

## Historical Exploration in Minnesota



# Nonferrous Metallic Mineral Exploration Activities, 1966 through 2011

## Details from State Leases, and a Summary from Non-State Lands

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Minnesota Department of Natural Resources  
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# Purpose

Background: The State leases state-owned mineral rights to exploration companies. Private individuals have also leased their private mineral rights to exploration companies.

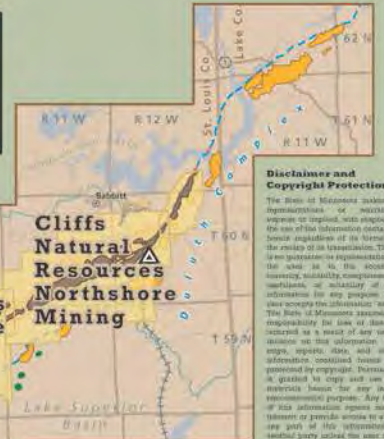
Let's look at the historical data of exploration activity from 46 years of state metallic mineral leasing from 1966 through 2011.

We will also summarize to a lesser degree the statewide exploration data, which includes private lands along with the state lands.

# Topic is Exploration .....Not Mining

## Iron Mining on the Mesabi Iron Range: Mine Lands and Mineral Resources

The Mesabi Iron Range is the largest iron mining district in North America [in terms of tons mined] and supplies most of the iron ore for the blast furnaces used in the US steel industry. This graphic shows where the companies mine, a list of the company plant capacities, the location of major development projects, and the status of the environmental permits. The state has many years of experience with environmental permits for mines.



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Hull Rust Mine Overlook (Hibbing Taconite)



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# Today's Topics

How many state mineral leases have there been in 46 years?

How long are state leases active?

Where were the state leases located?

What types of exploration activities occur on state mineral leases?

## Exploration Drilling

How many state mineral leases had Exploration Drilling?

What % of state mineral leases had Exploration Drilling?

- Summarize the drilling by classification
- Summarize the drilling by year
- Summarize the drilling by location
- How many state leases had no exploration activity? Why not?

# State Mineral Lease Transactions:

Jan.1, 1966-Jan.1, 2012

## **3,379 State Metallic Mineral Leases Total**

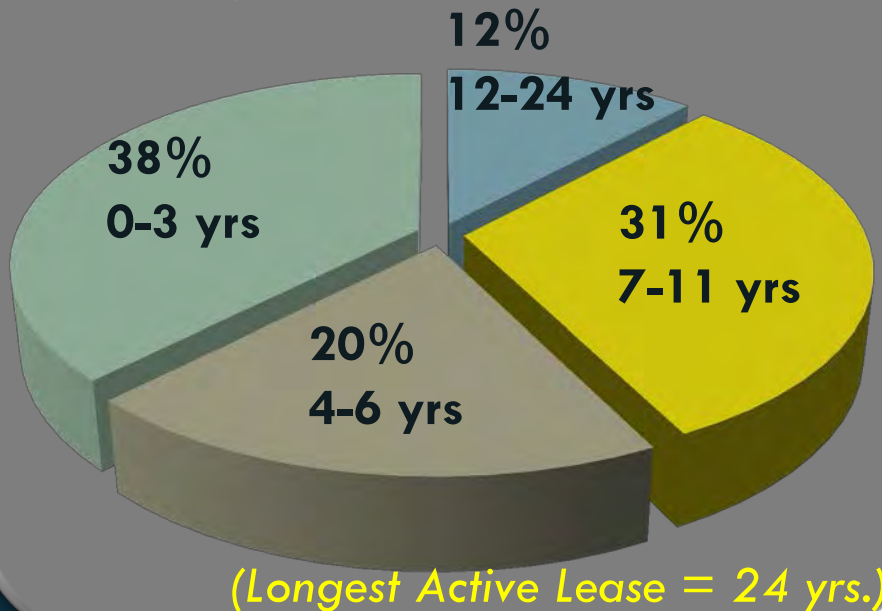
- 387 active (11%)
- 2,992 terminated (89%)

# State Mineral Leases: 1966- 2012

3,379 State Mineral Leases

- 387 active (11%)
- 2,992 terminated (89%)

## Length of Active Leases



Lease Year	Rental Rate
1 through 3	\$1.50/acre
4 through 6	\$5.00/acre
7 through 11	\$15.00/acre
12 through 50	\$30.00/acre

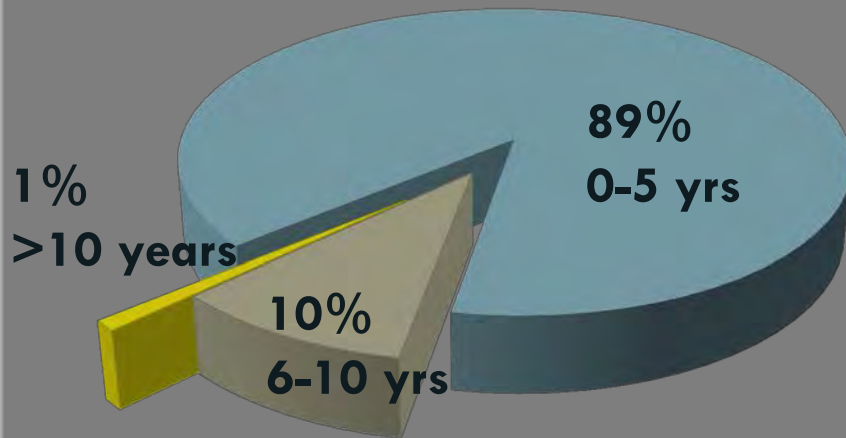
# State Mineral Lease Transactions:

Jan.1, 1966-Jan.1, 2012

3,379 State Metallic Mineral Leases Total

- 387 active (11%)
- **2,992 terminated (89%)**

## Length of 2992 Terminated Leases




(Longest Terminated Lease = 23 yrs)

*Trend: Most leases will terminate at 10 years or less*

# State Mineral Lease Transactions

Looking at forty-acre parcels and government lots provides a meaningful perspective for local landowners. Government lots may be larger or smaller than forty acres in size, but we will generalize here and call this count the “number of forty-acre parcels”.



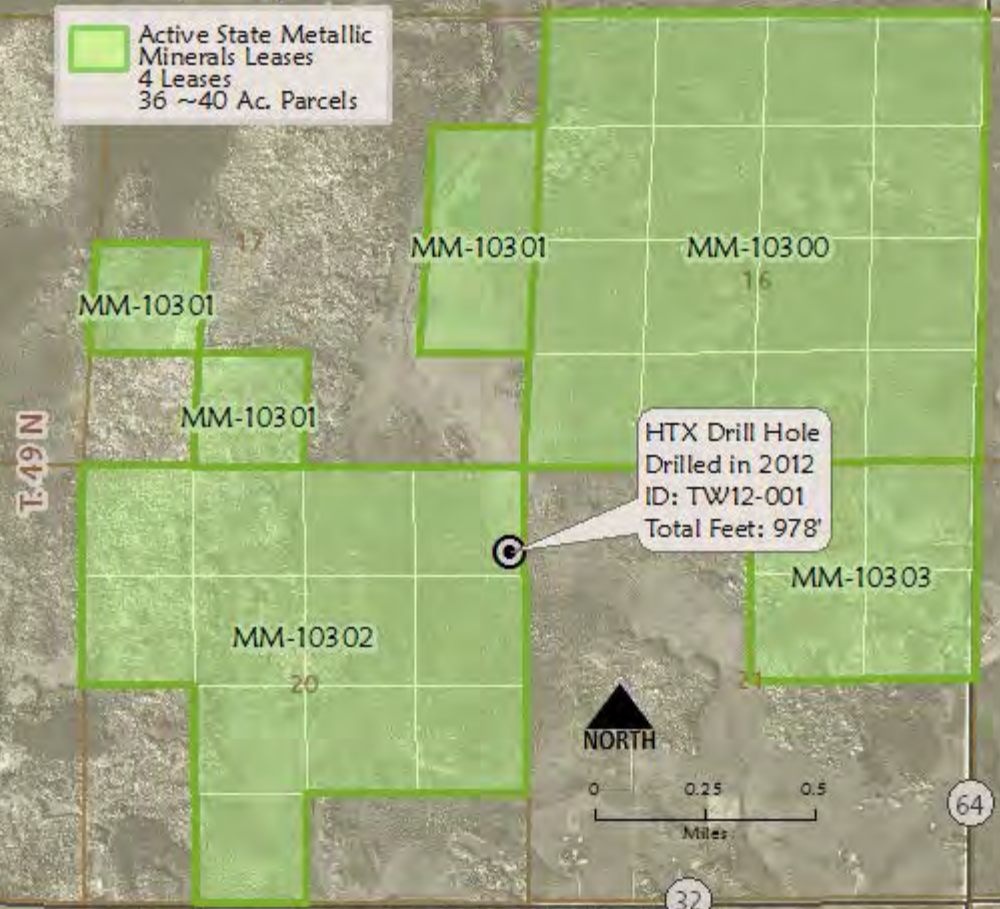
*A single state lease may contain up to sixteen 40-acre parcels within a typical single mining unit, but the mining unit acreage varies based upon ownership.*

