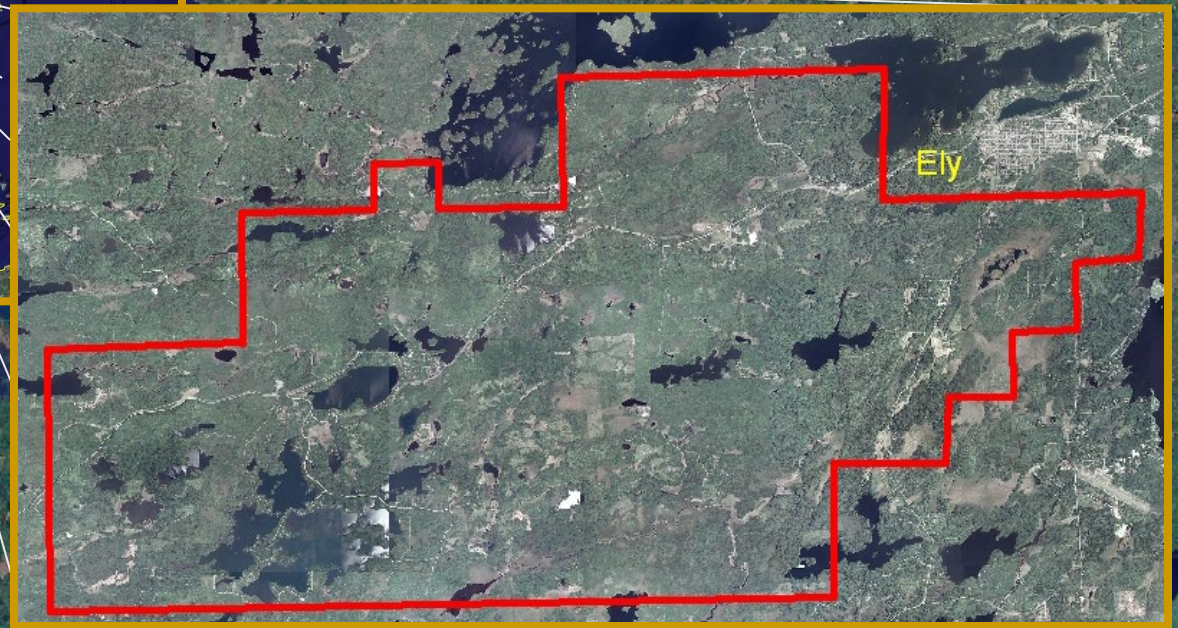
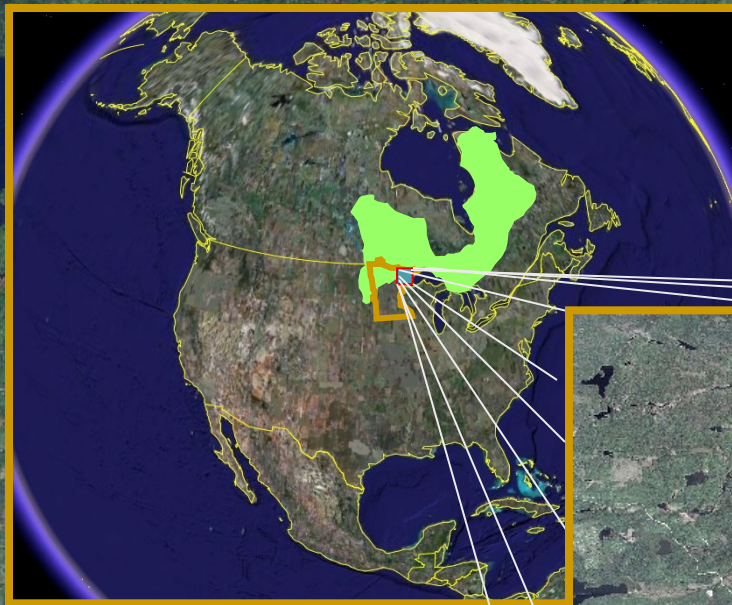
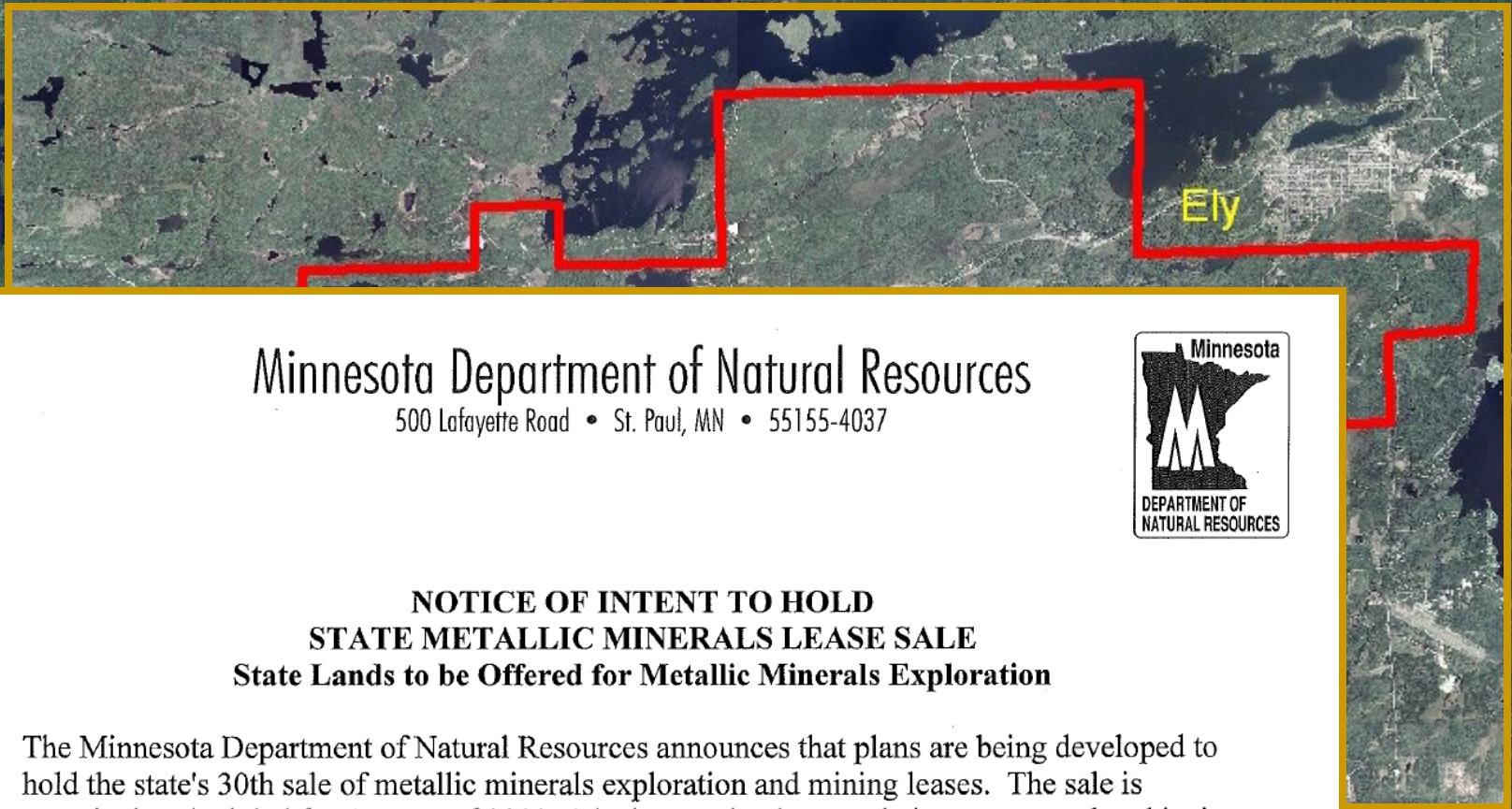


State Metallic Minerals Lease Sale Minnesota's Vermilion Gold District



State Metallic Minerals Lease Sale Notice of Intent



Minnesota Department of Natural Resources

500 Lafayette Road • St. Paul, MN • 55155-4037



NOTICE OF INTENT TO HOLD STATE METALLIC MINERALS LEASE SALE State Lands to be Offered for Metallic Minerals Exploration

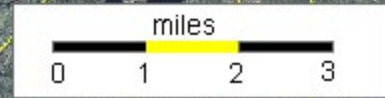
The Minnesota Department of Natural Resources announces that plans are being developed to hold the state's 30th sale of metallic minerals exploration and mining leases. The sale is tentatively scheduled for January of 2009. The lease sale plans are being announced at this time in order to give mining companies, public interest groups and all other interested parties additional time to review the areas under consideration.

State Metallic Minerals Lease Sale

This portion of the lease sale area is accessible by a state highway and covered by boreal forest.

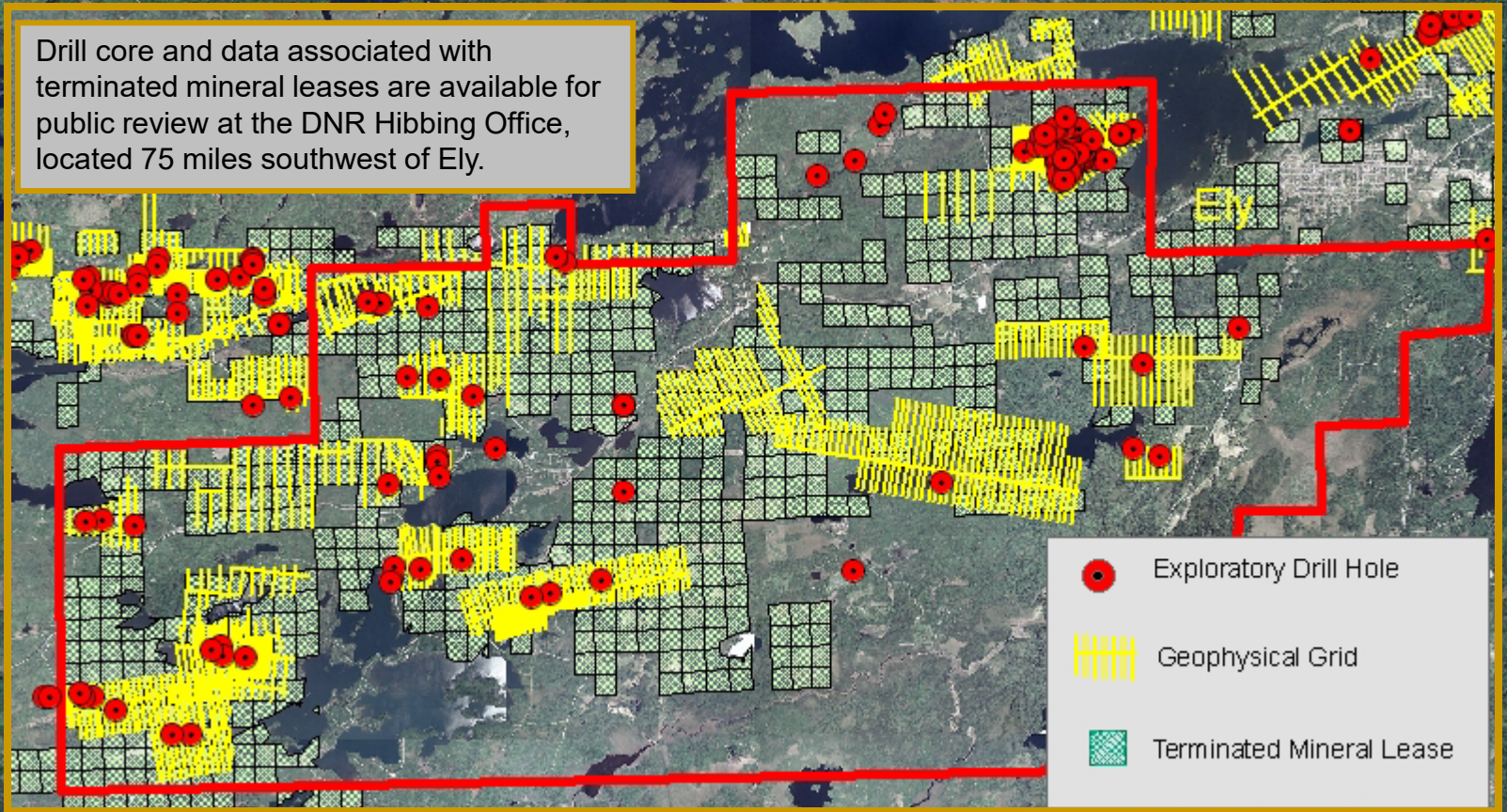
Ely

Scale 1:400,000



State Metallic Minerals Lease Sale Minnesota's Vermilion Gold District

Drill core and data associated with terminated mineral leases are available for public review at the DNR Hibbing Office, located 75 miles southwest of Ely.





Vermilion Gold District History

1865-1866	Non-Productive Vermilion Gold Rush Discovers far more iron ore than gold
1884 - 1963	Vermilion Range Iron Mining 100 million tons of iron ore from District
1960's – 70's	Regional Airborne Geophysical Surveys Airborne Input EM Surveys Identify Anomalies
1980 - 1992	Ground-based Exploration and Drilling Work on more than 20 distinct prospects
1992 - 2008	Limited Metallic Mineral Leasing and Exploration



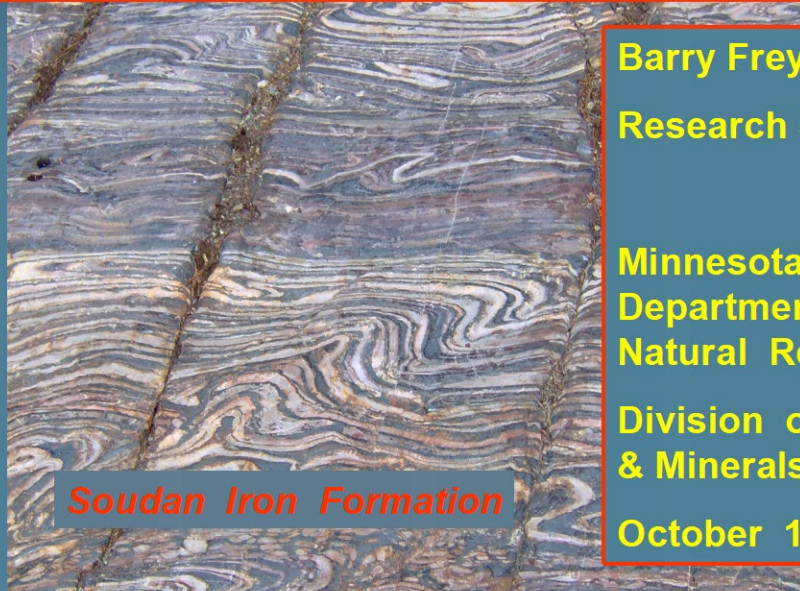
Vermilion Gold District – Why take another look?

- ❖ **Located Within Wawa Subprovince, Superior Province**
 - ❖ Same Archean greenstone belt terrane as Hemlo and other world-class gold deposits located in Ontario, Canada
- ❖ **Economics**
 - ❖ Gold prices at or near historic highs
- ❖ **Maps and Models Produced Since 1992**
 - ❖ Bedrock geology and mineral potential maps
 - ❖ New mineralization models
- ❖ **Historic drill core and exploration data available for public review.**
- ❖ **New DNR Project Work**

Minnesota's Vermilion Gold District New Results – See Separate Presentation

Project 373

***Vermilion Greenstone Gold
New Results from Drill Holes***



Soudan Iron Formation

Barry Frey

Research Scientist 2

**Minnesota
Department of
Natural Resources**

**Division of Lands
& Minerals**

October 1, 2008



Minnesota's Vermilion Gold District New Results

Prospect	Au Mineralization Type	XRF Au Interval *	Au Association
Raspberry	Intrusion Hosted	To 230 ppm Au	Pb (galena), Quartz veins, Rutile; Fe, As, Mn, Cr, Se, Sn
Raspberry	Shear zone related (remobilization?)	To 67 ppm Au	Pb (galena), Quartz veins, Rutile?; Pb, Ag, Se
Foss Lake	Algoma BIF related Au	To 28 ppm Au	Fe Oxide to Sulfide-graphite transition; As, Ba, Pb
Foss Lake	Shear zone related	To 16 ppm Au	Pyrite; Hg, As, Cu, Cr, Mo
Eagles Nest Shear	Shear zone related	To 9 ppm Au	Pyrite; Mn, Sr, Ba, Mo?, Cu?
Murray Shear	Volcanic Hosted Massive Sulfide	To 148 ppm Au	Sphalerite, pyrrhotite?; Cr, Zn, Sb, Cd, Hg

