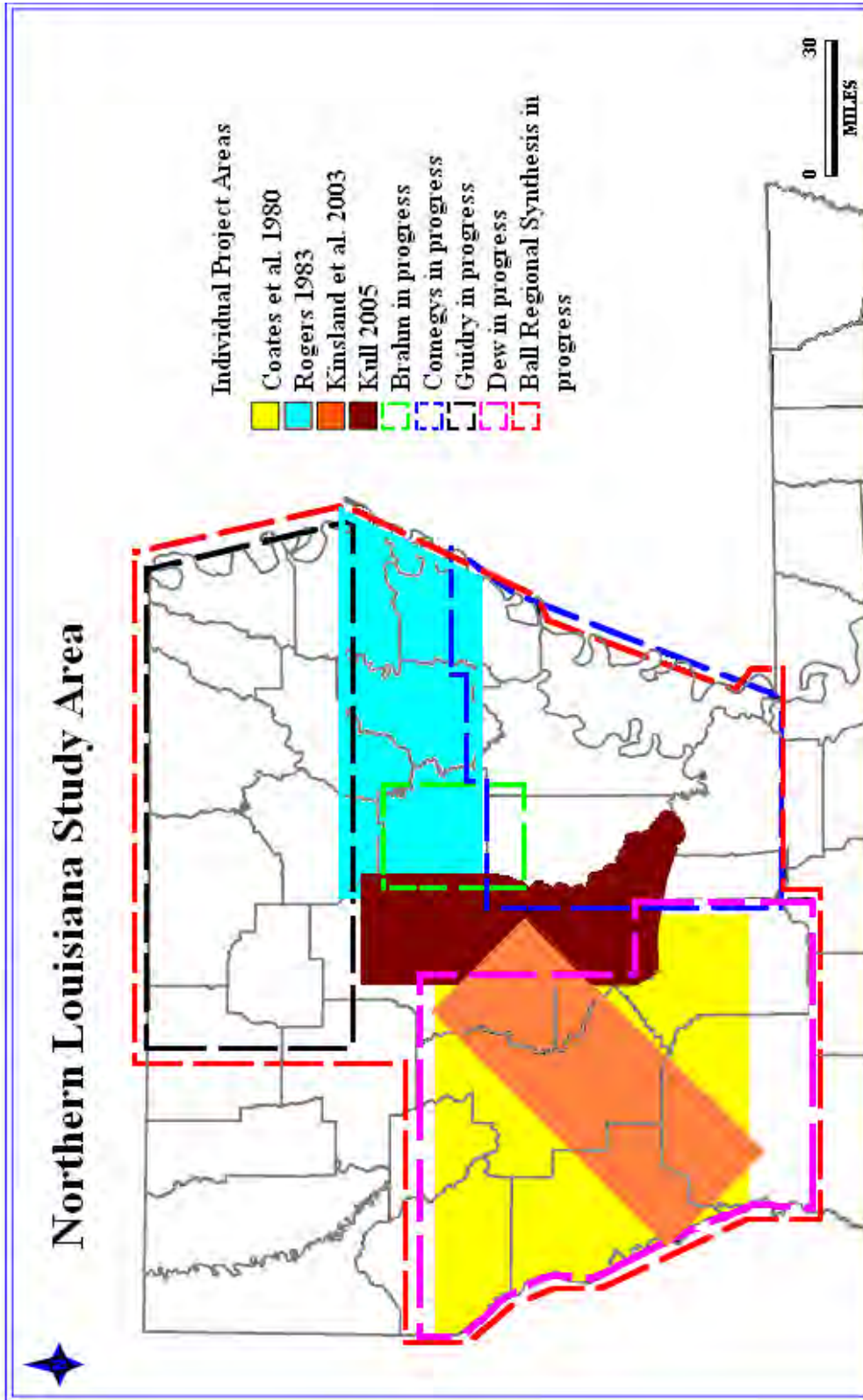


Figure 1. Area of study. The general area of study includes all of North Louisiana, north of about 31 degrees, except over the Sabine Uplift and north of the uplift. Regions of several separate studies (dates given if completed) are superimposed.