State Mineral Leases, 1966-2012



*HTX Minerals Corp.  
State Leasing and Exploration Drilling  
Aitkin County, T. 49N, R. 22W  
Sections 16, 17, 20, and 21*

Active State Metallic Minerals Leases  
4 Leases  
36 ~40 Ac. Parcels



HTX Drill Hole  
Drilled in 2012  
ID: TW12-001  
Total Feet: 978'

Basemap from MN DNR Public Land Survey, Townships and Sections, Lakes, Mn/DOT Roads and Rail, and 2010 FSA Black and White Photography

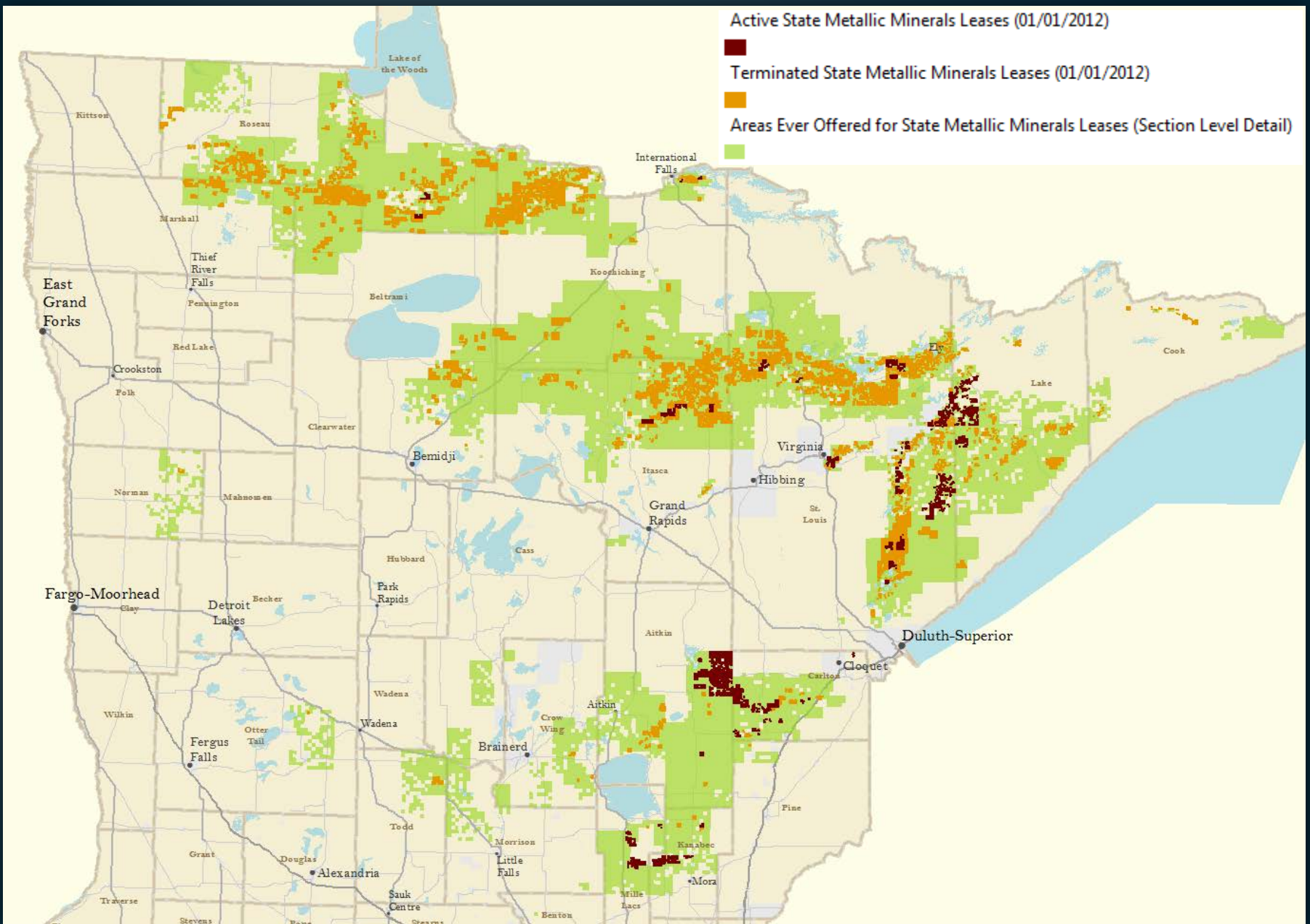
Active State Metallic Minerals Leases (01/01/2012)



Terminated State Metallic Minerals Leases (01/01/2012)



Areas Ever Offered for State Metallic Minerals Leases (Section Level Detail)



# State Mineral Lease Transactions



120,659  
offered parcels

**120,659** forty-acre parcels have been offered by the State of Minnesota for mineral exploration since 1966.

Note : many parcels have been offered repeatedly over the years, but are only counted once for this purpose.

State Mineral Leases, 1966 to 2012;  
See Disclaimer in Notes Below

# State Lease Transactions



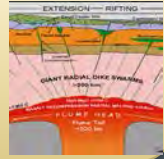
**20%** of the forty-acre parcels offered by the State for mineral exploration have been leased

All figures are the “40-acre parcel count” described in the notes. The 23,752 parcels are within 3,379 State leases.

State Mineral Leases, 1966-2012

# “Searching For” Phase

1. Business Plan  
& Financing  
[1 – 5 yrs]



2. Land Package  
[1 – 5 yrs]



3. Exploration  
[1 -10 yrs]



4. Decision



*State Mineral Leases  
are involved here.*

*The state lease requires  
exploration data be  
submitted to the state at  
the time of state lease  
termination.*

Trend: The majority of State Leases terminated after 10 years with no significant mineral discovery.

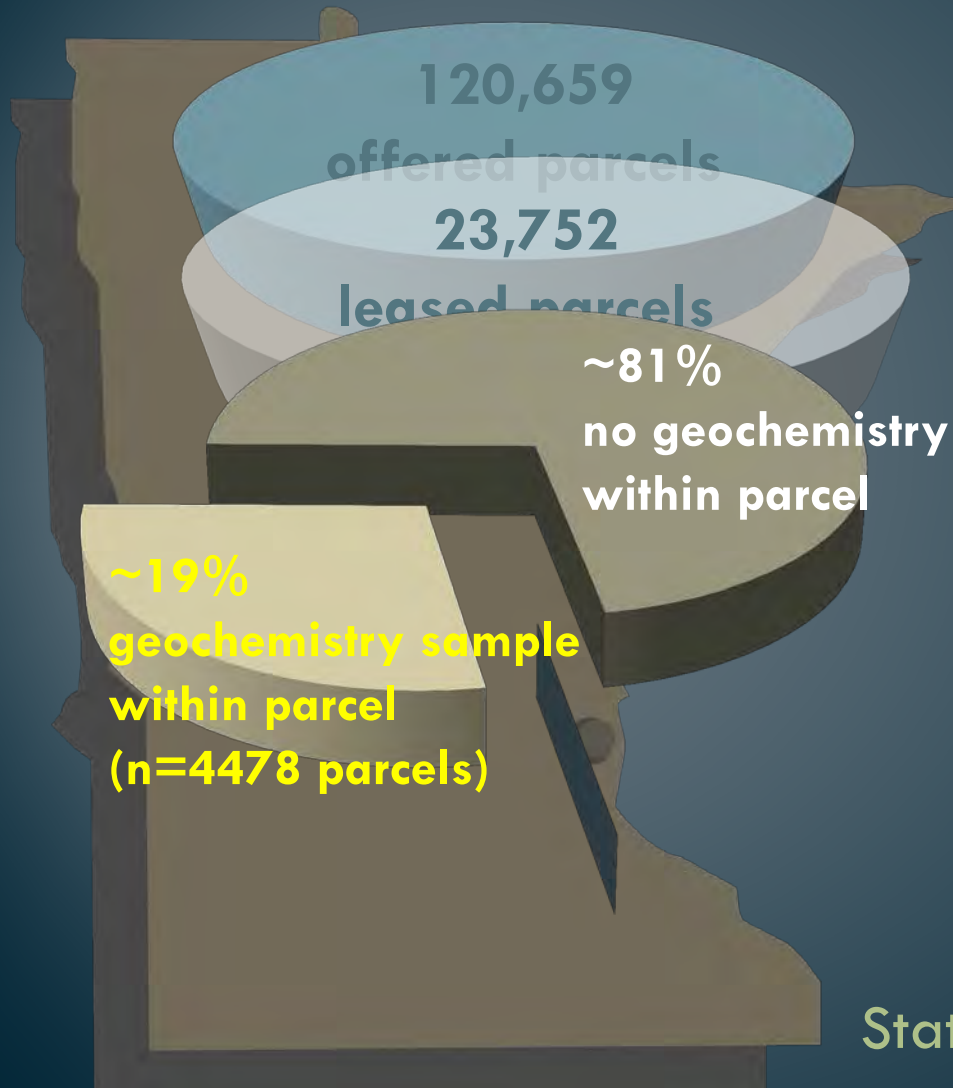
# “Searching For” Phase

## Activity: Geochemistry & Geophysics



# “Searching For” Phase Activity: Geochemistry

Estimated 19% of the forty-acre parcels leased had at least one geochemical sample taken.



