

# **<sup>AV</sup>Wasatch - Green River Resource Play, Uinta Basin, Utah\***

**John Roesink<sup>1</sup> and Jason Anderson<sup>1</sup>**

Search and Discovery Article #110167 (2013)\*\*

Posted August 12, 2013

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<sup>1</sup>Bill Barrett Corporation, Denver, CO ([jroesink@me.com](mailto:jroesink@me.com))

## **Conclusions**

- The Tertiary Wasatch/Green River System in the Uinta Basin presents distinct challenges and opportunities for operators.
- Geographic Limits of the play are not fully understood, even 60 years into development.
- Improving technology in Drilling and Completions continues to open up new opportunities if we know where to look.
- Persistence through business cycles creates opportunity on the uptick.

## **References Cited**

Fouch, T.D., 1975, Lithofacies and related hydrocarbon accumulations in Tertiary strata of the western and central Uinta Basin, Utah, *in* D.W. Bolyard, ed., Symposium on Deep drilling frontiers in the central Rocky Mountains: Rocky Mtn. Assoc. Geologists, p. 163-173.

Franczyk, K.J., J.K. Pitman, W.B. Cashion, J.R. Dyni, T.D. Fouch, R.C. Johnson, M.A. Chan, J.R. Donnell, T.F. Lawton, and R.R. Remy, 1989, Evolution of resource-rich foreland and intermontane basins in eastern Utah and western Colorado, *in* P.M. Hanshaw, (ed.), 28<sup>th</sup> International Geological Congress Field Trip Guidebook: Washington, D.C., American Geophysical Union, 53 p.

Morgan, C.D., T.C. Chidsey, Jr., K.P. McClure, S.R. Bereskin, and M.D. Deo, 2003, Reservoir characterization of the Lower Green River Formation, Uinta Basin, Utah: Utah Geological Survey Open-File Report 411, 142 p.

## **Website**

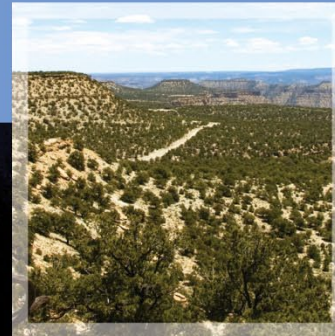
Blakey, R., 2013, Paleogeographic Maps: Colorado Plateau Geosystems, Inc. Website accessed July 26, 2013.  
[http://cpgeosystems.com/ColoPlat\\_Eocene\\_GreenRiver.jpg](http://cpgeosystems.com/ColoPlat_Eocene_GreenRiver.jpg)



**Bill Barrett Corporation**

# Wasatch-Green River Resource Play *Uinta Basin, Utah*

John Roesink and Jason Anderson  
AAPG 2013 Annual Convention  
Discovery Thinking Forum  
5.20.2013





## Play Overview

- Wasatch/Green River Oil Play Covers Approximately 1,500 sq mi
- Multi-Stacked Resource Play - Spacing Ranges from 40-160 acre Development
- Mix of Tribal, Federal, State and Fee Leases and Surface Ownership
- Established Infrastructure with New Markets Being Opened by Rail
- Landowners and State Regulators have Positive Relationships with Industry and are Receptive to Development by Responsible Operators

	BTR/LC	UB HRZ	So Alta	EB
	Western		Central	Eastern
IP Range	200-600 bopd	500-1000 bopd	600-1200 bopd	100-300 bopd
EUR Range	200-800 MBOE	150-300 MBOE	400-1000 MBOE	150-250 MBOE
D&C Cost	\$3,000 – 4,000 M	\$5,500 M	\$5,000 – 6,000 M	\$3,000 – 4,000 M



# Acknowledgements

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## At BBC:

- Terry Barrett, Anna Young, Justin Pivik, John Conner, Dan Pritchard

## Formerly at Bill Barrett Corporation and/or Barrett Resources:

- Kurt Reinecke, Roy Roux, Fred Barrett, Ric Kopp

## Colleagues in the Basin:

- NFX - Steve Adams, Nate Gilbertson, Brice Caldes
- BRY – Jeff Ehrenzeller, Julie Pyle
- EP – Ron Schneider
- QEP – Bob Basse
- Colorado Mesa University - Rex Cole
- Utah Geologic Survey – Michael van den Berg
- Geofuels – Alan Carroll





# Forward-Looking & Other Cautionary Statements

Acreage and reserve figures are presented as of year-end 2011. Current production is December 2011.

**FORWARD-LOOKING STATEMENTS** – These slides contain forward-looking statements, including statements regarding projected results and future events. These forward-looking statements are based on management's judgment as of the date of this presentation and include certain risks and uncertainties. Please refer to the Company's Annual Report on Form 10-K for the year-ended December 31, 2010 filed with the Securities and Exchange Commission ("SEC"), and subsequent filings including our Current Reports on Form 8-K and Quarterly Reports on Form 10-Q, for a list of certain risk factors.

Actual results may differ materially from Company projections and can be affected by a variety of factors outside the control of the Company including, among other things, market conditions, oil and gas price volatility, exploration and development drilling and testing results, the ability to receive drilling and other permits and regulatory approvals and rights-of-way, government approval for development projects, existing governmental laws and regulations, and changes to enforcement of those laws and regulations, new laws and regulations, and risks related to and costs of hedging activities including counterparty viability, surface access and costs, availability of third party gathering, transportation and processing, the availability and cost of services and materials, the ability to obtain industry partners to jointly explore certain prospects and the willingness and ability of those partners to meet capital obligations when requested, availability and costs of financing to fund the Company's operations, uncertainties inherent in oil and gas production operations and estimating reserves, the speculative actual recovery of estimated potential volumes, unexpected future capital expenditures, competition, risks associated with operating in one major geographic area, the success of the Company's risk management activities, title to properties, litigation, environmental liabilities, and other factors discussed in the Company's reports filed with the SEC. Bill Barrett Corporation encourages readers to consider the risks and uncertainties associated with projections and other forward-looking statements. In addition, the Company assumes no obligation to publicly revise or update any forward-looking statements based on future events or circumstances.



# Forward-Looking & Other Cautionary Statements

## Non-GAAP MEASURES:

**DISCRETIONARY CASH FLOW** - is a non-GAAP financial measure. It is presented because management believes it provides useful additional information to investors for analysis of the Company's ability to internally generate funds for exploration, development and acquisitions as well as adjusting net income for unusual items to allow for a more consistent comparison from period to period. In addition, these measures are widely used by professional research analysts and others in the valuation, comparison and investment recommendations of companies in the oil and gas exploration and production industry, and many investors use the published research of industry research analysts in making investment decisions. Historical discretionary cash flow is reconciled to net income each quarter in the Company's quarterly press release of results of operations.

**EBITDAX** - is a non-GAAP financial measure. It is presented because management believes that it is useful to an investor for evaluating the Company's operating performance. This is a widely used measure by investors in the oil and gas industry to measure a company's operating performance without regard to items excluded from the calculation of such term, which can vary substantially from company to company depending upon accounting methods and book value of assets, capital structure and the method by which assets were acquired, among other factors. There are significant limitations to using EBITDAX as a measure of performance, including the inability to analyze the effect of certain recurring and non-recurring items that materially affect net income or loss, the lack of comparability of results of operations of different companies and the different methods of calculating EBITDAX reported by different companies. The Company's calculation of EBITDAX is discretionary cash flow plus cash interest expense and cash tax expense added back.

**FINDING AND DEVELOPMENT COST** - Finding and development cost is a non-GAAP metric commonly used in the exploration and production industry. Calculations presented by the Company are based on costs incurred, as adjusted by the Company, divided by reserve additions. Reconciliation of adjustments to costs incurred is provided in the Company's earnings release and Current Report on Form 8-K issued February 23, 2011.

**RESERVE DISCLOSURE** -The SEC, under its recently revised guidelines, permits oil and gas companies to disclose probable and possible reserves in their filings with the SEC. The Company does not plan to include probable and possible reserve estimates in its filings with the SEC.

The Company has provided internally generated estimates for probable and possible reserves in this presentation. The estimates conform to SEC guidelines. They are not prepared or reviewed by third party engineers. Our probable and possible reserve estimates are determined using strip pricing, which we use internally for planning and budgeting purposes. The Company's estimate of probable and possible reserves is provided in this presentation because management believes it is useful, additional information that is widely used by the investment community in the valuation, comparison and analysis of companies. U.S. investors are urged to consider closely the disclosure in our Annual Report on Form 10-K for the year ended December 31, 2010, available on the Company's website at [www.billbarrettcorp.com](http://www.billbarrettcorp.com) or from the corporate offices at 1099 18th Street, Suite 2300, Denver, CO 80202. You can also obtain this form from the SEC by calling 1-800-SEC-0330 or at [www.sec.gov](http://www.sec.gov).

**RESOURCE POTENTIAL** - In this presentation the Company refers to "Resource Potential" and "Unrisked Upside," which refer to proved, probable and possible reserves as well as theoretical resource volumes that are estimates, speculative in nature and have not been reviewed by independent engineers. Theoretical resource volumes might never be recoverable and are contingent on exploration success, technical improvements, permitting, commerciality and other factors.

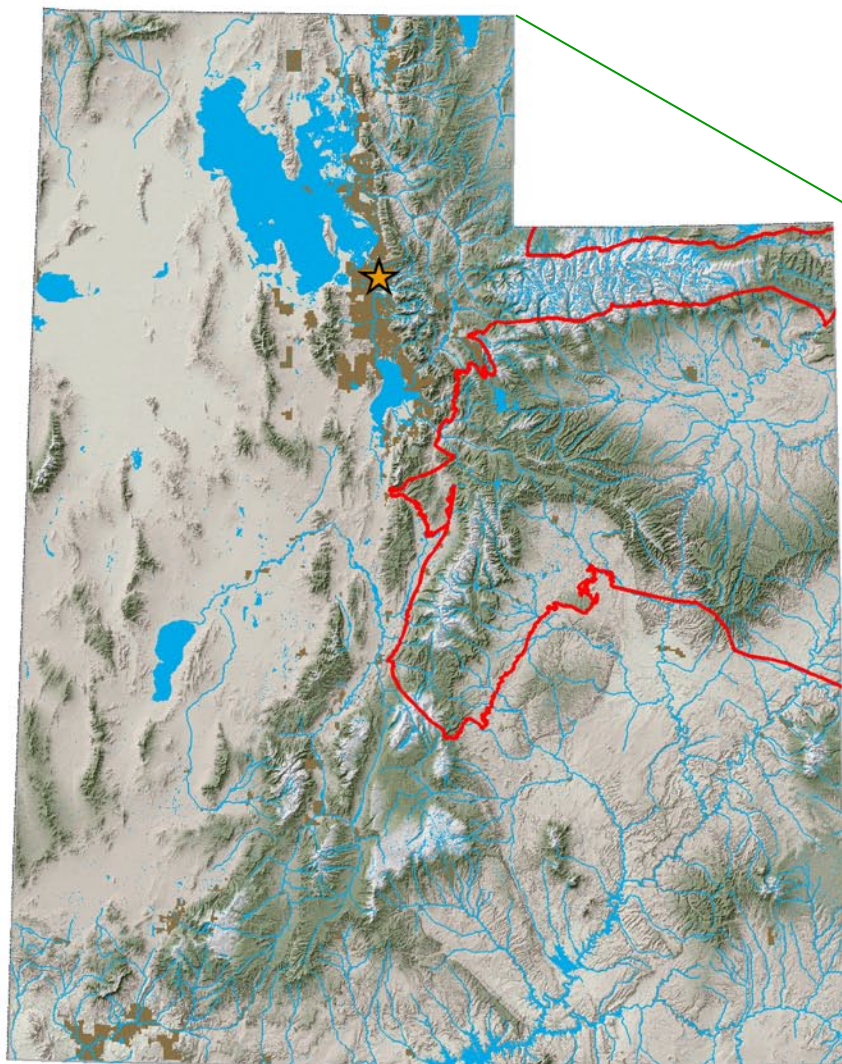
This presentation does not constitute a solicitation to buy or sell Bill Barrett Corporation securities.



# Discussion

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- Basin Location and Overview
- Geologic Setting and the Tertiary Lacustrine Petroleum System
- Regional Cross-Sections – Strike and Dip Changes in Reservoir
- Evolution of Wasatch/Green River Production from 1949 to 2013
- Challenges to Development
- The Future of the Play



