

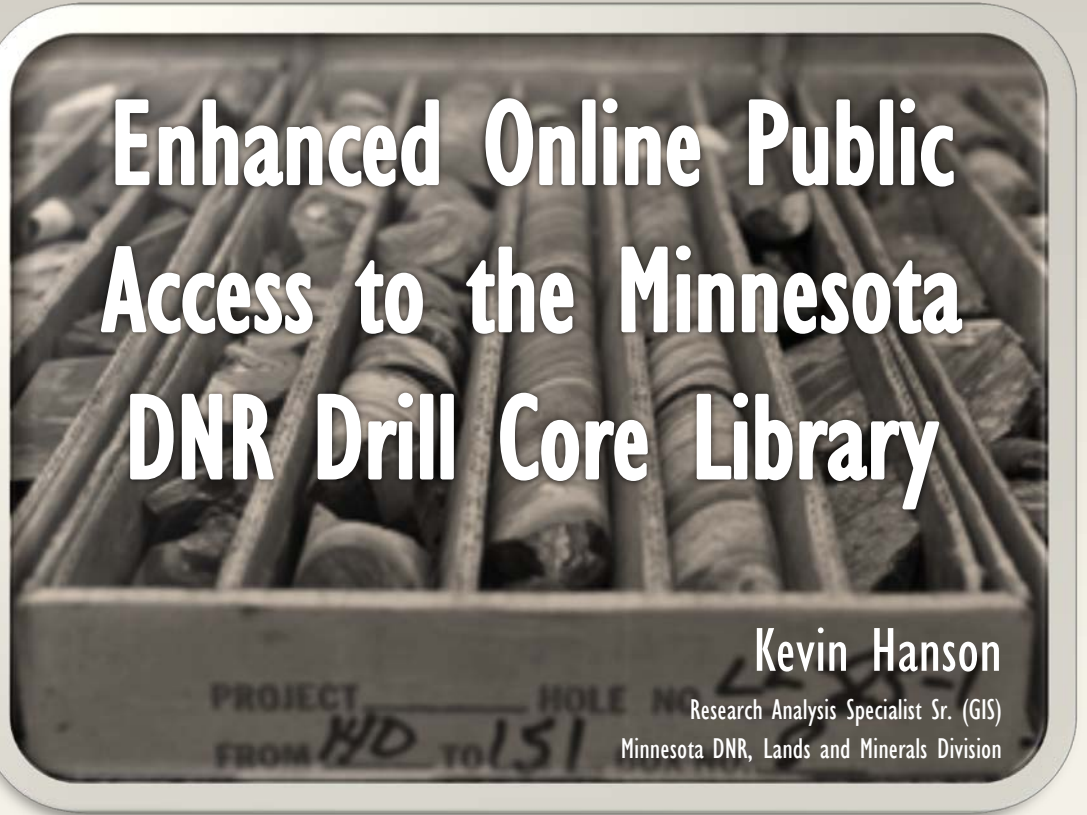


2015 SME MN Conference
Mining Minerals For Our Lives

Enhanced Online Public Access to the Minnesota DNR Drill Core Library

Kevin Hanson

Research Analysis Specialist Sr. (GIS)
Minnesota DNR, Lands and Minerals Division





DRILL CORE LIBRARY WEBPAGE

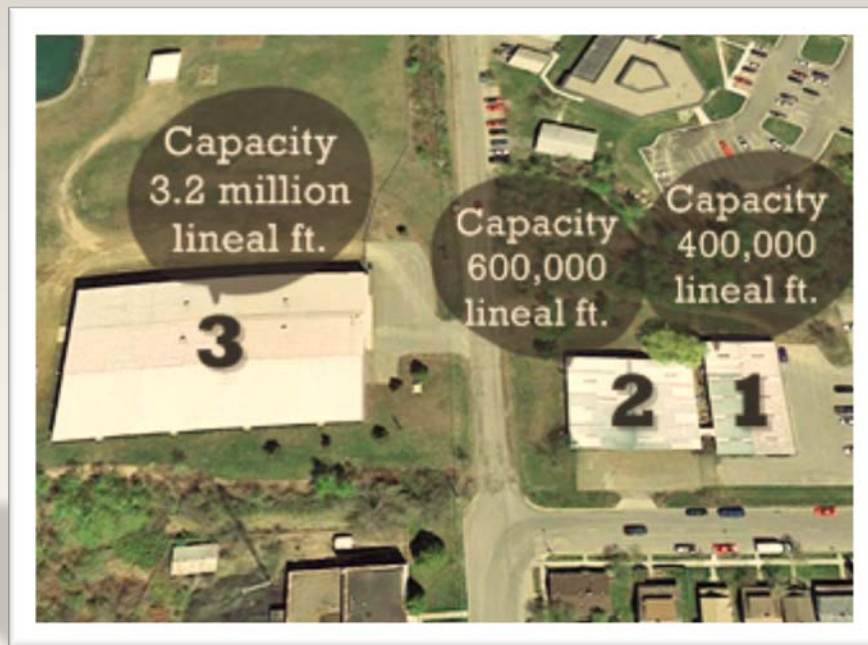
- Library overview
- Library significance
- Webpage
- Web map





OVERVIEW

- 3 buildings located in Hibbing, MN
- 4+ million feet of capacity
- Currently, 3 million feet of core
- From 9,000+ drill holes

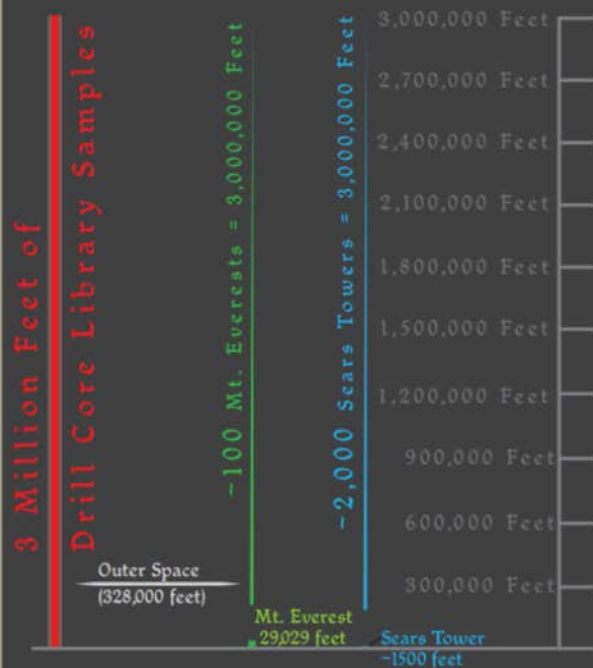




Stretching 3 Million Feet Along Interstate Highways



Stretching 3 Million Feet Up into Space and Relative to the Sears Tower and Mt. Everest



3 Million Feet in Perspective

OVERVIEW

- Open to the public
- Log and sample public drill core
- Accept delivered drill core
- Delivered drill core fulfills statutory requirements (since 1980)



Inside examination room in building #3



OVERVIEW

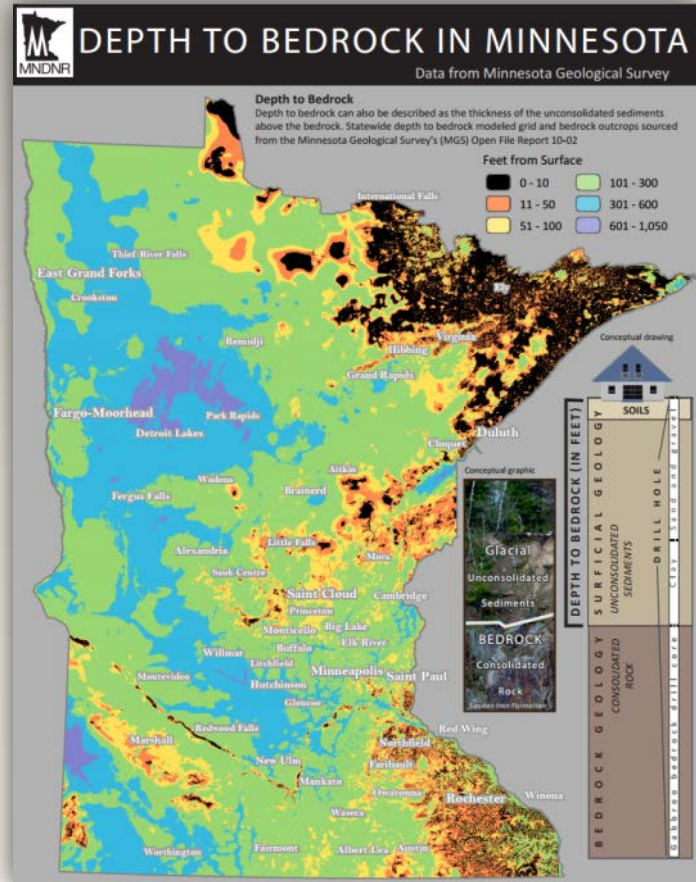
- Clients include
 - Exploration geologists,
 - Researchers,
 - Geological surveys,
 - Professors and college students.



