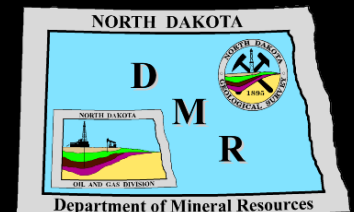


DEVELOPMENT OF THE BAKKEN RESOURCE

***The Bakken/Three Forks
Shale Oil Innovation
Conference & Expo***

Grand Forks, ND—February 11, 2014

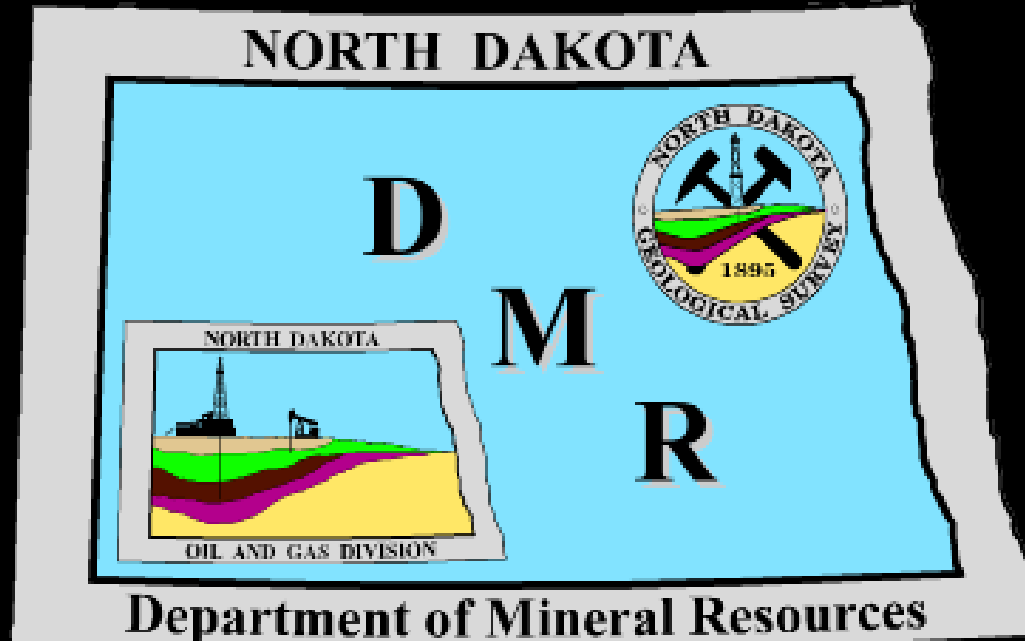


North Dakota Development

- **Resource Play**
- **Rules**
 - **Uniform Spacing—orderly development**
 - **Multi-well locations—small footprint**
 - **Energy Corridors—industry & residents**
- **Unitization**
- **Bakken Results**

Bruce E. Hicks
Assistant Director
NDIC-DMR-OGD
Bismarck, ND

North Dakota Department of Mineral Resources



<https://www.dmr.nd.gov/oilgas/>

<https://www.dmr.nd.gov/ndgs/>

600 East Boulevard Ave. - Dept 405

Bismarck, ND 58505-0840

(701) 328-8020

(701) 328-8000

https://www.dmr.nd.gov/oilgas/ nd.gov

File Edit View Favorites Tools Help

North Dakota nd.gov Official Portal for North Dakota State Government

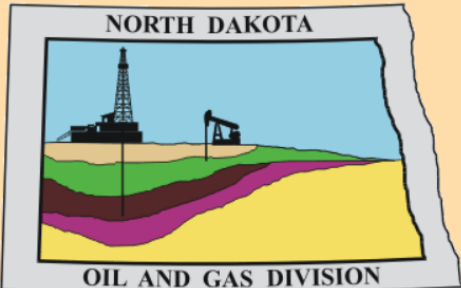
Services

- Rules & Regulations
- Forms
- Hearing Dockets
- Active Drilling Rigs
- Daily Activity Reports
- Confidential Well List
- General Statistics
- Seismic
- Well Search
- Report a Spill/Incident
- GIS Map Server
- Publications
- Surface Mineral Owner
- Basic Services
- Premium Services
- Electronic Filing
- Related Links
- FAQ & Web Help

Contact Us

- Employee Directory
- Email Addresses

NORTH DAKOTA



OIL AND GAS DIVISION

Welcome to the North Dakota Industrial Commission, Department of Mineral Resources and Gas Division, home page.

Director's Cut - 01/14/2014 and Recent Presentations

The Director's Cut is an update on current activity in the North Dakota oil patch from the Director of the Department of Mineral Resources and Gas Division.

([View past Director's Cuts](#) | [Webinars](#))

View the [latest press releases](#) from the Oil and Gas Division

North Dakota Industrial Commission Draft Permitting Policies

Commission Approved Rules

Bakken and Three Forks Information!

Class VI Primacy Application for the authority to regulate the Geologic Storage of Carbon Dioxide

Oil and Gas Division Employment Opportunities!

Available on the ND Petroleum Council web site are the [Surface Owner Information Center](#), the [Royalty Owner Information Center](#) and the PowerPoint presentation that were used at the [2012 Williston Basin Petroleum Conference](#).

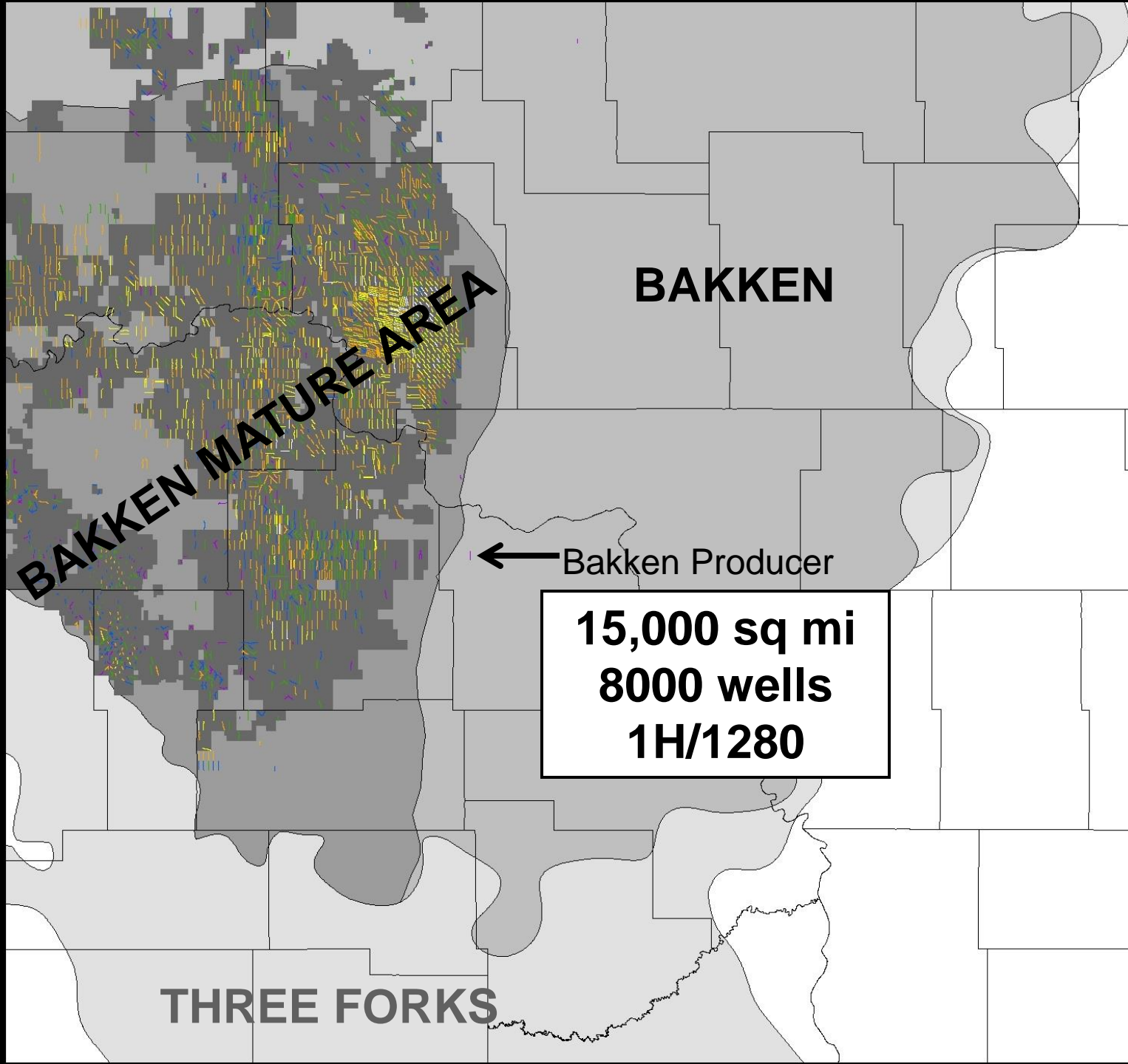
The Oil and Gas Division regulates the drilling and production of oil and gas in North Dakota. Our mission is to encourage and promote the development, production, and utilization of oil and gas in the state in such a manner as will prevent waste, maximize economic recovery, and

Phone: (701) 328-8020
Fax: (701) 328-8022
Mail: [ND Oil & Gas Division](#)

