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Metallic Mineral Exploration in Minnesota:

A Look at 46 Years of State Mineral (Nonferrous) Leasing Data 1966 to 2012

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Purpose of Presentation

Background: The State leases its mineral rights to exploration companies. In some cases, the surface owner is different from the state mineral ownership.

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

This data summarizes some of the common exploration activities a surface owner or neighbor would have seen.

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 Lease Transactions

Looking at forty-acre parcels and government lots provides a meaningful perspective for proximity to 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

Historical Exploration Activity Organized Here in Two Phases

1. Phase I = Exploration Phase

- Goal is to Discover an Economic Deposit
- 99 % of state leases did not get past this Phase and terminated at or before year 10 of the lease

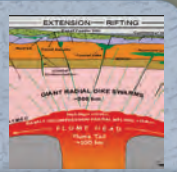
2. Phase II = Evaluation Phase

- Delineation of the Discovery
- Economic Feasibility & Mine Planning
- Four companies on State Leases that appear to be in Evaluation Phase – Twin Metals , Teck American, Kennecott Exploration and Encampment (PolyMet and Cardero do not have state mineral leases)

Exploration Phase

A grass-roots metallic mineral exploration program in Minnesota may be described as a four-step process that can take anywhere from 1 to 20 years to complete.

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



2. Land Package
[1 - 5 yrs]



3. Exploration
[1 -10 yrs]



4. Decision



A phased approach to mineral exploration allows for cost-effective evaluation of many targets

Exploration Phase

A grass-roots metallic mineral exploration program in Montana typically takes four to six years to complete anywhere from 10 to 20 years to complete.