Drill Core Building #1 built in 1972. 400,000 lineal feet

Significance of Library

- Explorers are searching for mineral deposits in the bedrock.
- Deposits can be difficult to assess because most of the bedrock in Minnesota is buried under glacial sediments.
- Drill core samples, combined with indirect methods (geophysics and geochemistry) provide the only glimpse of the bedrock for many tens of square miles in Minnesota.



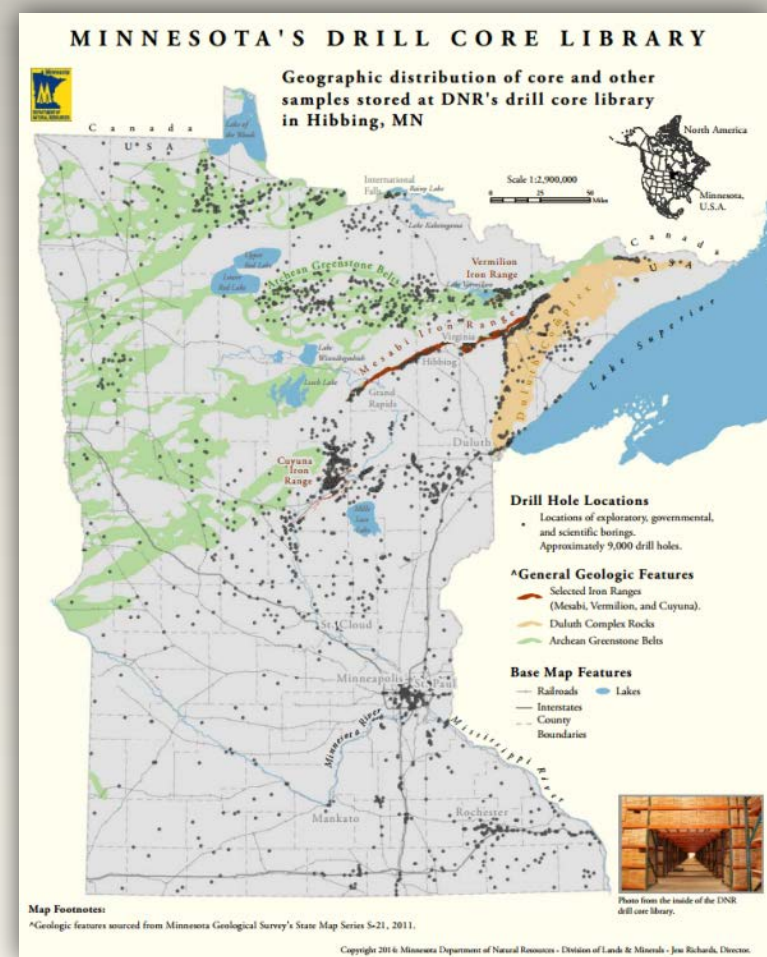
Significance of Library

- Explorers reuse existing core samples to develop new ideas about Minnesota's mineral resources and geology.
- The materials at the library have contributed to the discovery of two valuable nonferrous mineral deposits: the Birch Lake deposit & Maturi deposit in the Duluth Complex
- Additionally contributed to the Tamarack Ni-Cu-PGM discovery



Significance of Library

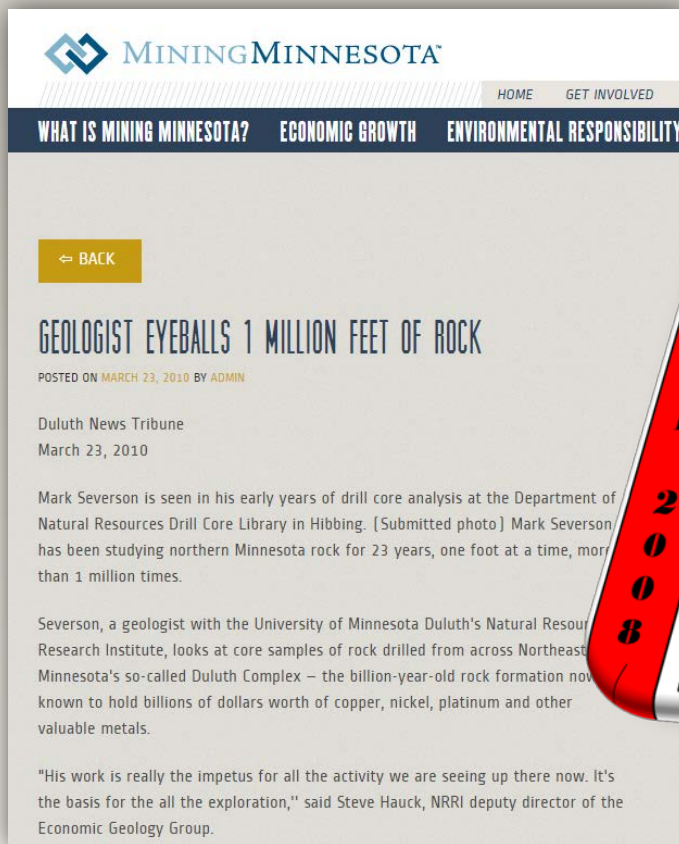
- Drill core samples are often reused several times in exploration programs and academic research
- Limiting the need for additional drilling disturbances



Significance of Library

Mapping and research

-Drill core logging



MINING MINNESOTA

HOME GET INVOLVED

WHAT IS MINING MINNESOTA? ECONOMIC GROWTH ENVIRONMENTAL RESPONSIBILITY

[← BACK](#)

GEOLOGIST EYEBALLS 1 MILLION FEET OF ROCK

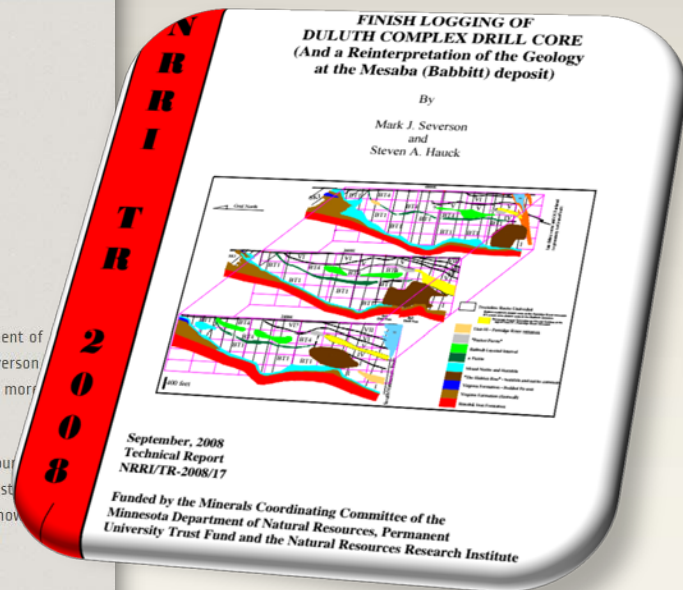
POSTED ON MARCH 23, 2010 BY ADMIN

Duluth News Tribune
March 23, 2010

Mark Severson is seen in his early years of drill core analysis at the Department of Natural Resources Drill Core Library in Hibbing. [Submitted photo] Mark Severson has been studying northern Minnesota rock for 23 years, one foot at a time, more than 1 million times.

Severson, a geologist with the University of Minnesota Duluth's Natural Resources Research Institute, looks at core samples of rock drilled from across Northeast Minnesota's so-called Duluth Complex – the billion-year-old rock formation now known to hold billions of dollars worth of copper, nickel, platinum and other valuable metals.

"His work is really the impetus for all the activity we are seeing up there now. It's the basis for the all the exploration," said Steve Hauck, NRRI deputy director of the Economic Geology Group.



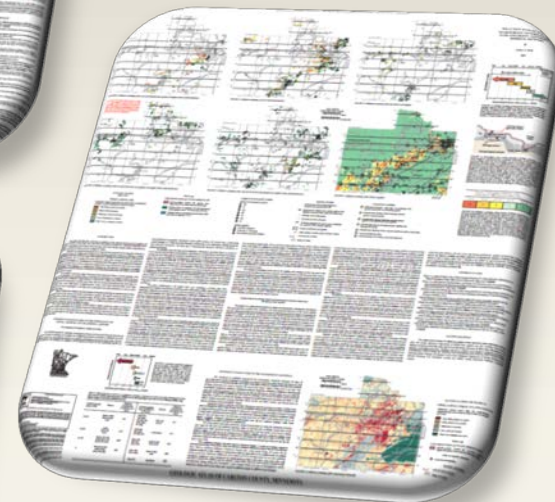
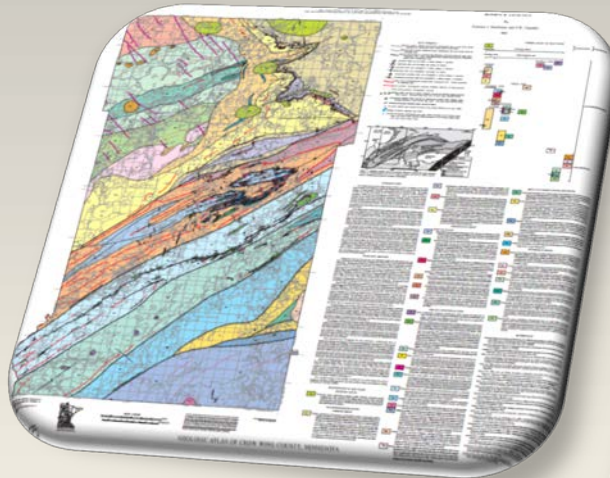
Significance of Library

