

# EASTERN MONTANA POPULATION... THEN, NOW & INTO THE FUTURE



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**CEIC DATA USER'S CONFERENCE**  
**HELENA, MT**  
**NOVEMBER 2013**



**MONTANA**  
DEPARTMENT OF COMMERCE



# WHAT ARE WE TALKING ABOUT TODAY...

2

- **GEOGRAPHIC OVERVIEW**
  - MONTANA... WHAT/WHERE IS THAT?
  - DEMOGRAPHIC OVERVIEW
- **RECENT ACTIVITY IN THE REGION WARRANTING A CLOSER LOOK AT POPULATION TRENDS**
  - DEVELOPMENT OF THE BAKKEN OIL PLAY IN WESTERN ND AND EASTERN MT
- **HISTORIC OVERVIEW OF EASTERN MONTANA**
  - RECENT HISTORIC POPULATION IN THE REGION
- **WHY PURELY HISTORIC BASED MODELING JUST DOESN'T APPEAR TO MAKE SENSE**
  - EXTRAPOLATED POPULATION TRENDS LOOKING FORWARD AT POPULATION FOR THE REGION
- **WHAT TO DO ABOUT IT**
  - MERGING MONTANA DEPARTMENT OF TRANSPORTATION'S PI+ MODELING ANALYSIS WITH EREMI

# GEOGRAPHIC OVERVIEW

3



CANADA



Idaho



North Dakota



South Dakota



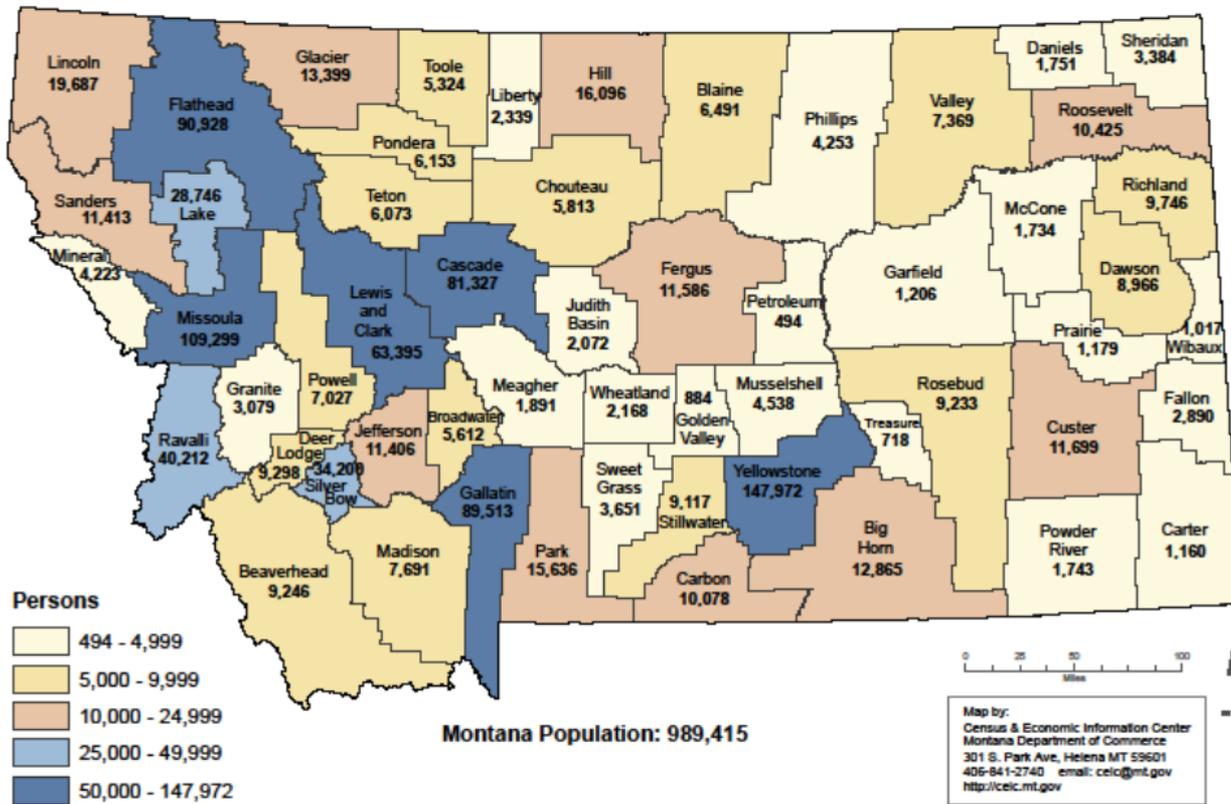
Wyoming



# GEOGRAPHIC OVERVIEW

4

**Census 2010: MONTANA  
Population By County**



MISSOULA COUNTY



GALLATIN COUNTY

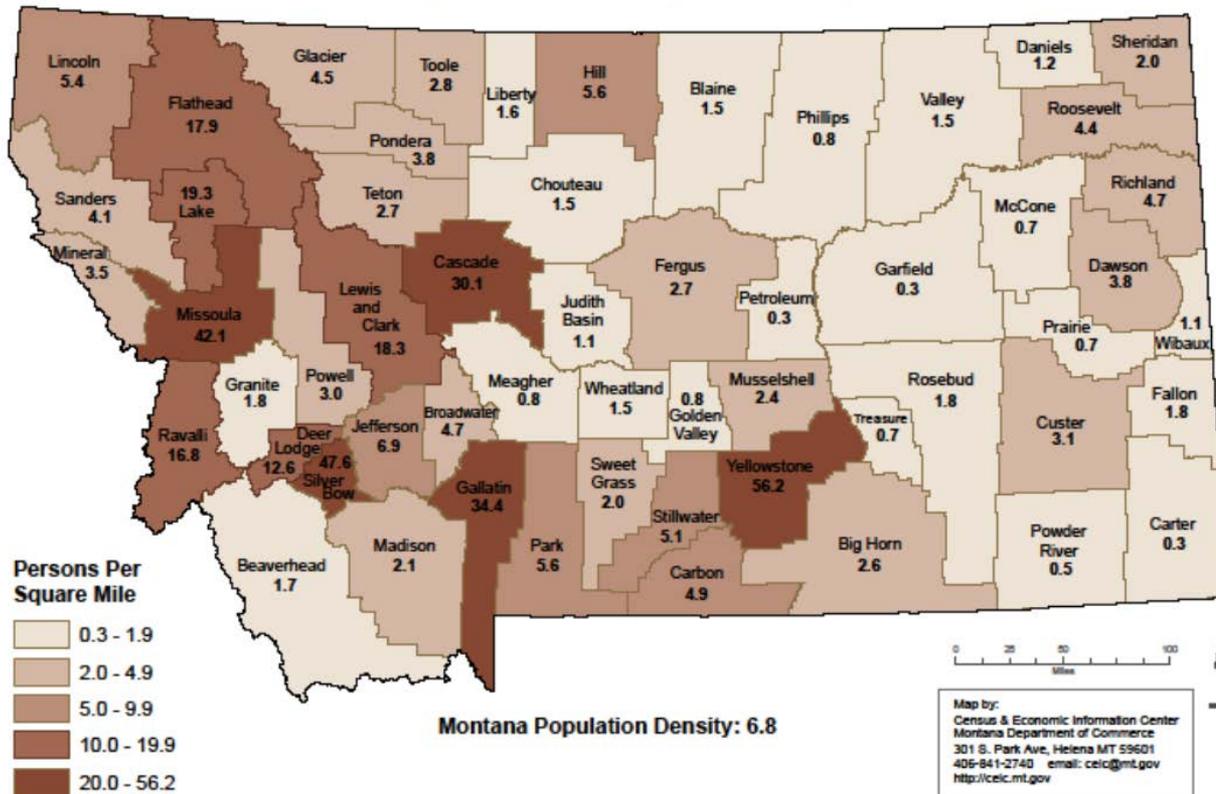
LARGEST "CITY"...

BILLINGS IN  
YELLOWSTONE COUNTY  
104,170 PEOPLE (2010 CENSUS)

# GEOGRAPHIC OVERVIEW

5

**Census 2010: MONTANA  
Population Density By County**



Source: U.S. Census Bureau, Census 2010, PL 94-171, 2011

April 2011 - PopDensityByCounty2010.mxd

## POPULATION DENSITY COMPARISON (2010 CENSUS)

UNITED STATES

87.4 PEOPLE/MILE<sup>2</sup>

DISTRICT OF COLUMBIA

9,856.5 PEOPLE/MILE<sup>2</sup>

NEW JERSEY  
(MOST DENSE STATE)

1,195.5 PEOPLE/MILE<sup>2</sup>

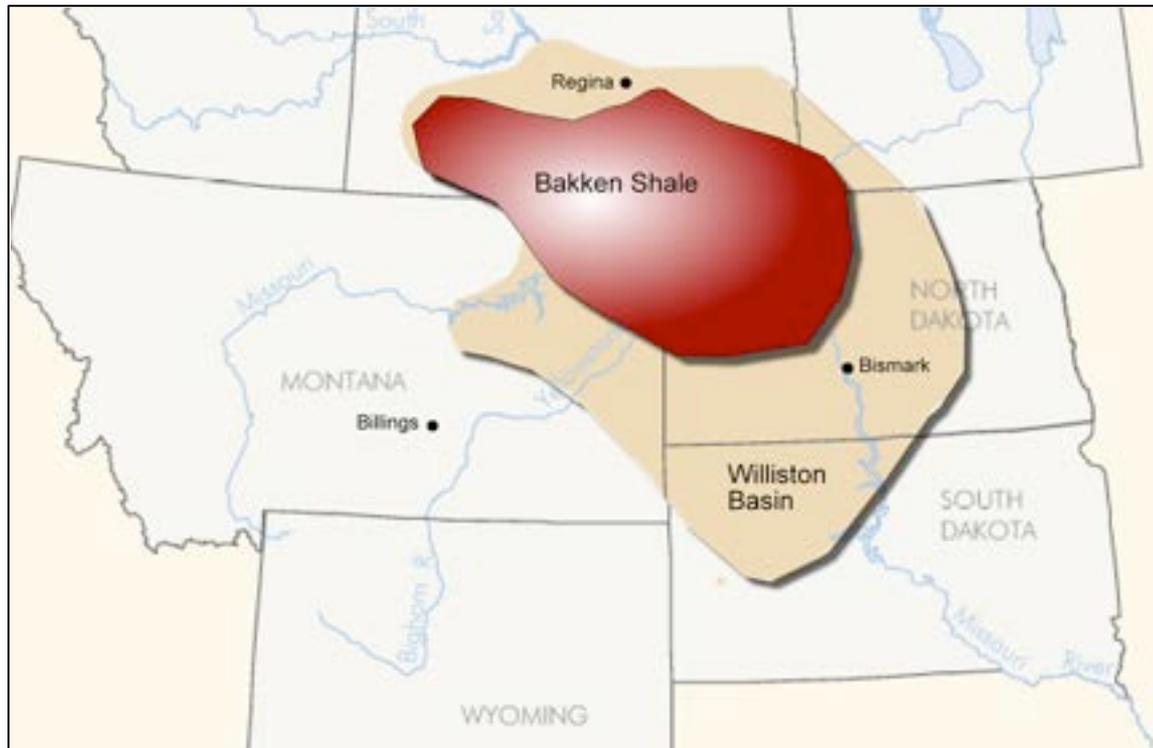
ALASKA  
(LEAST DENSE STATE)

1.2 PEOPLE/MILE<sup>2</sup>

# SWITCHING GEARS A LITTLE...

## OVERVIEW OF THE REGION

6



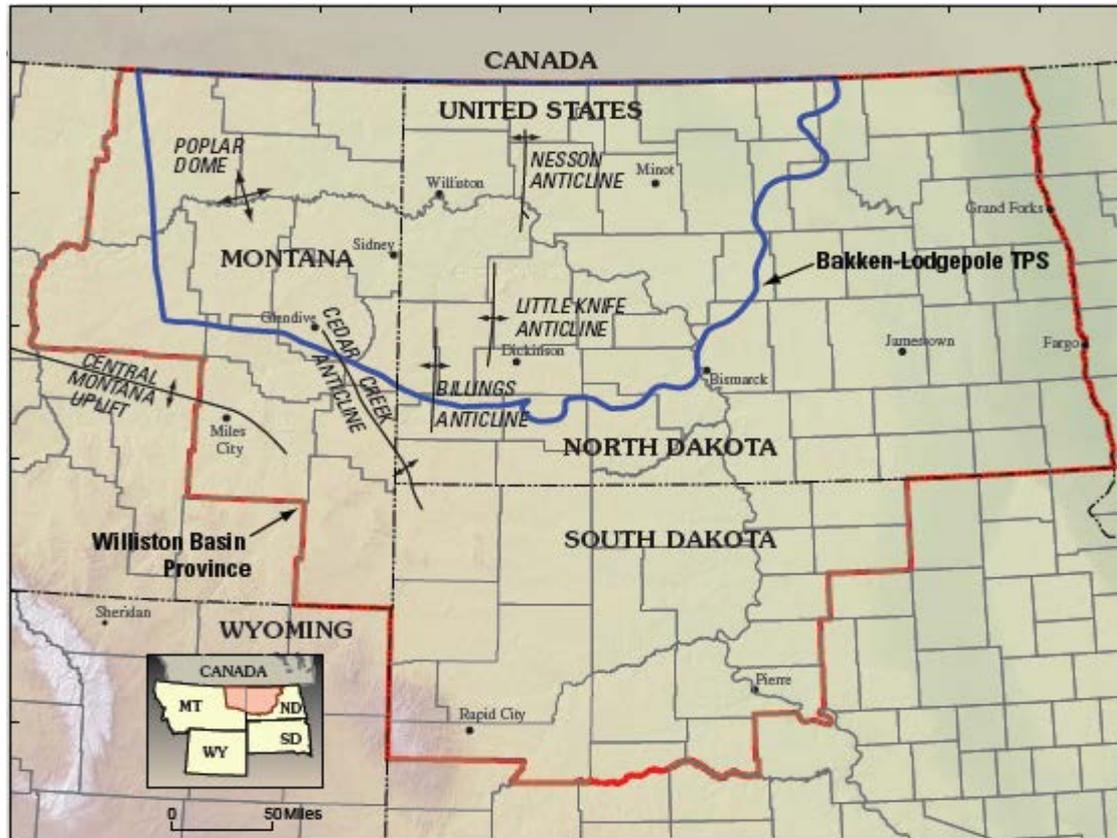
THE WILLISTON BASIN IS A LARGE INTRACRATONIC SEDIMENTARY BASIN IN EASTERN MONTANA, WESTERN NORTH DAKOTA, AND SOUTHERN SASKATCHEWAN KNOWN FOR ITS RICH DEPOSITS OF PETROLEUM...

