

# Calculation & Function of Oil & Gas Valuations in Estate Planning

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# Introduction

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Space between technical oil and gas information and the legal and financial world

Specialized in valuations of shale properties for past five years

Provides expert witness testimony and exhibit preparation services

# Introduction

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**Additional Company Offerings:**

*Energy – Infrastructure – Water*

Landslide prevention and repair oversight

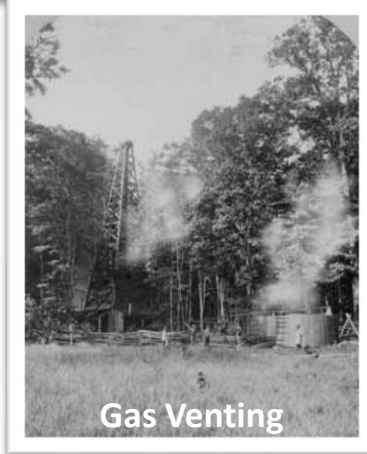
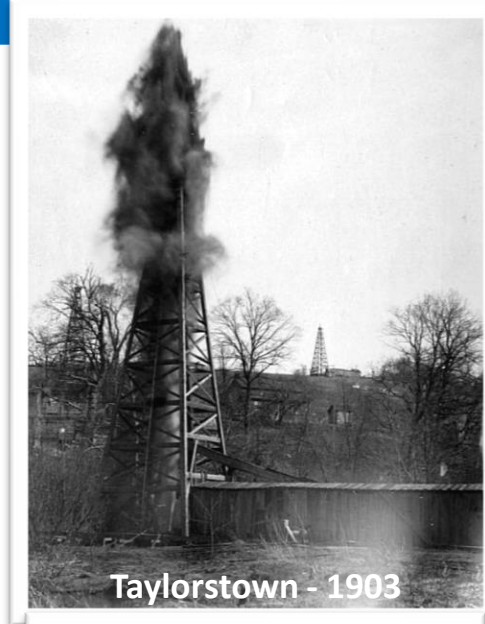
Exploration and Management of oil and  
gas projects

Groundwater and soil projects associated  
with construction

# Views from Around Pennsylvania 1900-1910



# Views from Around Pennsylvania 1900-1910



# Geology 101

Marcellus Shale in Outcrop



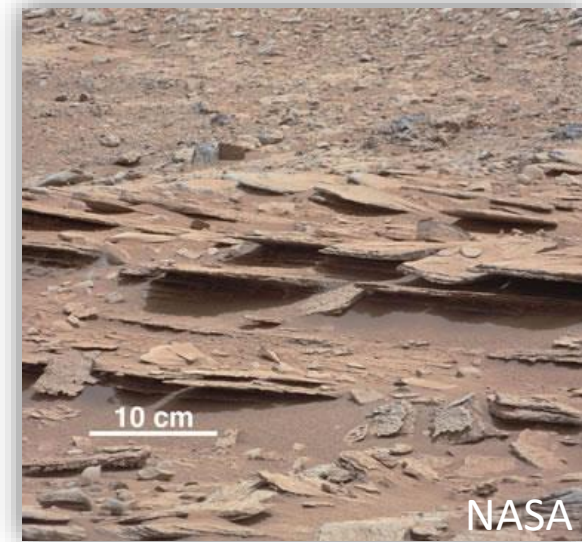
Shale is:

- Sedimentary rock
- Made from “mud”
- Breaks easily
- Laminated

Organic Shale is:

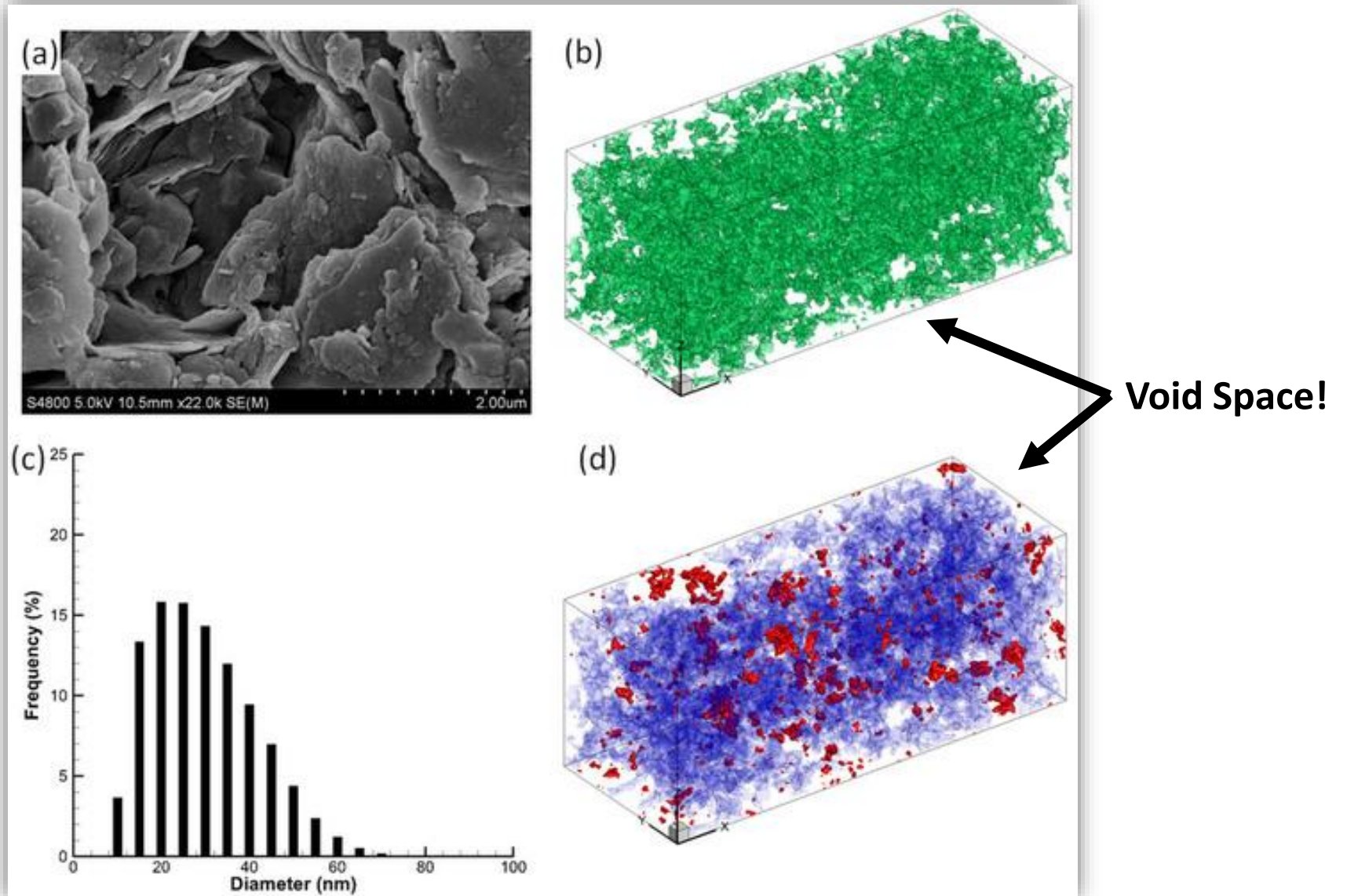
- Source Rock
- Now considered a reservoir
- Produces 8X the hydrocarbon it can hold
- Termed an Unconventional Resource