*2007-08 MnDNR "spot" analyses using handheld XRF



Minnesota

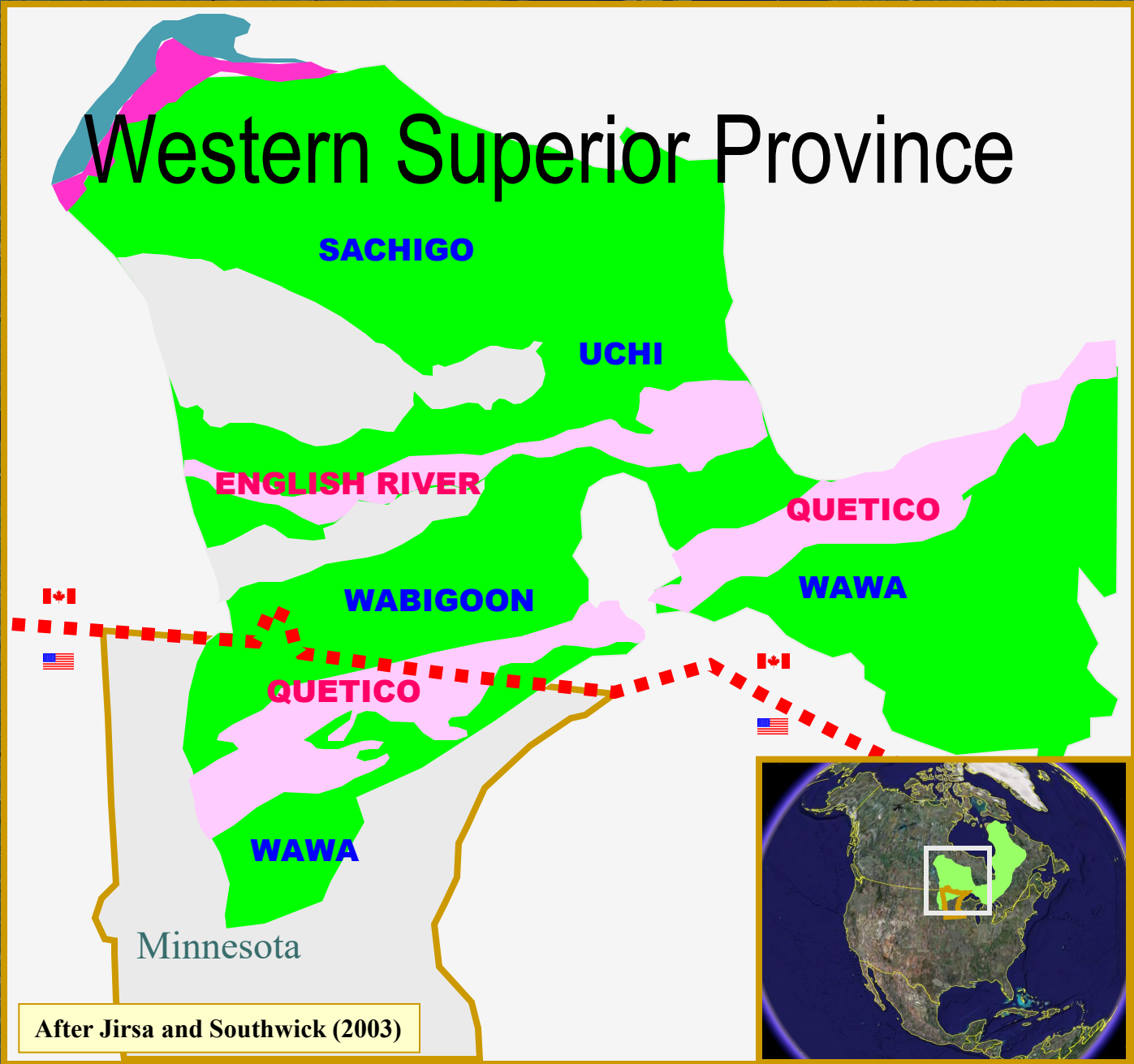




Archean Superior Province

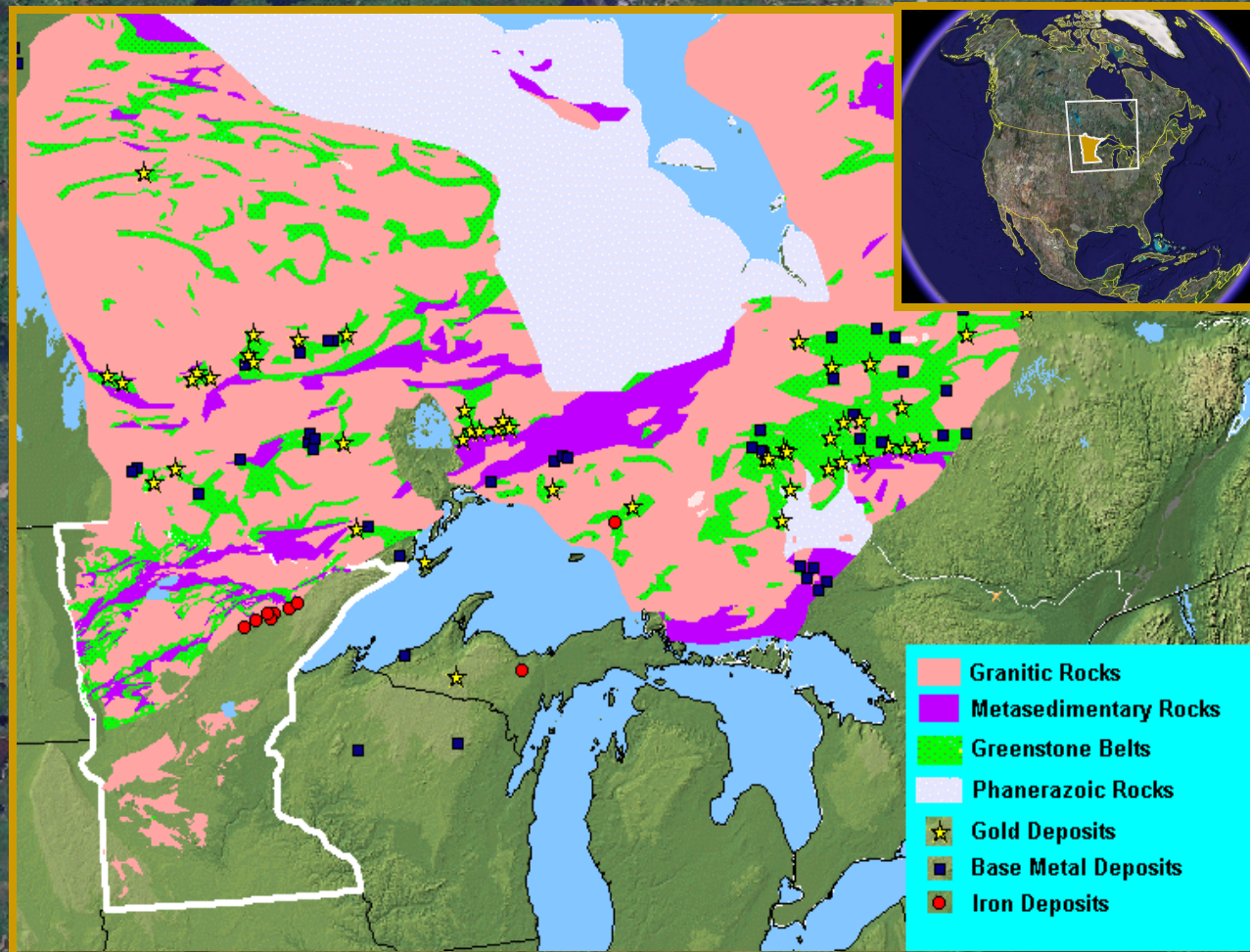


Western Superior Province

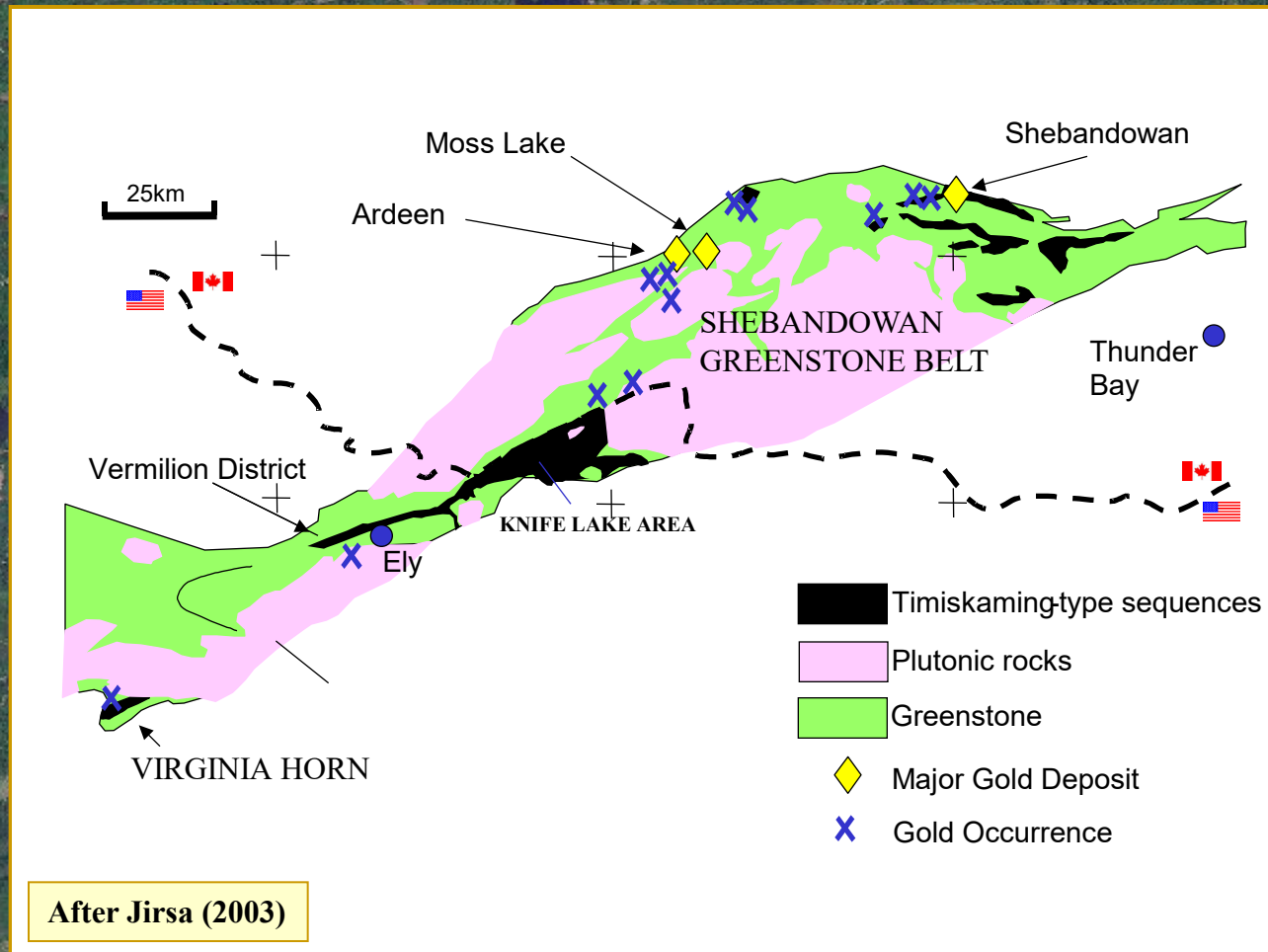


After Jirsa and Southwick (2003)

Superior Province Mineral Deposits



From Ontario, Canada into Minnesota, USA





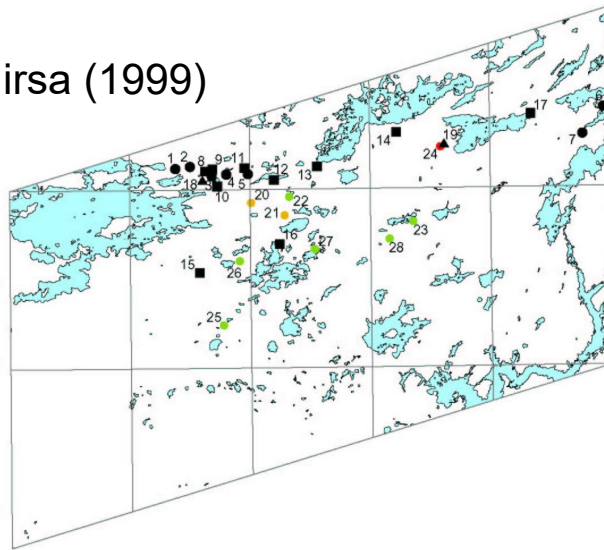
Greenstone Belt Gold Mineralization Models

- ❖ Shear-related Lode Gold
- ❖ Intrusion hosted Gold
- ❖ VMS-related Gold Deposits
- ❖ Banded Iron Formation (BIF)
- ❖ Timiskiming-Type Sediments

Vermilion District Gold

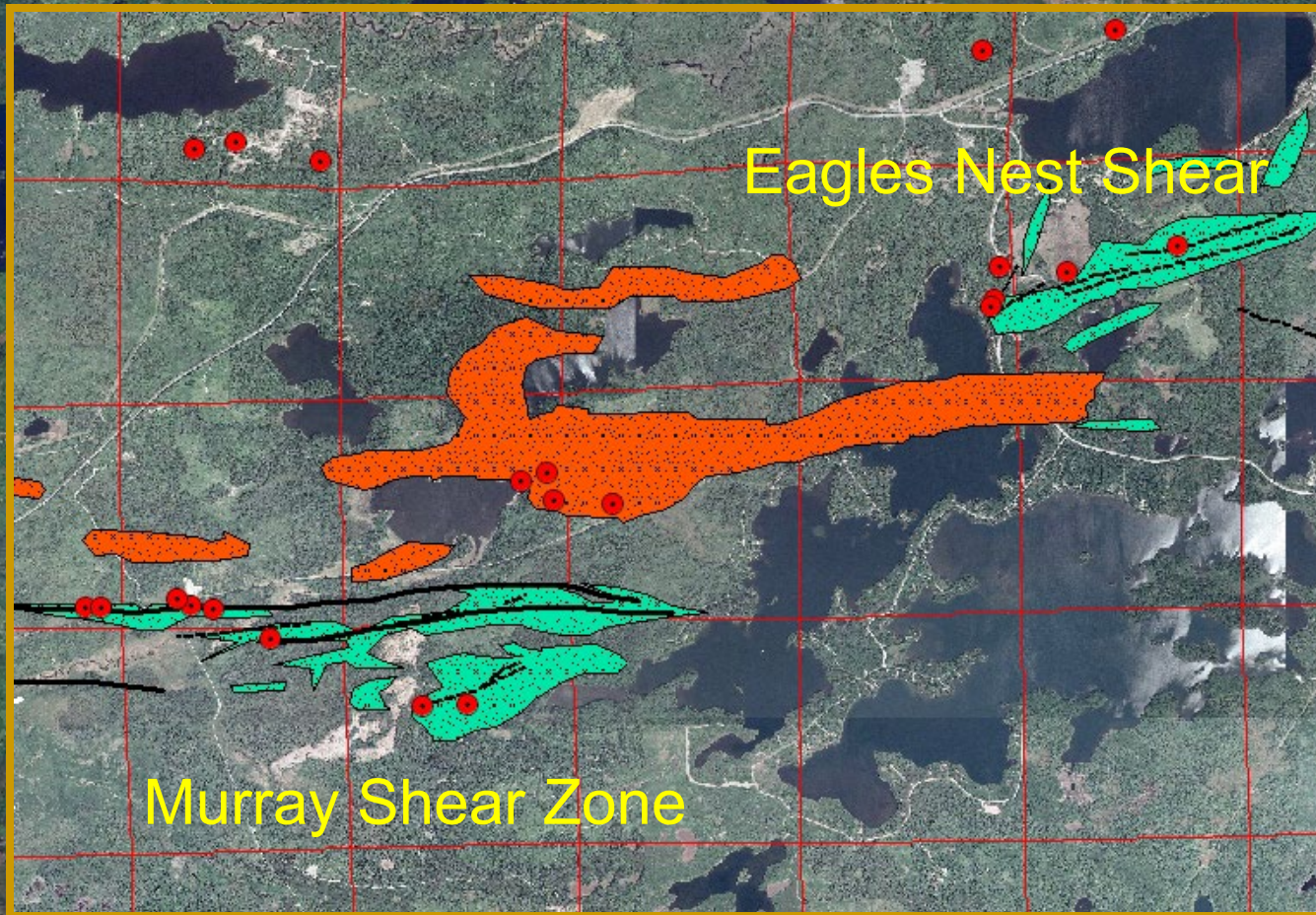
Peterson and Jirsa (1999)

- PROSPECTS AND SHOWINGS**
- **Iron-formation-hosted lode gold**
 - 1. Dead Canary West
 - 2. Dead Canary
 - 3. Pac Man Pond
 - 4. Section 5
 - 5. Walsh Shaft
 - 6. Garden Lake
 - 7. Section 30
 - ▲ **Intrusion-hosted gold**
 - 18. Section 6
 - 19. Raspberry Prospect
 - **Volcanogenic massive sulfide Felsic dominated**
 - 20. Gafvert Lake
 - 21. McComber
 - **Volcanogenic massive sulfide Mafic dominated**
 - 22. Clear Lake
 - 23. Twin Lakes
 - 25. Skeleton Lake
 - 26. Fivemile Lake
 - 27. Eagles Nest No. 4
 - 28. Purvis Road
 - **Shear zone-hosted gold**
 - 8. Clear Cut
 - 9. Kerr McGee Show
 - 10. Section 6 Southeast
 - 11. Railroad Zone
 - 12. Mud Lake
 - 13. Foss Lake
 - 14. Burnside River
 - 15. Murray Shear
 - 16. Eagles Nest Shear
 - 17. Spaulding Bay
 - **Volcanogenic massive sulfide and lode gold**
 - 24. Quartz Hill



Gold prospects and showings in the Vermilion District have been interpreted using a range of mineralization models for greenstone terranes.