Mapping and research

-Geologic mapping

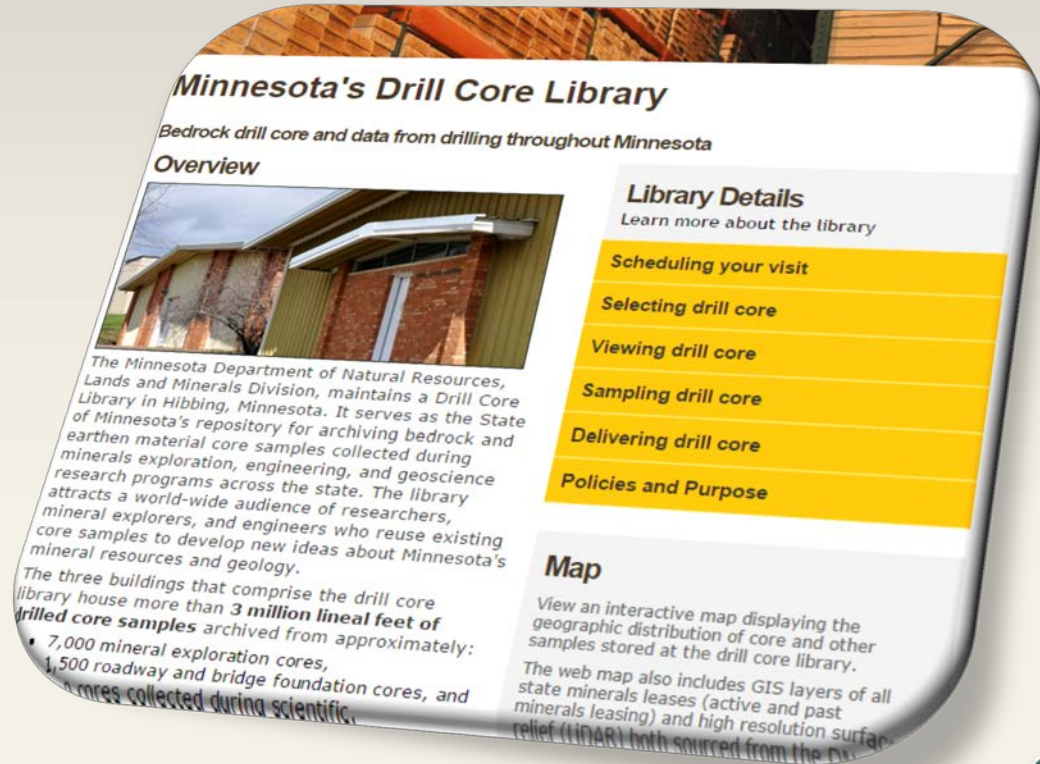
-Mineral potential studies

-Hydrogeologic studies

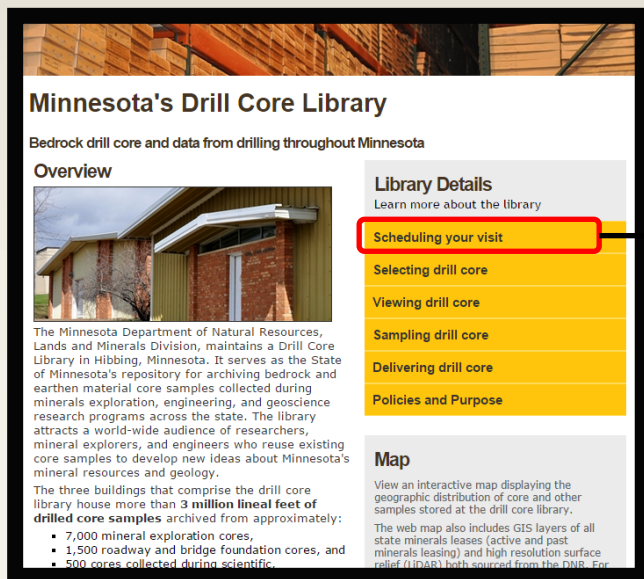


DRILL CORE LIBRARY WEBPAGE

- Scheduling a visit
- View drill core
- Sample drill core
- Deliver drill core
- Policies & purpose



Webpage Features



Scheduling your visit

Location

The Drill Core Library is located in the DNR's Hibbing office at:

1525 Third Avenue East Hibbing, MN 55746

Hours

While the library is open to the public during normal business hours **you must contact the DNR before visiting the facility. The DNR prefers to be notified two weeks in advance of each visit.**

Before Your Visit

In order to better assist those visiting the Drill Core Library the DNR has prepared a pre-visit document listing information we would like to know when you contact us.

[Pre-visit information document](#) »

DNR Contact

■ **Barry Frey**

Email: **Barry.Frey@state.mn.us**

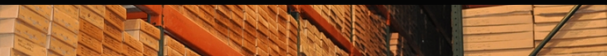
Telephone: 218-231-8450



Stacks of core boxes in Building 3. ~3,200,000 lineal feet of capacity




Webpage Features



Minnesota's Drill Core Library

Bedrock drill core and data from drilling throughout Minnesota

Overview



The Minnesota Department of Natural Resources, Lands and Minerals Division, maintains a Drill Core Library in Hibbing, Minnesota. It serves as the State of Minnesota's repository for archiving bedrock and earthen material core samples collected during minerals exploration, engineering, and geoscience research programs across the state. The library attracts a world-wide audience of researchers, mineral explorers, and engineers who reuse existing core samples to develop new ideas about Minnesota's mineral resources and geology.

The three buildings that comprise the drill core library house more than **3 million lineal feet of drilled core samples** archived from approximately:

- 7,000 mineral exploration cores,
- 1,500 roadway and bridge foundation cores, and
- 500 cores collected during scientific

Library Details

Learn more about the library

- Scheduling your visit
- Selecting drill core**
- Viewing drill core
- Sampling drill core
- Delivering drill core
- Policies and Purpose

Map

View an interactive map displaying the geographic distribution of core and other samples stored at the drill core library.

The web map also includes GIS layers of all state minerals leases (active and past minerals leasing) and high resolution surface relief (10m) both sourced from the DNR. For

Selecting drill core

Provided below are drill core sample datasets and digital documents related to drill holes in Minnesota. The datasets are updated quarterly throughout the year. Note that some of the drill core samples found in these data sets are not publicly available for viewing as a result of being a part of an active mineral exploration program.

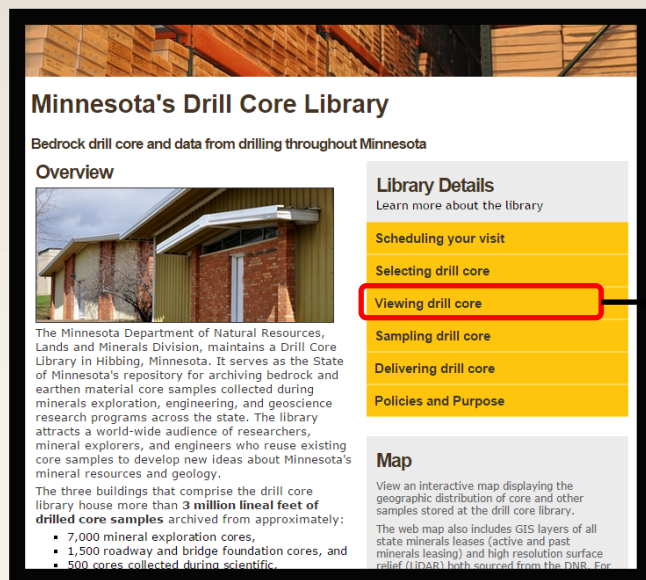
[GIS drill core data](#) »

[Microsoft Excel drill core data](#) »

[Interactive web map](#) »

[Minarchive: mineral exploration documents](#): »


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Viewing drill core



Examination rooms:

The drill core library has two heated rooms in which to view your selected drill core samples. The DNR will retrieve your selected core samples in preparation for your visit. Please see the '**Schedule Your Visit**' tab above for more information.