1. Planning
[1 - 5 yrs]



2. Land Package
[1 - 5 yrs]



3. Exploration
[1 -10 yrs]



4. Evaluation

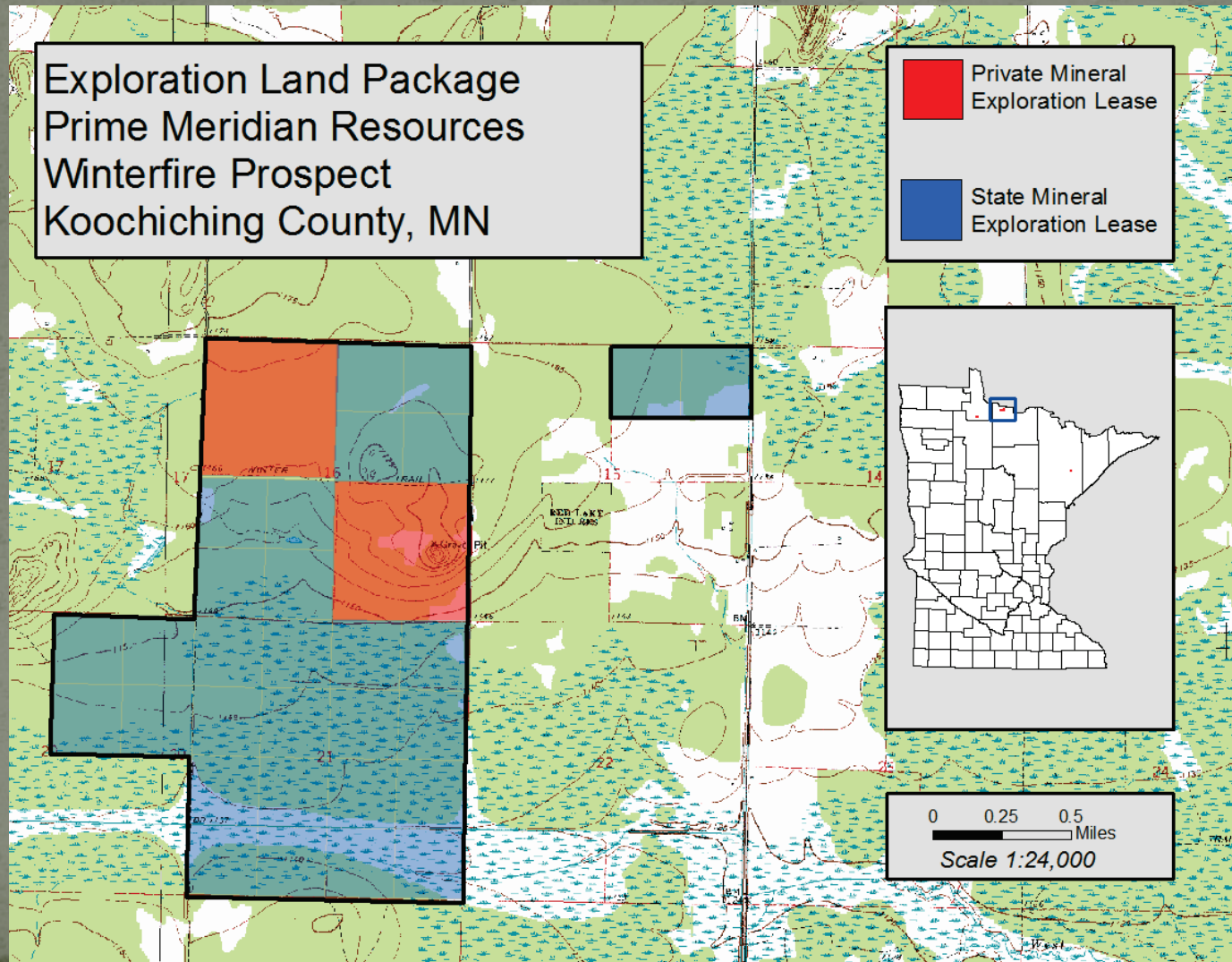


Acquire a Land Package

- Secure the rights to explore for minerals over a buried geological target feature
- Land package may include:
 - State mineral leases
 - Private mineral leases
 - Federal prospecting permits

This is the primary source of the historical data: State Mineral Leases

Example of Exploration Land Package

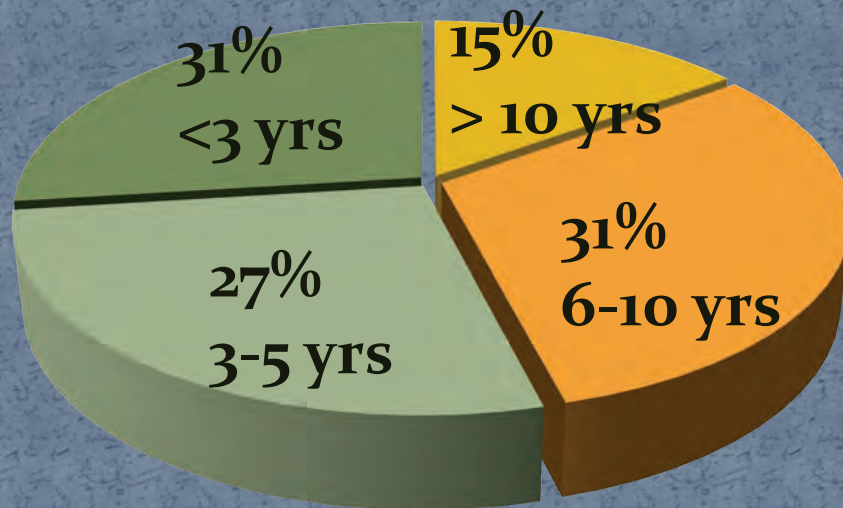


State Mineral Leases: 1966- 2012

3,379 State Mineral Leases

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

Length of Active Leases



(Longest Active Lease = 24 yrs.)

Some active state leases are in the Exploration Phase, while others are in the **Evaluation Phase**.