THE BAKKEN FORMATION IS AN OIL-BEARING STRATUM WITHIN THE WILLISTON BASIN.

SOURCE: BAKKEN RESOURCES, INC. [WWW.BAKKENRESOURCESINC.COM](http://WWW.BAKKENRESOURCESINC.COM)

# SEMI-RECENT DEVELOPMENTS IN THE REGION

7



**Figure 1.** Map showing Williston Basin Province boundary (in red), Bakken-Lodgepole Total Petroleum System (TPS) (in blue), and major structural features in Montana, North Dakota, and South Dakota.

IN 2008 THE USGS REPORTED AN ESTIMATED 3.65 BILLION BARRELS OF RECOVERABLE OIL IN JUST THE ND AND MT PORTION OF THE BAKKEN FORMATION OF THE WILLISTON BASIN PROVINCE.

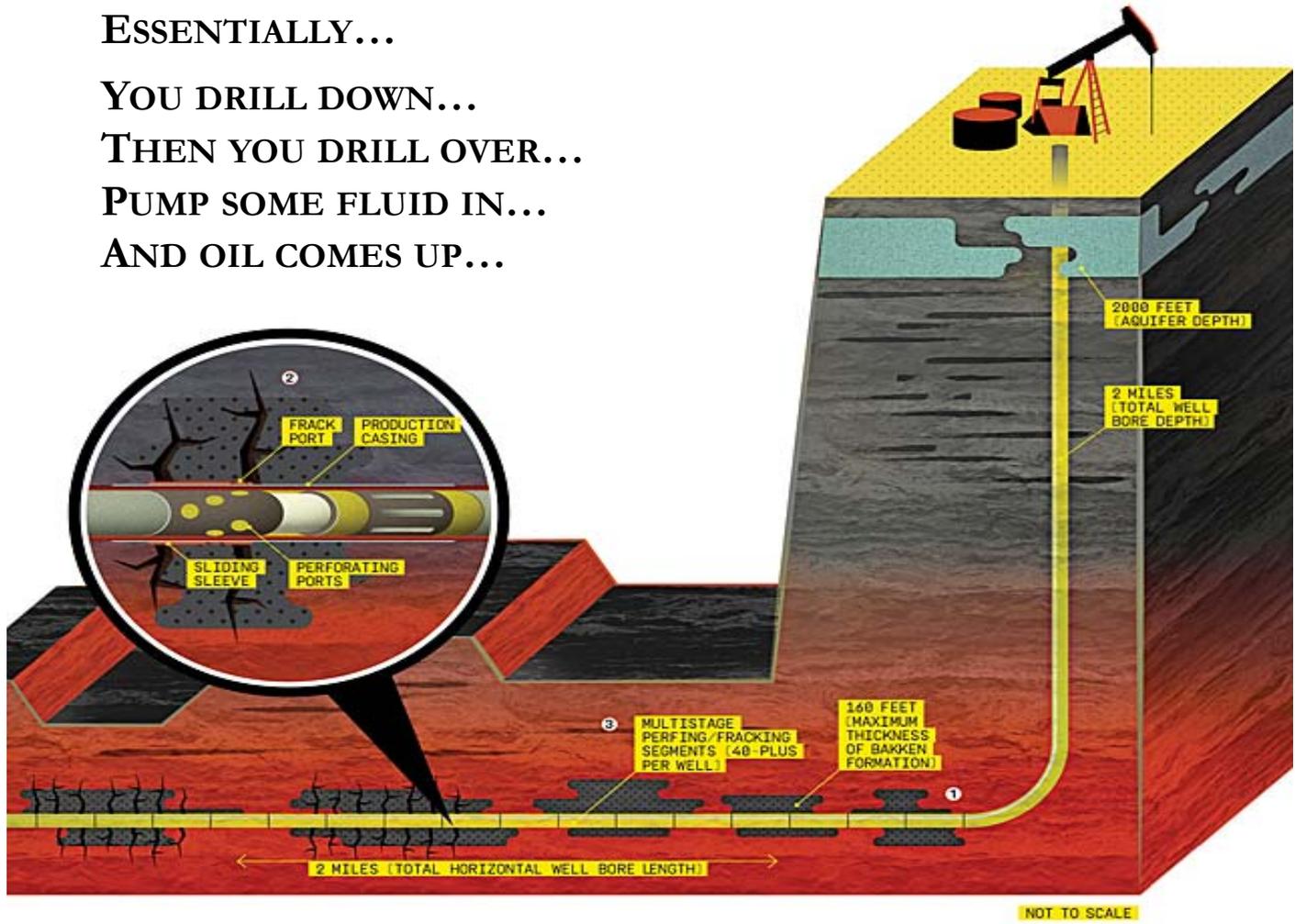
THIS FAR EXCEEDS 1995 USGS ESTIMATE OF 151 MILLION BARRELS OF OIL FOR THE SAME AREA.

<sup>1</sup>Source: USGS, April 2008

# HYDRAULIC FRACTURING 101

8

ESSENTIALLY...  
YOU DRILL DOWN...  
THEN YOU DRILL OVER...  
PUMP SOME FLUID IN...  
AND OIL COMES UP...



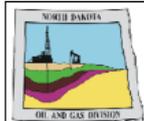
## DISCLAIMER

I'm an economist with access to Google and not a petroleum engineer ...

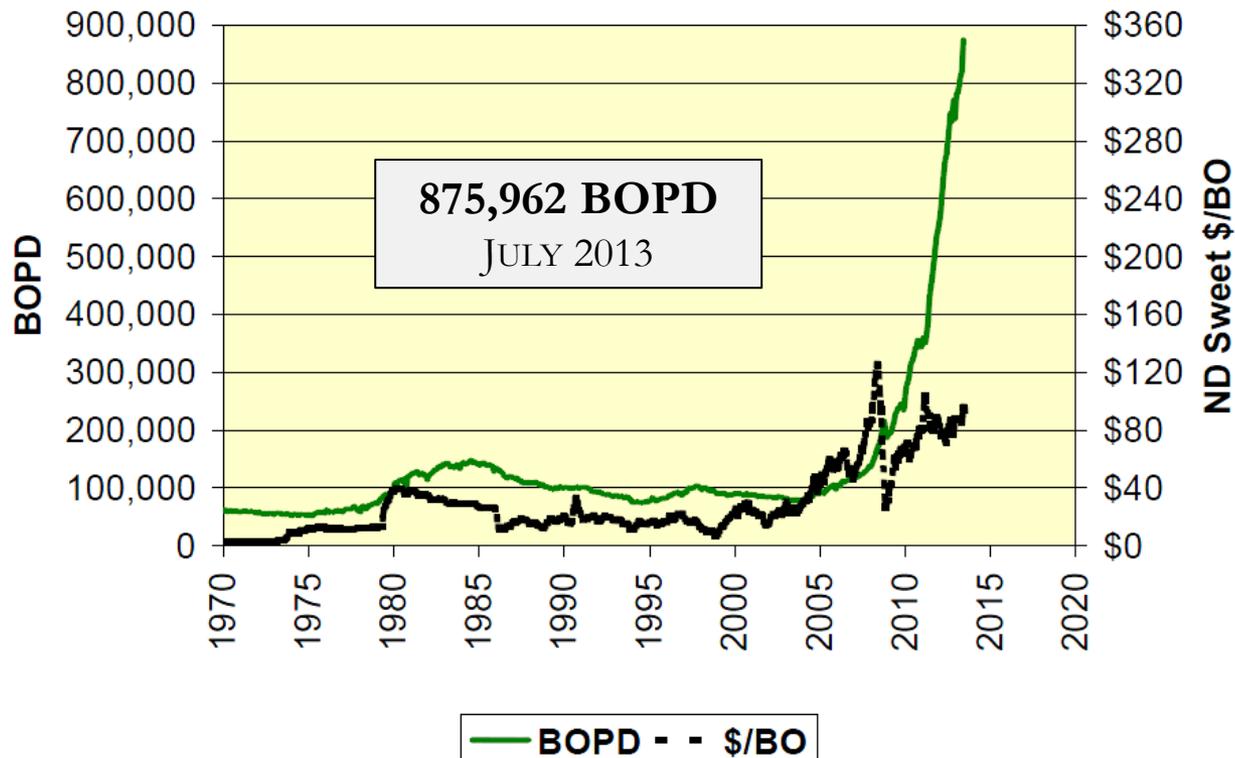
Just something to keep in mind...

# OIL PRODUCTION – NORTH DAKOTA

9



### North Dakota Daily Oil Produced and Price



THOUGH I HAVEN'T COMPLETELY FIGURED OUT HYDRAULIC FRACKING AND OIL PRODUCTION...

SOMEBODY HAS AND IT HAS TURNED INTO KIND OF A BIG DEAL IN NORTH DAKOTA.

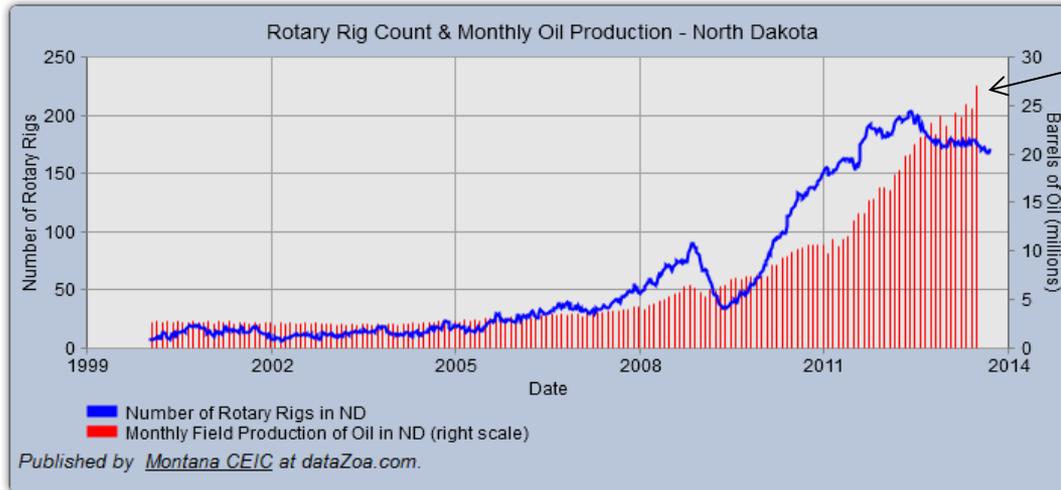
SOURCE: NORTH DAKOTA DEPARTMENT OF MINERAL RESOURCES, OIL AND GAS DIVISION

DOWNLOADED 10/18/2013

# HISTORIC MONTHLY OIL PRODUCTION

10

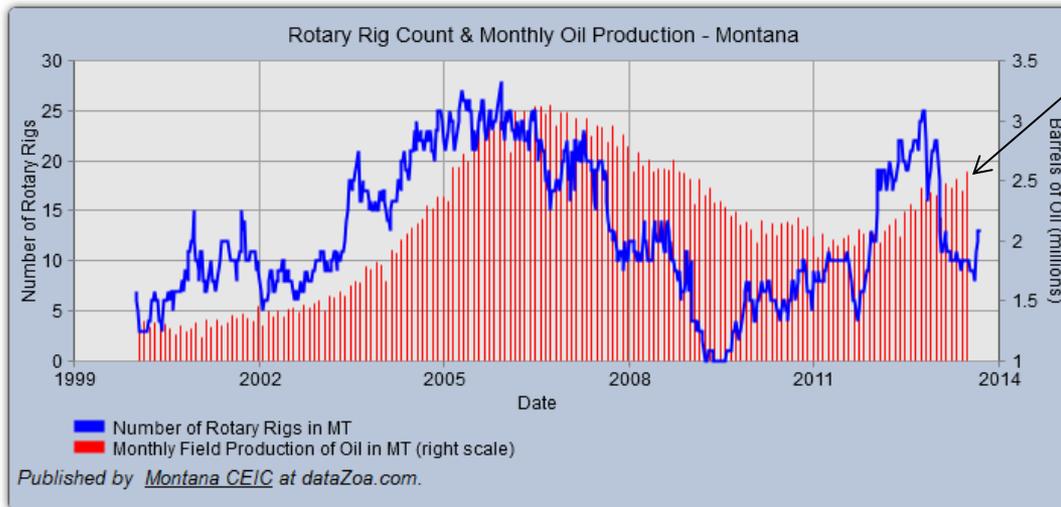
THESE GRAPHS ARE CURRENT THROUGH OCTOBER 2013



JULY 2013 ND PRODUCTION  
**27.11 MILLION BARRELS OF OIL**



THESE GRAPHS ARE NOT ON THE SAME SCALE...  
SOMETHING TO KEEP IN MIND FOR COMPARISON PURPOSES...



