

Regional Geology of the Middle Devonian Marcellus Shale, Appalachian Basin

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The Middle Devonian Marcellus Shale is the oldest, thickest and most widespread of four formations in the Hamilton Group of central and eastern New York. This black shale unit extends from New York southward to Virginia and West Virginia, and westward into eastern Ohio where it pinches out beneath the Middle Devonian unconformity. In Ohio, the Marcellus Shale generally is not separated from younger rocks in the lower Olentangy Formation; in Virginia, the Marcellus usually is included in the basal portion of the thick Millboro Shale. Throughout the basin, the Marcellus Shale overlies the Onondaga Limestone or eastern facies equivalents, the Huntersville Chert or Needmore Shale.

The areal distribution of the Marcellus Shale is similar to other Lower and Middle Devonian black shale units in that it is thicker to the east, and thins to the west, whereas younger Devonian black shale tongues in the Rhinestreet and Lower Huron are thicker in the west and thin, then pinchout to the east. Thus, the thickest accumulation of this organic-rich black shale occurs along the eastern side of the basin from New York to Virginia where thermal maturity is the highest. This combination of thick, thermally mature (dry gas window) black shales with well-developed regional fracture sets makes the Marcellus Shale an attractive play along the eastern side of the basin far from historical shale play areas as well as in the center of the basin.

The eastern side of the basin also is structurally more complex, creating discrete areas where the Marcellus Shale is likely to be intensely fractured along major anticlines in the Valley and Ridge and High Plateau provinces. Thus, "sweet spots" would be expected within the broad regional extent of the Marcellus. Conversely, some of the current thinking is that these highly fractured areas should be avoided.