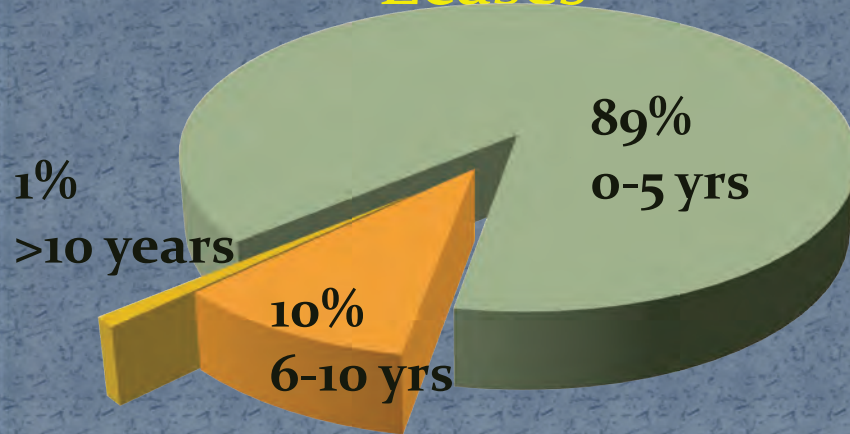
State Mineral Lease Transactions:

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)

The Exploration Phase is usually completed in 10 years

(99% of leases were terminated at 10 years or less)