State Mineral Leases, 1966-2012

# Today's Topics

How many state mineral leases have there been in 46 years?

How long are state leases active?

Where were the state leases located?

What types of exploration activities occur on state mineral leases?

## Exploration Drilling

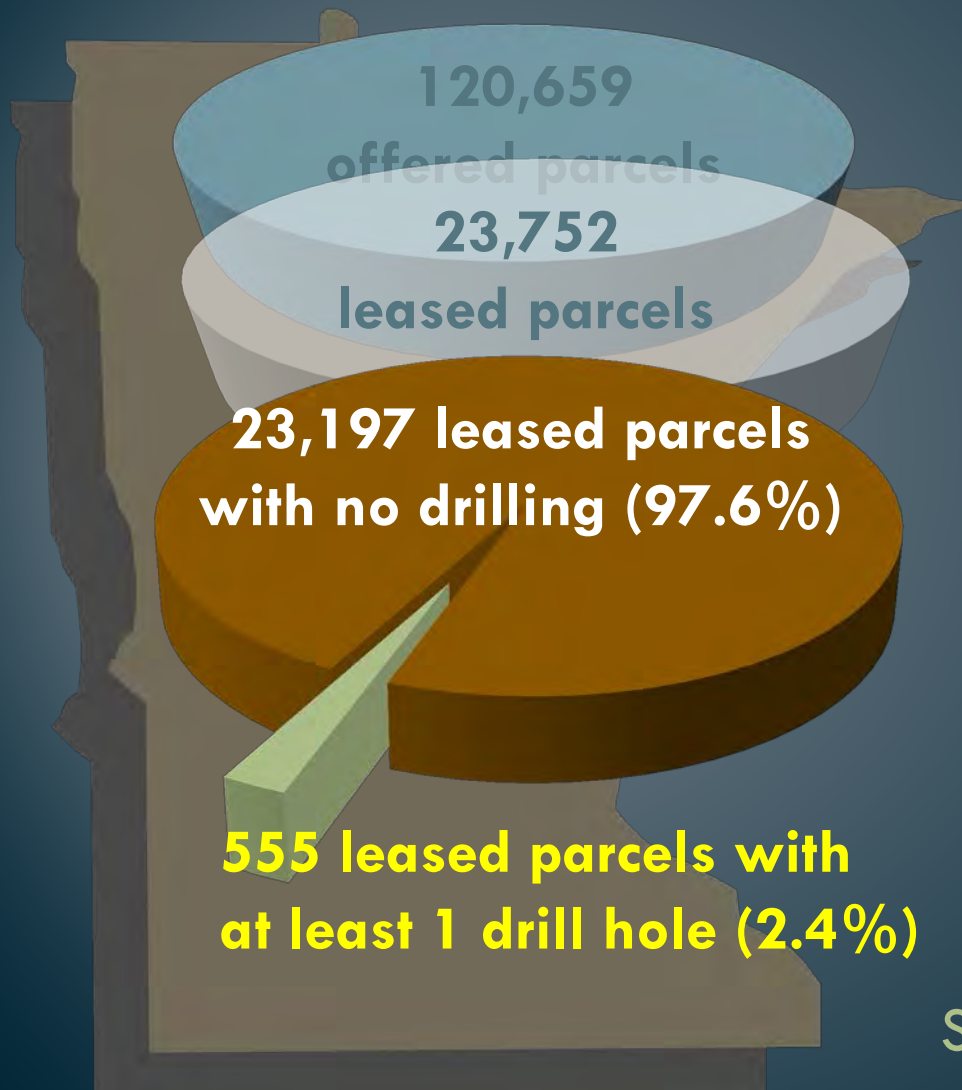
How many state mineral leases had Exploration Drilling?

What % of state mineral leases had Exploration Drilling?

- Summarize the drilling by classification
- Summarize the drilling by year
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- How many state leases had no exploration activity? Why not?



# Combined **Searching For** & **Investigative** Phases Activity : Drilling on State Mineral Leases

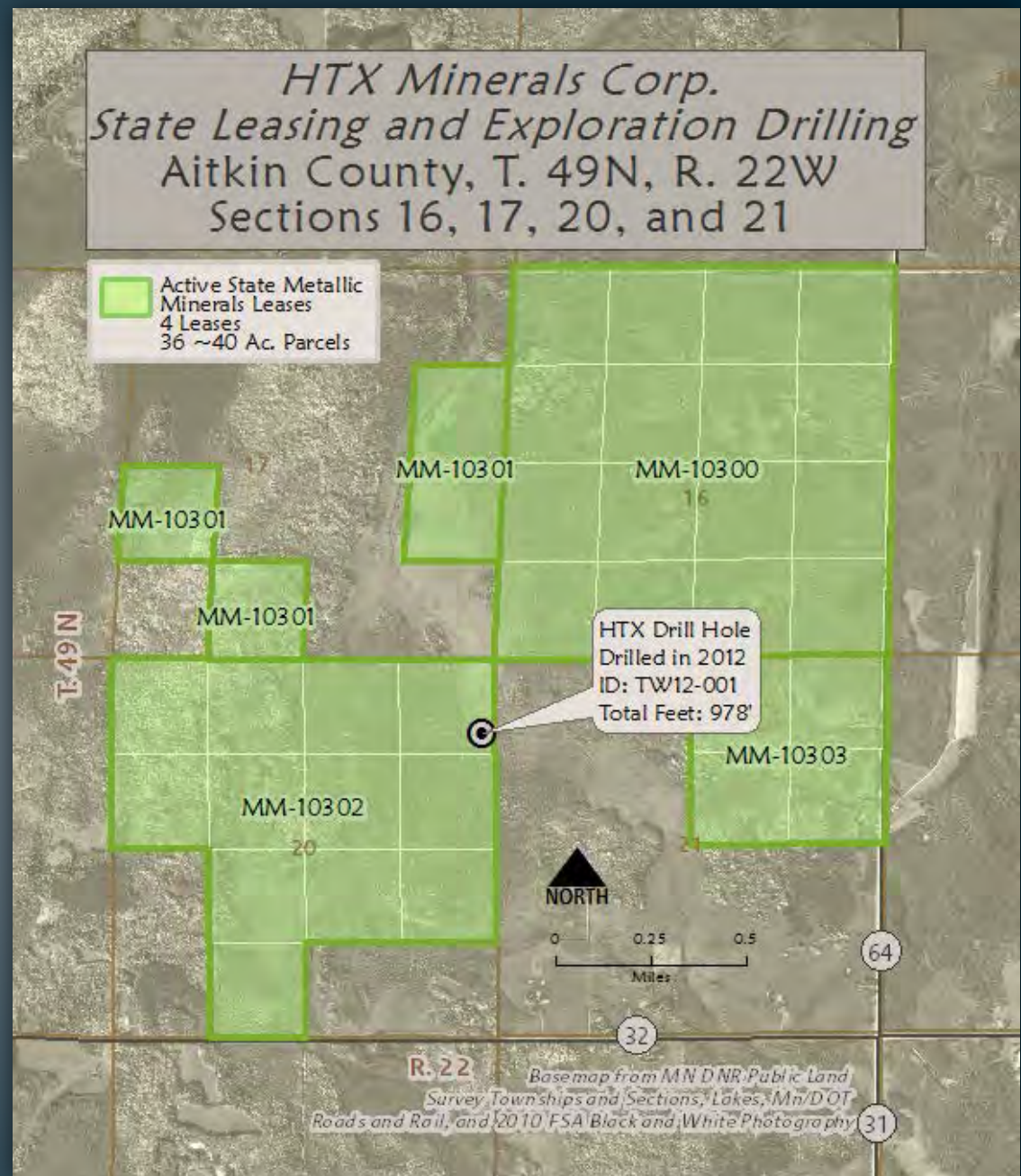


**2.4%** of the forty-acre state leased parcels had at least one drill hole put on it during 46 years.

State Mineral Leases, 1966-2012

## Trend:

The majority of parcels that are offered for lease by the state and parcels that are leased will not have a drill hole done.