Martian Shale in Outcrop



# Facts on Organic Shale

Organic Shale in Core



# Modern Drilling Rig



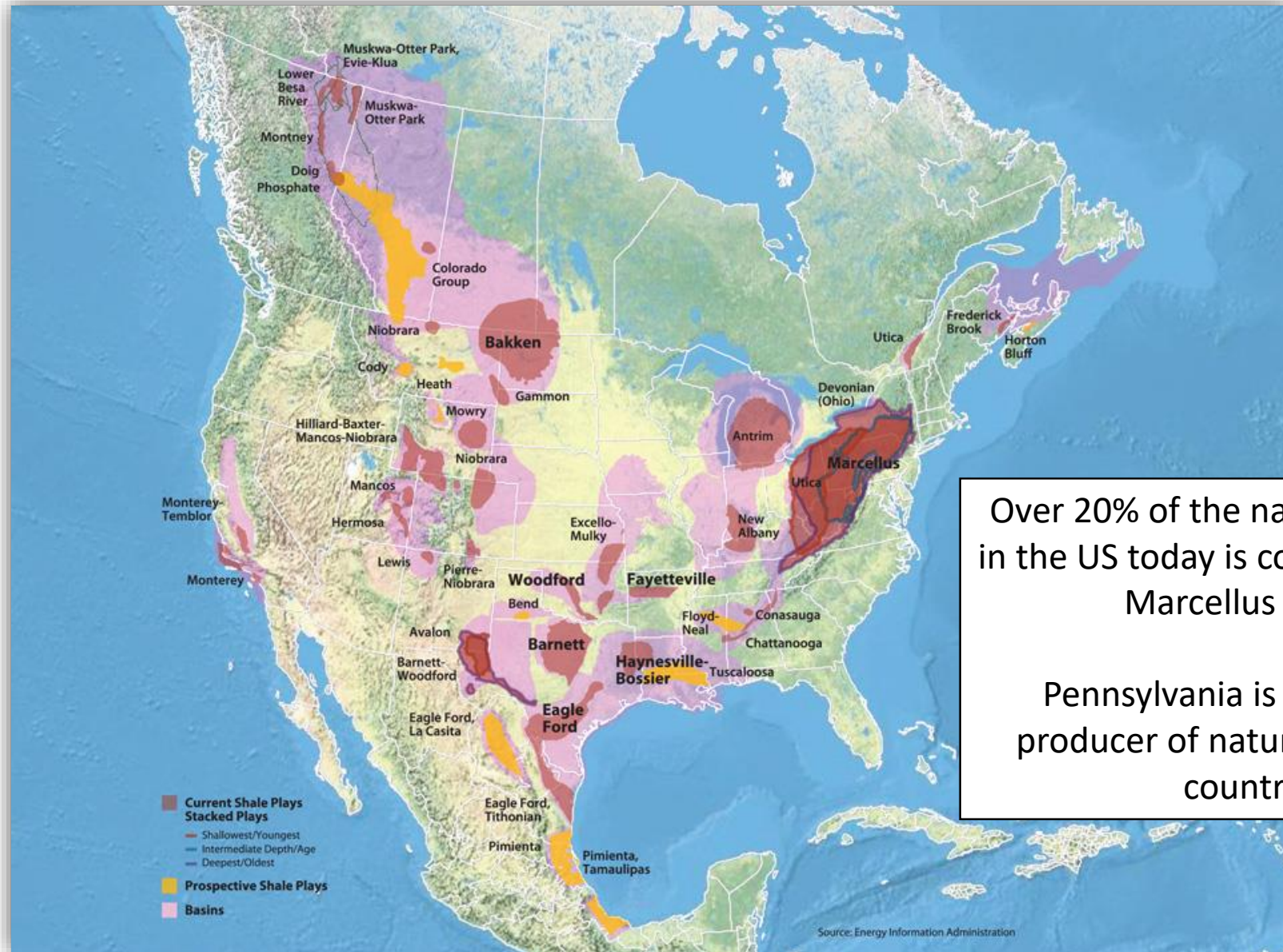
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# Shale Wells in Production