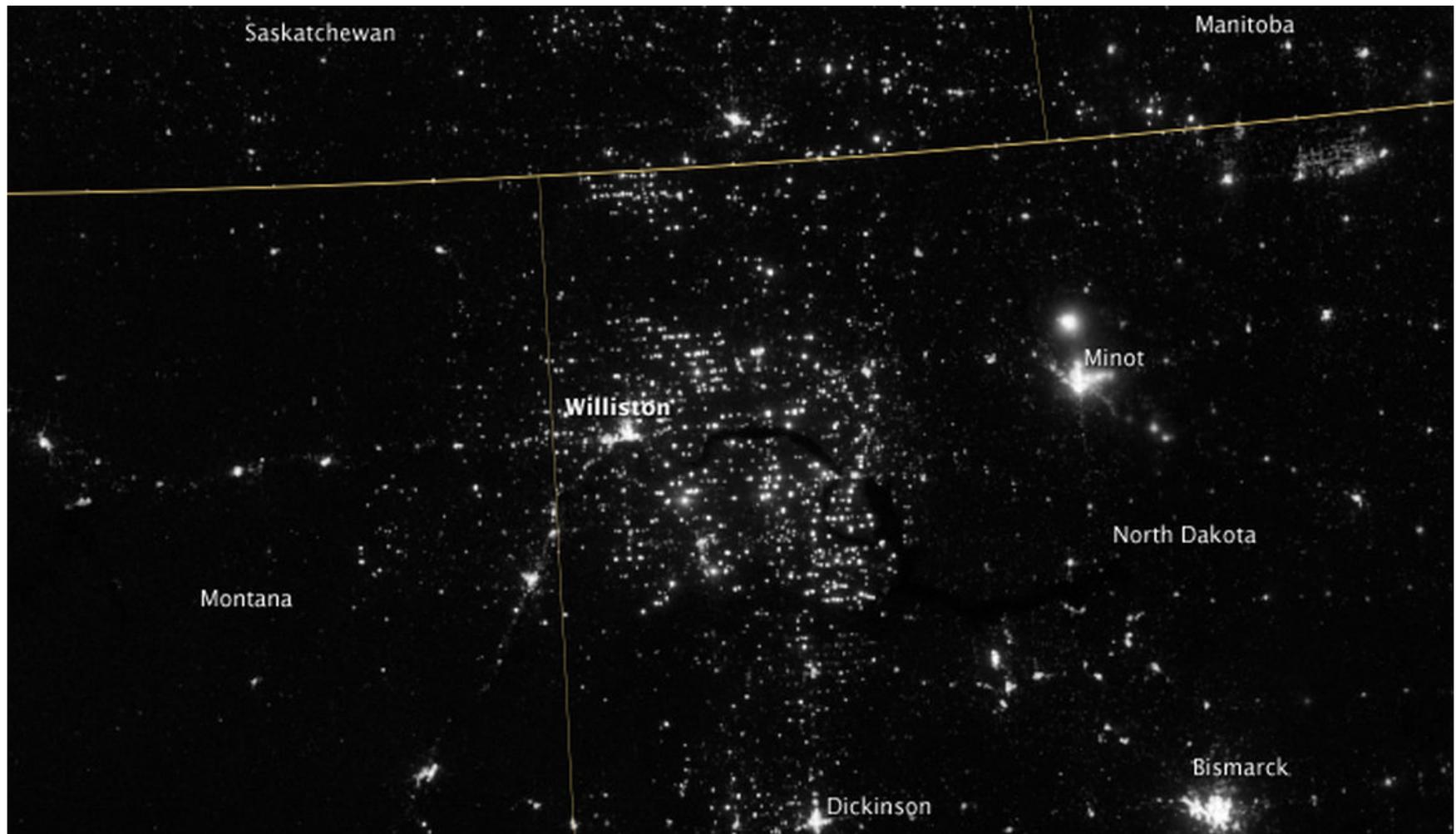
JULY 2013 MT PRODUCTION  
**2.58 MILLION BARRELS OF OIL**

CEIC PLUG:

THESE CHARTS ARE AVAILABLE IN REAL-TIME ON OUR WEBSITE

[http://ceic.mt.gov/Economics/OilAndGas\\_DataPage.aspx](http://ceic.mt.gov/Economics/OilAndGas_DataPage.aspx)

# NIGHTTIME SATELLITE IMAGE OF BAKKEN REGION



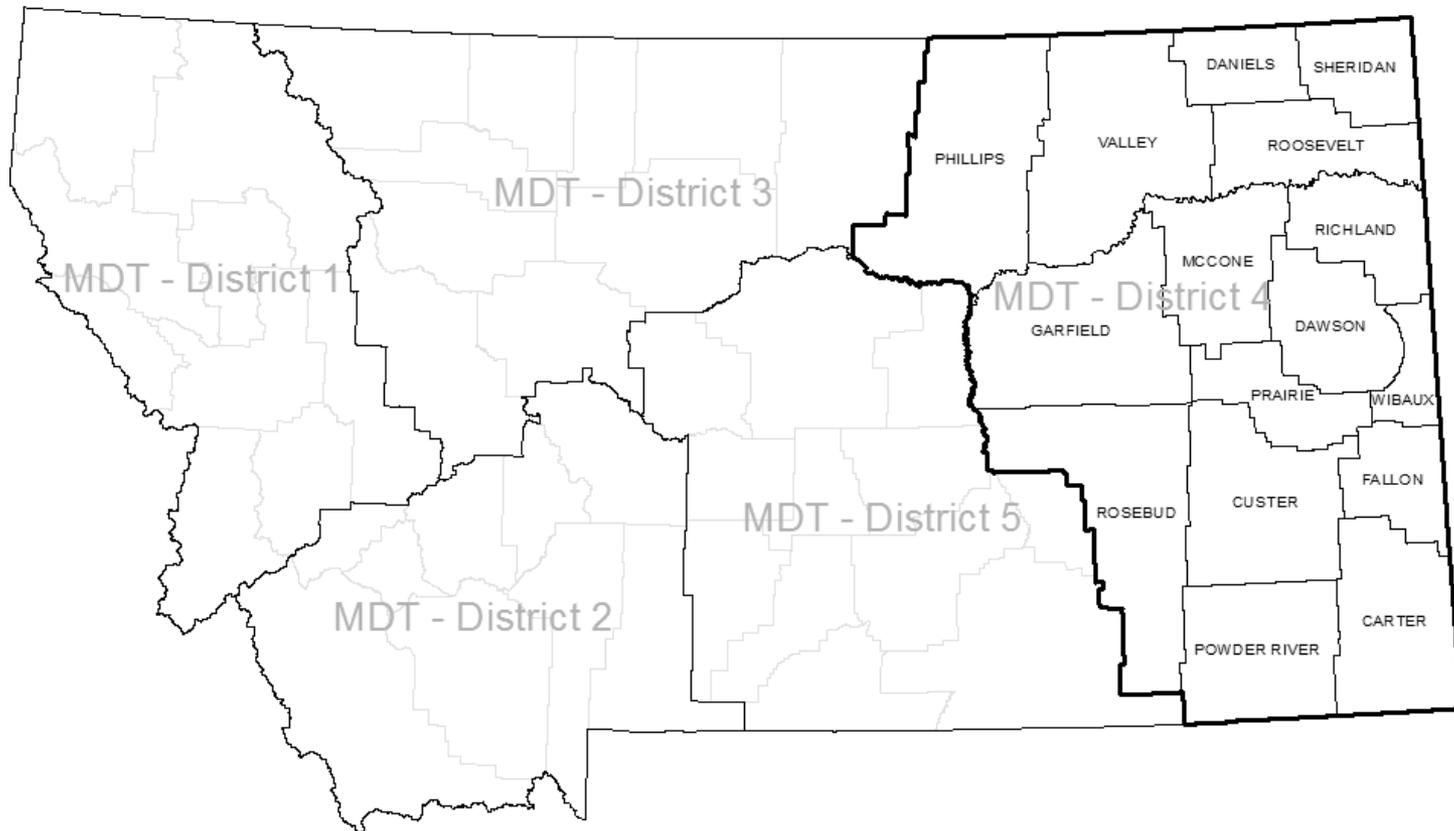
SOURCE: NASA EARTH OBSERVATORY [HTTP://EARTH OBSERVATORY.NASA.GOV/NATURALHAZARDS/VIEW.PHP?ID=79810](http://earthobservatory.nasa.gov/naturalhazards/view.php?id=79810)

THE LION'S SHARE OF THE BAKKEN OIL DEVELOPMENT IS IN WESTERN NORTH DAKOTA...HOWEVER, EASTERN MONTANA HAS SEEN OIL DEVELOPMENT AS WELL.

# MOVING ON... POPULATION

12

THE 16 EASTERN MONTANA COUNTY AREA IS DEFINED TO BE  
**“THE REGION”**



# DATA SOURCE & INFORMATION

13

THE POPULATION DATA USED IN THIS PRESENTATION IS FROM eREMI – A PRODUCT OF REGIONAL ECONOMIC MODELS, INC. (REMI)

- FIGURES FOR 1990 – 2010 ARE HISTORIC *ESTIMATES*
- FIGURES FOR 2011 – 2060 ARE PROJECTED ESTIMATES

NOTE – THE HISTORIC POPULATION NUMBERS PRESENTED HERE ARE **NOT** OFFICIAL CENSUS FIGURES...

THEY ARE MODELED ESTIMATES **BASED** ON HISTORIC DATA...

THESE HISTORIC FIGURES TRACK HISTORIC CENSUS POPULATION TRENDS AND PROVIDE A CONSISTENT TIME SERIES OF DEMOGRAPHIC CHARACTERISTICS MOVING FORWARD INTO THE FUTURE



# HISTORIC OVERVIEW OF THE REGION

## Historic Total Population

Montana Area	1990	2000	2010
Carter County	1,489	1,335	1,157
Custer County	11,684	11,678	11,710
Daniels County	2,246	2,005	1,750
Dawson County	9,410	9,050	8,939
Fallon County	3,070	2,816	2,891
Garfield County	1,584	1,268	1,185
McCone County	2,259	1,960	1,738
Phillips County	5,150	4,568	4,267
Powder River County	2,077	1,847	1,737
Prairie County	1,368	1,179	1,190
Richland County	10,640	9,619	9,753
Roosevelt County	10,958	10,623	10,458
Rosebud County	10,473	9,399	9,264
Sheridan County	4,692	4,078	3,383
Valley County	8,175	7,653	7,376
Wibaux County	1,189	1,072	1,002
<b>Total 16 County Region</b>	<b>86,464</b>	<b>80,150</b>	<b>77,800</b>

Source: eREMI historic estimates - Released April 2013

NOMINALLY SPEAKING, WE ARE DEALING WITH FAIRLY SMALL POPULATION FIGURES...