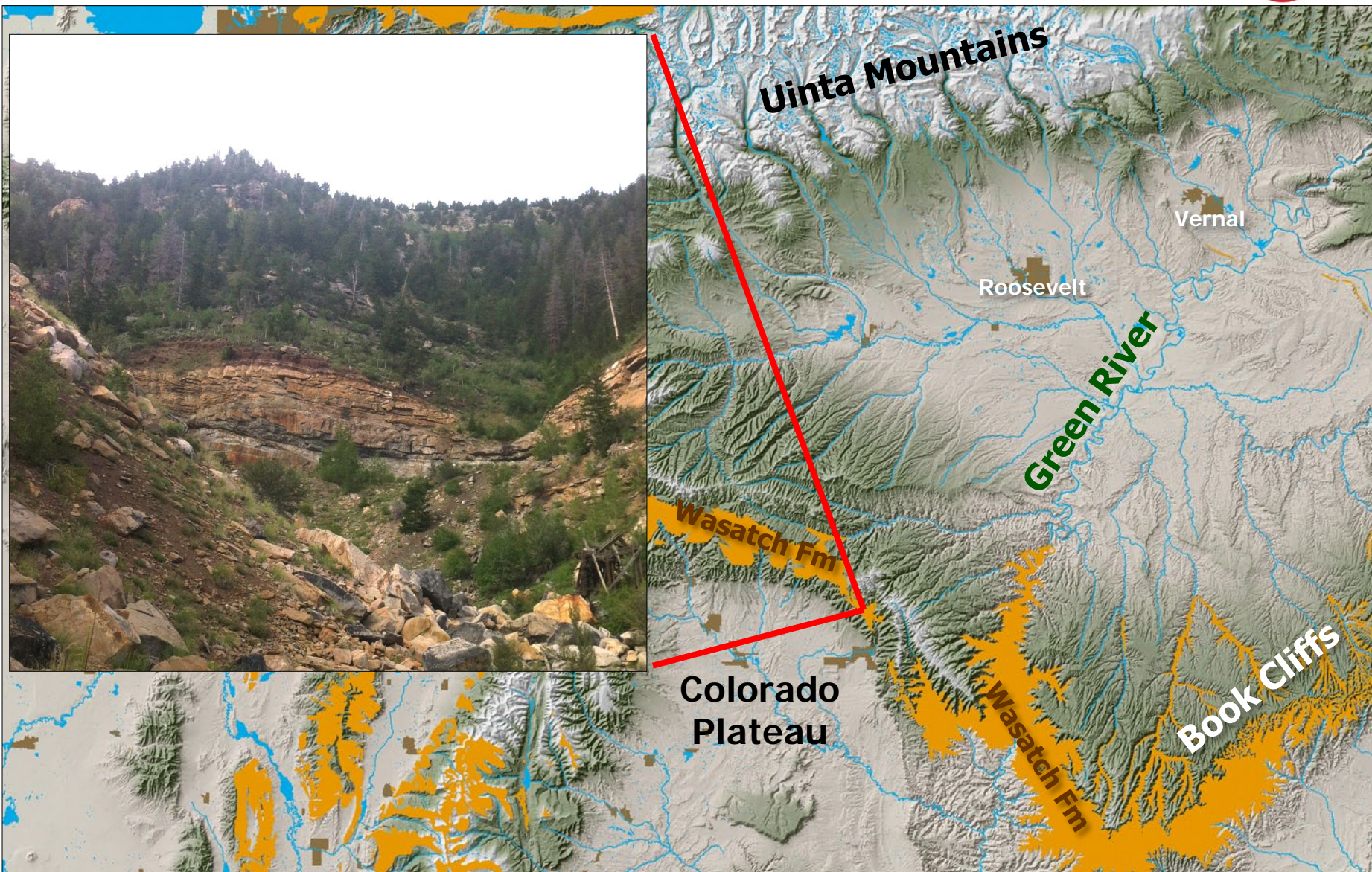




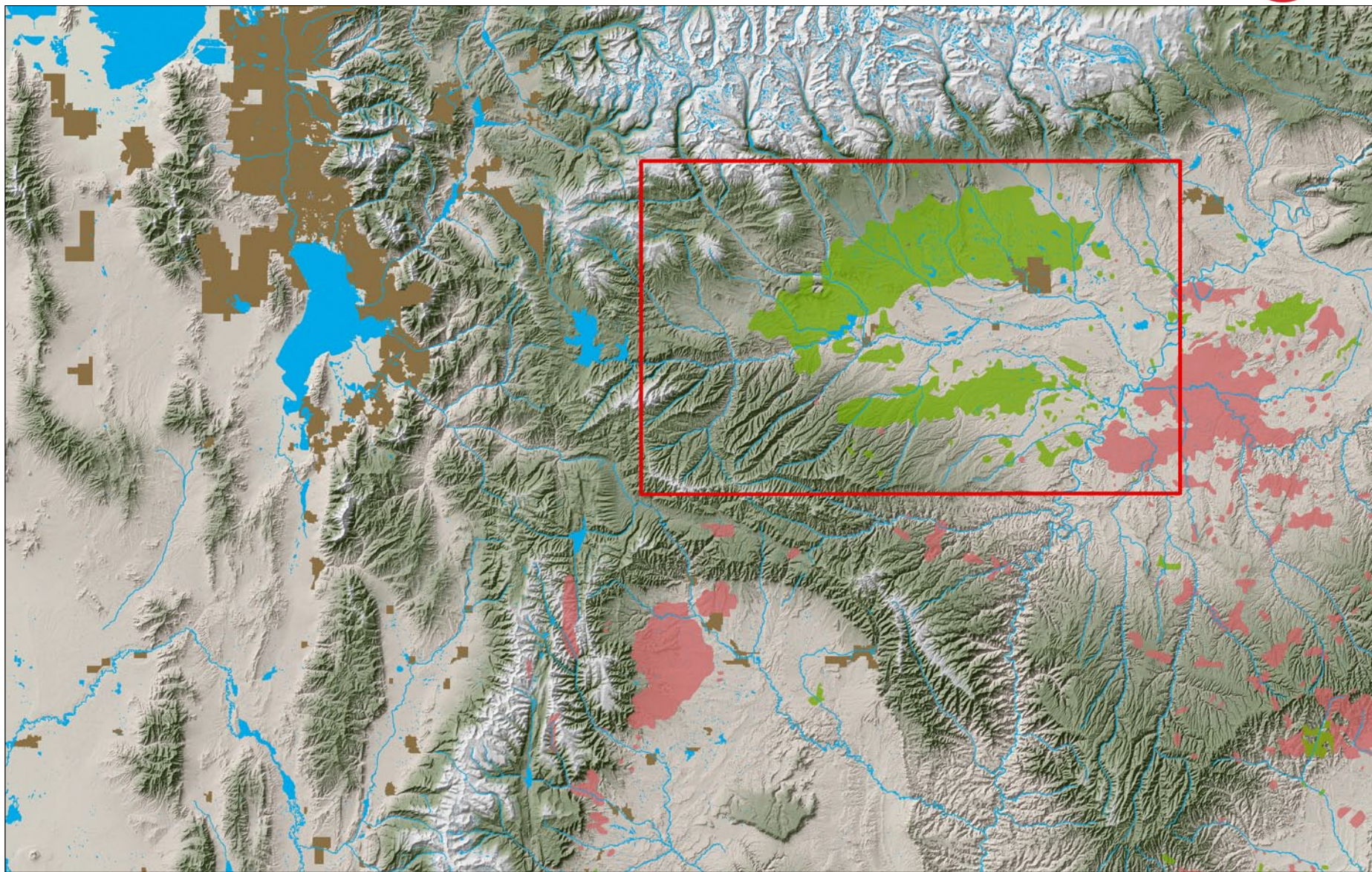




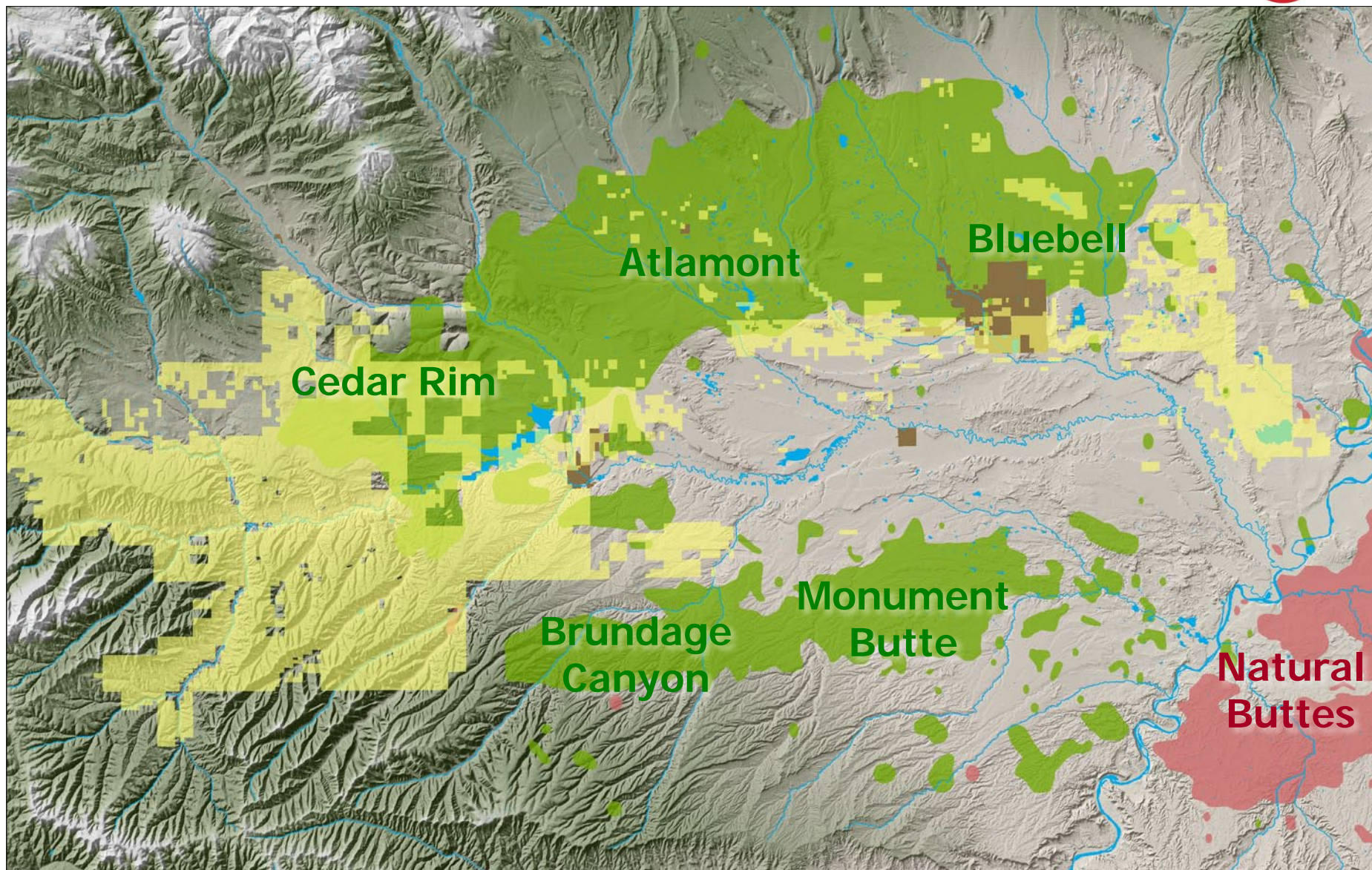




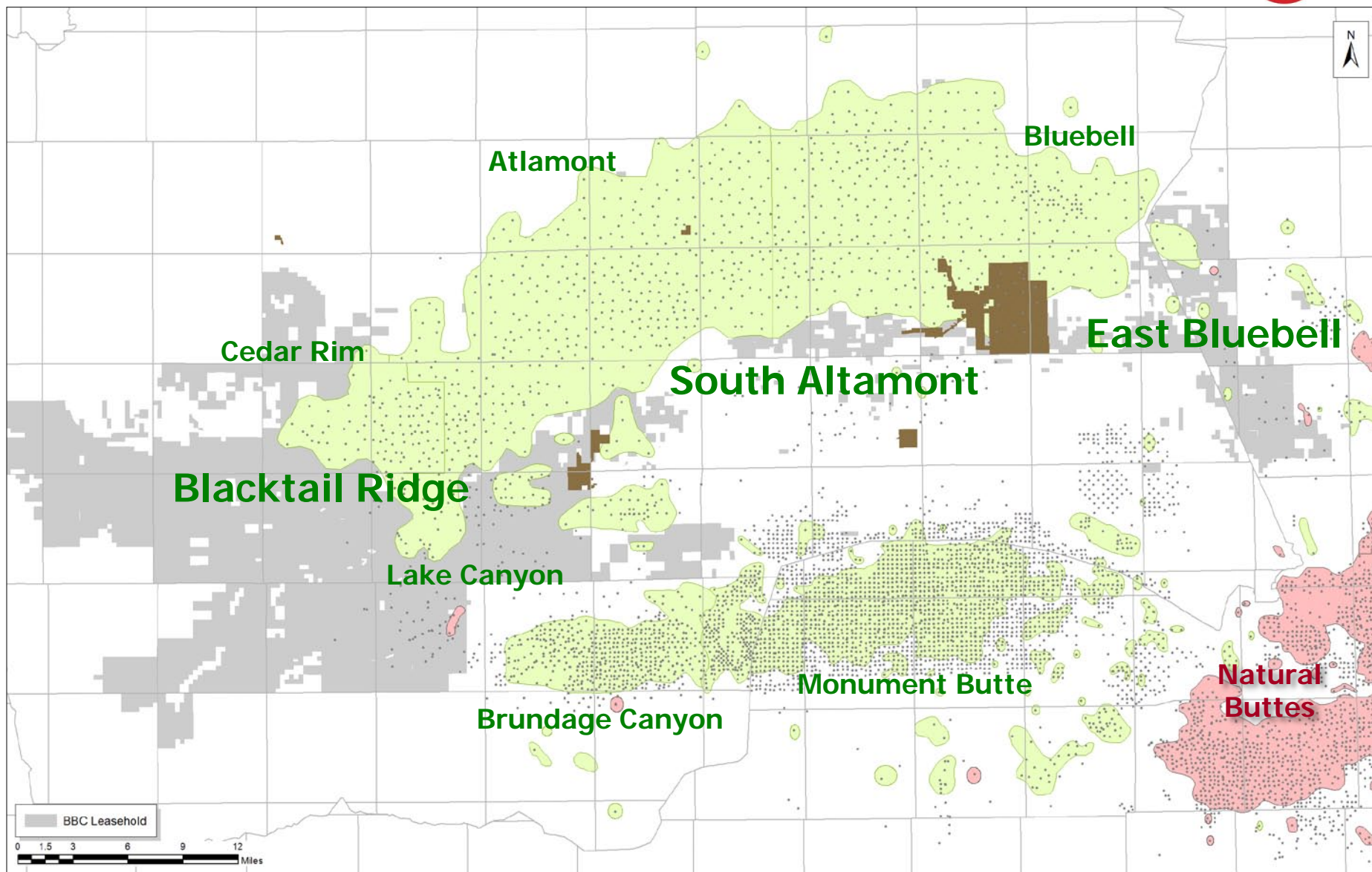
















# Discussion

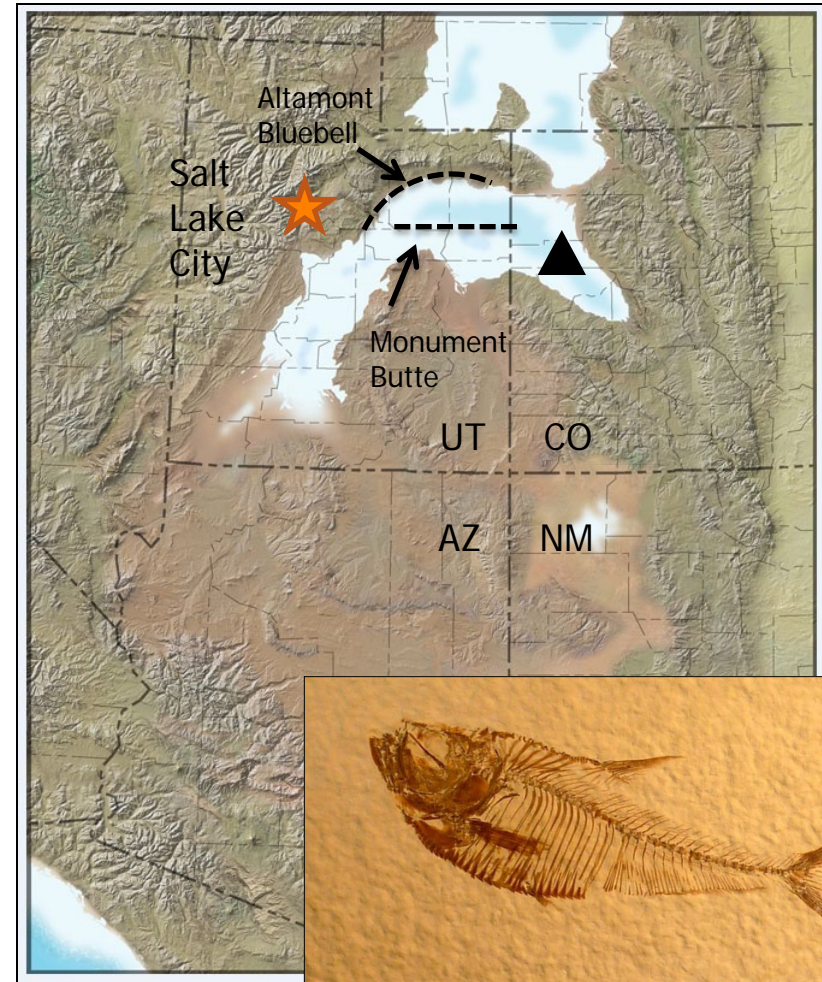
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- **Geologic Setting and the Tertiary Lacustrine Petroleum System**
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# Depositional Environment: Wasatch/Green River

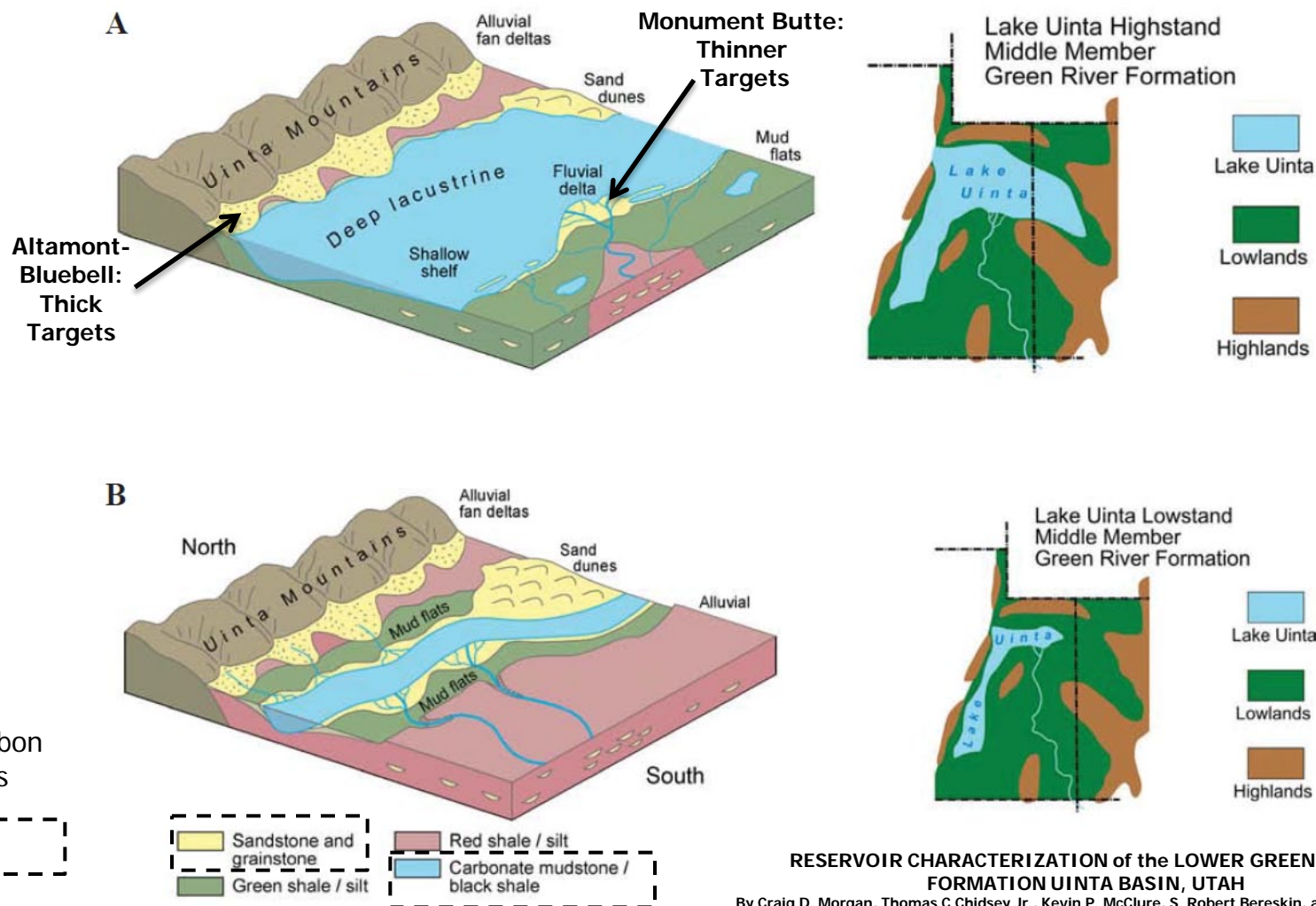
- Formations are 34-56 mya
- Deposition of Paleo-Lake trends southwest from known fields
- Altamont-Bluebell development targets northern shore facies adjacent to high-relief area = High sediment influx
- Monument Butte development targets southern shore facies adjacent to low-relief area = Low sediment influx

▲ Location of Mahogany Oil Shale  
= in situ retort attempts  
"It's the same lake"



From: [http://cpgeosystems.com/ColoPlat\\_Eocene\\_GreenRiver.jpg](http://cpgeosystems.com/ColoPlat_Eocene_GreenRiver.jpg)

# Depositional Environment: Lake Levels Oscillate, Reservoirs Stack

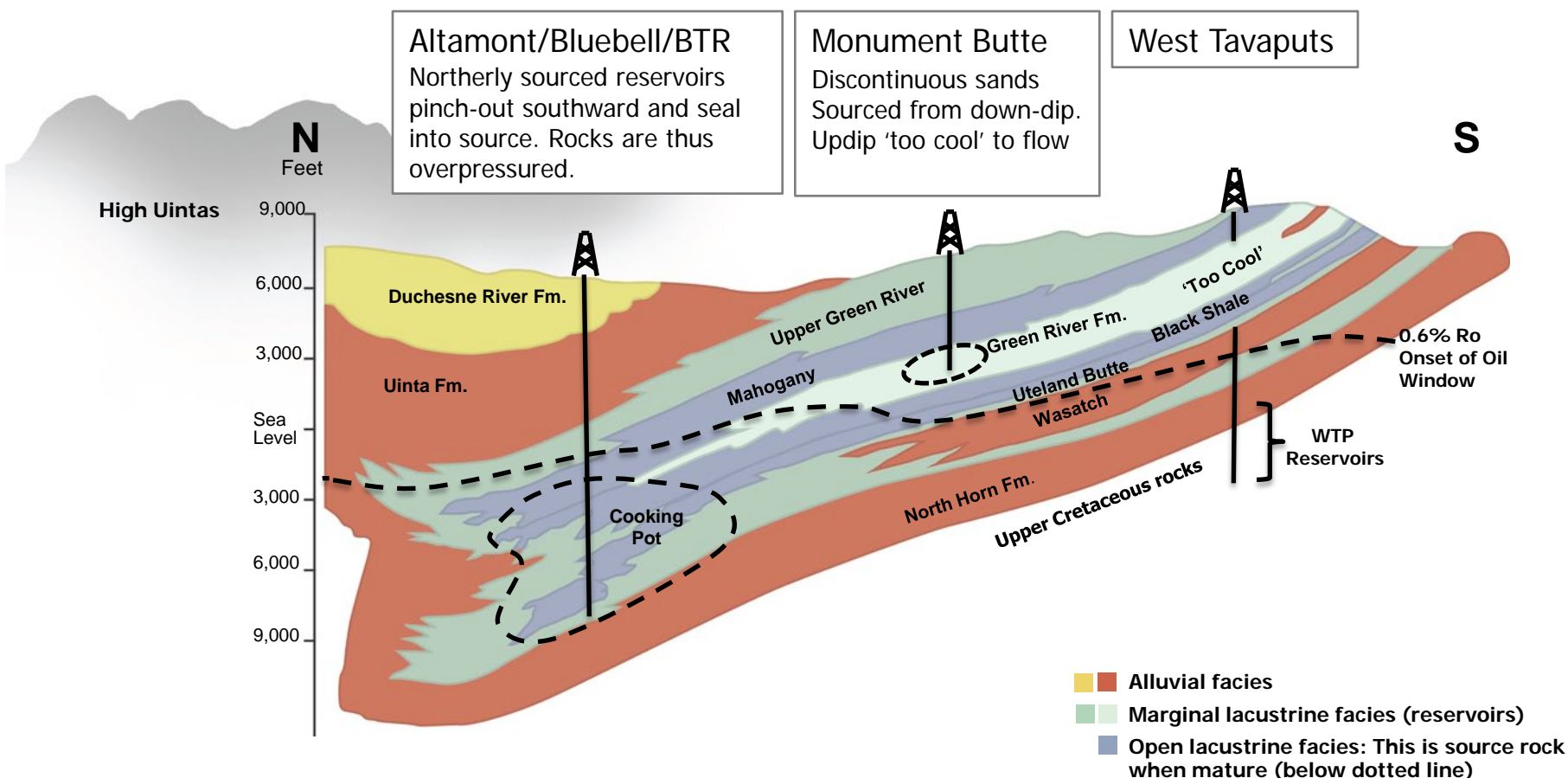


## RESERVOIR CHARACTERIZATION of the LOWER GREEN RIVER FORMATION UINTA BASIN, UTAH

By Craig D. Morgan, Thomas C Chidsey Jr., Kevin P. McClure, S. Robert Bereskin, and Milind D. Deo



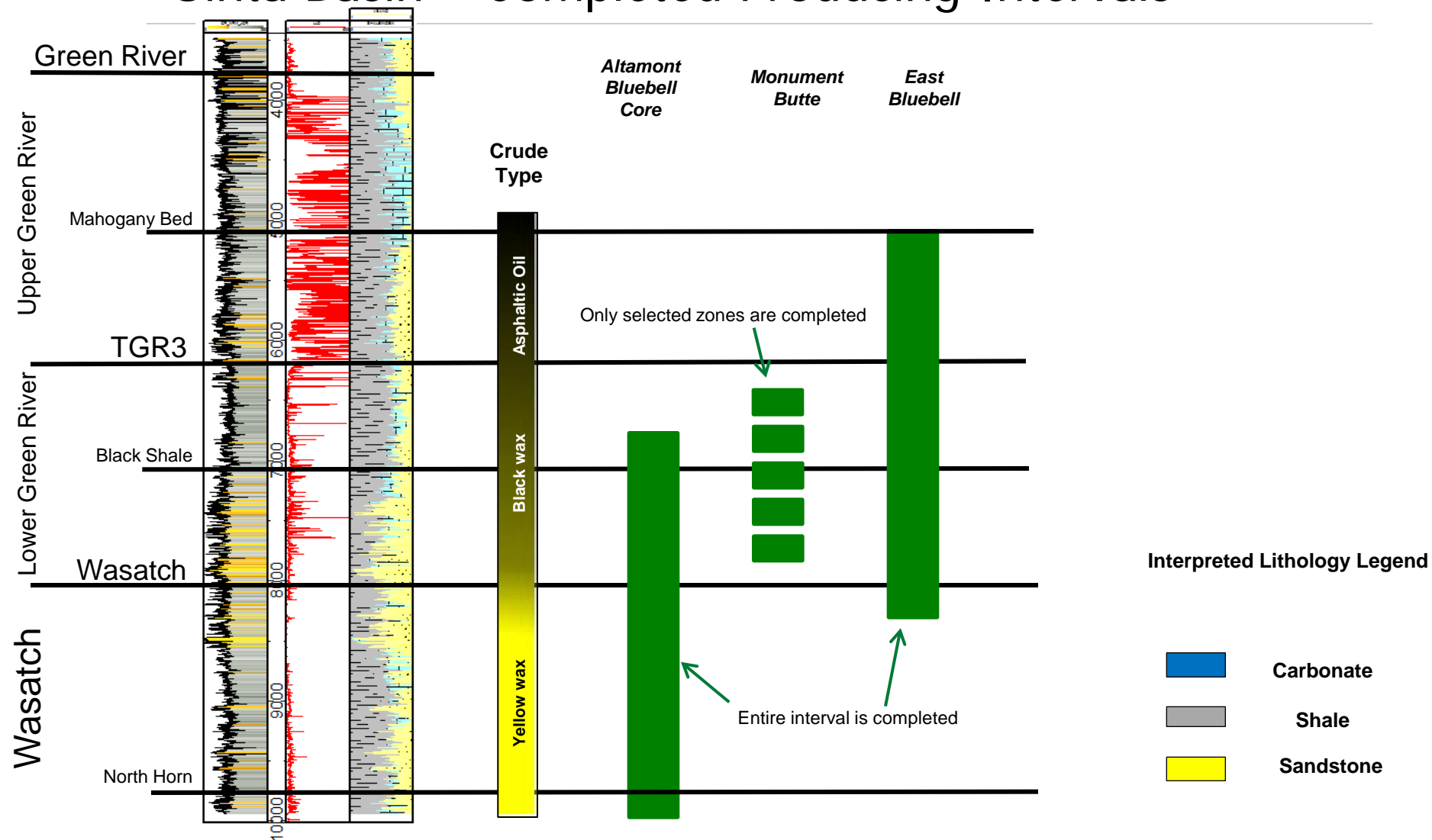
# The Producing Interval: Geology Changes from South to North



(modified from Fouch, 1975, and Franczyk and others, 1989)



# Uinta Basin – Completed Producing Intervals





## Uinta Oil: Oil Parameters



	Wasatch (Yellow Wax)	Lower Green River (Black Wax)
API Gravity	42 Deg	32 Deg
Pour Point	120 Deg F	105 Deg F
BH Temperature	230 Deg F	180 Deg F

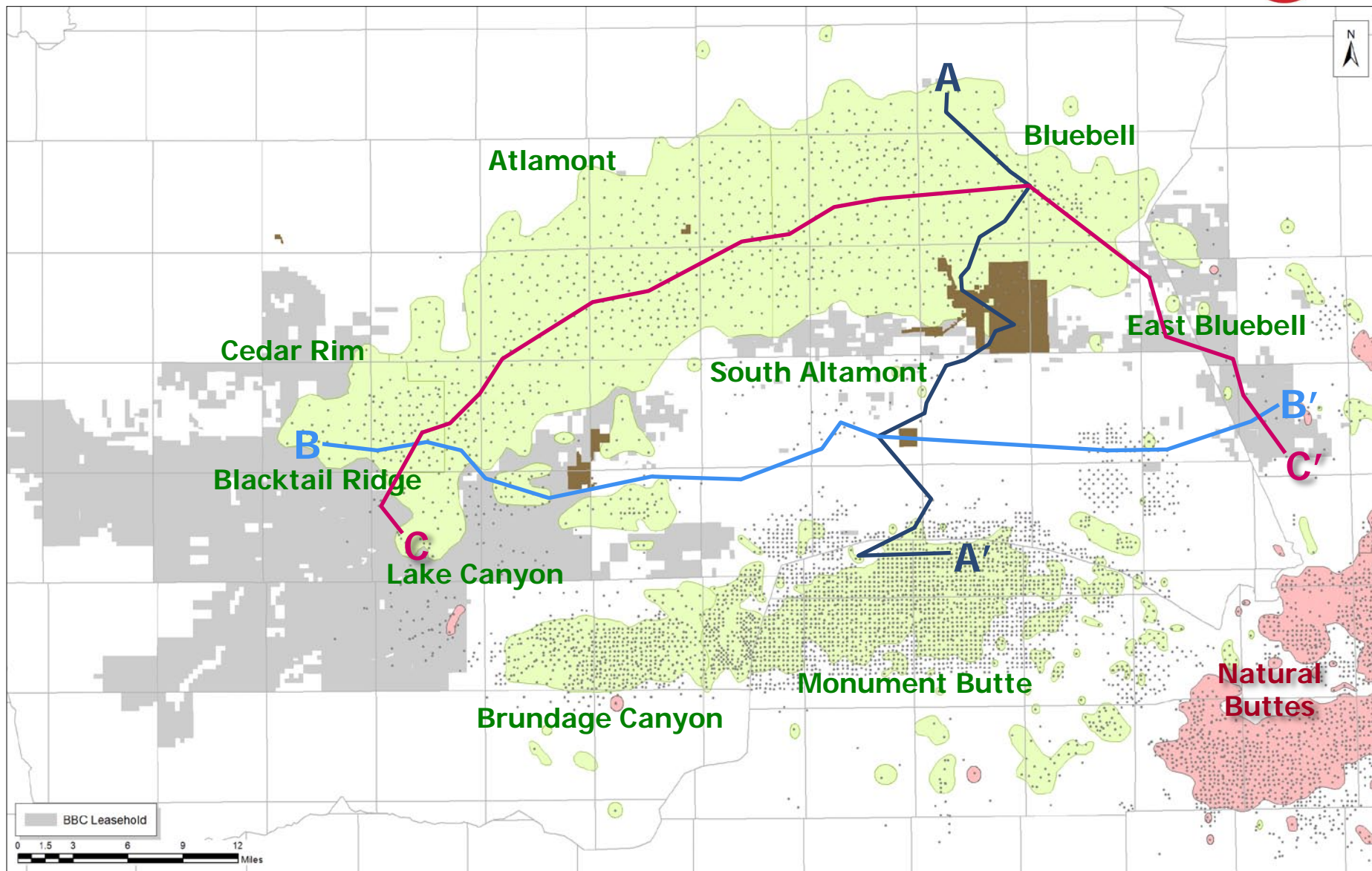
*\*Asphaltic Upper Green River Crude is currently uneconomic due to cost of trucking to refineries in Wyoming or Nevada*