Shear-Related Lode Gold



● Exploratory Bore Hole

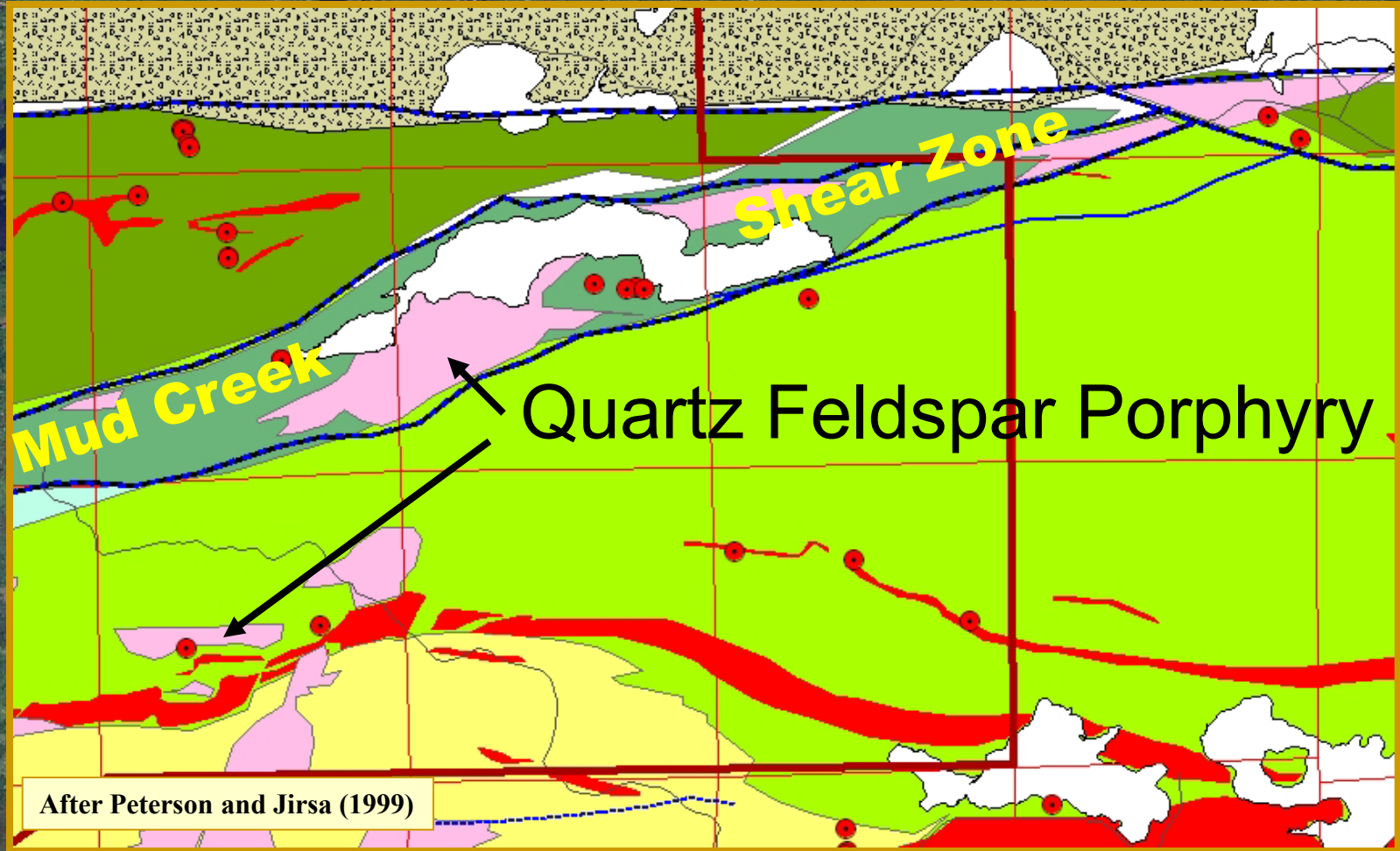
Faults and Shears

- ▨ First Order
- ▬ Second Order
- ⋯ Third Order

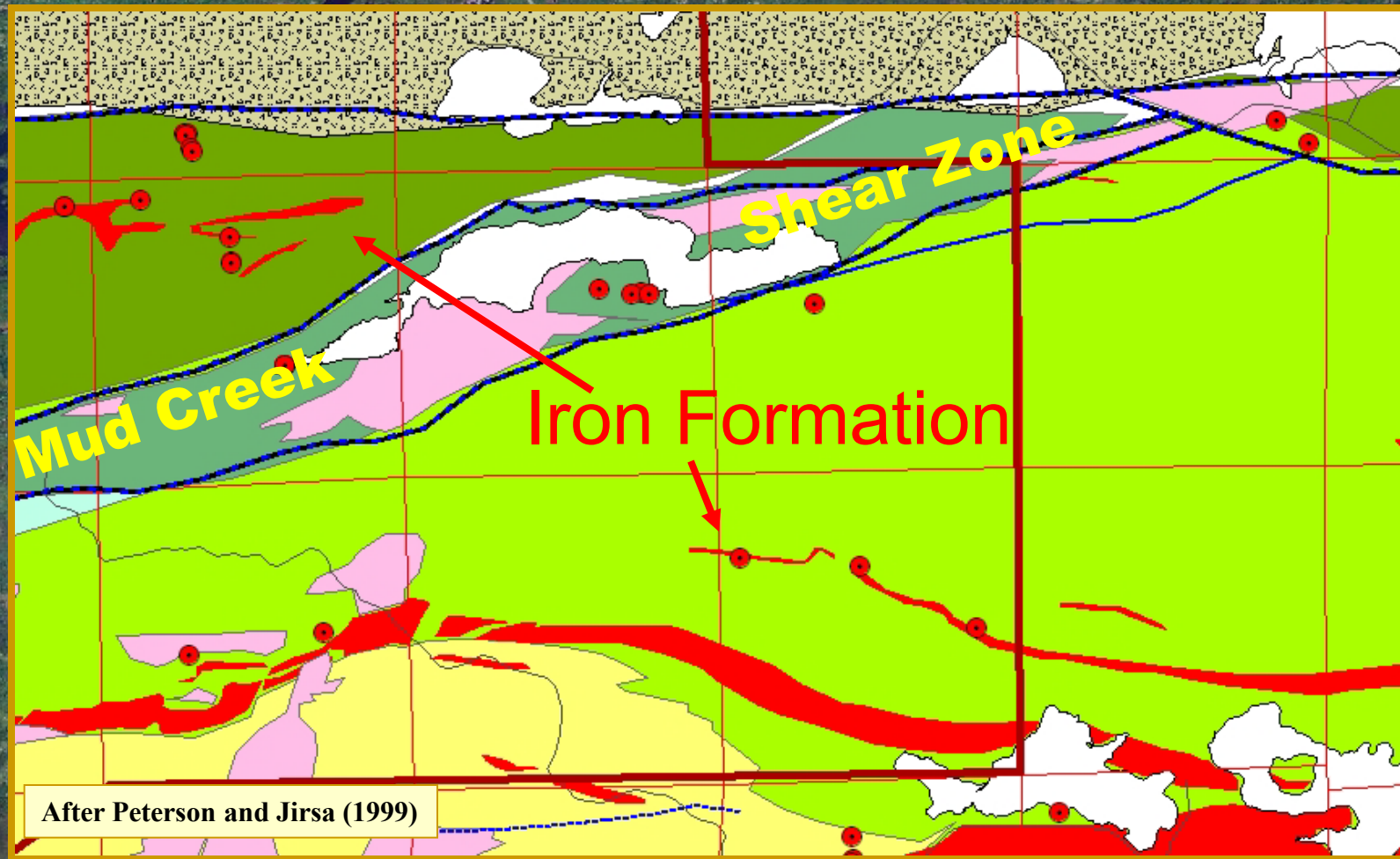
Alteration

- Lode gold Style
- VMS Style

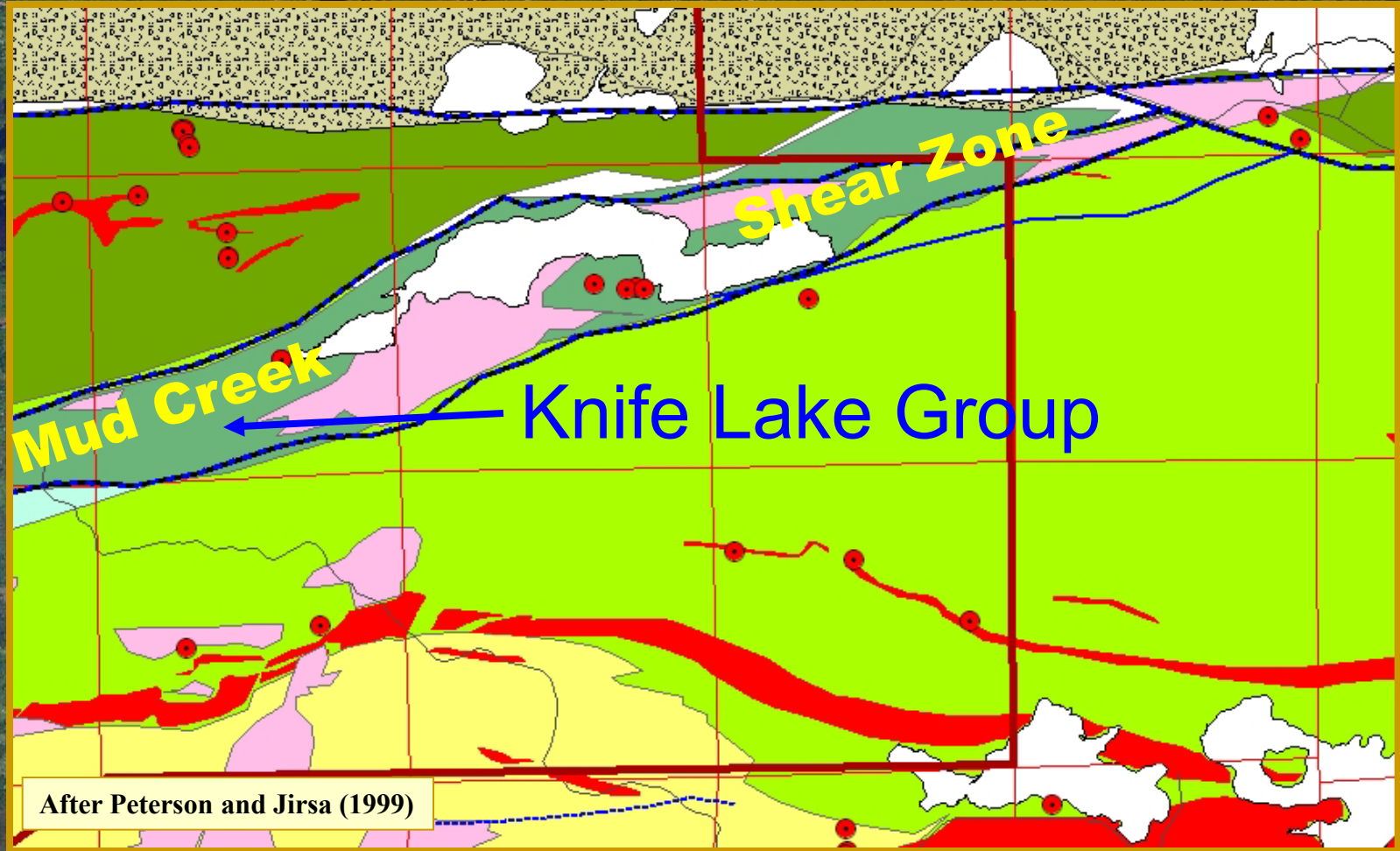
Intrusion Hosted Gold Deposits



Banded Iron Formation-Hosted Gold

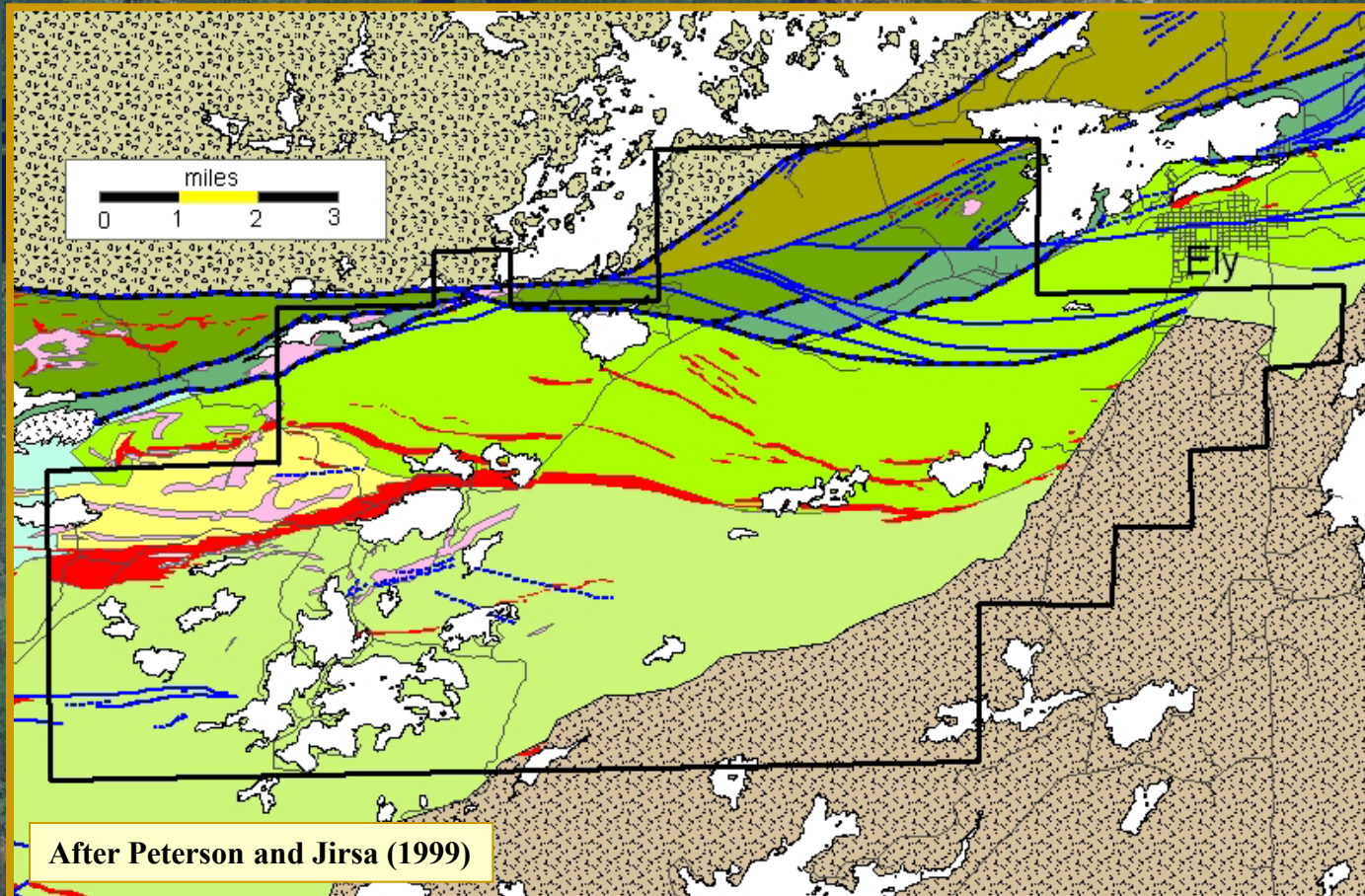


Timiskiming-Type Metasediments



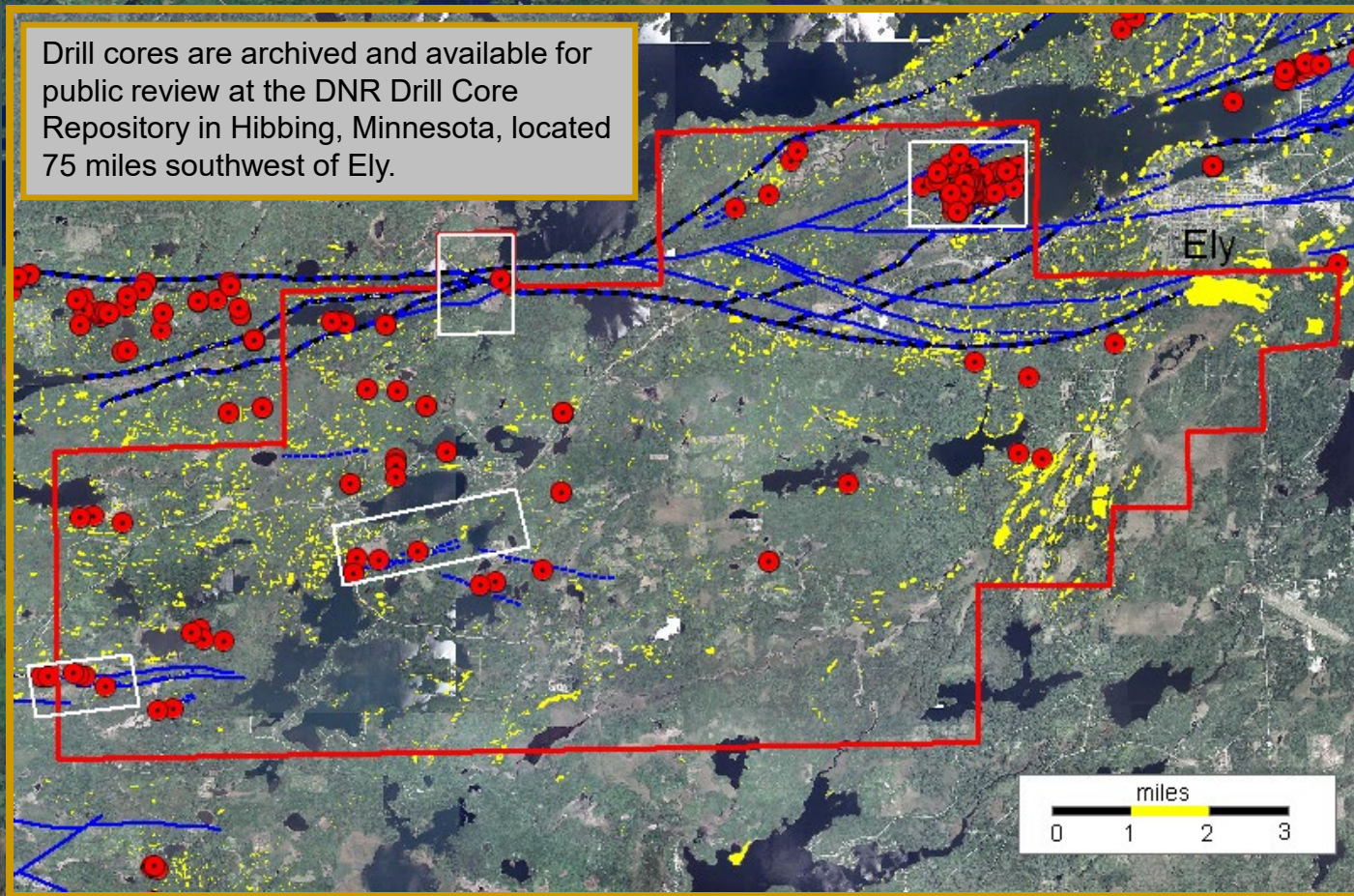
After Peterson and Jirsa (1999)

Vermilion District Bedrock Geology



Outcrops and Drill Holes

Drill cores are archived and available for public review at the DNR Drill Core Repository in Hibbing, Minnesota, located 75 miles southwest of Ely.



Exploratory Bore Hole

Outcrop
2009 Lease Sale

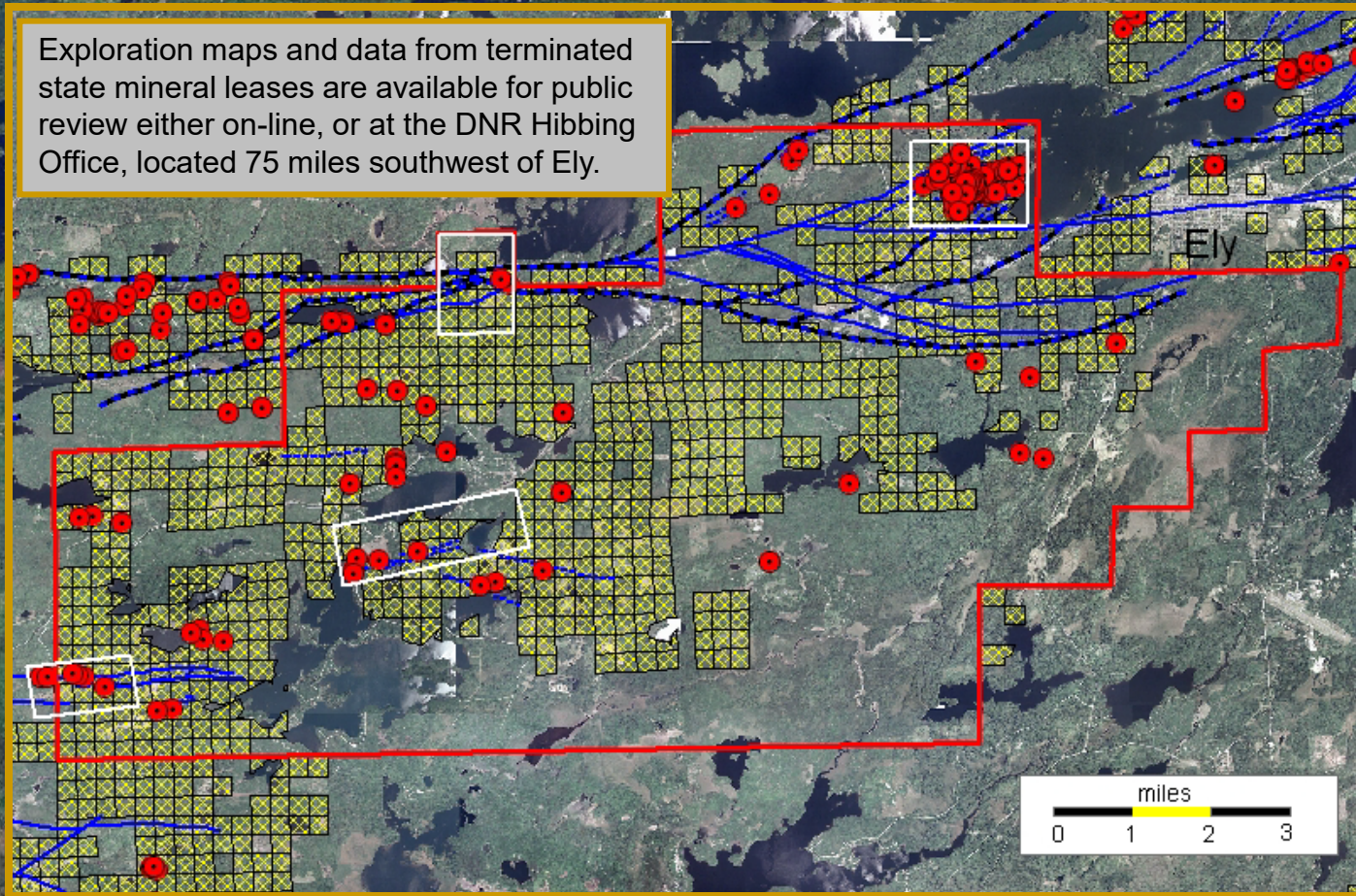
Prospect Boundary

Faults and Shears

First Order
Second Order
Third Order

Terminated State Mineral Leases

Exploration maps and data from terminated state mineral leases are available for public review either on-line, or at the DNR Hibbing Office, located 75 miles southwest of Ely.



