

Hydraulic Fracturing and Produced Water Reuse



**PRESENTATION BY DAVID MARTIN, SECRETARY-DESIGNATE
FOR THE ENERGY, MINERALS & NATURAL RESOURCES
DEPARTMENT**

**FOR THE
WATER & NATURAL RESOURCES
COMMITTEE**

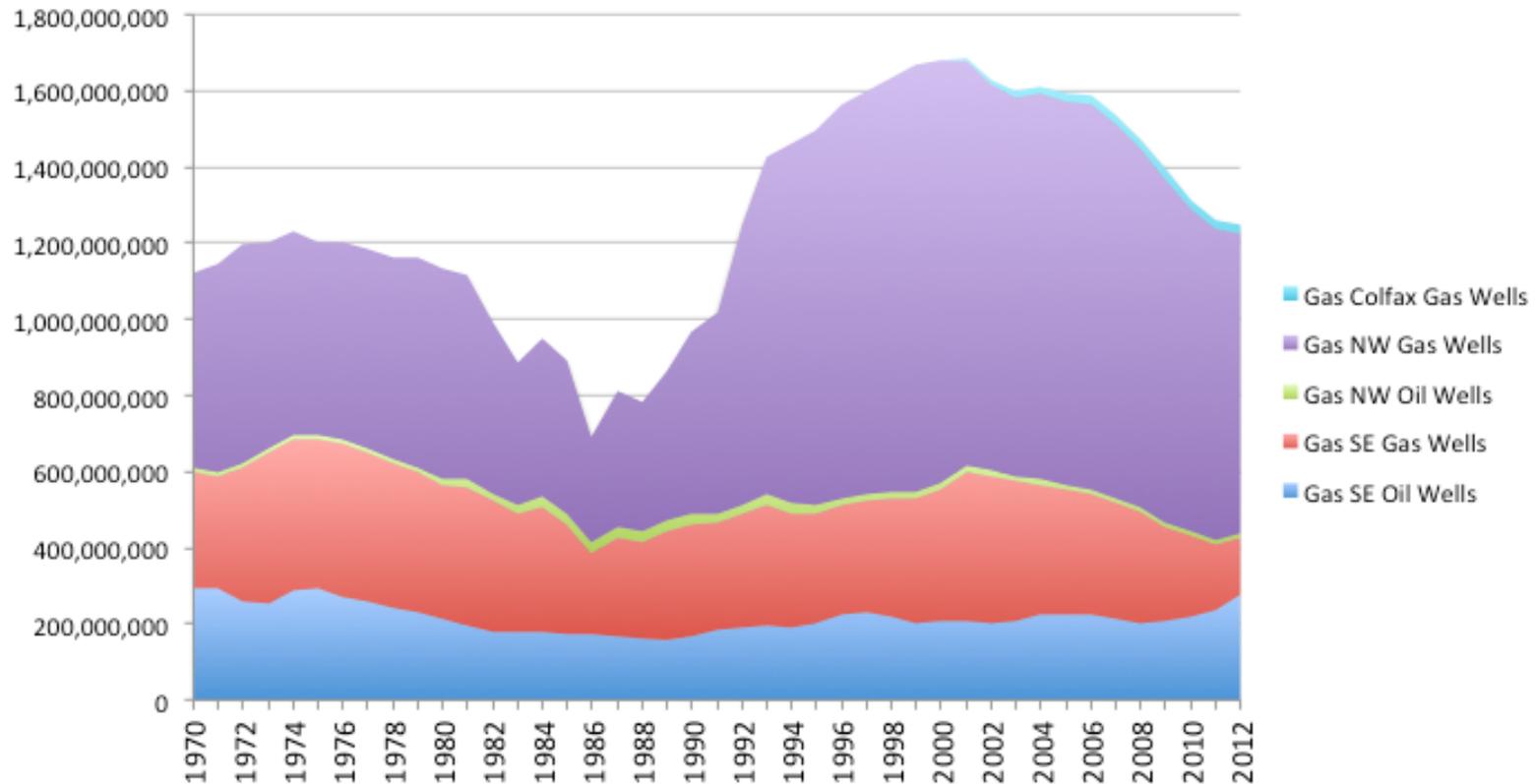
OCTOBER 16, 2013

Outline



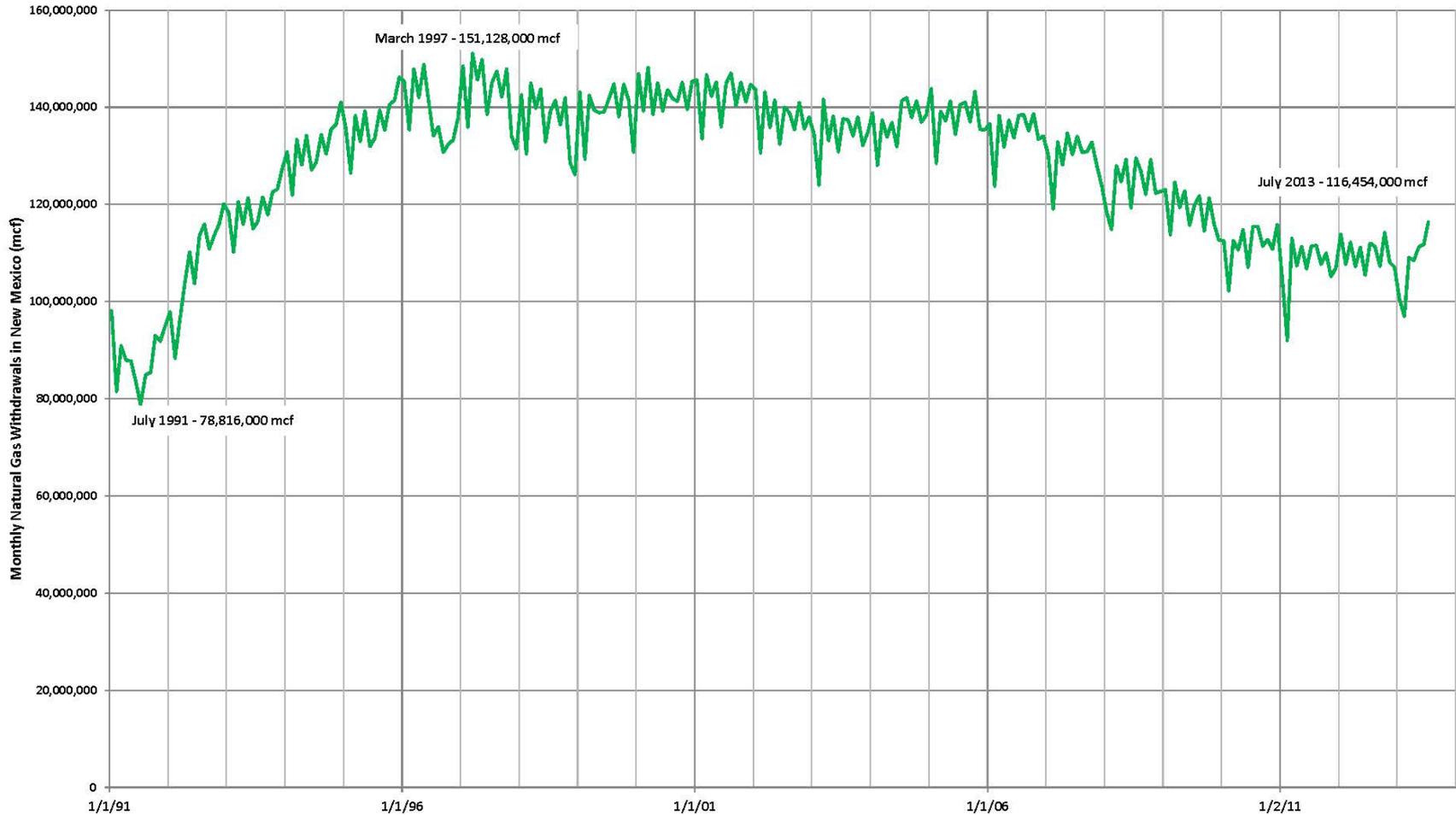
- **Drilling and production data**
- **State revenue from oil & gas**
- **Horizontal wells**
 - Less surface disturbance, less truck traffic, fewer wells
- **Hydraulic fracturing**
