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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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
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:

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
- 38% 0-3 yrs
- 31% 7-11 yrs
- 20% 4-6 yrs
- 12% 12-24 yrs

(Longest Active Lease = 24 yrs.)

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:

3,379 State Metallic Mineral Leases Total
- 387 active (11%)
- 2,992 terminated (89%)

Trend: Most leases will terminate at 10 years or less

Length of 2992 Terminated Leases

- 89% 0-5 yrs
- 10% 6-10 yrs
- 1% >10 years

(Longest Terminated Lease = 23 yrs)
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'

Base map from MN DNR Public Land Survey Townships and Sections, Lakes, Mn DOT Roads and Rail, and 2010 FSA Black and White Photography
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.
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.
“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
State Mineral Leases, 1966-2012

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

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120,659 offered parcels
23,752 leased parcels
~81% no geochemistry within parcel
~19% geochemistry sample within parcel (n=4478 parcels)
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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?
2.4% of the forty-acre state leased parcels had at least one drill hole put on it during 46 years.
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.
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
State Mineral Leases, 1/1/1966-1/1/2012; Drill Hole Data 1/1/1966-3/30/2011
Estimated 0.5% of the forty-acre parcels leased had Investigative drilling.
Ownership: Minerals Rights vs. Surface Rights
Subset: Total # Parcels with Combined Searching For and Investigative Drilling on State Mineral Leases

- 120,659 offered parcels
- 23,752 leased parcels
- 555 leased parcels with at least 1 drill hole
- 445 leased parcels with combined rights (80%)
- 110 leased parcels with severed minerals (20%)

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

10% (55) of these 555 parcels are within Active leases with severed minerals rights, not the surface)

State Mineral Leases, 1966-2012
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*

<table>
<thead>
<tr>
<th>State Leases</th>
<th>Non-State Leases</th>
<th>Scientific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,421 Drill Holes</td>
<td>1,418 Drill Holes</td>
<td>555 Drill Holes</td>
</tr>
<tr>
<td>534 'Searching For' Drill Holes</td>
<td>777 'Searching For' drill holes</td>
<td>379 by MGS</td>
</tr>
<tr>
<td>887 'Investigative' Drill Holes</td>
<td>641 'Investigative' drill holes</td>
<td>158 by DNR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 by NRRI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 by other</td>
</tr>
</tbody>
</table>

*Exploratory drill holes extracted from MN DNR drill hole database as of 3/30/2011. Only records with a drilling year were used in this analysis.*
Exploratory Drill Holes in Minnesota
Data from January 1966-March 2011

- Scientific: 16%
- State Leases: 42%
- Non-State Leases: 42%
Exploratory Drill Holes in Minnesota
Excluding Scientific Drilling
Data from January 1966-March 2011

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

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

*Exploratory drill holes extracted from MN DNR drill hole database as of 3/30/2011. Only records with a drilling year were used in this analysis.
*Exploratory Drill Holes in Minnesota 'Searching For' versus 'Investigative'
Data from January 1966-March 2011

'Searching For'
46%
n = 1,311

'Investigative'
54%
n = 1,528

*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*

- **Yes**: 95%
- **No**: 5%
- **145 drill holes**

*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*

- **'Searching For' Drill Holes**
  - 924 ~40 ac. Parcels
  - 1,311 Drill Holes
  - 1.4 drill holes per parcel on average

- **'Investigative' Drill Holes**
  - 239 ~40 ac. Parcels
  - 1,528 Drill Holes
  - 6.4 drill holes per parcel on average

*Removed 555 scientific drill holes*
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.
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

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

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

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


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

<table>
<thead>
<tr>
<th>Well/Boring Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Water Supply Well</td>
<td>108,201</td>
</tr>
<tr>
<td>Mineral Exploration Drill Hole</td>
<td>1,031</td>
</tr>
<tr>
<td>All Other</td>
<td>20,436</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>129,668</td>
</tr>
</tbody>
</table>

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

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