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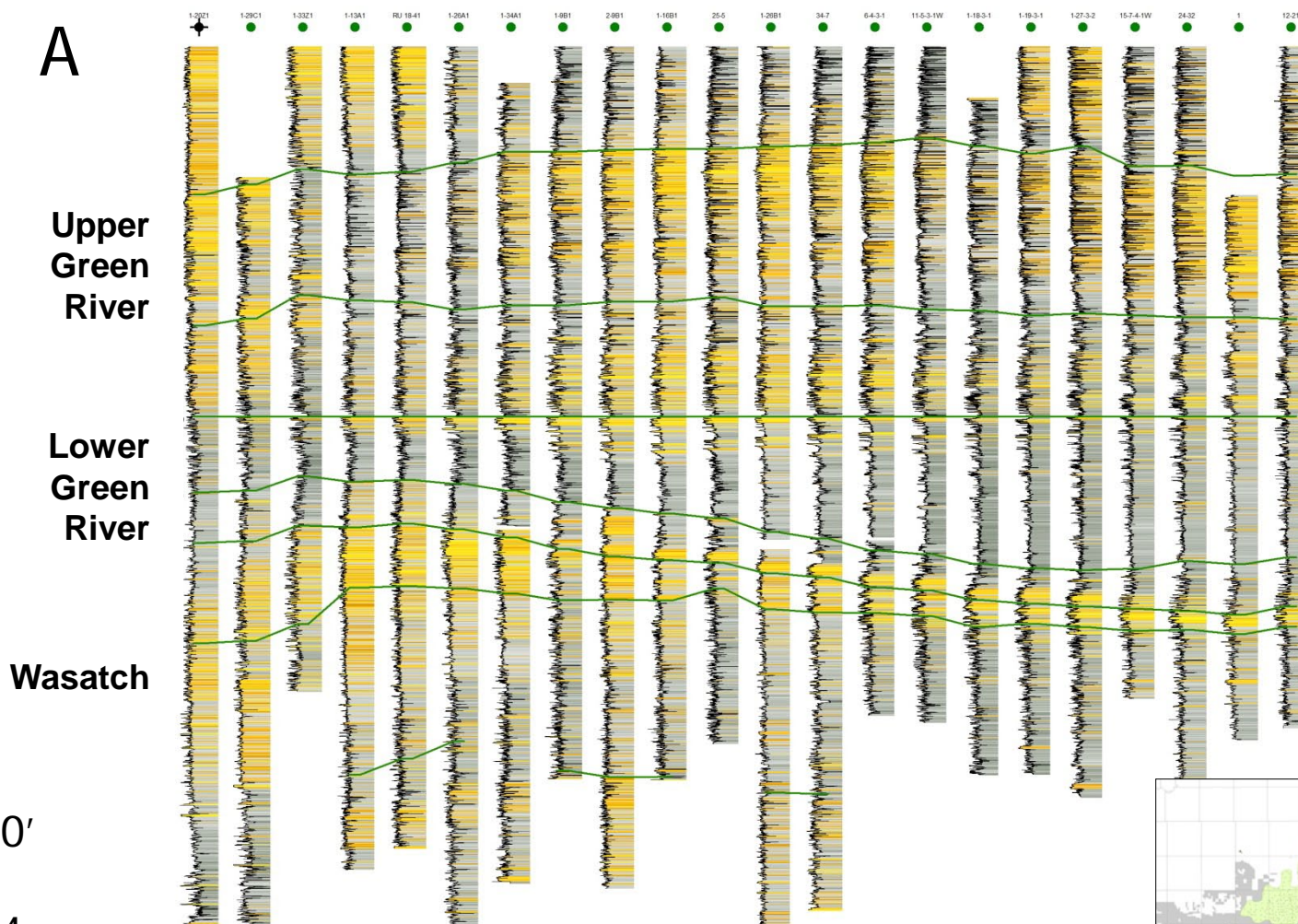


North

South

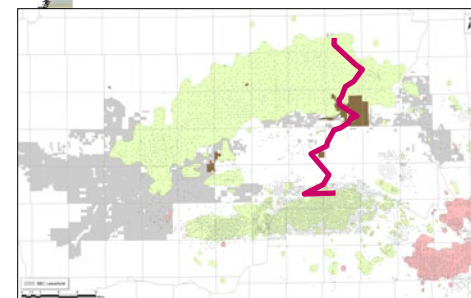
A

A'



1000'

VE=24x







North

South

A

A'

Upper  
Green  
River

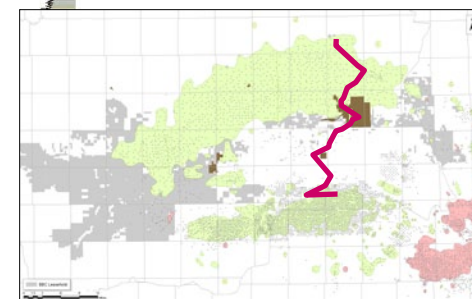
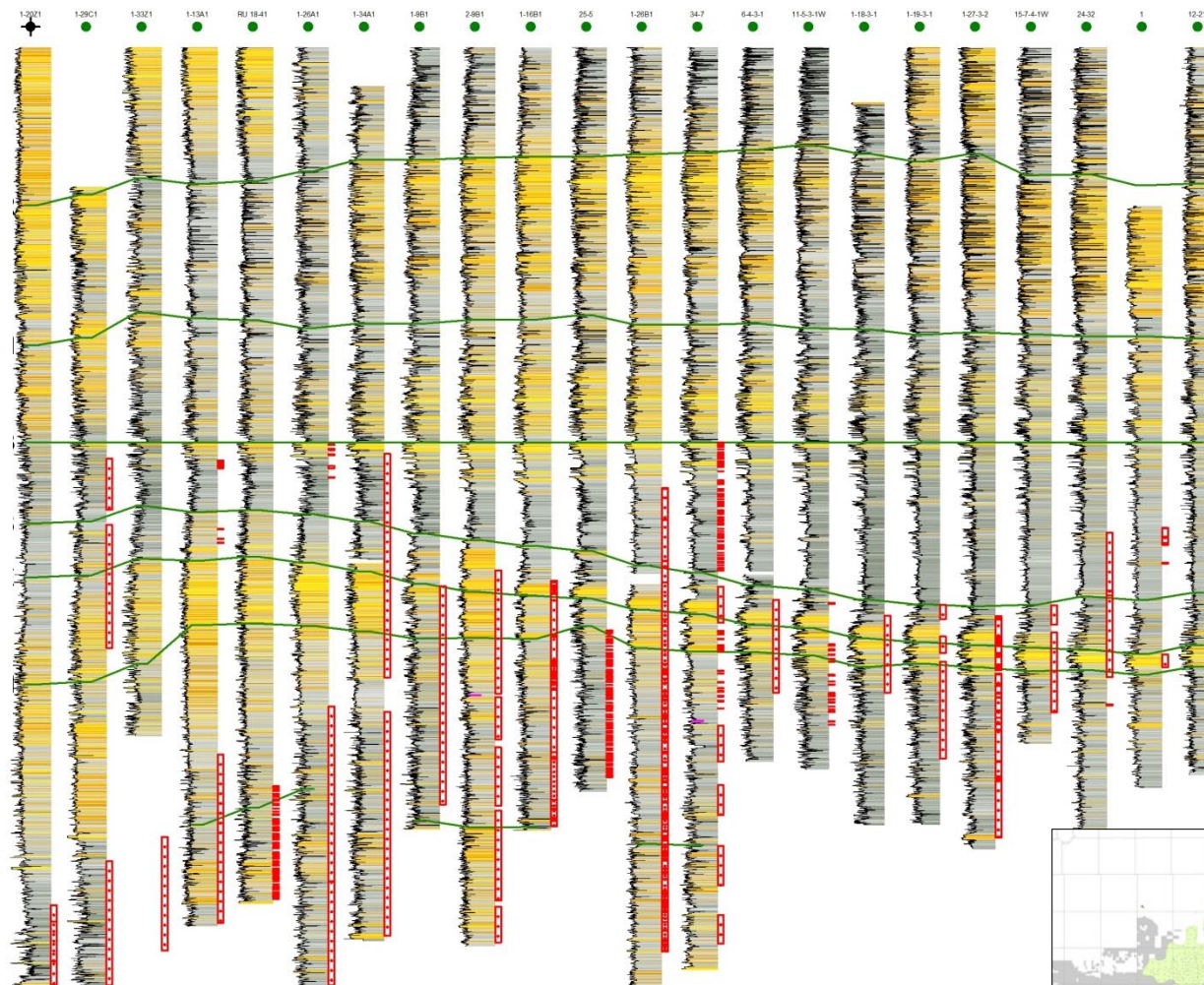
Lower  
Green  
River

Wasatch

Perfs

1000'

VE=24x





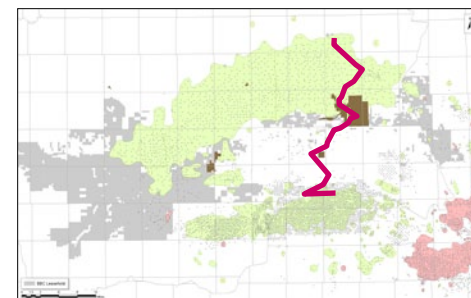
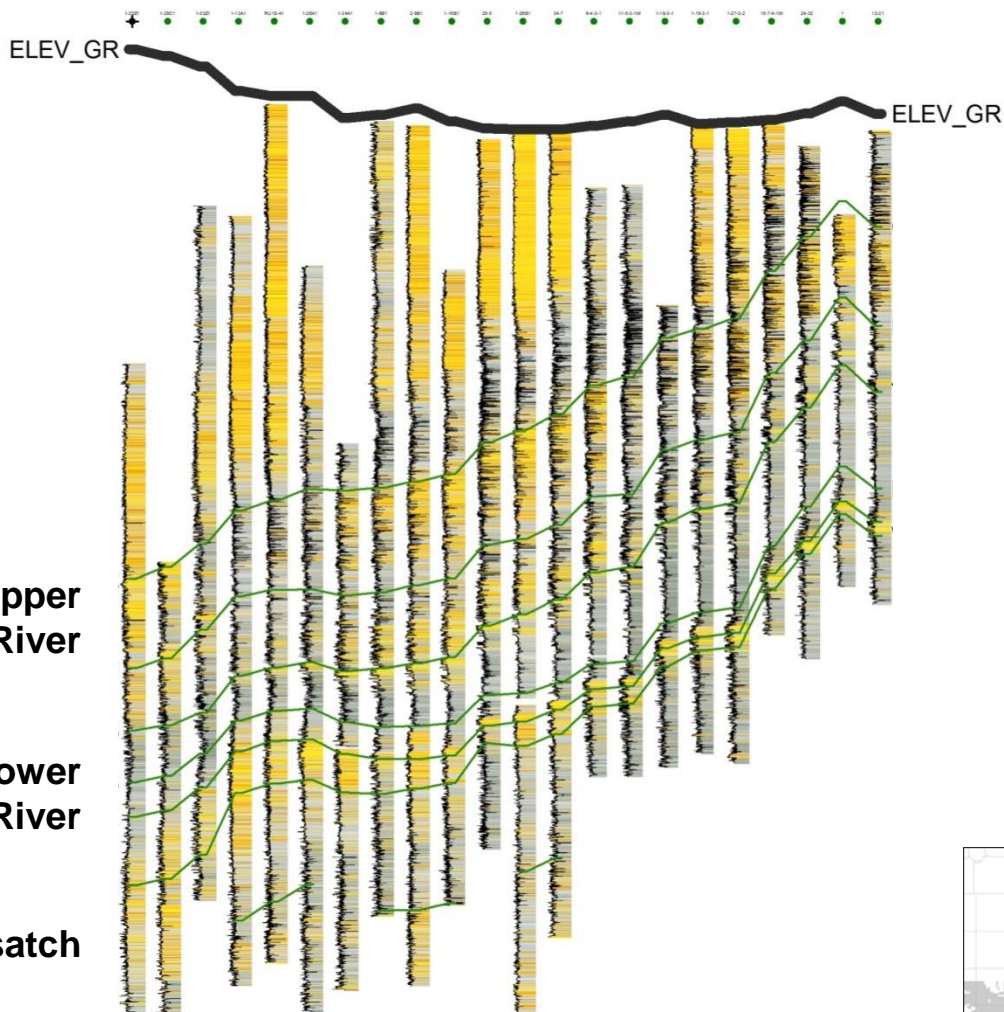


North

South

A

A'



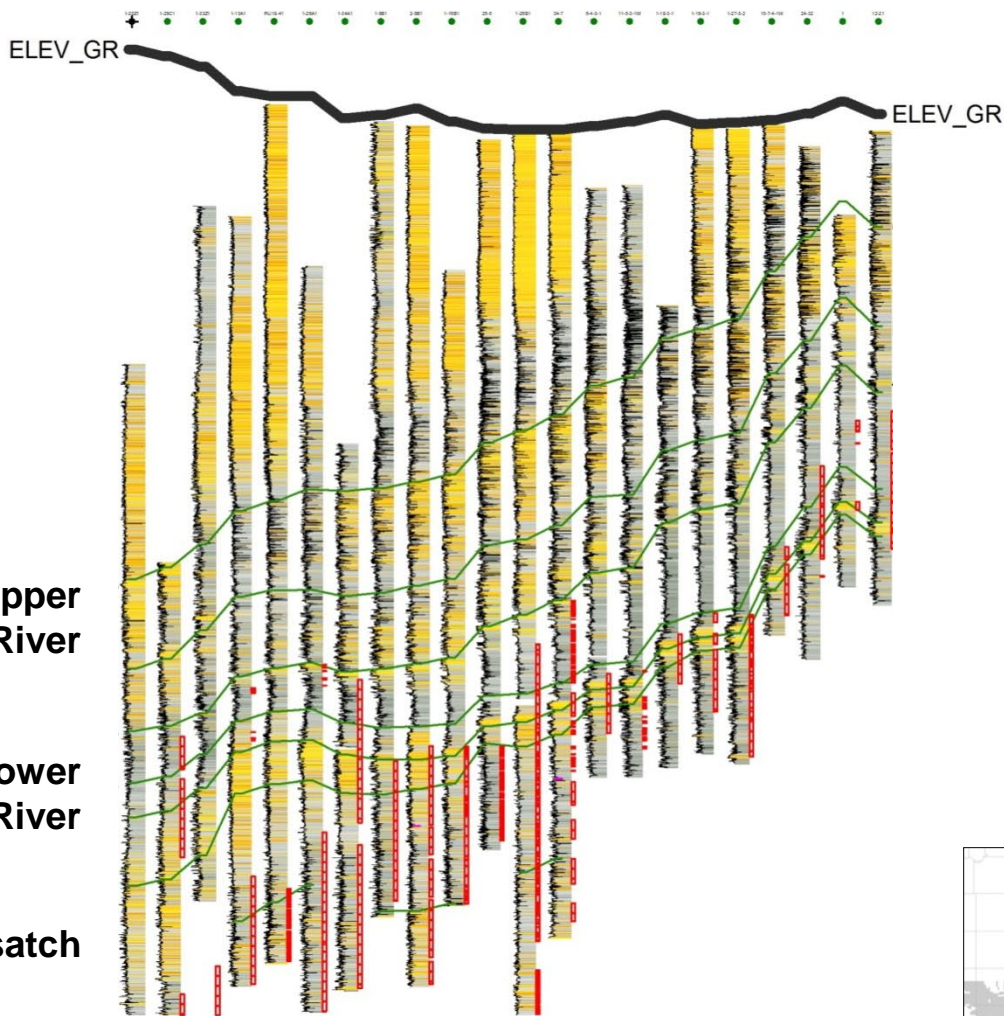


North

South

A

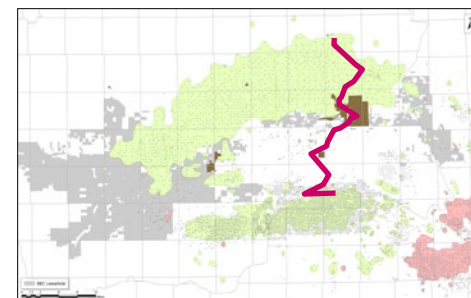
A'



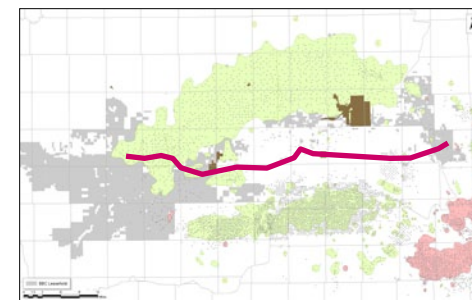
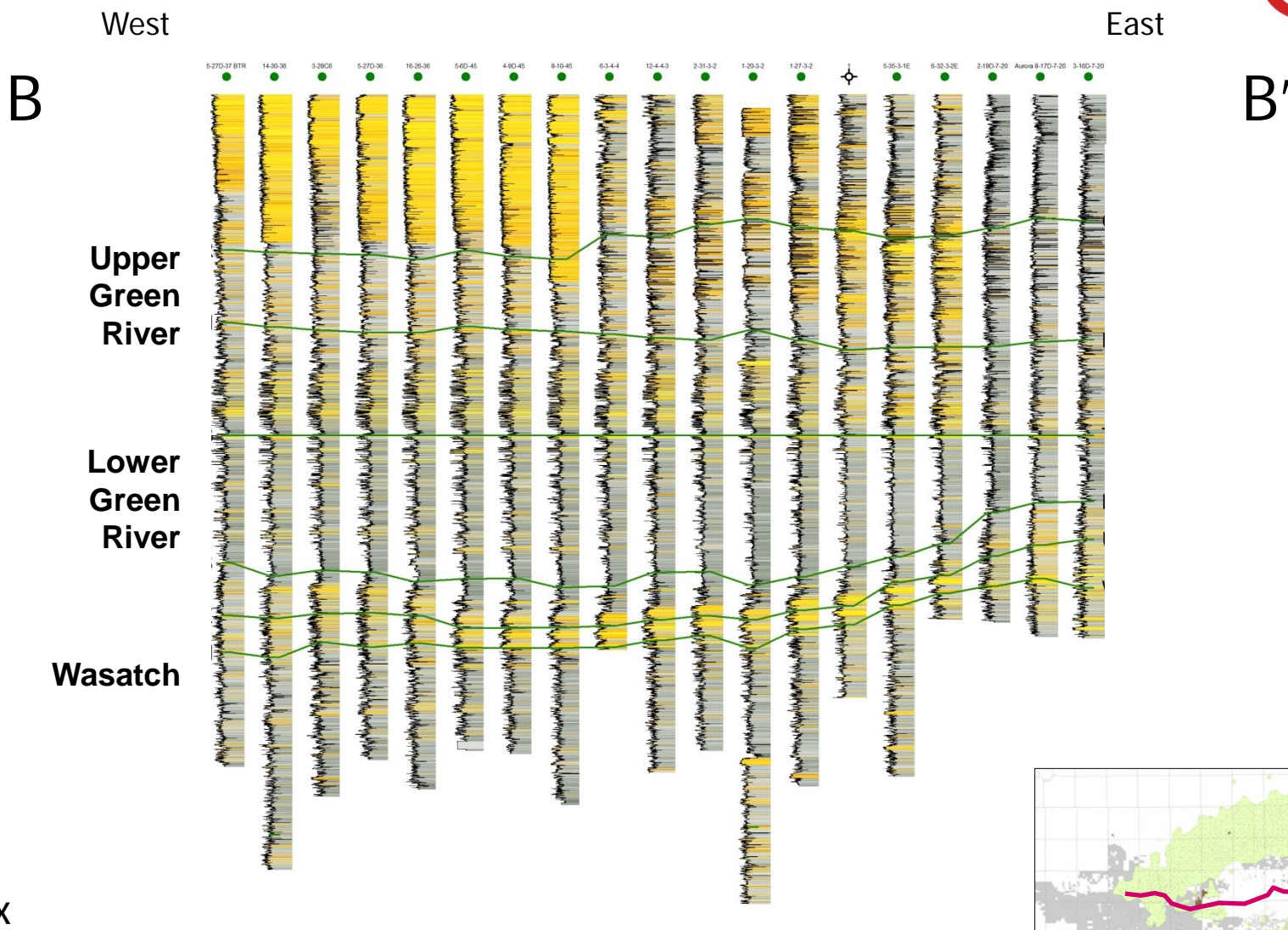
Perfs

1000'

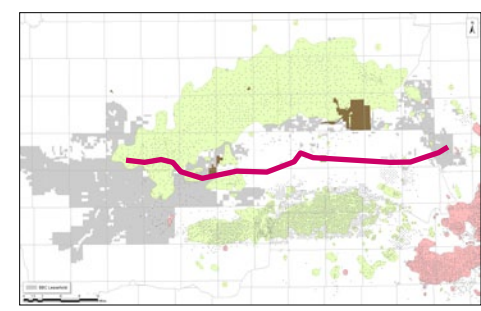
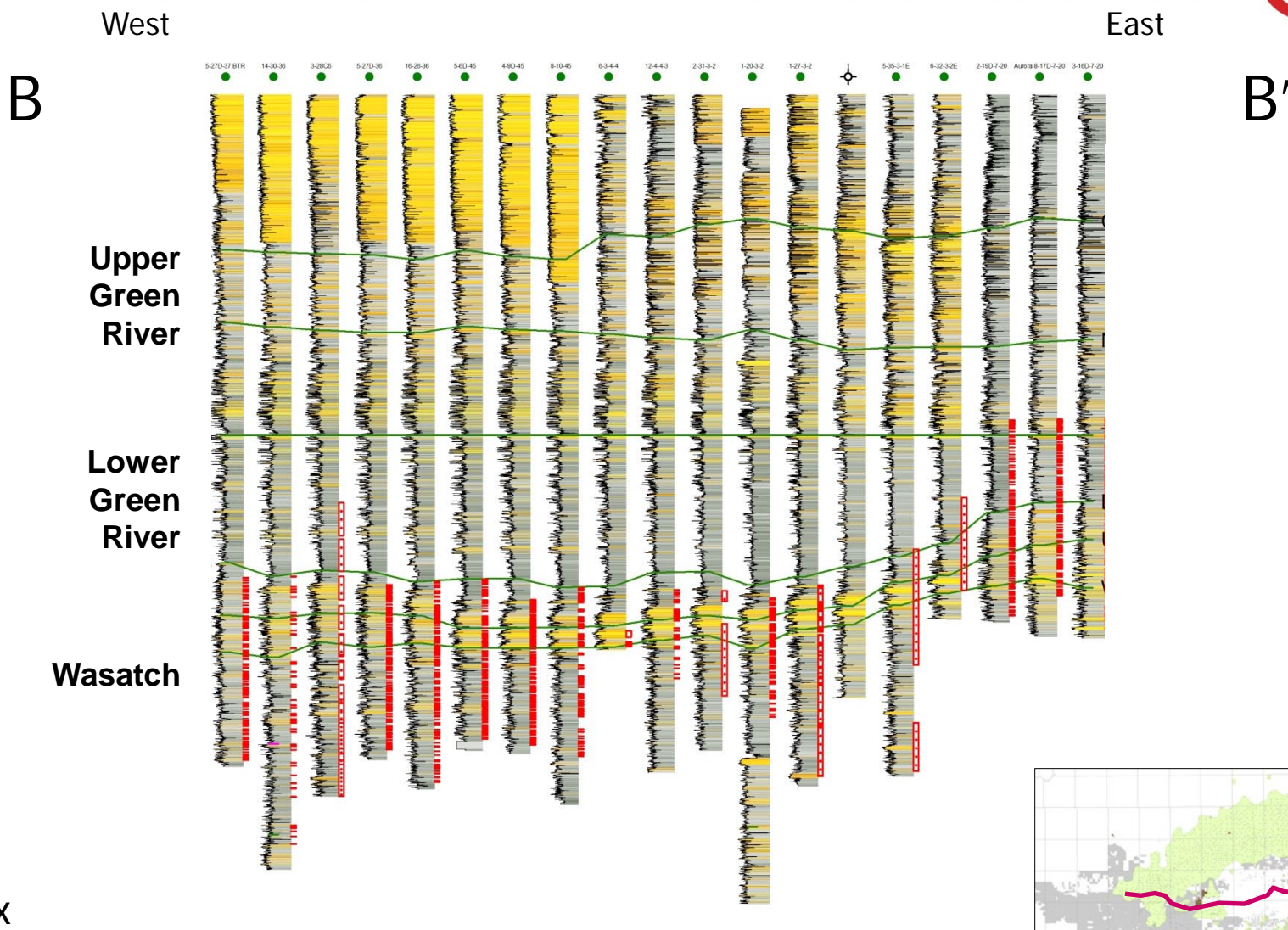
VE=15x