SHEET 1 OF 1

BEAR CREEK MINING CO. - CENTRAL DISTRICT
DRILL LOG B1-1

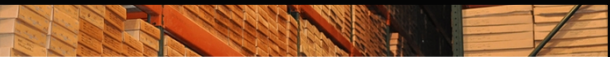
AREA DG-BABBITT-ALLEN SWSE OVERBURDEN OR CHURN 0 TO 17
LOCATION BABBITT No. 1 GRID: 1600W/250S NX 17 TO 19
OWNER: SURFACE RESERVE MINING CO. BX 19 TO 22
MINERALS LONGYEAR-MESABA LD. & IRON CO. BX "C" 22 TO 520 (Wireline)
COORDINATES _____ N. _____ E. AX _____ TO _____
COLLAR ELEVATION Appr. 1600' TOTAL CORE REC. 100 70
DIP -60° DIRECTION N32°W (Grid North)
DATE COLLARED Nov. 6, 1958
DATE COMPLETED Nov. 15, 1958
DRILLED BY J.D. Mancuso & J.H. LaGrange

LEGEND

OVER- BURDEN	ANDRUS LABBED	COARSE LABBED (1-1/4")	SLIME RICH OR FERRUGINEOUS	HORAFELS
GRANITE- GNEISS	HORN- FELLS LABBED	FINE LABBED (1/2-3/4")	FINE LABBED (1/2-3/4")	QUARTZITE- GNEISS

Drill log from drill hole B1-1. Drilled by Bear Creek Mining in 1958 and intercepted mineralization at Babbitt Grid #1 for the first time. Today commonly known as the Mesaba Cu-Ni Deposit.


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Sampling drill core

The DNR encourages sampling of publicly available drill core for chemical analysis, thin sectioning, etc. The following documents are designed to preserve and enhance the value of these unique cores. Please preview or download these documents if you plan to sample drill core. Your cooperation will be greatly appreciated. If you have any questions please contact a staff member.

[Sampling guidelines »](#)

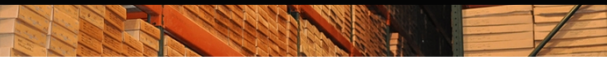
[Policy and Instructions for Sample](#)

[Request Form »](#)

[Sampling Request Form »](#)




Webpage Features



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Delivering drill core

Delivering drill core:

In order to better assist those delivering drill core to the Drill Core Library the DNR prefers a minimum 2 week notice in advance of core deliveries and pickups to best ensure meeting the customer's needs. The DNR has prepared a pre-deliver document listing information we would like to know before you deliver drill core.

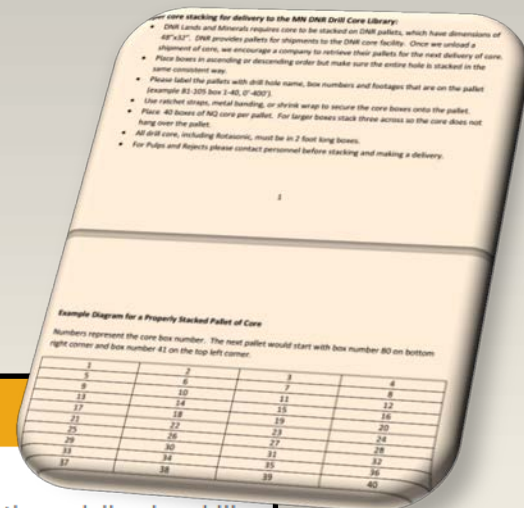
Delivering core information document »

DNR Contact

■ Nicholas Niemi

Email: Nicholas.Niemi@state.mn.us

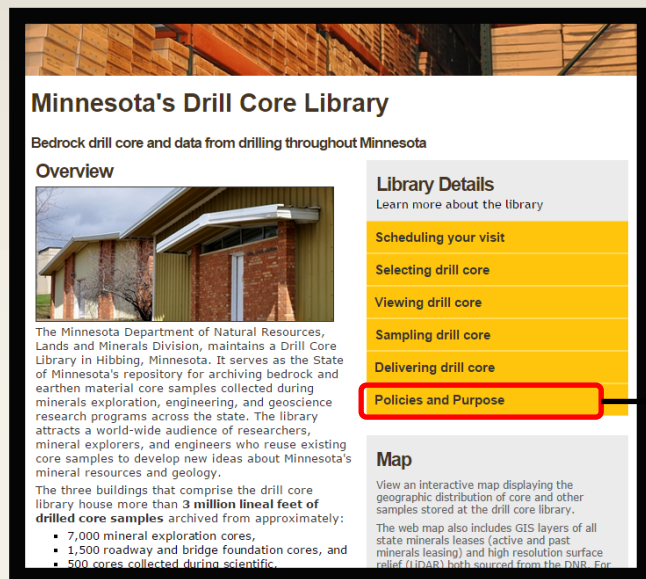
Telephone: 218-231-8461





Drill core boxes from drill hole BM-3. This core was drilled in 1953 by the US Bureau of Mines (USBM).


Webpage Features



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Policies and Purpose

[View a PDF of this information »](#)

Policies

The majority of drill samples in the library are public data and available for viewing. Most exploratory boring samples are delivered to the library in fulfillment of statutory requirements which have been in effect since 1980.

- If a state mineral lease terminates, then the drill cores associated with that lease become state property and public data. The drill samples remain public data even if a new lease becomes active on the same mining unit.
- Exploratory Boring Procedures- [Minnesota Statutes 103I.601](#) »
- Submission of Data from Exploratory Borings- [Minnesota Statutes 103I.605](#) »

Those same statutes also identify that some core samples and related data are not public data meaning they are not viewable by the public. This is due to the core sample and data being on an active state minerals lease. The DNR must follow this law. If you wish to view confidential core, then you need to be an employee of the state mineral lessee or have written permission from the state mineral lessee.

Purpose

The primary purpose of the Drill Core Library is to receive, preserve, and make available drill samples to serve the state policy for mineral development ([M.S. 93.001](#)). This means that environmental impacts are reduced when existing drill samples can be re-used multiple times such that the total number of drill holes is reduced. The drill samples have also proven to be extremely valuable for academic researchers, such as university professors and graduate students. Many graduate student theses have been possible largely based upon the free access to drill core samples in this library. Further, the drill samples are available for environmental research, such as to understand the natural background trace element composition of the bedrock materials.




Access Web Map

Minnesota's Drill Core Library

Bedrock drill core and data from drilling throughout Minnesota

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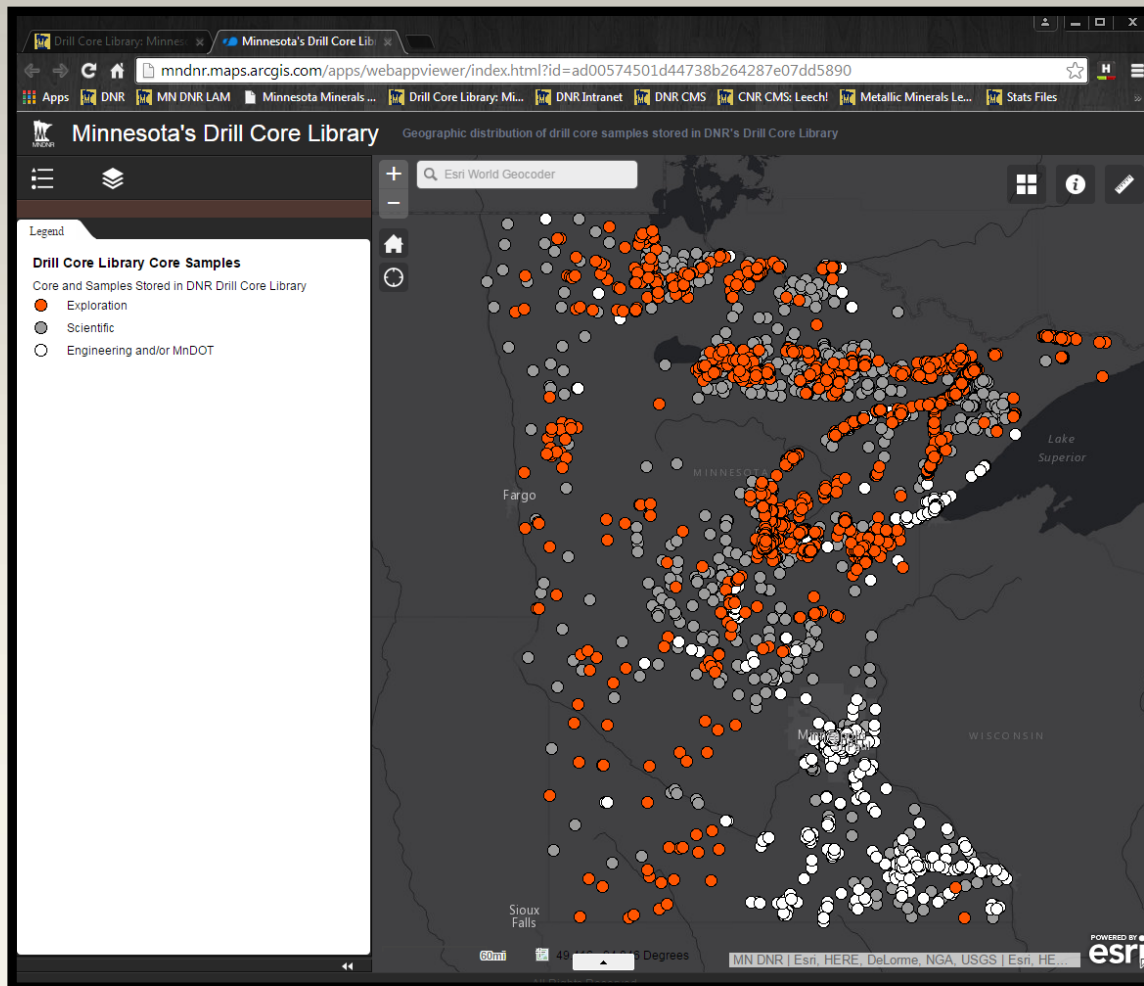
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
The web map also includes GIS layers of all state minerals leases (active and past relief (UDAB) both sourced from the DNR. For