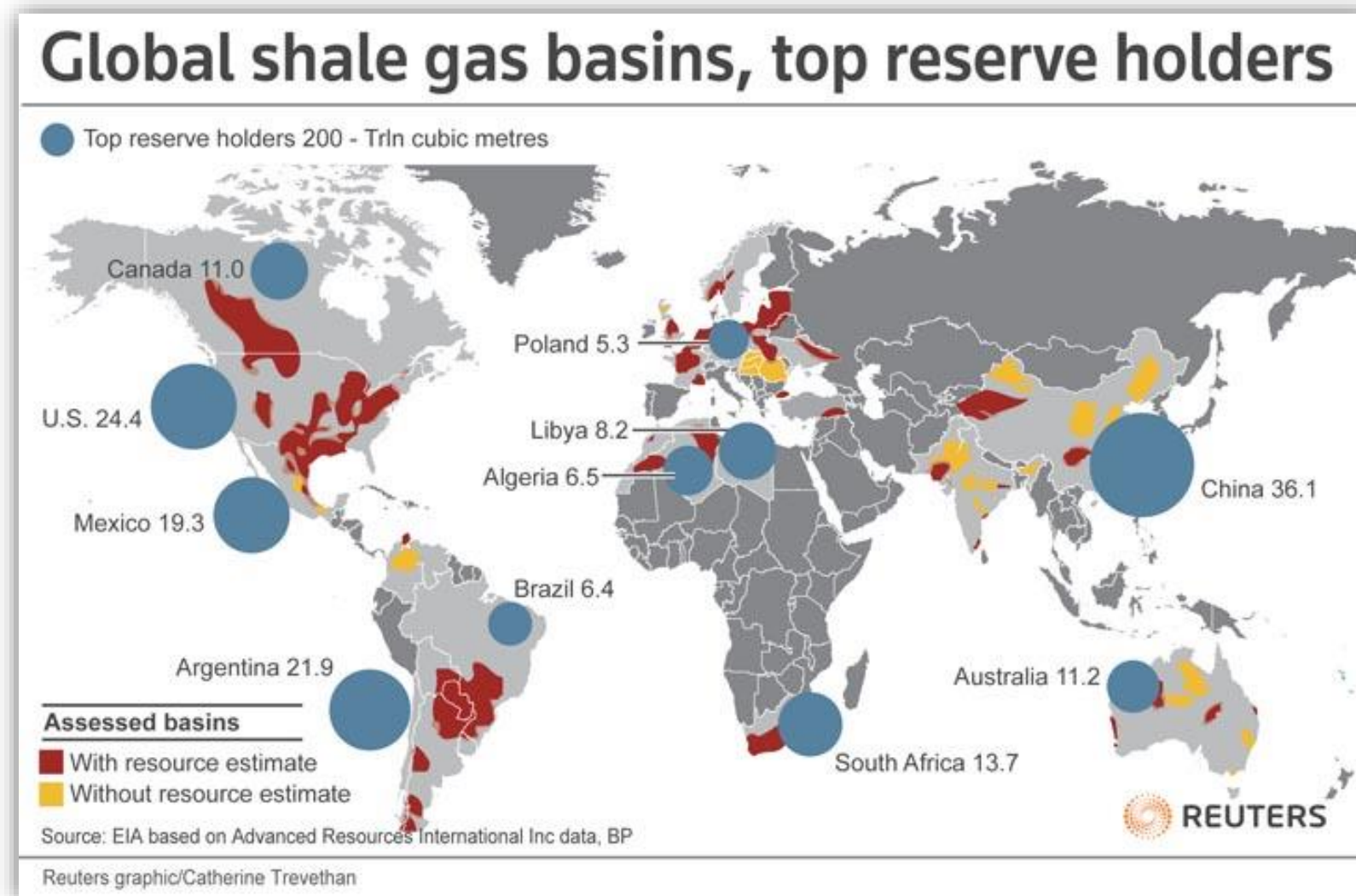
# Shale Basins Across North America



Over 20% of the natural gas used in the US today is coming from the Marcellus Shale

Pennsylvania is the largest producer of natural gas in the country.

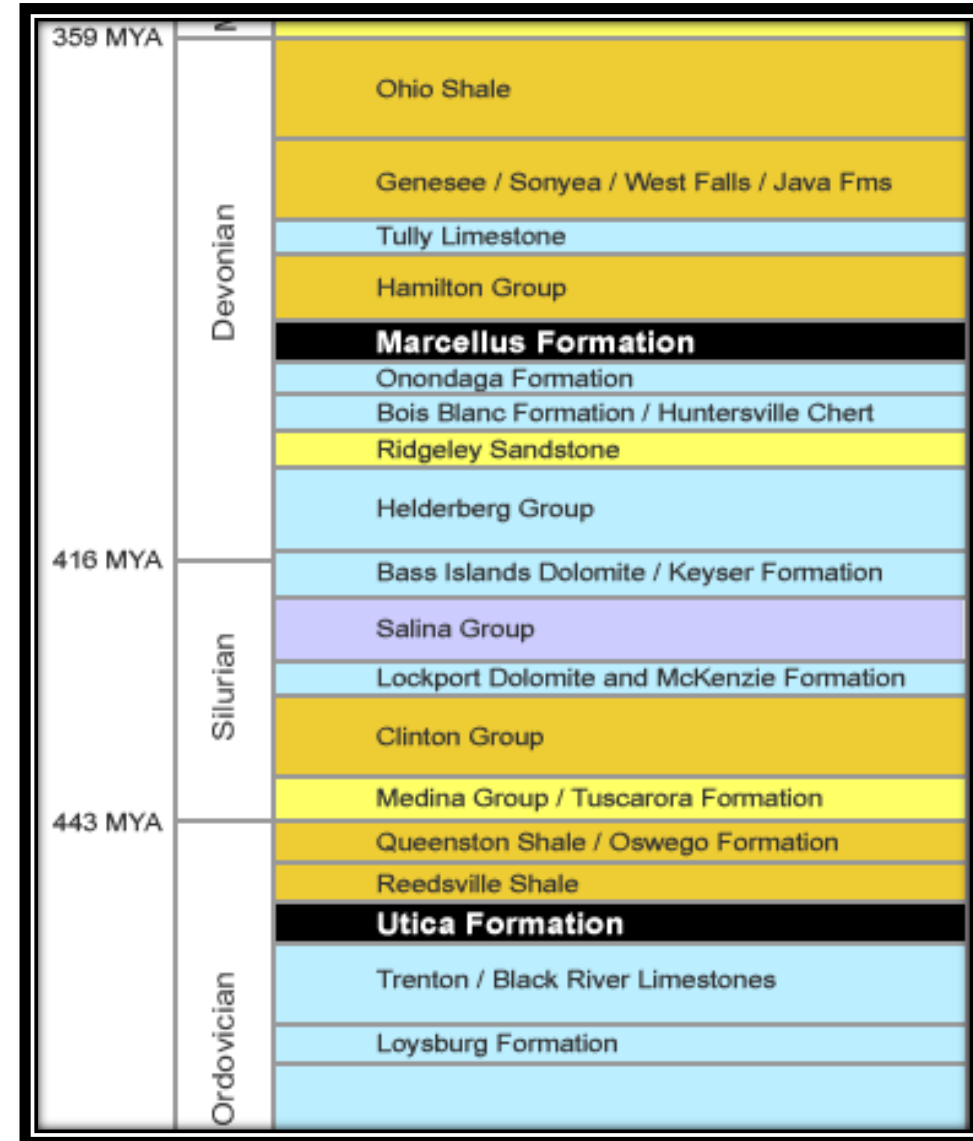
# Shale Basins Across the World



# The Rocks in Pennsylvania

## Stratigraphic Column

- Shows how the rocks lay in vertical relationship to one another
- Classifies the rocks according to age
- Each age has a name
- Colors are coded to the type of rock