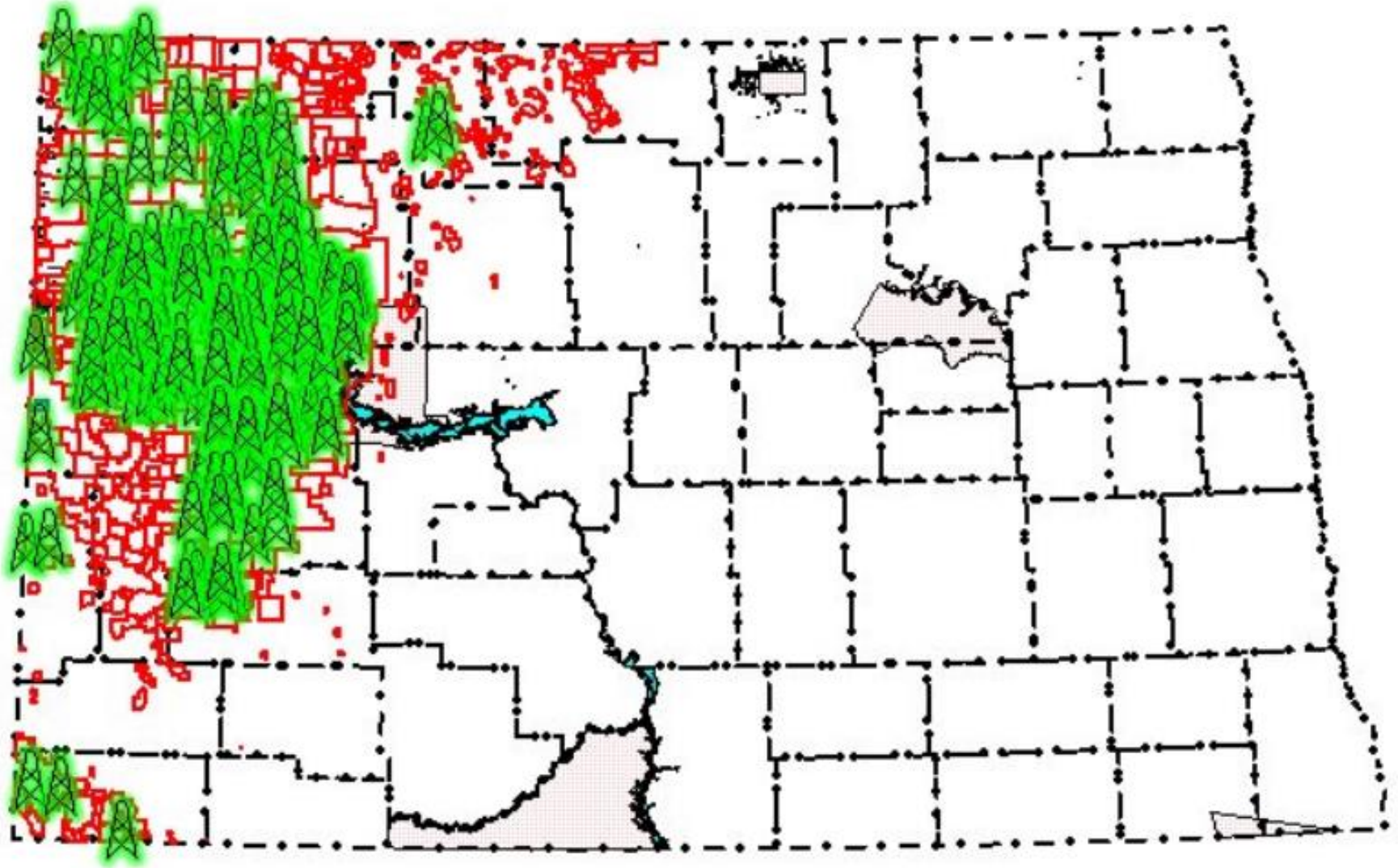
Statistics Activity Upd... Microsoft Ex... https://www...

North Dakota Development

- **Resource Play**
- **Rules**
 - Uniform Spacing—orderly development
 - Multi-well locations—small footprint
 - Energy Corridors—industry & residents
- **Unitization**
- **Bakken Results**



NORTH DAKOTA – 188 DRILLING RIGS – FEBRUARY 2014



**Current drilling activity is focused
in Mountrail, Dunn, McKenzie, and Williams Counties.**

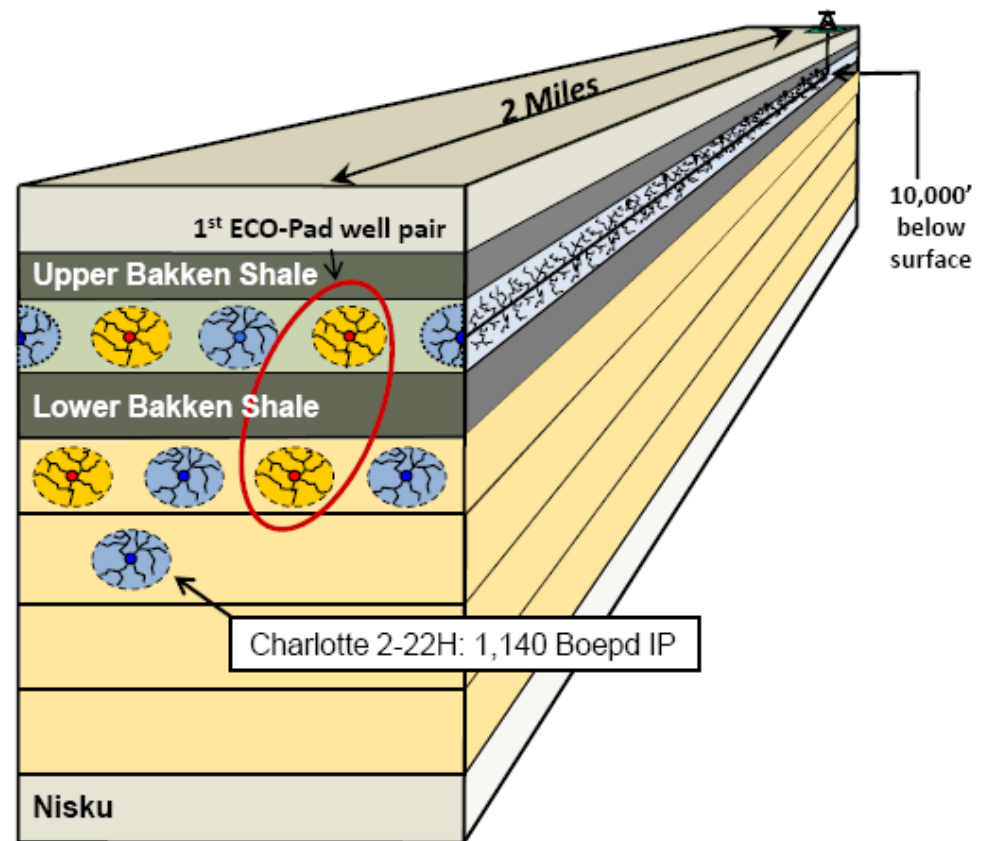
Bakken Development Plan

Original dual-zone development plan

- 8 wells per 1,280 acres – 4 MB, 4TF
- 603,000 Boe EUR per well (avg. 24.5 stages/completion)
- ECO-Pad® design: 2 wells south, 2 wells north

Additional Three Forks potential

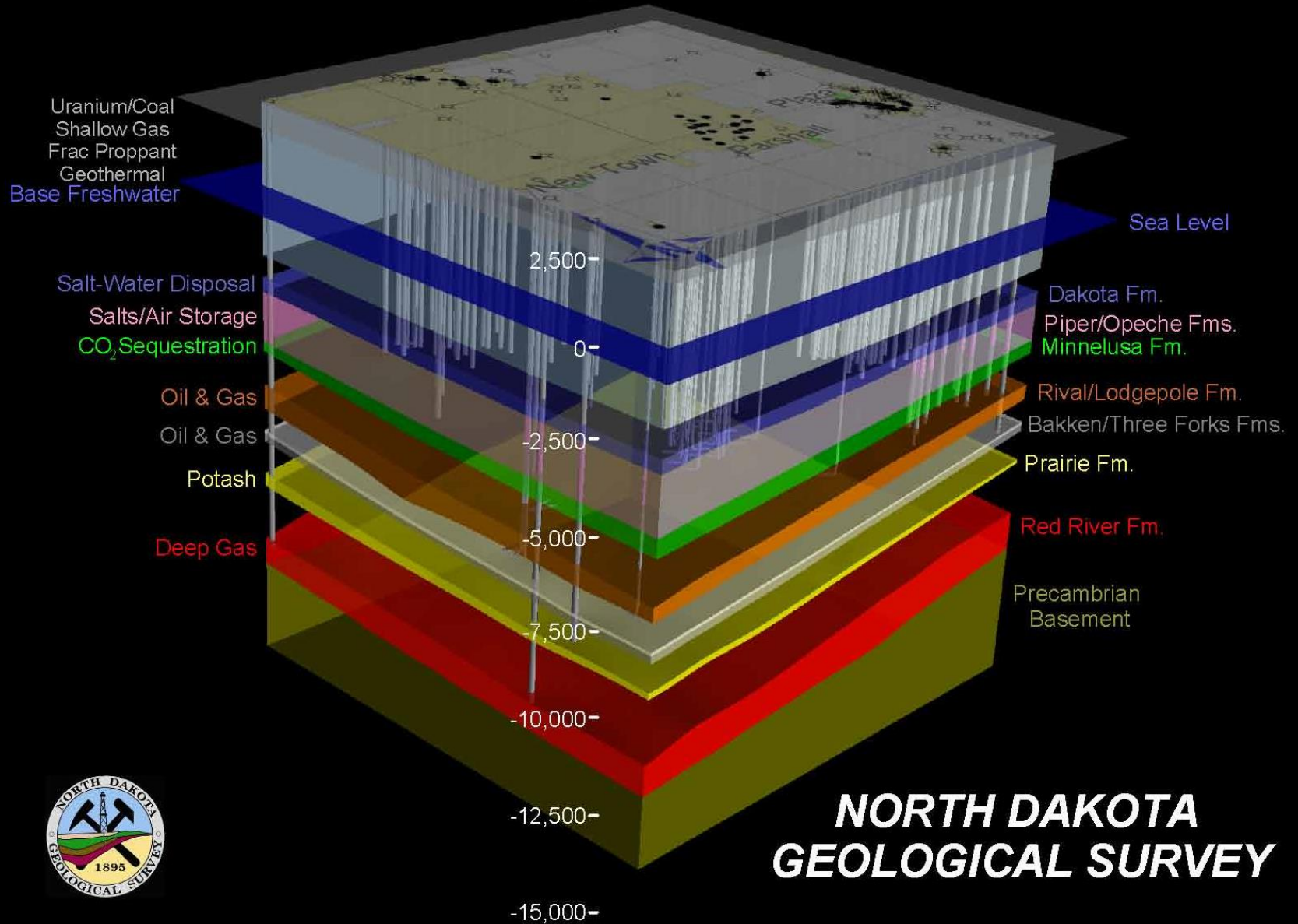
Three Forks



11



Three-Dimensional Geologic Model of the Parshall Area



North Dakota Development

- Resource Play
- Rules
 - Uniform Spacing—orderly development
 - Multi-well locations—small footprint
 - Energy Corridors—industry & residents
- Unitization
- Bakken Results