 - No water contamination from fracking ever recorded in NM
- **Maximum fracture heights**
 - Thousands of feet below fresh water aquifers
- **Pit Rule requirements**
 - Siting, Construction, Operation, and Closure
- **Produced water volumes**
- **Oilfield Produced Water Subcommittee**

New Mexico Natural Gas Production (MCF)



Source: NMOGA

Monthly Natural Gas Gross Withdrawals in New Mexico Since 1991

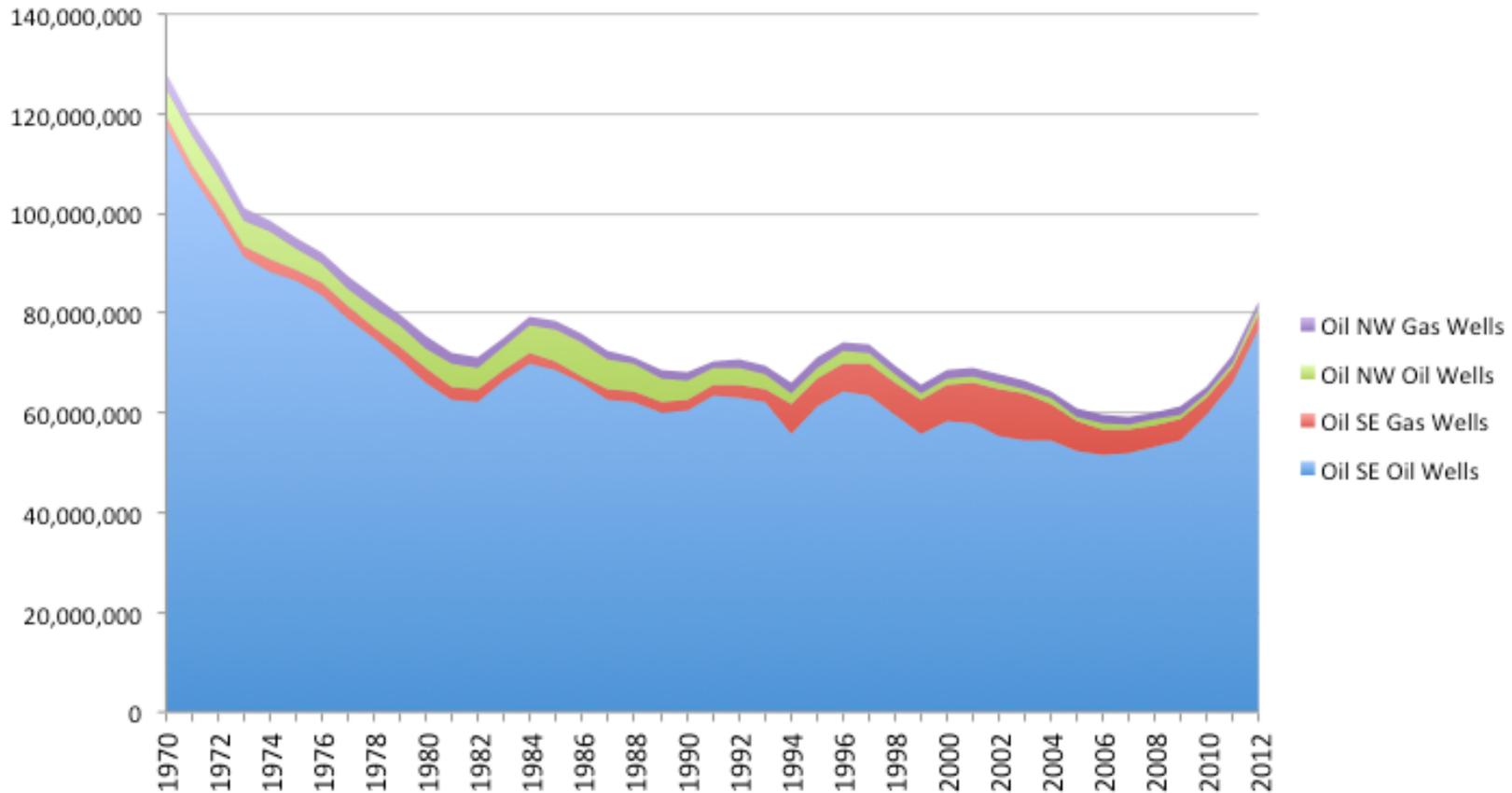


Gas Production by County (mcf)