# Historical Exploration Drilling Activity Organized Here in Two Phases

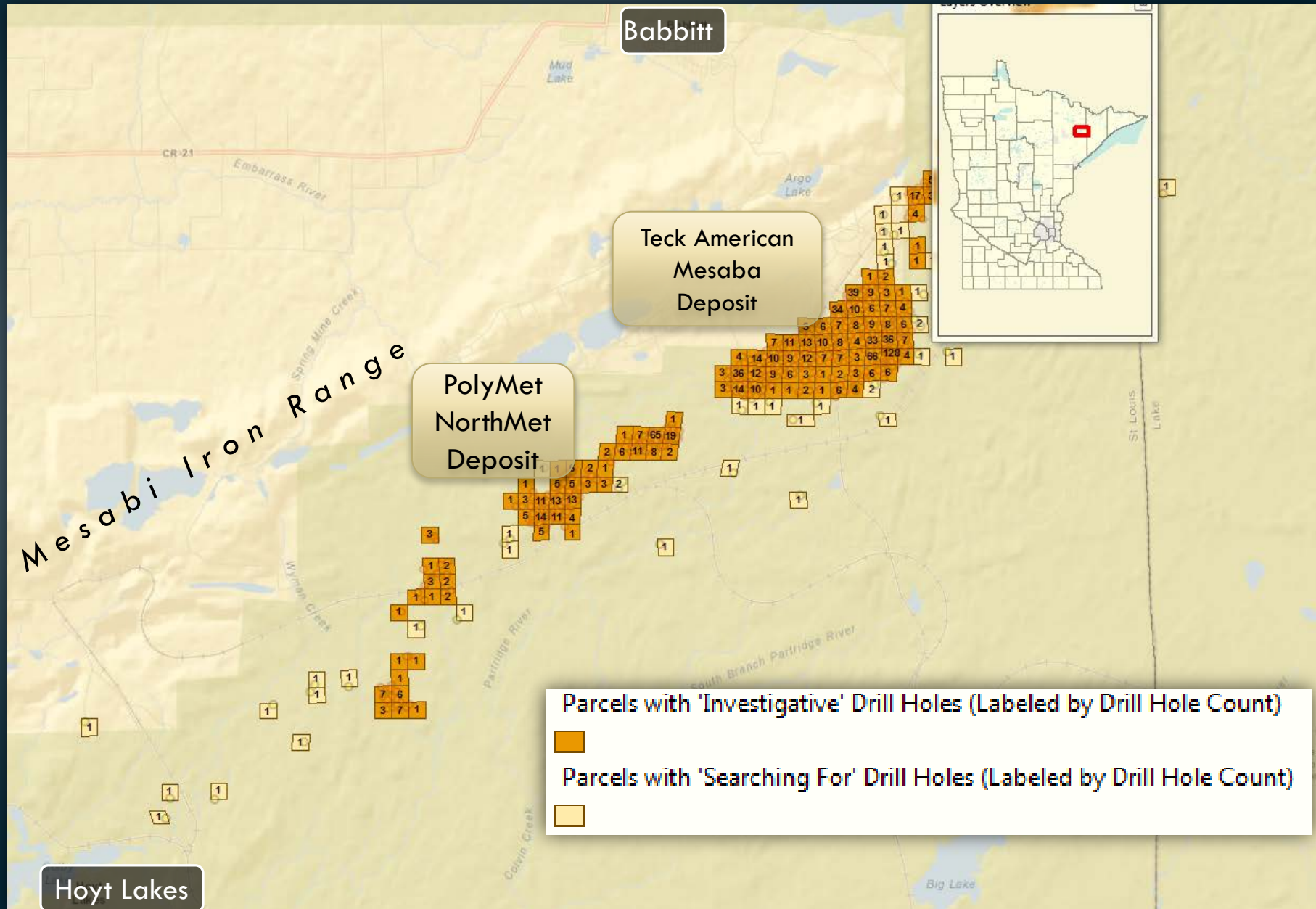
## 1. Searching For Phase

- Goal is to Discover a New Deposit

## 2. Investigative Phase

- Areal extent & quality of the Discovery
- Six companies in the State appear to be in this phase

# 'Searching For' Drilling vs. 'Investigative' Drilling: 40 Acre Parcels



# Combined Searching For & Investigative Phase on State Mineral Leases

## Drill Holes Per Parcel on State Mineral Lease

**1 drill hole/parcel**  
**1.6% (n=380)**

**More than**  
**1 drill hole/parcel**  
**0.8%**  
**(n=175)**

No Drill Holes in  
 97.6% of the state parcels  
 leased

555 parcels with 1 or more drill holes  
 (n=1 477 total drill holes)

Number of drill holes within a 40 acre parcel	Number of 40 acre parcels	Percentage
0	23197	97.6%
1	380	1.6%
2 - 5	116	0.5%
6 - 10	41	0.2%
11-21	13	Less than 0.1%
22-128	5	Less than 0.1%
<b>Total</b>	<b>23752</b>	<b>100%</b>

# Investigative Phase

## Activity: Drilling on State Mineral Leases

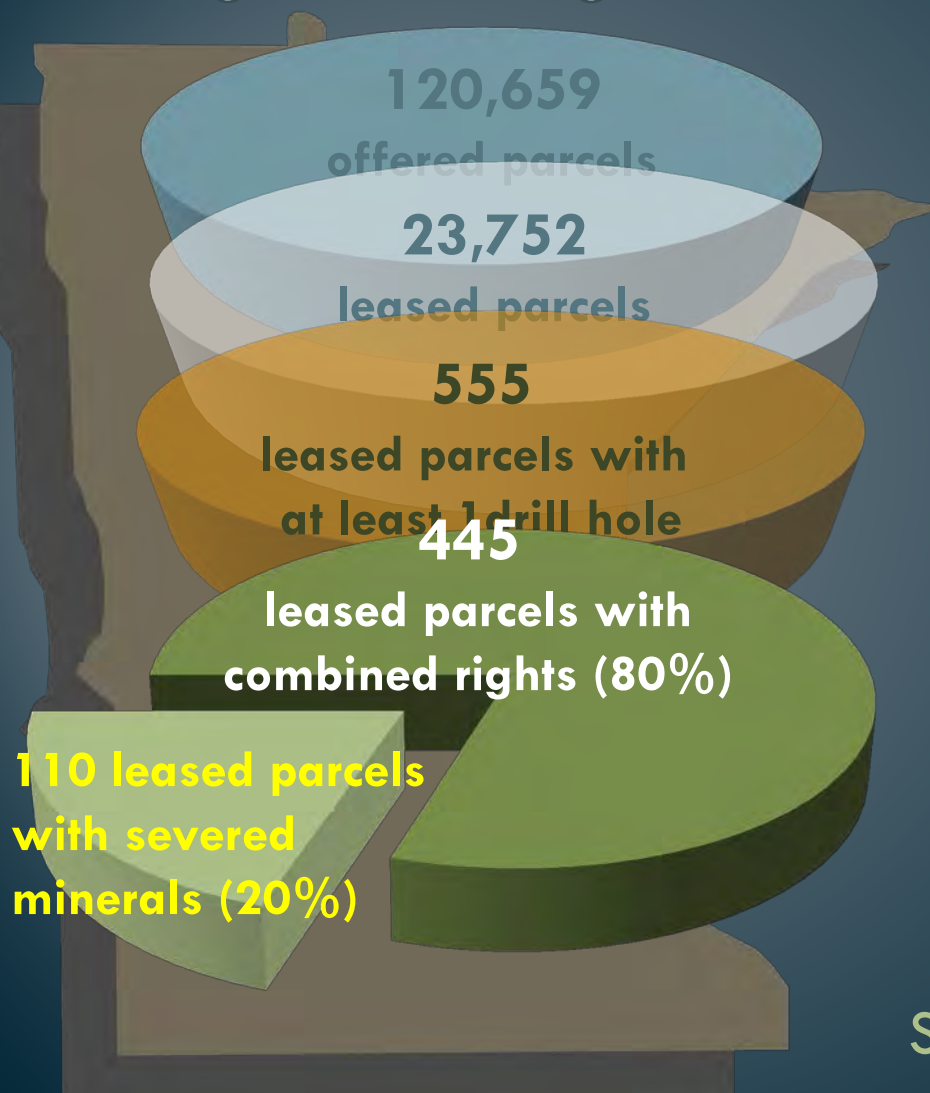


Estimated **0.5%** of the forty- acre parcels leased had **Investigative** drilling.