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

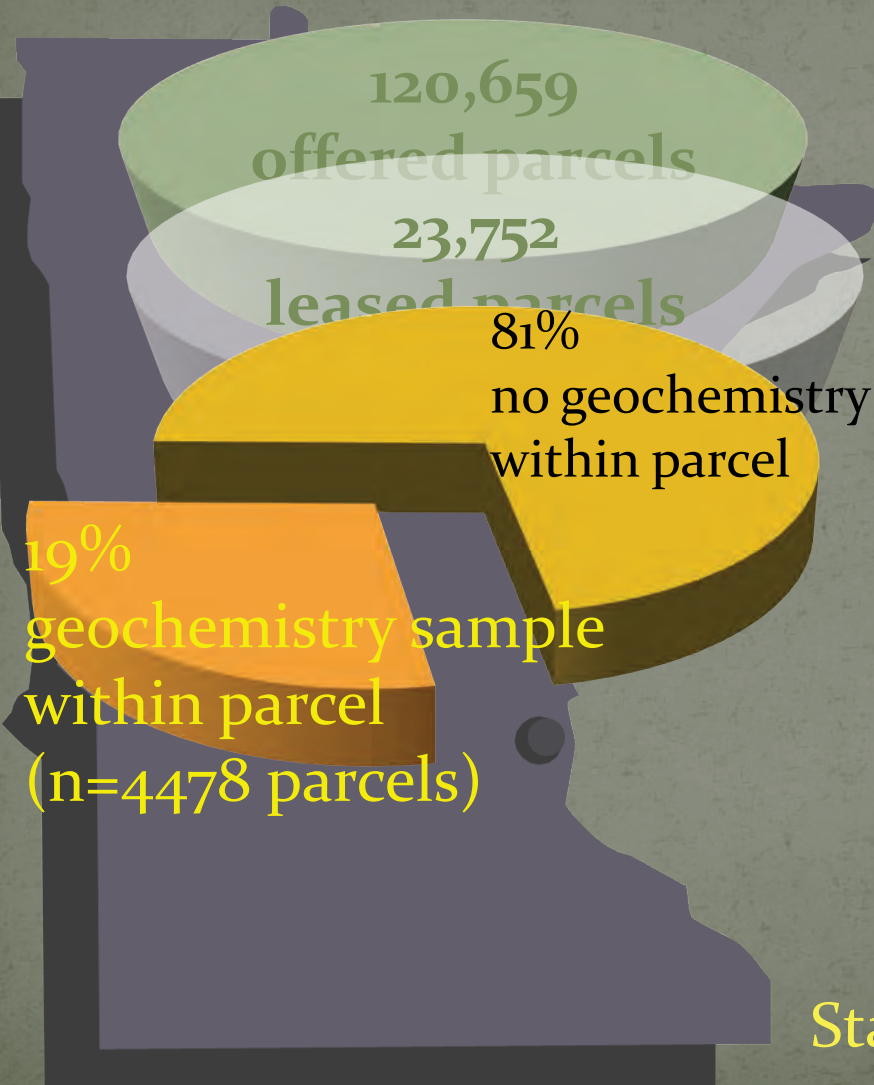
Exploration Phase

Activity: Geochemistry & Geophysics



Exploration Phase

Activity: Geochemistry

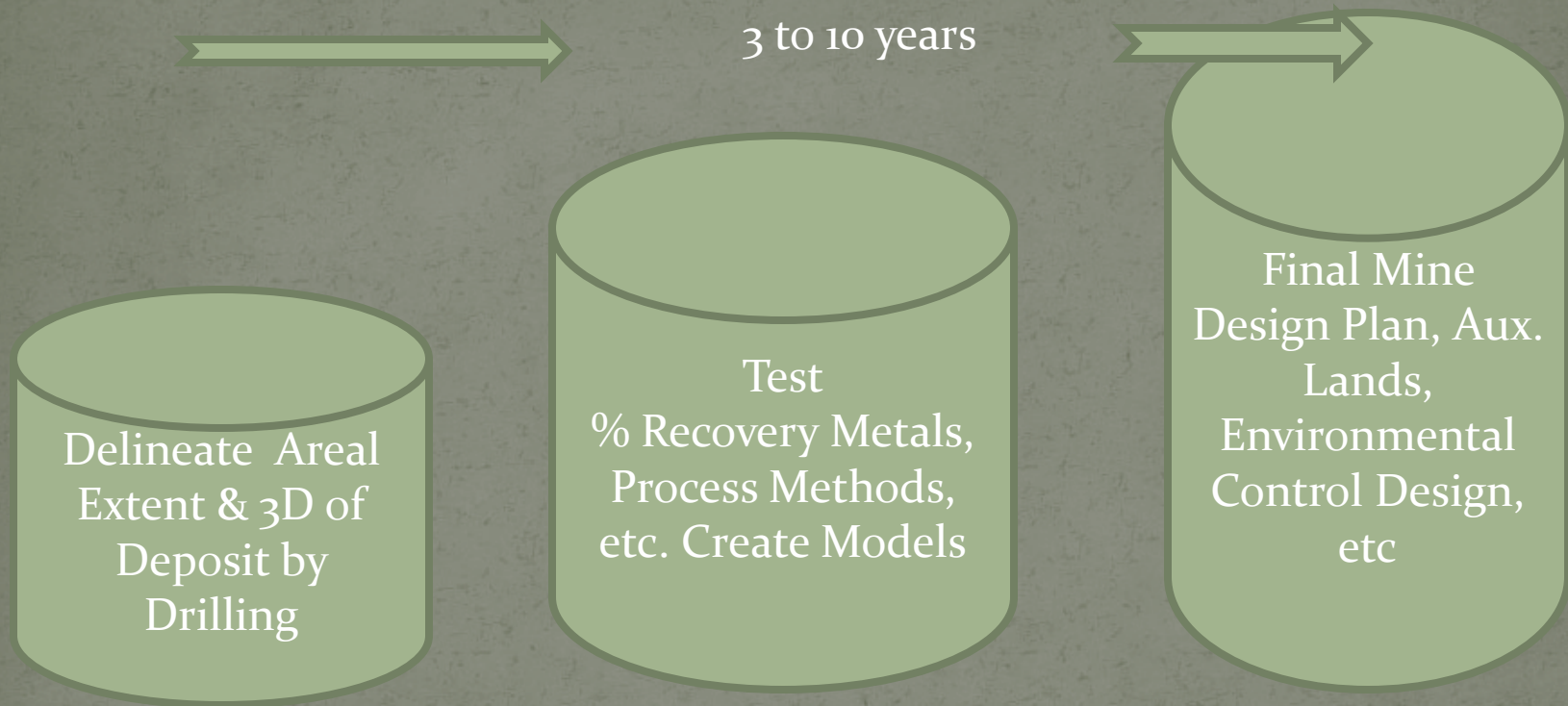


Estimated 19% of the forty-acre parcels leased had at least one geochemical sample taken.