	<u>2012</u>	<u>2011</u>	<u>2010</u>
San Juan	472,467,005	493,753,961	552,917,277
Rio Arriba	340,513,681	350,004,013	350,727,882
Eddy	228,430,767	214,348,121	217,000,582
Lea	170,778,317	176,208,367	183,200,685

New Mexico Oil Production (Barrels)



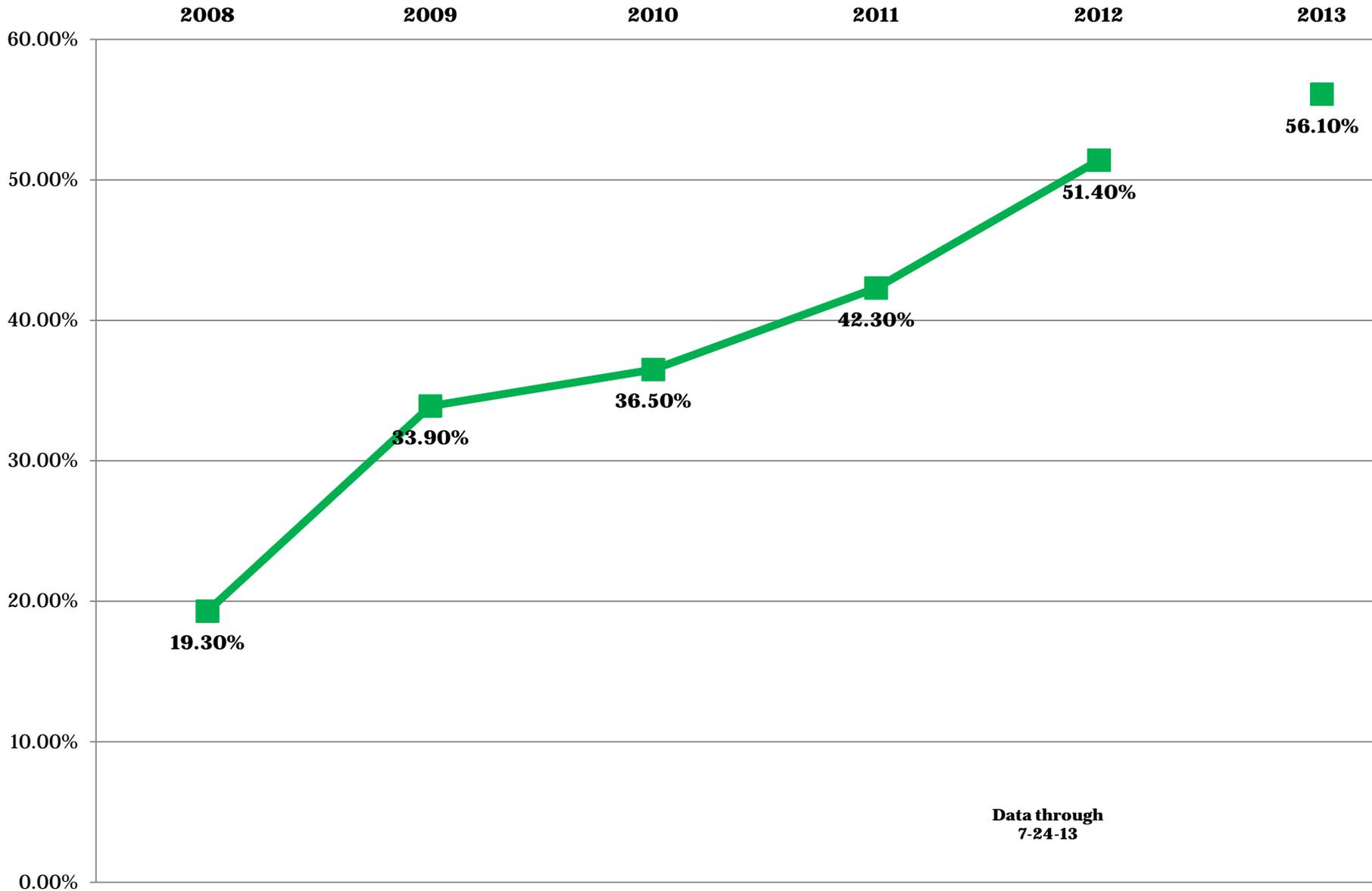
Source: NMOGA

Oil Production by County (bbls)



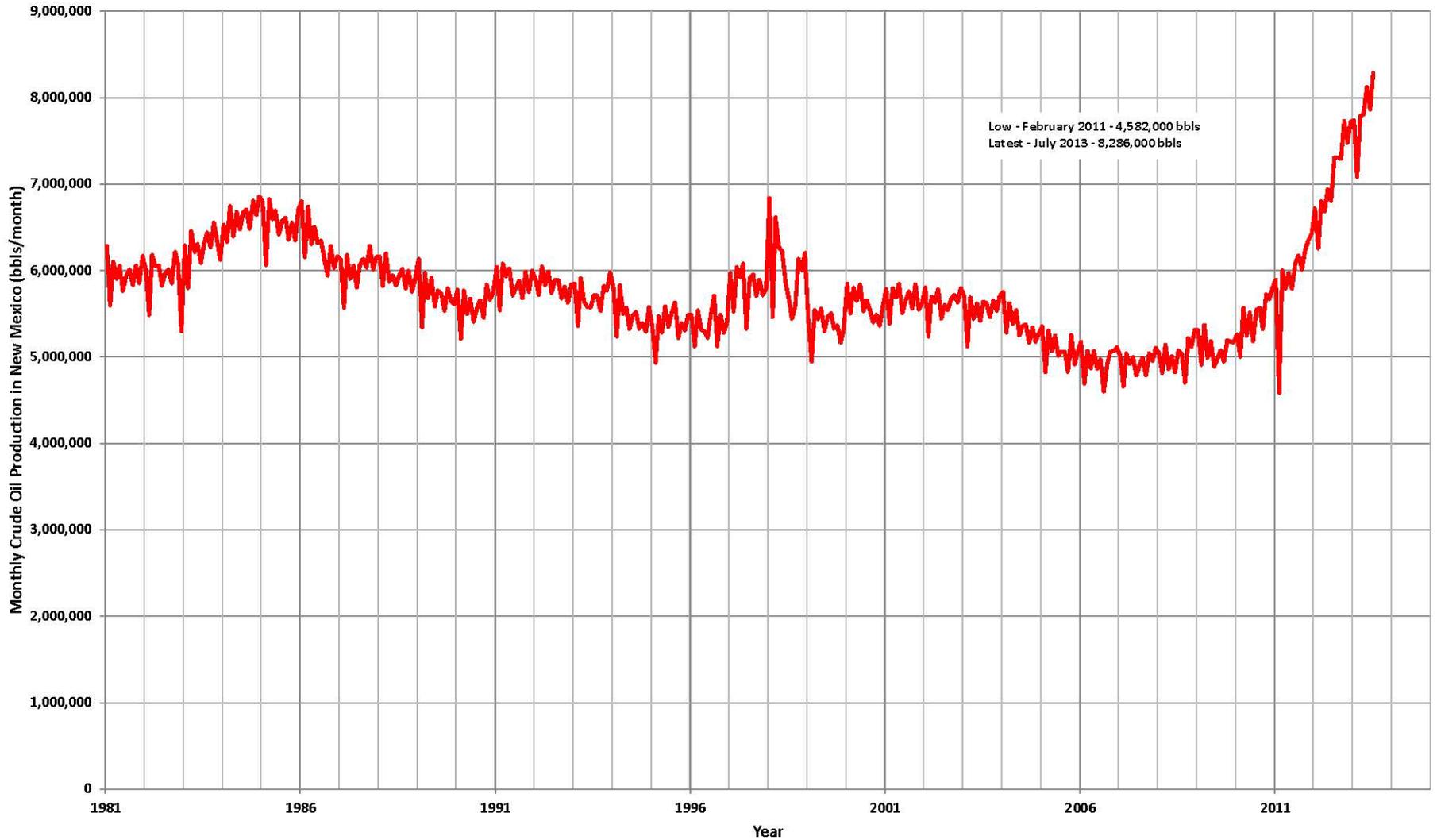
	<u>2012</u>	<u>2011</u>	<u>2010</u>
Eddy	37,751,087	29,966,047	25,499,466
Lea	34,948,703	33,066,761	32,772,627
Chaves	1,854,087	1,947,040	1,483,575
Rio Arriba	1,204,986	1,166,826	1,143,664
San Juan	1,092,156	1,074,120	1,071,810