● Exploratory Bore Hole

■ Terminated Lease

— 2009 Lease Sale

— Prospect Boundary

Faults and Shears

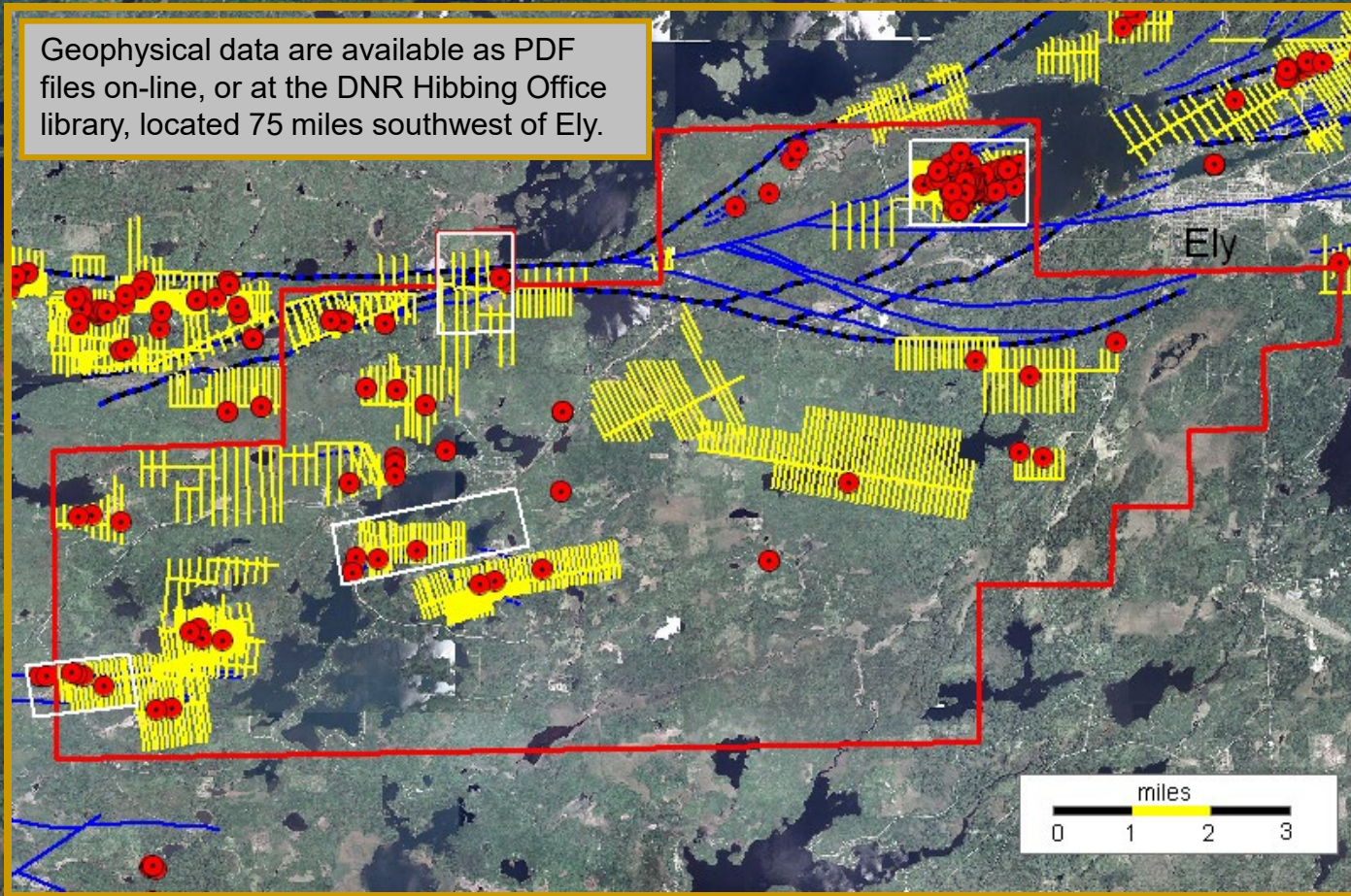
▨ First Order

— Second Order

⋯ Third Order

Geophysical Grids

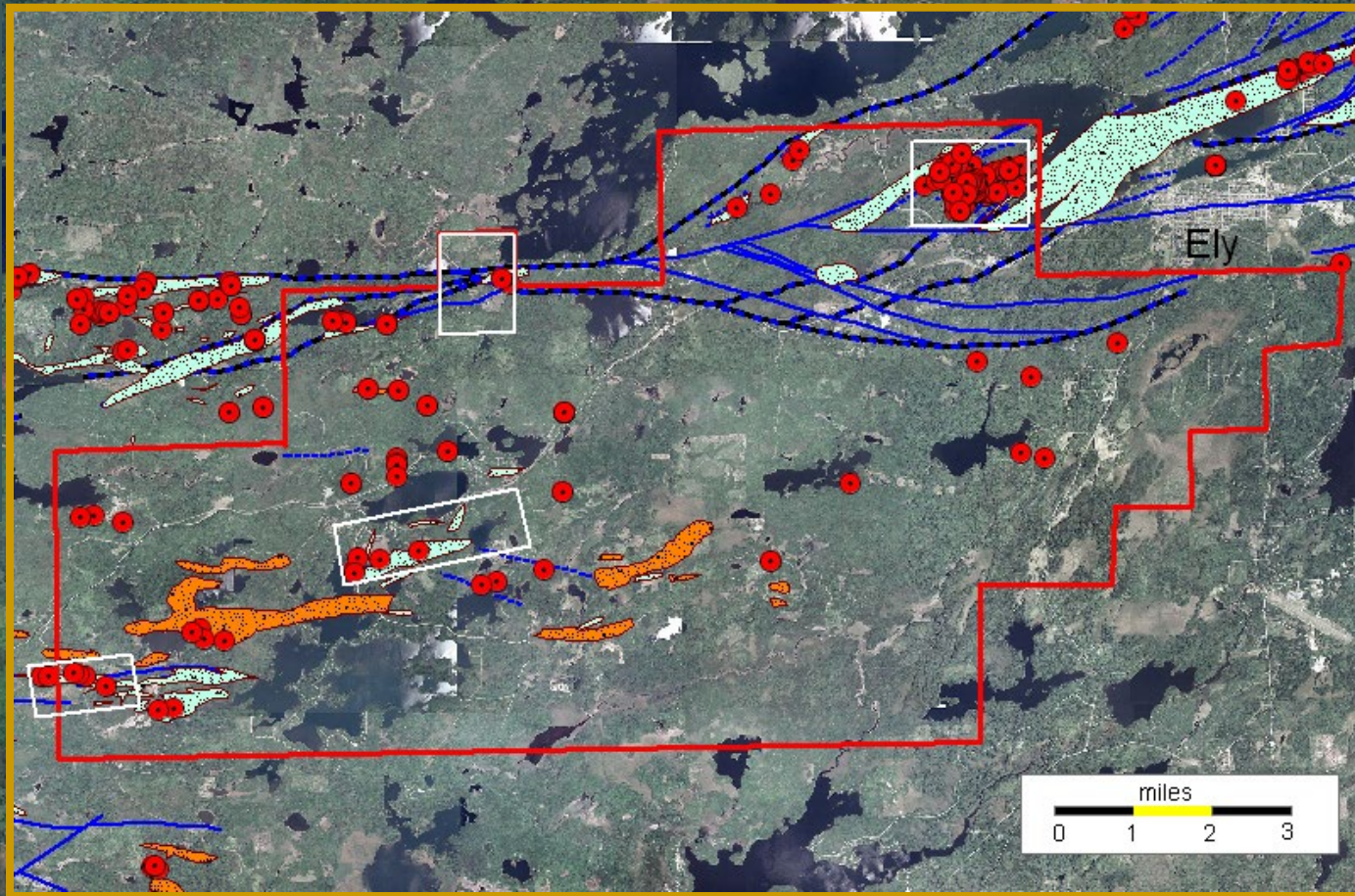
Geophysical data are available as PDF files on-line, or at the DNR Hibbing Office library, located 75 miles southwest of Ely.