West

East



ELEV\_GR

**B'**

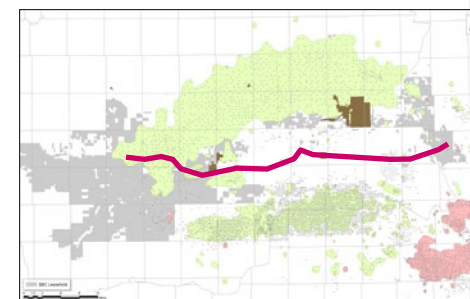
- ELEV\_GR

## Upper Green River

## Lower Green River

## Wasatch

1000'

$$VE = 24x$$




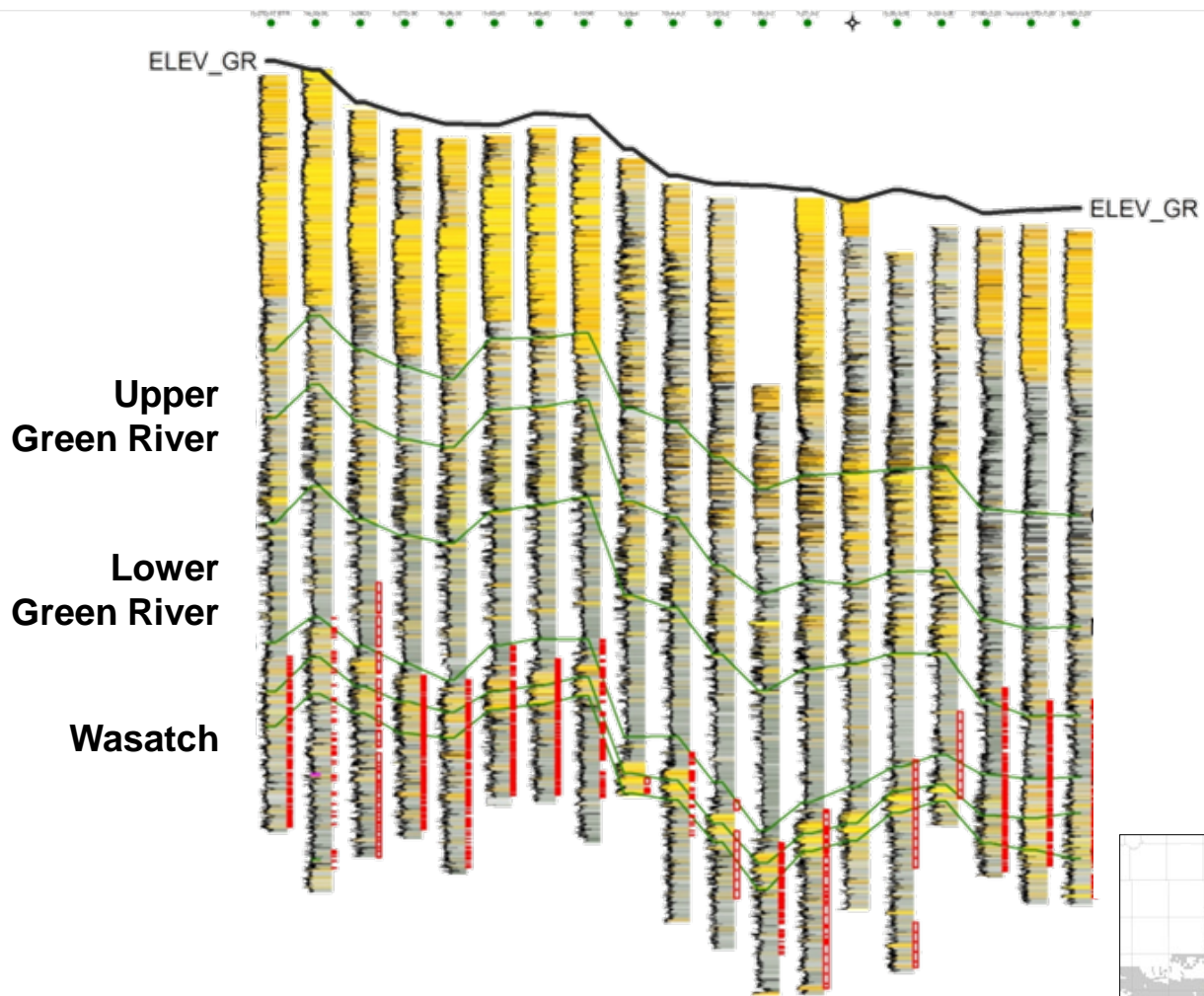


West

East

B

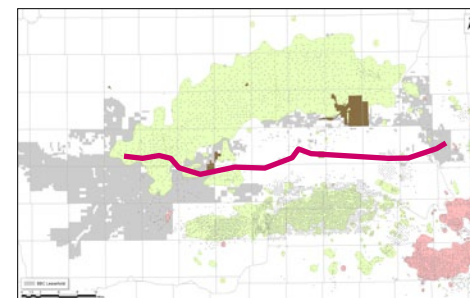
B'



Perfs

1000'

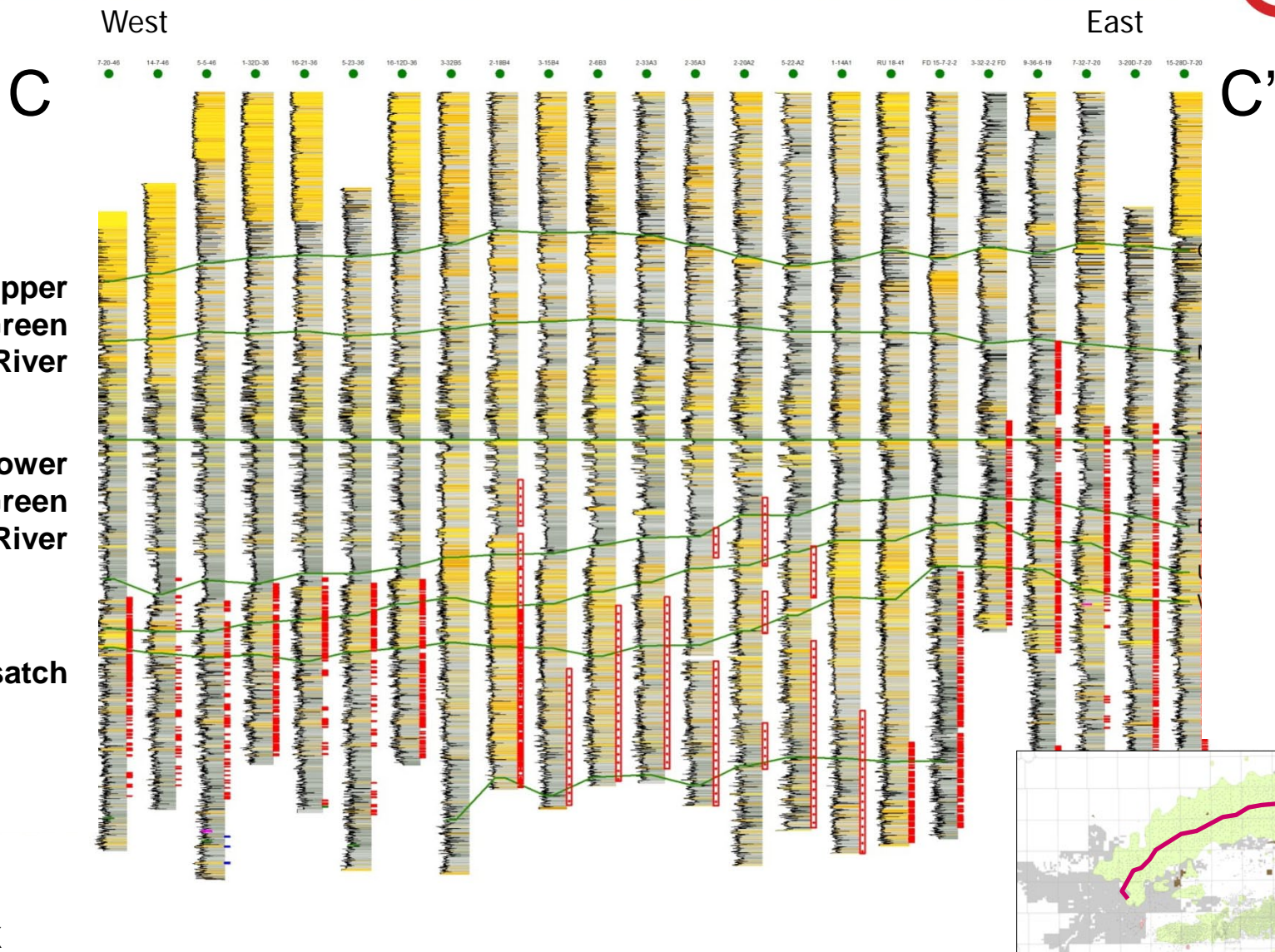
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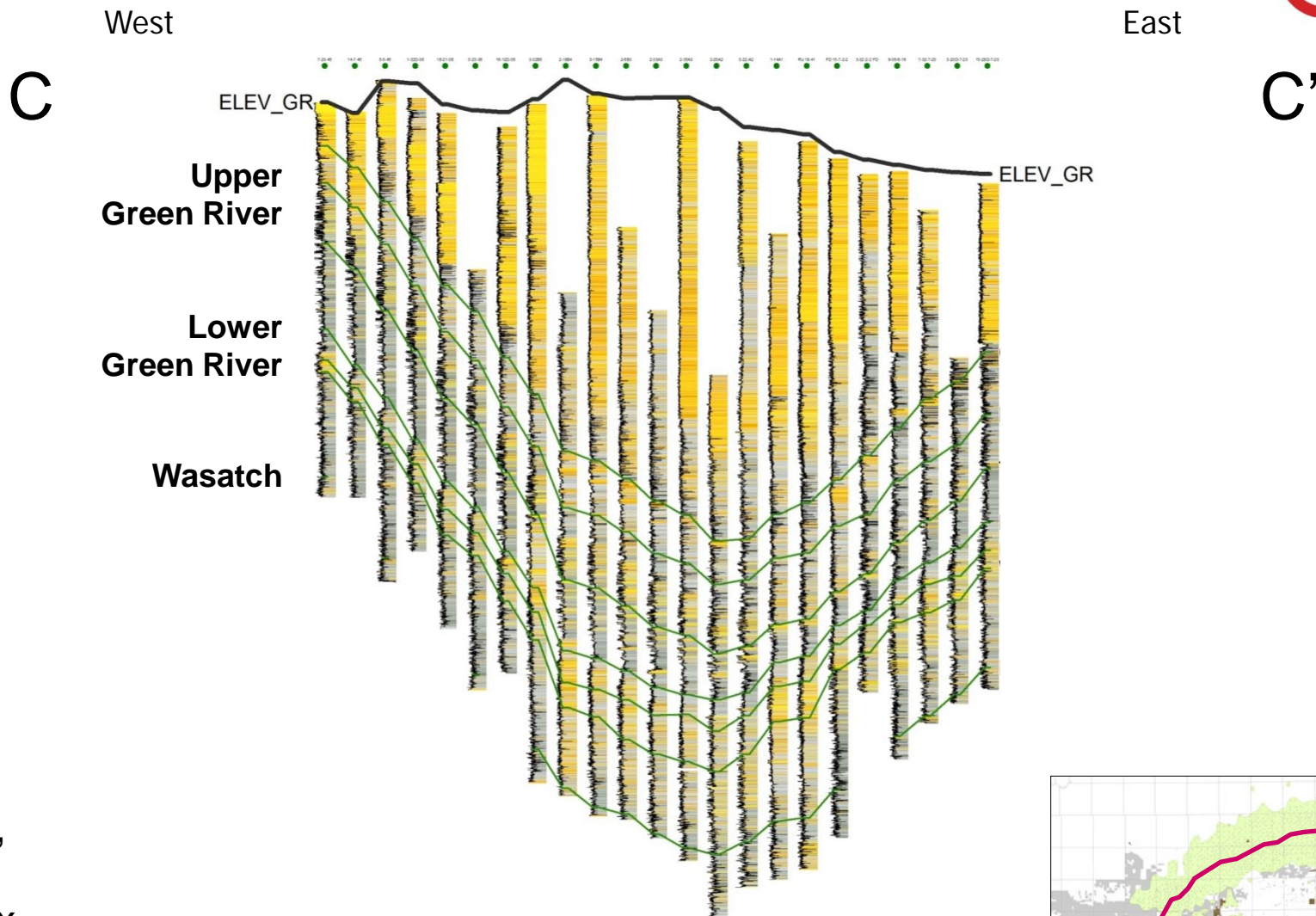






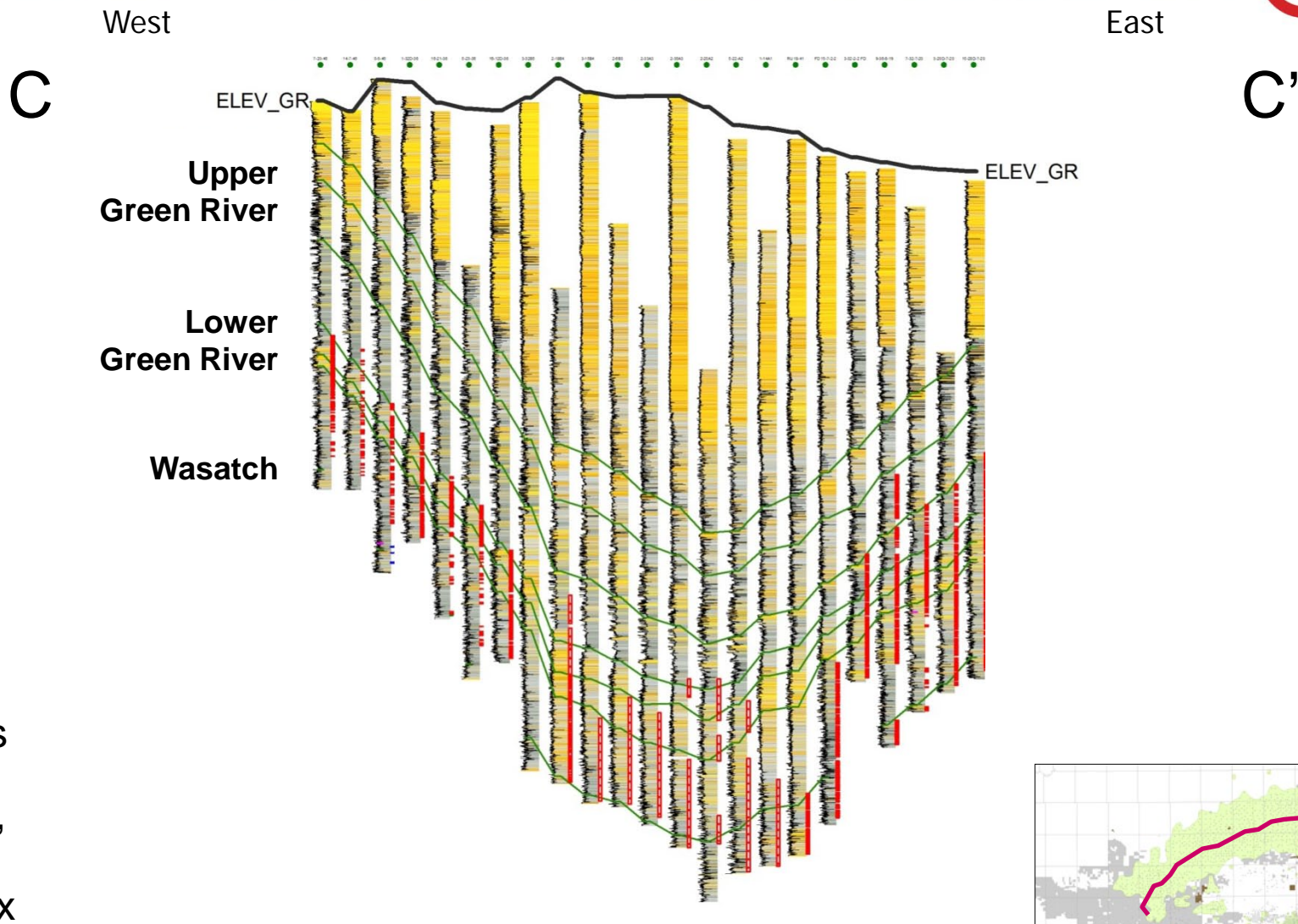






1000'

VE=21x





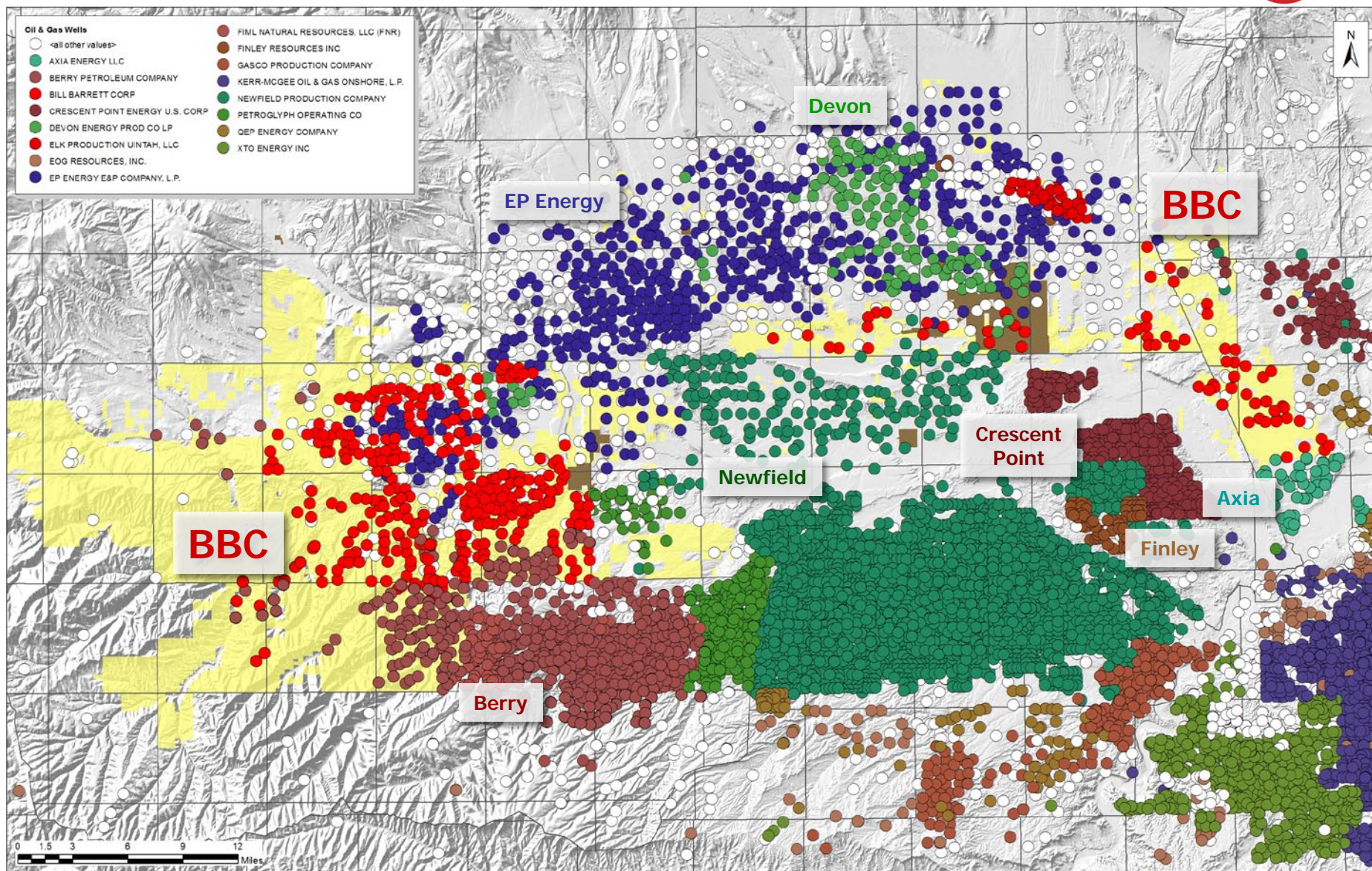


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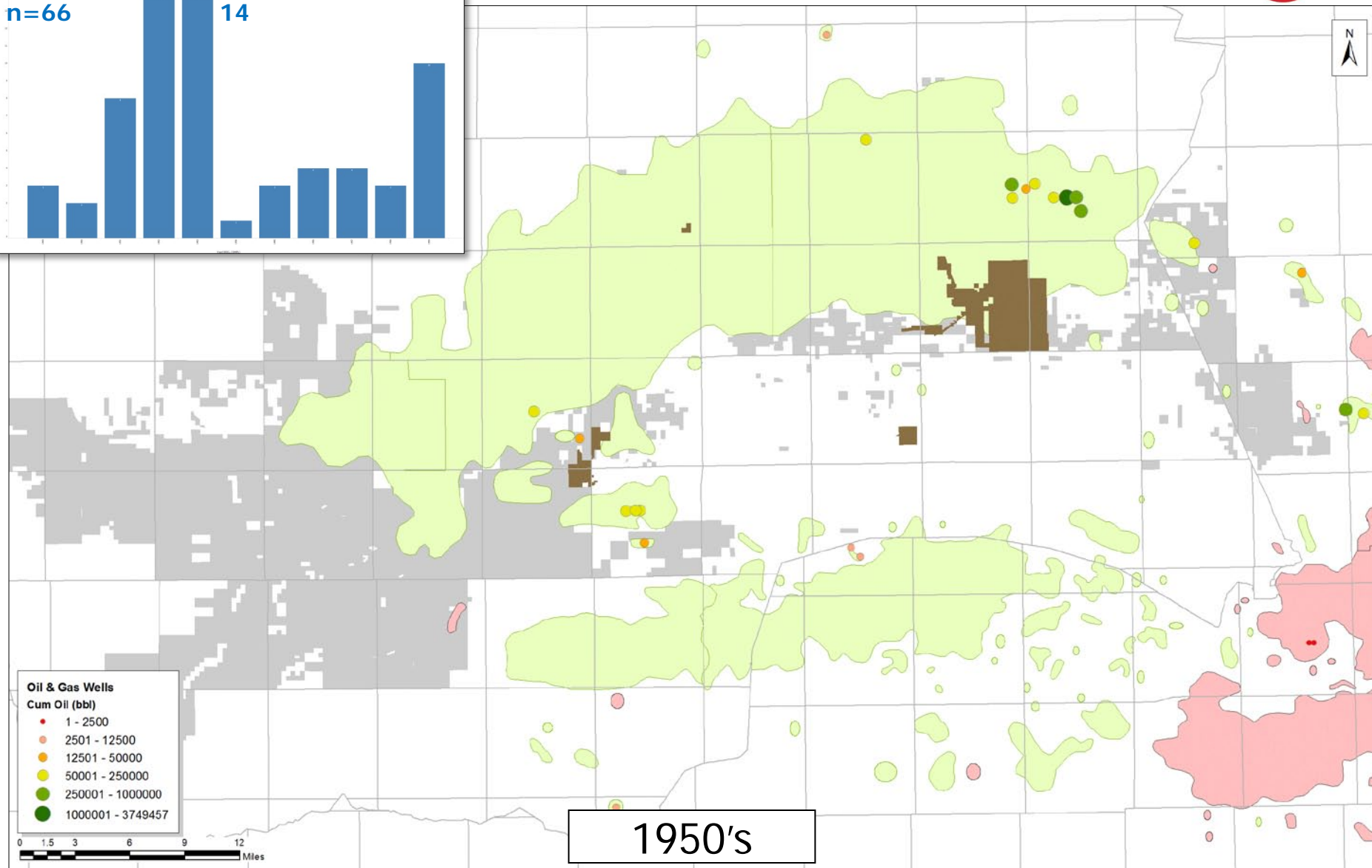
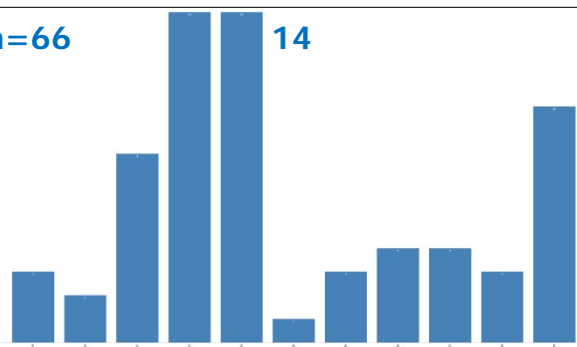






