

OIL AND GAS WELL  
PERMITTING IN  
WV

# Permitting Process

- ▣ Leasing
  - Not under OOG/process, but first step
  - Severed Estates
  - Provides right to property
  
- ▣ Registration and Bonding (\$5K, \$50K)
  
- ▣ Preliminary Property Review
  
- ▣ Survey

# Process (cont.)

- ▣ Water Testing Notice
  - All owners of water wells/springs within 1000'
  - Pre-drill samples/analysis
  
- ▣ Well Work Permit Notice (certified mail/personal service)
  - All surface owners for both well location and access road
  - All coal owners, lessees, operators
  
- ▣ COMMUNICATION

# Process (cont.)

- ▣ COMMUNICATION
  
- ▣ Filing Application
  
- ▣ Basic Permit Application Components
  - Listing of parties required to be noticed
  - Proposed work and well construction
  - Proof of service
  - Reclamation Plan
  - Survey Plat and Topo.
  - Drilling Pit Site Registration

# Process (cont.)

- ▣ Comment/Objection Period (15 days)
  - Coal objection – hearing before the SGWRB/CBMRB/OOG depending on type of well
  - Surface owner comment – further OOG review, response from applicant; hearing before the CBMRB for CBM wells
  
- ▣ Field Review
  - Casing Program – fresh water and coal protection, must know depths
  - Reclamation Plan – clear, concise, and detailed

# Process (cont.)

- ▣ Office Review
- ▣ Hearing Results
- ▣ Comment Review
- ▣ Permit Decision
  - Permit expires in two years if no work done

# Post Drilling

- ▣ Reclamation
- ▣ Well Records
- ▣ Discharge Monitoring Reports
- ▣ Permit Release

# General Well Construction

- ▣ Surface Casing – Ground Water Protection
  - Cement Circulated
  
- ▣ Coal Protection Casing
  - Cement Circulated
  
- ▣ Intermediate Casing
  
- ▣ Production Casing

# Site Construction

- ▣ Construction/Reclamation Plan
  - Surface Water Protection
  
- ▣ Erosion and Sediment Control Manual
  - BMPs for constructions & reclamation

# Water Protection Regulations

- ▣ 200' Drilling Prohibition From Water Wells/Dwellings (WV Code 22-6-21)
- ▣ 1000' Water Well Testing (Leg. Rule 35-4-19)
- ▣ 1000' Rebuttable Presumption (WV Code 22-6-35)
- ▣ Surface Owner Damage Compensation (22-7)

# Definition of an oil and gas play

- ▣ A play is a set of discovered or undiscovered oil and gas accumulations or prospects that exhibit nearly identical geological characteristics. A play is defined, therefore, by the geological properties (such as trapping style, type of reservoir, nature of the seal) that are responsible for the accumulations or prospects. (U.S. Geological Survey).