State Mineral Leases, 1966-2012

## Ownership: Minerals Rights vs. Surface Rights

Subset: Total # Parcels with Combined Searching For and Investigative Drilling on State Mineral Leases

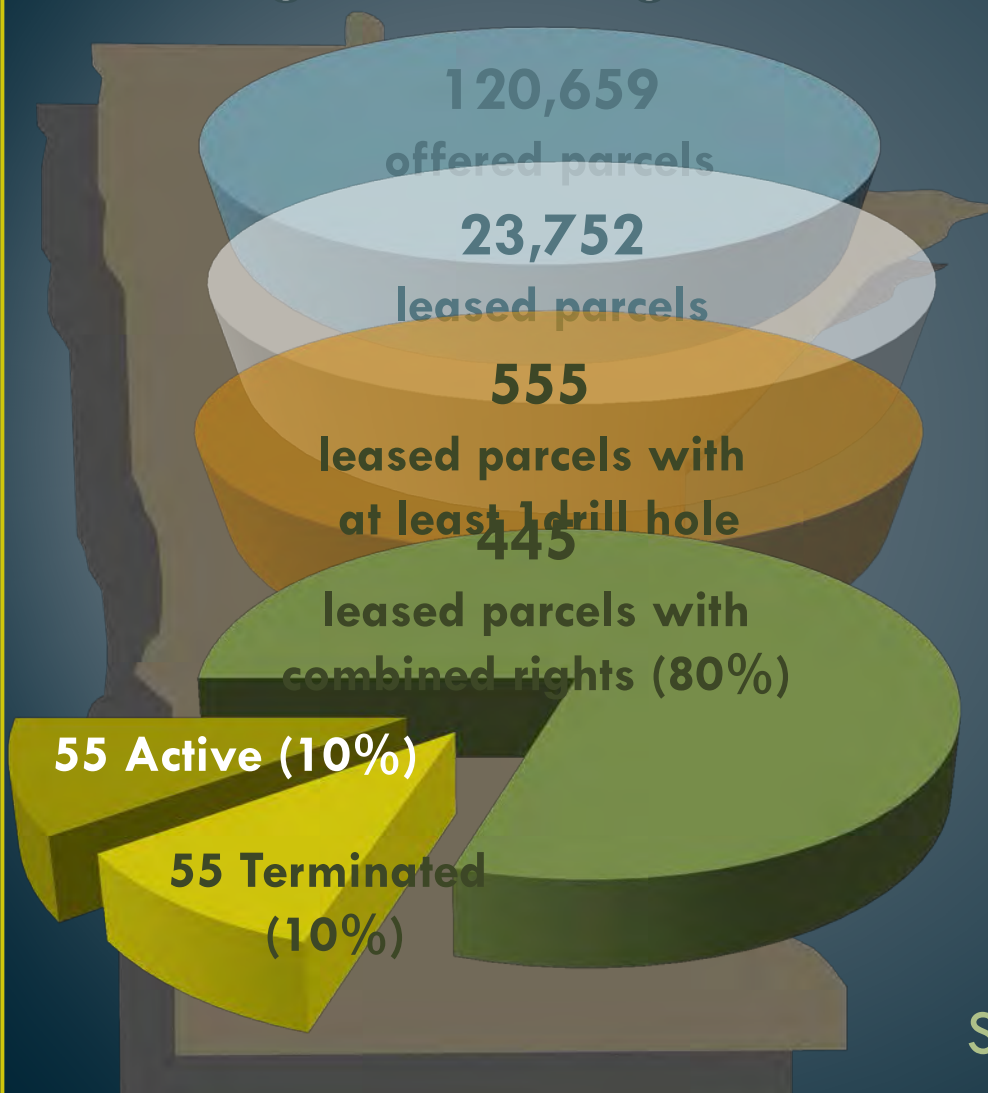


20% (110) of the parcels with at least 1 drill hole have different surface & minerals owners (State owns the minerals rights, not the surface)

State Mineral Leases, 1966-2012

## Ownership: Minerals Rights vs. Surface Rights

Subset: Total # Parcels with Combined Searching For and Investigative Drilling on State Mineral Leases



20% (110) of the  
parcels with at least 1

10% (55) of these 555  
parcels are within Active  
leases with severed minerals

minerals rights, not the  
surface)

State Mineral Leases, 1966-2012



# Multiple drill holes in a small area



Each red pipe is a drill hole. There are 6 drill holes in a small area on this parcel. Not all drilling can be done in a small area like this. **59 state lease parcels had 6 or more drill holes out of 23,752 parcels leased over a 46 year period.**

# **\*Statewide Exploratory Drill Holes in Minnesota Combined : State leases and Non-state leases Data from January 1966-March 2011**

## **State Leases**

- 1,421 Drill Holes
  - 534 'Searching For' Drill Holes
  - 887 'Investigative' Drill Holes

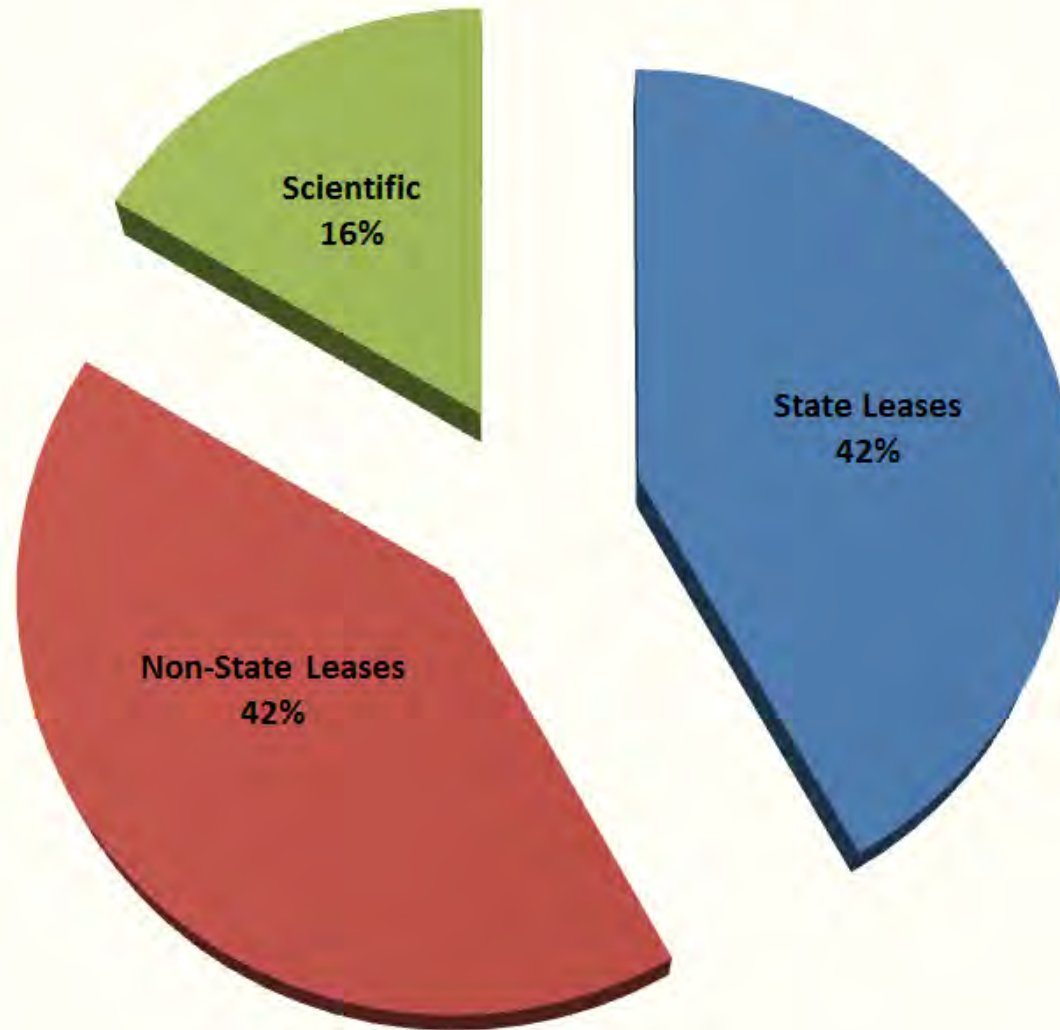
## **Non-State Leases**

- 1,418 Drill Holes
  - 777 'Searching For' drill holes
  - 641 'Investigative' drill holes