ArcIMS Viewer



Townships

Rec	Township	Tdir	Range	Rdir	TWPRNG	TWPTEXT	RNGTEXT
1	156	N	90	W	156090	T156N	R 90W

ND OI

- ☒ Oil and Gas
- ☒ Water
- ☒ Petroleum
- ☒ Right of Way
- ☒ Ditch
- ☒ Ditch
- ☒ Highway
- ☒ Highway
- ☒ Canal
- ☒ Oil
- ☒ Un
- ☒ In
- ☒ Dr
- ☒ Se
- ☒ Ga
- ☒ Other
- ☒ Re
- ☒ Co
- ☒ Riv
- ☒ La
- ☒ Imagery
- ☒ Topo
- ☒ Topo
- ☒ NAIP

1



A horizontal number line segment is shown, starting at 0 and ending at 1mi. The segment is divided into 4 equal parts by three tick marks.

Information	Size	Type	Ref Code	Feature Created	Feature Updated	Case No	Order No	Map Symbol
Bakken	1280	SPC		Thu, 5 Jun 2008 00:00:00	Mon, 8 Dec 2008 00:00:00			1280SPC



ND OIL & GAS LAYERS

- ☒ Oil and Gas
 - ☐ Wells
 - ☐ Permit Status Before Spud
 - ☐ Rig Location
 - ☐ Directional Surveys
 - ☐ Directional Legs
 - ☐ Horizontal Surveys
 - ☐ Horizontal Legs
 - ☐ Cases Docketed
 - ☒ Oil Fields
 - ☐ Unit Boundaries
 - ☐ Inspector Areas
 - ☒ Drilling / Spacing
 - ☐ Seismic
 - ☐ Gas Plants
- ☒ Other
- ☐ Imagery
 - ☐ Topo/DRG 250k
 - ☐ Topo/DRG 100k
 - ☐ NAIP 2009

Refresh Map

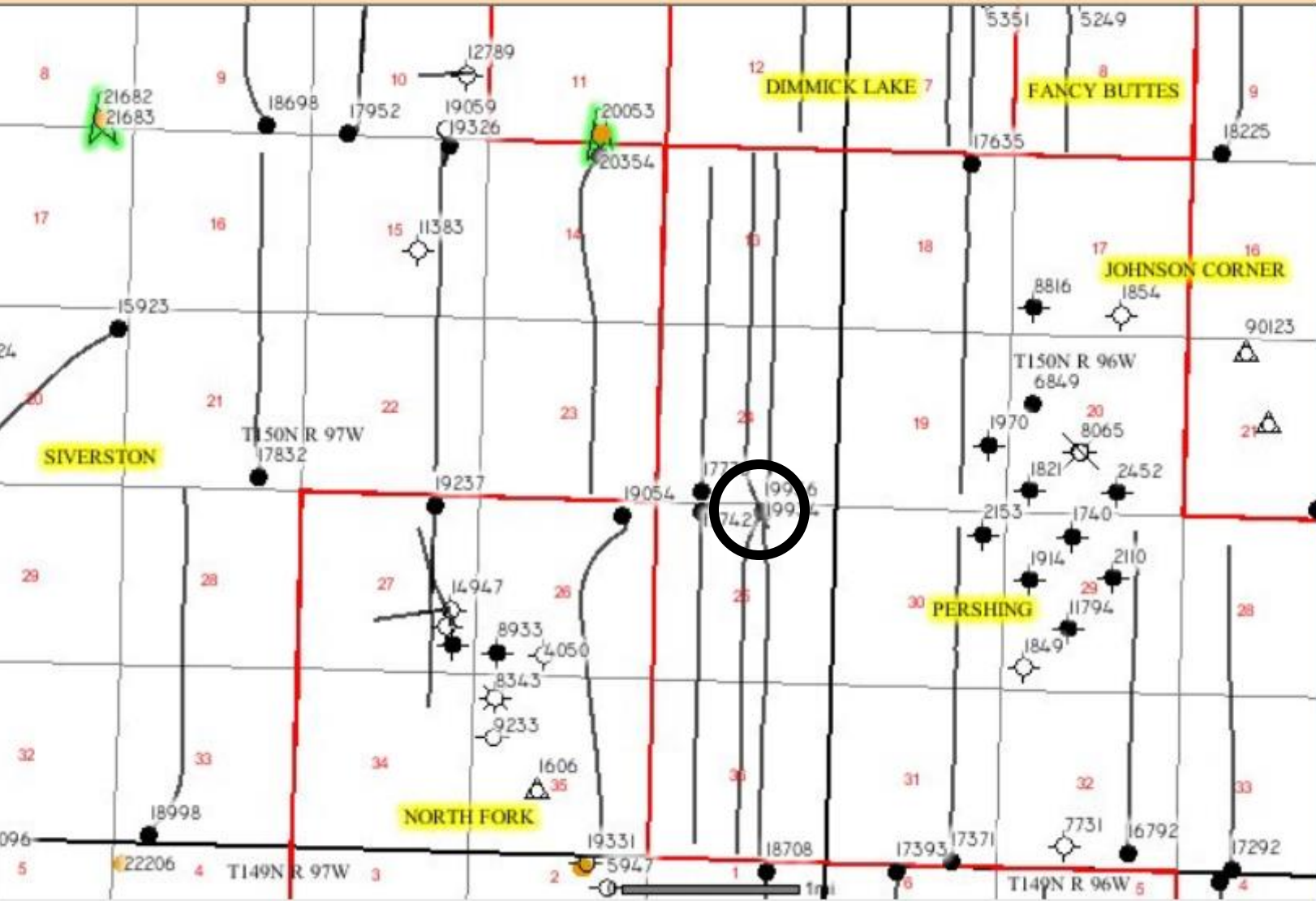
☒ Auto Refresh

Help:

- ☐ A closed group, click to open.
- ☐ An open group, click to close.
- ☐ A map layer.

North Dakota Development

- Resource Play
- Rules
 - Uniform Spacing—orderly development
 - **Multi-well locations—small footprint**
 - Energy Corridors—industry & residents
- Unitization
- Bakken Results



ND OIL & GAS

- ☒ Oil and Gas
- ☒ Wells
- ☒ Rig Location
- ☒ Directional
- ☒ Directional
- ☒ Horizontal
- ☒ Horizontal
- ☒ Cases Do
- ☒ Oil Fields
- ☒ Unit Boun
- ☒ Inspector
- ☒ Drilling / S
- ☒ Seismic
- ☒ Gas Plants
- ☒ Other
- ☒ Imagery
- ☒ Topo/DRG 2
- ☒ Topo/DRG 1
- ☒ NAIP 2009

Refresh

☒ Auto R

Help:

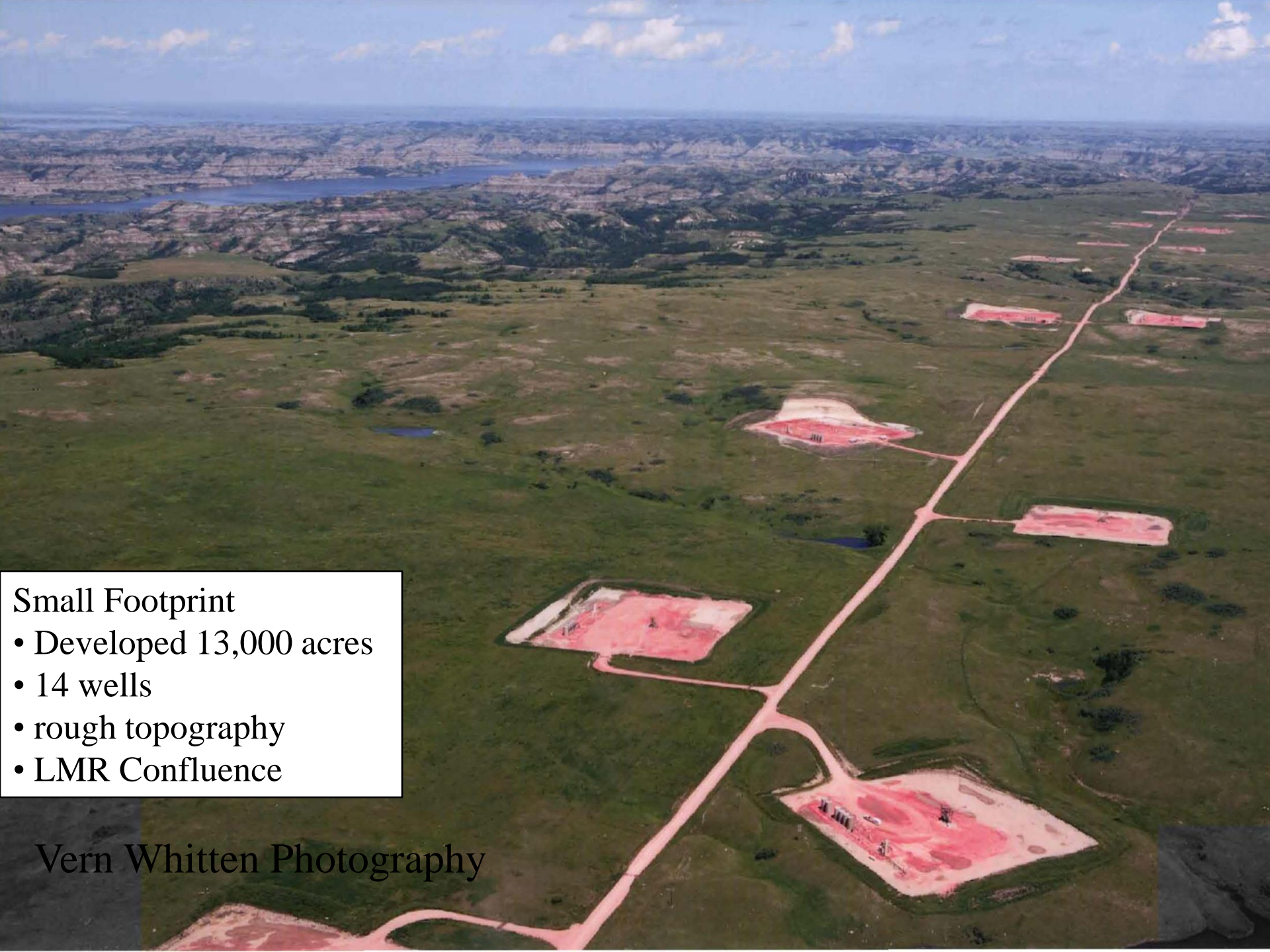
- A closed group, click to open
- An open group, click to close
- A map layer.
- A hidden group/layer, click to show
- A visible group/layer, click to hide
- A visible layer, but not at top
- A partially visible group, click to show