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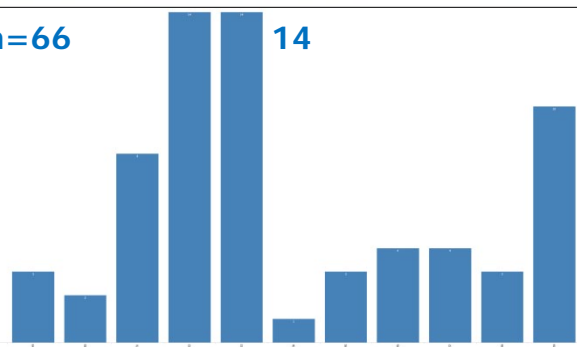
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14



Oil & Gas Wells  
Cum Oil (bbl)

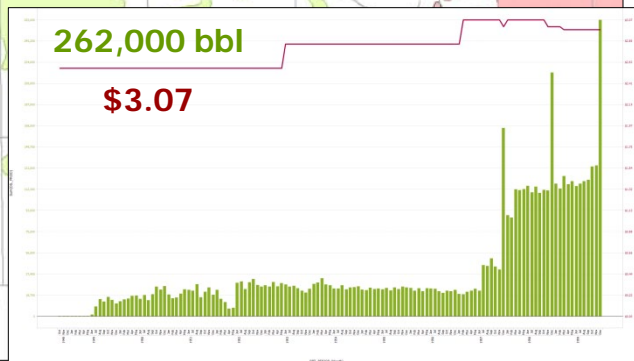
- 1 - 2500
- 2501 - 12500
- 12501 - 50000
- 50001 - 250000
- 250001 - 1000000
- 1000001 - 3749457

0 1.5 3 6 9 12 Miles

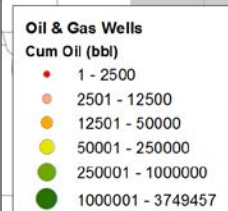
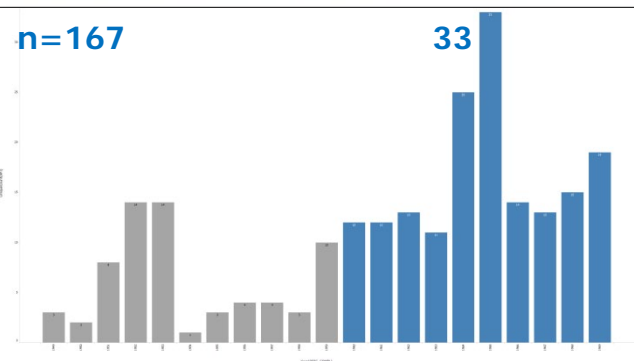
1950's

262,000 bbl

\$3.07





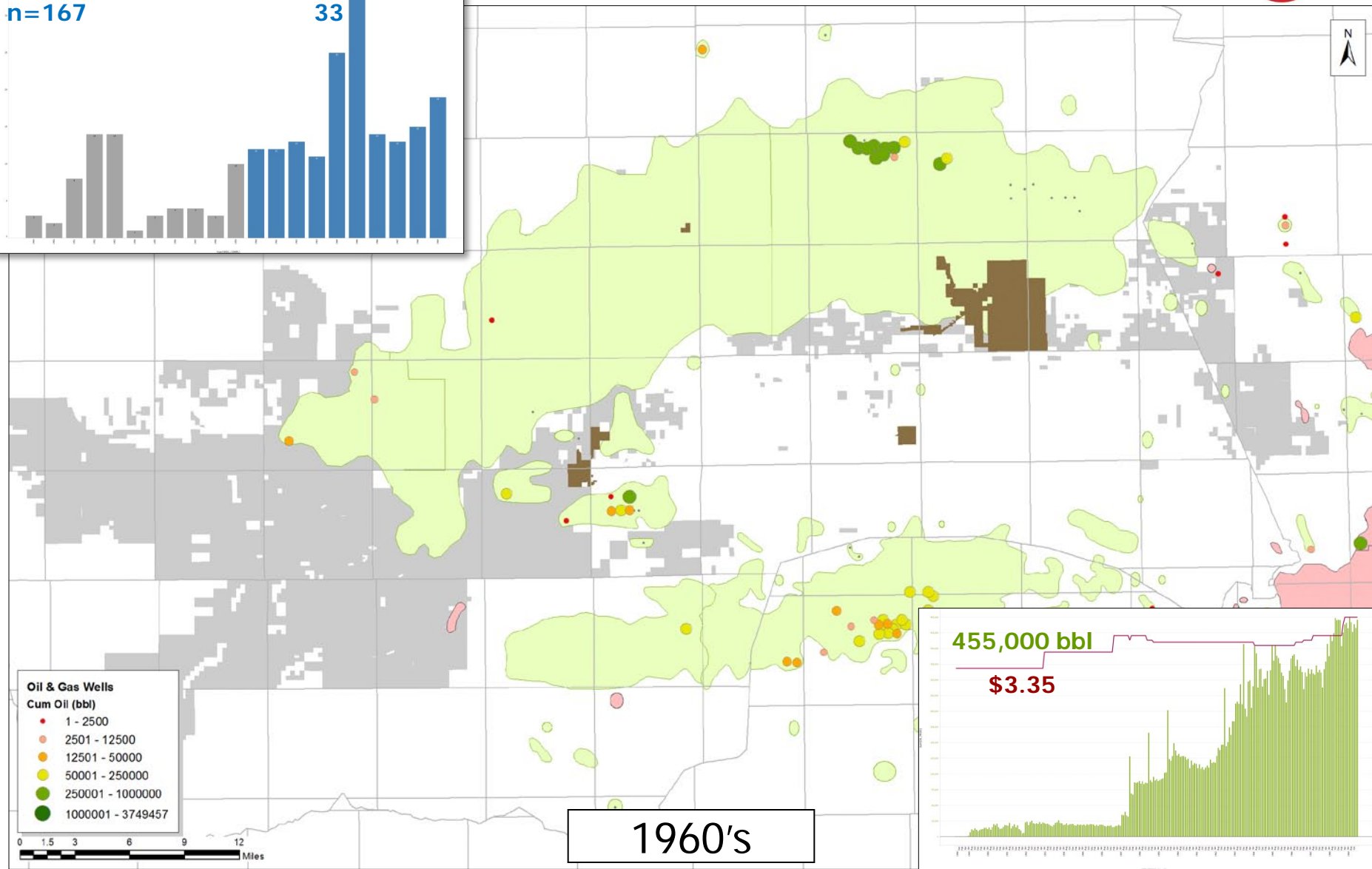
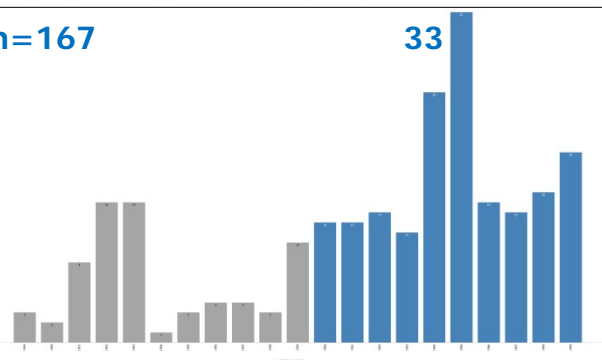


1960's



n=167

33

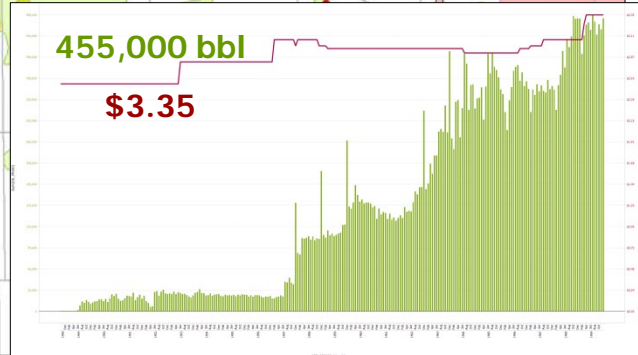


Oil & Gas Wells  
Cum Oil (bbl)

- 1 - 2500
- 2501 - 12500
- 12501 - 50000
- 50001 - 250000
- 250001 - 1000000
- 1000001 - 3749457

455,000 bbl

\$3.35



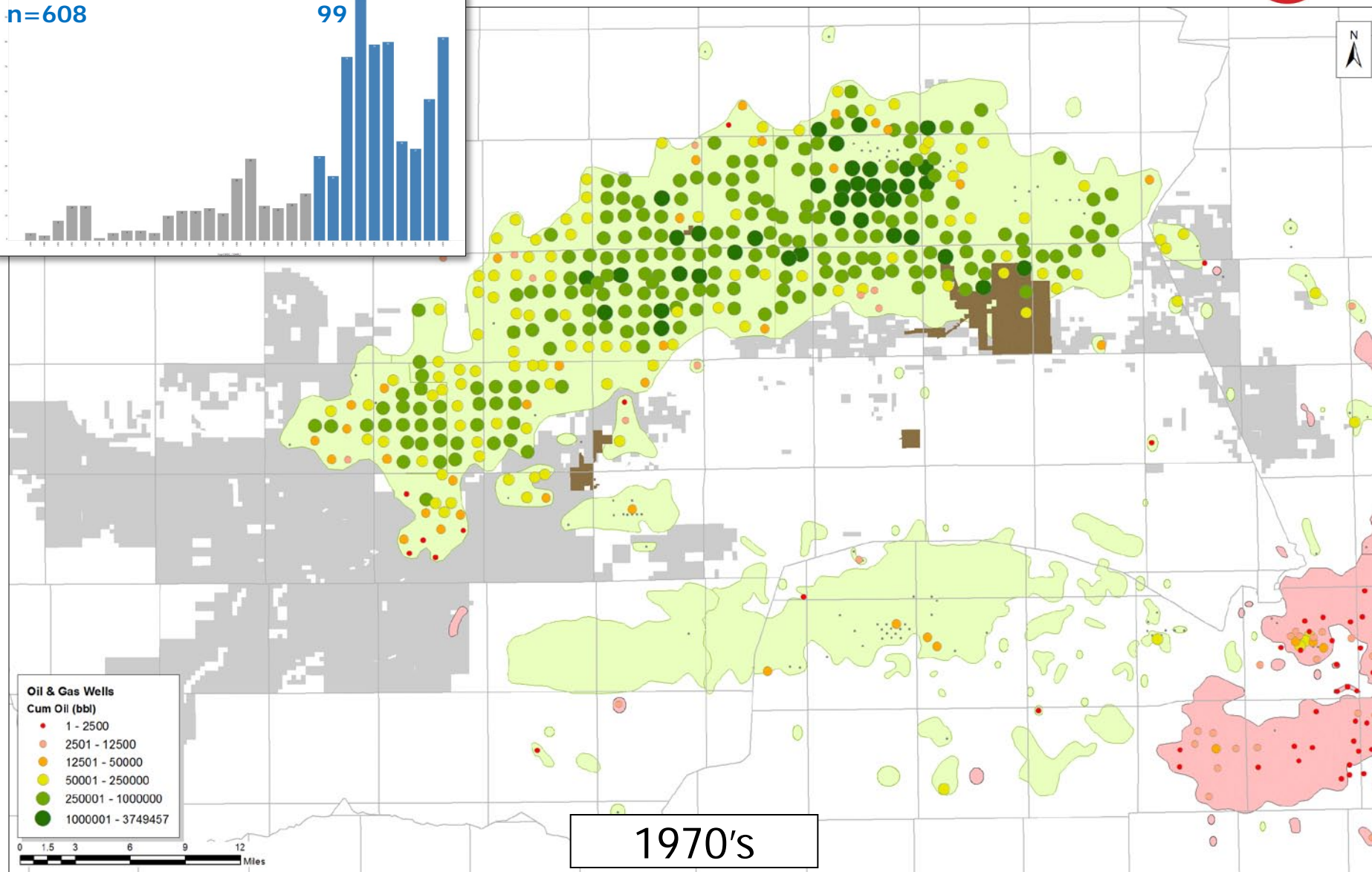
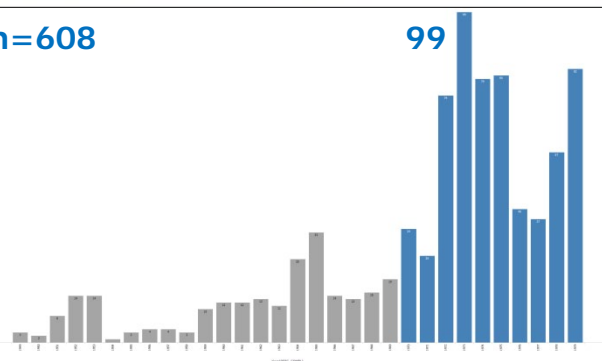
1960's





n=608

99



Oil & Gas Wells  
Cum Oil (bbl)

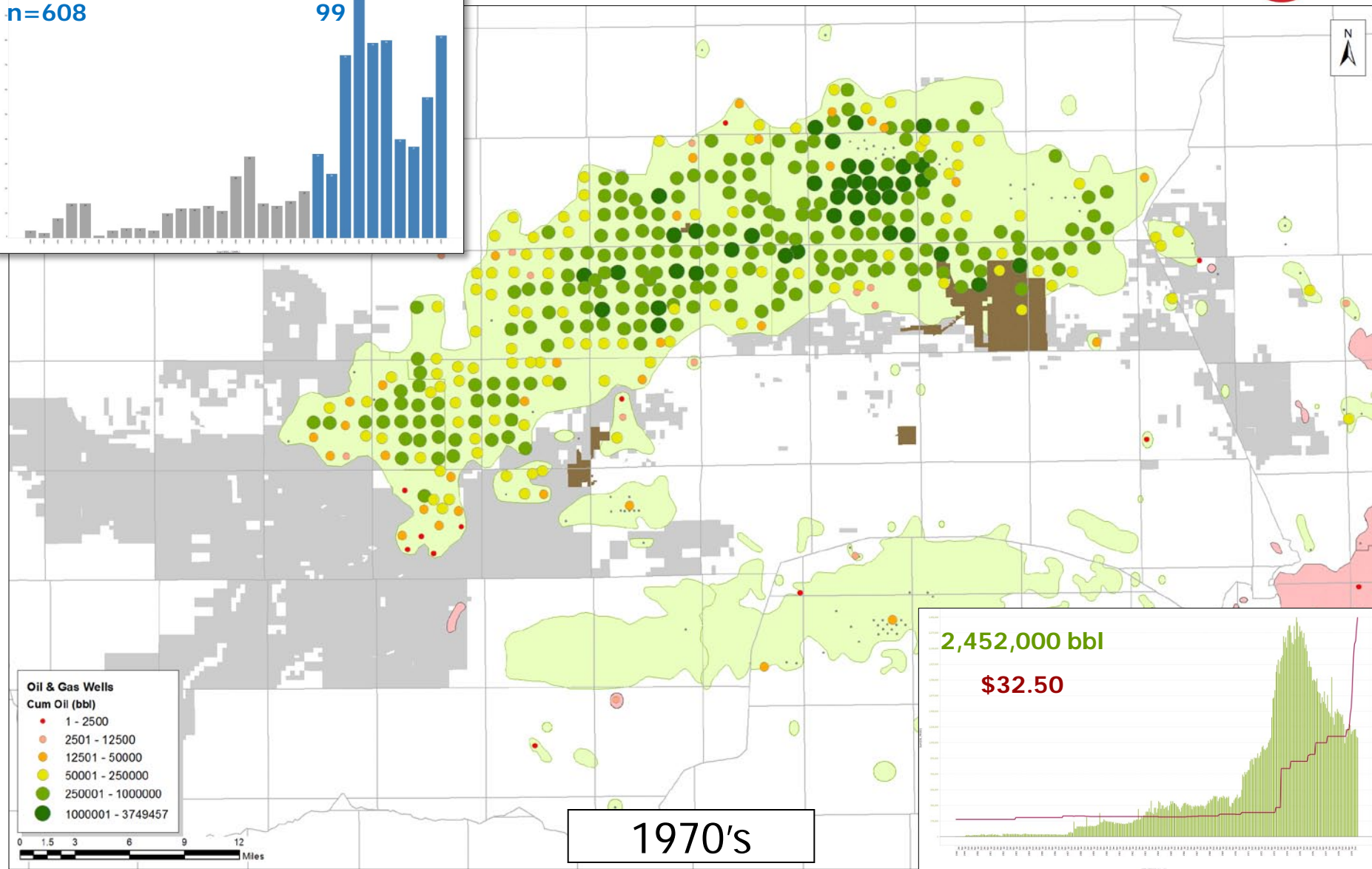
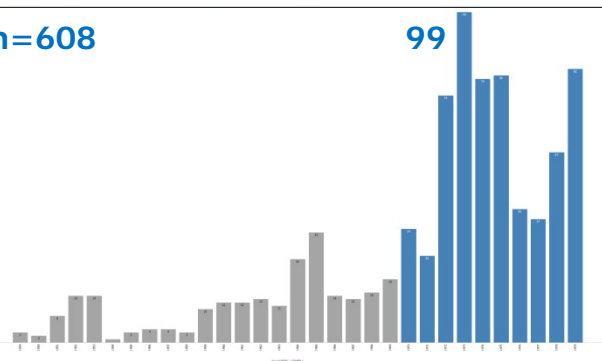
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- 12501 - 50000
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- 250001 - 1000000
- 1000001 - 3749457

1970's



n=608

99

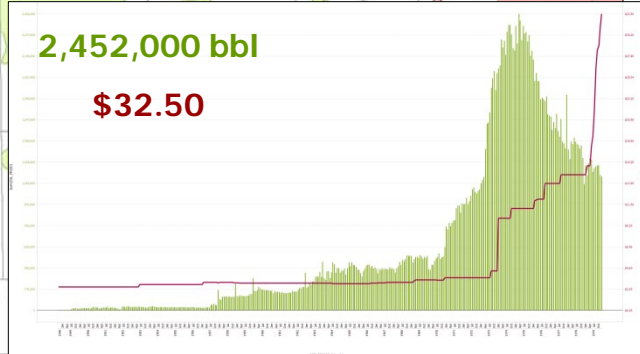


Oil & Gas Wells  
Cum Oil (bbl)

- 1 - 2500
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- 12501 - 50000
- 50001 - 250000
- 250001 - 1000000
- 1000001 - 3749457

2,452,000 bbl

\$32.50



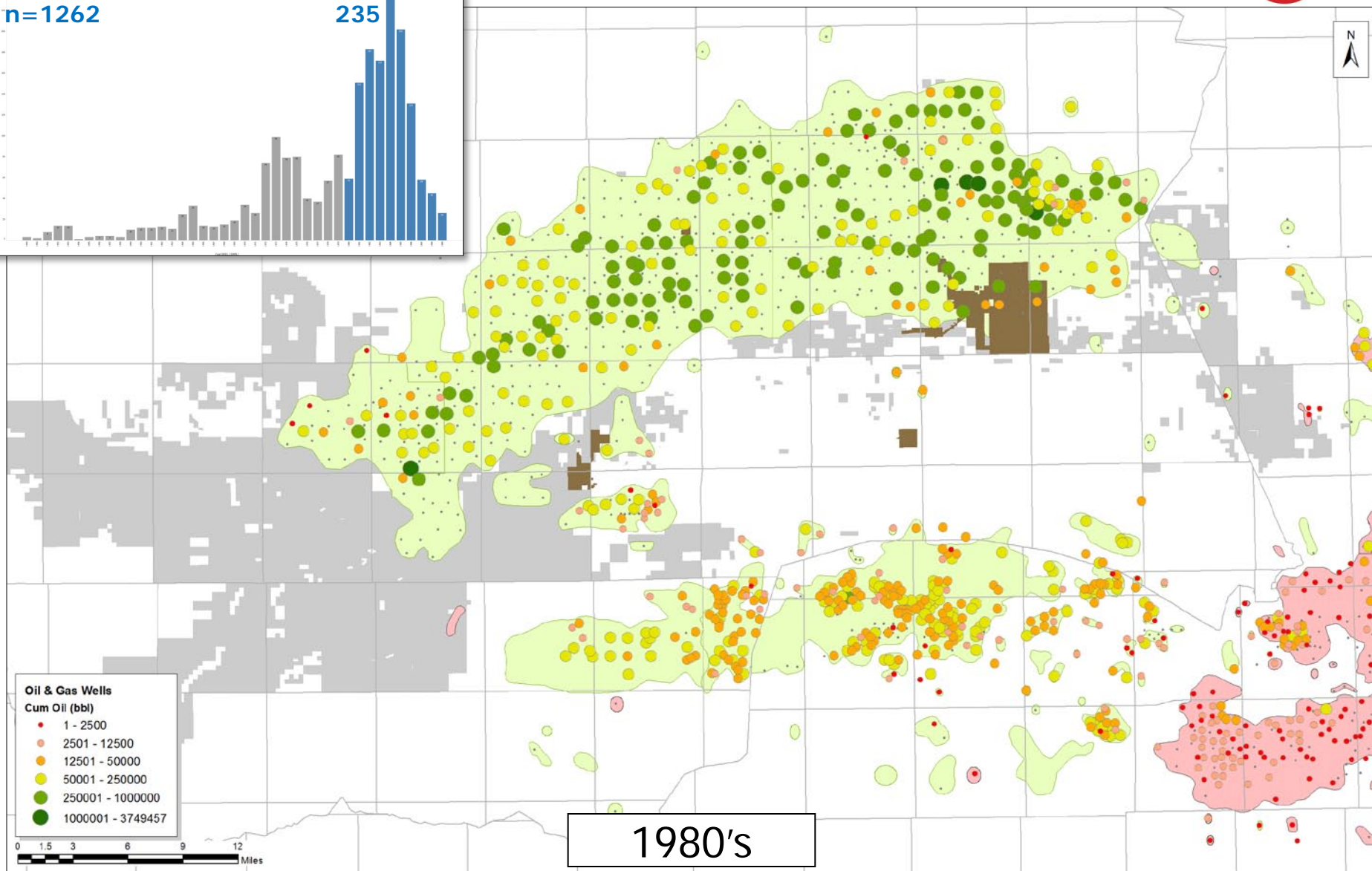
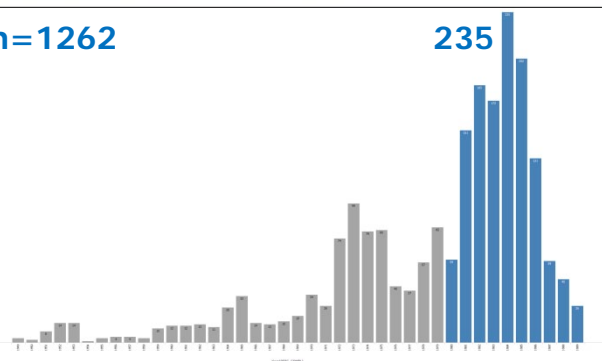
1970's





n=1262

235



Oil & Gas Wells  
Cum Oil (bbl)

