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THE IMPORTANCE OF MINERAL EXPLORATION

Cherie Leeden

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Presented to the: Women's Mining Coalition

About the Speaker

Cherie Leeden BSc (Hons) in Applied Geology (Curtin University WA School of Mines)

- **Founder & CEO of NV Resources, a U.S.-focused project generation Company**
- 24 years in the global resource industry, including the past 14 years serving as Director of ASX & TSX-listed companies
- Expert in discovering new (Greenfields) critical mineral deposits
- Experienced in exploring for: copper, lithium, graphite, cobalt, nickel, lead, zinc, uranium, vanadium, coal, REEs, iron ore, manganese, gold & silver
- Led multiple start-ups to successful IPOs (founder and former CEO of several Publicly listed Companies), M&A, and feasibility milestones
- Skilled in capital raising, JV negotiations, and establishing stakeholder relations (including with tribes, local community, and ranchers)
- Global project leadership & discovery experience across the Americas, Africa, and Australasia (20 countries)
- Advisor to Women's Mining Coalition and host of the Apex Women Leadership Course, which empowers more women to join Executive positions within the Mining sector
- US Permanent Resident since 2016 and proud American citizen since 2022

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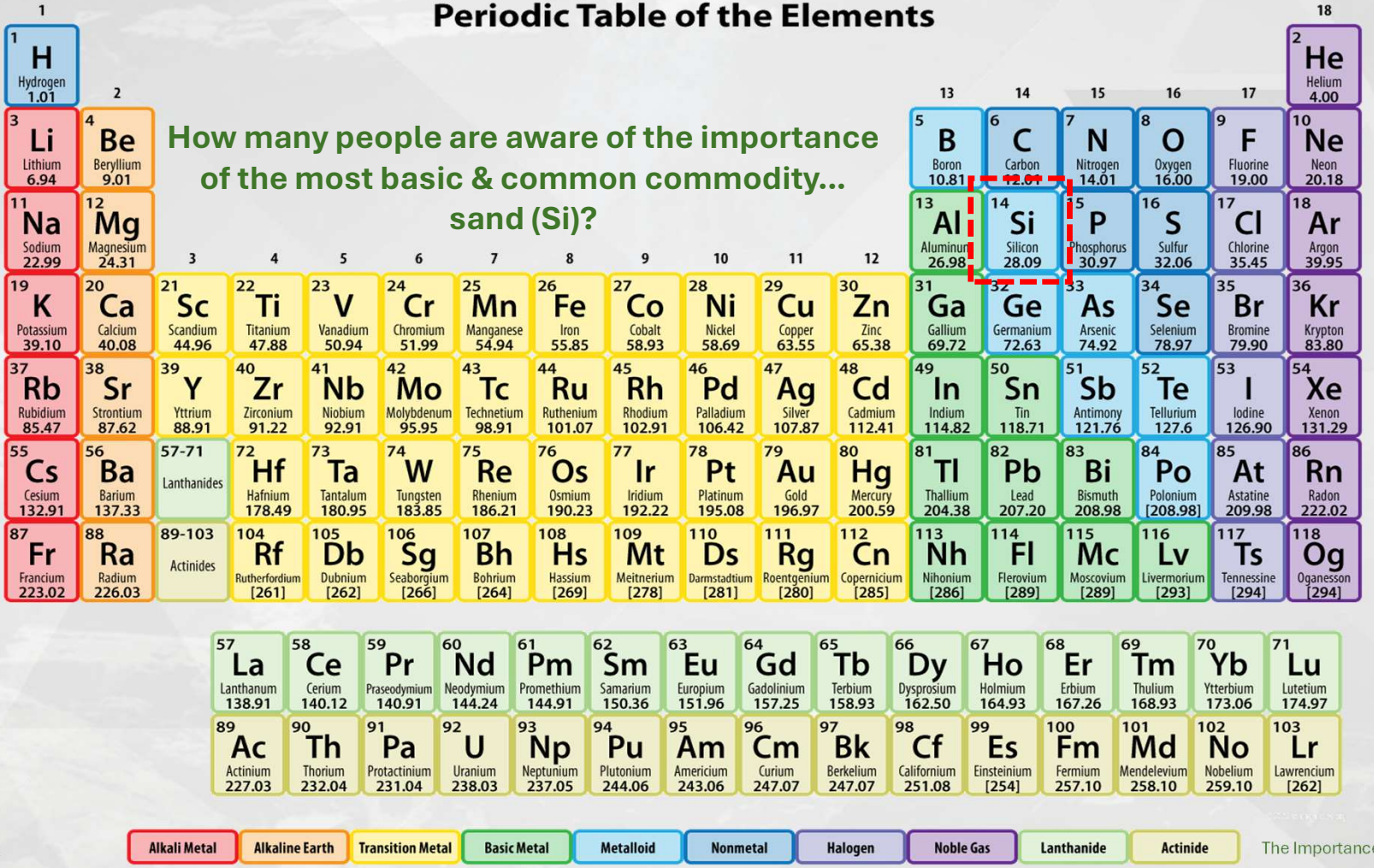
The Elements That Shape Our World