# Drilling in Pennsylvania

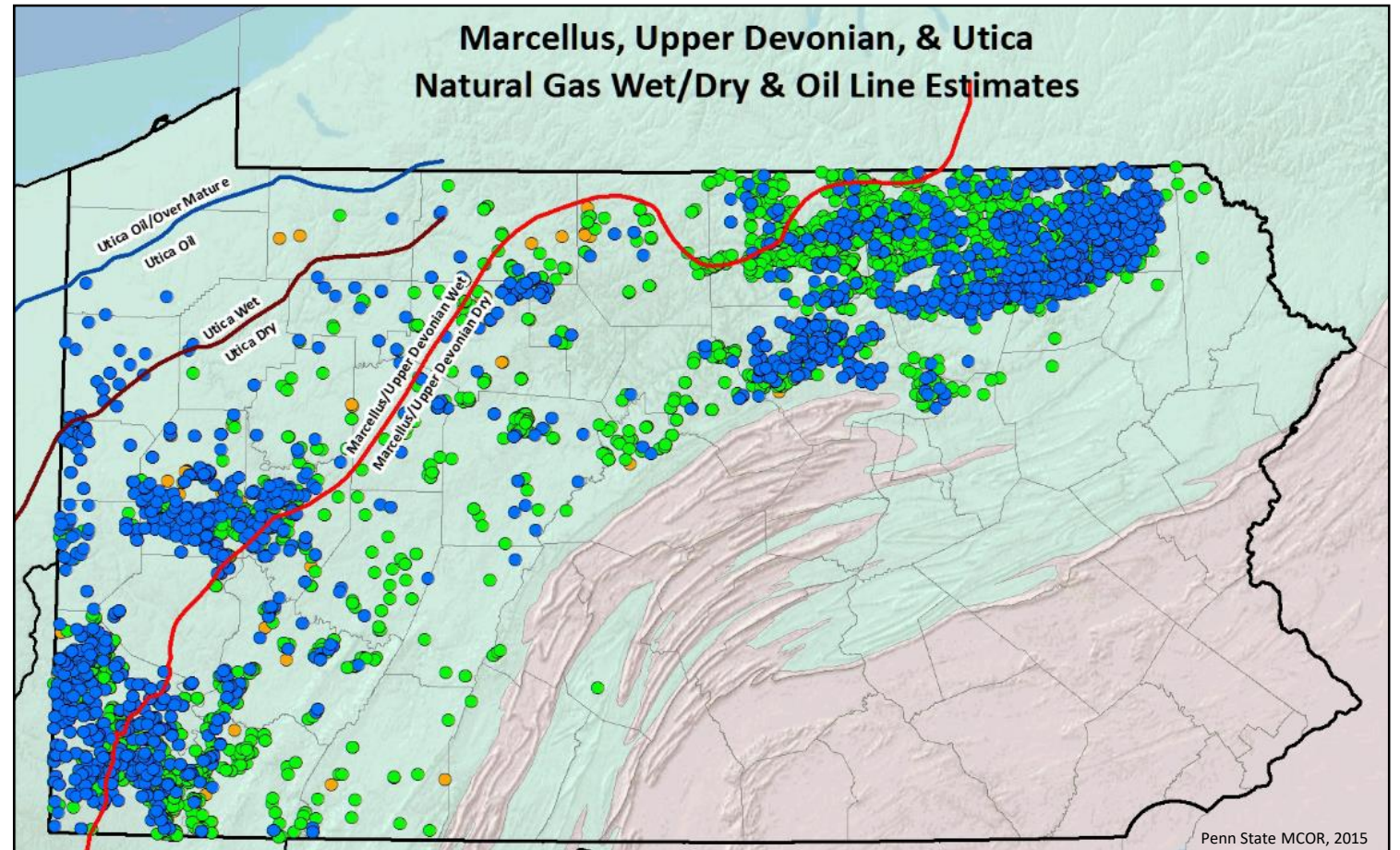
The shale deposits are present under  
2/3rds of Pennsylvania

Drilling is not distributed evenly

Economic success is not distributed  
evenly across the drillers

Produced product and the horizon it is  
produced from varies based on  
geologic factors

Production curve of each well is unique  
and requires experienced modeler to  
forecast in a defensible manner



# Financial Impact

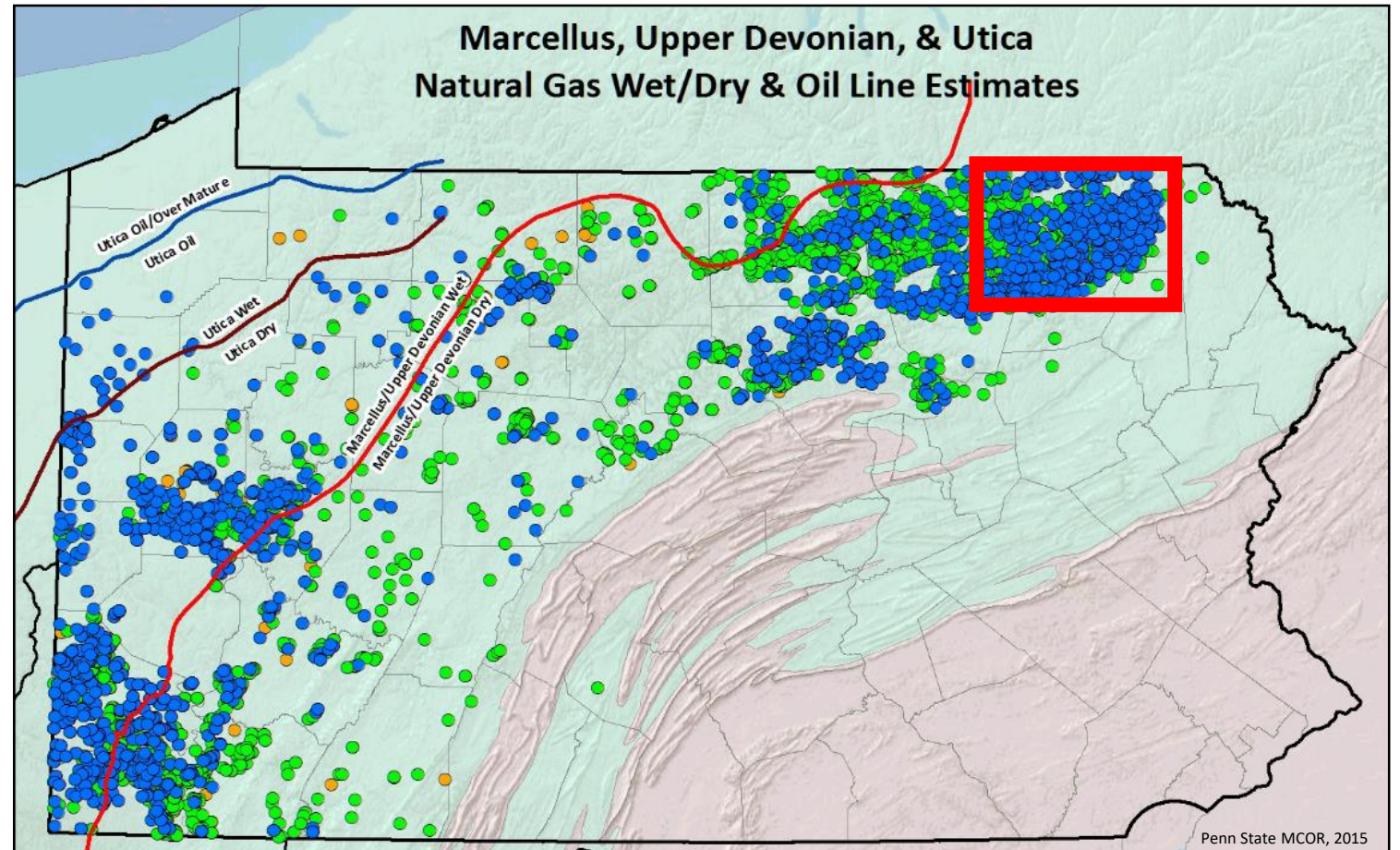


Cabot Oil & Gas Corporation

“One Billion Dollars. That’s one company, in one county.” – COG Spokesman

In 10 years of production and 557 wells, Cabot paid out \$1 Billion in royalties to landowners.