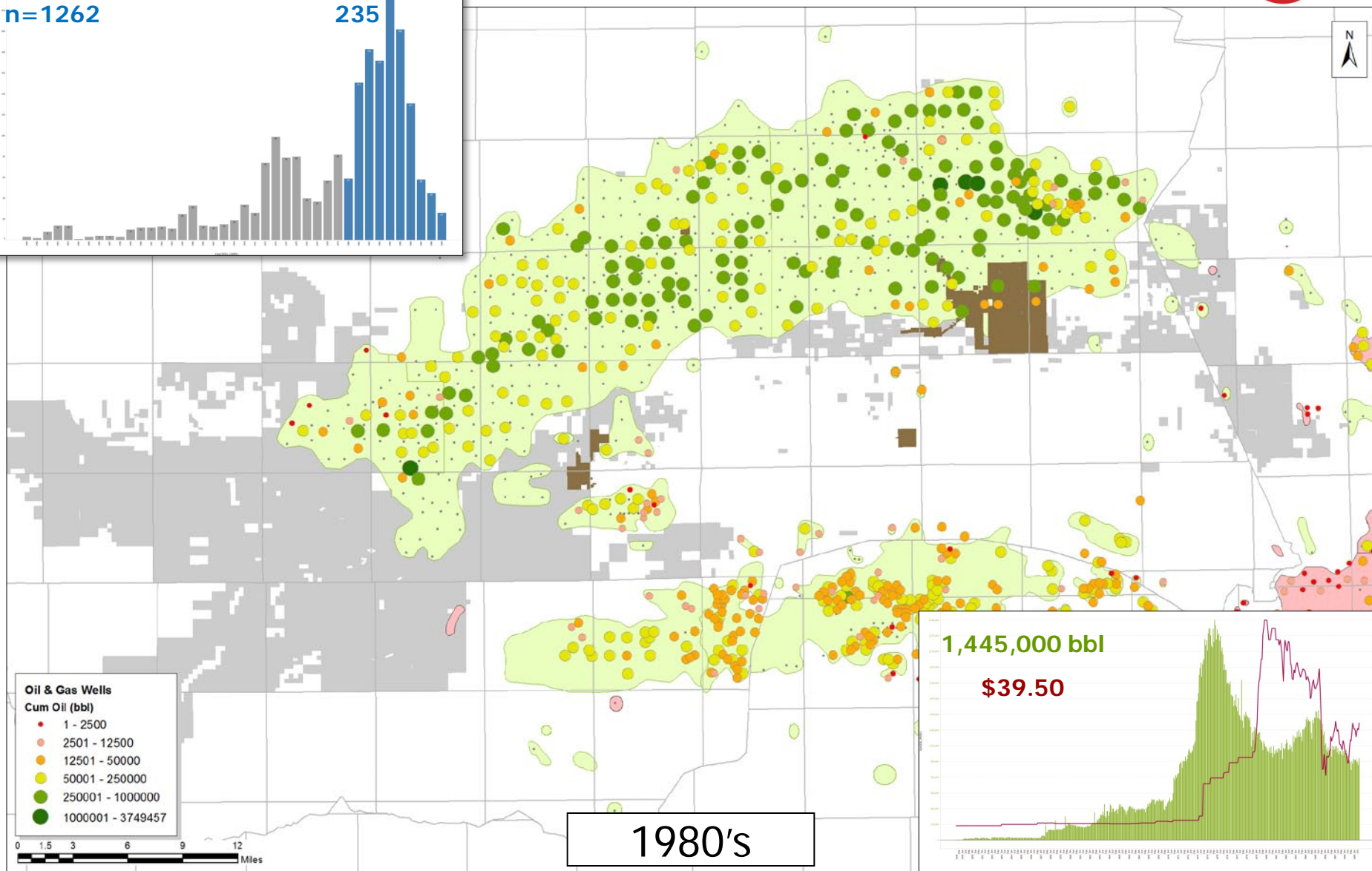
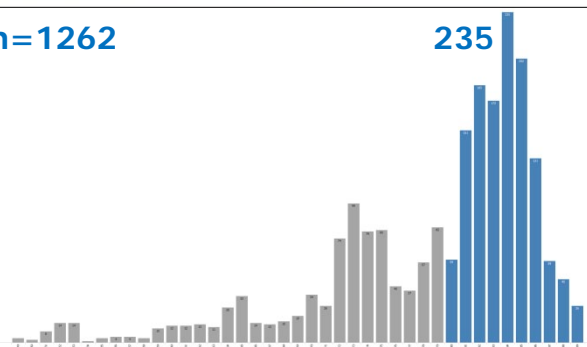
- 1 - 2500
- 2501 - 12500
- 12501 - 50000
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1980's



n=1262

235



Oil & Gas Wells  
Cum Oil (bbl)

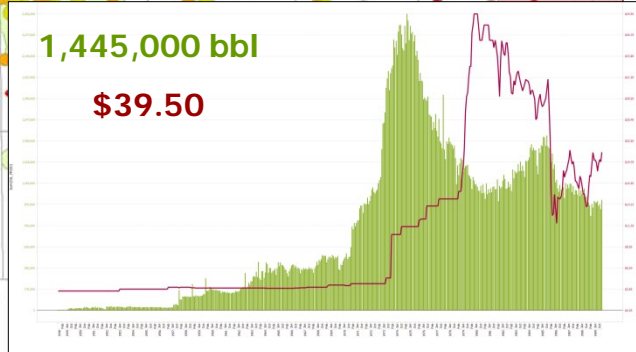
- 1 - 2500
- 2501 - 12500
- 12501 - 50000
- 50001 - 250000
- 250001 - 1000000
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0 1.5 3 6 9 12 Miles

1980's

1,445,000 bbl

\$39.50

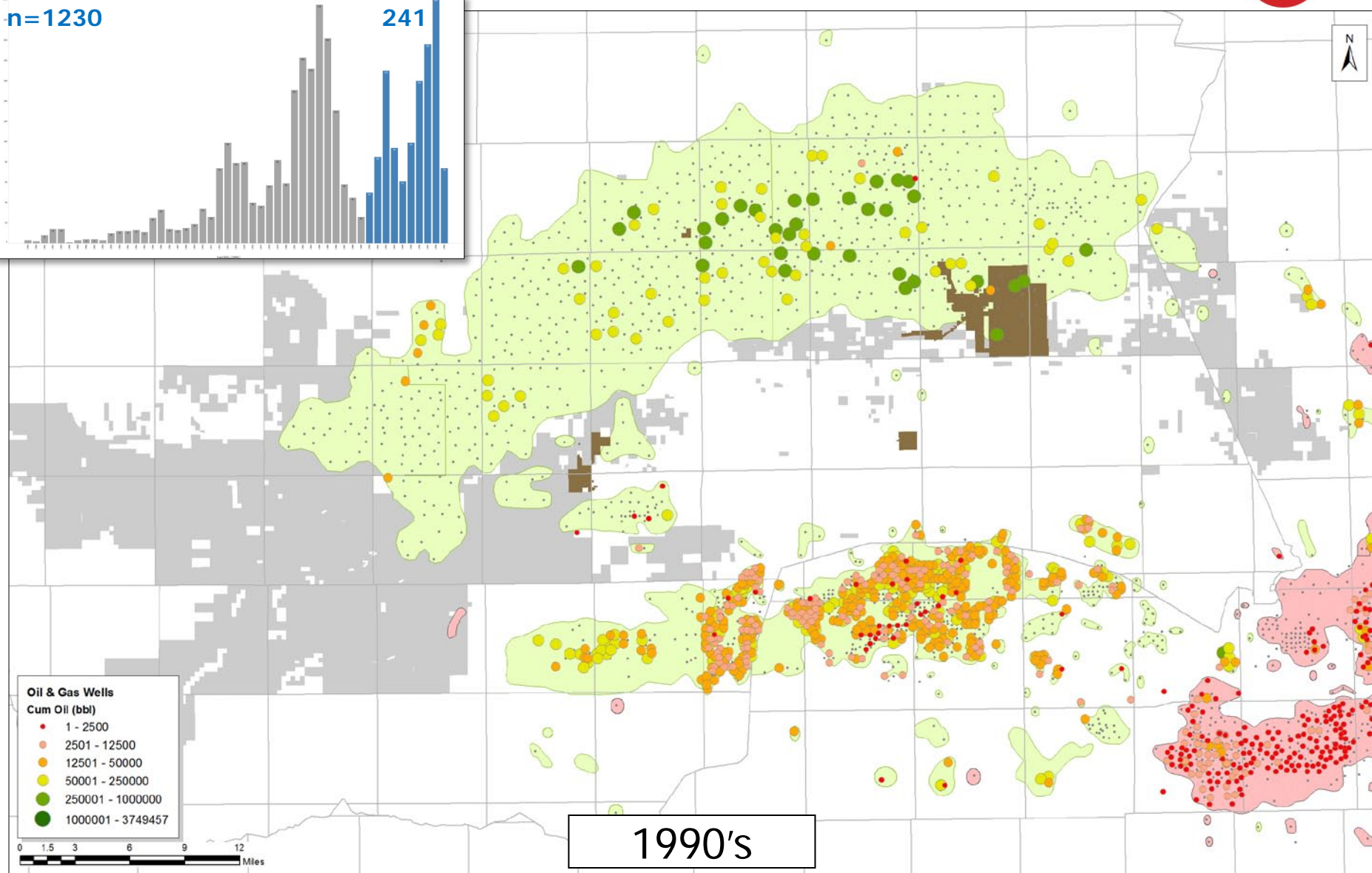
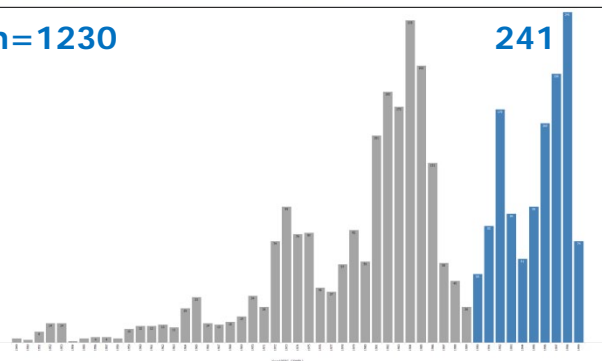






n=1230

241



Oil & Gas Wells  
Cum Oil (bbl)

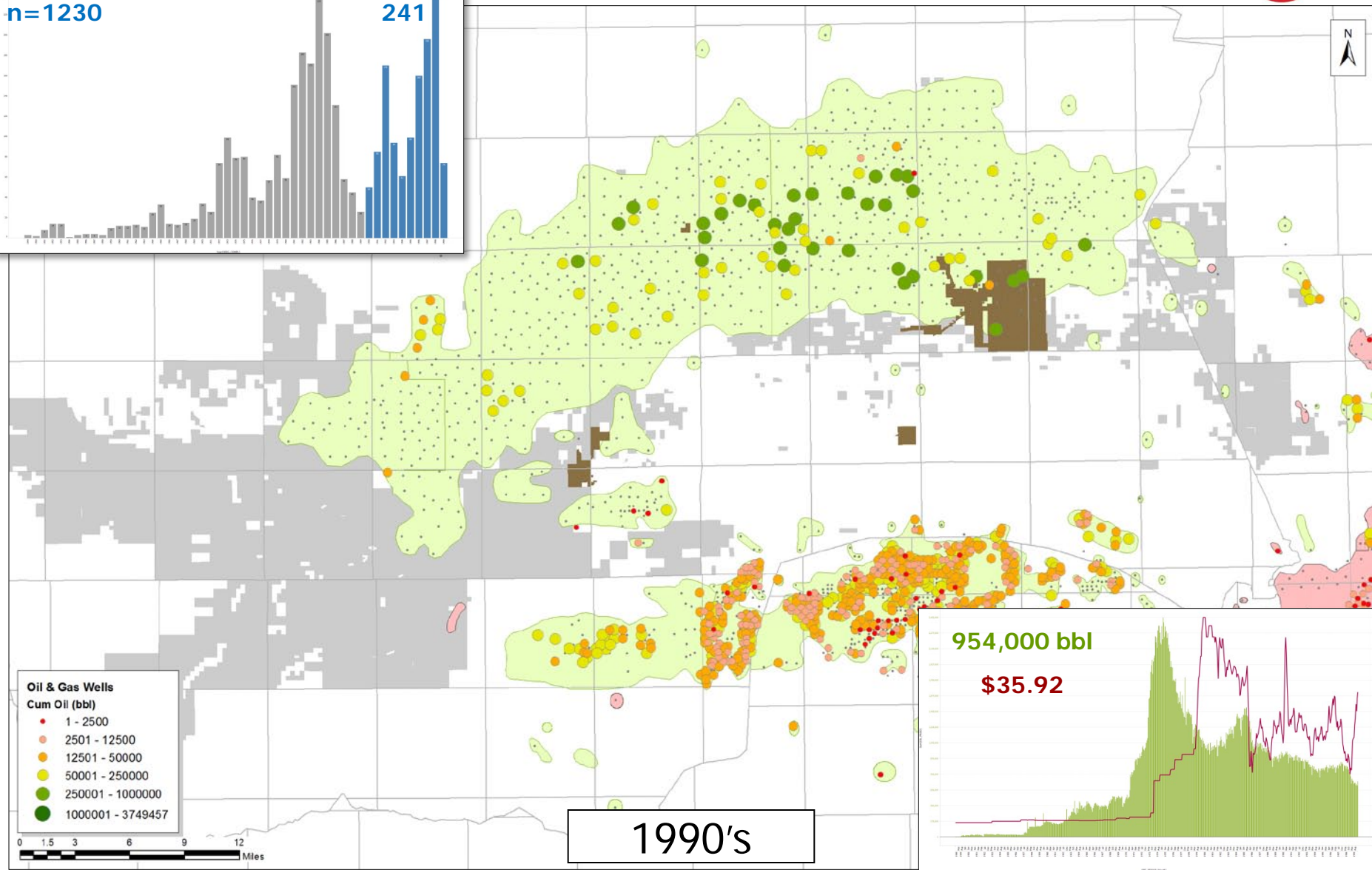
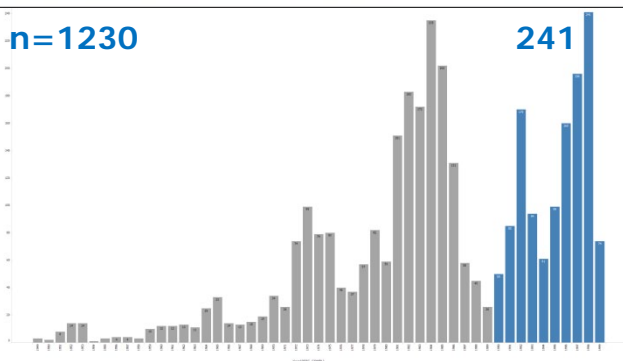
- 1 - 2500
- 2501 - 12500
- 12501 - 50000
- 50001 - 250000
- 250001 - 1000000
- 1000001 - 3749457

1990's



n=1230

241



Oil & Gas Wells  
Cum Oil (bbl)

- 1 - 2500
- 2501 - 12500
- 12501 - 50000
- 50001 - 250000
- 250001 - 1000000
- 1000001 - 3749457

1990's

954,000 bbl

\$35.92

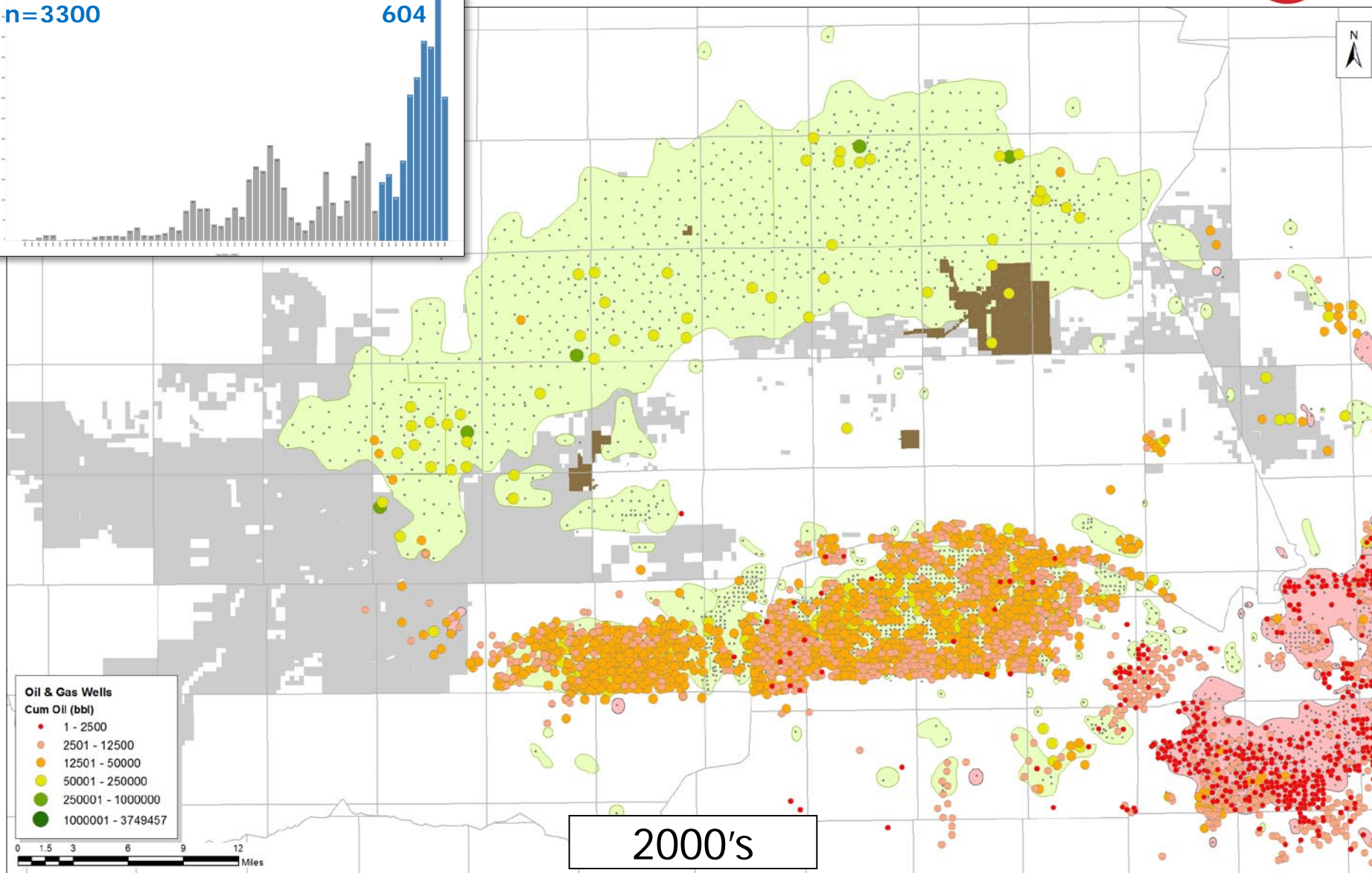
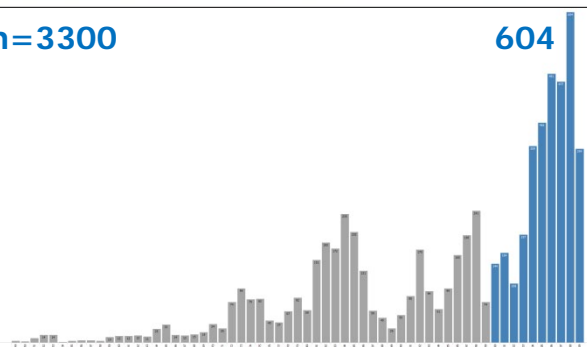






n=3300

604

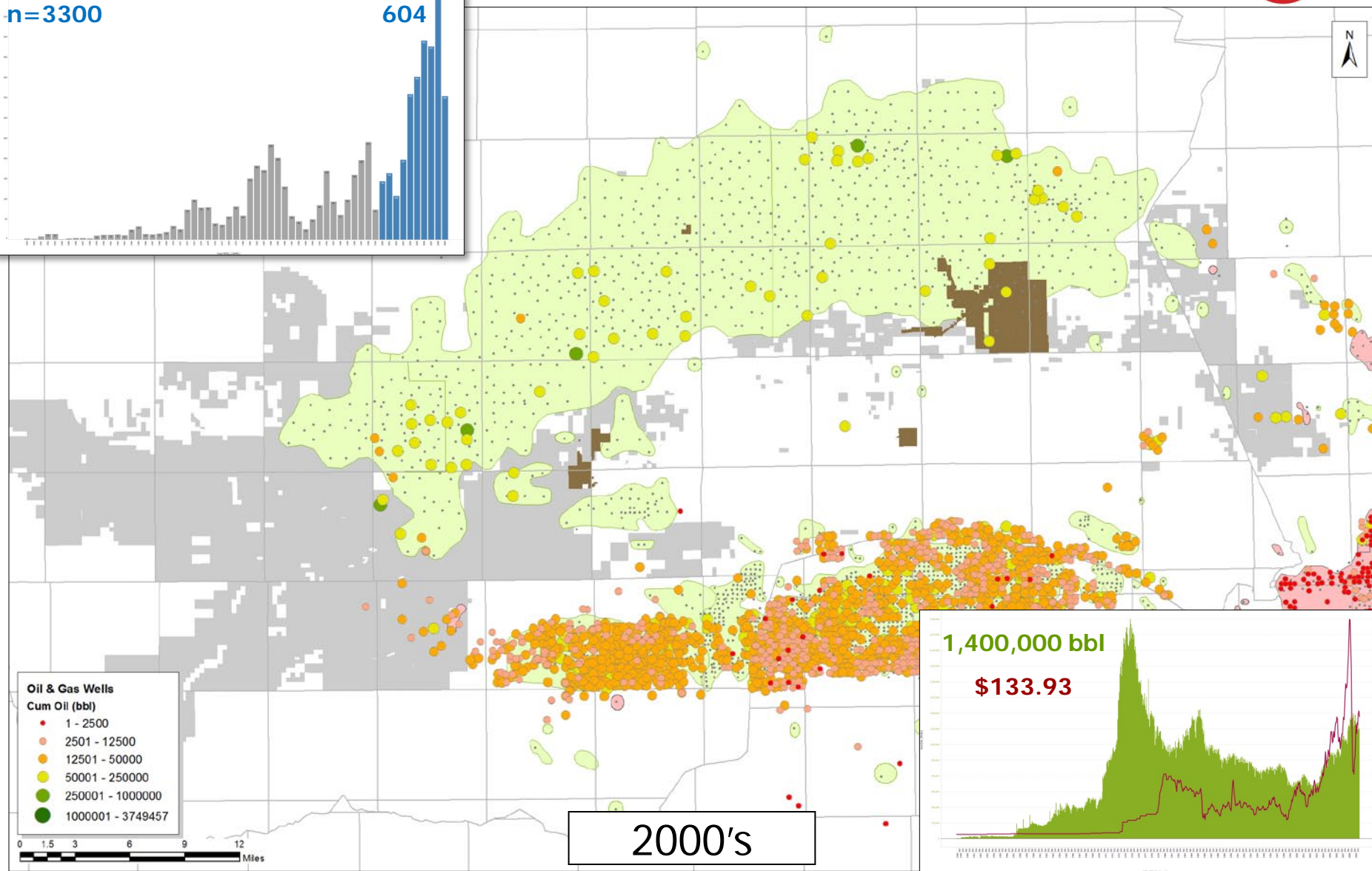
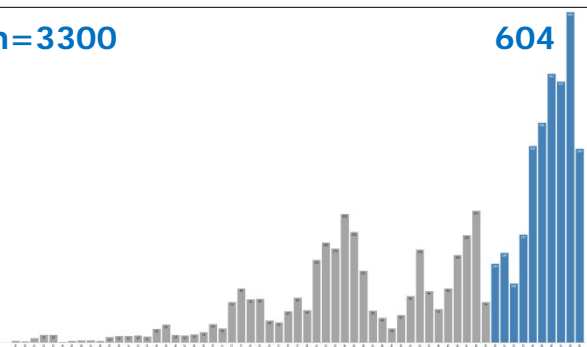