Vern Whitten Photography

North Dakota Development

- Resource Play
- Rules
 - Uniform Spacing—orderly development
 - Multi-well locations—small footprint
 - **Energy Corridors—industry & residents**
- Unitization
- Bakken Results



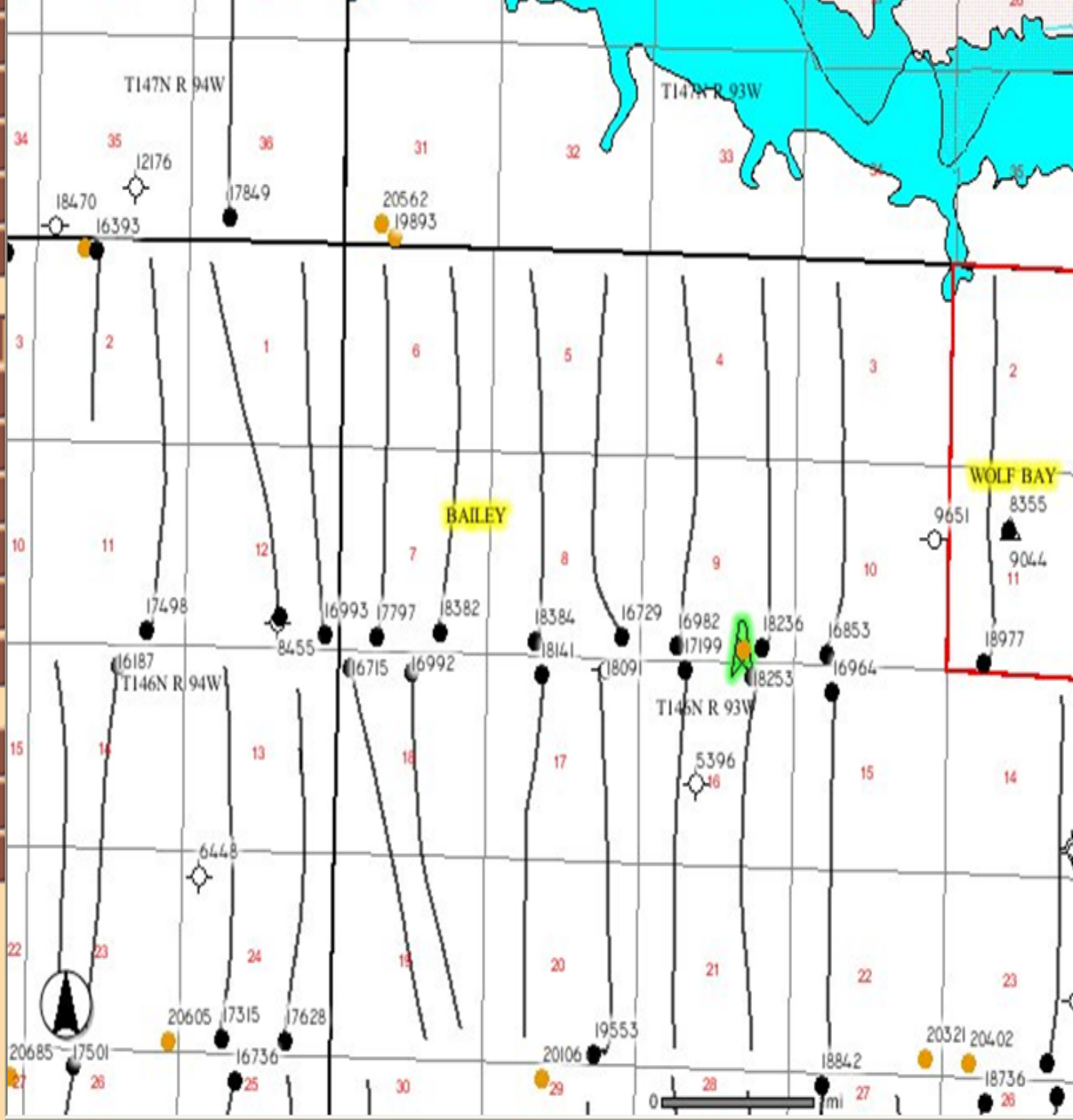
Small Footprint

- Developed 13,000 acres
- 14 wells
- rough topography
- LMR Confluence

Vern Whitten Photography

Full Map
Entire State
Previous View
Near Selection
Search
Generate PDF

Zoom In
Zoom Out
Pan
Rect Identify
Select Object
Buffer
Distance
Find Well
Find Field/Unit
Find Section



- ☒ Wells
- ☒ Rig Location
- ☒ Directional Surveys
- ☒ Directional Legs
- ☒ Horizontal Surveys
- ☒ Horizontal Legs
- ☒ Cases Docketed
- ☒ Oil Fields
- ☒ Unit Boundaries
- ☒ Inspector Areas
- ☒ Drilling / Spacing
- ☒ Seismic
- ☒ Gas Plants
- ☒ Other
- ☒ Reservations
- ☒ Corporate Boundaries
- ☒ Rivers and Roads
- ☒ County Roads
- ☒ Major Roads
- ☒ Major Rivers
- ☒ Missouri River
- ☒ Land Ownership
- ☒ Imagery
- ☒ Topo/DRG 250k
- ☒ Topo/DRG 100k
- ☒ NAIP 2009

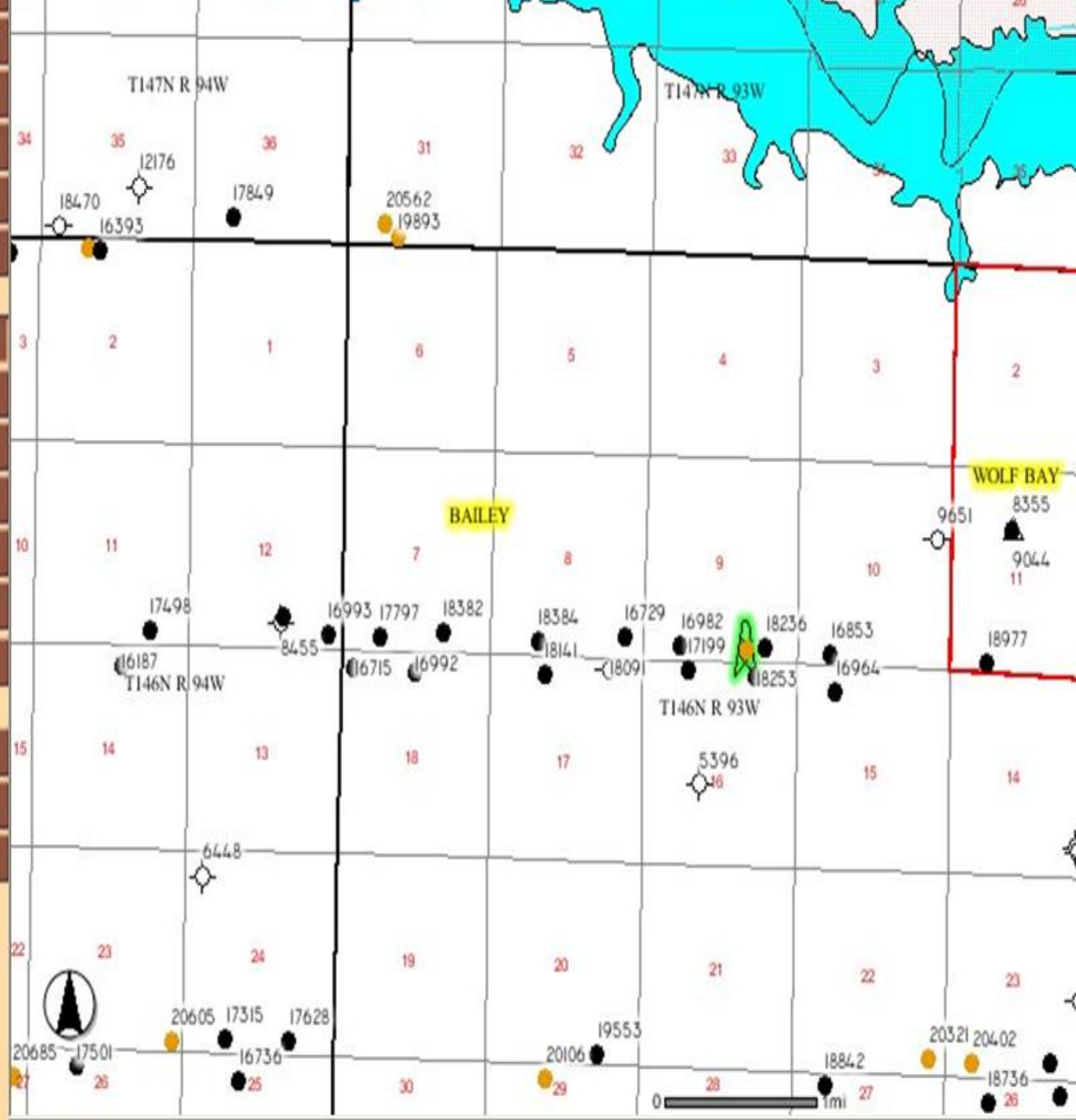
Refresh Map

☒ Auto Refresh

Major Rivers
Selection cleared.