% of Directional Wells - All NM Counties



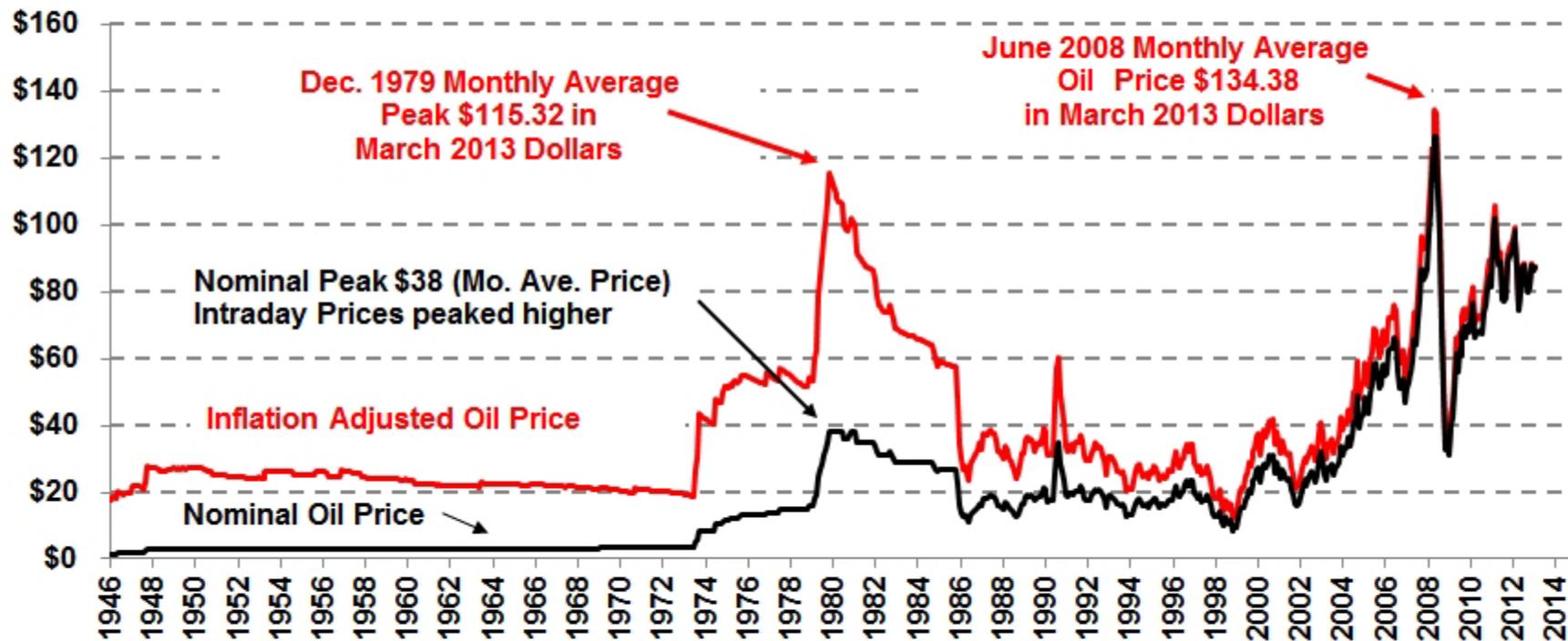
Data through
7-24-13

Monthly Crude Oil Production in New Mexico Since 1981



Inflation Adjusted Monthly CRUDE OIL PRICES (1946-Present) In March 2013 Dollars

© www.InflationData.com
Updated 4/16/2013



Source of Data:

Oil Prices- www.PlainsAllAmerican.com -- illinois Crude
CPI-U Inflation index- www.bls.gov

State of New Mexico and Local Government Revenue From Oil and Gas Operations



	<u>FY12</u>	<u>FY11</u>
<u>State General Fund:</u>		
-Production Taxes	444,400,000	390,000,000
-Royalties, bonuses	595,100,000	440,000,000
-Taxes on direct activities	247,300,000	215,000,000
-Taxes on indirect activities	315,100,000	274,000,000
Total General Fund Revenue	1,601,900,000	1,319,000,000
Percent of General Fund	28%	25%
<u>Other State Funds:</u>		
Severance Tax Bonding Fund	412,878,420	372,000,000
Land Grant Permanent Fund	426,212,628	395,000,000
Total Other State Funds	839,091,048	767,000,000
Total State Funds	2,440,991,048	2,086,000,000
<u>Local Government Revenues:</u>	<u>455,232,190</u>	<u>357,000,000</u>
<u>Grand Total</u>	<u>2,896,223,238</u>	<u>2,443,000,000</u>