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Minerals Drives Modern Civilization

14
Si
Silicon
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- Main ingredient in **most sand is silica** (silicon dioxide), commonly known as **quartz**
- **Sand is the main ingredient in concrete** & since glass is melted sand, **silica is the primary ingredient of glass**
- Glass & concrete have been a foundational innovation to humankind, **not just for what it is, but for what it has enabled us to do** (to make further leaps in technology & better our way of life)
- Glass has enabled **major leaps in science and society**, from telescopes and microscopes to greenhouses and glasses
- The **internet is built on glass** — optical fibers are strands of melted sand transmitting data
- **More recently we have learned how to turn sand into silicon chips!**
- Without glass (silicon chips), we would not be able to make the **brains of the most advanced computers and smartphones**
- This process starts with **coal-fueled furnaces** that convert quartz into metallurgical silicon
- **Mineral exploration combined with R&D has made all this possible, from sand!**

Imagine what humans are capable, if we spent this much focus on each of the elements…

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What is Mineral Exploration?

Mineral exploration is the process of searching for and evaluating mineral resources to determine their location, quality, and quantity. It is **crucial for identifying new mineral deposits** that can be mined for economic use.

Initial Research (Project Generation)
Review geological maps, satellite imagery & mining records to identify prospective areas

Field Work
Geological mapping, soil sampling, and geophysical surveys to collect data on the types of rocks and minerals present

Geochemical & Geophysical Techniques
Analyze samples and measure earth properties to detect valuable minerals

Drilling
Collect subsurface samples to test the target. If mineralization is intersected, assess size and grade of the deposit

Analysis & Evaluation (Resource Estimation)
Analyzation and collection of further data (such as metallurgy) to assess viability and if promising, definition of a mineral resource

Did You Know?
A new discovery is typically found by the 3rd, 4th, 5th, 6th, 7th.... explorer (more data increases the odds of discovery)

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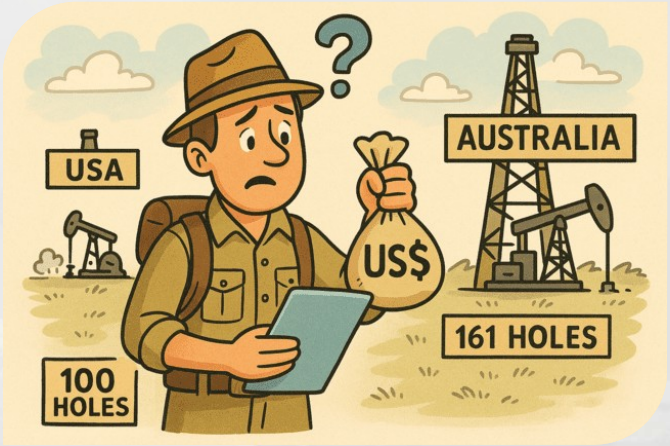
What Influences Mineral Exploration?

- **Geological setting**
- **Available data** (historical, surface, airborne)
- **Economic factors**
  - Commodity prices
  - Exchange rates
  - Market demand/supply
  - Cost of Exploration (including drill rates, labor rates)
- **Technological advancements**
- **Access to capital/funds**
- **Political & Regulator Factors**
  - Government policies & regulations
  - Mineral ownership & access
  - Trade & Geopolitical factors
  - National security
  - Mineral withdrawals/restrictions
- **Clear permitting pathways**
- **Environmental & Social Factors**
  - Environmental impact
  - Community & indigenous concerns
- **Access and infrastructure**
- **Corporate & Investment Decisions**
  - Corporate strategy (i.e. Company decides to exit coal, or the USA, from their portfolio)
- **Risk & Uncertainty**

A strong USD hurts U.S. mineral exploration

USD = 1, AUD = 0.62



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Typically, high commodity price = exploration boom/incentive

Why is this not happening in the USA in 2025?