THIS MAY CREATE CONCERNS WITH OVER-EXAGGERATION OF RELATIVE TERMS SUCH AS “PCT. CHANGE” AND “PCT. GROWTH/DECLINE”

*Between 2010 and 2012, Richland County, MT was the 6<sup>th</sup> fastest growing (10.9%) county in the US of **all** counties with at least 10,000 people...*

**That’s a result of 1,064 people...**  
Source: Census Bureau Population Estimates

# HISTORIC OVERVIEW OF THE REGION

15

## Historic Total Population Change

Montana Area	Change 1990 - 2000			Change 2000 - 2010			Change 1990 - 2010		
	Nominal	Percent	Avg. Annual % Change	Nominal	Percent	Avg. Annual % Change	Nominal	Percent	Avg. Annual % Change
Carter County	-154	-10.3%	-1.03%	-178	-13.3%	-1.33%	-332	-22.3%	-1.11%
Custer County	-6	-0.1%	-0.01%	32	0.3%	0.03%	26	0.2%	0.01%
Daniels County	-241	-10.7%	-1.07%	-255	-12.7%	-1.27%	-496	-22.1%	-1.10%
Dawson County	-360	-3.8%	-0.38%	-111	-1.2%	-0.12%	-471	-5.0%	-0.25%
Fallon County	-254	-8.3%	-0.83%	75	2.7%	0.27%	-179	-5.8%	-0.29%
Garfield County	-316	-19.9%	-1.99%	-83	-6.5%	-0.65%	-399	-25.2%	-1.26%
McCone County	-299	-13.2%	-1.32%	-222	-11.3%	-1.13%	-521	-23.1%	-1.15%
Phillips County	-582	-11.3%	-1.13%	-301	-6.6%	-0.66%	-883	-17.1%	-0.86%
Powder River County	-230	-11.1%	-1.11%	-110	-6.0%	-0.60%	-340	-16.4%	-0.82%
Prairie County	-189	-13.8%	-1.38%	11	0.9%	0.09%	-178	-13.0%	-0.65%
Richland County	-1,021	-9.6%	-0.96%	134	1.4%	0.14%	-887	-8.3%	-0.42%
Roosevelt County	-335	-3.1%	-0.31%	-165	-1.6%	-0.16%	-500	-4.6%	-0.23%
Rosebud County	-1,074	-10.3%	-1.03%	-135	-1.4%	-0.14%	-1,209	-11.5%	-0.58%
Sheridan County	-614	-13.1%	-1.31%	-695	-17.0%	-1.70%	-1,309	-27.9%	-1.39%
Valley County	-522	-6.4%	-0.64%	-277	-3.6%	-0.36%	-799	-9.8%	-0.49%
Wibaux County	-117	-9.8%	-0.98%	-70	-6.5%	-0.65%	-187	-15.7%	-0.79%
<b>Total 16 County Region</b>	<b>-6,314</b>	<b>-7.3%</b>	<b>-0.73%</b>	<b>-2,350</b>	<b>-2.9%</b>	<b>-0.29%</b>	<b>-8,664</b>	<b>-10.0%</b>	<b>-0.50%</b>

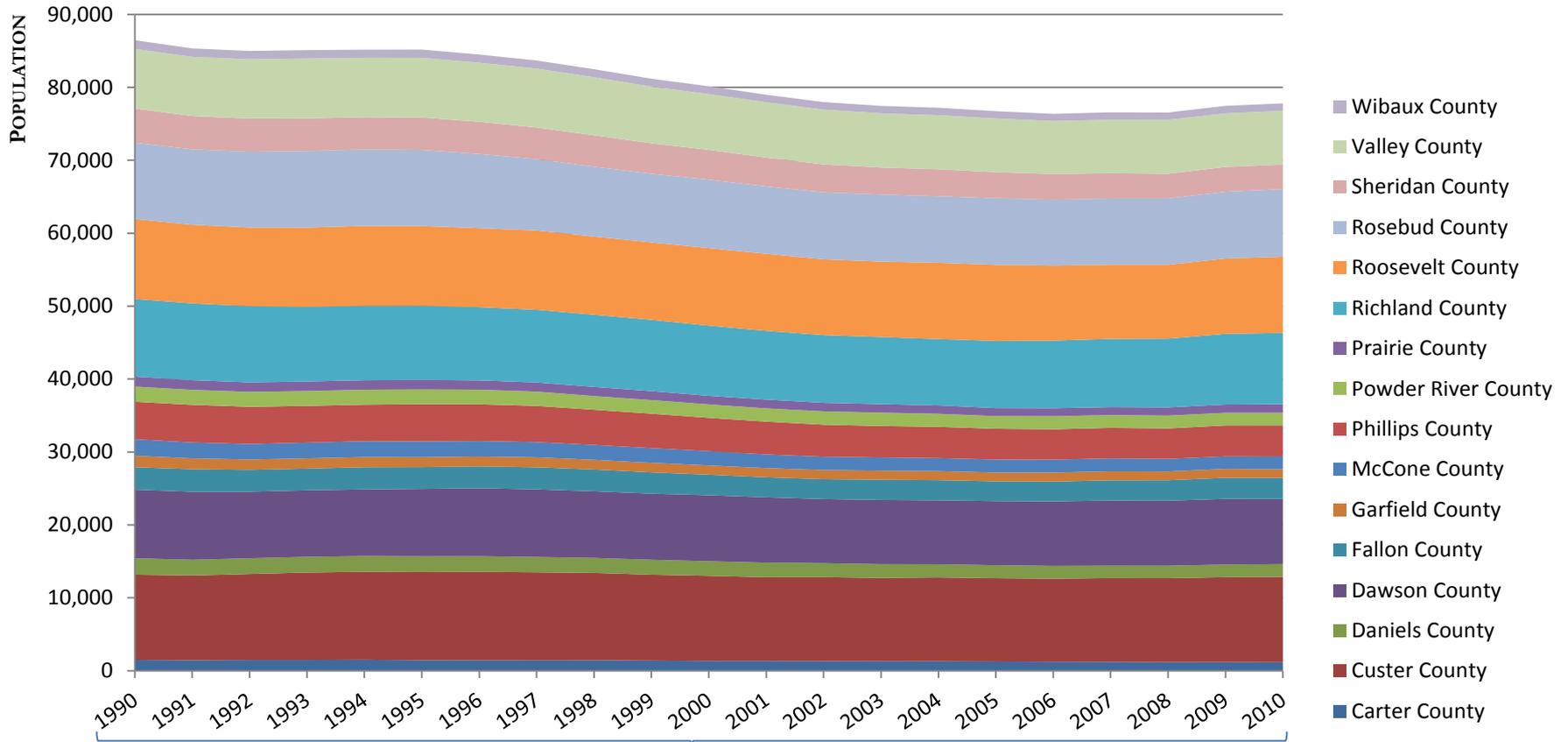
Source: eREMI historic estimates - Released April 2013

# HISTORIC OVERVIEW OF THE REGION

16

## HISTORIC TOTAL POPULATION - EASTERN MONTANA 16 COUNTY REGION, 1990 - 2010

SOURCE: EREMI HISTORIC ESTIMATES - RELEASED APRIL 2013



ERE MI - HISTORIC ESTIMATES

# SO WHAT NOW?

17



HISTORICALLY (1990 – 2010),  
GROWTH IN THE REGION HAS  
BEEN NEGATIVE...

WILL THAT CONTINUE INTO THE  
FUTURE? WHY DO WE CARE?



# IMPORTANCE OF POPULATION PROJECTIONS...

18

## PUBLIC & PRIVATE COMMUNITY PLANNING

### INFRASTRUCTURE INVESTMENTS

- POWER GENERATION & TRANSMISSION UTILITIES
- WATER & WASTEWATER TREATMENT UTILITIES
- TRANSPORTATION INFRASTRUCTURE SUCH AS ROADS & BRIDGES
- HOUSING & BUSINESS DEVELOPMENT



### SERVICE INVESTMENT

- POLICE PROTECTION
- FIRE PROTECTION
- EMT SERVICES
- HEALTH CARE SERVICES

ALONG WITH MANY OTHERS...



# HOW DO WE PREDICT FUTURE POPULATIONS?

19

## IN SHORT...

THE HISTORIC DECLINE IN POPULATION WITHIN THE REGION IS A PRODUCT OF NOT ENOUGH WORKING AGE PEOPLE BACKFILLING THE EXISTING POPULATION THAT ARE GROWING AGED IN PLACE.

LOOKING PURELY AT THE HISTORIC POPULATION TRENDS WITHIN THE REGION, MOST MODEL-BASED ESTIMATES WOULD, ON AVERAGE, PROJECT EASTERN MONTANA TO CONTINUE IN A DOWNWARD TAILSPIN INTO THE FUTURE....

HOWEVER, WE KNOW THAT IS JUST NOT THE CASE... WHY???

## OIL DEVELOPMENT OF THE BAKKEN



THAT HYDRAULIC FRACTURING SECTION IS STARTING TO COME FULL CIRCLE ISN'T IT...

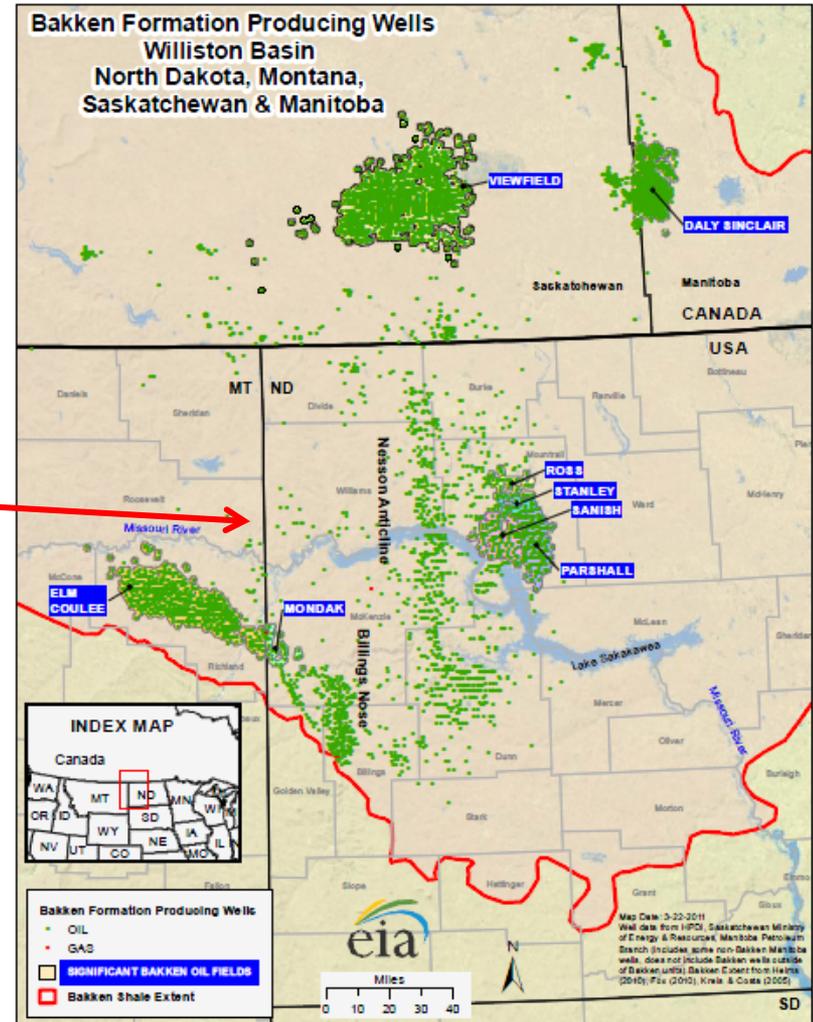
# A LITTLE CLOSER TO HOME...

20

*“When this boom hit, our town of 150 people went to 450 people in a very short time... Our school population was only 76 kids, and now it’s in the 165 range. Everything is going very fast.”*

- DENNIS PORTRA,  
MAYOR OF BAINVILLE

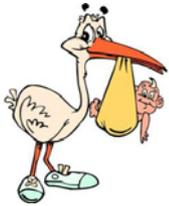
(Article by Jennifer Oldham *Bloomberg News* October 9, 2013)



# HOW DO WE PREDICT FUTURE POPULATIONS?

21

$$\textit{Total Population} = \textit{Births} - \textit{Deaths} + \textit{Net Migration}$$



**FROM A MODELING STAND-POINT...**

BIRTH & DEATH RATES ARE *RELATIVELY* STRAIGHTFORWARD TO ESTIMATE AND PROJECT FORWARD...



IN COMPARISON TO ESTIMATING NET MIGRATION WHICH TENDS TO BE THE STICKING POINT IN MODEL-BASED POPULATION PROJECTIONS...