Select Map Layers

Toggle on/off GIS layers
to view in map



Minnesota's Drill Core Library



Layer List

Operational Layers

☒ Drill Core Library Core Samples

☐ All State Minerals Leases

☐ Surficial Geology of Minnesota

☐ Bedrock Geology of Minnesota

☐ Bedrock Outcrops

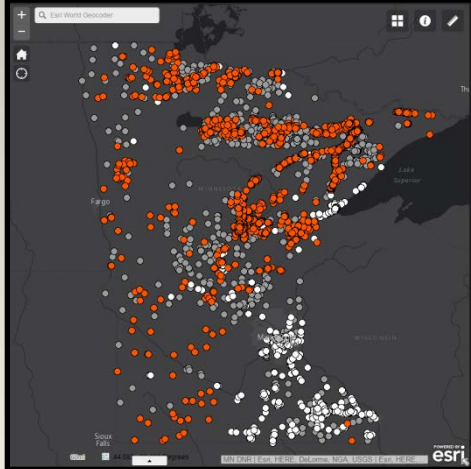
☐ Depth to Bedrock Map for Minnesota

☐ Aeromagnetic Map of Minnesota

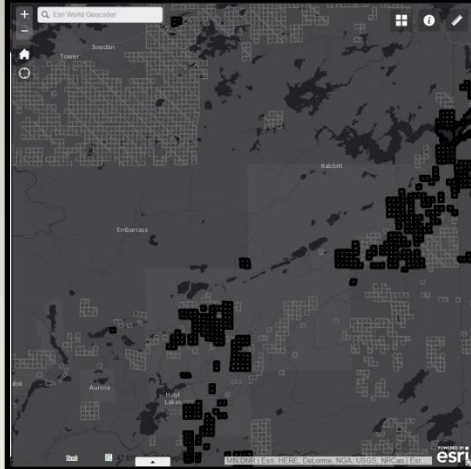
☐ Hillshade

☐ USA Topo Maps

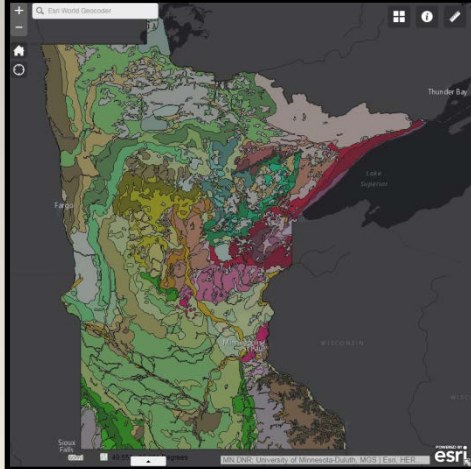
Drill Holes (DNR)



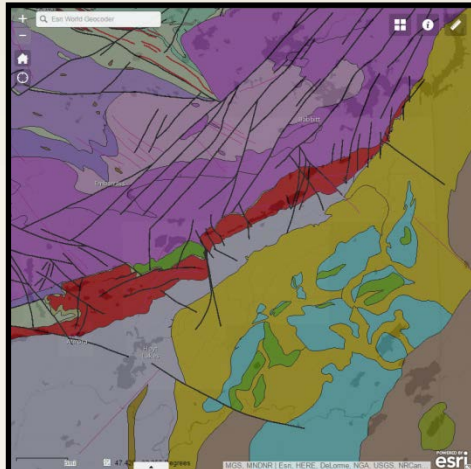
State Mineral Leases (DNR)



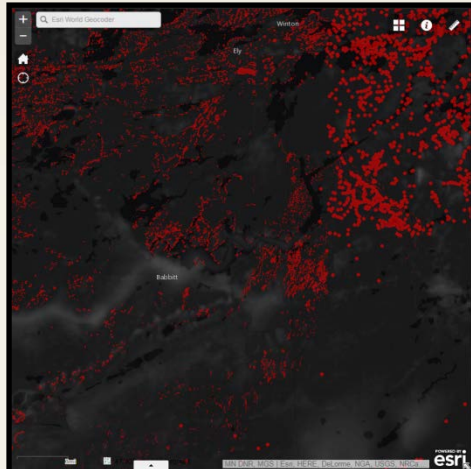
Surficial Geology (MGS)



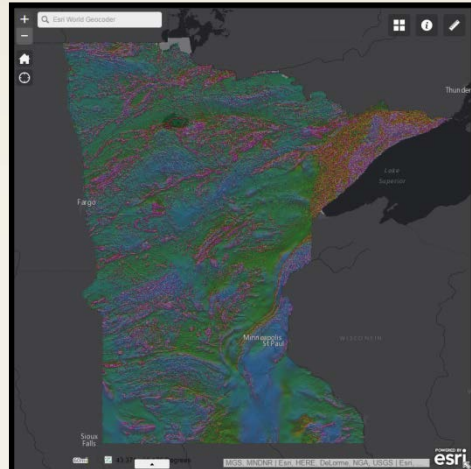
Bedrock Geology (MGS)



Bedrock Outcrops & Depth to
Bedrock Model (MGS)



Aeromagnetic Map (MGS)



http://www.dnr.state.mn.us/lands_minerals/dc_library.html

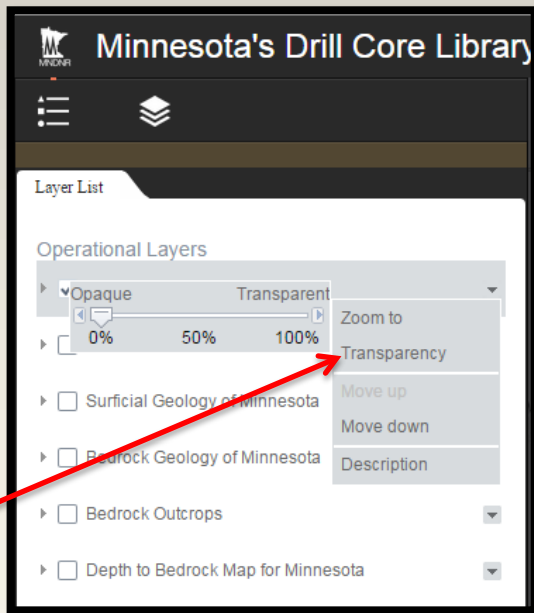




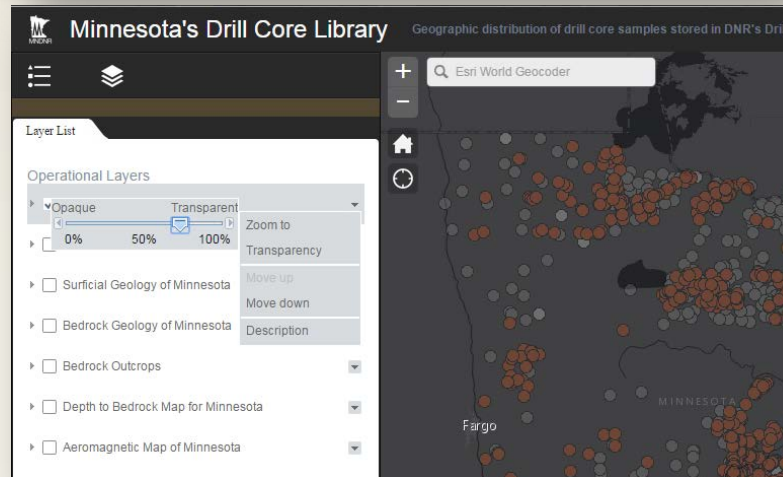
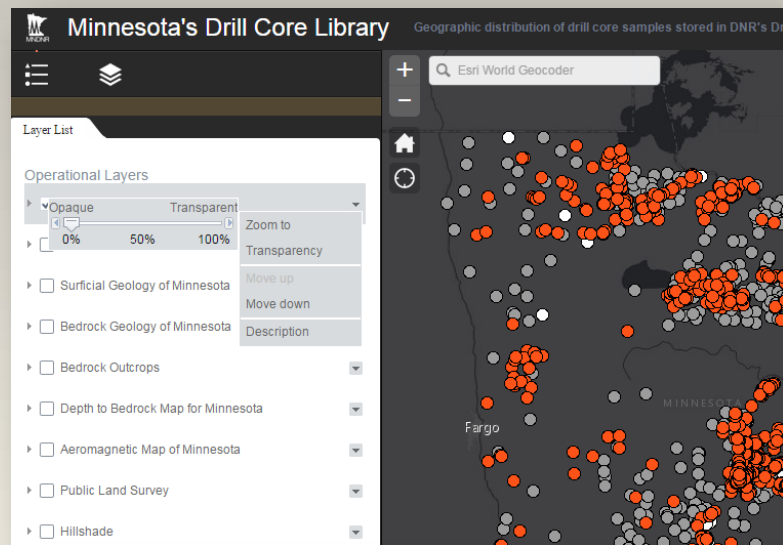
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Select Map Layers