Help:
A closed group, click to open.
An open group, click to close.
A map layer.
A hidden group/layer, click to make visible.

- Full Map
- Entire State
- Previous View
- Clear Selection
- Search
- Generate PDF
- Zoom In
- Zoom Out
- Pan
- Rect Identify
- Select Object
- Buffer
- Distance
- Find Well
- Find Field/Unit
- Find Section



Major Rivers
Selection cleared.

- ☒ Wells
- ☒ Rig Location
- ☒ Directional Surveys
- ☒ Directional Legs
- ☒ Horizontal Surveys
- ☒ Horizontal Legs
- ☒ Cases Docketed
- ☒ Oil Fields
- ☒ Unit Boundaries
- ☒ Inspector Areas
- ☒ Drilling / Spacing
- ☒ Seismic
- ☒ Gas Plants
- ☒ Other
- ☒ Reservations
- ☒ Corporate Boundaries
- ☒ Rivers and Roads
- ☒ County Roads
- ☒ Major Roads
- ☒ Major Rivers
- ☒ Missouri River
- ☒ Land Ownership
- ☒ Imagery
- ☒ Topo/DRG 250k
- ☒ Topo/DRG 100k
- ☒ NAIP 2009

Refresh Map

☒ Auto Refresh

Help:

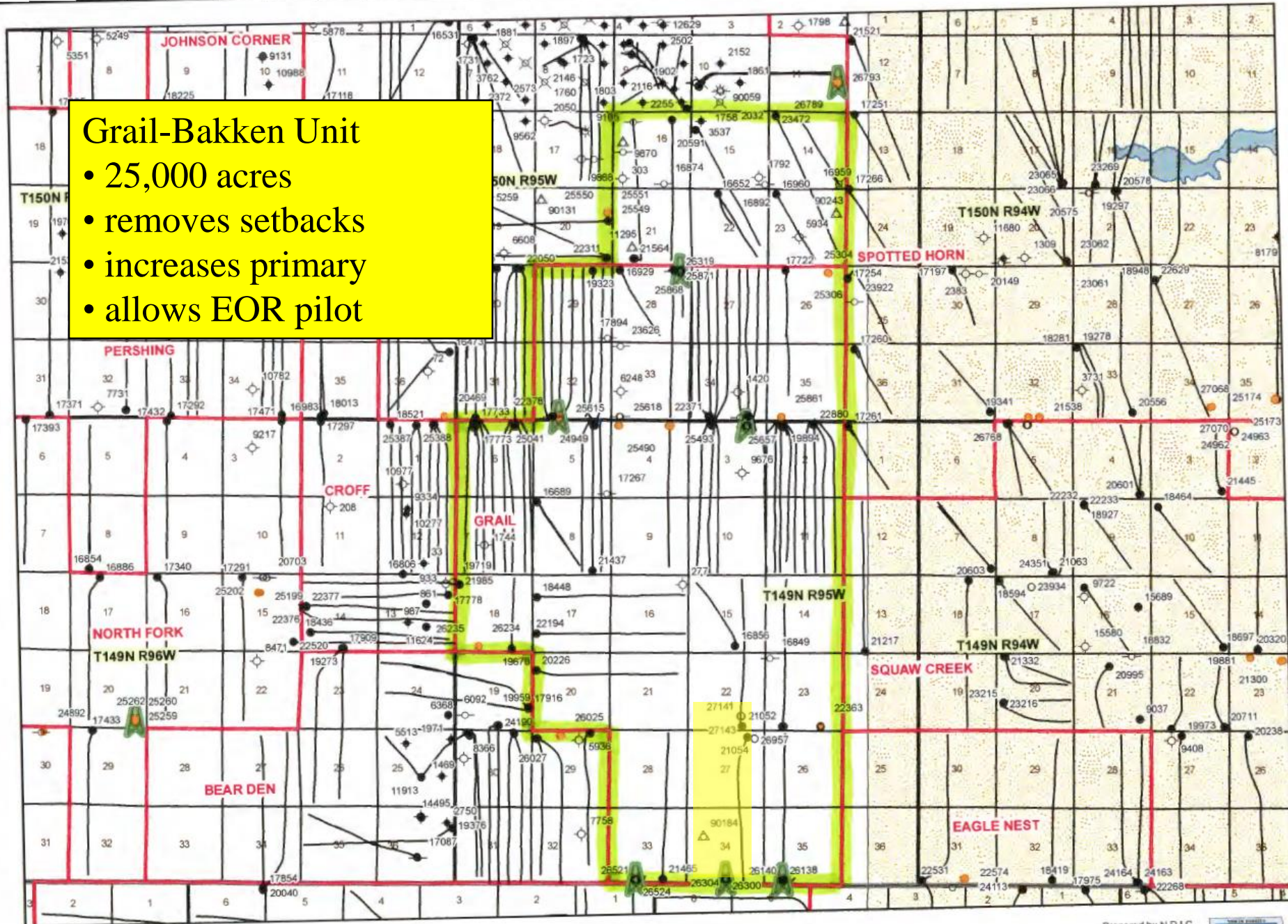
- A closed group, click to open.
- An open group, click to close.
- A map layer.
- A hidden group/layer, click to make visible.

North Dakota Development

- Resource Play
- Rules
 - Uniform Spacing—orderly development
 - Multi-well locations—small footprint
 - Energy Corridors—industry & residents
- Unitization
 - Corral Creek-Bakken Unit—30,000 ac, Dun Cty
 - Grail-Bakken Unit—25,000 ac, McK Cty
- Bakken Results

Grail-Bakken Unit

- 25,000 acres
- removes setbacks
- increases primary
- allows EOR pilot



Disclaimer: Neither the State of North Dakota, nor any agency, officer, or employee of the State of North Dakota warrants the accuracy or reliability of this product and shall not be held responsible for any losses caused by reliance on this product. Portions of the information may be incorrect or out of date. Any person or entity that relies on any information obtained from this product does so at his or her own risk.

0 1.25 2.5 5 Miles

Prepared by N.D.I.C.
Oil and Gas Division

1/7/2014
9:52:48 AM



Oil and Gas Subscription: ArcIMS Viewer

Legend / Layers

Overview Map

View Entire State

Previous View

Clear Selection

Search

Create PDF

Zoom In

Zoom Out

Pan

Rect Identify

Select Object

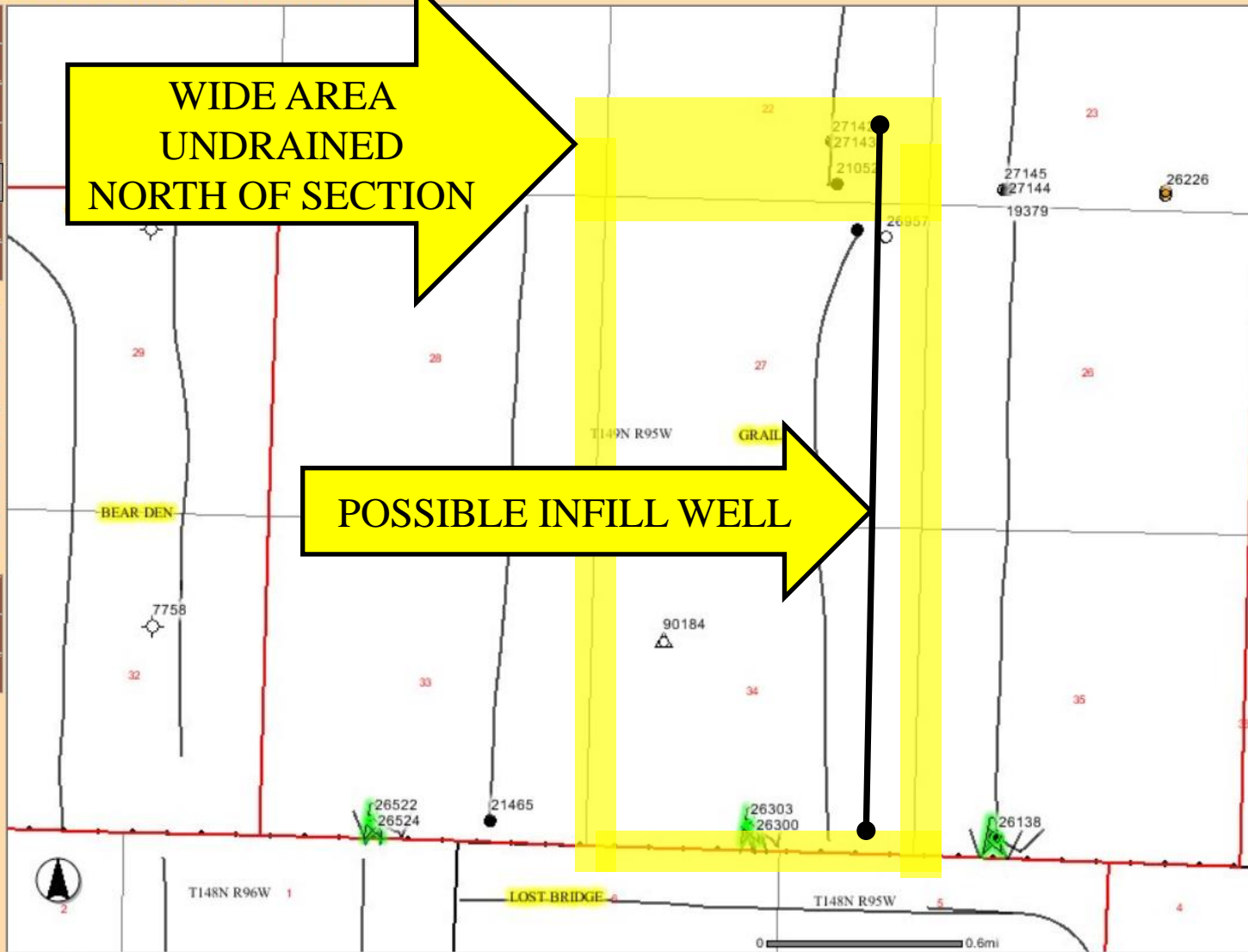
Buffer

Distance

Find Well

Find Field / Unit

Find Section



Oil Fields
Selection cleared.