***“WALL STREET INDICES PREDICTED NINE OUT OF THE LAST FIVE RECESSIONS!”*** – PAUL A. SAMUELSON (NEWSWEEK 1966)

# EREMI POPULATION PROJECTIONS

22

## Projected Total Population - eREMI

Montana Area	2015	2020	2025	2030	2035	2040
Carter County	1,295	1,388	1,456	1,480	1,455	1,403
Custer County	13,128	14,119	14,810	15,244	15,395	15,502
Daniels County	1,889	1,979	2,017	2,021	1,981	1,930
Dawson County	9,282	9,618	9,846	9,917	9,816	9,644
Fallon County	3,548	3,992	4,228	4,312	4,273	4,241
Garfield County	1,363	1,464	1,511	1,528	1,513	1,484
McCone County	1,871	1,955	2,003	2,005	1,968	1,913
Phillips County	4,290	4,276	4,256	4,234	4,156	4,038
Powder River County	1,818	1,846	1,869	1,882	1,859	1,793
Prairie County	1,291	1,394	1,465	1,486	1,457	1,409
Richland County	11,247	12,294	13,005	13,357	13,389	13,393
Roosevelt County	10,978	11,232	11,370	11,335	11,033	10,626
Rosebud County	9,293	9,399	9,497	9,413	9,016	8,463
Sheridan County	3,505	3,585	3,662	3,711	3,719	3,693
Valley County	7,841	8,074	8,171	8,178	8,093	7,938
Wibaux County	1,071	1,120	1,161	1,203	1,234	1,245
<b>Total 16 County Region</b>	<b>83,710</b>	<b>87,735</b>	<b>90,327</b>	<b>91,306</b>	<b>90,357</b>	<b>88,715</b>

Source: eREMI projected estimates - Released April 2013

# EREMI POPULATION PROJECTIONS

23

## Projected Total Population Change - eREMI

Montana Area	Change 2010 - 2020			Change 2020 - 2030			Change 2010 - 2030		
	Nominal	Percent	Avg. Annual % Change	Nominal	Percent	Avg. Annual % Change	Nominal	Percent	Avg. Annual % Change
Carter County	231	20.0%	2.00%	92	6.6%	0.66%	323	27.9%	1.40%
Custer County	2,409	20.6%	2.06%	1,125	8.0%	0.80%	3534	30.2%	1.51%
Daniels County	229	13.1%	1.31%	42	2.1%	0.21%	271	15.5%	0.77%
Dawson County	679	7.6%	0.76%	299	3.1%	0.31%	978	10.9%	0.55%
Fallon County	1,101	38.1%	3.81%	320	8.0%	0.80%	1421	49.2%	2.46%
Garfield County	279	23.5%	2.35%	64	4.4%	0.44%	343	28.9%	1.45%
McCone County	217	12.5%	1.25%	50	2.6%	0.26%	267	15.4%	0.77%
Phillips County	9	0.2%	0.02%	-42	-1.0%	-0.10%	-33	-0.8%	-0.04%
Powder River County	109	6.3%	0.63%	36	2.0%	0.20%	145	8.3%	0.42%
Prairie County	204	17.1%	1.71%	92	6.6%	0.66%	296	24.9%	1.24%
Richland County	2,541	26.1%	2.61%	1,063	8.6%	0.86%	3604	37.0%	1.85%
Roosevelt County	774	7.4%	0.74%	103	0.9%	0.09%	877	8.4%	0.42%
Rosebud County	135	1.5%	0.15%	14	0.1%	0.01%	149	1.6%	0.08%
Sheridan County	202	6.0%	0.60%	126	3.5%	0.35%	328	9.7%	0.48%
Valley County	698	9.5%	0.95%	104	1.3%	0.13%	802	10.9%	0.54%
Wibaux County	118	11.8%	1.18%	83	7.4%	0.74%	201	20.1%	1.00%
<b>Total 16 County Region</b>	<b>9,935</b>	<b>12.8%</b>	<b>1.28%</b>	<b>3,571</b>	<b>4.1%</b>	<b>0.41%</b>	<b>13506</b>	<b>17.4%</b>	<b>0.87%</b>

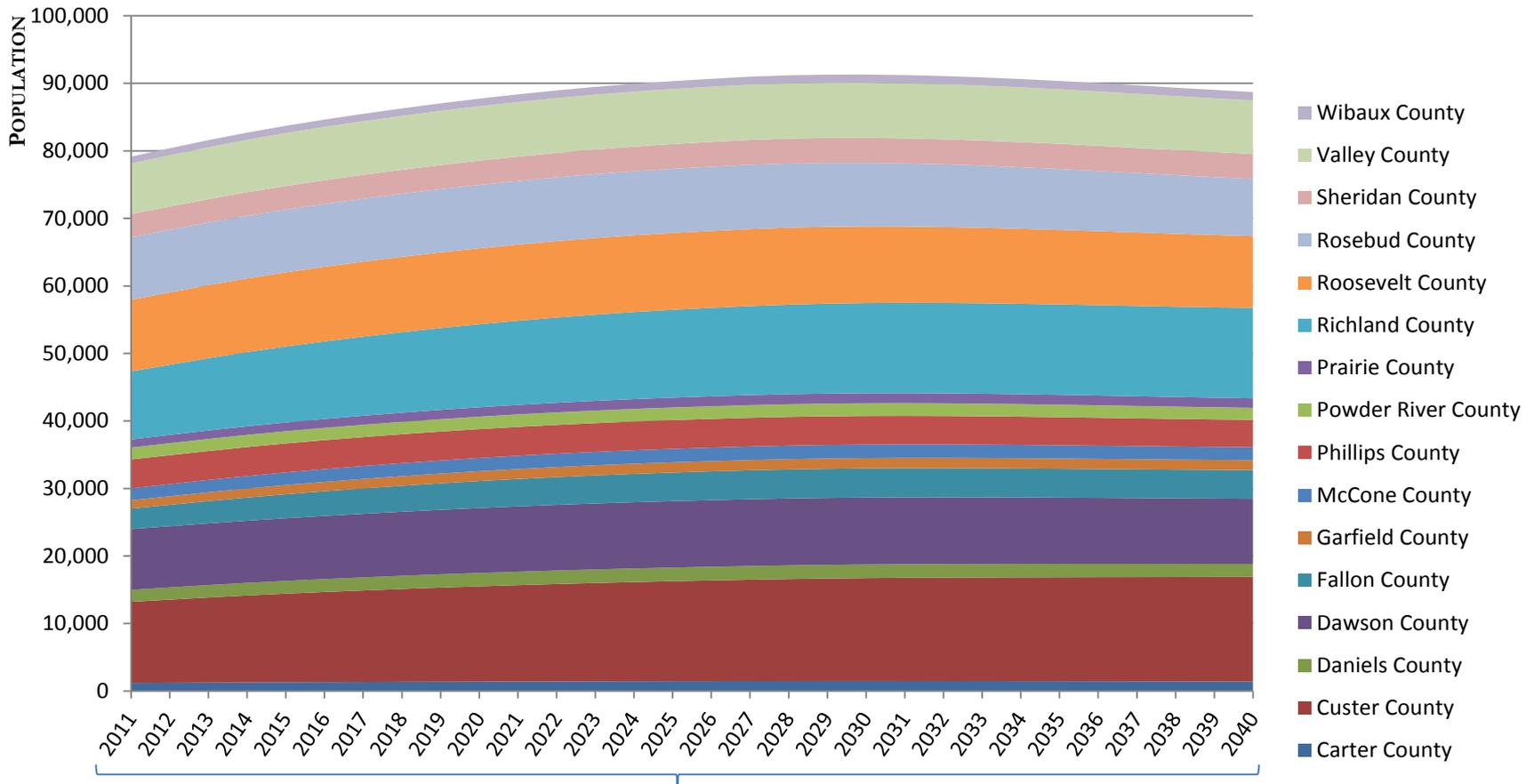
Source: eREMI projected estimates - Released April 2013

# EREMI PROJECTED POPULATION

24

## TOTAL PROJECTED POPULATION - EASTERN MONTANA 16 COUNTY REGION, 2011 - 2040

SOURCE: EREMI PROJECTED ESTIMATES - RELEASED APRIL 2013

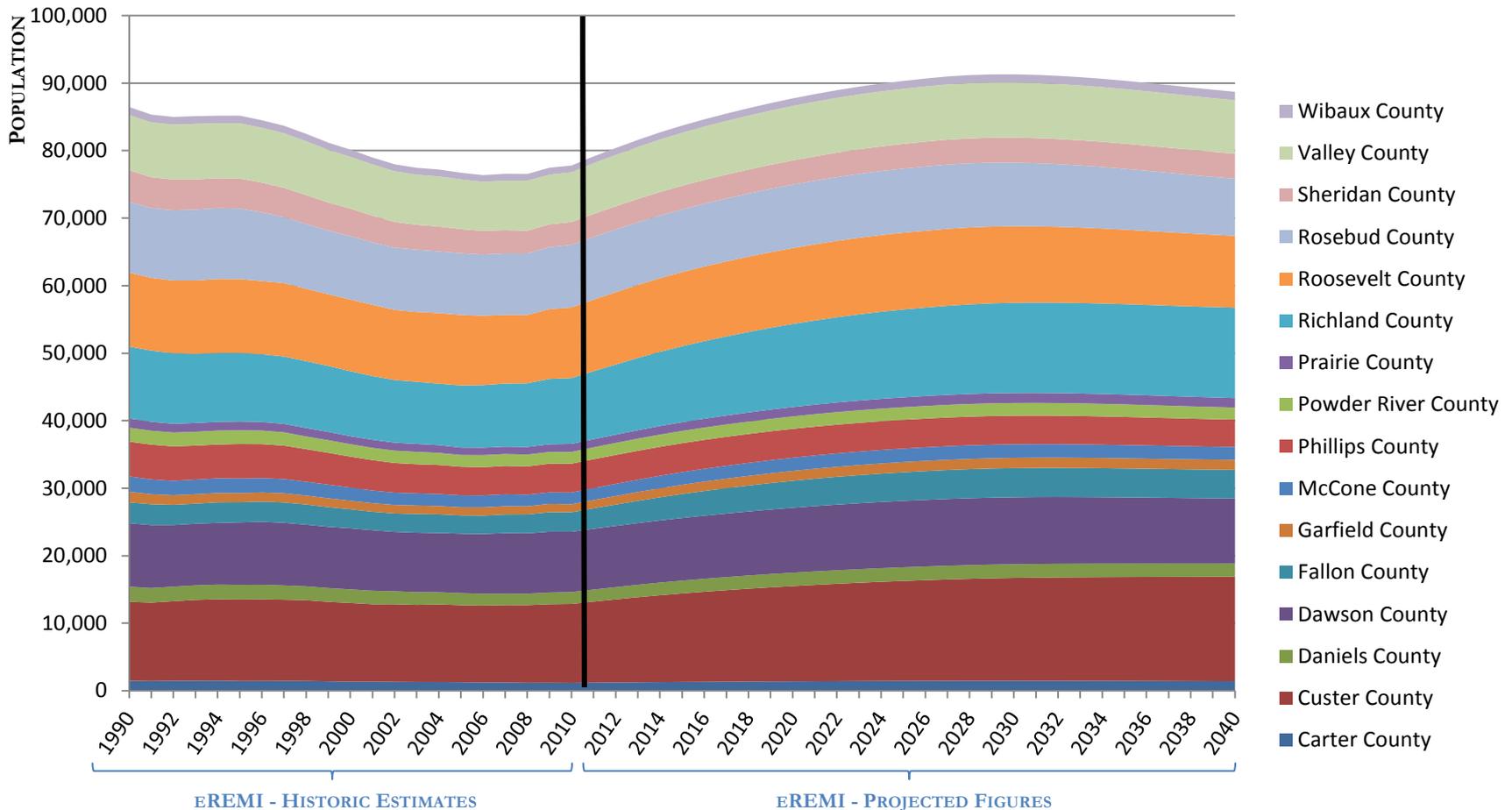


EREMI - PROJECTED FIGURES

# HISTORIC & PROJECTED POPULATION OF THE REGION

## TOTAL HISTORIC & PROJECTED POPULATION - EASTERN MONTANA 16 COUNTY REGION, 1990 - 2040

SOURCE: EREMI HISTORIC & PROJECTED ESTIMATES - RELEASED APRIL 2013



# EREMI POPULATION PROJECTIONS

26

## **GREAT!!!**

- EREMI HAS MANAGED TO PROJECT POPULATION FIGURES FOR ALL 16 EASTERN MONTANA COUNTIES PREDICTING GROWTH OVER THE NEXT 10 – 15 YEARS DESPITE HISTORIC TRENDS
- HOW DID THEY DO IT???
- LONG STORY SHORT... ECONOMIC IN-MIGRATION TO THE AREA DUE TO OIL DEVELOPMENT BOTH IN MT AND ND



# WHY CAN'T WE JUST BE HAPPY WITH EREMI?

27

## **SO WHY CAN'T WE JUST BE HAPPY WITH EREMI POPULATION PROJECTIONS FOR EASTERN MONTANA COUNTIES AND GO HOME?**

1. THERE IS SOME UNCERTAINTY AROUND FUTURE OIL DEVELOPMENT TRENDS IN EASTERN MONTANA WHICH CREATES UNCERTAINTY AROUND FUTURE POPULATION IN THE REGION;
2. AND, THE MONTANA DEPARTMENT OF TRANSPORTATION ALREADY HAD ESTIMATED TOTAL POPULATION FIGURES BASED ON THEIR OIL PRODUCTION SCENARIO PI+ ANALYSIS FOR THE REGION AND WAS WILLING TO SHARE THEM WITH US...

