Basic Source Rock Geochemistry of the Utica-Point Pleasant in Ohio

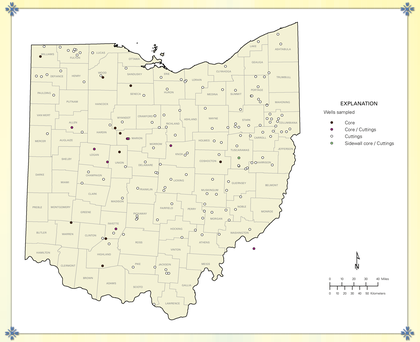
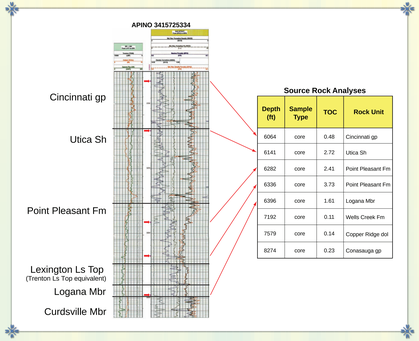


Figure 13.—Location map of wells sampled from holdings of the Ohio Geological Survey for the Logana through Utica interval for source rock analyses and mapping. Analyses performed by multiple labs over a wide range of time; however, a large amount of sampling and analyses have taken place since 2009. The Ohio Geological Survey requires analyses from its archival core and cuttings to be turned in; these can be held confidential for up to 12 months.



Source Rock Analyses

Depth (ft)	Sample Type	TOC	Rock Unit
6064	core	0.48	Cincinnati gp
6141	core	2.72	Utica Sh
6282	core	2.41	Point Pleasant Fm
6336	core	3.73	Point Pleasant Fm
6396	core	1.61	Logana Mbr
7192	core	0.11	Wells Creek Fm
7579	core	0.14	Copper Ridge dol
8274	core	0.23	Conasauga gp

Figure 14.—Type log for eastern Ohio and total organic carbon (TOC) analyses from sidewall cores in the Ohio Geological Survey CO_2 No. 1 well in Tuscarawas County.

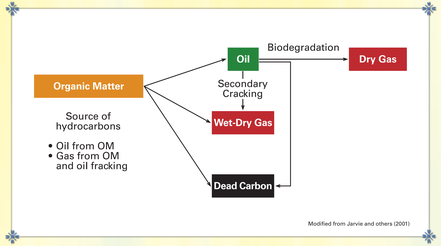


Figure 15.—Diagram illustrating the generation of oil and gas from organic matter.

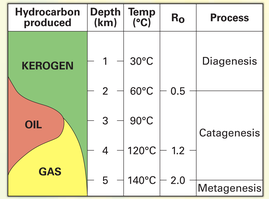


Figure 16.—Graph of subsurface processes, depths, temperatures, and vitrinite reflectance values associated with the conversion of organic matter to hydrocarbons in petroleum source rocks. Modified from Tissot and Welte (1984).

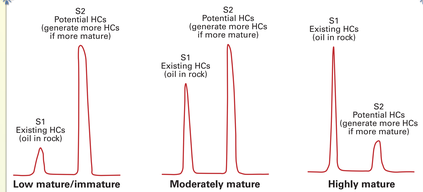


Figure 17.—Comparison of relative S_1 and S_2 values/curves at different levels of hydrocarbon-generation maturity.

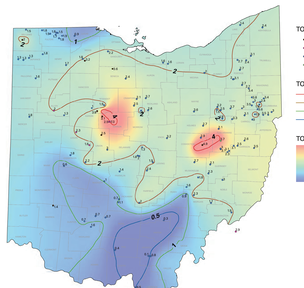


Figure 18.—Map of total organic carbon (TOC) distribution from available Ohio analyses. TOC is a measurement in weight percent of the quantity of organic carbon preserved in a rock sample. Note: For this and subsequent maps, values for core-derived samples and fresh cuttings are generally higher than from older cuttings-derived samples. Values shown are not corrected for type or age.

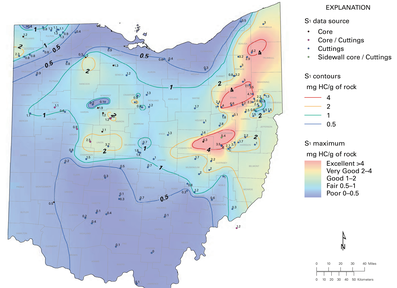


Figure 19.—Map of maximum S_1 values per well (from the Logana-Utica interval). S_1 is a measurement (in mg hydrocarbon/gm of rock) of the free hydrocarbons already generated.