State Mineral Leases, 1966-2012

Evaluation Phase

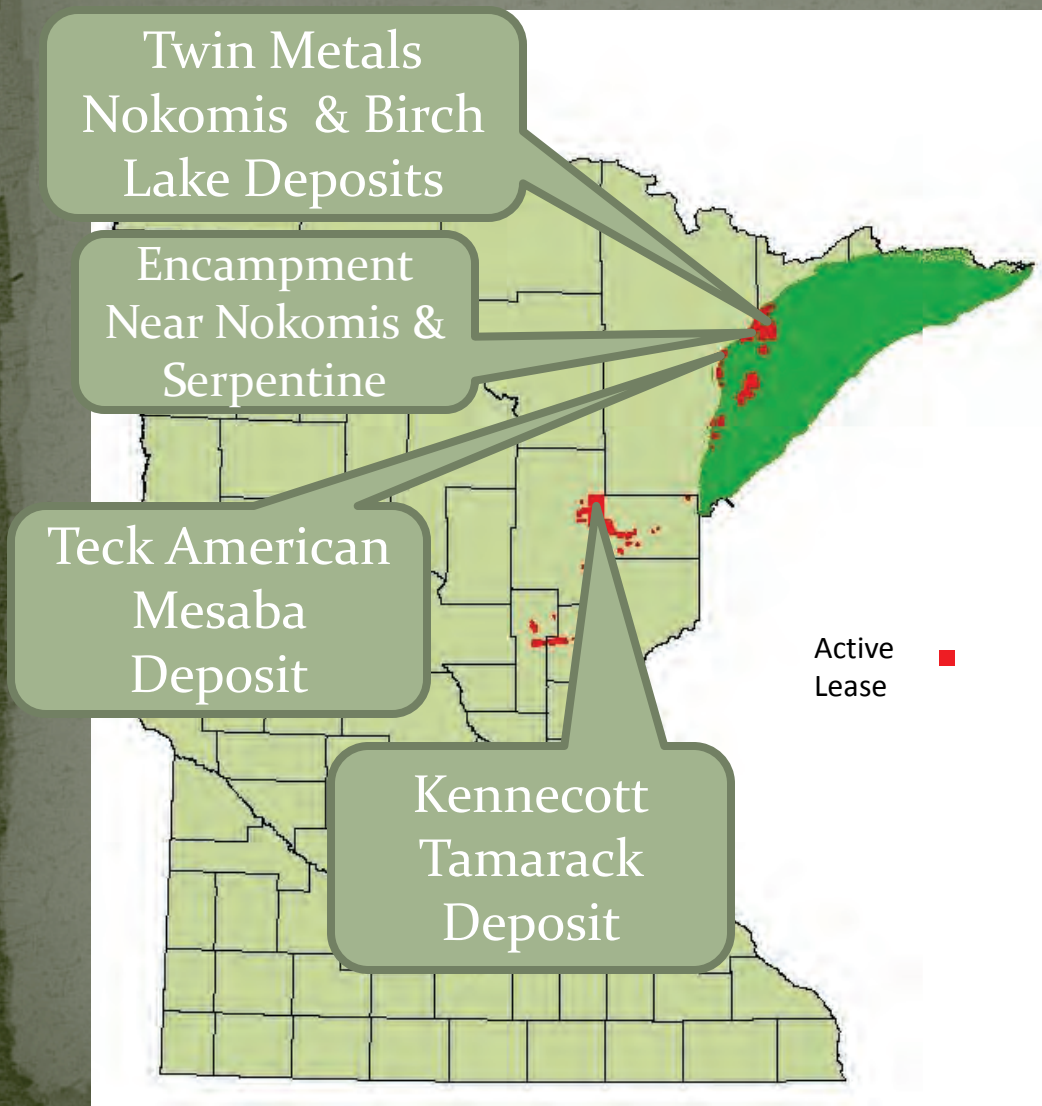
after Exploration and Discovery



Metal price trends; cost of capital; energy supply; business partnerships & sale of future metal; technology improvements

Evaluation Phase for Cu + Nickel

Active Projects on State Mineral Leases



Four exploration companies have Evaluation Phase Projects on State-Leased Lands.