Set a layers transparency

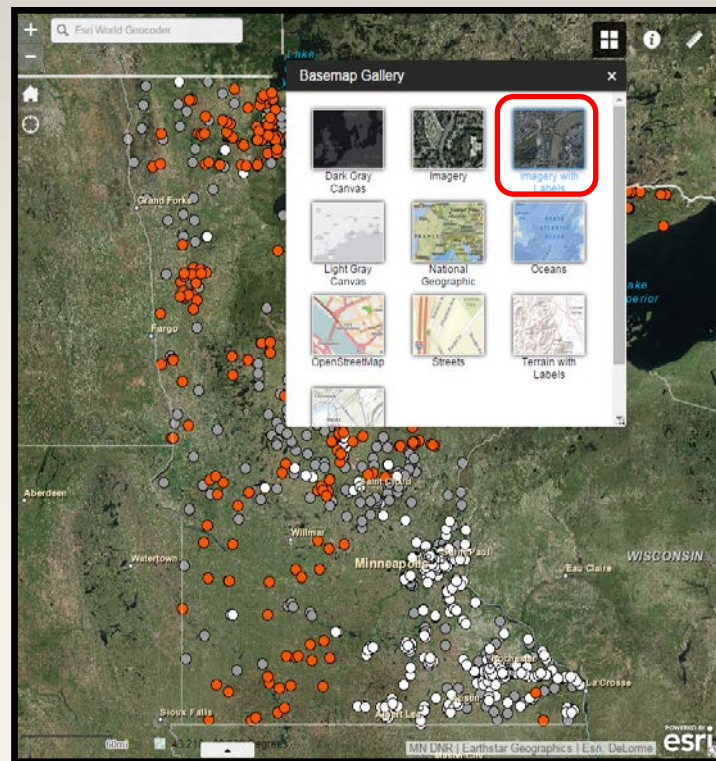
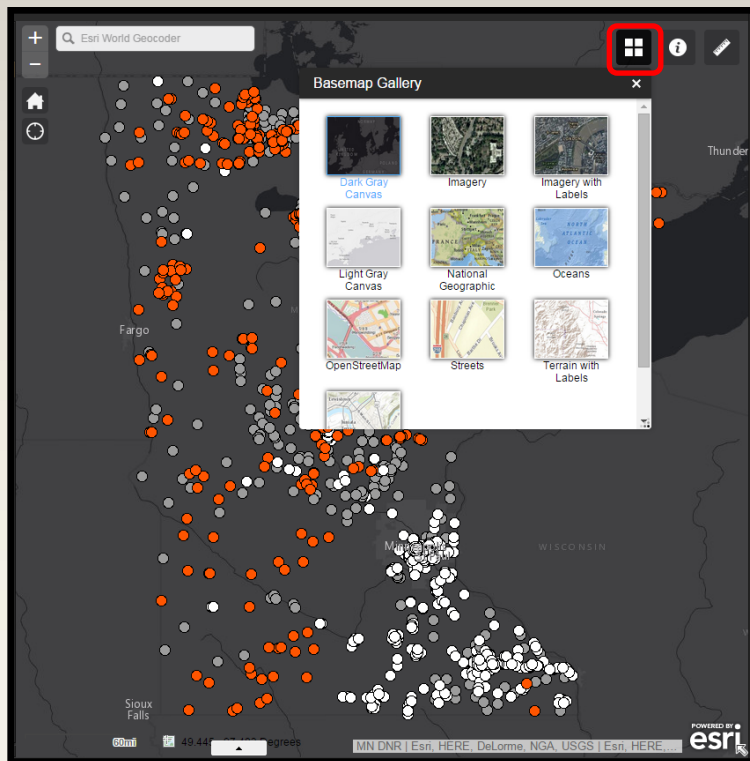


75% Opaque:
See items below easier





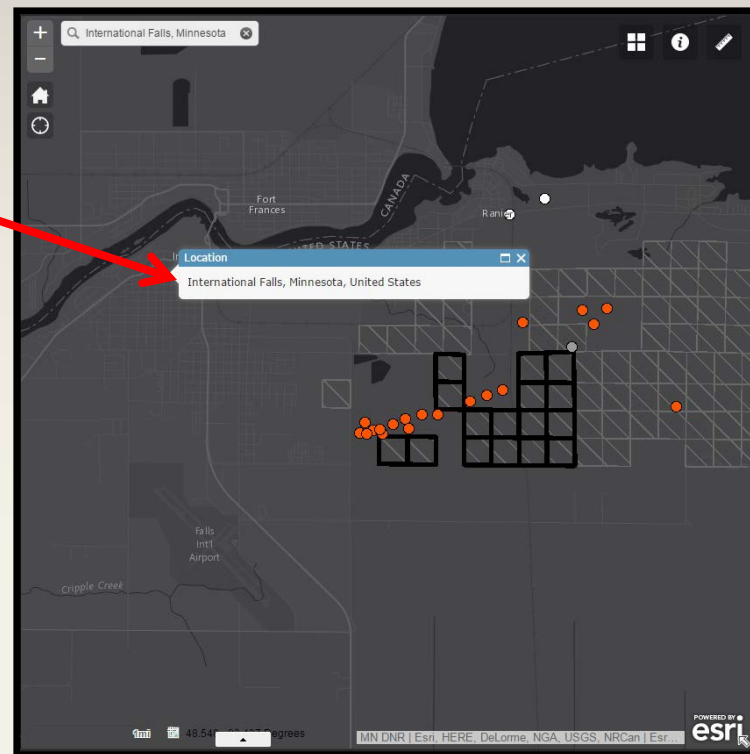
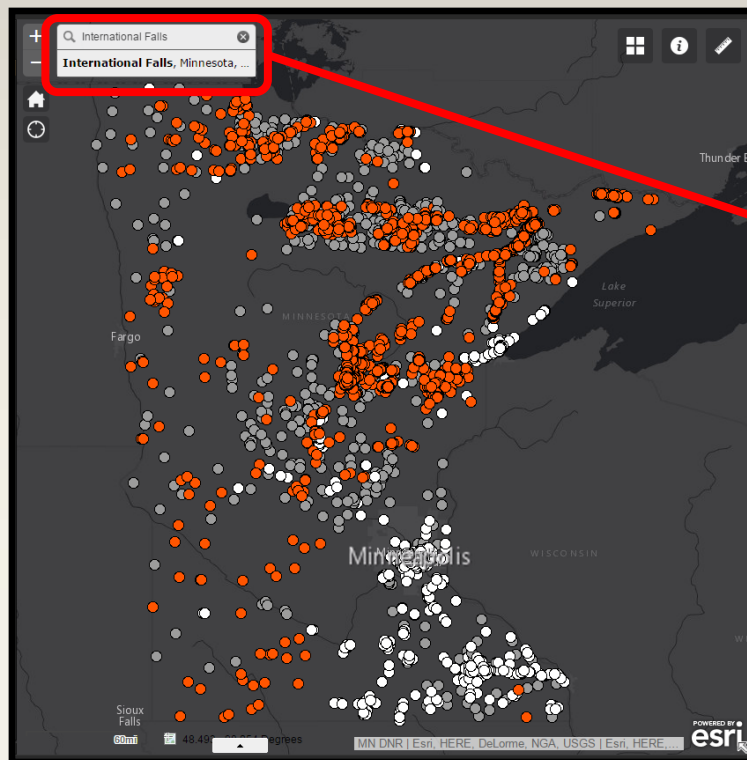
Change Basemap – Select from 10 different basemaps





Search for a geographic location

Use the search bar to zoom to a city or county



Display and ID drill holes, geology, and state mineral leases

Minnesota's Drill Core Library Geographic distribution of drill core samples stored in DNR's Drill Core Library

Search: Cook, Minnesota, United States

Layer List

Operational Layers

- ☒ Drill Core Library Core Samples
 - ☒ Core and Samples Stored in DNR Drill Core Library
 - Exploration
 - Scientific
 - Engineering and/or MnDOT
- ☒ All State Minerals Leases
 - ☒ Active State Minerals Leases
 - ☒ Terminated or Expired State Minerals Leases
- ☐ Surficial Geology of Minnesota
- ☒ Bedrock Geology of Minnesota
- ☐ Bedrock Outcrops
- ☐ Depth to Bedrock Map for Minnesota
- ☐ Aeromagnetic Map of Minnesota
- ☒ Hillshade

Drill Holes

Active State Leases

Terminated State Leases

Core and Samples Stored in DNR Drill Core Library: Exploration

DNR Inventory Number	14721
General Type	Exploration
Drill Hole Name (DDH)	TC-35-7
Date Drilled	December 18, 1989
County	KOOCHICHING
Drill Method	CORE
Company or Agency	NEWMONT EXPL LTD
Township	71
Range	23
Section	35
Forty	SESENE

[Zoom to](#)

Also view MGS Statewide Surficial & Bedrock Geology, Outcrops, Depth to Bedrock, and Aeromagnetic Layers

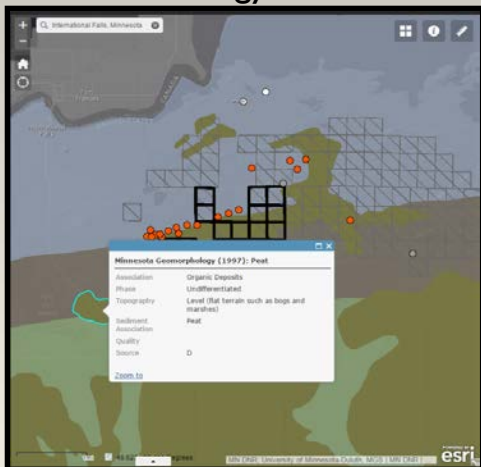
MGS, MNDNR | MN DNR | Esri, HERE, DeLorme, NGA, USGS, NRCan | Esri, HERE, ...