- Exploratory Bore Hole
- Geophysical Grid
- 2009 Lease Sale
- Prospect Boundary

- Faults and Shears**
- First Order
 - Second Order
 - Third Order

Alteration Zones



● Exploratory Bore Hole

⊥ Geophysical Grid

— 2009 Lease Sale

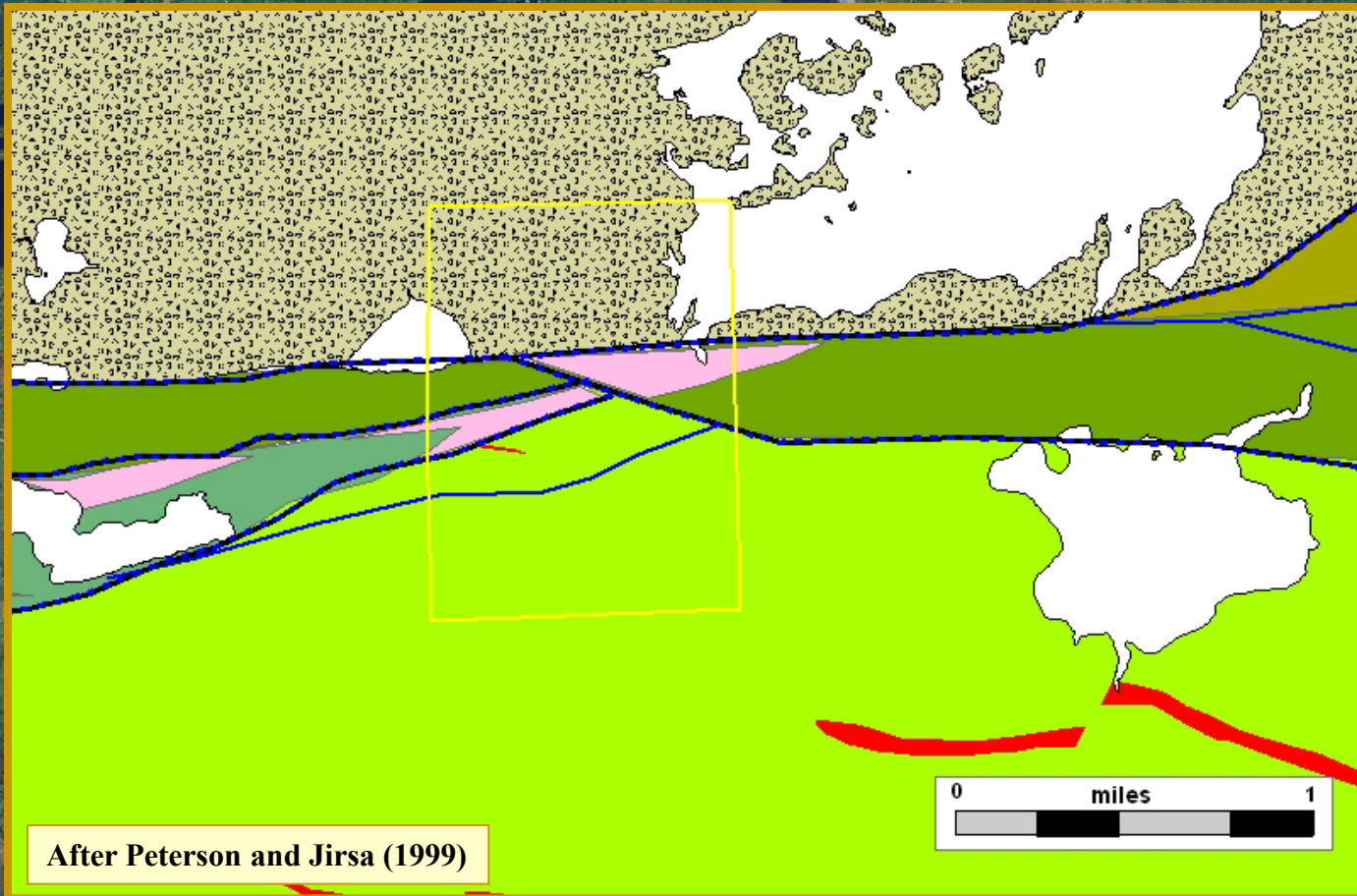
— Prospect Boundary

Alteration

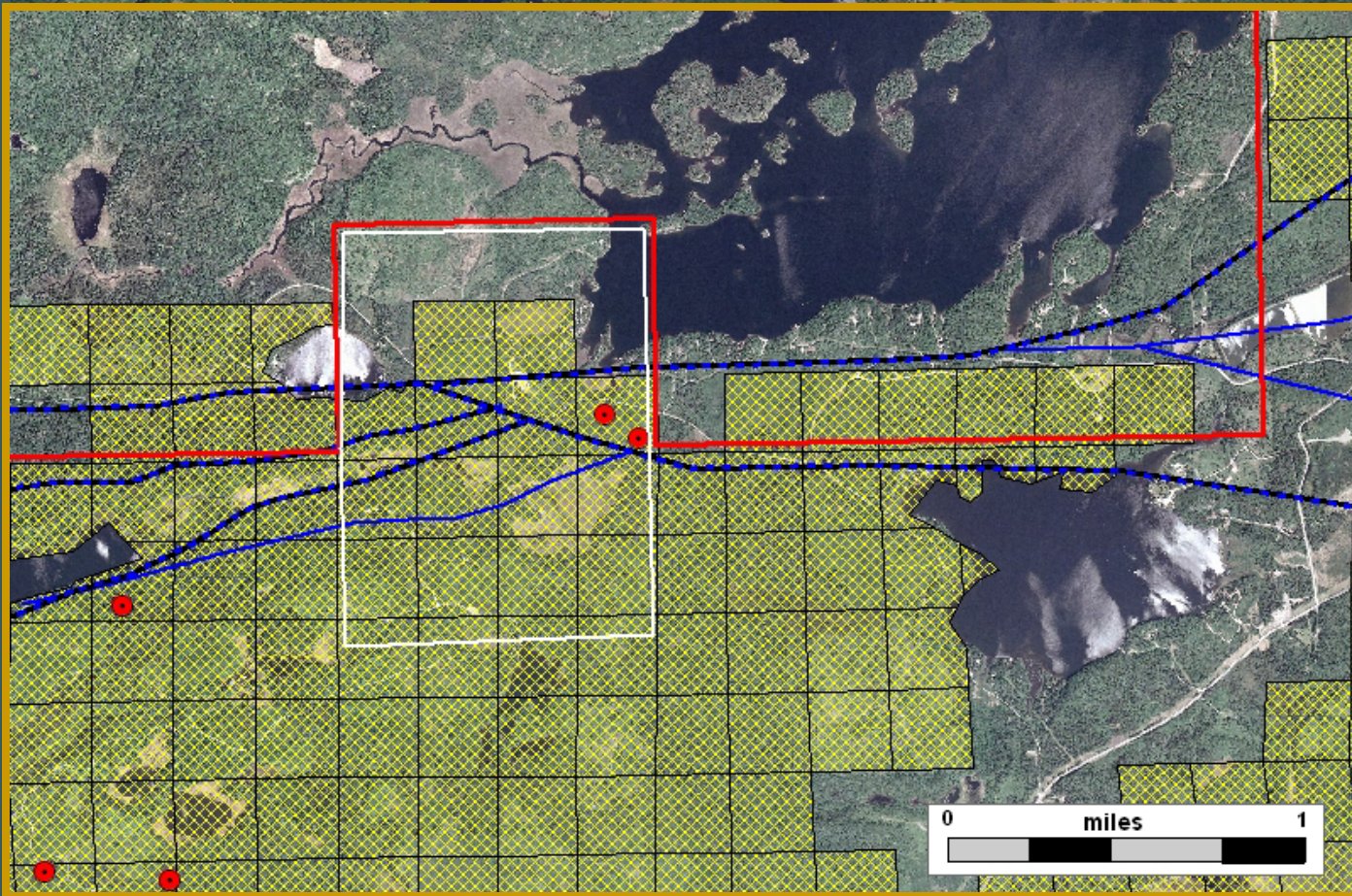
● Lode gold Style

● VMS Style

Foss Lake Prospect



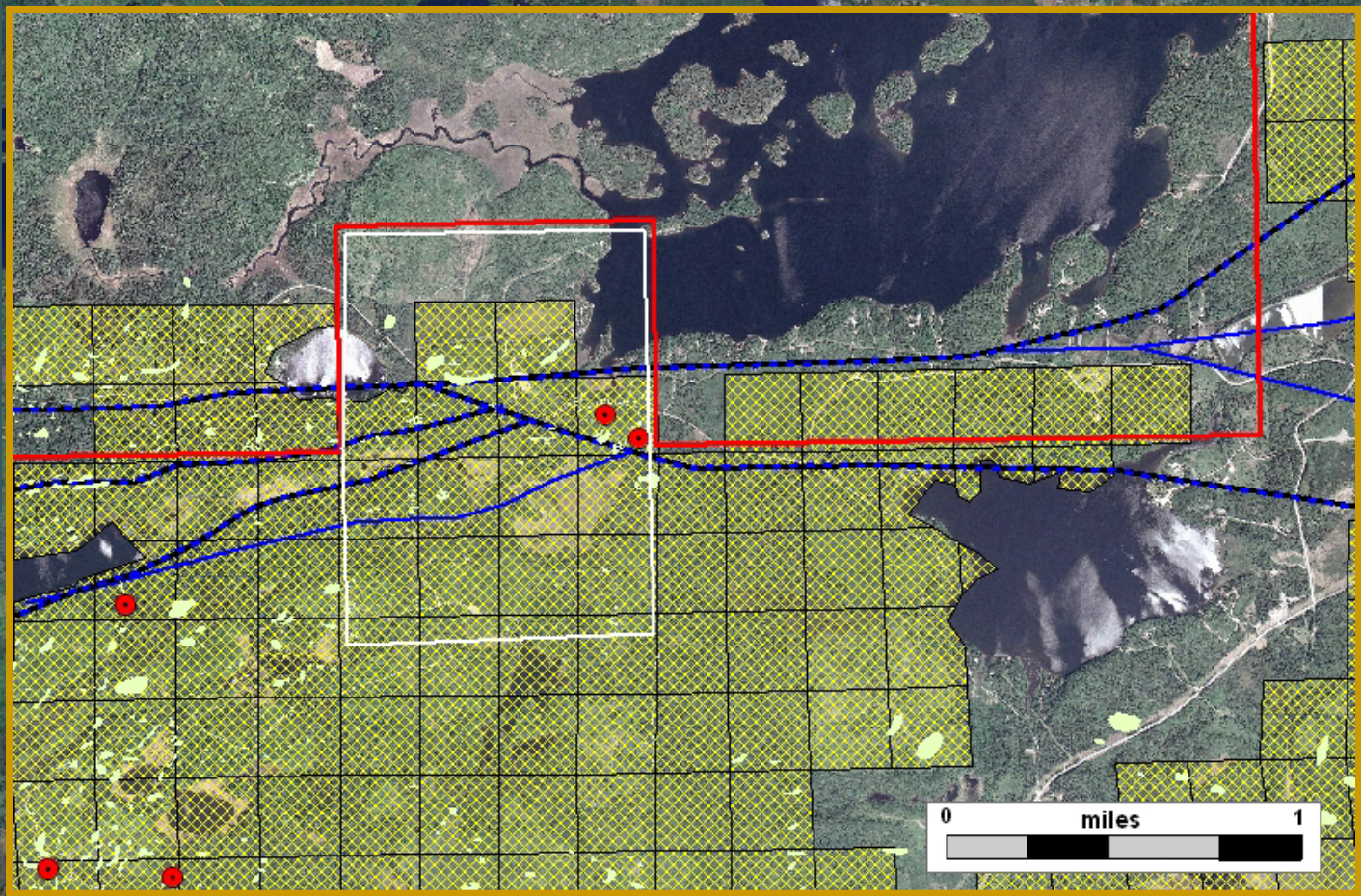
Foss Lake Prospect



- Exploratory Bore Hole
- Terminated Lease
- 2009 Lease Sale
- Prospect Boundary

- Faults and Shears**
- ▨ First Order
 - Second Order
 - ⋯ Third Order

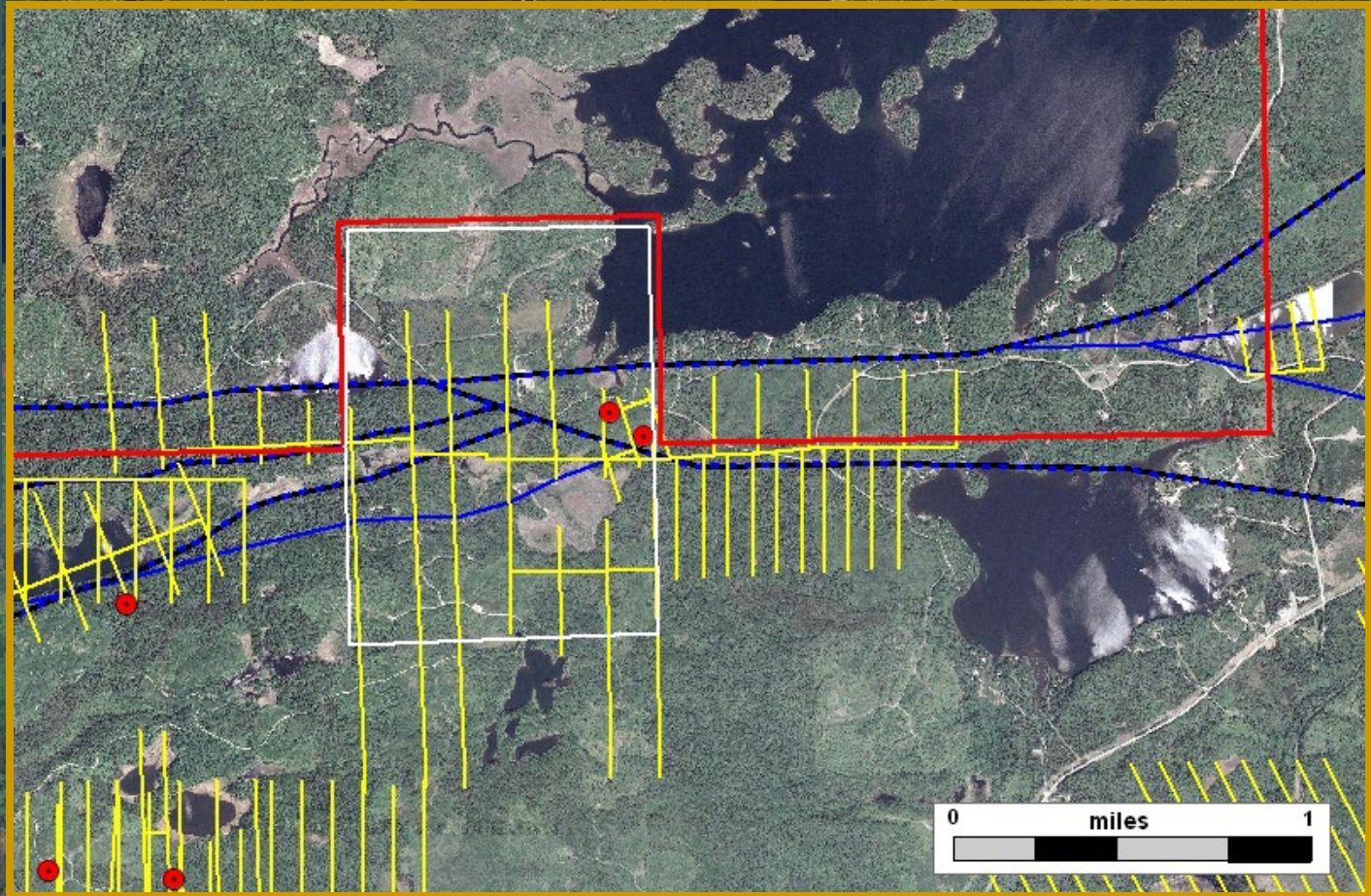
Foss Lake Prospect



- Exploratory Bore Hole
- Terminated Lease
- ▧ Outcrop
- 2009 Lease Sale
- Prospect Boundary

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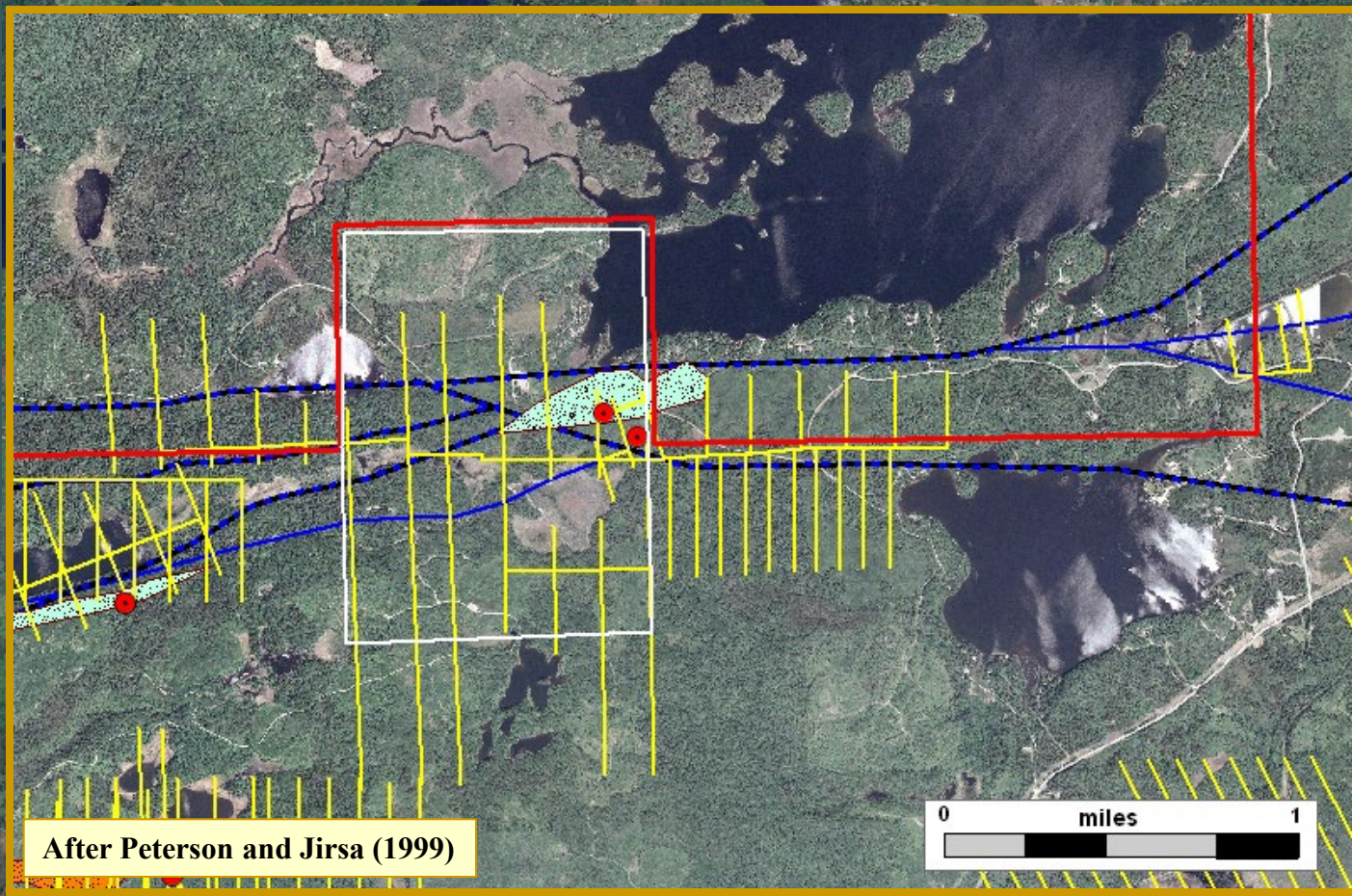
Foss Lake Prospect



- Exploratory Bore Hole
- ⌘ Geophysical Grid
- 2009 Lease Sale
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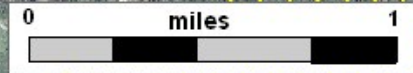
Foss Lake Prospect



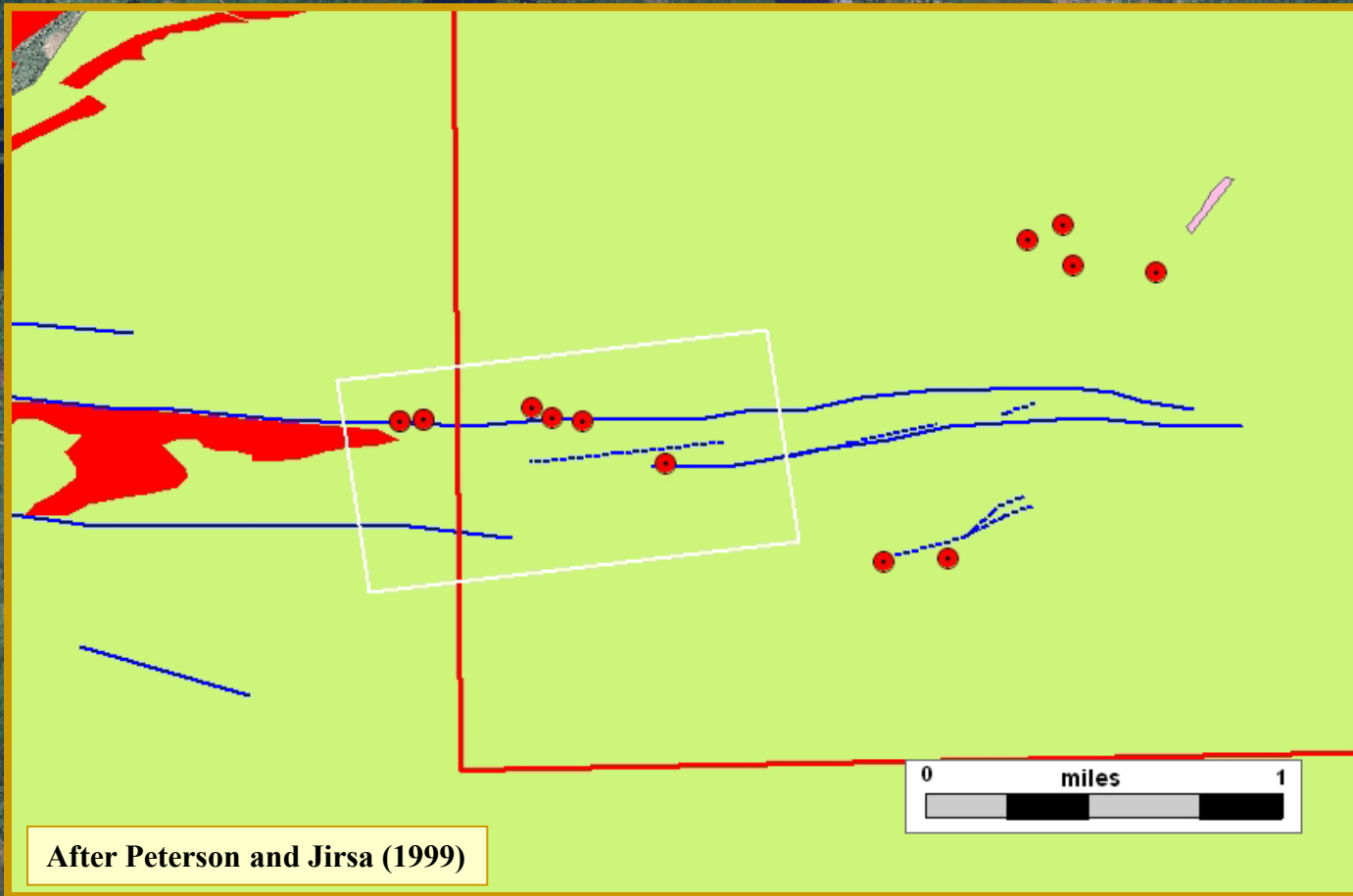
- Exploratory Bore Hole
- ||| Geophysical Grid
- 2009 Lease Sale
- Prospect Boundary

- Alteration**
- Lode gold Style
 - VMS Style

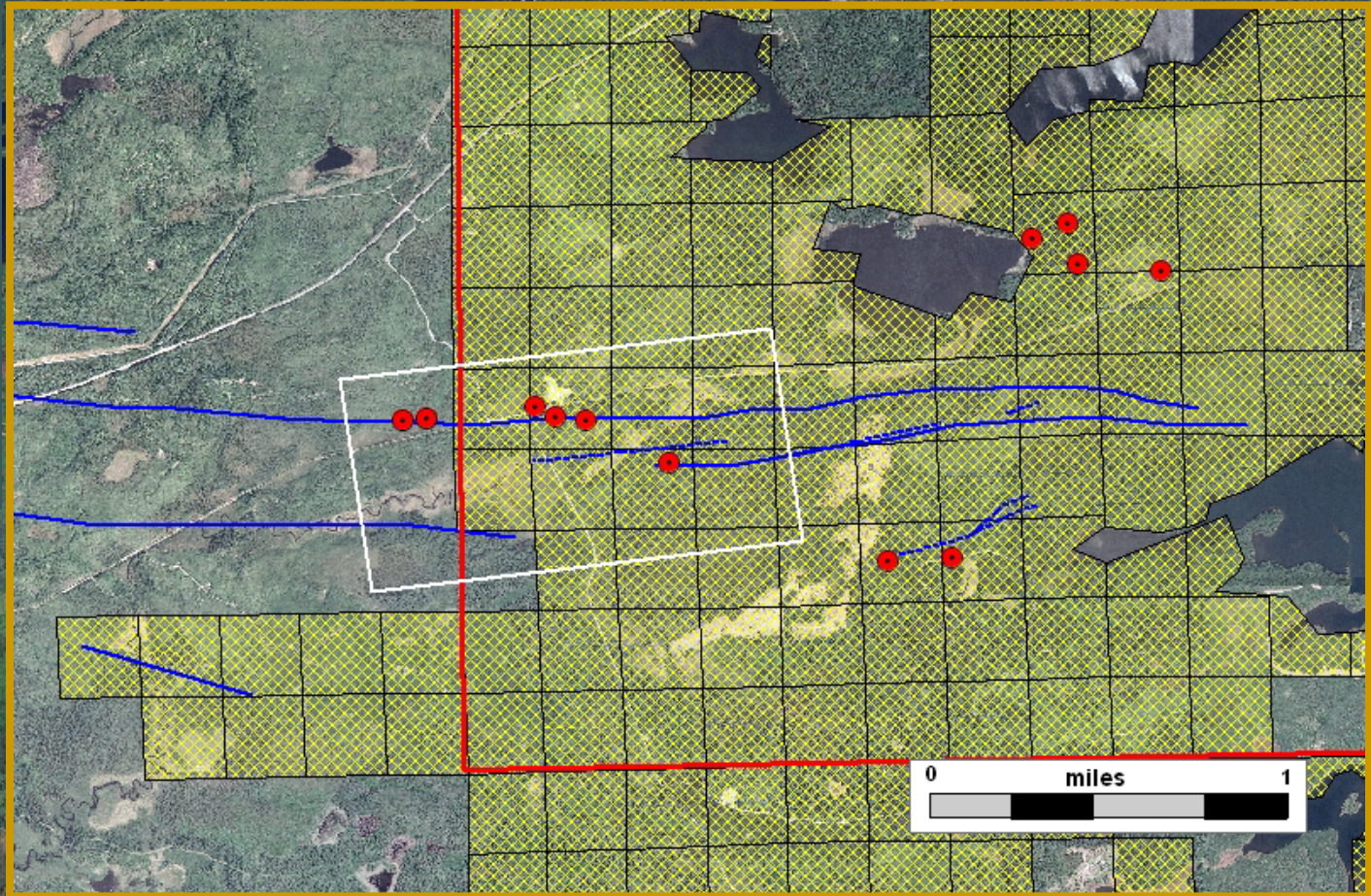
After Peterson and Jirsa (1999)