Download

ND OIL & GAS

- ☒ Oil and Gas
- ☐ Wells
- ☐ Permit S
- ☐ Rig Loca
- ☐ Direction
- ☐ Direction
- ☐ Horizont
- ☐ Horizont
- ☐ Cases D
- ☐ Oil Fields
- ☐ Unit Bou
- ☐ Inspecto
- ☐ Drilling /
- ☐ Seismic
- ☐ Gas Plan
- ☐ Other
- ☐ Imagery
- ☐ Topo/DRG
- ☐ Topo/DRG
- ☐ NAIP 2009

Refresh

☒ Auto

Help

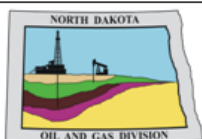
- A closed group, click to
- An open group, click to
- A map layer.
- A hidden group/layer, c
- A visible group/layer, c
- A visible layer, but not
- A partially visible group
- An inactive layer, click
- The active layer.

Unitization

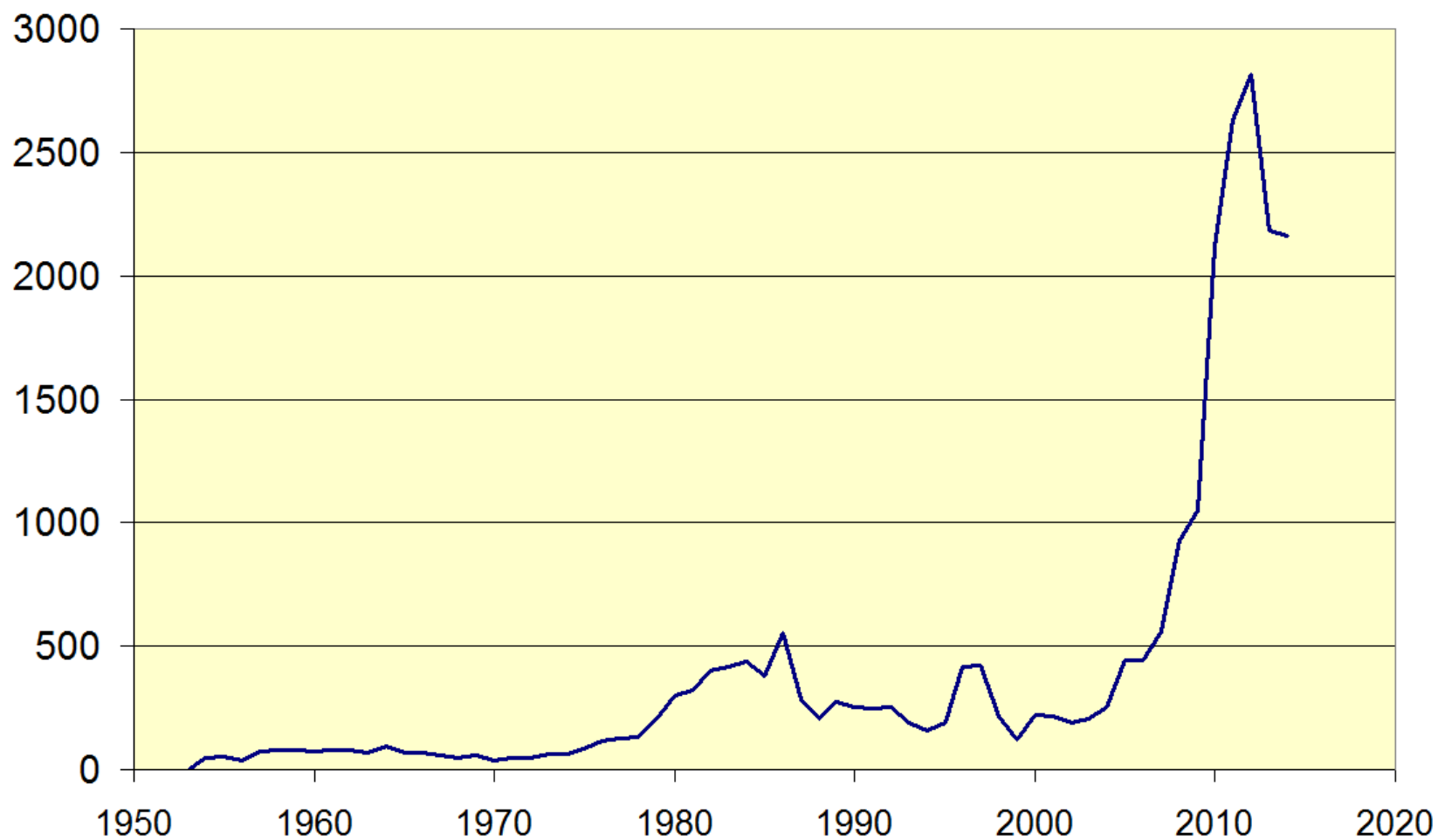
- **EOR—tremendous potential**
 - **+1% in Grail OOIP = 6 million bo**
- **Pilot Programs**
 - **Sanish**
 - **Parshall**

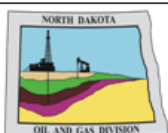
North Dakota Development

- Resource Play
- Rules
 - Uniform Spacing—orderly development
 - Multi-well locations—small footprint
 - Energy Corridors—industry & residents
- Unitization
- Bakken Results

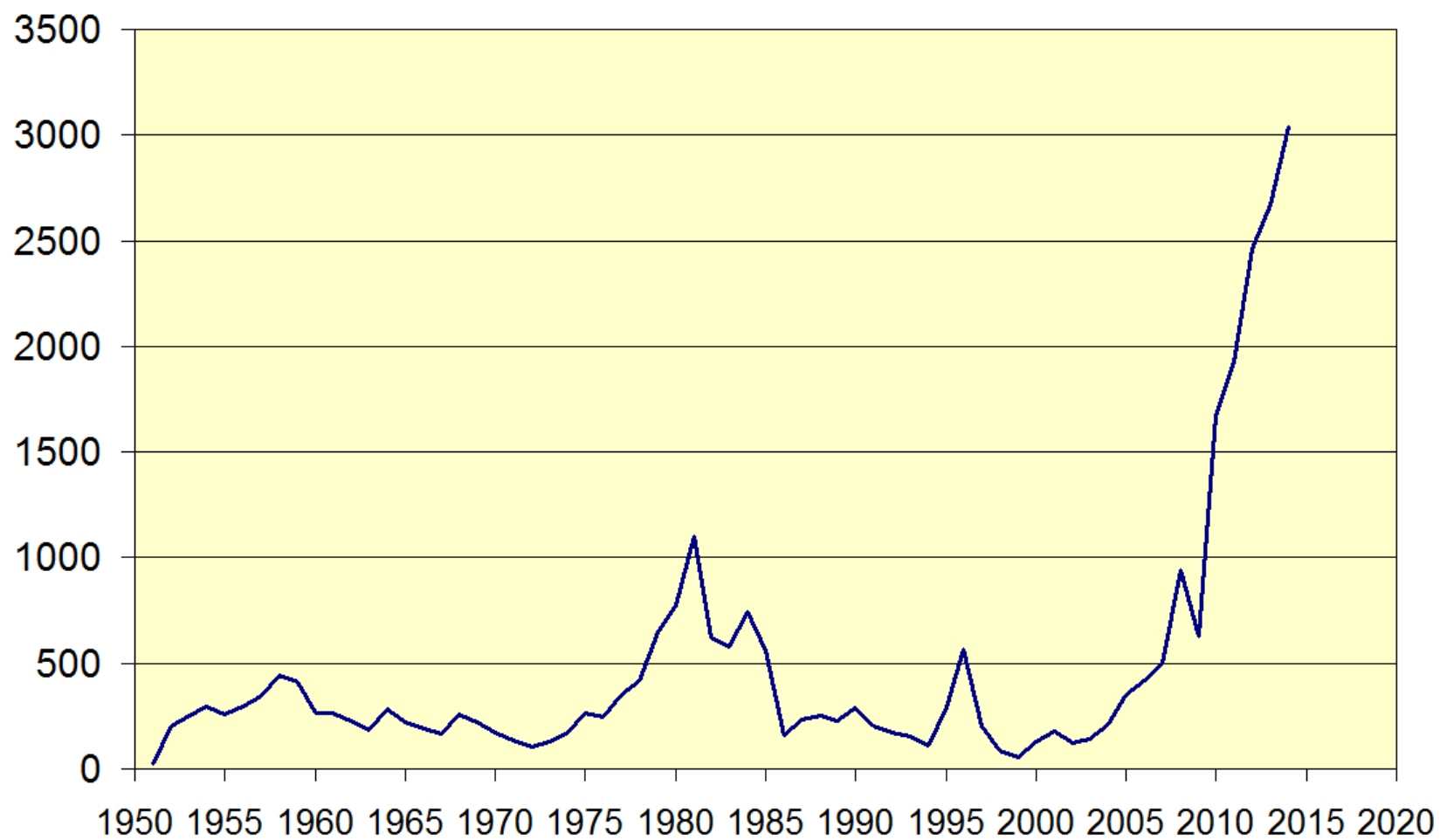


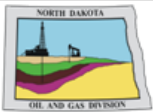
North Dakota Industrial Commission Cases Heard