“I would say to everybody that hydraulic fracturing is safe”

Source: Ken Salazar, Former U.S. Secretary of the Interior and former U.S. Senator from Colorado, Domenici Public Policy Conference, Las Cruces NM, September 18, 2013

“[Shale gas drilling] is something you can do in a safe manner”

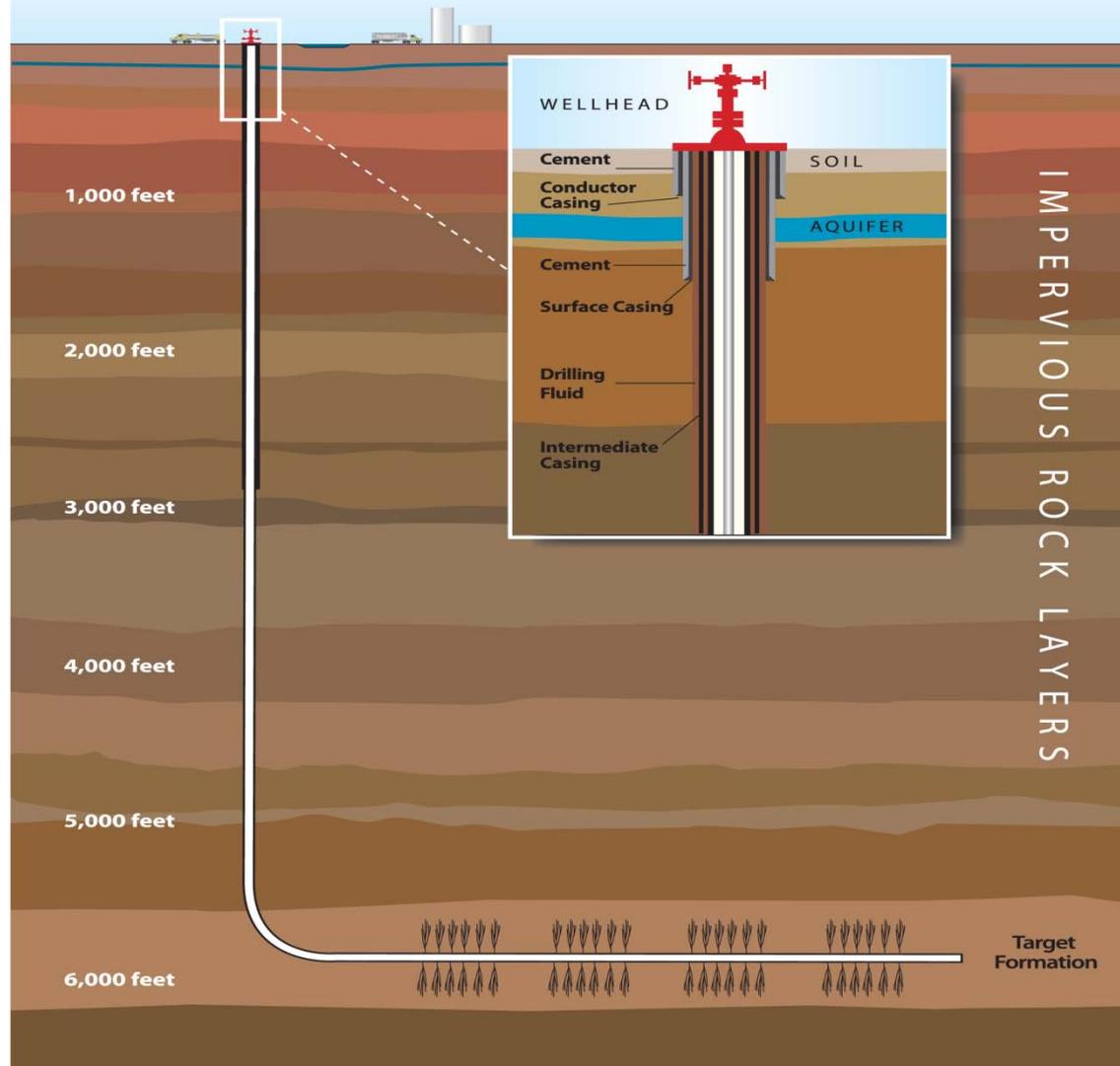
Source: Dr. Stephen Chu, Former U.S. Secretary of Energy America's Natural Gas Alliance, Columbus OH, Sept. 17, 2013

“To my knowledge I still have not seen any evidence of fracking per se contaminating groundwater”

Source: Dr. Ernest Moniz, U.S. Secretary of Energy, Breakfast Meeting of the Christian Science Monitor, Washington DC, Aug. 1, 2013