## **Scientific**

- 555 Drill Holes
  - 379 by MGS
  - 158 by DNR
  - 6 by NRRI
  - 12 by other

**Exploratory Drill Holes in Minnesota**  
*Data from January 1966-March 2011*



# \*Exploratory Drill Holes in Minnesota Excluding Scientific Drilling

*Data from January 1966-March 2011*

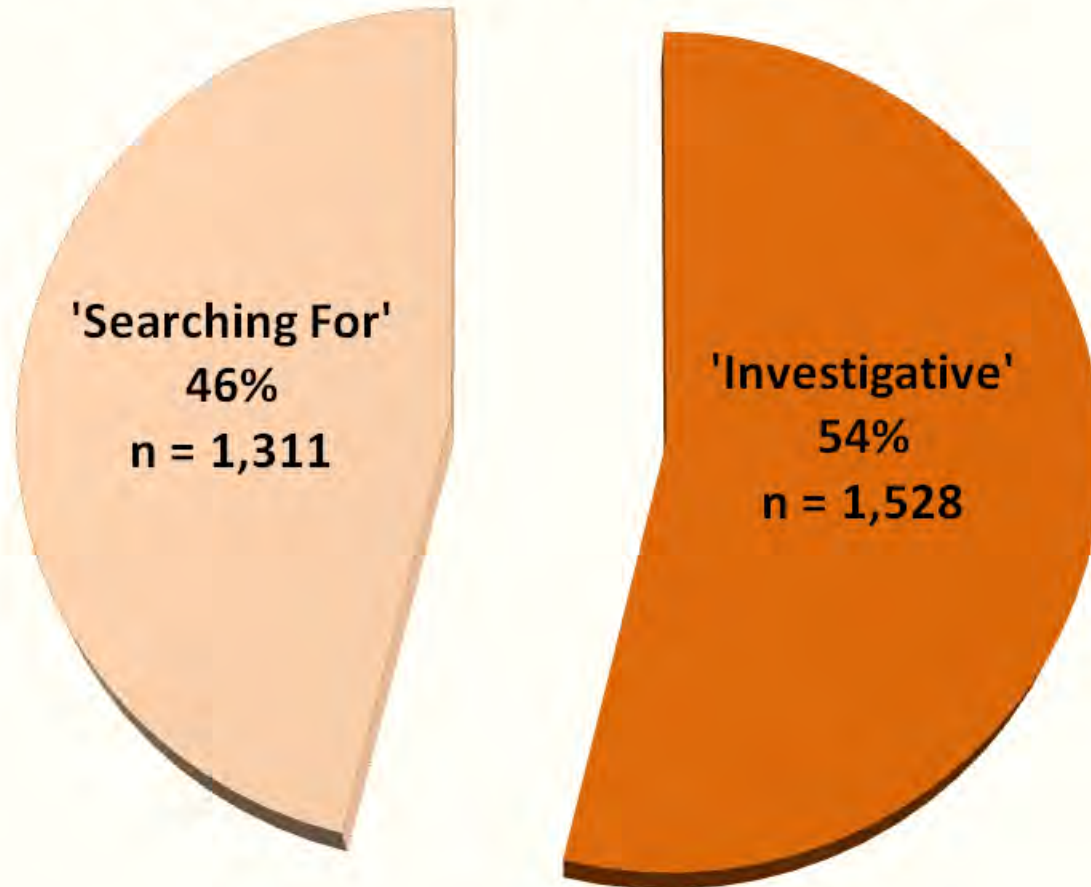
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## Non-State Leases

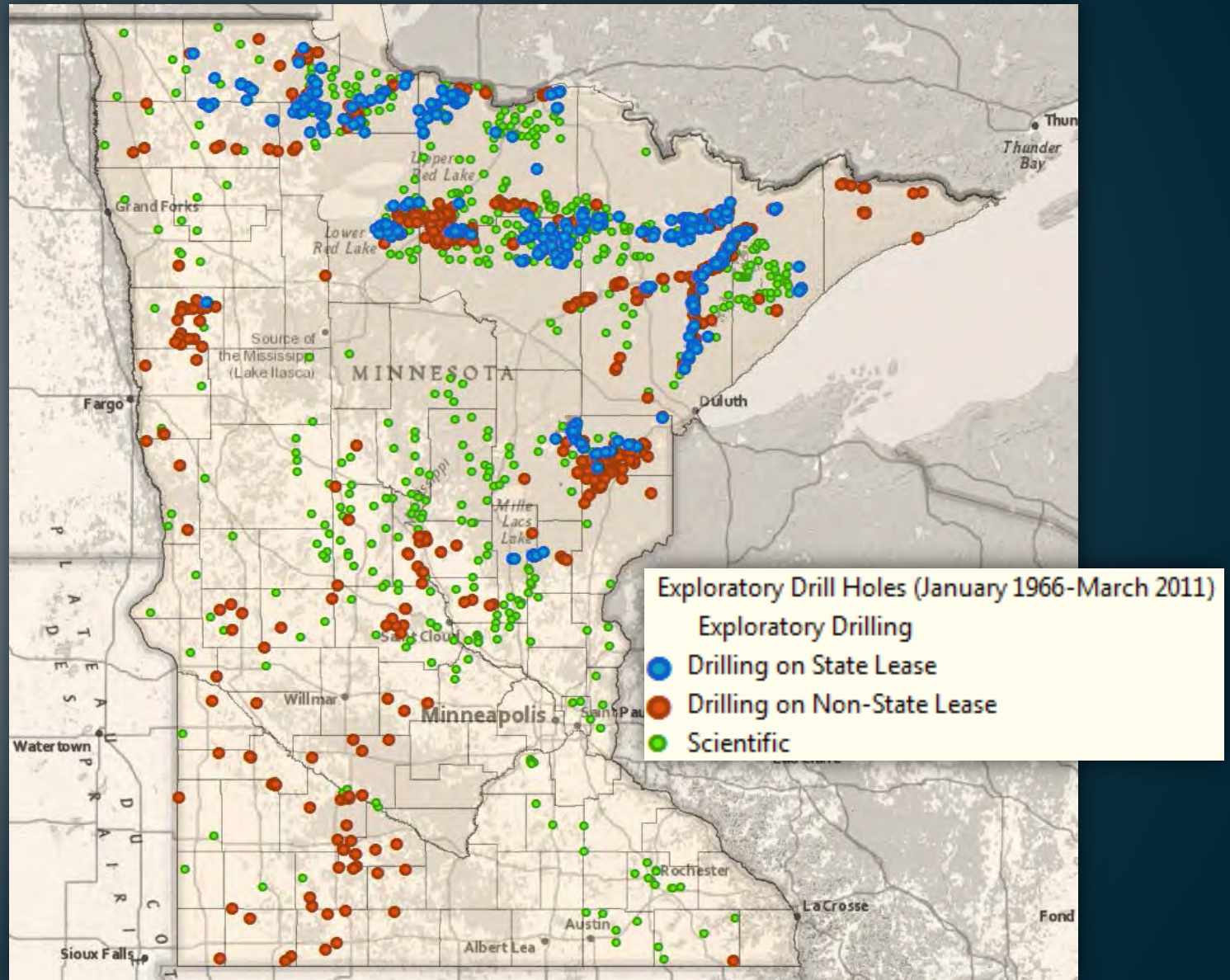
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**\*Exploratory Drill Holes in Minnesota  
'Searching For' versus 'Investigative'  
*Data from January 1966-March 2011***



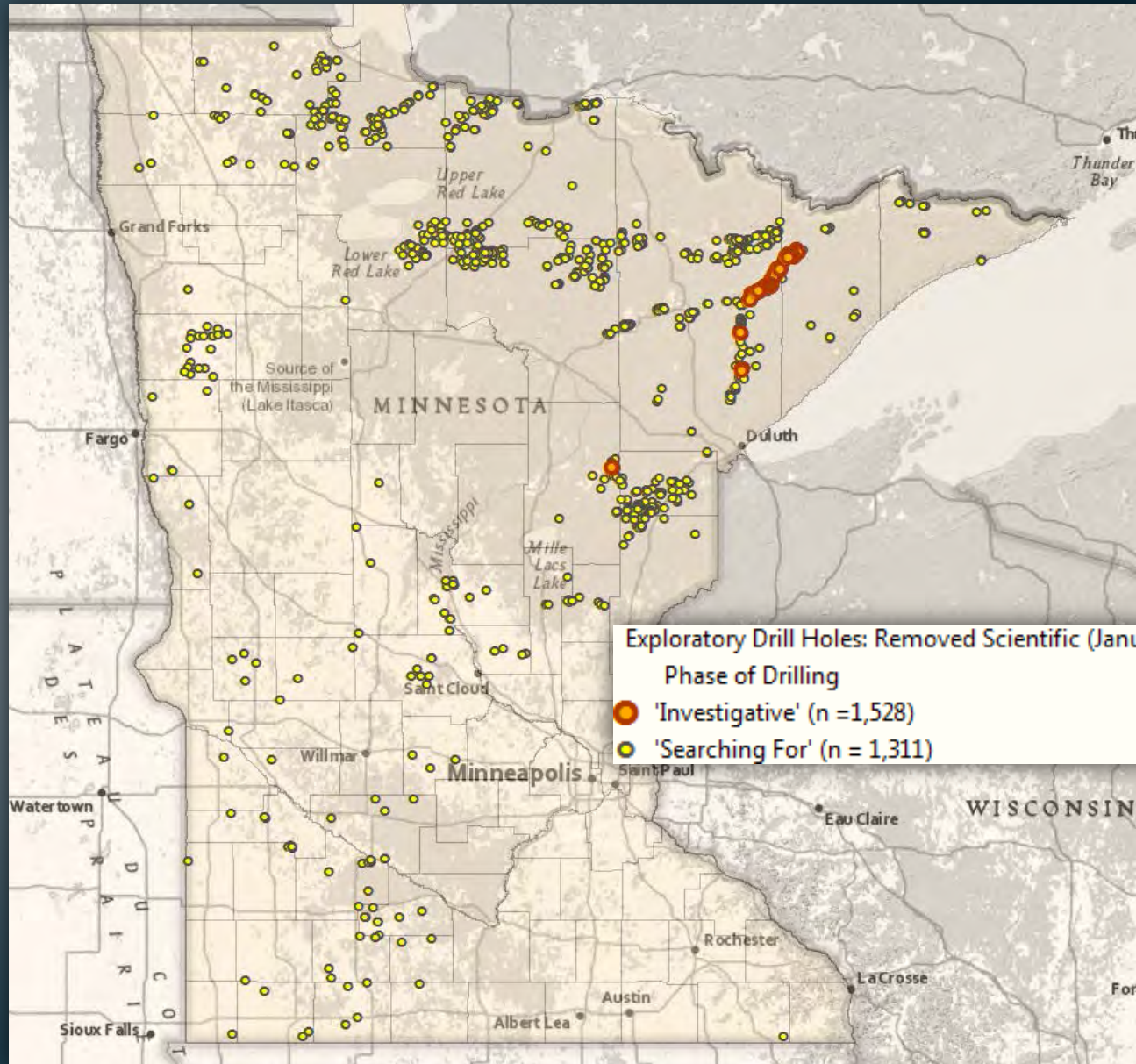
\*Removed 555 scientific drill holes

# Map Example of Exploratory Drill Holes on State Leased Land, Non-State Leased, and Scientific Drilling in Minnesota (January 1966-March 2011)