Murray Shear Prospect



Murray Shear Prospect

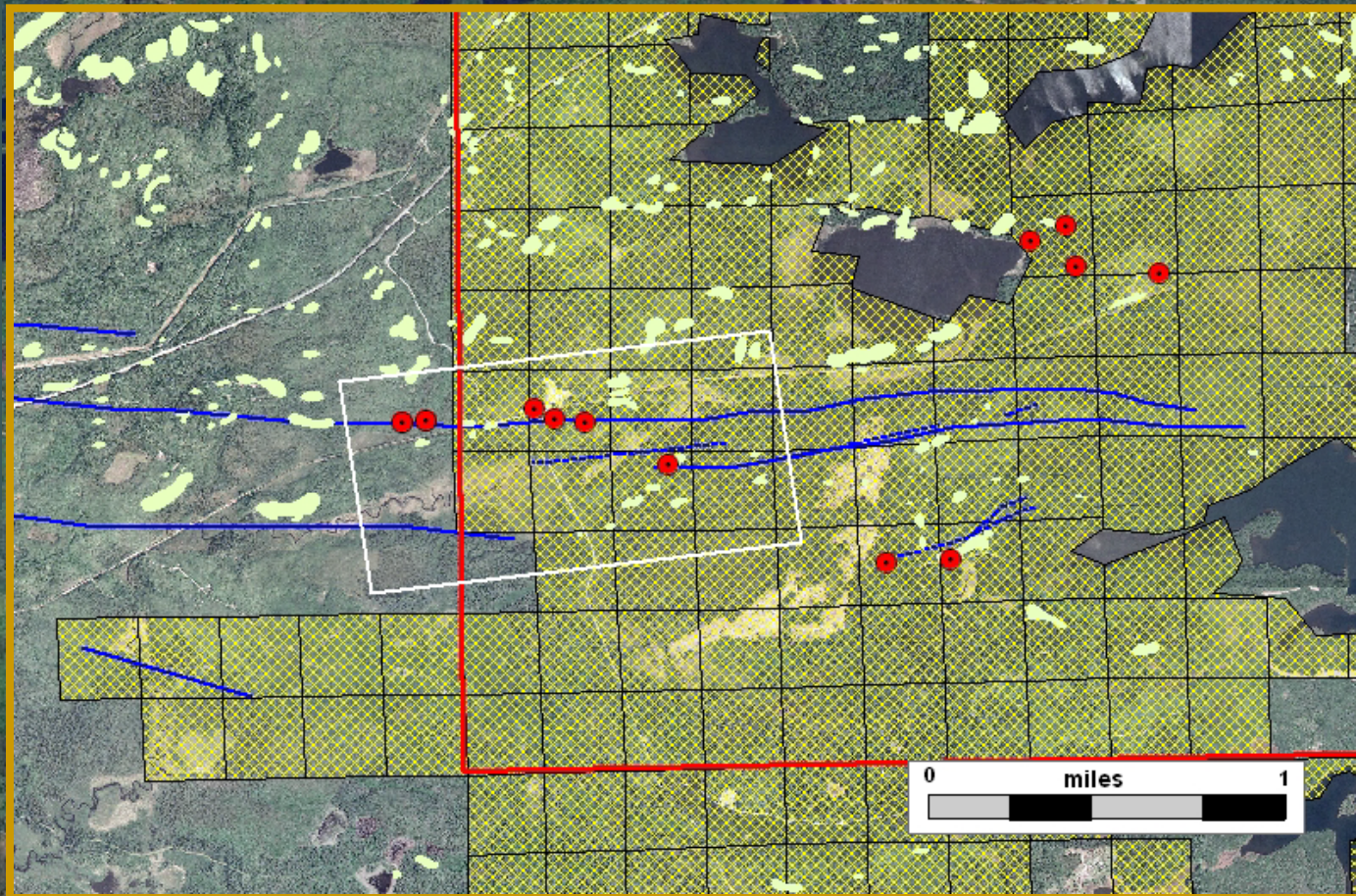


- Exploratory Bore Hole
- Terminated Lease
- 2009 Lease Sale
- Prospect Boundary

Faults and Shears

- ▨ First Order
- Second Order
- ⋯ Third Order

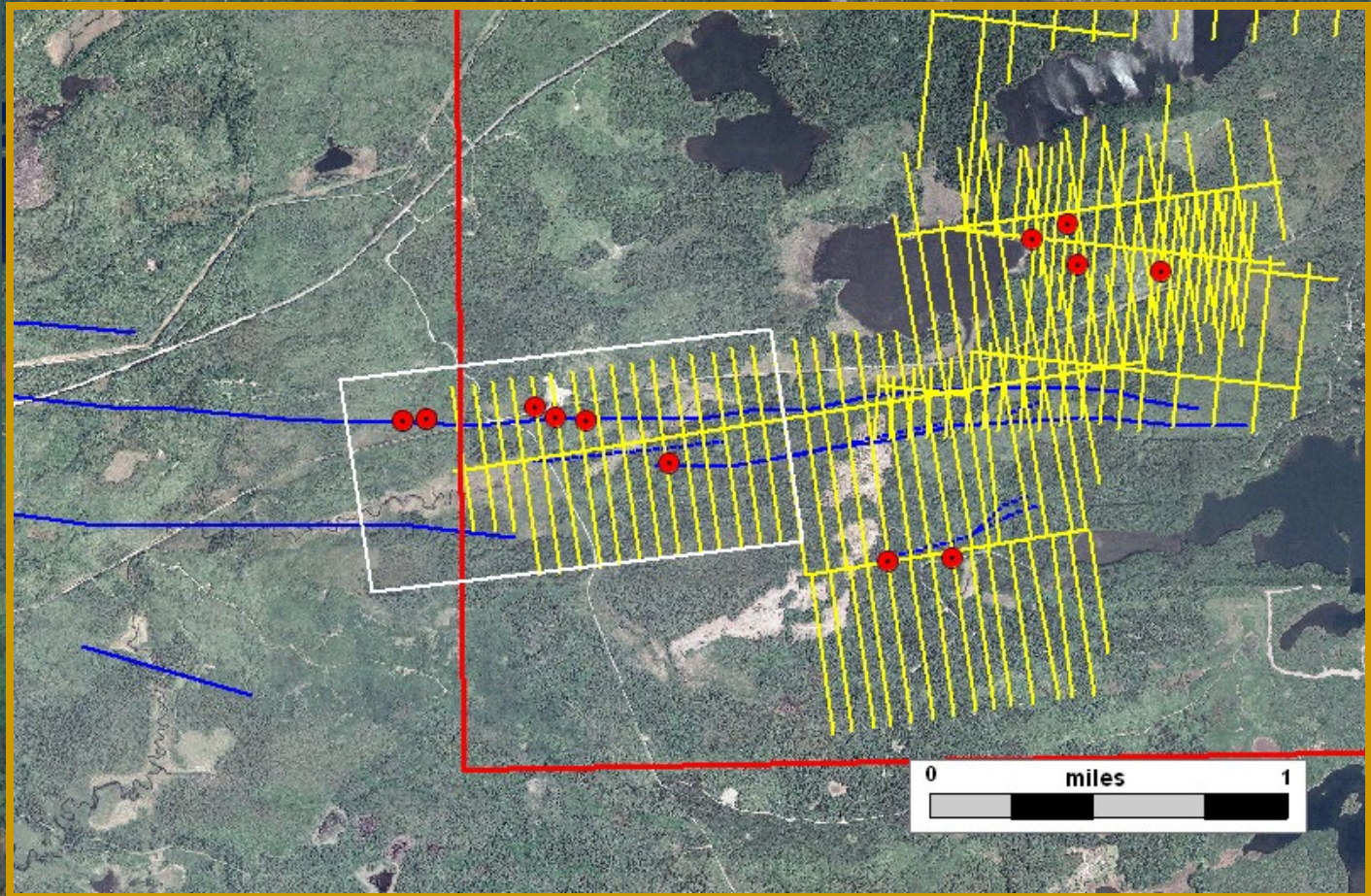
Murray Shear Prospect



- Exploratory Bore Hole
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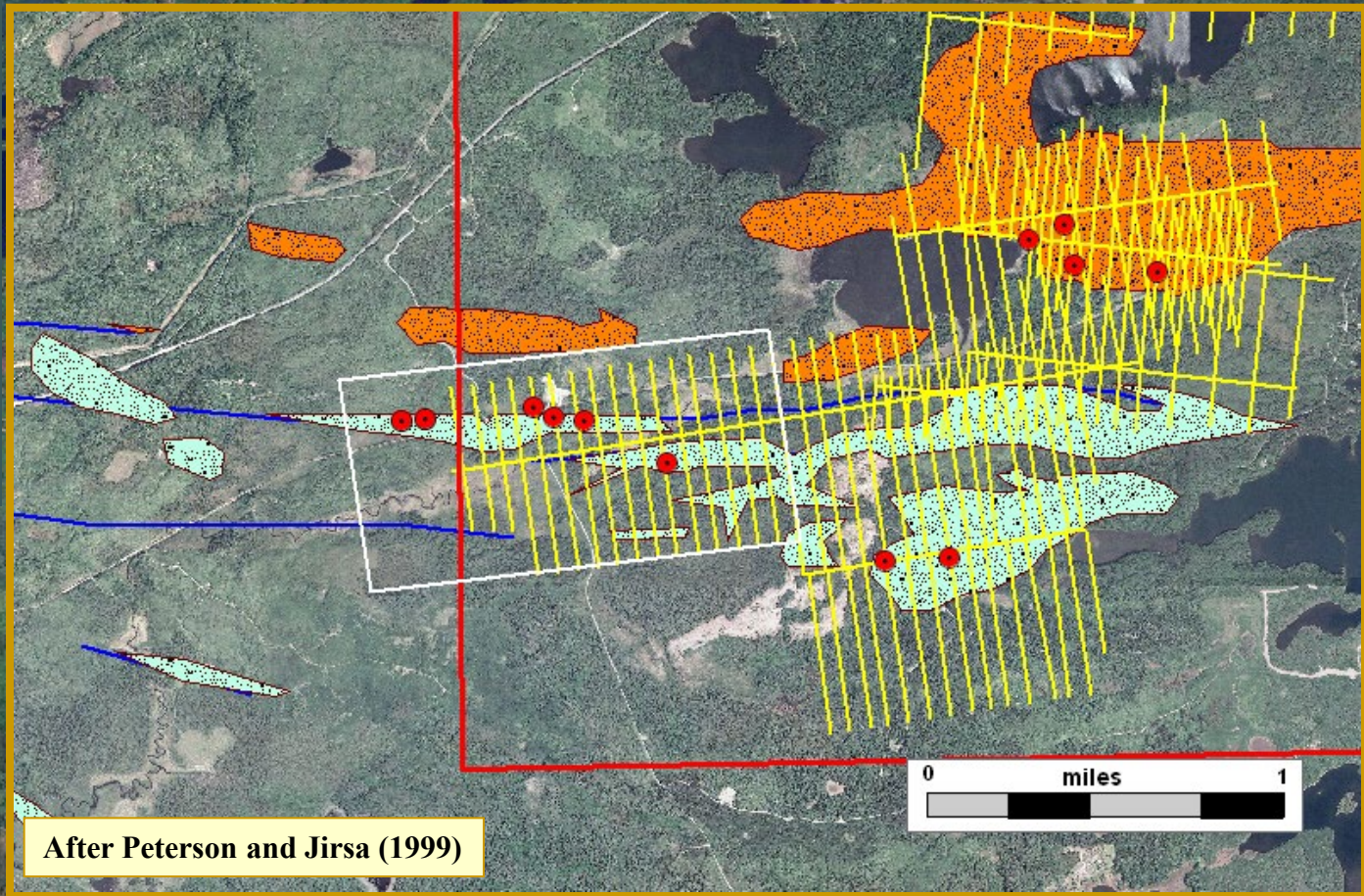
Murray Shear Prospect



- Exploratory Bore Hole
- ▤ Geophysical Grid
- ▬ 2009 Lease Sale
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Murray Shear Prospect

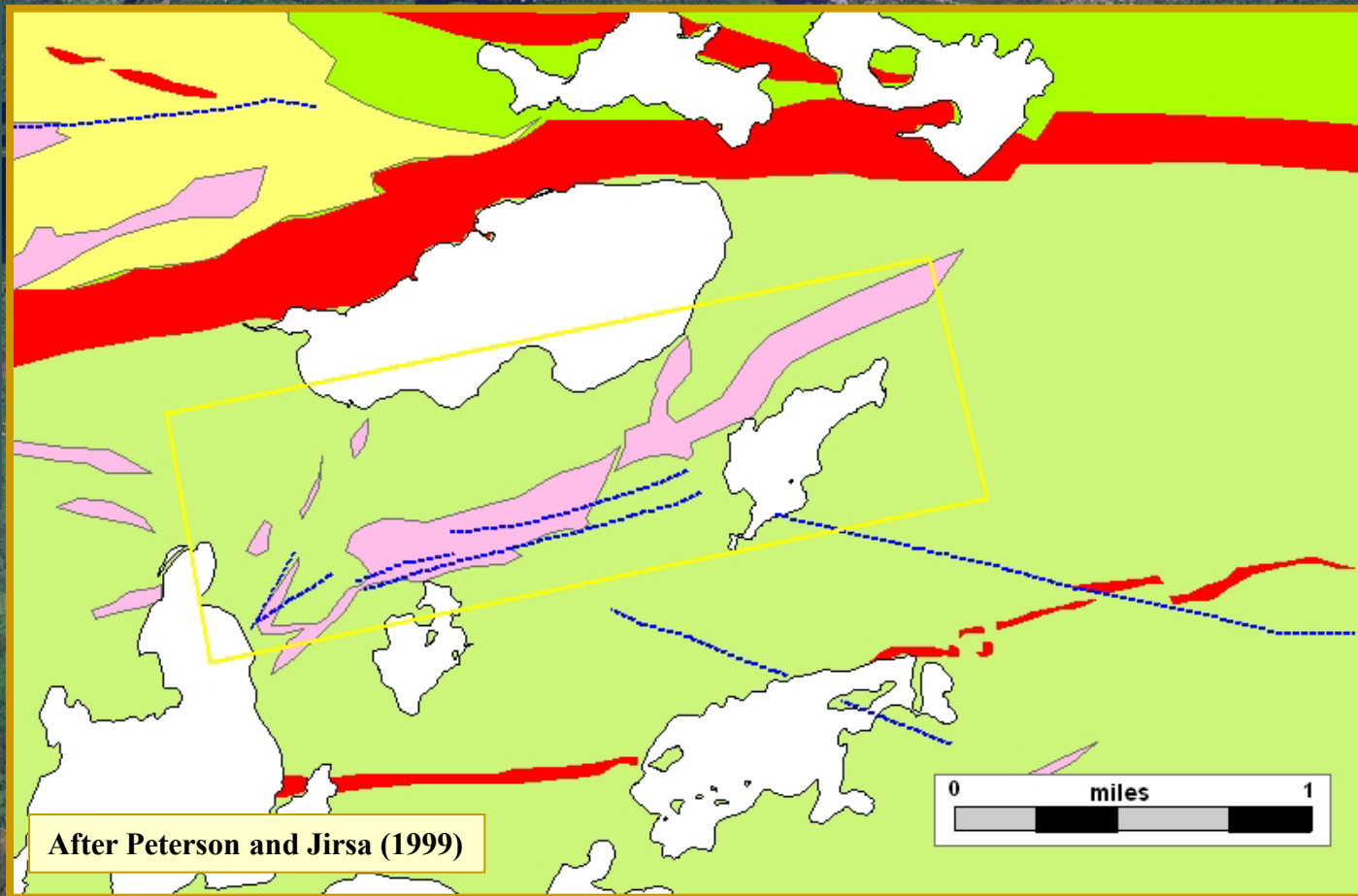


After Peterson and Jirsa (1999)

- Exploratory Bore Hole
- ⌘ Geophysical Grid
- 2009 Lease Sale
- ▭ Prospect Boundary

- Alteration**
- Lode gold Style
 - VMS Style

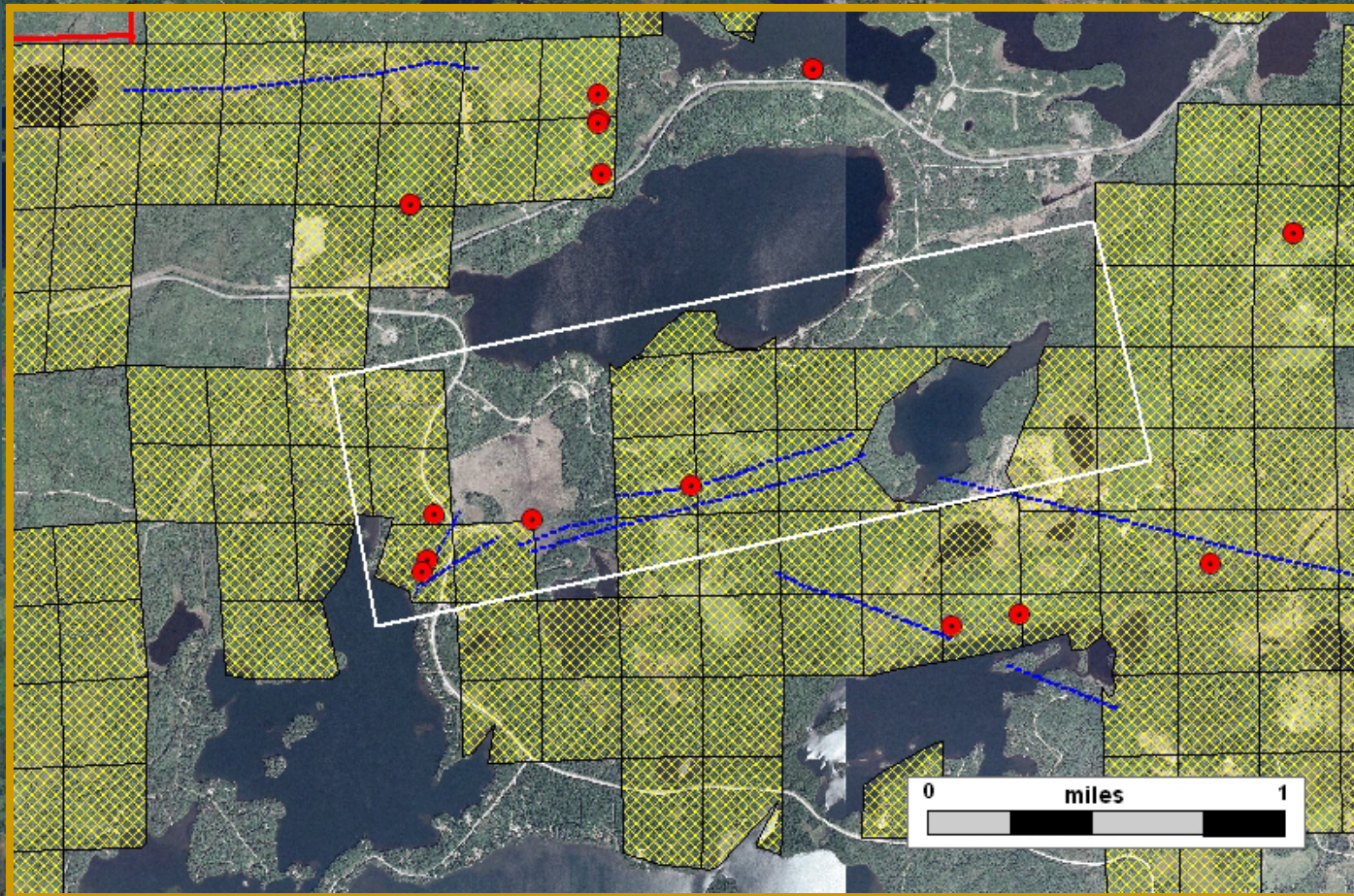
Eagles Nest Shear Prospect



After Peterson and Jirsa (1999)