2000's



n=3300

604

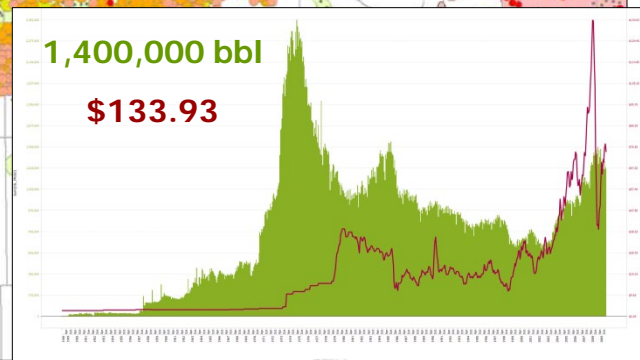


Oil & Gas Wells  
Cum Oil (bbl)

- 1 - 2500
- 2501 - 12500
- 12501 - 50000
- 50001 - 250000
- 250001 - 1000000
- 1000001 - 3749457

1,400,000 bbl

\$133.93



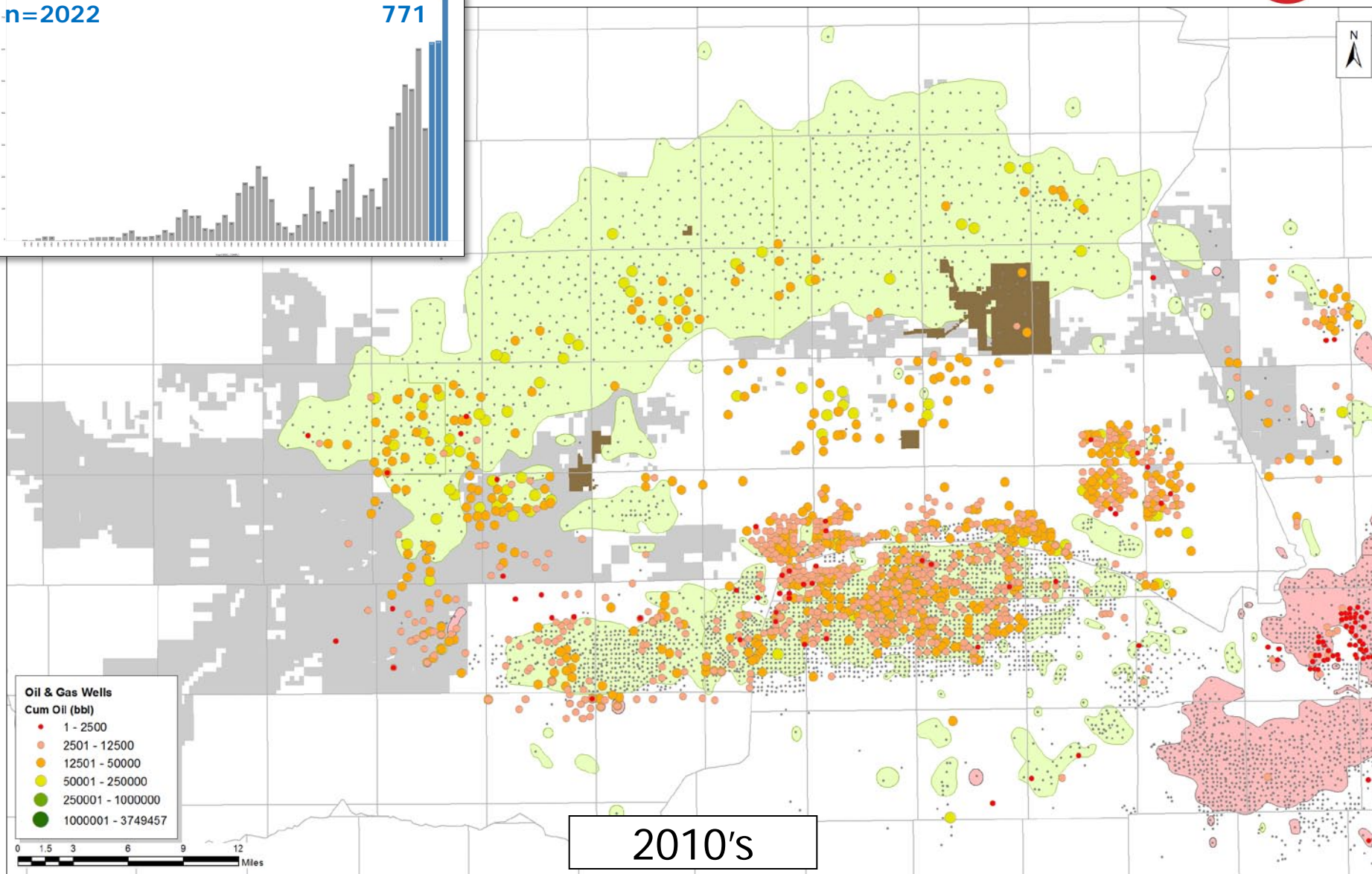
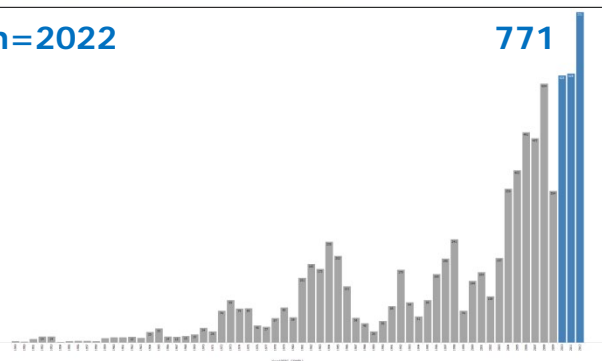
2000's





n=2022

771



Oil & Gas Wells  
Cum Oil (bbl)

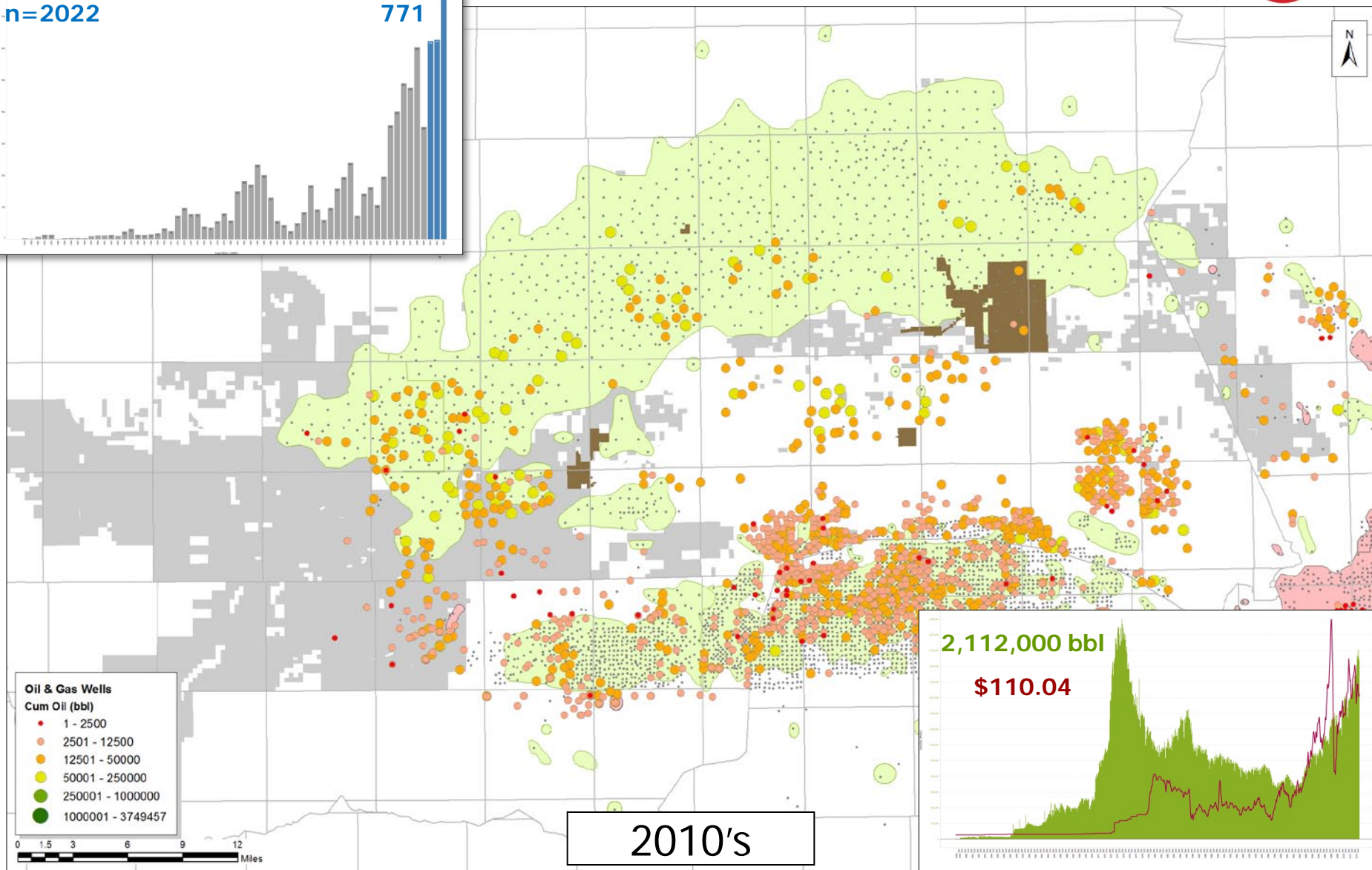
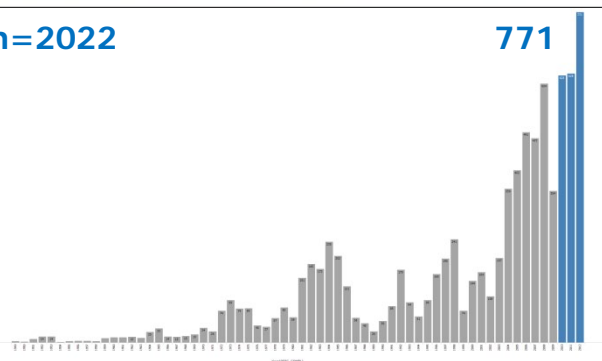
- 1 - 2500
- 2501 - 12500
- 12501 - 50000
- 50001 - 250000
- 250001 - 1000000
- 1000001 - 3749457

2010's



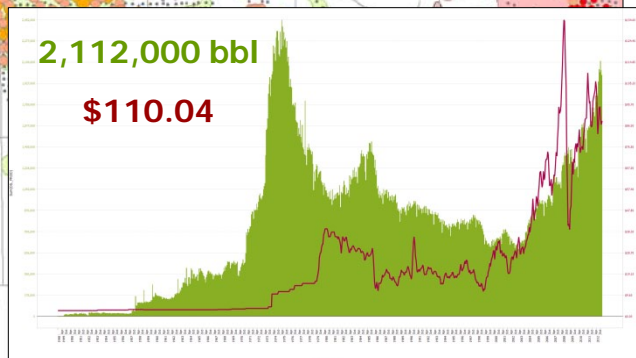
n=2022

771



2,112,000 bbl

\$110.04







# Nice History...

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...but what about the future?

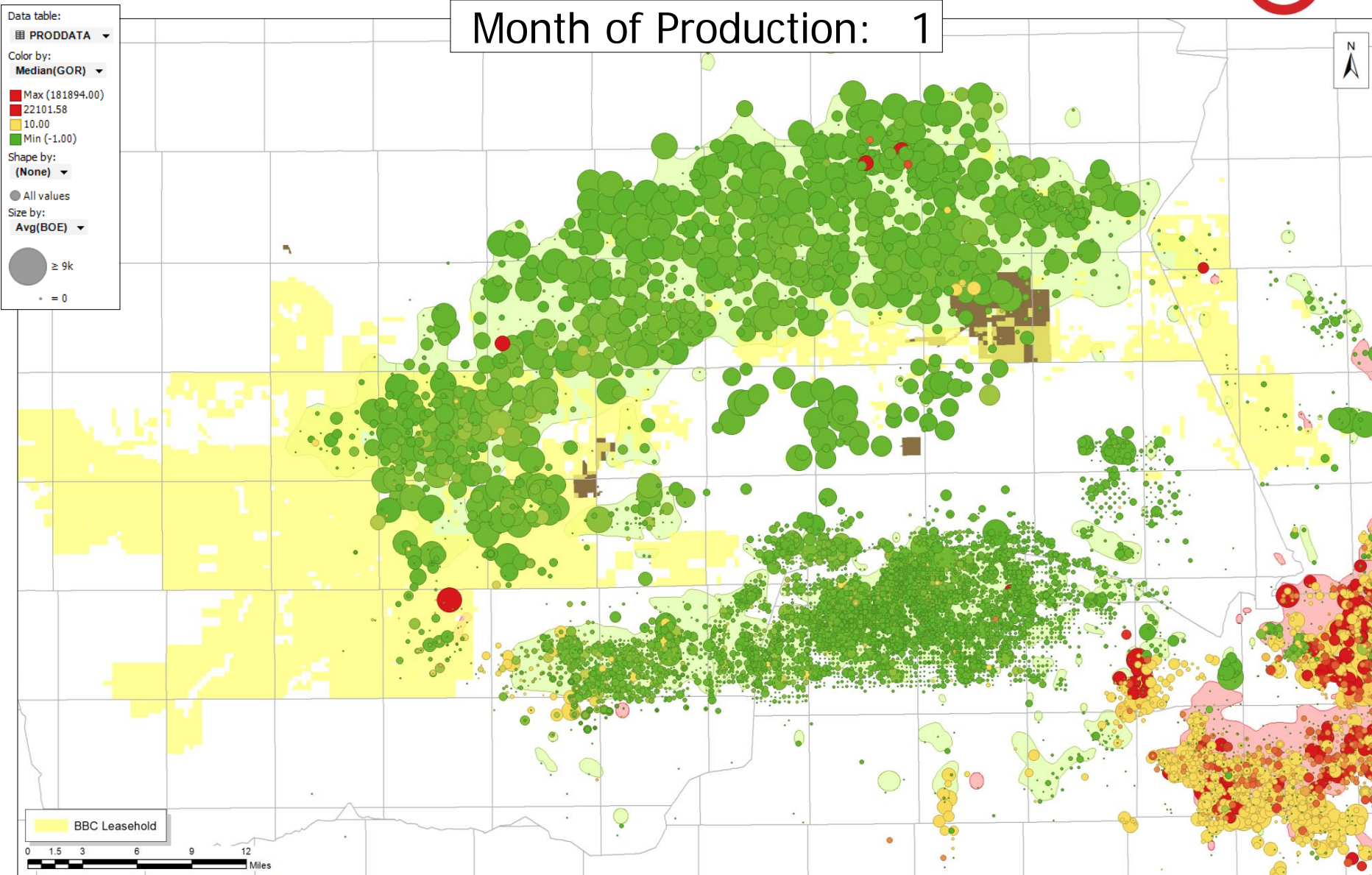
Was Historical High Production a From a "Sweet Spot" in a Resource Play?

Did the Best Wells Get Drilled First and We're Traversing Down the Creaming Curve?

What Upside Exists from Continued Development and Delineation?