The 22 State leases associated with these 5 deposits represent **6%** of the active State leases

Evaluation Phase

Activity: Drilling

120,659
offered parcels

23,752
no drilling

111 leased parcels

Estimated 0.5% of the forty- acre parcels leased had evaluation phase drilling.

State Mineral Leases, 1966-2012

All Exploration Phase & Evaluation Phase Activities Combined: Drill Holes Per Parcel

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

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

No Drill Holes in
97.6% of the parcels leased

555 parcels with 1 or more drill holes

n=1477 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%
Total	23752	100%

State Mineral Leases, 1/1/1966-1/1/2012;
Drill Hole Data 1/1/1966-3/30/2011

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.

Exploration Phase vs. Evaluation Phase

Drilling History

Exploration Phase
Drilling tends to be small numbers of holes and widely spaced

Estimate 595 Drill Holes on 444 forty-acre parcels

Vs.

Evaluation Phase
Drilling tends to be higher numbers and closer spacing over a target deposit

Estimate 882 Drill Holes on 111 forty-acre parcels within 22 active State Mineral Leases for five deposits

General Trend from 46 Years
Classification of # of Drill Holes: Exploration 40% vs. Evaluation 60%

A sum of 1477 drill holes on 555 forty-acre parcels within State Mineral Leases from both Phases of exploration. These are estimates.