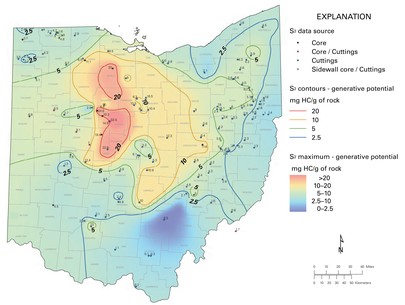


Figure 20.—Map of maximum S_2 values per well. S_2 is a measurement (mg HC/g of rock) of the amount of hydrocarbons generated through thermal cracking of kerogen and heavy hydrocarbons. It represents the existing potential of a rock to generate hydrocarbons and is a measure of remaining source rock potential.

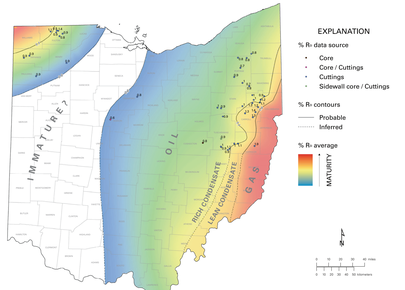


Figure 21.—Map of Average R_o values from available Ohio samples. Vitrinite reflectance (R_o) is a key diagnostic tool for assessing thermal maturity and is based on measuring the reflectivity (R) of vitrinite. Vitrinite is a maceral (plant and animal remains) found in many kerogens. As temperature increases, vitrinite undergoes complex alterations that increase the reflectance. Because vitrinite is only present in sediments with plants, and because there was no plant life yet in the Ordovician, calculations and plots using T_{max} and hydrogen index (HI), or other means of calibrating a given rock's R_o, are used to generate proxy values, or equivalent R_o values.

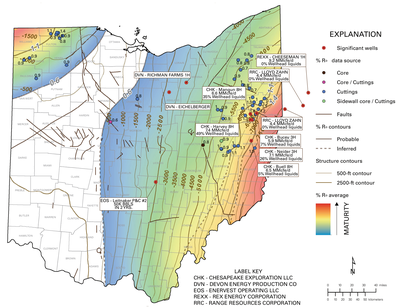


Figure 22.—Preliminary map of equivalent R_o average per well overlain on the Trenton structure contours. Significant wells are labeled with their associated IP (initial potential) or production. The presence of the natural gas liquids and oil windows in Ohio are attracting much of the attention of this play.

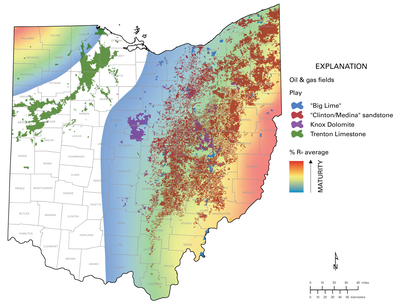


Figure 23.—Map of equivalent R_o average overlain with Cambrian through Silurian oil and gas fields of Ohio. Oil-source rock pairing indicates most of the hydrocarbons from conventional Cambrian-Silurian fields in Ohio were sourced from the Utica-Point Pleasant interval.

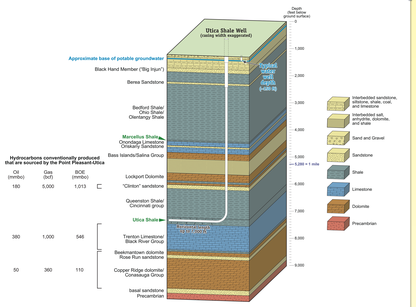


Figure 24.—Diagram to scale in the vertical direction of generalized geology and a horizontal well, based on depths and thicknesses for Portage County area (northeastern Ohio). Also shown are known produced hydrocarbons from Cambrian through Silurian conventional reservoirs in Ohio.

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DISCLAIMER

The maps presented here are based on presently available data. As such, they are preliminary. As additional wells are drilled and analyses conducted, the maps will be updated. No lines on the maps should be considered absolute or final.

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Geologic Overview and Activity Update for the Utica-Point Pleasant Shale Play in Ohio ▫ Lawrence H. Wickstrom, Ronald A. Riley, Matthew S. Erenpreiss, and Christopher J. Perry ▫ Ohio Department of Natural Resources, Division of Geological Survey ▫ 2045 Morse Rd., Bldg. C-1, Columbus, OH 43229-6693