- **Gold Exploration in the USA**: Despite gold's high price (> $3,300), there's little increase in gold exploration, because acquiring known resources is cheaper than discovering new ones!
- **USA Exploration Struggles**: The US gold exploration sector is facing tight funding due to broader market uncertainty and high costs
- **Gold & Silver Performance**: Gold has reached record highs, driven by its safe-haven appeal amid uncertainty and higher bank demand
- **Uncertain Outlook**: Future metal prices depend on economic growth, geopolitical tensions, and the energy transition. In 2025, metal prices have varied due to global economic and geopolitical factors
- **M&A Activity**: There may be a need for mergers and acquisitions to close the gap between known and new gold reserves
- **Australia's Gold Boom**: Australia's current gold boom is driven by a weak Aussie dollar, pushing prices to around AUD$5,000 per ounce

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Source: Bloomberg, US Global Investors

Who Explores and Who Invests?

- **Historically, governments, the World Bank and major mining companies** funded most mineral exploration
- **In the late 1990s** numerous governments and mining companies reduced their exploration budgets and downsized teams during a prolonged period of recession
- This led to the **rise of junior exploration companies**, typically funded through public markets—high-risk, high-reward ventures. Today, **there are over 1500 junior exploration Companies globally** (most have <$1 mil cash)
- **Significant discoveries** by juniors are often acquired or advanced by major mining companies
- **Over the past 30 years**, the rate of new discoveries has declined, due to reduced exploration investment & because most new deposits are under cover and deeper (more costly to find)
- **Exploration investor returns have suffered**, with fewer profitable new discoveries
- As a result, **junior companies face increasing challenges in raising capital** for new high-risk exploration programs
- The value of **new discoveries that turn into mines has a ripple effect** of immense wealth creation
- Creating **government funding initiatives** to advance exploration **will be vital for success**
- Current **technologies could unlock more potential** and reverse three decades of decline **with increased exploration funding and legislative support**

Despite the recent U.S. critical mineral government grants…
ZERO funds were available in the USA for mineral exploration!

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Think Global-Act Local: It's a Global & Competitive Industry

- **Global Interdependence**: Mineral exploration, mining, and downstream processing rely on a complex international network of countries for technology, machinery, and intellectual property
- **International Stock Exchange Listings**:
  - Most mineral exploration companies are listed on reputable exchanges, such as the **Australian Stock Exchange** (ASX) and **Toronto Stock Exchange Venture** (TSXV)
  - These exchanges operate under established frameworks **(JORC & NI 43-101)** that allow junior speculative stocks to trade securely
  - **Opportunity in the USA**: The USA lacks a similar junior exchange framework for penny stocks, presenting a potential growth opportunity
- **Funding from Global Markets**:
  - Mineral exploration companies with assets in the USA typically secure most of the **exploration funding from international investors**, particularly from **Australia, Canada,** UK, and Germany (largely due to where the Company stock exchanges are located)

Market volatility is the biggest risk to mineral exploration

"When elephants fight, the grass gets squashed" – African proverb

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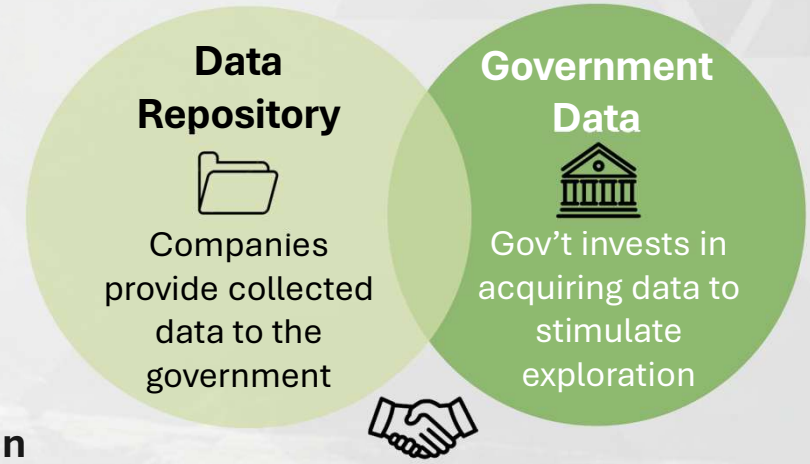
DATA DATA DATA