# Map Example of Exploratory Drill Holes:

'Searching For' versus 'Investigative' Drilling (January 1966-March 2011)



**Is the Drill Hole Within 2 miles of a State Mineral Lease Offering called an *Area Ever Offered for Metallic Minerals Lease* or the *Biwabik Iron Formation*?**

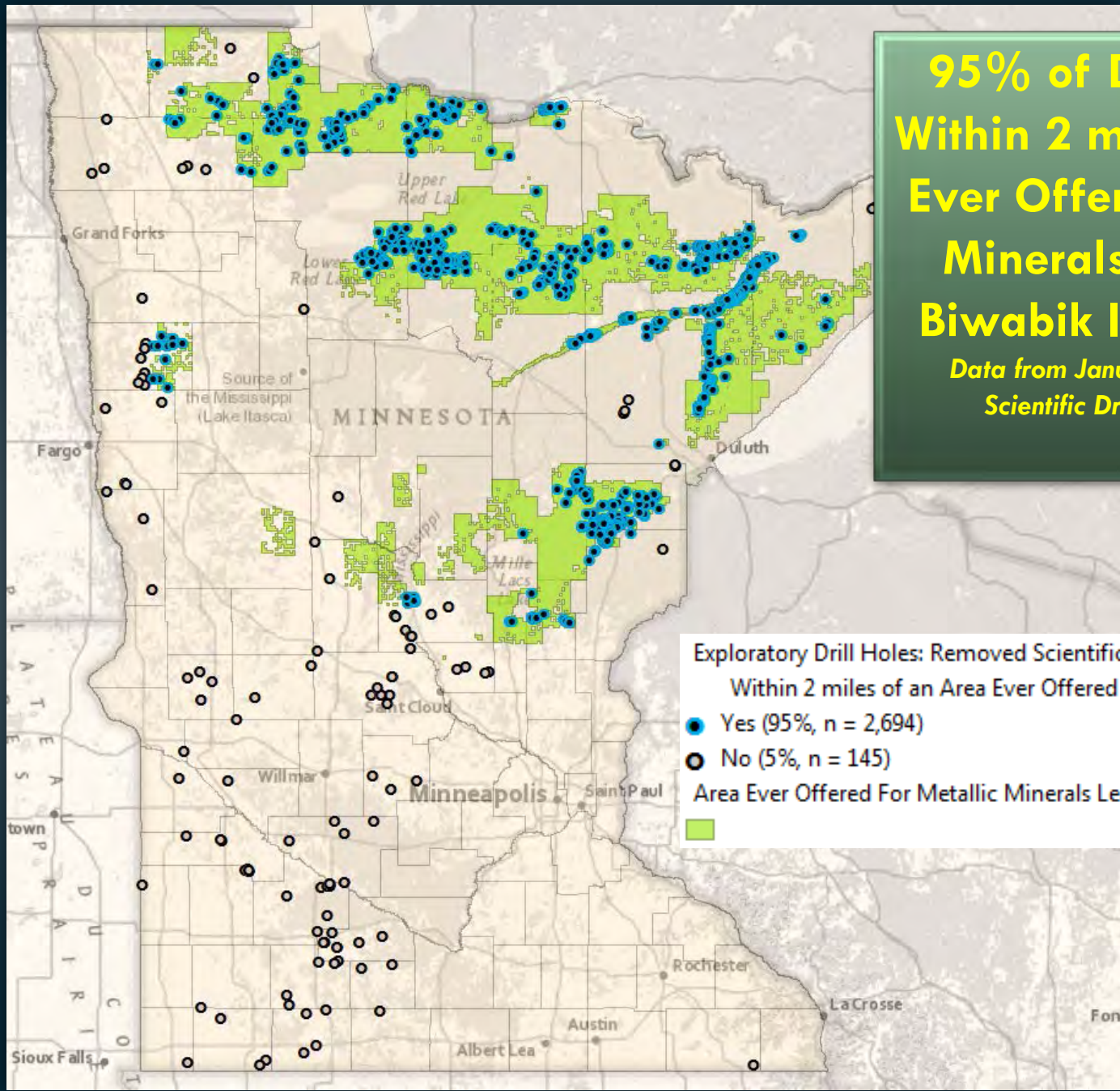
***\*Data from January 1966-March 2011***



\*Removed 555 scientific drill holes



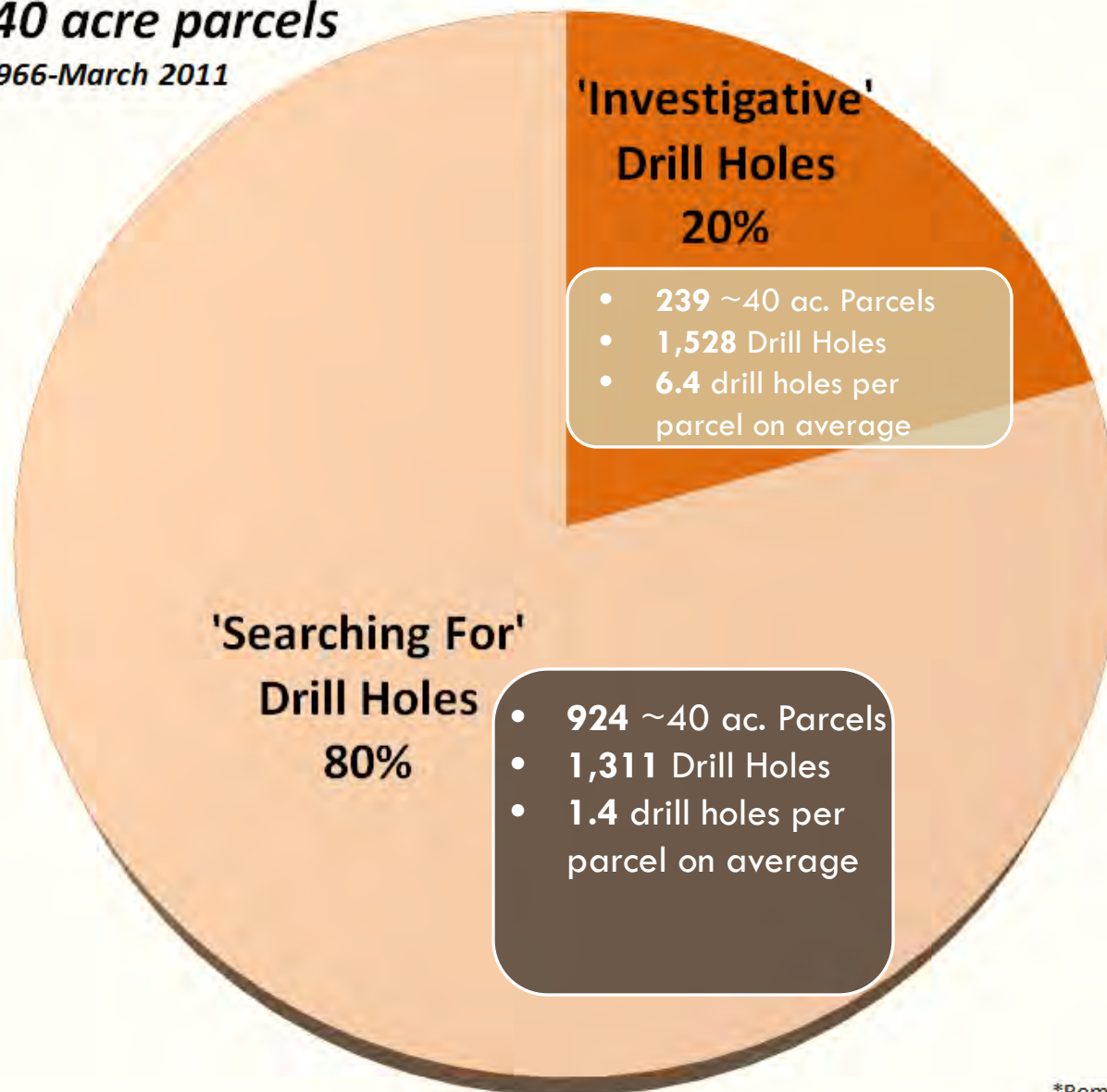
**95% of Drill Holes are  
Within 2 miles of an Area  
Ever Offered for Metallic  
Minerals Lease or the  
Biwabik Iron Formation**  
*Data from January 1966-March 2011  
Scientific Drill Holes not Included*



# \*Exploratory Drill Holes in Minnesota 'Searching For' versus 'Investigative'

*Number of ~40 acre parcels*

*Data from January 1966-March 2011*



# State Mineral Lease Activity Historical Summary

**1 out of 5** = ratio of number of 40-acre parcels actually leased compared to number of parcels offered

**1 out of 5** = ratio of estimated number of 40-acre parcels leased and had at least one geochemical sample taken

**1 out of 43** = ratio of number of 40-acre parcels leased and had at least one exploratory boring

**1 out of 132** = ratio of number of 40-acre parcels leased and had more than one exploratory boring

**Trend:** The mineral exploration process examines areas of land and then does the more expensive activities such as drilling on a small percentage of the parcels.