Combined Exploration & Evaluation Phases

Activity : All Drilling



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

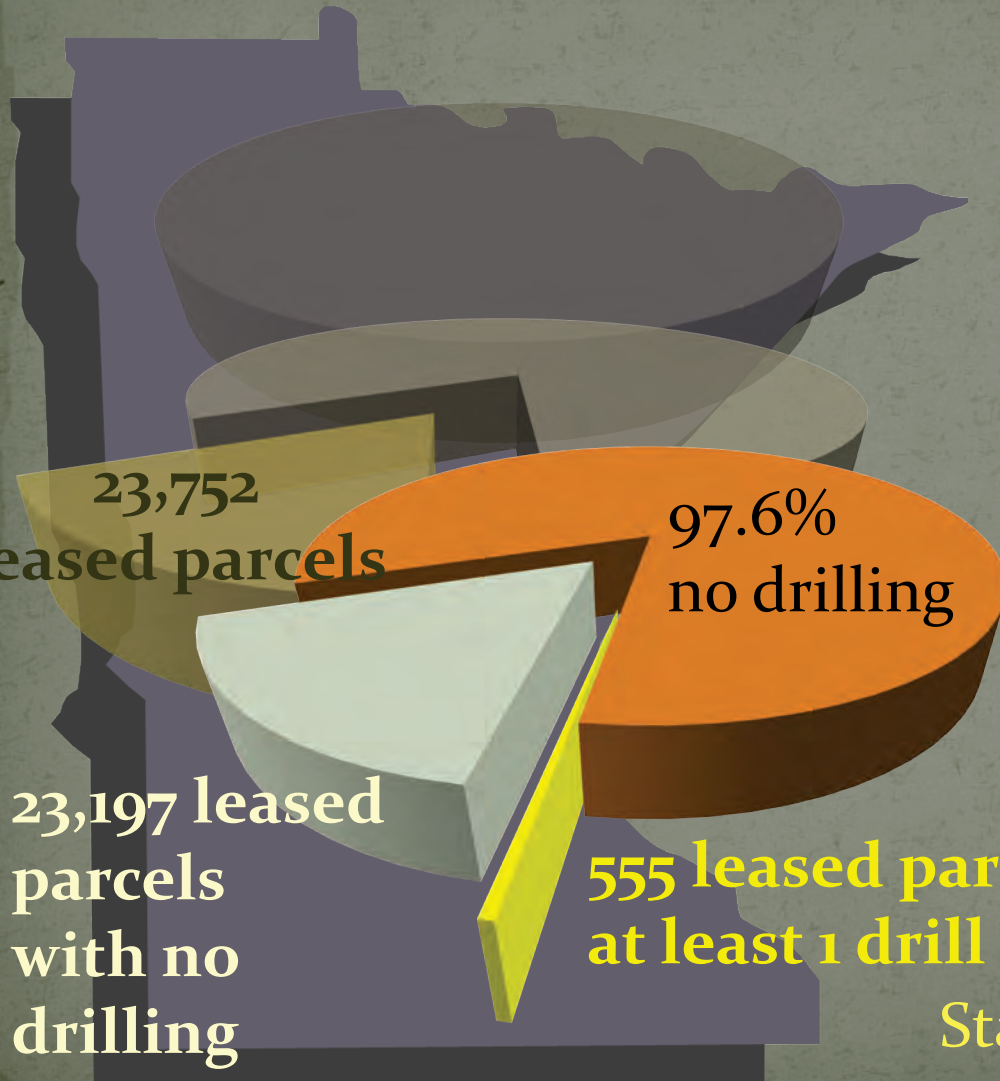
State Mineral Leases, 1966-2012

Ownership: Minerals rights vs. surface rights

Subset: All parcels with Exploration Drilling

20% (110) of these 555 parcels have different surface & minerals owners (State owns the minerals rights, not the surface)

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



555 leased parcels at least 1 drill hole

State Mineral Leases, 1966-2012

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

Note: It has taken 46 years to accumulate the activity to these ratios. These activities did not happen after any single state lease sale event.

State Mineral Lease Activity Historical Summary

Exploration activity

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 13 (min.=0; max=58) drill holes per year (n=595) 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.

Evaluation Activity

Evaluation occurs on very small areas.

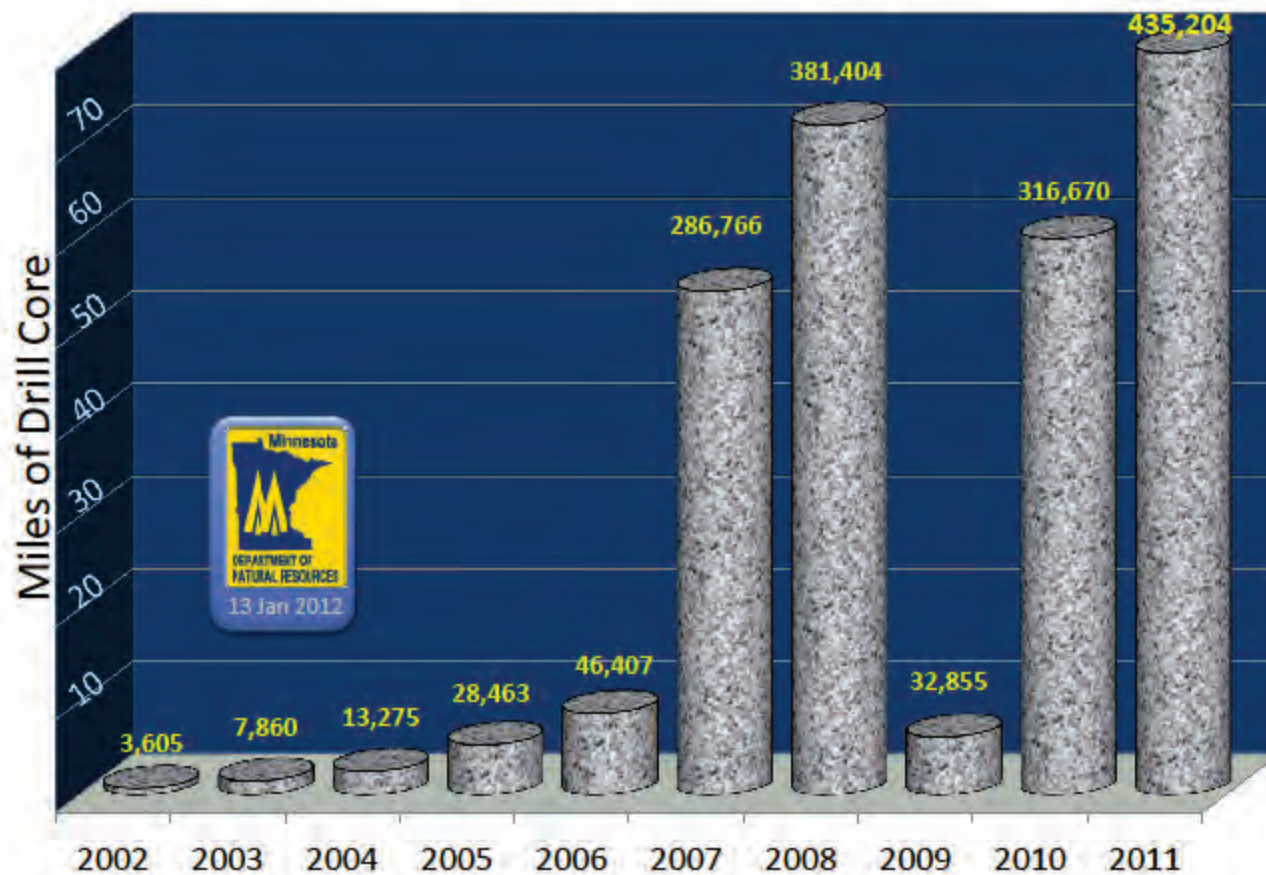
Occurs in 5 to 10 year periods of high level of activity, separated by long time periods of no activity.