Eagles Nest Shear Prospect



● Exploratory Bore Hole

■ Terminated Lease

— 2009 Lease Sale

— Prospect Boundary

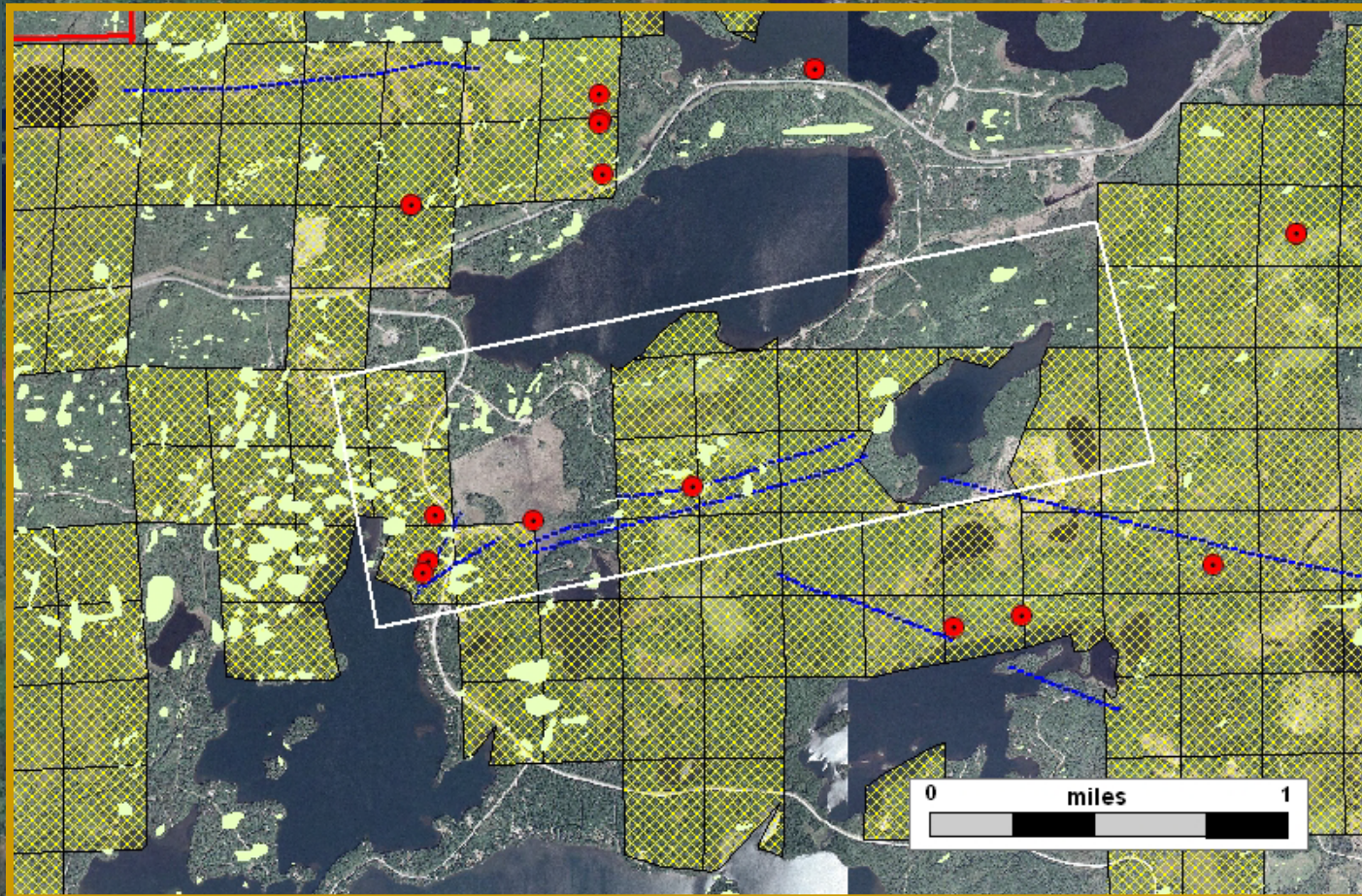
Faults and Shears

— First Order

— Second Order

... Third Order

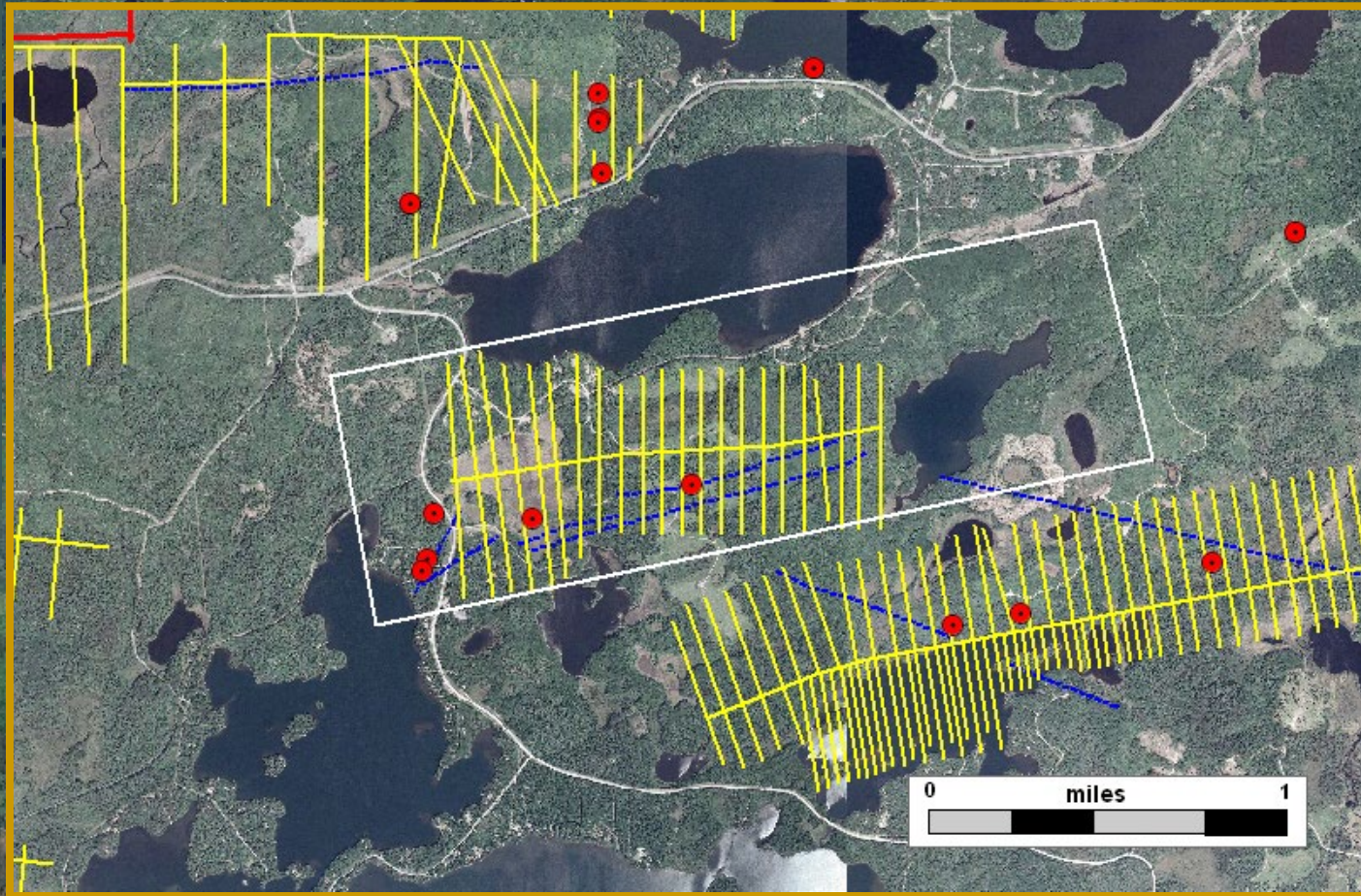
Eagles Nest Shear Prospect



- Exploratory Bore Hole
- Terminated Lease
- Outcrop
- 2009 Lease Sale
- Prospect Boundary

- Faults and Shears**
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 - Second Order
 - Third Order

Eagles Nest Shear Prospect



● Exploratory Bore Hole

||| Geophysical Grid

— 2009 Lease Sale

— Prospect Boundary

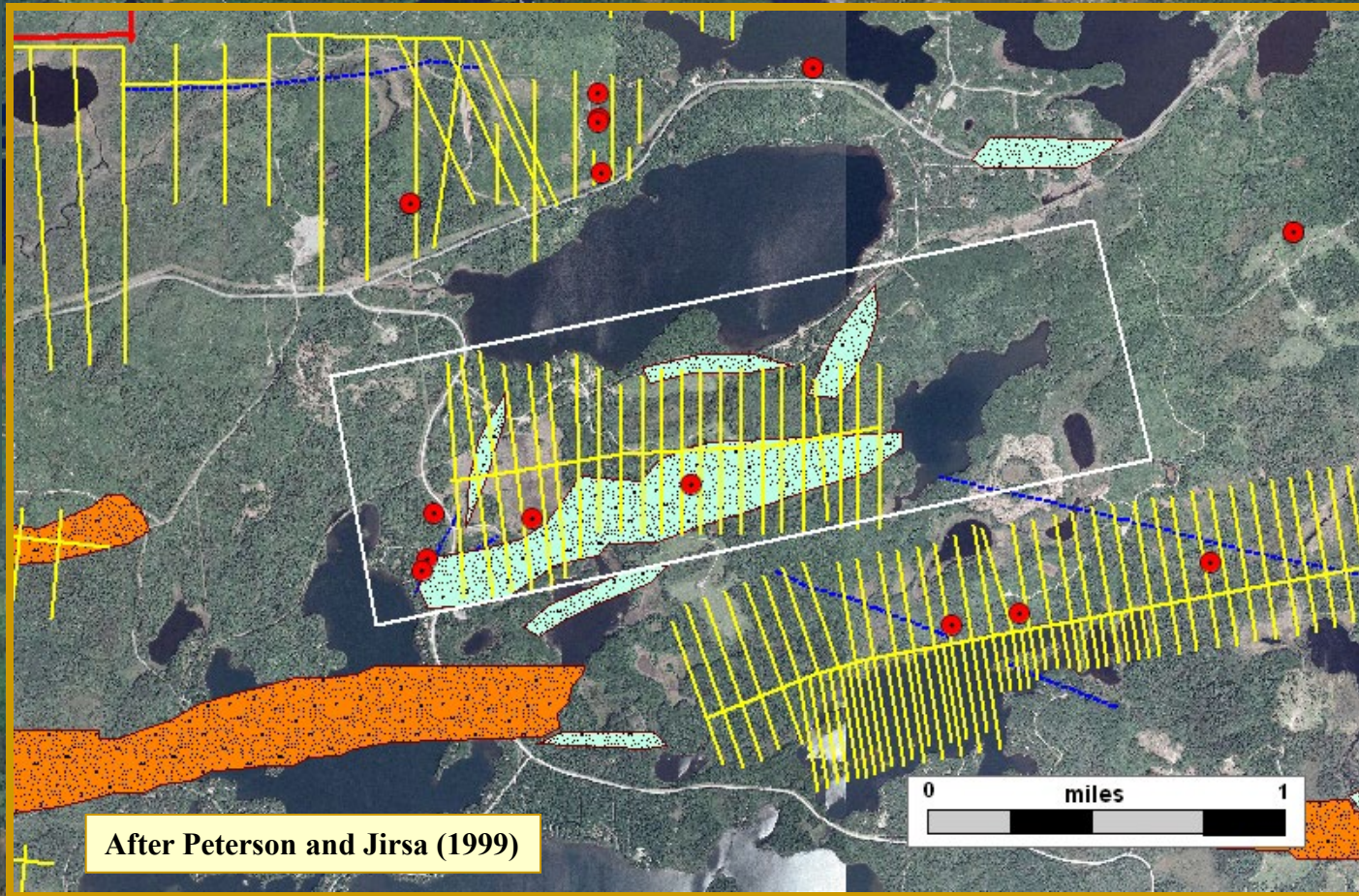
Faults and Shears

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Eagles Nest Shear Prospect

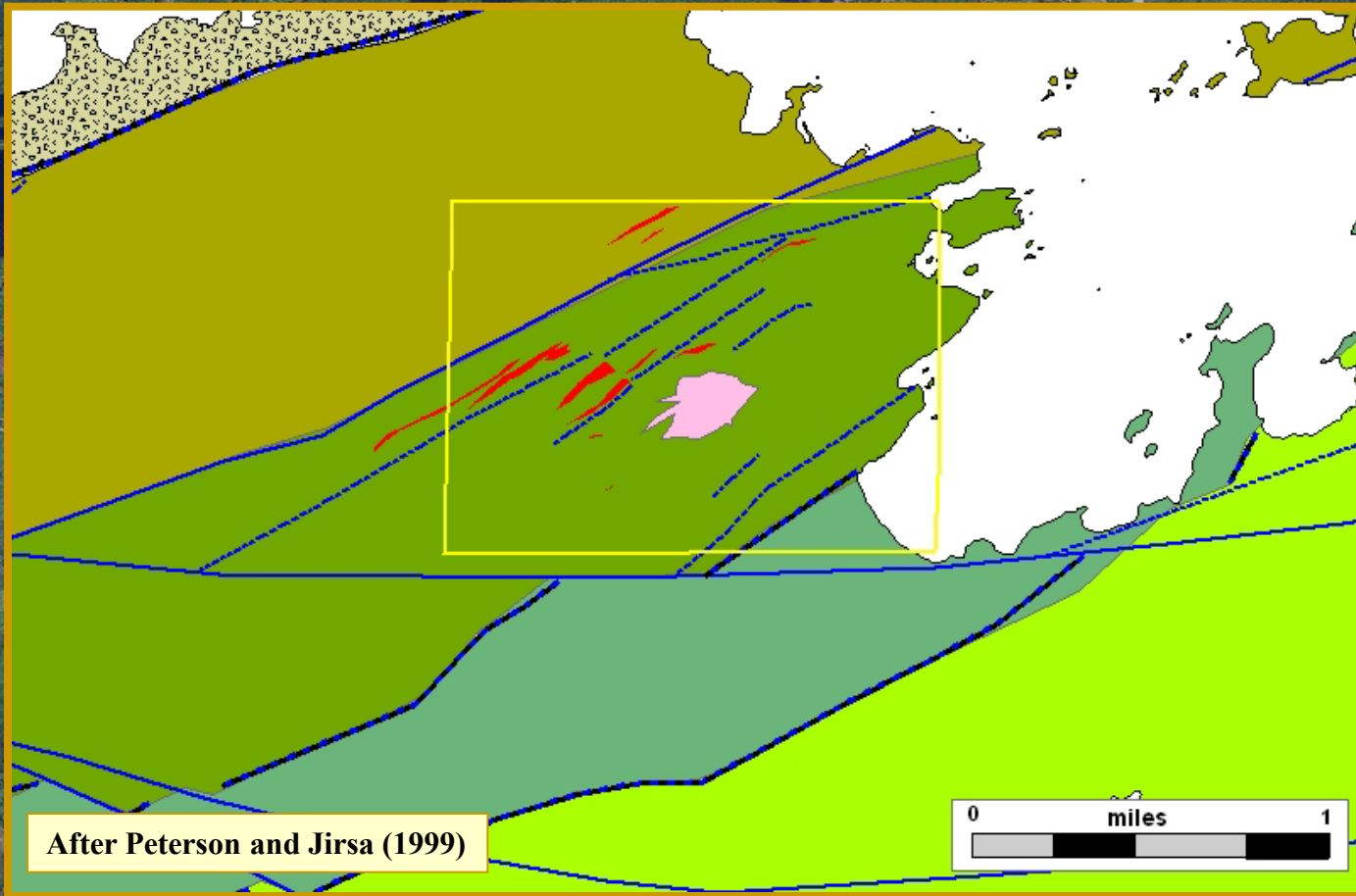


After Peterson and Jirsa (1999)

- Exploratory Bore Hole
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- Prospect Boundary

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- Lode gold Style
 - VMS Style