Protection of Groundwater

Groundwater Protection through Proper Well Construction



Multi-stage Hydraulic Fracturing

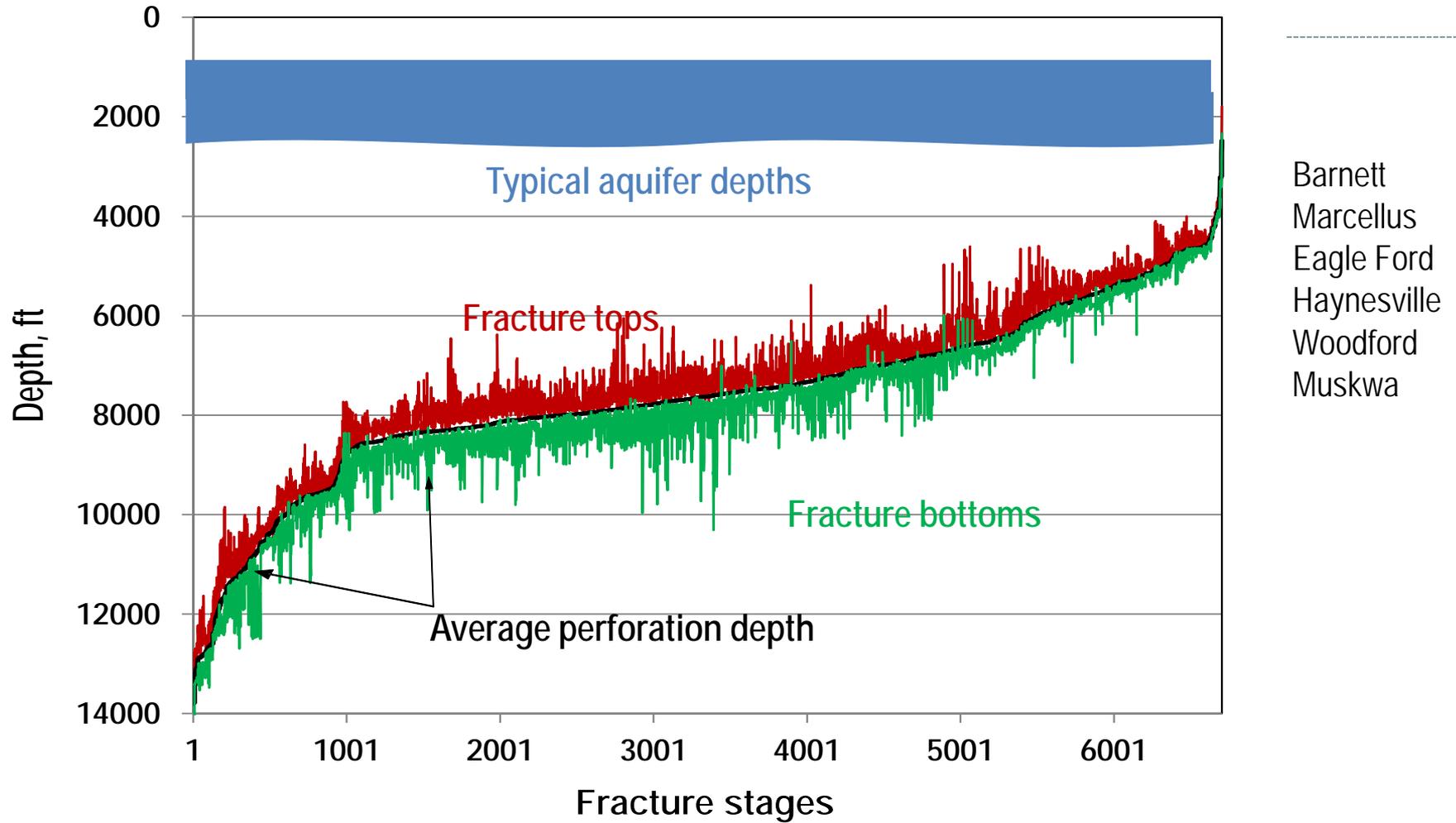


- Fracking is a well-defined term that refers to hydraulic fracturing operations only.
- The height of hydraulic fractures is limited by:
 - fracture physics,
 - formation mechanical properties,
 - the layered depositional environment and other factors.
- This causes fractures to remain in the nearby vicinity of targeted reservoirs.

Source: Fisher and Warpinski, SPE Production & Operations (February 2012)

Mapped Microseismic Height: North American Shales

Top: shallowest microseism; Bottom: deepest microseism



Source: Warpinski (2013) after SPE 145949

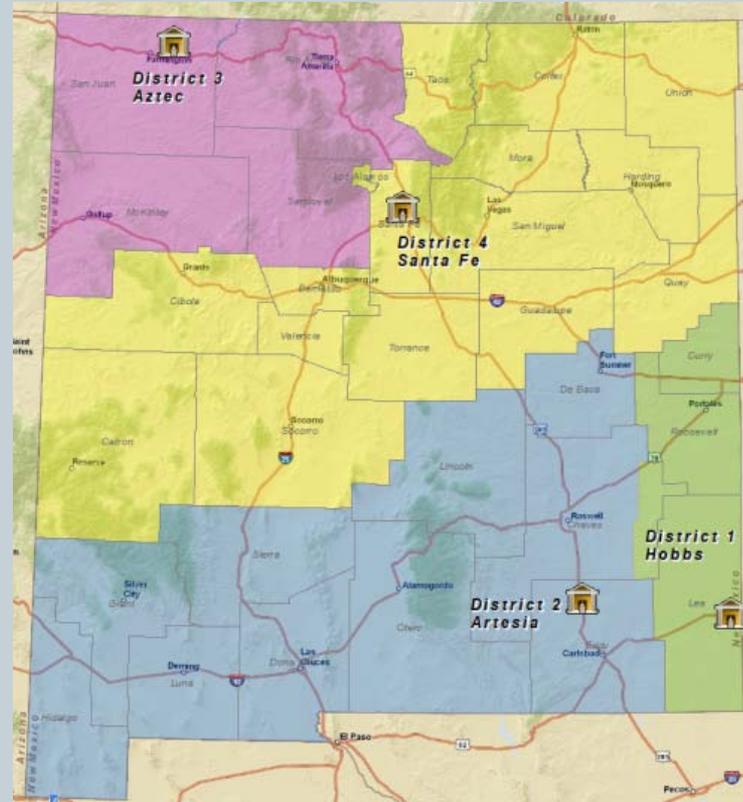
OCD Mission Statement



The Oil Conservation Division (OCD) was created by the legislature in 1935. The OCD regulates oil, gas and geothermal activity in New Mexico. The OCD protects correlative rights, prevents waste, protects fresh water, and also protects public health and the environment.

How we do it:

- ✓ Enforce the division's rules and the state's oil and gas statutes.
- ✓ Permitting of new wells drilled in New Mexico.
- ✓ Collection of well production data.
- ✓ Make certain abandoned wells are properly plugged; and ensure the land is responsibly restored.



Pit Rule



- Effective June 28, 2013
- Rule covers all pits, closed-loop systems, below grade tanks and sumps
- Requirements for:
 - Temporary Pits
 - Multi-well Fluid Management Pits
 - Permanent Pits
- Website: www.emnrd.state.nm.us/OCD/rules.html
- Presentation Material:
www.emnrd.state.nm.us/OCD/announcements.html

Reclamation



Pits, trenches, pads, below-grade tanks, areas associated with a closed-loop systems

- **Reclaim to a safe and stable condition**
 - Soil cover
 - Chloride levels
- **Contouring and re-vegetation**
- **Location blends with the surrounding area**
- **Restore to conditions that existed prior to oil and gas operations**

Produced Water Reuse



- Developed a process to allow oil & gas operators or commercial entities to reuse produced water in a safe and environmentally sound manner.
- Treatment and recycling of produced water can be used in drilling, completion, or plugging & abandoning operations. All of these applications will decrease the reliance on fresh water sources.
- No permit is required for produced water reuse for these purposes (New application form).