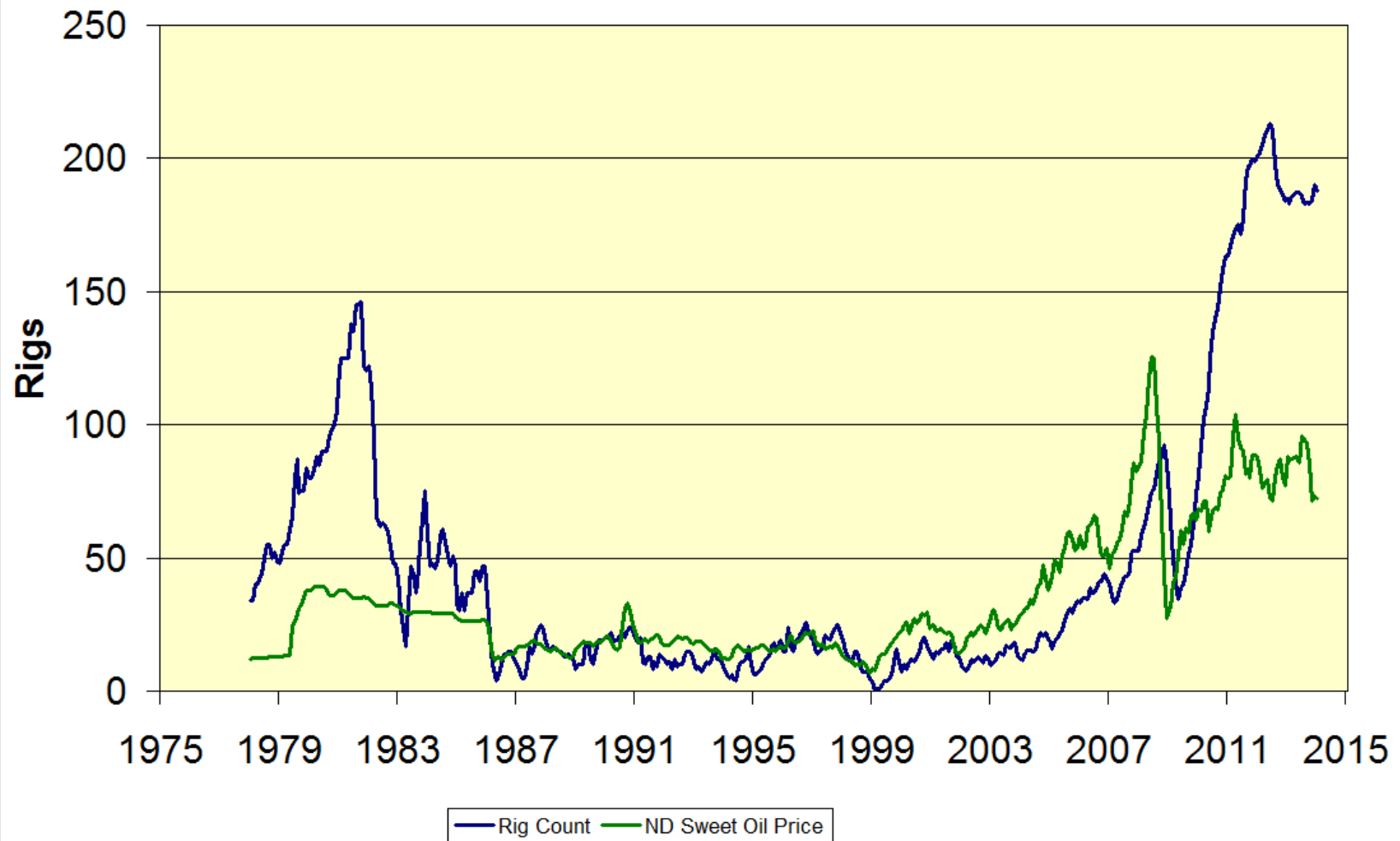


North Dakota New Well Permits Issued



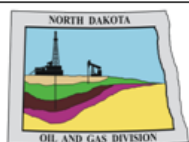


North Dakota Average Monthly Rig Count

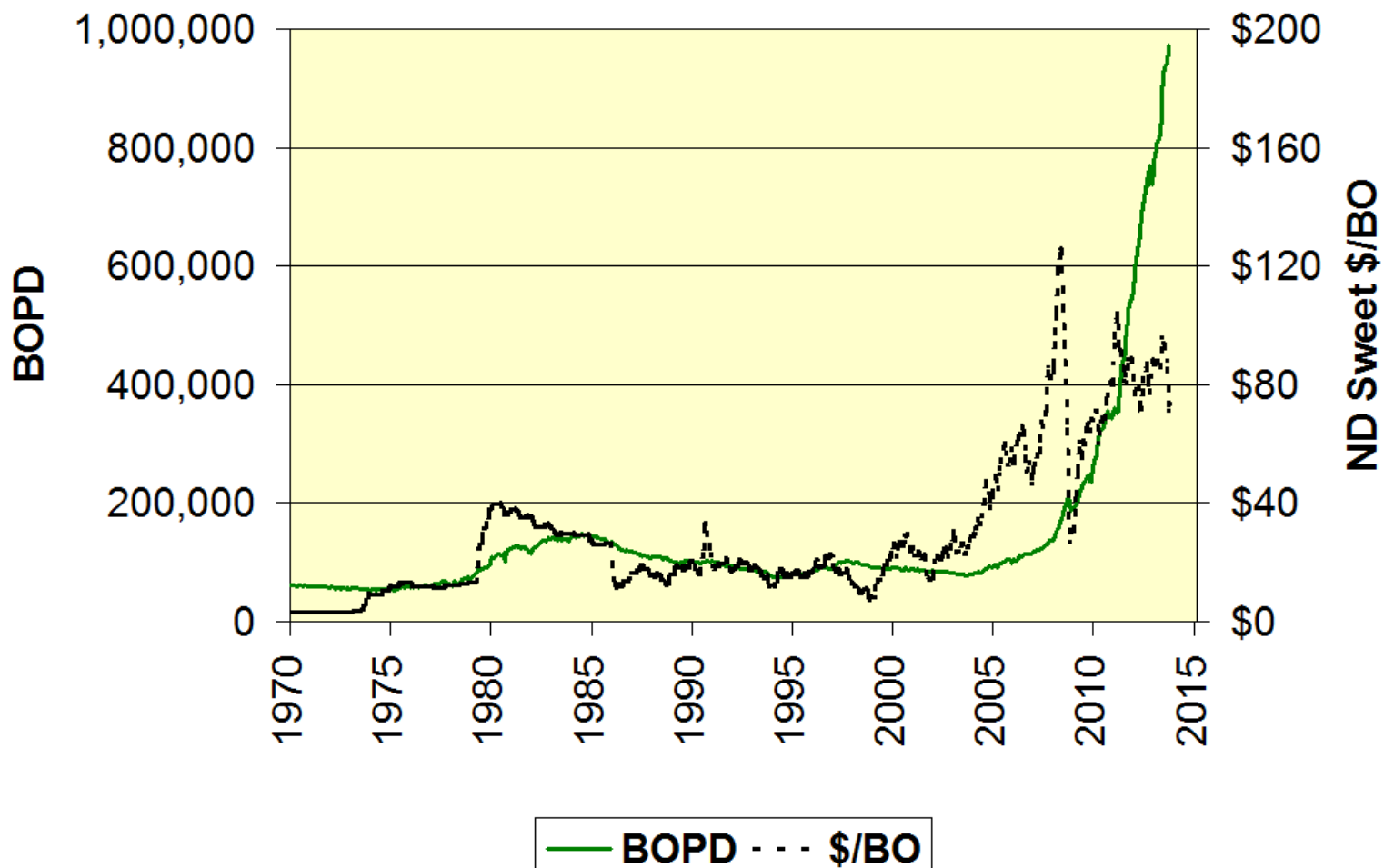


WELLS

- **10,022 wells currently producing**
 - **6,627 Bakken**
- **1,000 more to secure leases**
- **40,000 additional development wells**
 - **225 rigs – another 15 years**
 - **100 rigs – another 33 years**
- **Bakken Pool – 4 targets**