In addition, Cabot has paid \$417M in royalty bonus payments to landowners.



Penn State MCOR, 2015

# When Is a Valuation Needed

Mineral valuations are necessary for:

- Filing federal estate tax returns, especially where portability is desired
- “Gifting” acreage into a trust
- Disputes of value amongst contentious heirs
- Evaluating the sell price of property out of a trust



"It's death and taxes to see you - taxes wants to come in first."

# When Is a Valuation Needed

Mineral valuations are necessary for:

- Estate includes oil and gas property in the development fairway that is not yet in production
- Calculating deduction for gifting to charitable organization



"It's death and taxes to see you - taxes wants to come in first."



# When Is a Valuation Needed – Fiducial Duty

Commonly thought that using the PA state formula is the best way to calculate the property value.

This is correct for income from shallow wells.

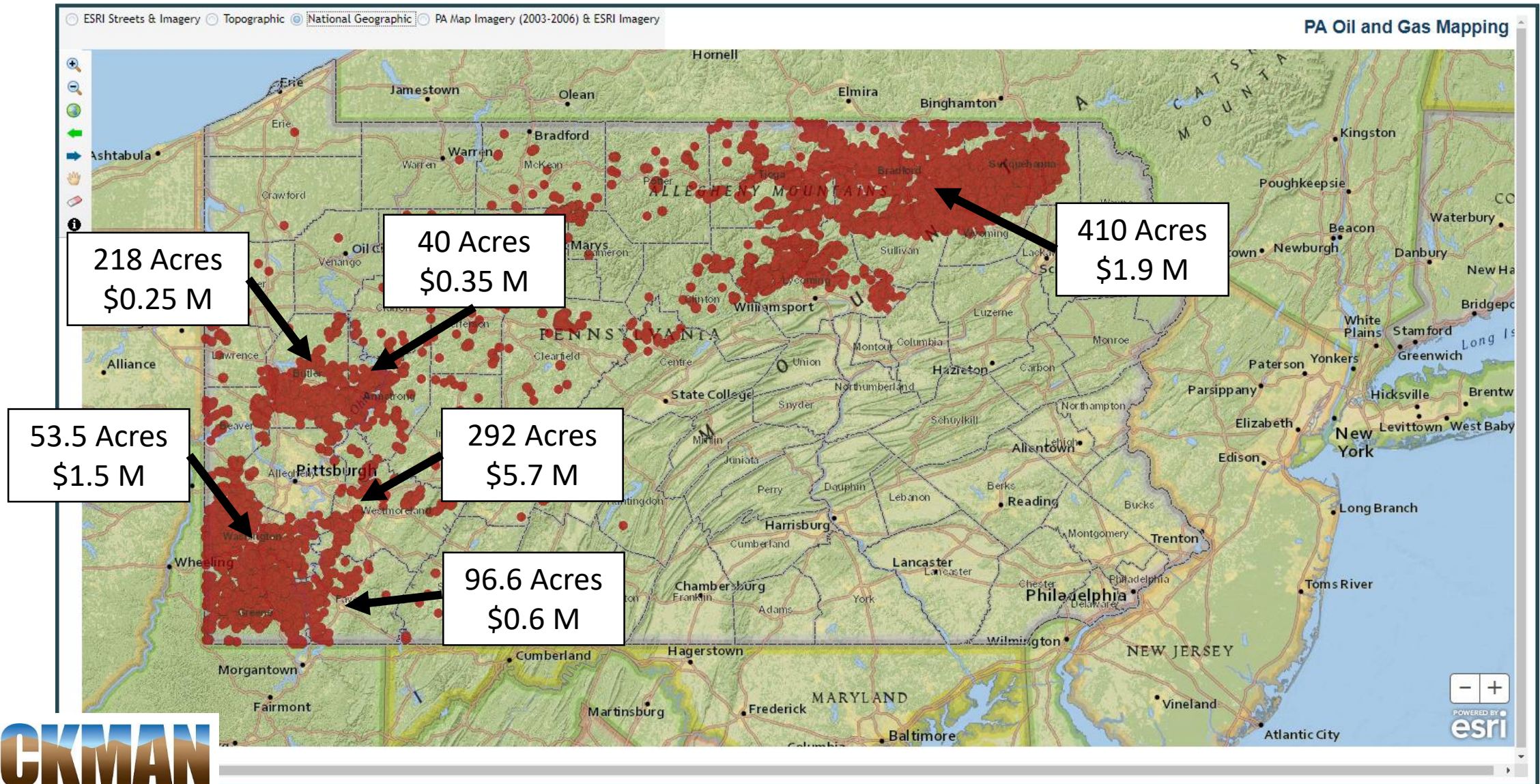
Formula did not anticipate shale development and generally overestimates the property value.

Fiduciary duty to act in the best way to save the estate money and to benefit the heirs.

*FIDUCI - WHAT?*

Money saved by client through using the proper calculation method concretely shows estate planning firms value to clients

# Recent Present Values with various PVFs



# Outline of the Valuation Process

Property with oil and gas assets identified

Property, Lease, and Royalty information is gathered by client

Need for valuation assessed by HGC

When no need, letter is drafted stating the reasoning

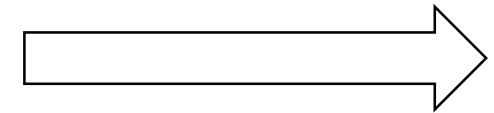
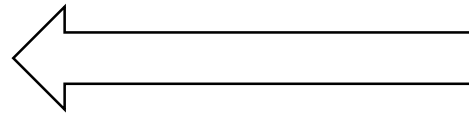
When needed, HGC is engaged for the valuation

**Data Inputs:**  
Property  
Geologic  
Production  
Decline  
Pricing  
Company Plans

Present Value Factor is assessed

Report is delivered to client and their representatives

2 – 4 Weeks



# Primary Controls on the Value

## Division Interest

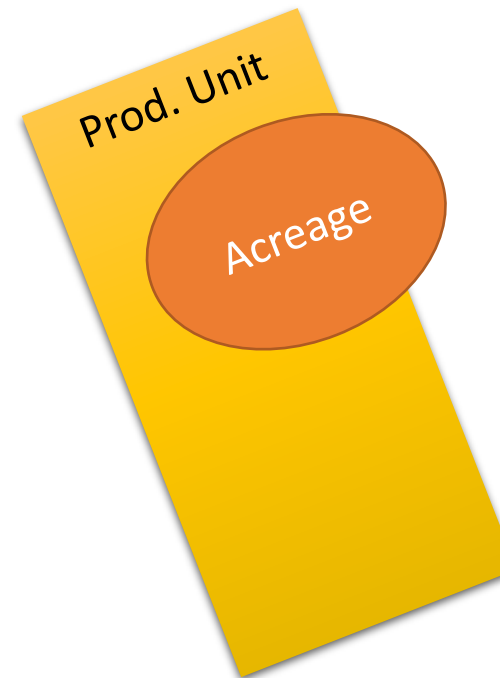
Calculates how much of a dollar of the product sold by the well goes to that specific land owner.