NM Crude Oil and Produced Water Volumes



Oil, million bbls

Water, million bbls

	SE	NW	Total	SE	NW	Total
2008	53.4	0.99	60.1	605.4	2.95	735.2
2009	54.6	0.95	61.1	571.5	2.23	690.9
2010	59.7	0.87	65.4	604.6	2.92	713.7
2011	66.1	0.95	71.3	625.8	2.79	722.1
2012	79.2	1.10	84.7	671.2	3.56	773.4

Water – Oil Ratio (SE)

$$\frac{671.2}{79.2} = 8.5$$

$$79.2$$

Water Injected, million bbls



	SE	NW
2008	671.7	45.8
2009	639.0	35.6
2010	676.1	41.1
2011	653.8	36.4
2012	732.7	34.8

10 AF = 77,584 bbls

2012 Frac Water Volumes*



<u>County</u>	<u>Wells</u>	<u>Water, bbls</u>	<u>Acre Ft</u>	<u>bbls/well</u>
Eddy	781	18,466,059	2,380	23,644
Lea	203	5,888,548	759	29,008
San Juan	87	508,621	66	5,846
Rio Arriba	70	366,327	47	5,233
Chaves	9	280,466	36	31,163
Other	26	<u>71,911</u>	<u>9</u>	2,766
		25,581,932	3,297	

*February 15, 2012 to December 31, 2012

New Mexico Recoverable Water Initiative



NM Drought Task Force

Chair, State Engineer Scott Verhines

Recoverable Water Initiative

Chair, Secretary Designate EMNRD, David Martin

Brackish Water
Subcommittee

Produced Water
Subcommittee

Oilfield Produced Water Subcommittee



Produced Water Subcommittee

- EMNRD
- NMED
- State Engineer
- Water experts from New Mexico universities and national laboratories

Produced Water Task Force

- Southeast NM Work Group
- Northwest Work Group
- Industry Advisory Group

Benefits of Produced Water Treatment and Reuse



State and NM Citizens

- Reduced reliance on and depletion of fresh water aquifers and surface water sources
- Reduced truck traffic and wear and tear on roads, and improved road safety
- Clean water for various applications

Oil & Gas Operators

- Provide alternatives to costly fresh water
- Provide additional sources of water to support drilling & completion activities
- Reduce operating expenses
- Minimize transportation and disposal of produced and frac flowback water
- Reduce trucking costs and disposal volumes

Goals of the Produced Water Task Force



- Reduce the amount of fresh water used in oil and gas operations
- Treat produced water for re-use in production operations
- Where applicable, consider treatment of oilfield brackish waters and brines for use in other applications outside of oil and gas operations

Objectives of the Produced Water Task Force



- **Initiate discussions with the oil and gas industry and technical experts that will allow New Mexico to consider comprehensive water management policies.**
- **For hydraulic fracturing operations, document approaches to reuse produced water or to use brackish or saline brines in place of fresh water sources.**
- **Investigate efforts to find methods to desalinate and clean produced waters from oil and gas production.**
- **Develop a regulatory environment that encourages recycling and reuse of fracturing fluids or oilfield produced water.**

Progress and Plans



- **Work Groups formed and meetings held to focus on recycling of oilfield produced water:**
 - Reuse produced water in hydraulic fracturing operations
 - Use of brackish water or brines in place of fresh water sources
 - Methods to treat produced waters from oil and gas production
 - Compile case history information, including economics
- **Subcommittee will report findings and recommendations to the Drought Task Force and to the Governor**
- **Subcommittee will keep the appropriate legislative committees informed of progress**



Thank You



Additional Details

Number of Wells in New Mexico



OCD Well Statistics

9/25/2013

Number of Wells

Well Type	Approved APDs, Not Plugged, Not Cancelled	Completed Wells
Carbon Dioxide	726	688
Gas	28760	27967
Injection	3658	3644
Misc	116	106
Oil	28213	25454
Salt Water Disposal	858	818
Water	69	62
Total	62400	58739
Coalbed Methane (Included Above)		6117

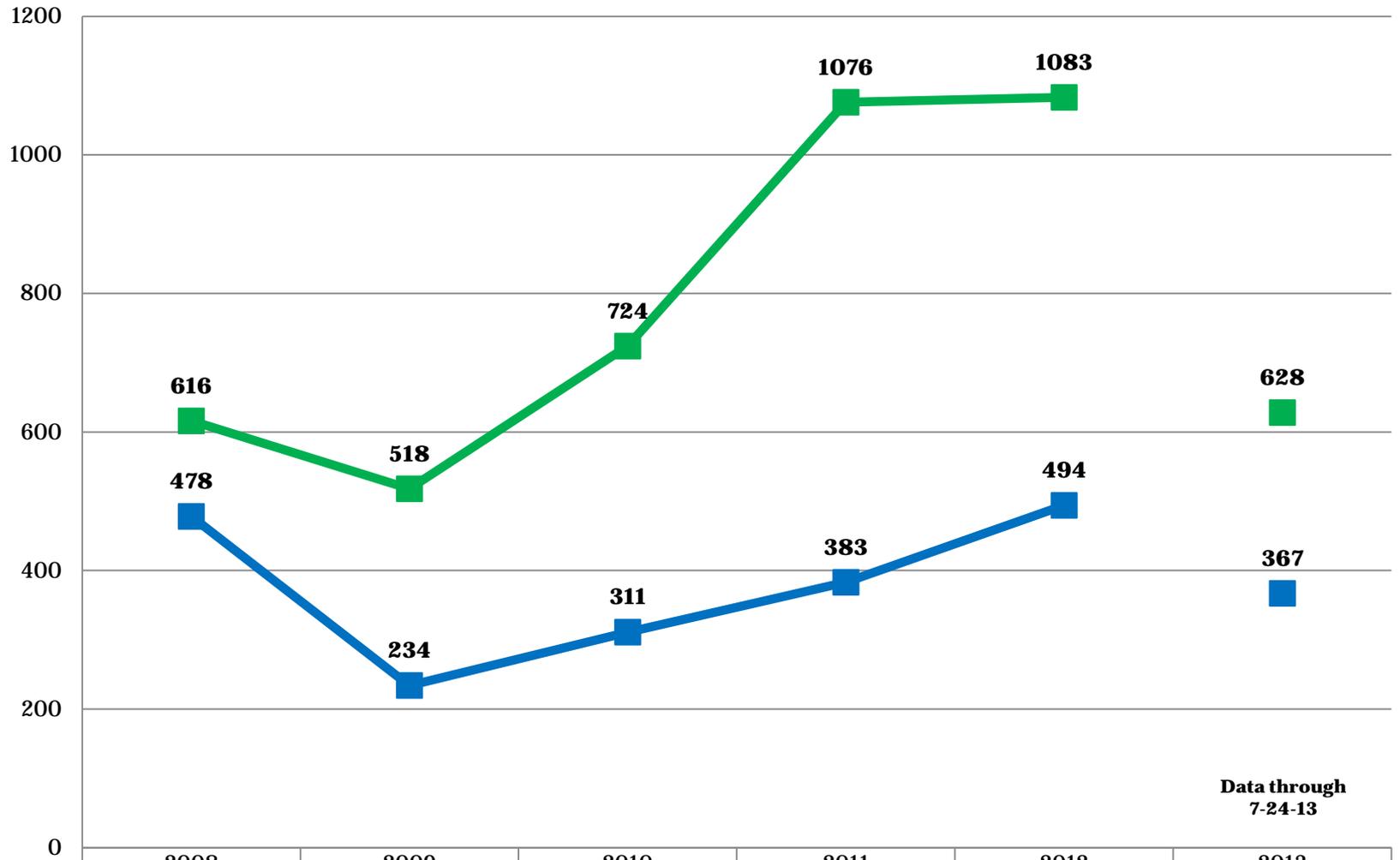
Production Totals (2012)