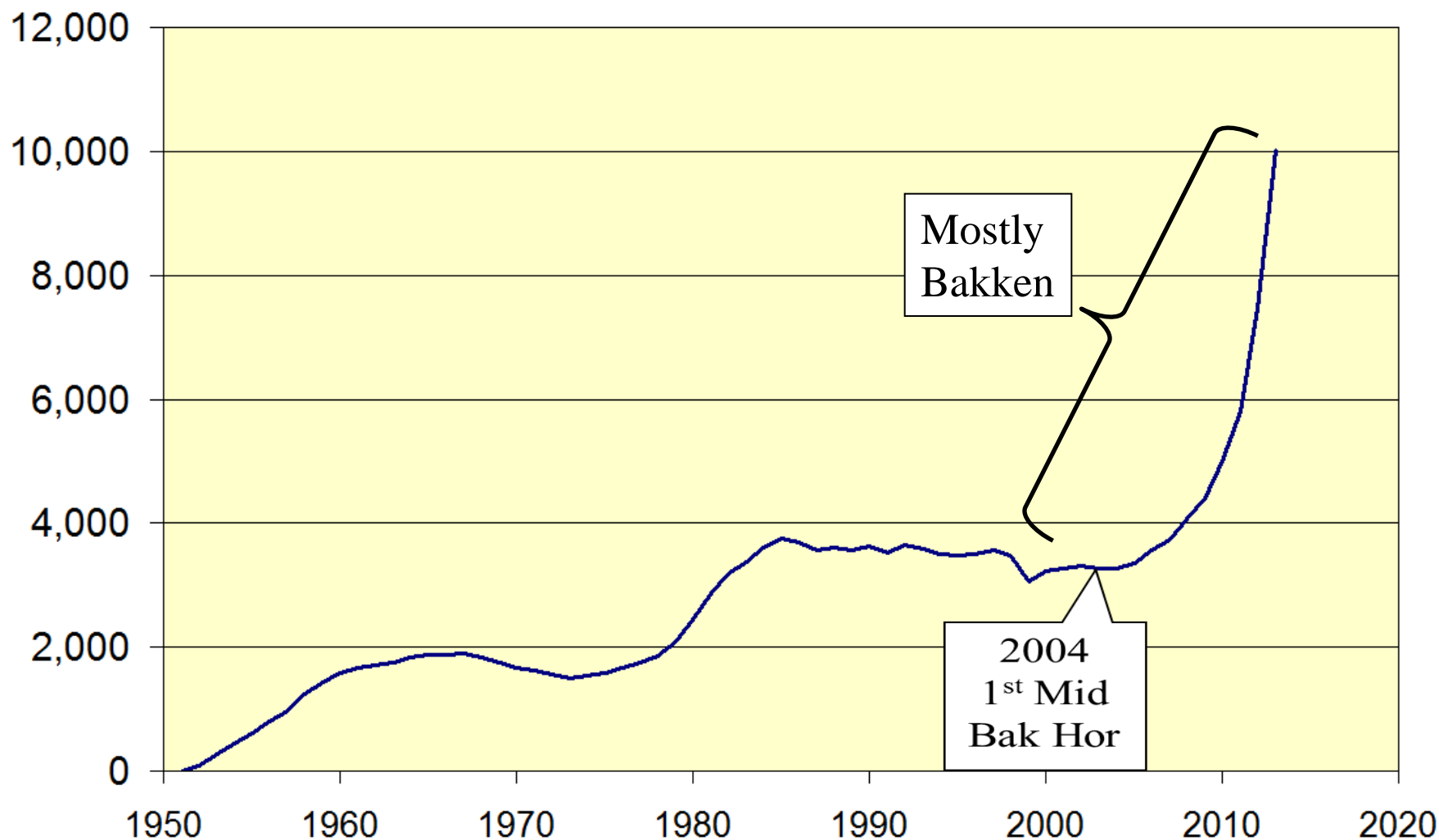
North Dakota Daily Oil Produced and Price



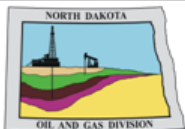
Production 973,045 bopd (appr 898,700 from Bakken—92%)



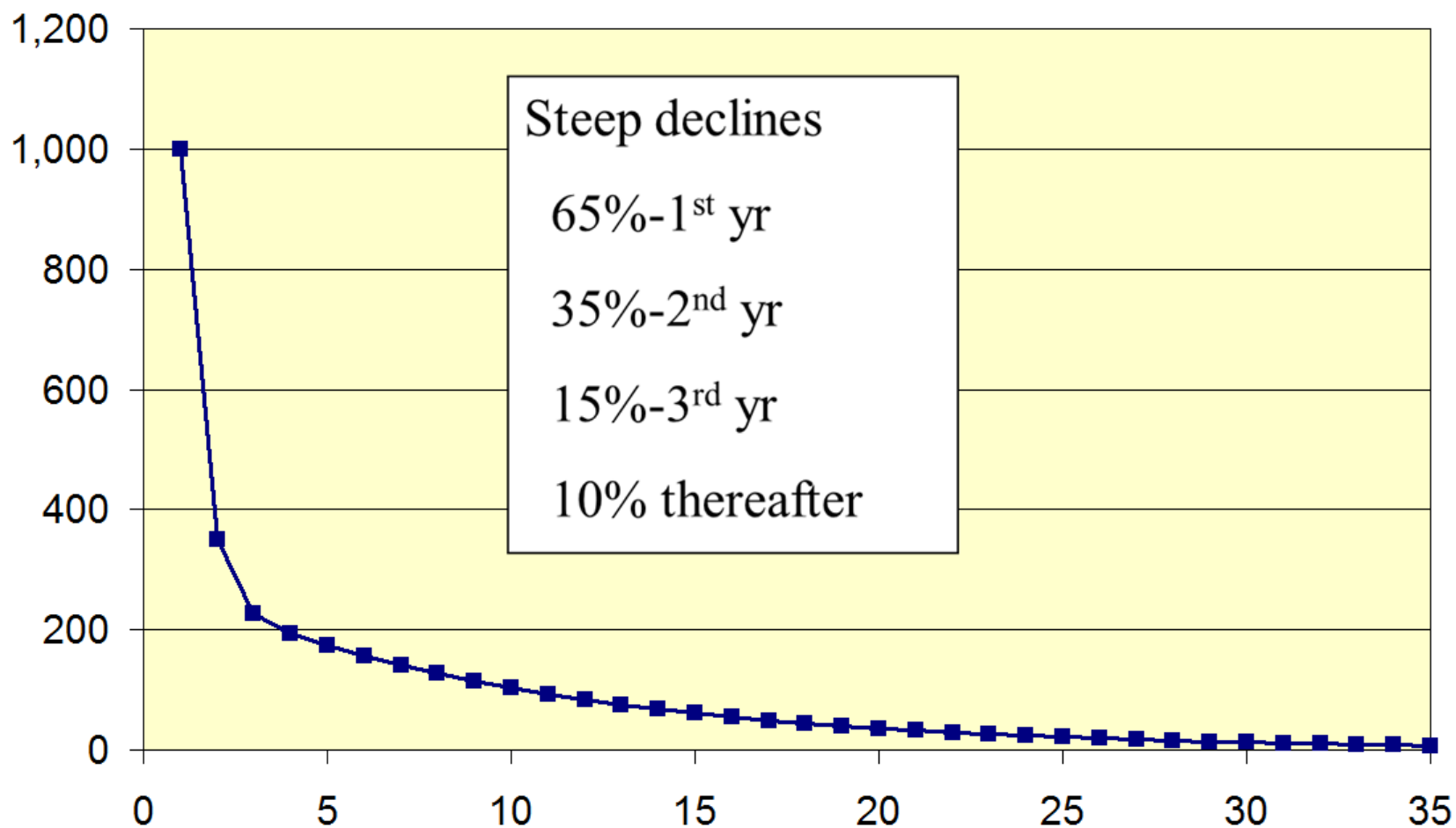
North Dakota Wells Producing

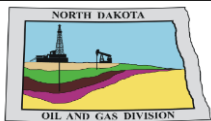


10,022 total wells – 6,627 Bakken horizontal (66.1%)

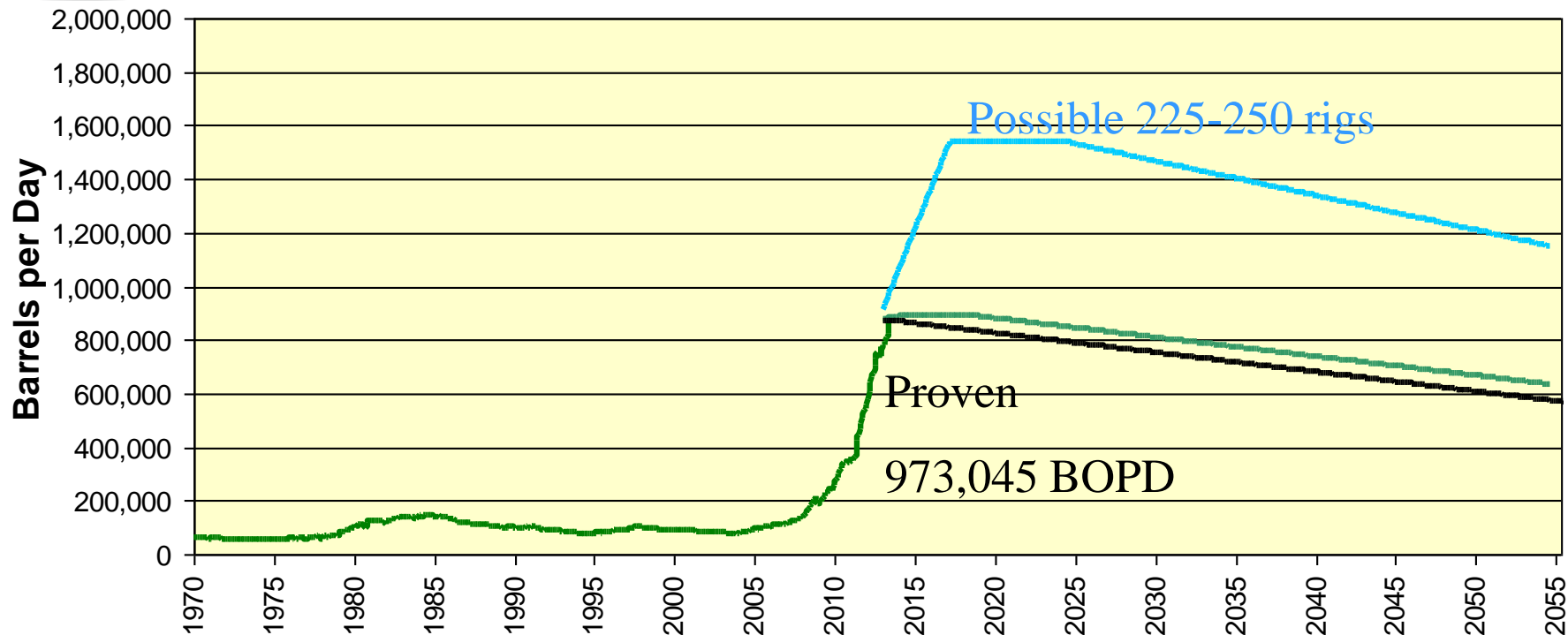


Typical Bakken/Three Forks Performance





North Dakota Oil Production



6,627 Bakken and Three Forks wells drilled and completed
40,000 more new wells possible in thermal mature area

History

Bakken - Three Forks P10

Bakken - Three Forks P50

Bakken - Three Forks P90



Reclaimed Location

File No. 15092
Armstrong #1-5 Hanson
Sec 5-T155N-R102W
Williams County, ND