# WHY WE'RE HERE TODAY...

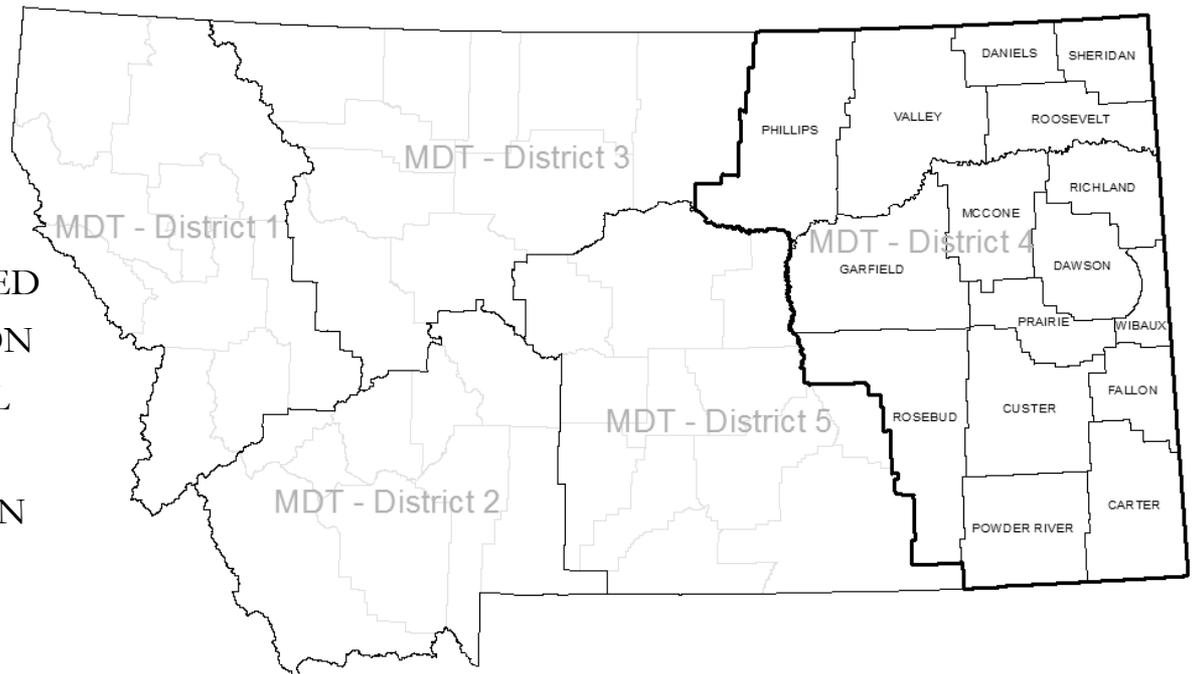
28



THE MONTANA DEPARTMENT OF TRANSPORTATION (MDT), PLANNING DIVISION HAS A 5-REGION REMI PI+ MODEL FOR THE STATE OF MONTANA...

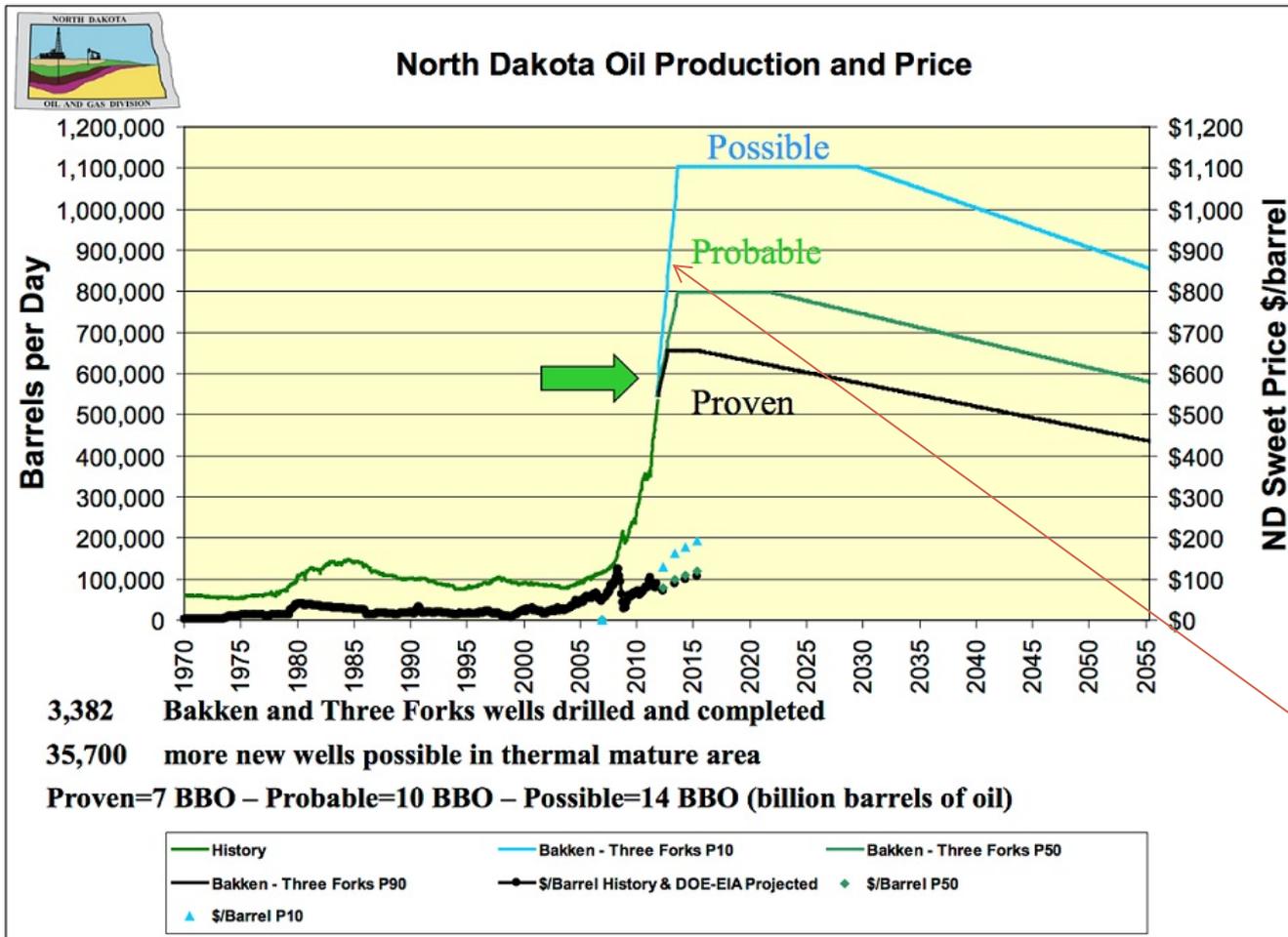
MDT LOOKED AT THE ESTIMATED IMPACTS TO MT TRANSPORTATION INFRASTRUCTURE *IF* FUTURE OIL DEVELOPMENT INCREASED TO VARYING LEVELS OF PRODUCTION IN EASTERN MONTANA.

MDT'S PLANNING DISTRICT 4 IS GEOGRAPHICALLY EQUAL TO "THE REGION"



# PROJECTED ND OIL PRODUCTION

29



THIS GRAPH IS SIMILAR TO ONE USED BY MDT... IT IS ALMOST A YEAR OLD, BUT IT SHOWS HOW ND'S OIL PRODUCTION HAS TRACKED FAIRLY WELL SINCE MDT MADE THEIR ASSUMPTIONS...

AS OF JULY 2013, ND WAS PRODUCING **876,000** BARRELS OF OIL PER DAY

# EREMI & MDT POPULATION PROJECTIONS

30

IN SHORT, MDT ESTIMATED 4 SCENARIOS OF HOW FUTURE OIL DEVELOPMENT *MAY LOOK* IN EASTERN MONTANA AND USED THEIR PI+ MODEL TO ESTIMATE THE IMPACTS FOR THE EASTERN MONTANA REGION – MOSTLY CONCERNED WITH TRANSPORTATION INFRASTRUCTURE.



I WAS NOT INVOLVED IN ANY OF THE ANALYSIS PROCESS AND THEREFORE, I DON'T HAVE A TOTALLY COMPREHENSIVE UNDERSTANDING OF ALL THAT WENT INTO THE ESTIMATES AND MODELING PROCESS.

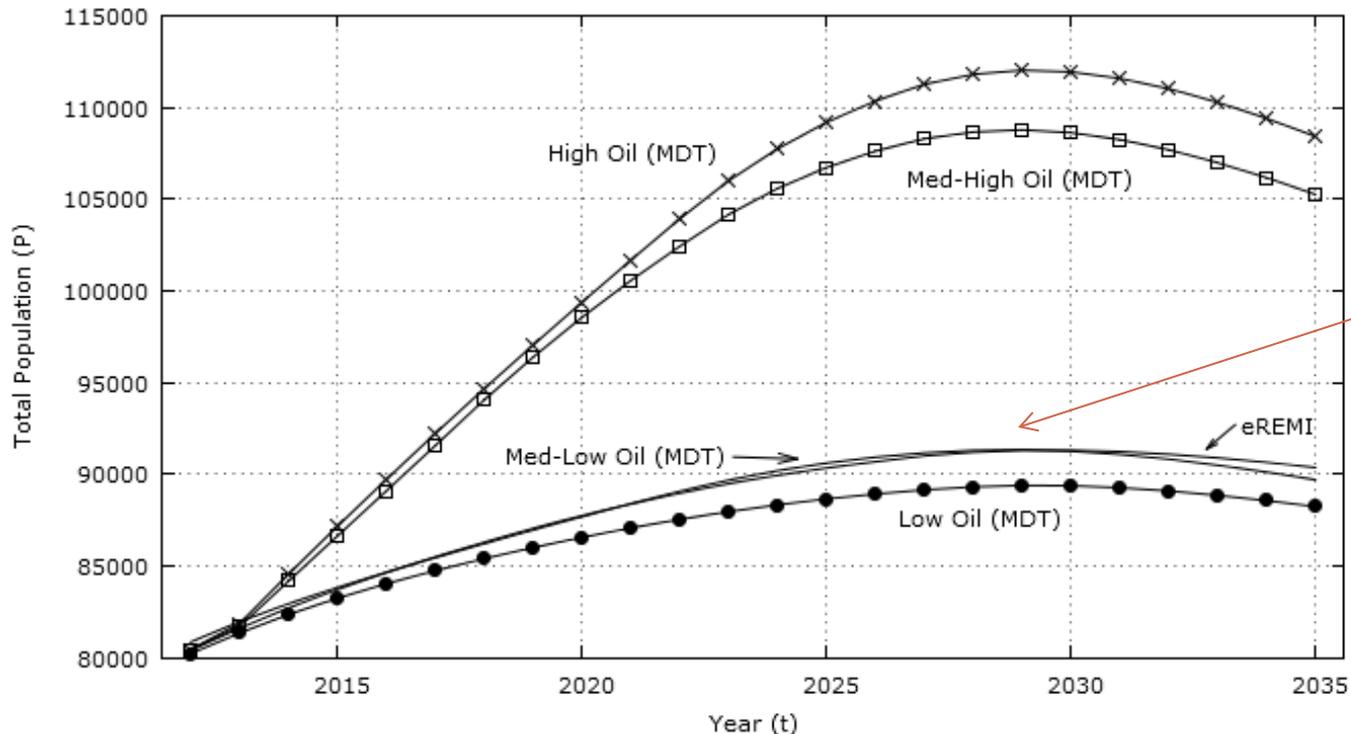
HOWEVER, I DO KNOW THE RESEARCHERS WHO DID THE WORK AND THEY ARE PHENOMENAL... TAKE MY WORD FOR IT.



*IMPACTS OF BAKKEN REGION OIL DEVELOPMENT ON  
MONTANA'S TRANSPORTATION AND ECONOMY - JAN 2013*

[www.mdt.mt.gov/other/research/external/docs/research\\_proj/oil\\_boom/TRANSPORTATION-ECONOMY\\_IMPACTS.pdf](http://www.mdt.mt.gov/other/research/external/docs/research_proj/oil_boom/TRANSPORTATION-ECONOMY_IMPACTS.pdf)

Total Projected Population for Eastern Montana 16 County Region (MDT Region #4)



LOOK AT THAT!