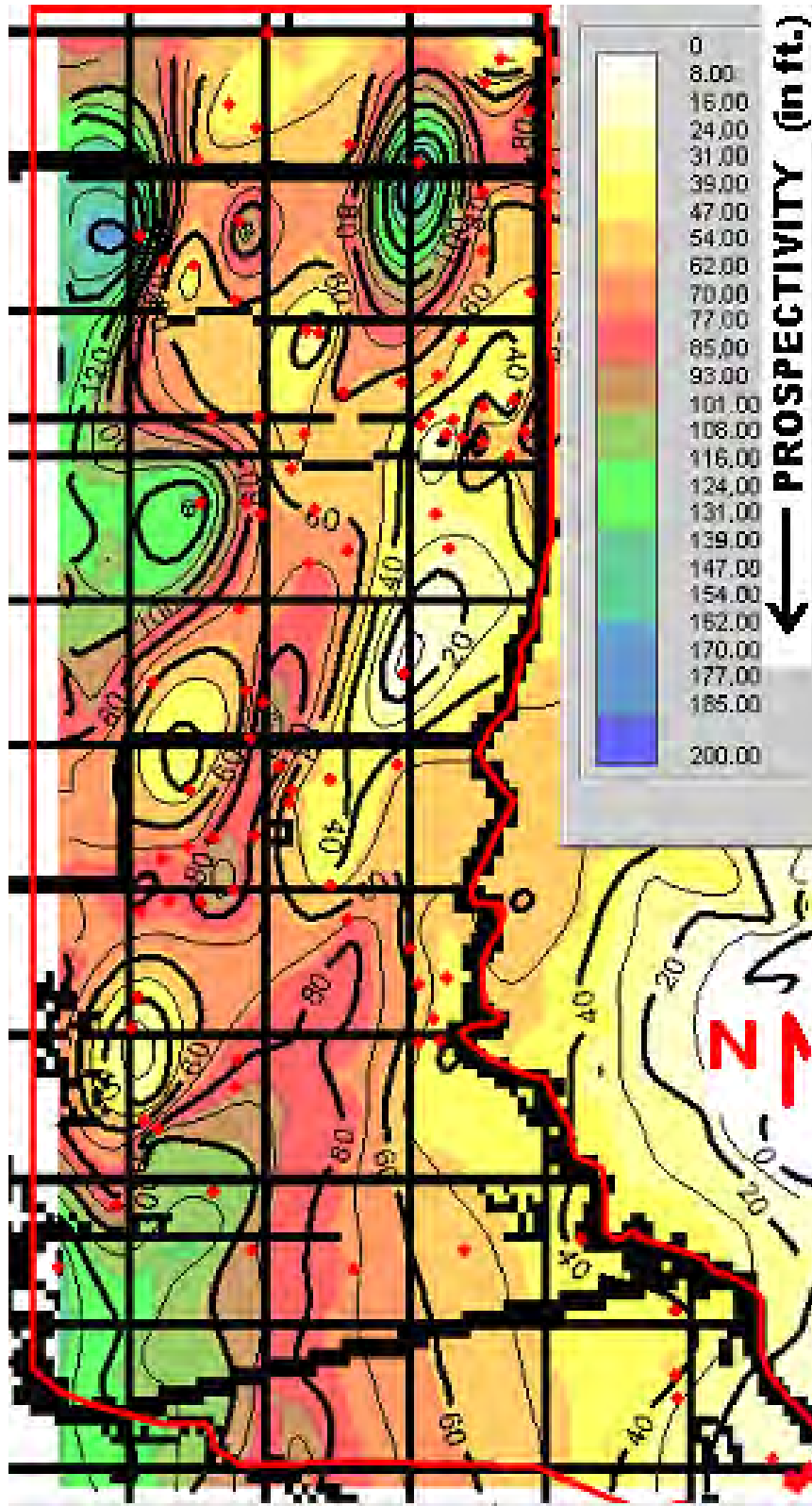


Figure 2. Lower Wilcox example of the maps produced by the Kull (2005) "Quick-look Technique" (modified after Kull, 2005). Prospectivity is in ft of log which has resistivity greater than a cutoff value above which the lithology is most likely to be coal.

In the future we plan to incorporate whatever data we may accumulate (*e.g.*, coal quality, gas content, gas chemistry, water chemistry, production histories, completion techniques, etc.) from individual wells and individual coals in individual wells as “clickable” textural/graphical data within the 3-D geographic information system. This will allow investigators to “touch/click” individual wells and individual coals within wells for information in real time while immersed within the data in 3-D virtual reality.

We are digitizing deep wells because we envision expanding this effort to create a true 3-D virtual-reality geographic information system database of North Louisiana petroleum information to horizons deeper than the Wilcox.

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