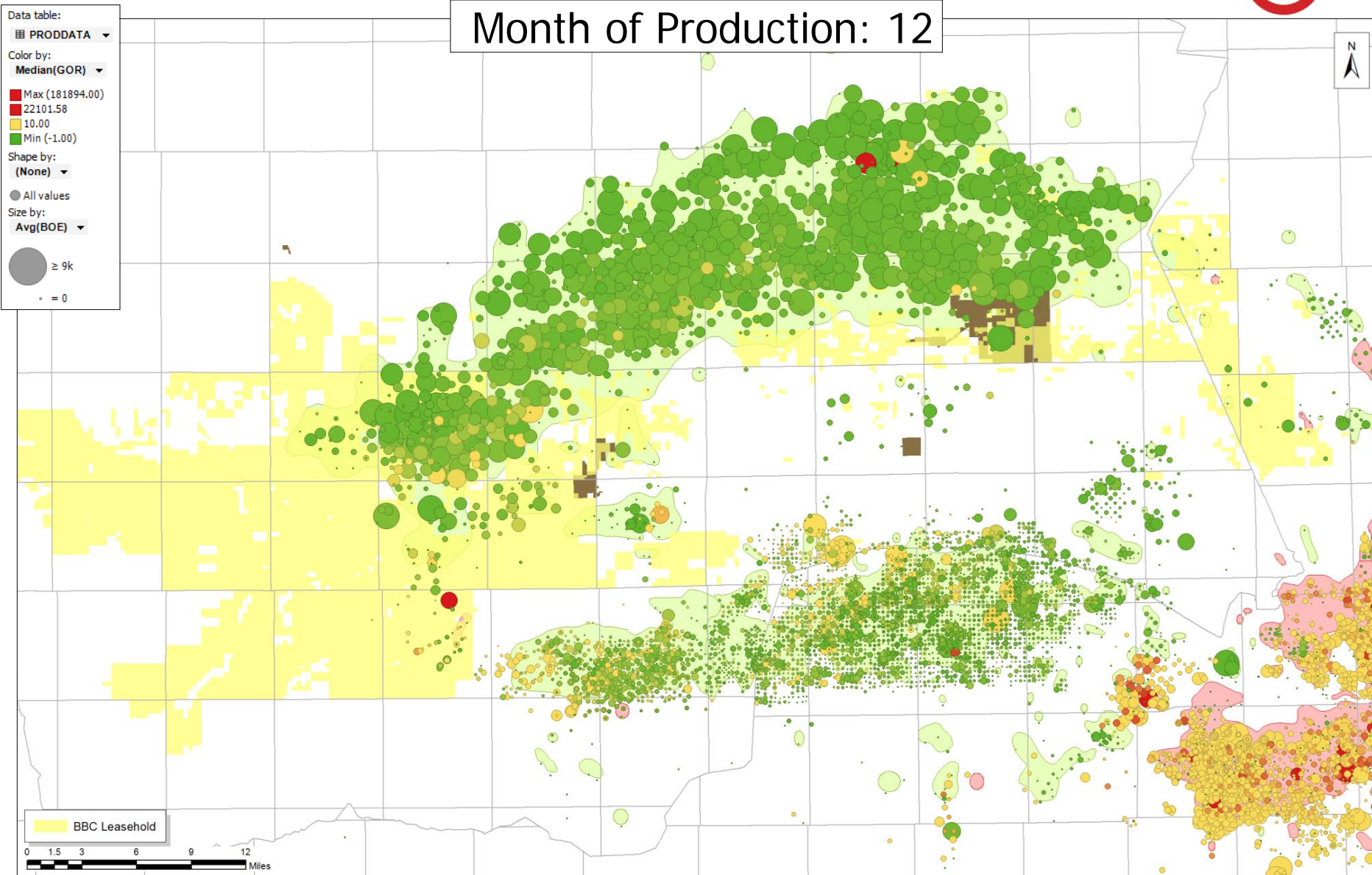
Month of Production: 1





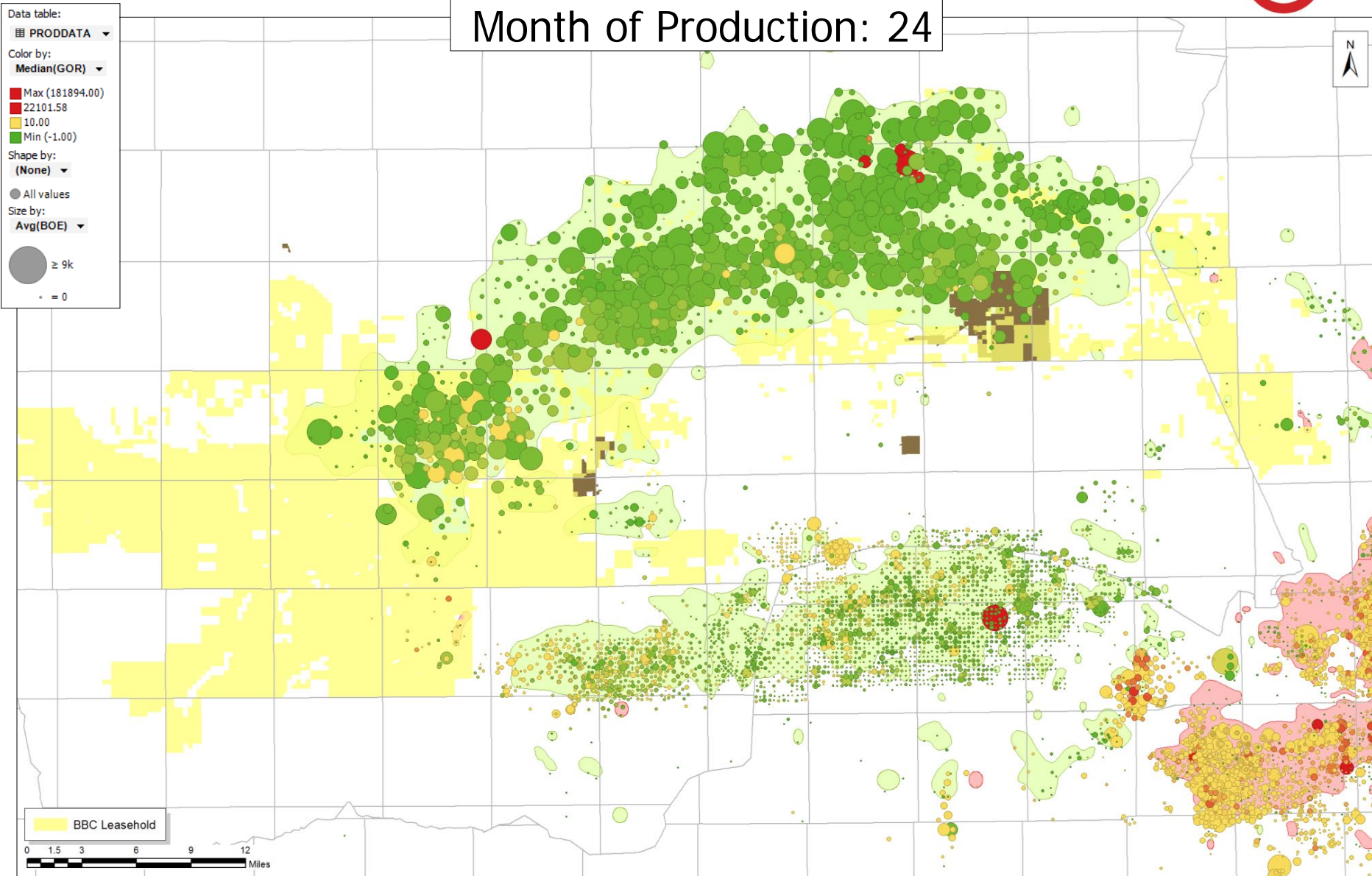


## Month of Production: 12





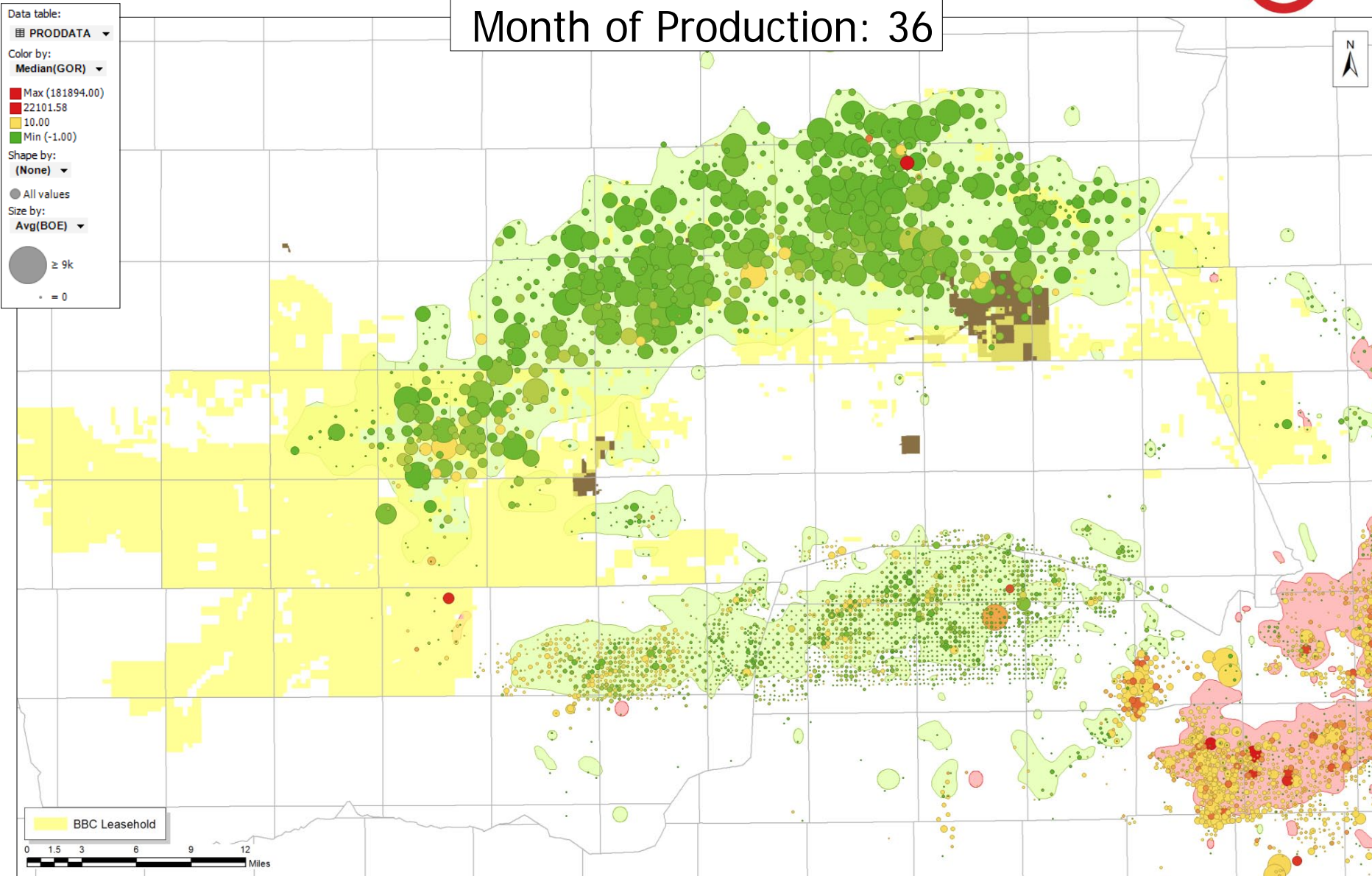
## Month of Production: 24

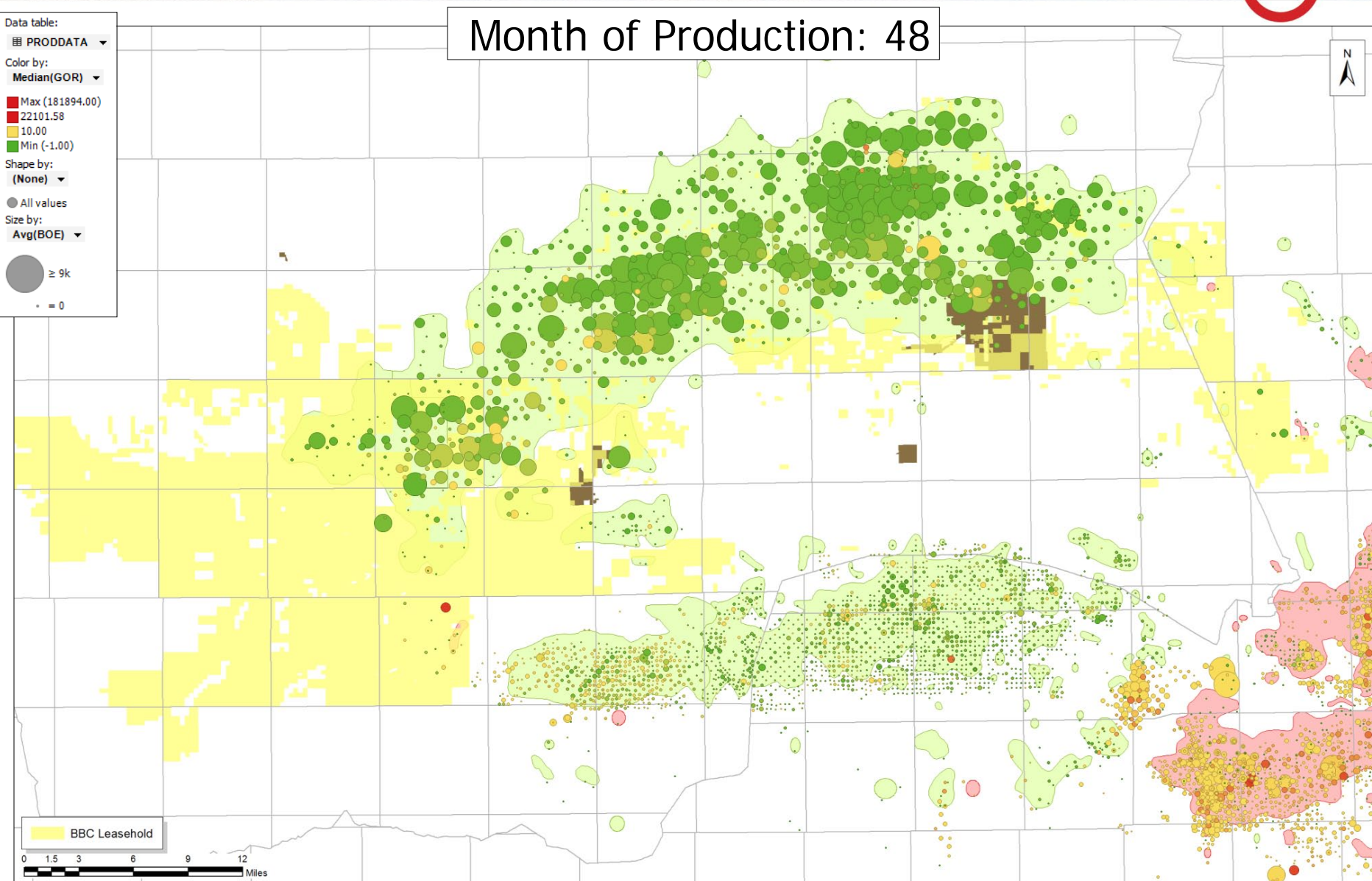






## Month of Production: 36

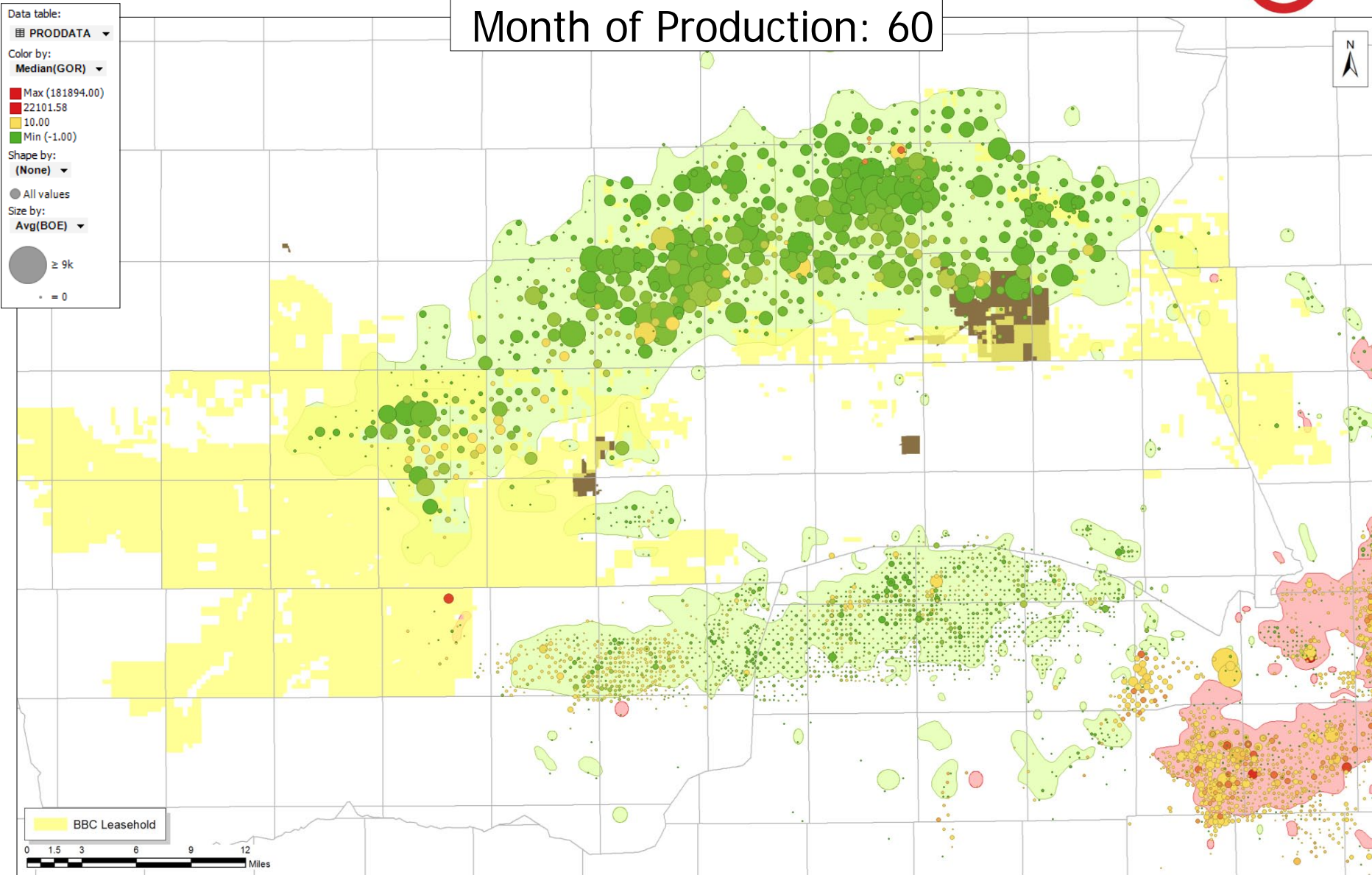








## Month of Production: 60





Month of Production: 120



Data table:

PRODDATA

Color by:

Median(GOR)

Max (181894.00)

22101.58

10.00

Min (-1.00)

Shape by:

(None)

All values

Size by:

Avg(BOE)

≥ 9k

= 0

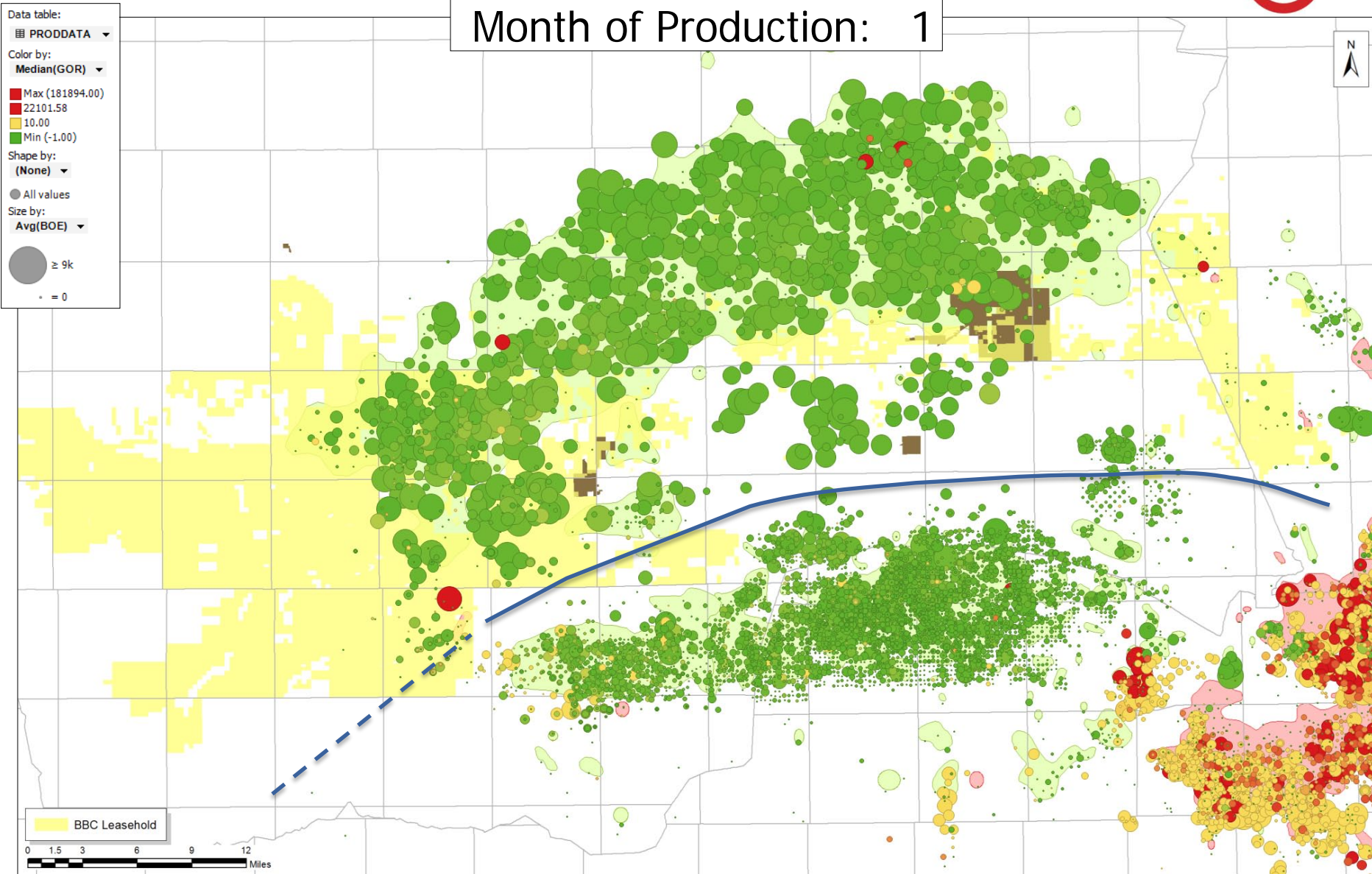
BBC Leasehold

0 1.5 3 6 9 12 Miles





Month of Production: 1





# Discussion

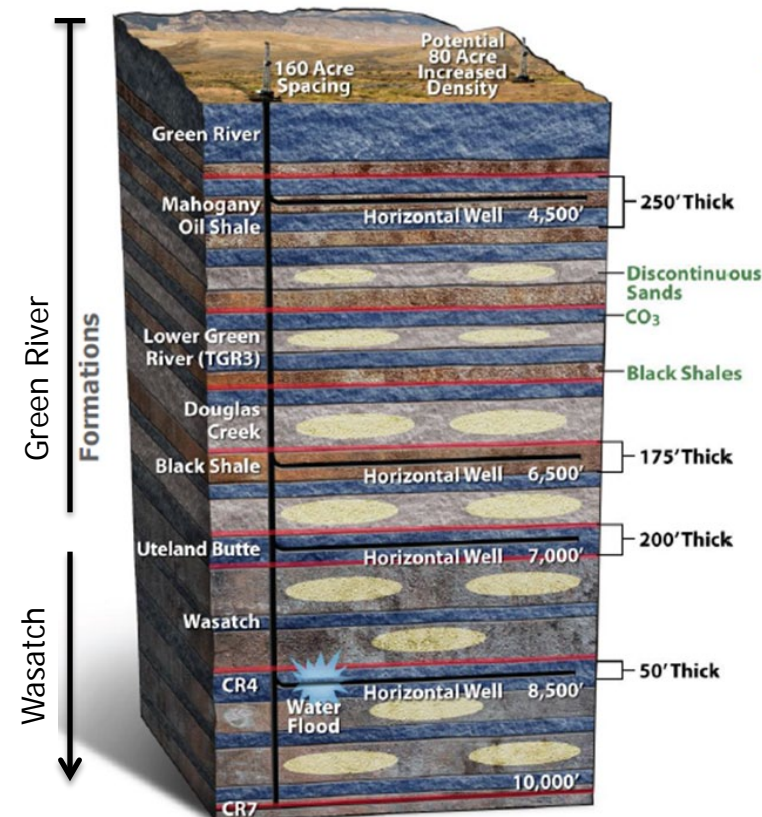
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- Basin Location and Overview
- Geologic Setting and the Tertiary Lacustrine Petroleum System
- Regional Cross-Sections – Strike and Dip Changes in Reservoir
- Evolution of Wasatch/Green River Production from 1949 to 2013
- Challenges to Development
- The Future of the Play



# Play Challenges – What Created the Opportunity

- Topography
- Business Cycles and Fluctuations in Commodities Market
  - Acreage Positions Built, Lost, Rebuilt...
- Difficulty of Log Interpretation
  - Dispersed Solid Hydrocarbon in Pore Space
  - Complex Mineralogy
  - Identification of Productive Fractures
- Multiple Sub-Plays Within Larger Trend
  - Deep Traditional Structure – Bluebell Discovery Well
  - Deep Overpressured Wasatch/Green River
  - Updip Strat Trap in Green River
  - Lacustrine Carbonate Mineralogy Play – Uteland Butte
    - *Understanding Where Your Acreage Falls in these Sub-Plays Is Key to Predicting EUR and Cash Flow*



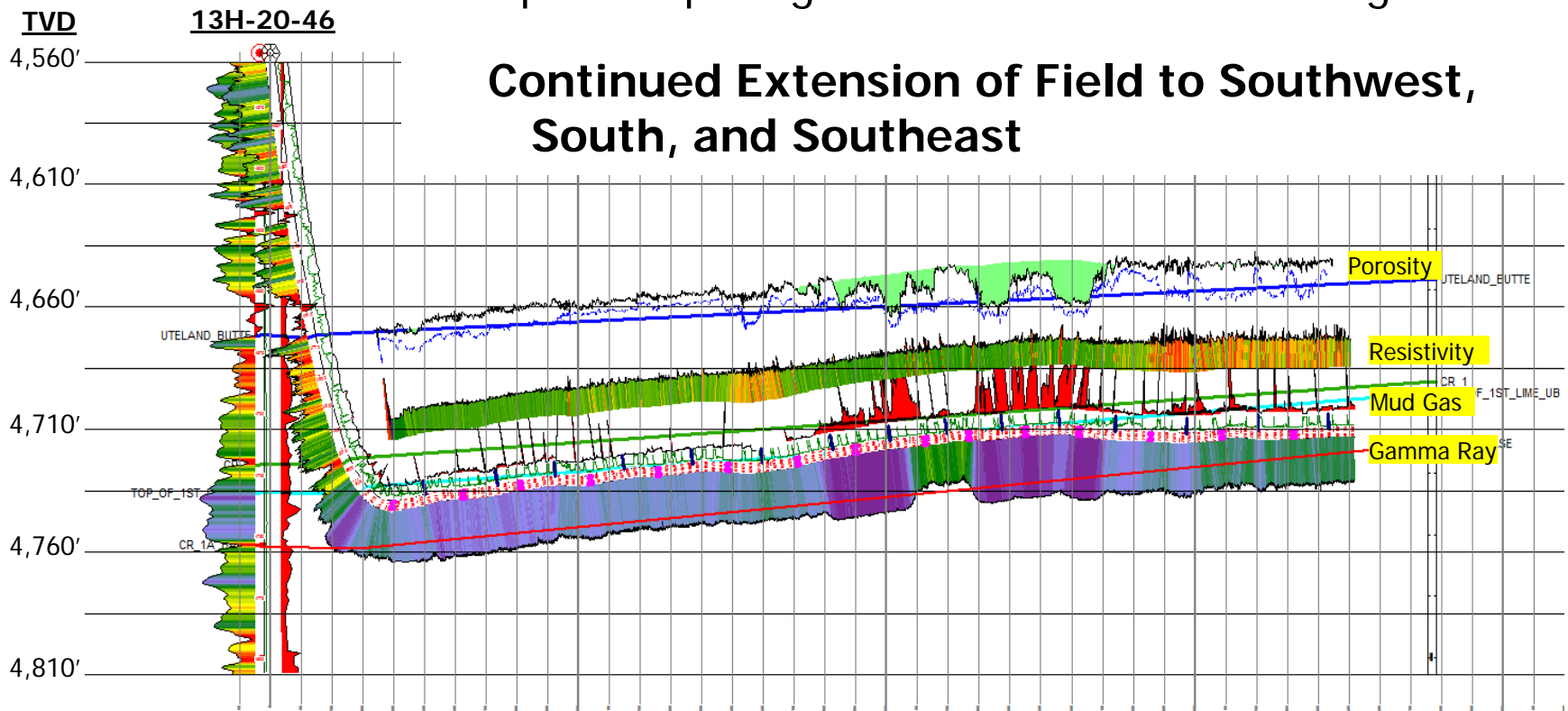


# The Future of the Play as We See It

Horizontal Targets in Distal, Deeper Water Setting in Basin Center

Optimal Spacing and Pattern for Infill Drilling

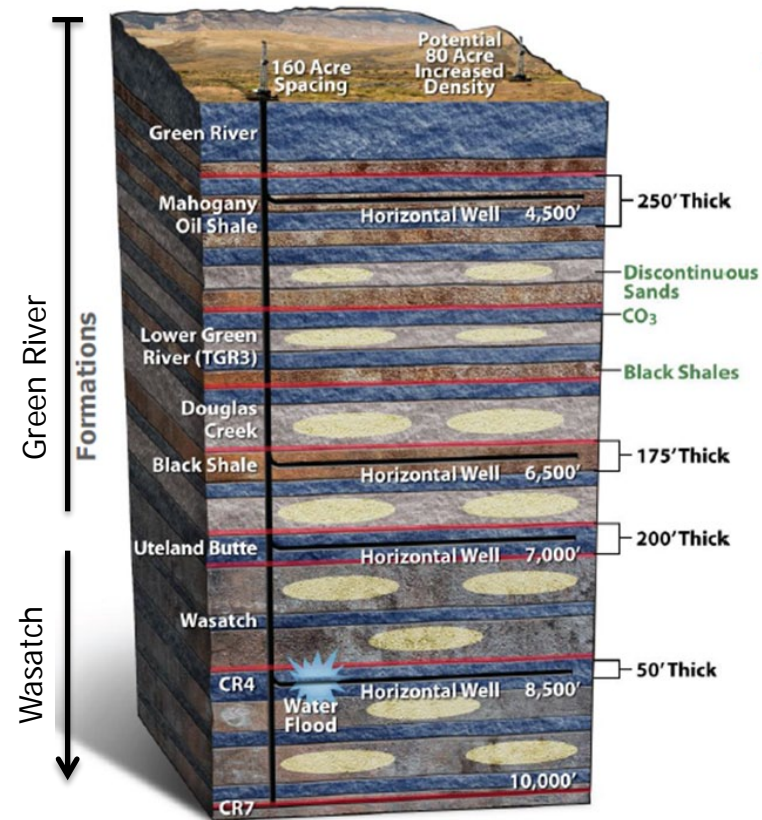
**Continued Extension of Field to Southwest, South, and Southeast**





## Conclusions

- The Tertiary Wasatch/Green River System in the Uinta Basin presents distinct challenges and opportunities for operators
- Geographic Limits of the play are not fully understood, even 60 years into development
- Improving technology in Drilling and Completions continues to open up new opportunities if we know where to look
- Persistence through business cycles creates opportunity on the uptick





**THANK YOU**