<b><i>High Oil (MDT)</i></b>	Represents the total projected population for the 16 eastern MT county Region based on MDT’s highest level of oil production scenario
<b><i>Med-High Oil (MDT)</i></b>	Represents the total projected population for the 16 eastern MT county Region based on MDT’s medium-high level of oil production scenario
<b><i>Med-Low Oil (MDT)</i></b>	Represents the total projected population for the 16 eastern MT Region based on MDT’s medium-low level of oil production scenario
<b><i>eREMI</i></b>	Represents the total projected population for the 16 eastern MT Region as estimated by eREMI
<b><i>Low Oil (MDT)</i></b>	Represents the total projected population for the 16 eastern MT Region based on MDT’s lowest level of oil production scenario

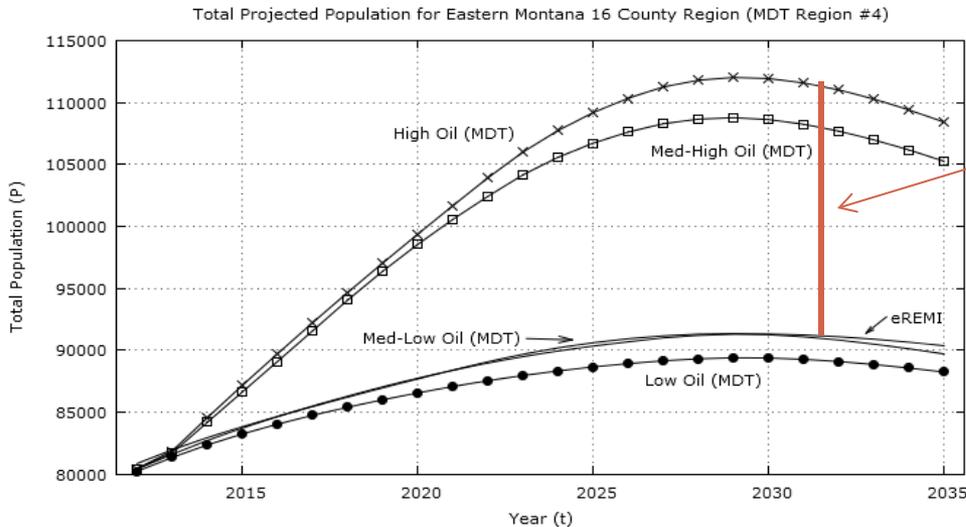
# SO... WHAT ARE WE TRYING TO DO?

32

## THE GOAL



- Allocate the difference between the total population for the Region projected by MDT's oil scenario PI+ analysis and eREMI to each of the 16 respective counties for each year 2012 - 2035



$diffTP_{HighOil-eREMI_t}$

$$diffTP_{HighOil-eREMI_t} = TP_{HighOil}_t - TP_{eREMI}_t$$

$diffTP_{HighOil-eREMI_t}$

is equal to the difference in total population projected for the Region between MDT's highest level of potential oil production scenario and eREMI

# MATH...

33

## CONSIDERATIONS

- EACH OF THE 16 COUNTIES THAT MAKE UP THE REGION DIFFERS IN THEIR OVERALL SIZE – SOME COUNTIES HAVE LARGER POPULATIONS THAN OTHERS.
- THEREFORE, THE TOTAL POPULATION OF THE REGION AS ESTIMATED BY eREMI ( $TP\_eREMI_t$ ) IS DISPROPORTIONALLY MADE UP OF THE SUM OF THE 16 COUNTY POPULATIONS



Such That:  $TP\_eREMI_t$

is equal to the total population of the Region in year  $t$  based on eREMI projection estimates

$P\_eREMI_{Ci_t}$

is equal to the total population of county  $Ci$  in year  $t$  as estimated by eREMI

$$TP\_eREMI_t = \sum_{Ci=1}^{16} P\_eREMI_{Ci_t}$$

# MATH...

34

## CONSIDERATIONS



- EACH OF THE 16 COUNTIES THAT MAKE UP THE REGION DIFFERS IN THEIR OVERALL SIZE – SOME COUNTIES HAVE LARGER POPULATIONS THAN OTHERS.
- TO ACCOUNT FOR THE RELATIVE MAGNITUDE (I.E. POPULATION SHARE) OF EACH OF THE 16 COUNTIES WITH RESPECT TO THE REGION AS A WHOLE IN YEAR  $T$ , THE SHARE OF EACH COUNTY'S TOTAL POPULATION OF THE REGIONS IS USED AS A WEIGHT FOR ALLOCATION.

$$shareP\_eREMI_{Ci_t} = \frac{P\_eREMI_{Ci_t}}{TP\_eREMI_t}$$

Such That:  $shareP\_eREMI_{Ci_t}$  is equal to the county  $Ci$ 's share of the total population for the Region in year  $t$  as estimated by eREMI



$$\sum_{Ci=1}^{16} shareP\_eREMI_{Ci_t} = 1$$

# MORE MATH...

35

## FINAL FUNCTIONAL FORM

$$P_{HighOil}_{ci_t} = (shareP_{eREMI}_{ci_t} * diffP_{HighOil-eREMI_t}) + P_{eREMI}_{ci_t}$$

Such That:  $P_{HighOil}_{ci_t}$  is equal to the total population of county  $i$  in year  $t$  based on MDT's high level of oil production scenario

BY USING A WEIGHTING FACTOR BASED ON EACH COUNTY'S PROPORTIONAL SHARE OF THE REGION'S TOTAL POPULATION *IN EACH YEAR T* AS ESTIMATED BY eREMI ( $shareP_{eREMI}_{ci_t}$ ), DIFFERENCES IN GROWTH TRENDS BETWEEN COUNTIES RELATIVE TO THE OVERALL GROWTH OF THE REGION ARE IMPLICITLY ACCOUNTED FOR OVER TIME.

OBVIOUSLY, WE'RE ASSUMING eREMI ESTIMATED THE COUNTY-SPECIFIC GROWTH RATES CORRECTLY YEAR OVER YEAR...

ESSENTIALLY, ALL WE'RE DOING HERE IS INCREASING THE MAGNITUDE OF THE CHANGE WHILE ASSUMING THE GROWTH RATE eREMI PROJECTS, RELATIVE TO THE REGION, REMAINS UNCHANGED.

# RESULTS...

36

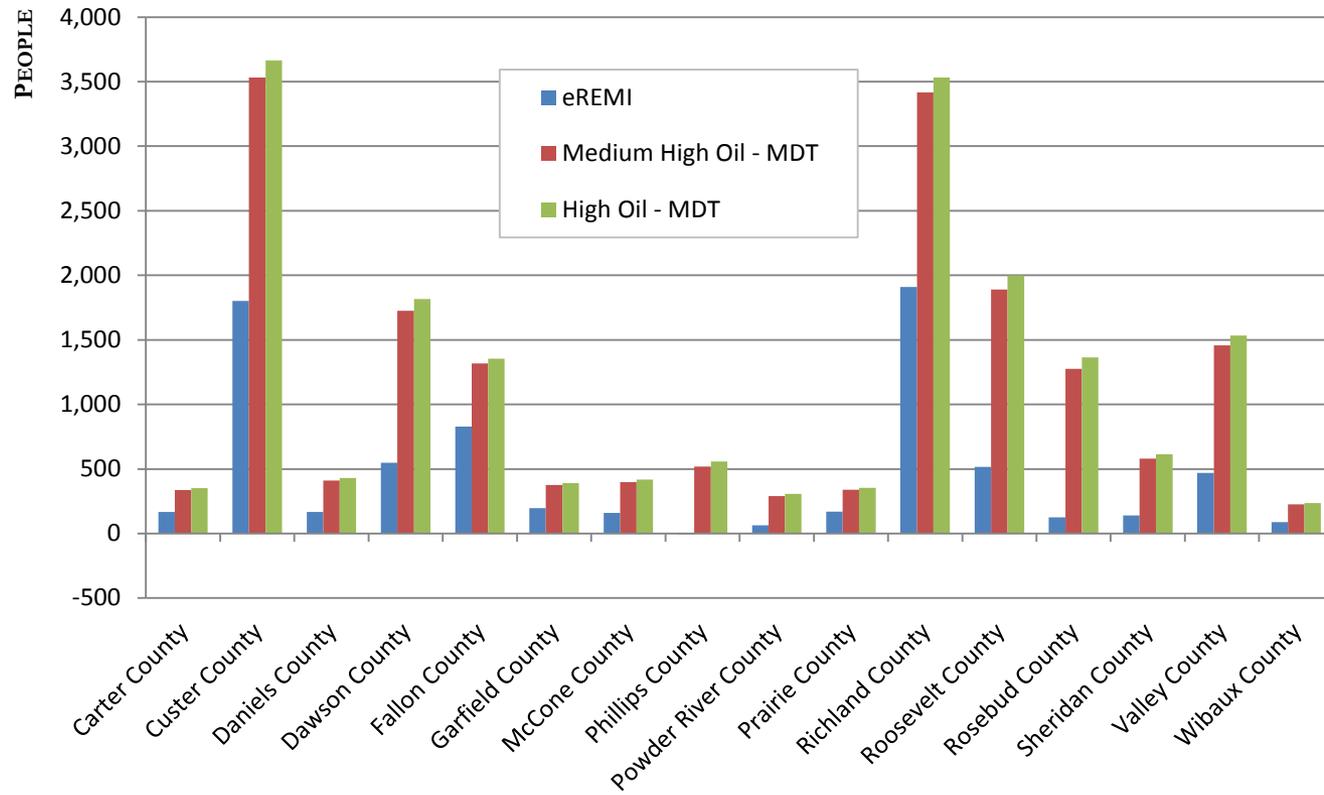
Montana County	Total Population Change 2012 - 2020								
	eREMI			Medium High Oil Production (MDT)			High Oil Production (MDT)		
	Number	Percent	Avg. Annual % Change	Number	Percent	Avg. Annual % Change	Number	Percent	Avg. Annual % Change
Carter County	168	13.8%	1.7%	338	27.7%	3.5%	351	28.8%	3.6%
Custer County	1,802	14.6%	1.8%	3,531	28.6%	3.6%	3,665	29.7%	3.7%
Daniels County	168	9.3%	1.2%	410	22.6%	2.8%	429	23.7%	3.0%
Dawson County	548	6.0%	0.8%	1,725	19.0%	2.4%	1,816	20.0%	2.5%
Fallon County	828	26.2%	3.3%	1,317	41.6%	5.2%	1,355	42.8%	5.3%
Garfield County	197	15.5%	1.9%	376	29.7%	3.7%	390	30.8%	3.8%
McCone County	159	8.9%	1.1%	398	22.2%	2.8%	417	23.2%	2.9%
Phillips County	-5	-0.1%	0.0%	518	12.1%	1.5%	559	13.0%	1.6%
Powder River County	64	3.6%	0.4%	290	16.3%	2.0%	307	17.2%	2.2%
Prairie County	169	13.8%	1.7%	340	27.7%	3.5%	353	28.8%	3.6%
Richland County	1,911	18.4%	2.3%	3,417	32.9%	4.1%	3,533	34.0%	4.3%
Roosevelt County	516	4.8%	0.6%	1,891	17.6%	2.2%	1,997	18.6%	2.3%
Rosebud County	126	1.4%	0.2%	1,276	13.8%	1.7%	1,365	14.7%	1.8%
Sheridan County	141	4.1%	0.5%	580	16.8%	2.1%	614	17.8%	2.2%
Valley County	470	6.2%	0.8%	1,458	19.2%	2.4%	1,535	20.2%	2.5%
Wibaux County	89	8.6%	1.1%	226	21.9%	2.7%	237	22.9%	2.9%
<b>Total - 16 County Region</b>	<b>7,351</b>	<b>9.1%</b>	<b>1.1%</b>	<b>18,092</b>	<b>22.5%</b>	<b>2.8%</b>	<b>18,923</b>	<b>23.5%</b>	<b>2.9%</b>

# RESULTS...

37

## TOTAL PROJECTED POPULATION CHANGE 2012 – 2020

(NOMINAL CHANGE – PEOPLE)