Oil Production = 84.7 Million BBLs

Gas Production = 1.25 Trillion Cubic Feet (TCF)

Source: OCD

NM Well APD Counts - Lea and Eddy Counties

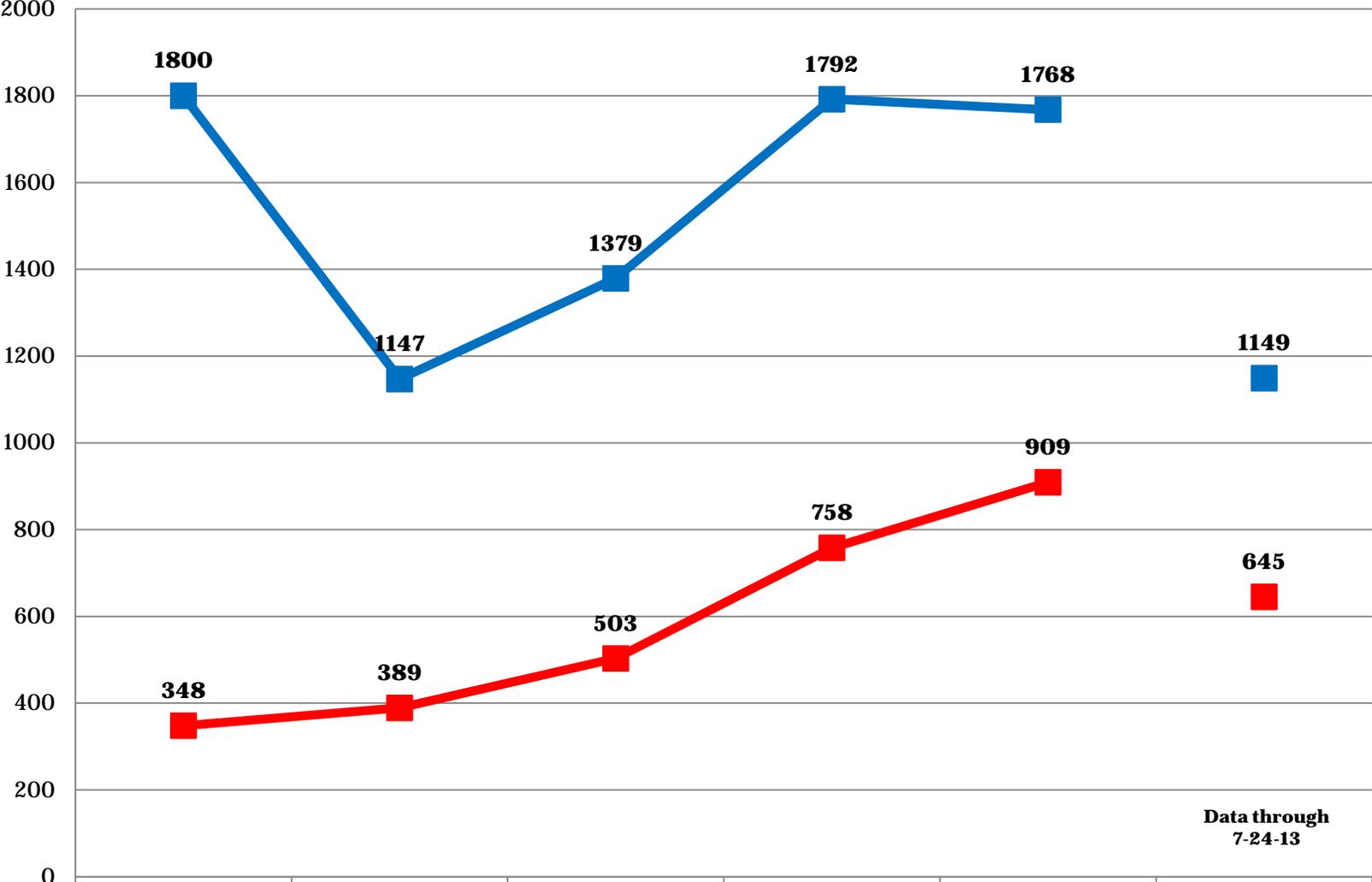


Data through
7-24-13

LEA COUNTY
EDDY COUNTY

2008	2009	2010	2011	2012	2013
478	234	311	383	494	367
616	518	724	1076	1083	628

NM Well APD Counts Since 2008 by Type



Data through
7-24-13

	2008	2009	2010	2011	2012	2013
All Types	1800	1147	1379	1792	1768	1149
Directional Wells	348	389	503	758	909	645

Transportation and Reuse of Produced Water, Drilling Fluids and other Liquid Oil Field Waste 19.15.34 NMAC

Transporter must first obtain an approved C-133 from the Santa Fe OCD Office and maintain an approved copy in the transporting vehicle.*