Well pads can have multiple wells on them, in multiple zones, and may have multiple units.

### Two parts:

1. ACREAGE INCLUDED IN THE UNIT
2. ROYALTY AGREED TO IN THE LEASE

$$\frac{\text{Acreage Included in Unit}}{\text{Acreage of Unit}} \times \text{Royalty}$$



22% of acreage not included in production unit

# Primary Controls on the Value

## Allocating production to the land owner

Decline of the wells is modeled from existing industry data or royalty statements provided by client.

If not in production, then nearby wells are used.

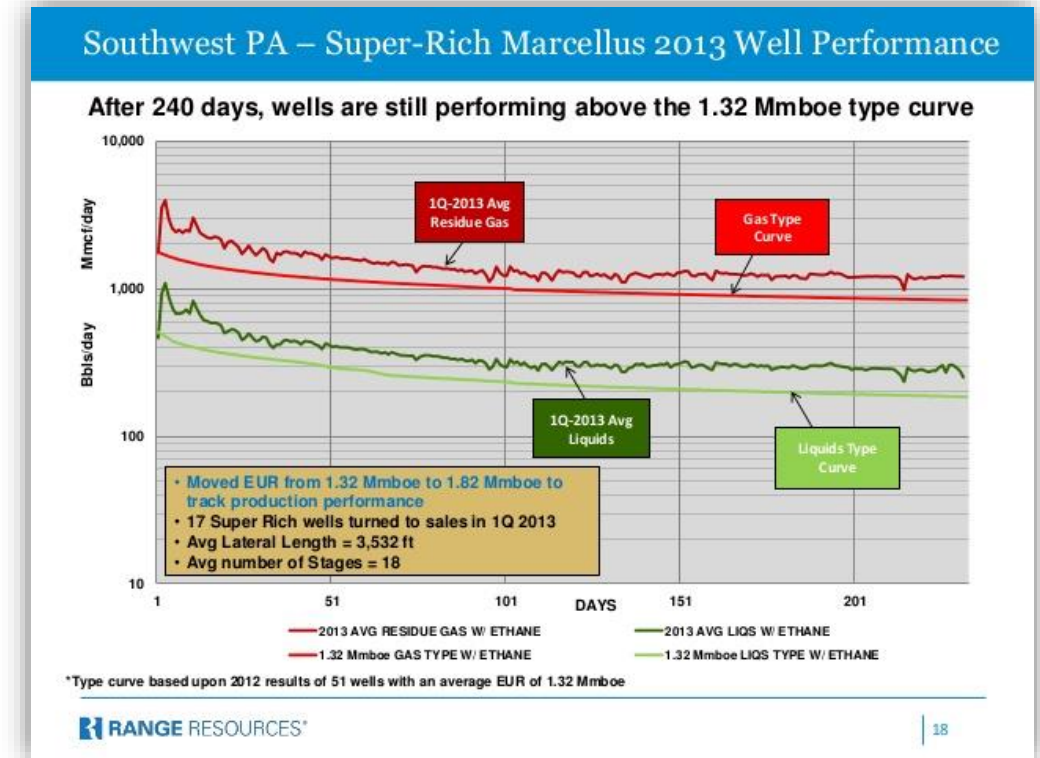
Production is allocated to the estate based on the size of acreage that is included in the unit, divided by the unit size and multiplied by the royalty agreed to in the lease.

Combination of dry gas, wet gas, and oil. Each have different profit structures.

**(Gross Production) X (Division Interest)**

for example in one day

**11,000 Mcf X (50 Ac/640 Ac) X (17%) = 146 Mcf**



# Other Inputs to the Model

- Size of the unit
- Number of wells in the unit
- Sale price of the commodities produced by the well
- Discount applied to the commodities for transportation and marketing
- Timing of development of the unit



# What is the PVF?

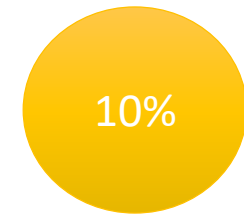
Present Value Factor (PVF) a number less than one that is used to derive the present value of a receipt of cash on a future date.

Based on both the time value of money and the risk associated with receiving the money.

Property is undeveloped and leased with little drilling in the area



Completely drilled units with stable production



# Example Mineral Valuation Inputs

## Model Inputs

Unit Size	640.00	Standard Unit Size
Acreage	50.00	Property Size
Unit Inclusion Rate	100%	Inclusion Rate
Acreage Inclusion	50.00	UIR X Acreage
Acreage/Unit	8%	% of Unit Composed of Acreage
# Wells/Unit	3.00	Calc. from average drilled around area
Royalty Interest	15.00%	Average Royalty Interest
% of Production	0.0117187500	Division Interest
PVF	0.10	Leased acreage in drilling area
Gas Price \$/Mcf	-2.00	Calc from - \$1.75 for Leidy and \$0.25 other fees