# RESULTS...

38

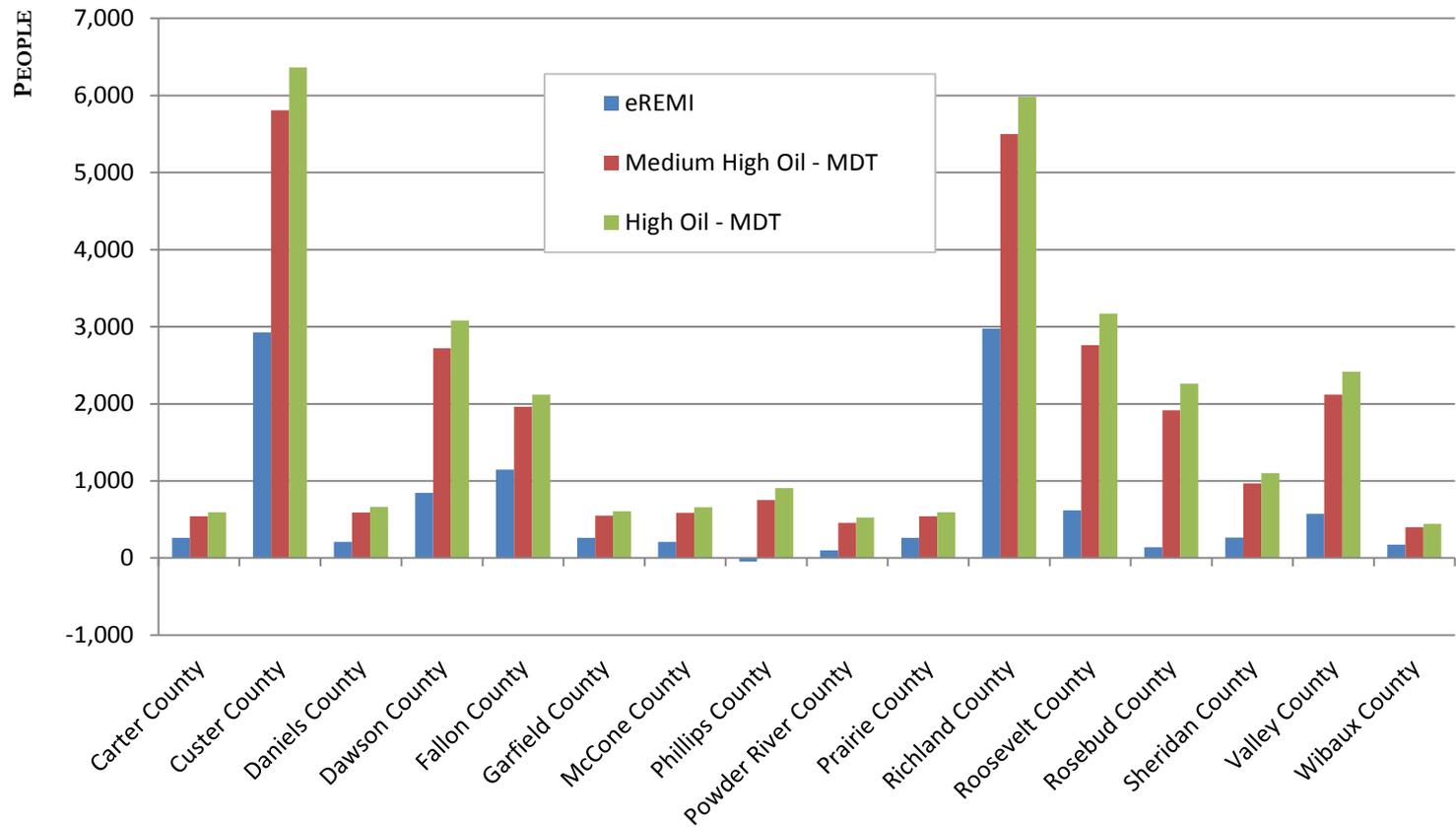
Montana County	Total Population Change 2012 - 2030								
	eREMI			Medium High Oil Production (MDT)			High Oil Production (MDT)		
	Number	Percent	Avg. Annual % Change	Number	Percent	Avg. Annual % Change	Number	Percent	Avg. Annual % Change
Carter County	260	21.3%	1.2%	540	44.2%	2.5%	593	48.6%	2.7%
Custer County	2,927	23.8%	1.3%	5,807	47.1%	2.6%	6,362	51.6%	2.9%
Daniels County	210	11.6%	0.6%	592	32.6%	1.8%	665	36.7%	2.0%
Dawson County	847	9.3%	0.5%	2,720	30.0%	1.7%	3,081	33.9%	1.9%
Fallon County	1,148	36.3%	2.0%	1,963	62.0%	3.4%	2,120	67.0%	3.7%
Garfield County	261	20.6%	1.1%	550	43.4%	2.4%	605	47.7%	2.7%
McCone County	209	11.6%	0.6%	588	32.7%	1.8%	661	36.8%	2.0%
Phillips County	-47	-1.1%	-0.1%	752	17.6%	1.0%	906	21.2%	1.2%
Powder River County	100	5.6%	0.3%	455	25.5%	1.4%	524	29.4%	1.6%
Prairie County	261	21.3%	1.2%	542	44.2%	2.5%	596	48.6%	2.7%
Richland County	2,974	28.6%	1.6%	5,498	52.9%	2.9%	5,984	57.6%	3.2%
Roosevelt County	619	5.8%	0.3%	2,759	25.7%	1.4%	3,172	29.6%	1.6%
Rosebud County	140	1.5%	0.1%	1,917	20.7%	1.1%	2,260	24.4%	1.4%
Sheridan County	267	7.8%	0.4%	968	28.1%	1.6%	1,103	32.0%	1.8%
Valley County	574	7.5%	0.4%	2,118	27.8%	1.5%	2,416	31.8%	1.8%
Wibaux County	172	16.7%	0.9%	399	38.7%	2.1%	443	42.9%	2.4%
<b>Total - 16 County Region</b>	<b>10,922</b>	<b>13.6%</b>	<b>0.8%</b>	<b>28,168</b>	<b>35.0%</b>	<b>1.9%</b>	<b>31,491</b>	<b>39.1%</b>	<b>2.2%</b>

# RESULTS...

39

## TOTAL PROJECTED POPULATION CHANGE 2012 – 2030

(NOMINAL CHANGE – PEOPLE)



# RESULTS...

40

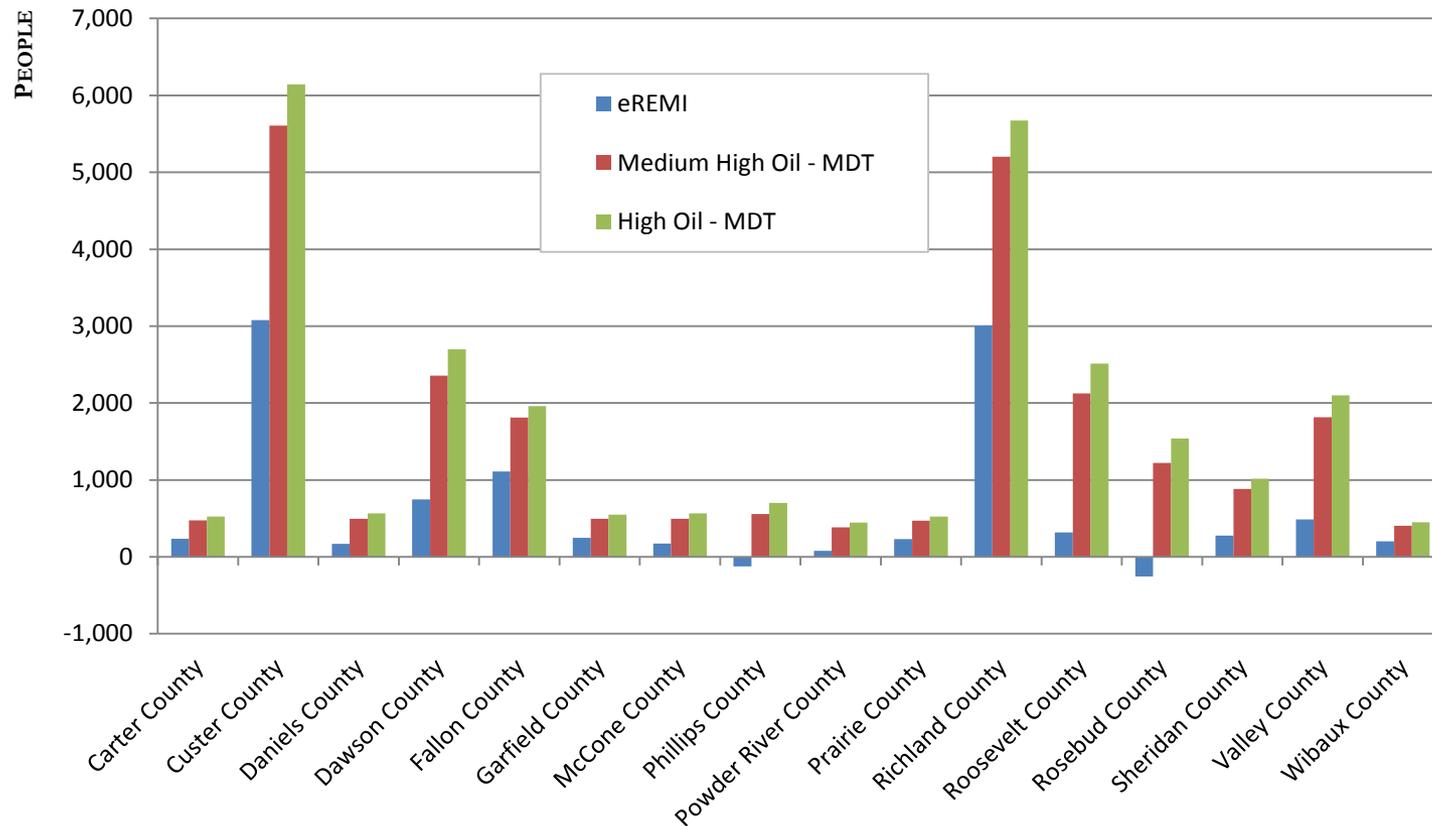
Montana County	Total Population Change 2012 - 2035								
	eREMI			Medium High Oil Production (MDT)			High Oil Production (MDT)		
	Number	Percent	Avg. Annual % Change	Number	Percent	Avg. Annual % Change	Number	Percent	Avg. Annual % Change
Carter County	235	19.3%	0.8%	474	38.8%	1.7%	525	43.0%	1.9%
Custer County	3,078	25.0%	1.1%	5,605	45.5%	2.0%	6,145	49.9%	2.2%
Daniels County	170	9.4%	0.4%	495	27.3%	1.2%	564	31.1%	1.4%
Dawson County	746	8.2%	0.4%	2,356	26.0%	1.1%	2,700	29.8%	1.3%
Fallon County	1,109	35.1%	1.5%	1,811	57.2%	2.5%	1,960	61.9%	2.7%
Garfield County	246	19.4%	0.8%	494	39.0%	1.7%	547	43.2%	1.9%
McCone County	172	9.6%	0.4%	495	27.5%	1.2%	564	31.4%	1.4%
Phillips County	-125	-2.9%	-0.1%	556	13.0%	0.6%	702	16.4%	0.7%
Powder River County	77	4.3%	0.2%	382	21.4%	0.9%	447	25.1%	1.1%
Prairie County	232	18.9%	0.8%	471	38.4%	1.7%	522	42.6%	1.9%
Richland County	3,006	29.0%	1.3%	5,204	50.1%	2.2%	5,673	54.6%	2.4%
Roosevelt County	317	3.0%	0.1%	2,127	19.8%	0.9%	2,513	23.4%	1.0%
Rosebud County	-257	-2.8%	-0.1%	1,221	13.2%	0.6%	1,538	16.6%	0.7%
Sheridan County	275	8.0%	0.3%	885	25.7%	1.1%	1,015	29.5%	1.3%
Valley County	489	6.4%	0.3%	1,817	23.9%	1.0%	2,100	27.6%	1.2%
Wibaux County	203	19.7%	0.9%	406	39.3%	1.7%	449	43.5%	1.9%
<b>Total - 16 County Region</b>	<b>9,973</b>	<b>12.4%</b>	<b>0.5%</b>	<b>24,798</b>	<b>30.8%</b>	<b>1.3%</b>	<b>27,966</b>	<b>34.8%</b>	<b>1.5%</b>

# RESULTS...

41

## TOTAL PROJECTED POPULATION CHANGE 2012 – 2035

(NOMINAL CHANGE – PEOPLE)



# OBVIOUS ISSUES...

42



## ARE THESE PERFECT.... No.

- THERE APPEARS TO BE A BIAS OF OVER ALLOCATION TO MORE POPULATED COUNTIES...
  - BUT, AN ARGUMENT COULD BE MADE THAT GROWTH WILL HAPPEN AROUND “URBAN CENTER” VS. AREAS WITH NO PRE-EXISTING POPULATION AREAS
- NO MORE DETAIL ON DEMOGRAPHIC CHARACTERISTICS ARE EXPLORED SUCH AS THE GENDER AND AGE BREAKDOWN
  - WE HAVE TO CONSIDER THE FACT THAT WE’RE WORKING WITH ESTIMATES UPON ESTIMATES UPON ESTIMATES...
  - WE DON’T HAVE A CRYSTAL BALL IN THE CLOSET

# Take Away...

43

## **THE TAKE AWAY...**

- THESE SUPPLEMENTARY TOTAL POPULATION PROJECTIONS PROVIDE SOME INSIGHT INTO THE POTENTIAL TRENDS THAT MAY BE REALIZED OVER THE NEXT FEW YEARS IF OIL DEVELOPMENT DOES ACCELERATE IN EASTERN MONTANA

## **OTHER CONSIDERATIONS NOT ADDRESSED...**

- THESE POPULATION FIGURES – LIKE MOST OTHERS – ATTEMPT TO QUANTIFY RESIDENT POPULATION ONLY
  - TRANSIENT POPULATIONS ARE NOT TAKEN INTO ACCOUNT HERE, AND THEREFORE THESE FIGURERS PROBABLY UNDERESTIMATE THE TOTAL NUMBER OF “BOOTS ON THE GROUND” IN THESE AREAS

# QUESTIONS???

44

## CONTACT INFORMATION

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