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 evaluation activity after 46 years.

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

**Exploration and Development Drilling for Metallic Minerals
Total Drill Core Footage Statewide by Calendar Year**



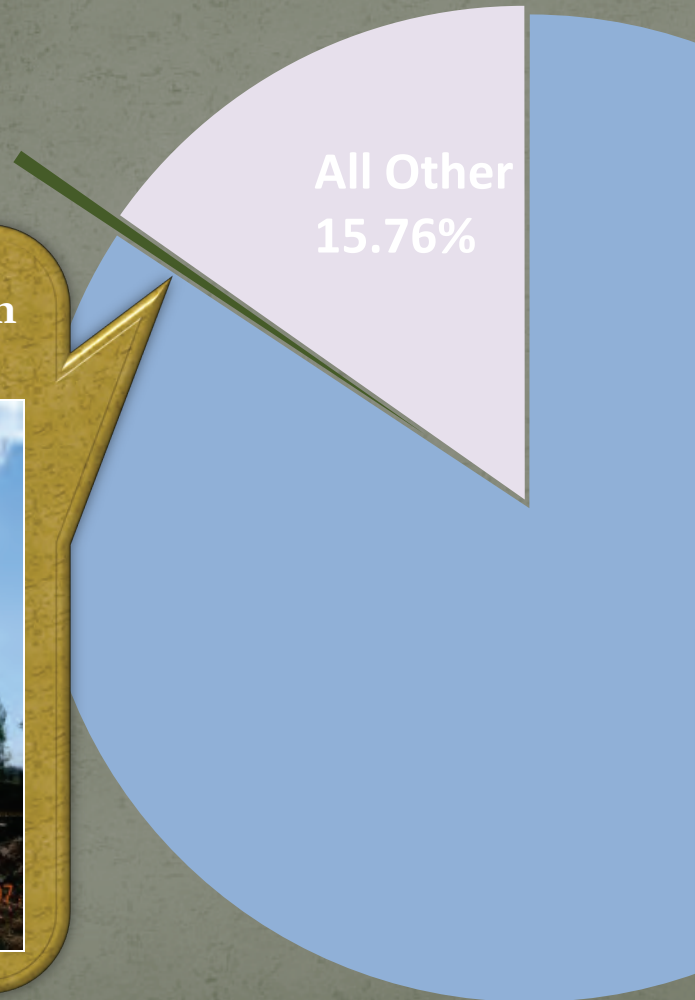
Forward Looking Statement

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	108,201
Mineral Exploration Drill Hole	1,031
All Other	20,436
Total	129,668

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



Mineral Exploration Drill Holes 0.80%



Domestic Water Supply Wells 83.44%



The End