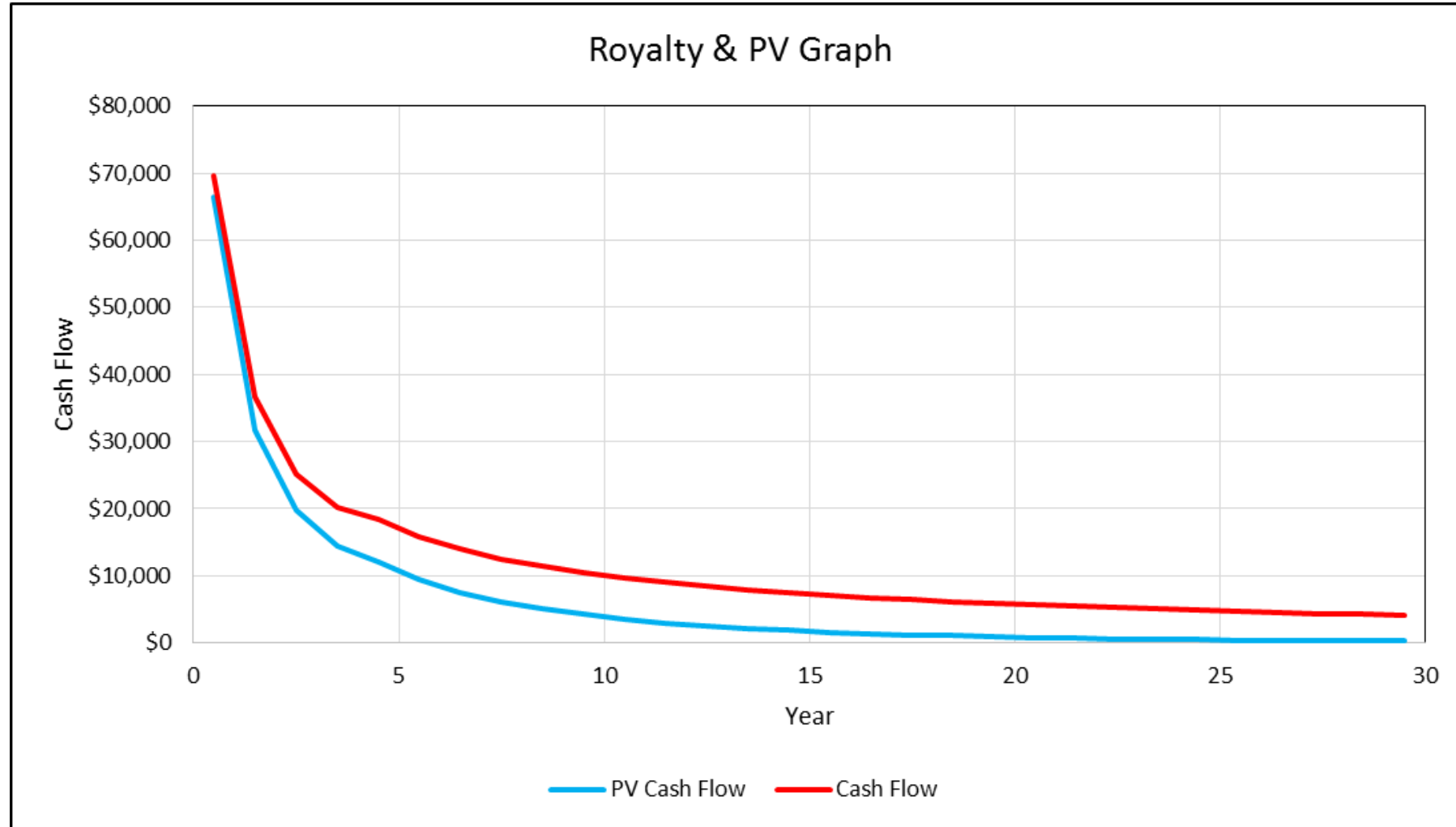
## Annual Effective Decline

Year	Decline
0	43%
1	28%
2	21%
3	17%
4	14%
5+	12%

A strip of sensitivities can also be run on the property that vary the production and/or prices



# Example Mineral Valuation Results



# Example Mineral Valuation Results

Year	Royalties	PVF	Present Value
0.5	\$69,738	0.95	\$66,493
1.5	\$36,629	0.87	\$31,749
2.5	\$25,164	0.79	\$19,829
3.5	\$20,247	0.72	\$14,504
4.5	\$18,414	0.65	\$11,992
5.5	\$15,871	0.59	\$9,396
6.5	\$13,992	0.54	\$7,531
7.5	\$12,542	0.49	\$6,137
8.5	\$11,387	0.44	\$5,065
9.5	\$10,443	0.40	\$4,223
10.5	\$9,655	0.37	\$3,549
11.5	\$8,987	0.33	\$3,003
12.5	\$8,414	0.30	\$2,556
13.5	\$7,915	0.28	\$2,186
14.5	\$7,477	0.25	\$1,877
15.5	\$7,088	0.23	\$1,618
16.5	\$6,742	0.21	\$1,399
17.5	\$6,431	0.19	\$1,213
18.5	\$6,150	0.17	\$1,055
19.5	\$5,894	0.16	\$919
20.5	\$5,661	0.14	\$802
21.5	\$5,447	0.13	\$702
22.5	\$5,251	0.12	\$615
23.5	\$5,067	0.11	\$540
24.5	\$4,890	0.10	\$473
25.5	\$4,719	0.09	\$415
26.5	\$4,554	0.08	\$364
27.5	\$4,394	0.07	\$320
28.5	\$4,241	0.07	\$280
29.5	\$4,092	0.06	\$246
<b>Total Cashflow Forecast</b>	<b>\$357,496</b>	<b>Total Present Value</b>	<b><u>\$201,051</u></b>

**Total Cash Flow:**  
**\$358,000**

**Total Present Value**  
**\$201,000**

This value for the mineral rights is  
 substantially higher than many surface  
 values in the area and should not be ignored