GENERALIZED STRATIGRAPHIC COLUMN  
WITH OIL AND GAS RESERVOIRS  
WEST VIRGINIA

Coalbed methane

Marcellus Shale

Trenton-Black River

Different age rocks of recent interest to oil and gas producers

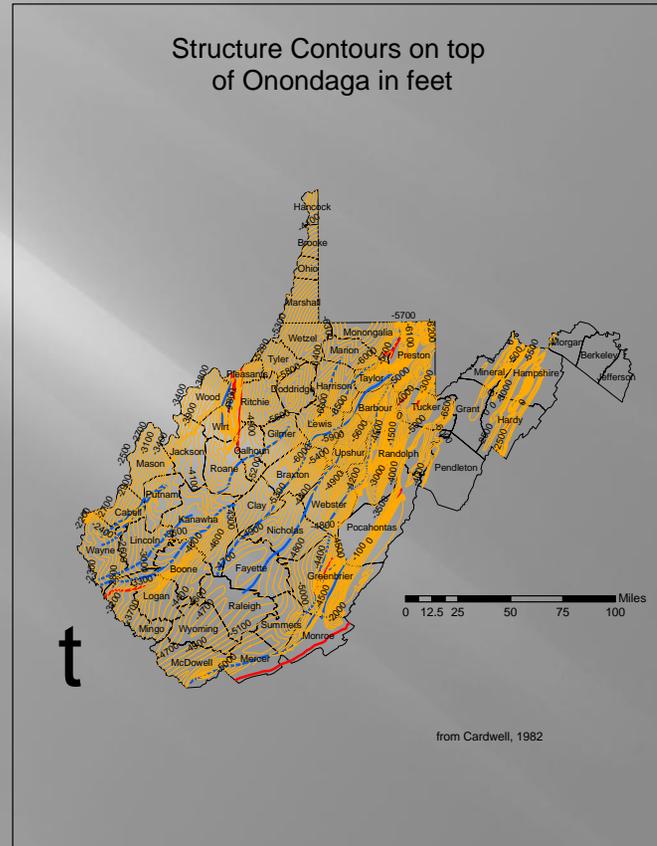
GEOLOGIC SYSTEMS AND SERIES	TERMINOLOGY USED ON 1968 STATE GEOLOGIC MAP	FORMER TERMINOLOGY (W.VA. GEOLOGICAL SURVEY COUNTY REPORTS) IF DIFFERENT	OIL AND GAS "SANDS" (DRILLERS' TERMS)	
PERMIAN	DUNKARD GROUP		CARROLL ANDRELL MURPHY MOUNDSVILLE COP RIVER LITTLE DUNKARD BIG DUNKARD	
	MONONGAHELA GROUP		BARBARO SPRINGS GAS AND LOWER GAS HORSE MECH	
PENNSYLVANIAN	UPPER CDWEMAUGH GROUP		SALT SANDS (INL. ENG. 3rd)	
	MIDDLE ALLEGHENY FORMATION		PRINCETON RAVENCLIFF MADISON	
MISSISSIPPIAN	LOWER POTTSVILLE GROUP		LOWER MAXON LITTLE LIME	
	UPPER MAUCH CHUNK GROUP		BLUE HONEYDAY BIG LIME KEENEYS	
DEVONIAN	MIDDLE GREENBRIER GROUP		CLAY MAIN WELP BEEBLE	
	LOWER MACCRAOY FORMATION POCONO GROUP		GANTS FIFTY FOOT THIRTY FOOT SANDON STRAY CORSON FOURTH FIFTH BAYARD	
	UPPER HAMPSHIRE FORMATION CHEMUNG GROUP	CATSKILL	ELIZABETH WARREN FIRST WARREN SECOND CLARENDON (TOSAS) SPEECHLEY BULLTON (CHERRY GROVE) RILEY BESION ALEXANDER	
	MIDDLE	BRALLIER FORMATION	PORTAGE	
		HARRILL SHALE	GENESSEE	
		MAHANTANGO FM MARCELLUS FM	HAMILTON	
	LOWER	ONONDAGA LS HUNTERSVILLE CHERT NEEDMORE SHALE	HUNTERSVILLE	ELK STAMORE
		ORISKANY SANDSTONE		CORNFIELDS YIELDS GAS IN OH AND SOUTHERN W.VA.
	SILURIAN	UPPER TONOLOWAY FM WILLS CREEK FM WILLIAMSPORT FM	BOSSARDVILLE RONDOUT BLOOMSBURG	NEWBURG SAND REPUTED GAS SAND IN WEST VIRGINIA
		MIDDLE MCKENZIE FM ROCHESTER SHALE KEFFER SANDSTONE ROSE HILL FORMATION	NIAGARA CLINTON	LOCKPORT DOLOMITE OIL IN N.Y. GAS IN OHIO AND W.VA. "NEWBURG DOLOMITE" OF OHIO KEFFER SANDSTONE GAS IN OHIO, N.Y. AND S.W. VA. LITH. SIL. SANDS
LOWER TUSCARORA SANDSTONE		WHITE MEDINA	CLINTON SAND SAND OF OHIO AND W.VA. MEDIAN GAS SAND IN N.Y. SOME OIL IN N.Y. AND OHIO	
UPPER JUNIATA FORMATION OSWEGO FORMATION REEDSVILLE SHALE		RED MEDINA GRAY MEDINA MARTINSBURG	TRENTON-BLACK RIVER YIELDS OIL IN ONTARIO, N.Y., WICH., C. KY., NE. TENN. AND SW. VA. SHOWS OF OIL AND GAS IN DEEP WELLS IN CENTRAL BASIN "ALEXANDER" HORIZON AT BASE	
MIDDLE TRENTON GROUP MARTINSBURG FM NEALMONT LS BLACK RIVER GROUP ST PAUL NEW MARKET LS ROSE HILL FORMATION ROCHESTER SHALE ROSE HILL FORMATION		CHAMBERSBURG MOCCASIN CHAZY STONES RIVER	CHAZY-STONES RIVER YIELDS OIL IN SOUTHW. CENTRAL KENTUCKY AT PETER SAND AND OIL IN OHIO AND KENTUCKY	
LOWER CONOCOCHIEGUE FORMATION		WICH. DOLOMITE OIL IN EASTERN KENTUCKY ROSE HILL SAND		
ORDOVICIAN	UPPER TRENTON GROUP MARTINSBURG FM NEALMONT LS BLACK RIVER GROUP ST PAUL NEW MARKET LS ROSE HILL FORMATION ROCHESTER SHALE ROSE HILL FORMATION	CHAMBERSBURG MOCCASIN CHAZY STONES RIVER		
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	LOWER CONOCOCHIEGUE FORMATION			
CAMBRIAN	UPPER CONOCOCHIEGUE FORMATION		TEMPERLEAU OIL AND GAS IN OHIO	
	MIDDLE ELBROOK FORMATION			
	LOWER WAYNESBORO FORMATION TAMSTOWN DOLOMITE		ROSE SANDSTONE OIL IN E. KY. OIL IN EASTERN KENTUCKY	
PRECAMBRIAN	CRYSTALLINE ROCKS			