POWERED BY **esri**

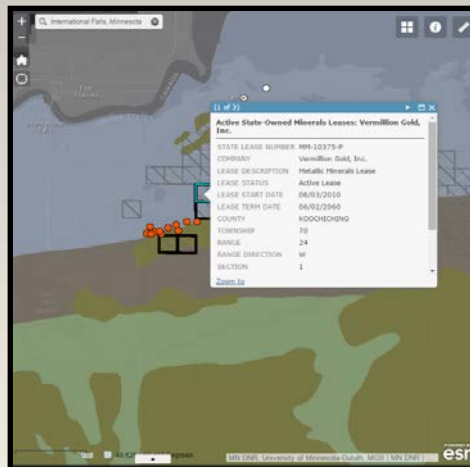


ID most map features by clicking on the map

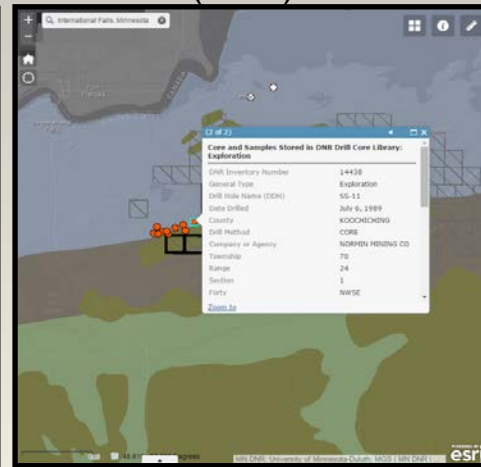
Surficial Geology



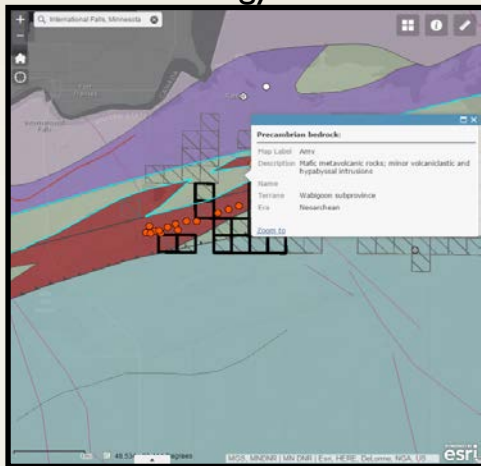
State Mineral Leases



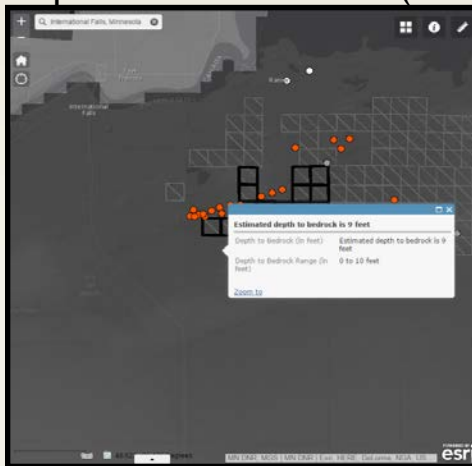
Drill Holes (DNR)



Bedrock Geology



Depth to Bedrock Model (MGS)



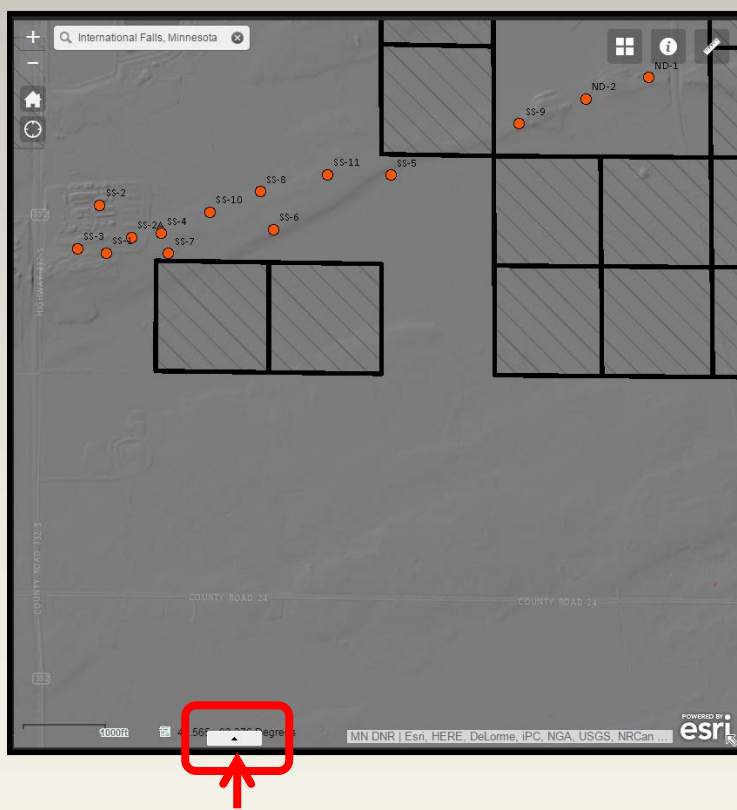
Core and Samples Stored in DNR Drill Core Library: Exploration	
DNR Inventory Number	14433
General Type	Exploration
Drill Hole Name (DDH)	SS-6
Date Drilled	February 1, 1989
County	KOOCHICHING
Drill Method	CORE
Company or Agency	NORMIN MINING CO
Township	70
Range	24
Section	1
Forty	NWSE
Zoom to	

Zoomed in look at ID window



http://www.dnr.state.mn.us/lands_minerals/dc_library.html





1. Select the 'up arrow symbol' to bring out the tabular records of any visible map layer. Shown here are:

- Drill holes
- Active state leases
- Terminated state leases

View map features in a tabular format

Minnesota's Drill Core Library Geographic distribution of drill core samples stored in DNR's Drill Core Library

Layer List

- Operational Layers
- ☒ Drill Core Library Core Samples
- ☒ All State Minerals Leases
- ☐ Surficial Geology of Minnesota
- ☐ Bedrock Geology of Minnesota
- ☐ Bedrock Outcrops
- ☐ Depth to Bedrock Map for Minnesota
- ☐ Aeromagnetic Map of Minnesota
- ☒ Hillshade
- ☐ USA Topo Maps

Options Zoom to Clear Selection Refresh

Core and Samples Stored in DNR Drill Core Library Active State Minerals Leases Terminated or Expired State Minerals Leases

drill hole id	general type	drill hole name	date drilled	county	drill method	company or	township	range	section	forty	governme
14-35	Exploration	SS-8	6/28/1989, 7:00 PM	KOOCHICHING	CORE	NORMIN MINING CO	70	24	1	NESW	0
14-38	Exploration	SS-11	7/6/1989, 7:00 PM	KOOCHICHING	CORE	NORMIN MINING CO	70	24	1	NWSE	0
10-262	Exploration	ND-1	2/2/1986, 6:00 PM	KOOCHICHING	CORE	NORMIN MINING CO	70	23	6	NESEW	0
14-436	Exploration	SS-9	6/30/1989, 7:00 PM	KOOCHICHING	CORE	NORMIN MINING CO	70	23	6	SWNW	0