# State Mineral Lease Activity Historical Summary

## Searching For Phase

Exploration starts with a large area and the process selects small areas to do more detailed work.

Fairly continuous through 46- year history, but levels do vary.

Average of 12 (min.=0; max=58) drill holes per year (n=534) on an average of 10 forty-acre parcels (min.=0; max=47) per year (n=444).

Geochemical & geophysical surveys, which have minimal and short term impacts, were commonly done prior to drilling and were done on more parcels.

Different metals were sought in different time periods and different exploration methods applied.

## Investigative Phase

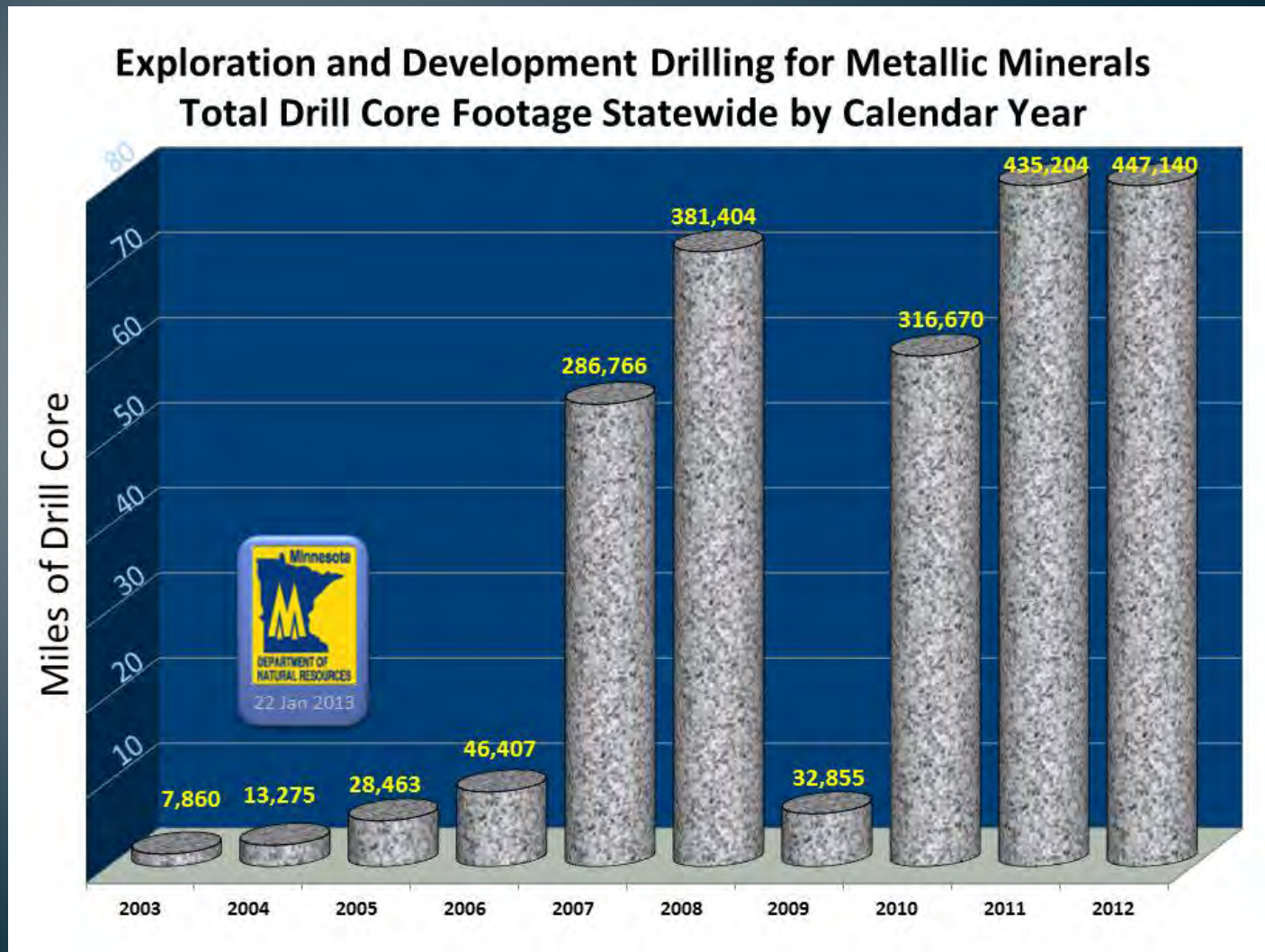
Investigation occurs on very small areas.

Occurs in 5 to 10 year periods of high level of activity, separated by long time periods of no activity.

Currently within a time period with a high level of activity.

A ratio of **approximately 1 out of 200 forty-acre parcels** leased have had investigative activity after 46 years.

# Exploration activity varies according to metal business cycles, as reflected in metal prices



\*Exploratory drill holes extracted from MN DNR Drill Hole Database as of 3/30/2011. Only records with a drilling year were used for this analysis. Furthermore 555 scientific drill holes were not included in this chart.

# Chart of Exploratory Drill Holes: 'Searching For' Drilling versus 'Investigative' Drilling

January 1966-March 2011 – No Scientific Drilling Included

Drill holes interpreted to be **'Searching For'** drilling

Drill holes interpreted to be **'Investigative'** drilling

Number of Drill Holes

Active 'Investigative' Drilling Era along Duluth Complex Subcrop (1967-'71)

Active 'Investigative' Drilling Era along Duluth Complex Subcrop ('74-'78)

Active 'Investigative' Drilling along Duluth Complex Subcrop and Tamarack Intrusion (2005-Today)

Active Gold 'Searching For' Drilling Era In Greenstone Terrane, Limited 'Investigative' Drilling in Duluth Complex ('80-'91)

Limited Exploratory Drilling Era (1992-2004)

Year	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Investigative	4	35	55	79	28	46	0	1	24	36	84	88	224	3	3	3	0	0	11	0	1	0	3	2	2	0	0	0	0	0	0	0	2	8	3	2	8	7	111	17	171	255	11	169	31	
Searching For	1	21	31	62	61	46	24	21	21	12	8	17	39	38	74	30	36	39	51	39	41	45	81	65	39	117	7	6	5	10	5	6	1	3	3	0	7	4	11	24	0	14	57	34	43	12

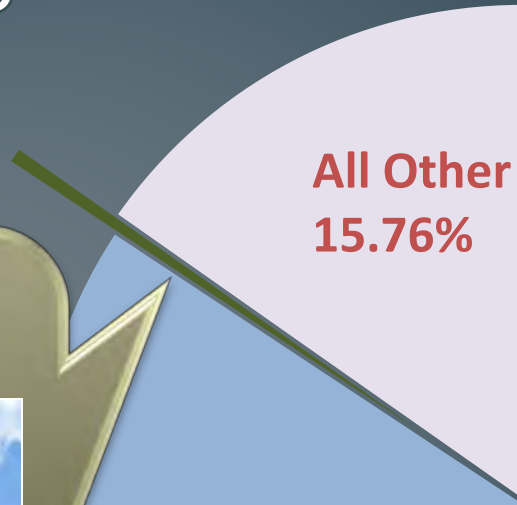
# Forward Looking Statement

The exploration data from the past 46 years provides an excellent picture of the past activity on state mineral leases. However, it does not predict the future exploration activity.

# Minnesota Wells and Boreholes Completed During the Years 2000 - 2010

Well/Boring Type	Number
Domestic Water Supply Well	<b>108,201</b>
Mineral Exploration Drill Hole	<b>1,031</b>
All Other	<b>20,436</b>
<b>Total</b>	<b>129,668</b>

Data Source: Minnesota Dept. Health, DNR Drill Core Database



Mineral Exploration Drill Holes 0.80%



Domestic Water Supply Wells 83.44%





## Acknowledgements

**Kevin Hanson** performed the geospatial analysis work and created the maps. **Don Elsenheimer** created the graphs and charts.

Both contributed greatly to improving the graphics and content of the presentation. Their work was vital to developing this presentation and their contributions are very much appreciated.