# Where is the Marcellus present in WV?

- ▣ It is present below the surface, at varying depths throughout much, but not all of WV.
- ▣ It is not present in extreme eastern or western WV.
- ▣ It crops out at the surface in parts of the Valley and Ridge province in eastern WV.
- ▣ It varies in thickness across WV.

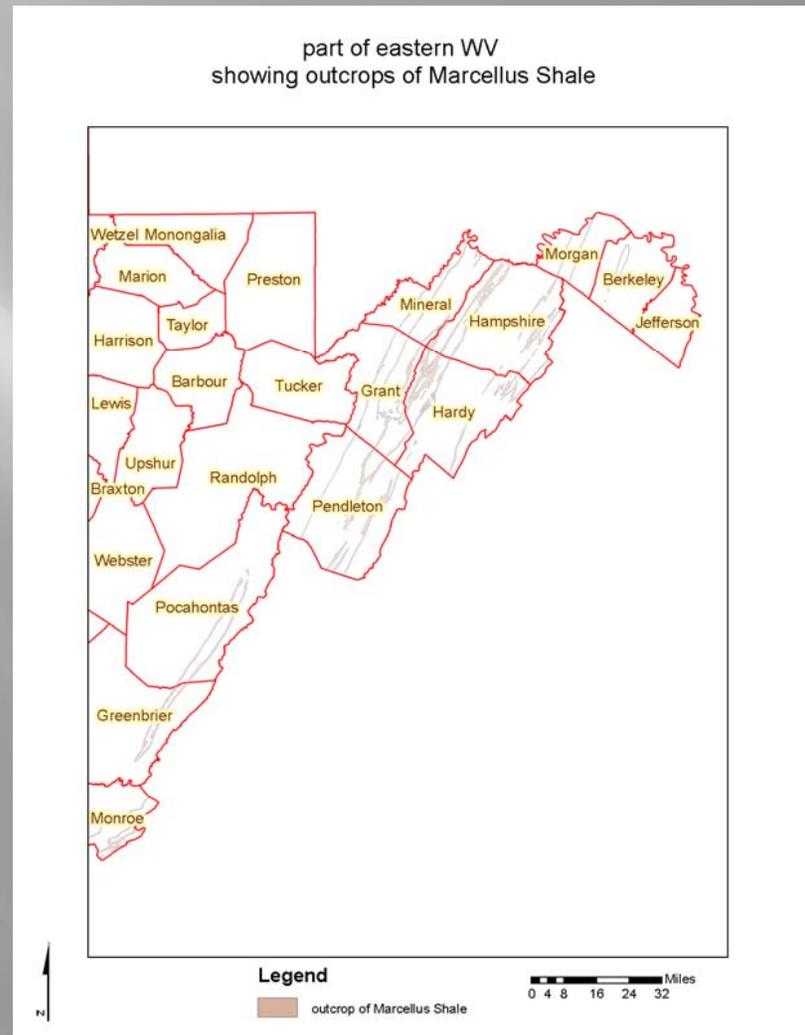
# Elevation of top of Onondaga Limestone, in feet

The Onondaga Limestone immediately underlies the Marcellus, so knowing the elevation of the top of the Onondaga and the surface elevation at a particular location provides a way to estimate the depth of a well drilled all the way through the Marcellus Shale.