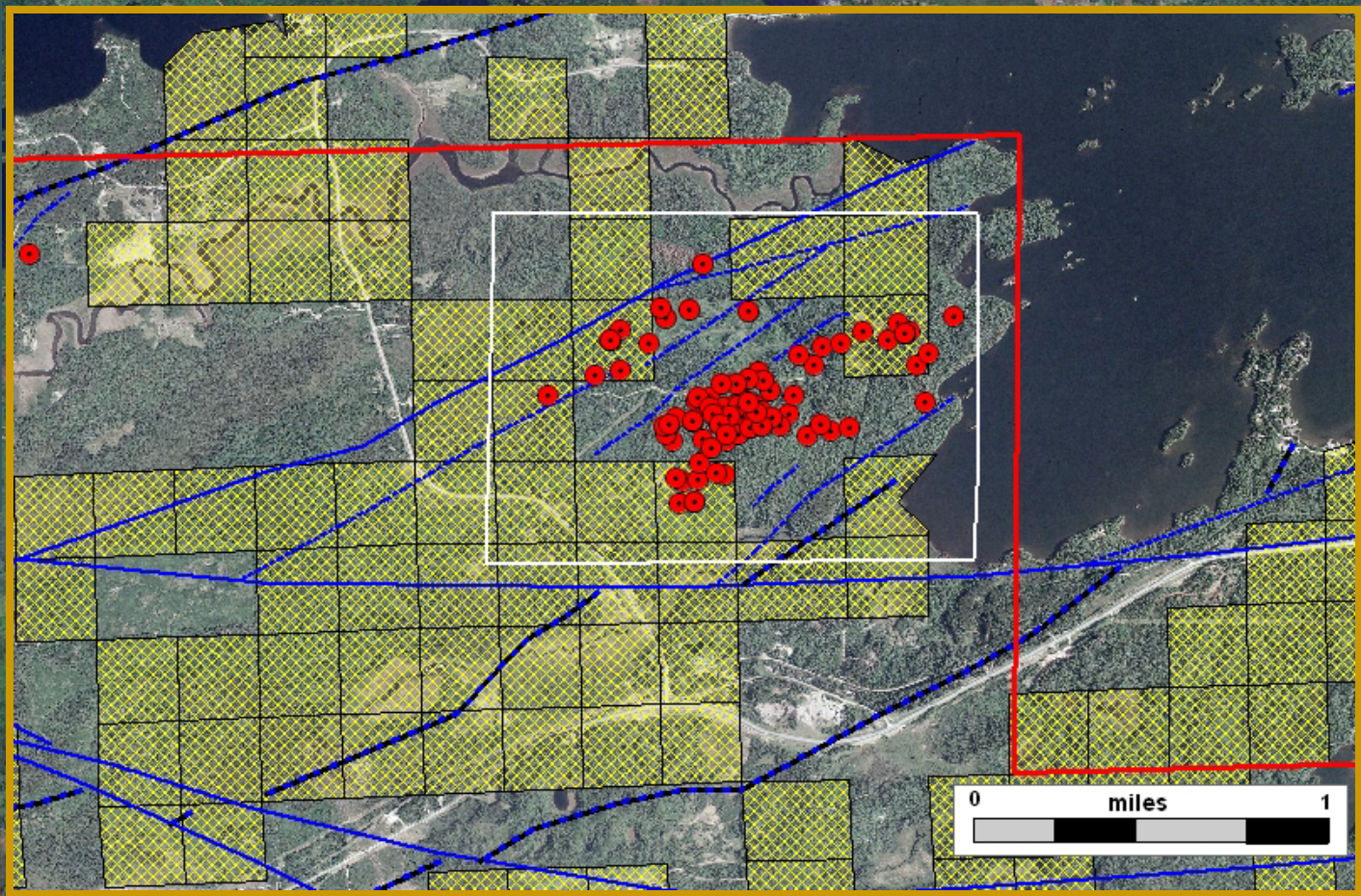
Raspberry Prospect



After Peterson and Jirsa (1999)



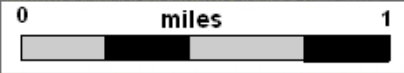
Raspberry Prospect



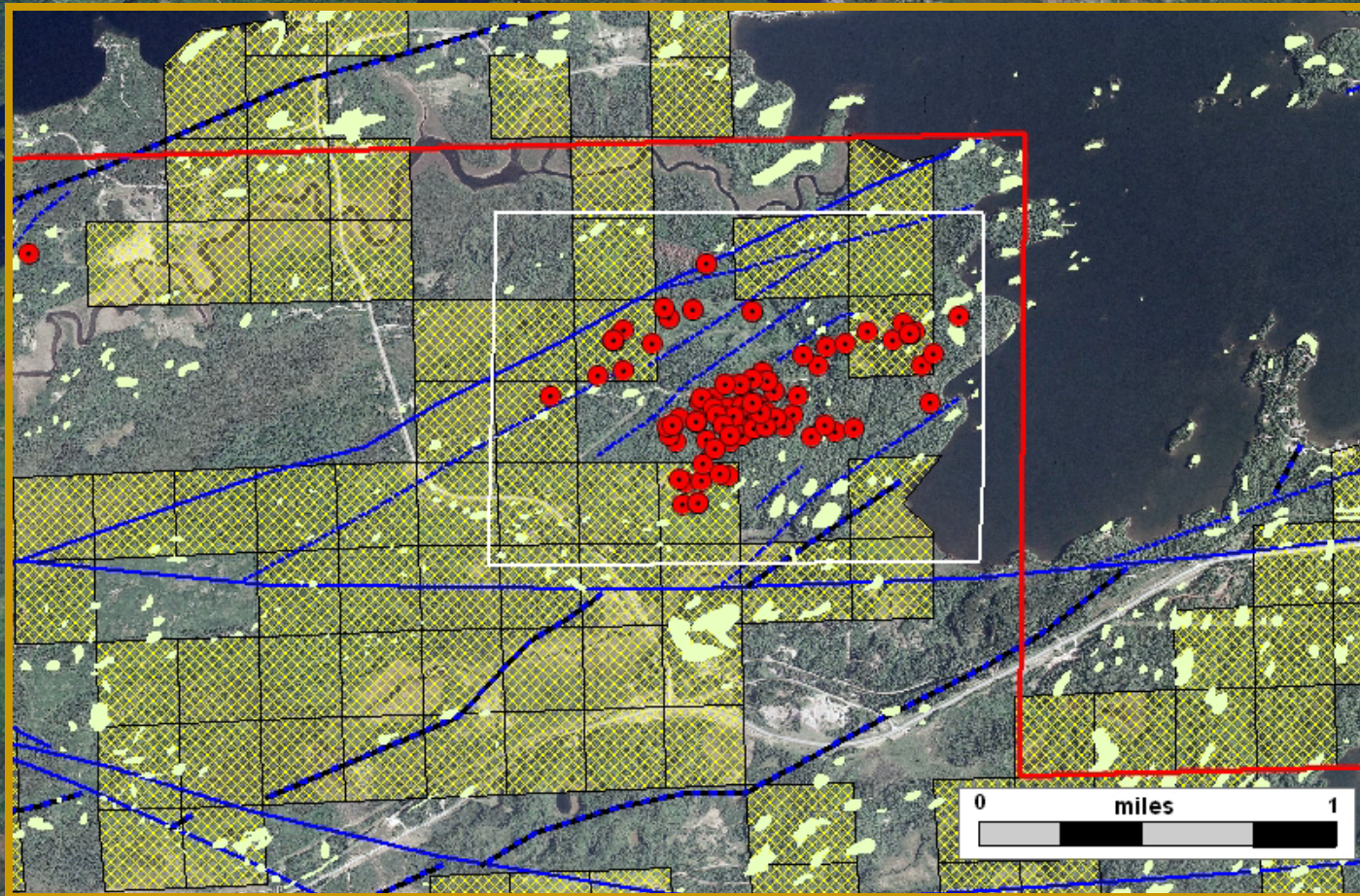
- Exploratory Bore Hole
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- 2009 Lease Sale
- Prospect Boundary

Faults and Shears

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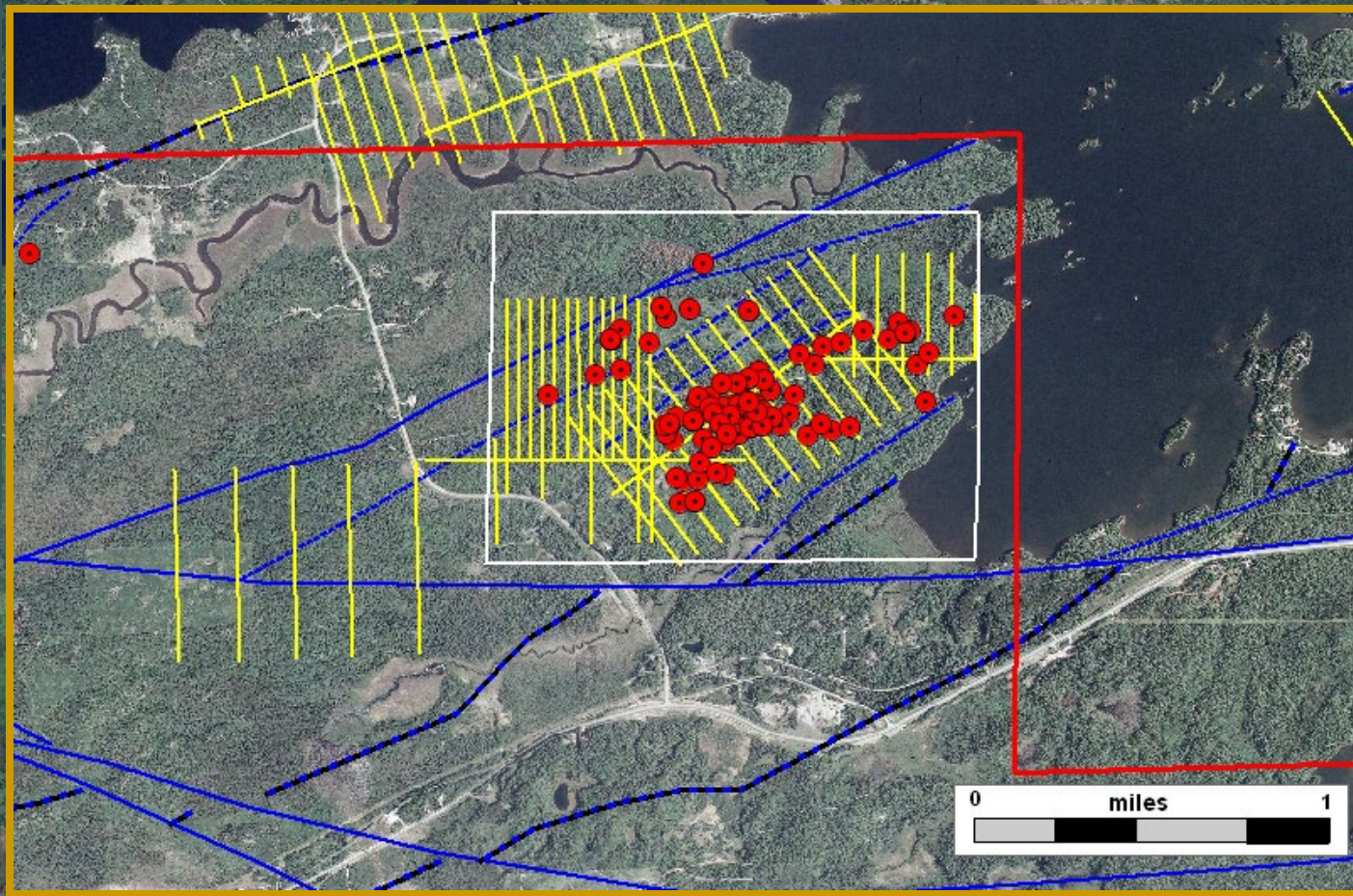
Raspberry Prospect



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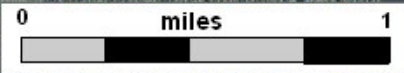
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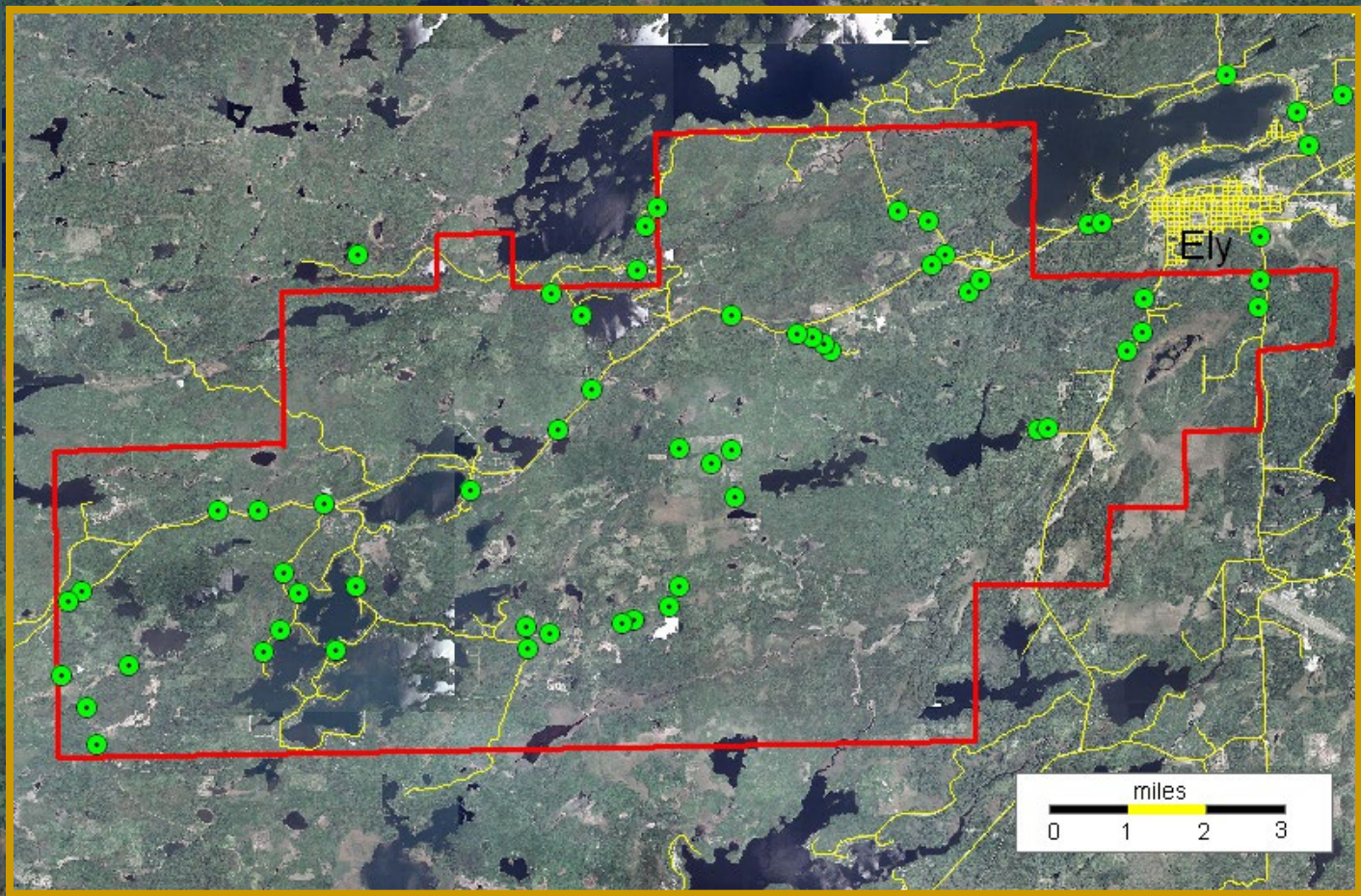






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Raspberry Prospect



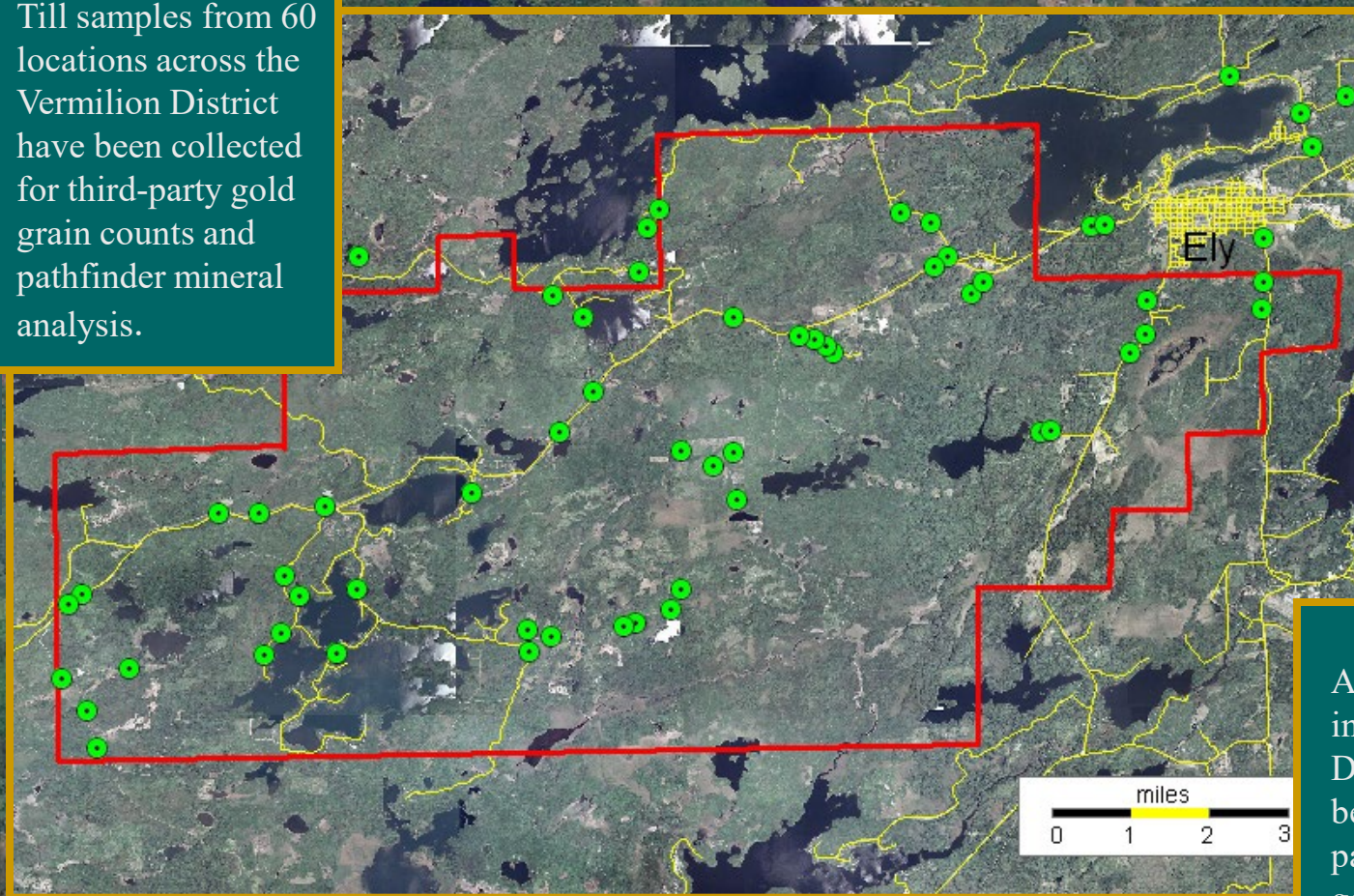
-  Exploratory Bore Hole
-  Geophysical Grid
-  2009 Lease Sale
-  Prospect Boundary

- Alteration**
-  Lode gold Style
 -  VMS Style



Work In Progress

Till samples from 60 locations across the Vermilion District have been collected for third-party gold grain counts and pathfinder mineral analysis.



An additional 250 sample intervals of Vermilion District drill core have been selected for third-party quantitative geochemical analysis.

For more information:

Vermilion District Geology

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(651) 259-5939

Barry Frey, Minnesota DNR
barry.frey@dnr.state.mn.us
(218) 231-8484

[Vermilion District Gold : New Results from Drill Holes](#)

[100 Years of Non-ferrous Mineral Information in Minnesota](#)

State of Minnesota Metallic Mineral Leases

Kathy A. Lewis, Minnesota DNR
kathy.lewis@dnr.state.mn.us
(651) 259-5404

[Notice of Intent to Hold Metallic Mineral Lease Sale](#)

[Minnesota's Mining Laws](#)

PDF