# The Effect of Present Value

Year	Cash Flow Royalties	PVF 20%	Year1 PVF Cash Flow 17%	PVF 17%	Year 2 PVF Cash Flow 13%	PVF 13%	Year 3 PVF Cash Flow 10%	PVF 10%	Year 4 PVF Cash Flow
0.5	\$ 1,171,564	0.91	\$ 1,069,487	0.92	\$ 1,083,111	0.94	\$ 1,102,115	0.95	\$ 1,117,043
1.5	\$ 598,985	0.76	\$ 455,663	0.79	\$ 473,301	0.83	\$ 498,653	0.87	\$ 519,191
2.5	\$ 412,080	0.63	\$ 313,480	0.68	\$ 325,614	0.74	\$ 343,055	0.79	\$ 357,185
3.5	\$ 320,332	0.53	\$ 243,684	0.58	\$ 253,117	0.65	\$ 266,675	0.72	\$ 277,658
4.5	\$ 265,305	0.44	\$ 201,824	0.49	\$ 209,636	0.58	\$ 220,865	0.65	\$ 229,962
5.5	\$ 225,349	0.37	\$ 171,429	0.42	\$ 178,065	0.51	\$ 187,602	0.59	\$ 195,329
6.5	\$ 196,254	0.31	\$ 149,296	0.36	\$ 155,075	0.45	\$ 163,381	0.54	\$ 170,110
7.5	\$ 174,077	0.25	\$ 132,425	0.31	\$ 137,550	0.40	\$ 144,918	0.49	\$ 150,887
8.5	\$ 156,585	0.21	\$ 119,118	0.26	\$ 123,729	0.35	\$ 130,357	0.44	\$ 135,726
9.5	\$ 142,420	0.18	\$ 108,343	0.23	\$ 112,536	0.31	\$ 118,564	0.40	\$ 123,448
10.5	\$ 130,705	0.15	\$ 99,430	0.19	\$ 103,279	0.28	\$ 108,811	0.37	\$ 113,293
11.5	\$ 120,846	0.12	\$ 91,931	0.16	\$ 95,489	0.25	\$ 100,604	0.33	\$ 104,747
12.5	\$ 112,430	0.10	\$ 85,528	0.14	\$ 88,839	0.22	\$ 93,598	0.30	\$ 97,453
13.5	\$ 105,158	0.09	\$ 79,996	0.12	\$ 83,093	0.19	\$ 87,544	0.28	\$ 91,149
14.5	\$ 98,808	0.07	\$ 75,166	0.10	\$ 78,075	0.17	\$ 82,257	0.25	\$ 85,645
15.5	\$ 93,214	0.06	\$ 70,910	0.09	\$ 73,655	0.15	\$ 77,600	0.23	\$ 80,796
16.5	\$ 88,246	0.05	\$ 67,131	0.07	\$ 69,729	0.13	\$ 73,464	0.21	\$ 76,490
17.5	\$ 83,803	0.04	\$ 63,751	0.06	\$ 66,219	0.12	\$ 69,766	0.19	\$ 72,639
18.5	\$ 79,806	0.03	\$ 60,710	0.05	\$ 63,060	0.10	\$ 66,438	0.17	\$ 69,174
19.5	\$ 76,189	0.03	\$ 57,959	0.05	\$ 60,202	0.09	\$ 63,427	0.16	\$ 66,039
20.5	\$ 72,900	0.02	\$ 55,457	0.04	\$ 57,603	0.08	\$ 60,689	0.14	\$ 63,189
21.5	\$ 69,896	0.02	\$ 53,171	0.03	\$ 55,230	0.07	\$ 58,188	0.13	\$ 60,584
22.5	\$ 67,140	0.02	\$ 51,075	0.03	\$ 53,052	0.06	\$ 55,894	0.12	\$ 58,196
23.5	\$ 64,603	0.01	\$ 49,145	0.02	\$ 51,048	0.06	\$ 53,782	0.11	\$ 55,997
24.5	\$ 62,268	0.01	\$ 47,369	0.02	\$ 49,202	0.05	\$ 51,838	0.10	\$ 53,973
25.5	\$ 60,086	0.01	\$ 45,709	0.02	\$ 47,478	0.04	\$ 50,021	0.09	\$ 52,082
26.5	\$ 57,983	0.01	\$ 44,109	0.02	\$ 45,817	0.04	\$ 48,271	0.08	\$ 50,259
27.5	\$ 55,954	0.01	\$ 42,565	0.01	\$ 44,213	0.03	\$ 46,581	0.07	\$ 48,500
28.5	\$ 53,995	0.01	\$ 41,076	0.01	\$ 42,666	0.03	\$ 44,951	0.07	\$ 46,802
29.5	\$ 52,105	0.00	\$ 39,638	0.01	\$ 41,172	0.03	\$ 43,378	0.06	\$ 45,164
	<b>\$5,269,087</b>		<b>\$ 4,186,578</b>		<b>\$ 4,320,856</b>		<b>\$ 4,513,287</b>		<b>\$ 4,668,710</b>

The cashflow is the royalty expected to be received, based on the parameters discussed

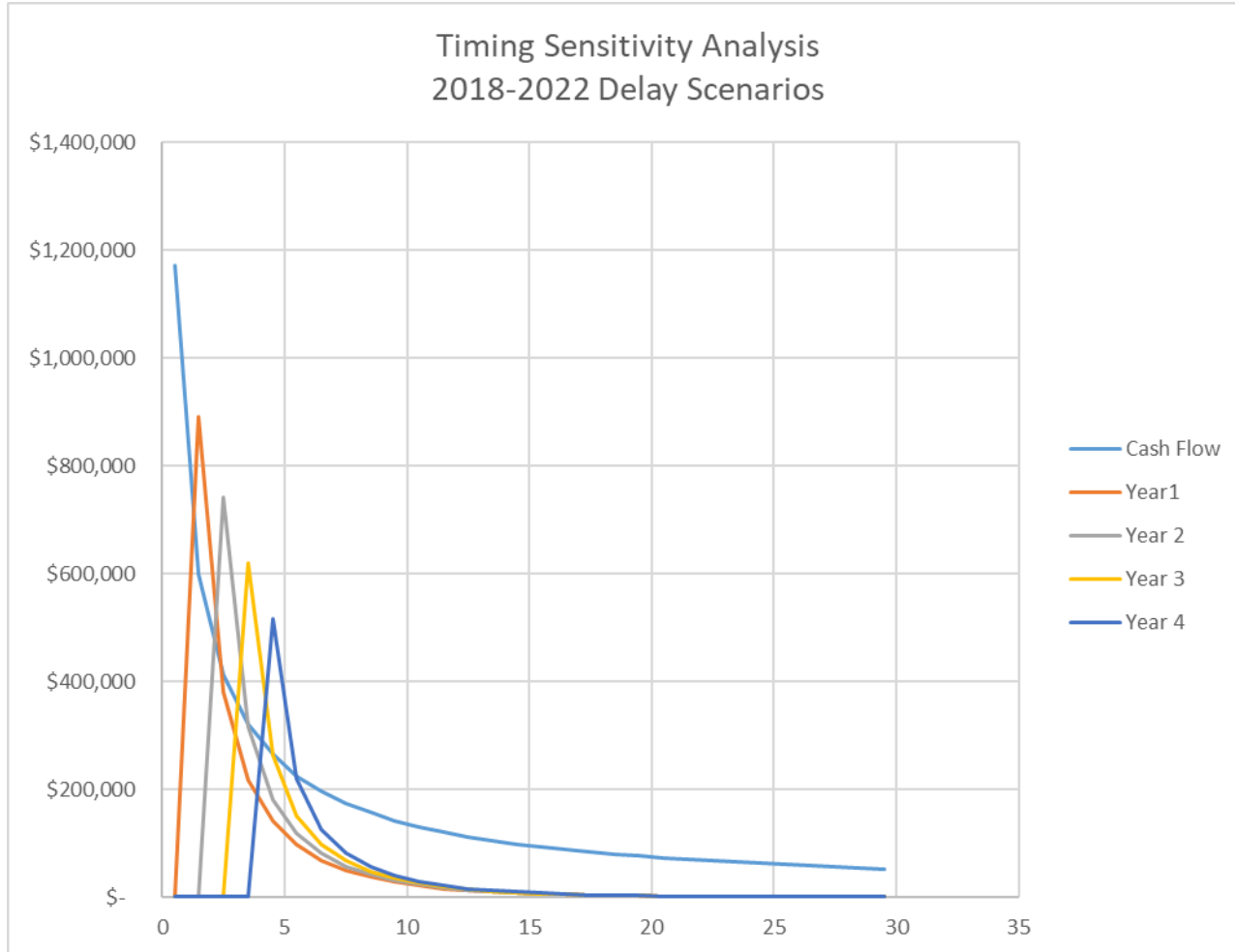
Other than calculating the taxable value of the property, PVF Value can be used to calculate

**Dollar Value per acre**

**Suggested Sales Price**

**Retail value of property that includes oil and gas rights**

# The Effect of Time



## Time Value of Money with Present Value Analysis:

Year 1: \$5,269,087

Year 2: \$2,004,400

Year 3: \$1,670,126

Year 4: \$1,391,556

Year 5: \$1,159,407

**Bird in the hand is worth two in the bush**

# Questions?

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