14 of 14 results 0 selected

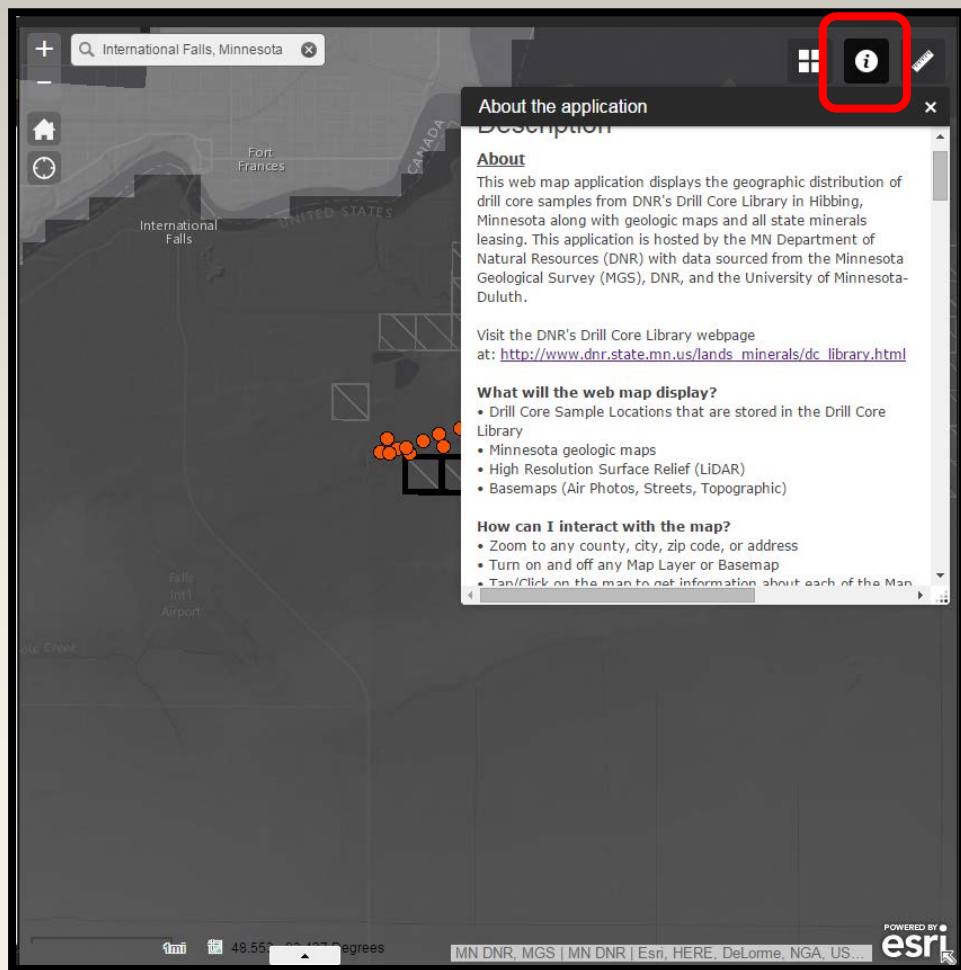
2. Select 'Options' then check on 'Filter by Map Extent' (not shown) to limit your records to what's on your map screen.

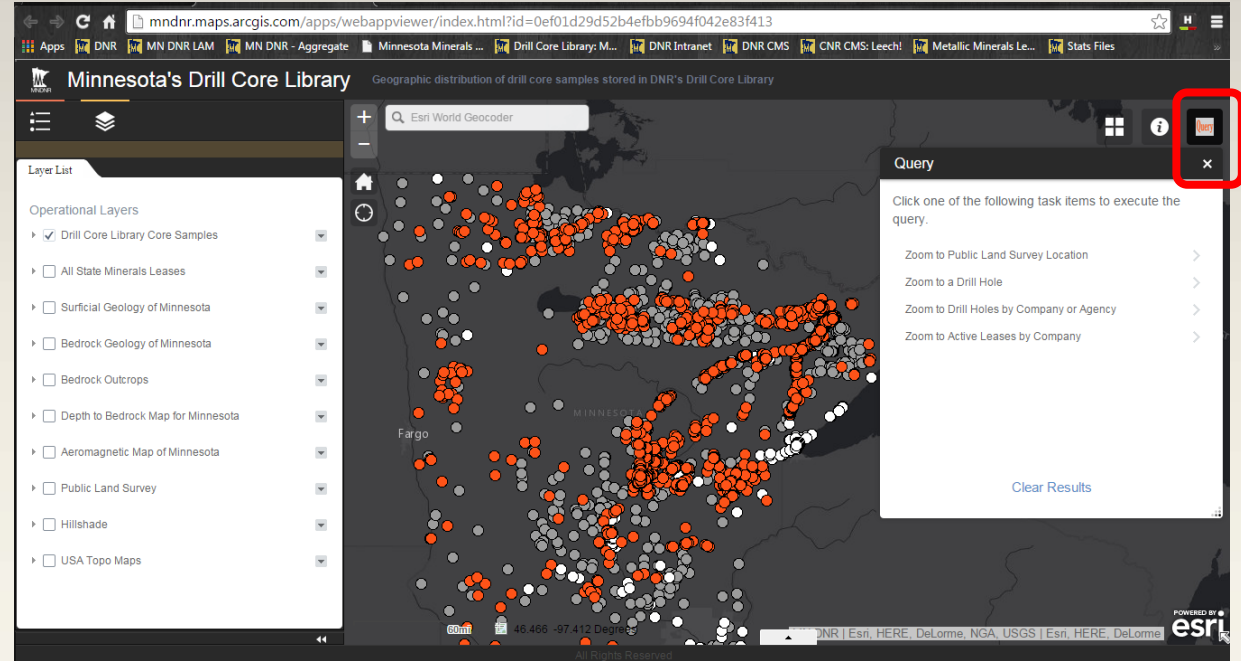
- This graphic is showing 14 drill hole records in this area.
- There is also tabular information that you can turn on for active and terminated state leases.



Learn more by clicking on the 'i' icon

- Instructions
- Metadata
- Links to data



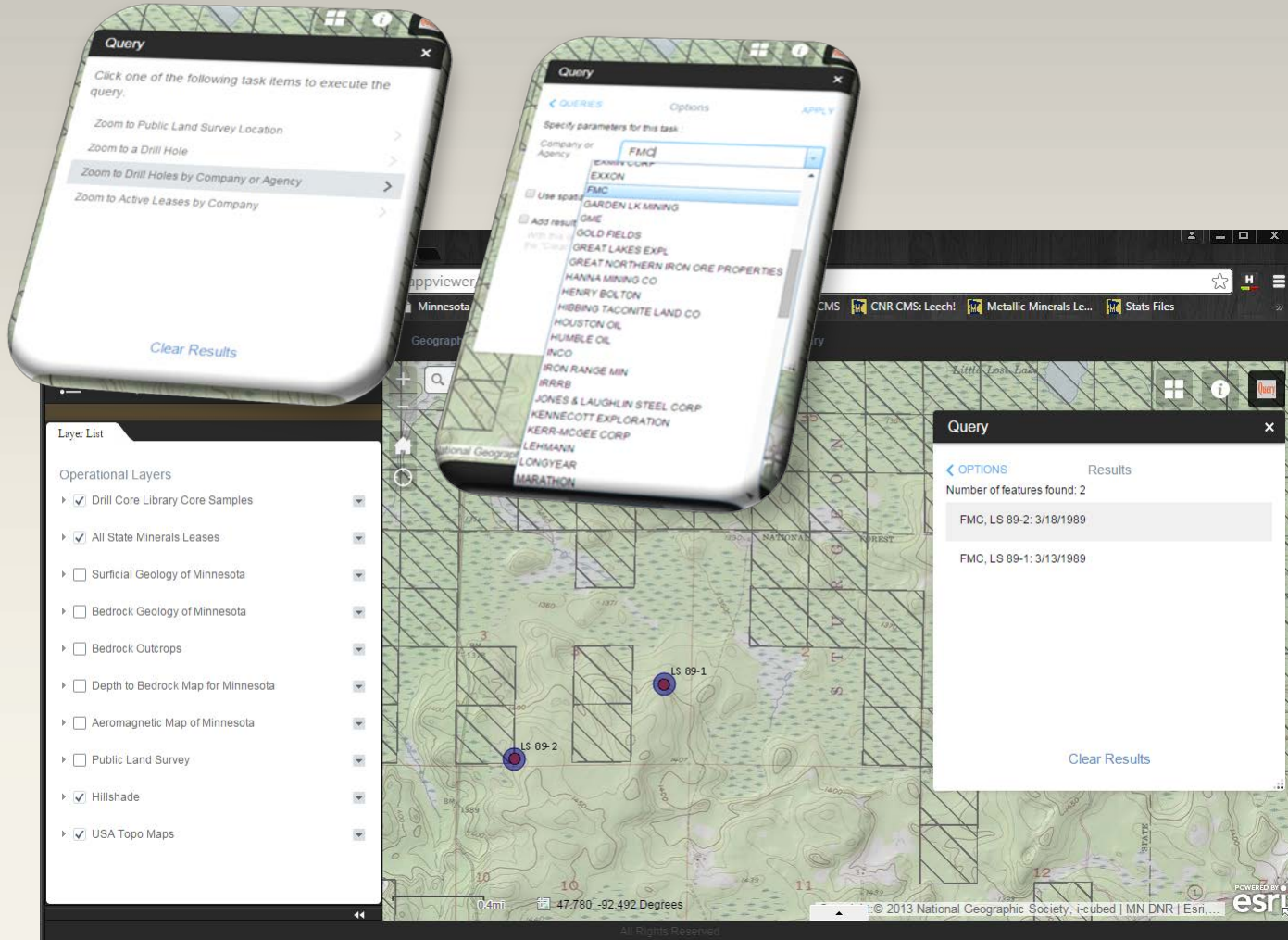


Query Tool:

- **Zoom to certain selected data**
 - **Public Land Survey Location**
 - **Drill hole name**
 - **Drill holes by company or agency**
 - **Active state minerals leases by company**

How it works?

- **Drill holes by company or agency query**
 - **Select from Drop-Down List (FMC)**
 - **Click Apply**
 - **Application zooms to drill hole locations**





Thank you!
Questions?