# Outcrops of Marcellus

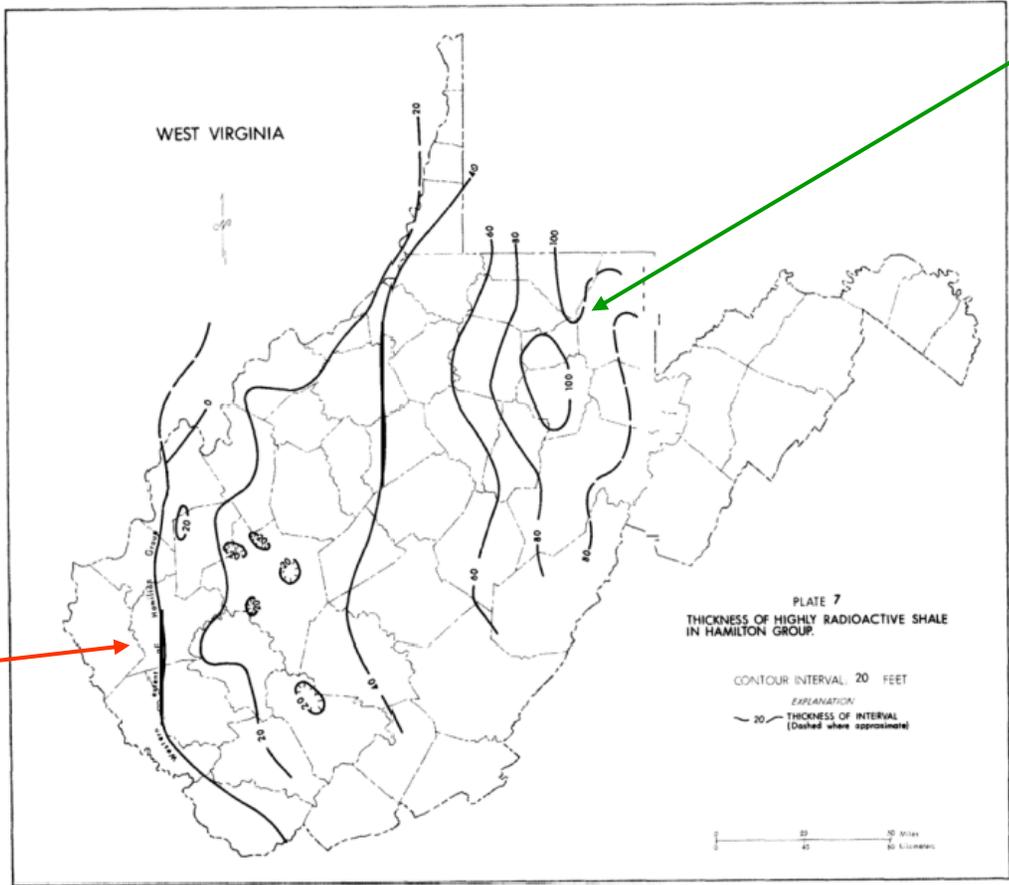
The Marcellus is exposed at the surface in eastern WV as shown by the outcrop map. In the eastern-most counties, older rocks are exposed at the surface and the Marcellus is not present.



From 1968 state geologic map

# Thickness in feet and extent of Marcellus Shale in subsurface

Area of thicker Marcellus



Marcellus not present west of this line

# Total Permitting Activity

- ▣ Permits Issued in 2007
  - 3238
  
- ▣ Permits Issued in 2008
  - 3246
  
- ▣ Permits Issued in 2009 (as of 4/20/09)
  - 639

# Activity Levels

Number of Marcellus Permits in 2007 & 2008

Approx. 682 (includes vertical and horizontal)

Number of Marcellus Wells Drilled in 2007 & 2008

Approx. 427 (includes vertical and horizontal)

Number of Marcellus Wells Permitted in 2009  
101 (as of 4/20/09)

# What's Different About This Play??

Water

Water

Water—Much Larger  
Volumes For Drilling/  
Fracturing

Roughly 10 Times More  
Water

# Well Development Issues

Water Withdrawal—Impacts to States' Water Resources

Site Construction—Larger Sites, Greater Erosion/Sedimentation Challenges; Larger Pits/Ponds, Greater Focus on Design Criteria (Industry Inspection Directive); Dam Safety Requirements (WV Code 22-14)

Water Disposal—Limited Options; Some Land Application, UIC, NPDES, Reuse/Recycle

# What's on the Horizon/Misc.

Industry Guidance Document

Permit Addendum

Water Characterization—Industry and DEP

Water Use Registration w/DWWM

Water Treatment Facility