The engine driving modern mineral exploration

- **The U.S. is severely lacking in geological data**
- **Data drives discovery** — the more we collect, the more we find
- Most countries **require annual data submissions** from explorers
- Data repositories **save billions of dollars** by avoiding duplicate drilling and unnecessary environmental impact
- The U.S. already tracks ground disturbance — we could **link data submission to ground disturbance approvals**
- A simple **lease amendment on BLM mining claims** regulations could enable this data requirement
- BUT… we would **need a governing body** such as a reinstated Bureau of Mines to manage it…
- **Industry collaboration is lacking** with the US government (probably because we do not have a Bureau of Mines!)

The USA's **Earth MRI is a positive start, however that still pales in comparison to most African nations'** government data available

U.S. Lacks in Two Types of Data



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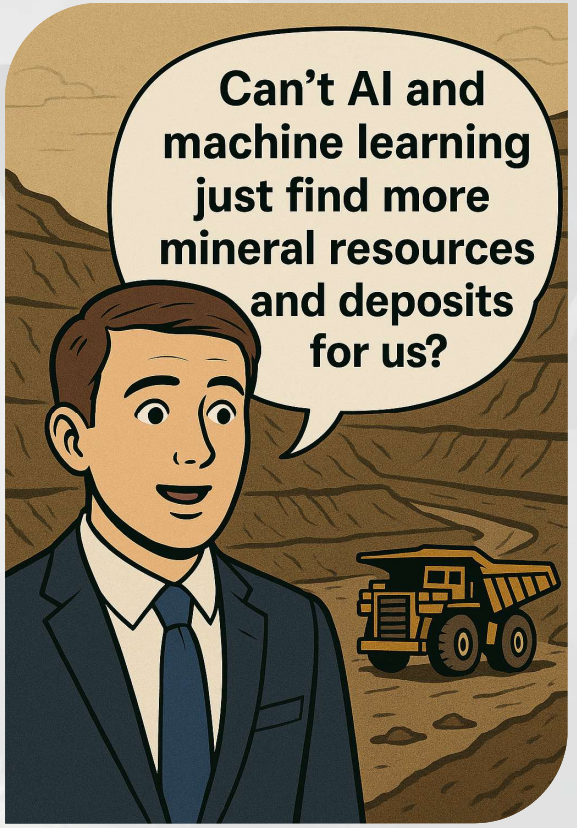
Machine Learning/AI and Mineral Resource Estimation

- There is growing interest in applying **machine learning and AI** to define new mineral resources
- **Conceptual targets** can be outlined without drilling, but must be **clearly distinguished** from Resources, Deposits and Reserves and appropriately qualified
- Machine learning has been applied in exploration since the **1980s** using a combination of **surface and airborne datasets and drill data**
- **Geology is as much an art as a science** – machine learning **cannot replace drill testing;** however, it can assist in defining drill hole locations
- Machine learning is only as effective as the **quality and completeness of the data** it receives
- The **U.S. lacks a centralized, robust critical mineral data repository**
- **Data collection and centralization** is a necessary **first step** before effective deployment of machine learning in mineral discovery
- These tools can **support geological interpretation**, but their **success is unmeasurable without drill hole validation**
- Under professional reporting standards, **no Competent Person** would sign off on a **Mineral Resource or Deposit estimate without drill hole data**



Machine learning/AI can aid with drill hole positioning; however, drilling remains the only method for defining new mineral resource discoveries

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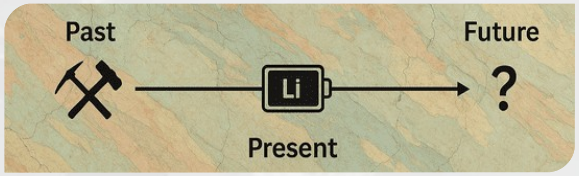
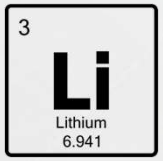
Exploration: Past-Present-Future?

- **Up until the 1980s, the USA was in pole position** for mineral exploration, processing, and mining
- **Today, the USA is trailing behind most developing countries**
- Within our shores is a vast wealth of minerals and prospective geology **that we have not yet even explored for yet!**
- We were not looking for lithium 20 years ago, because there was no market for it!
- What's "hot" today doesn't dictate what we'll explore in the future





What we're exploring now may not even be on our radar screen 50 years from now

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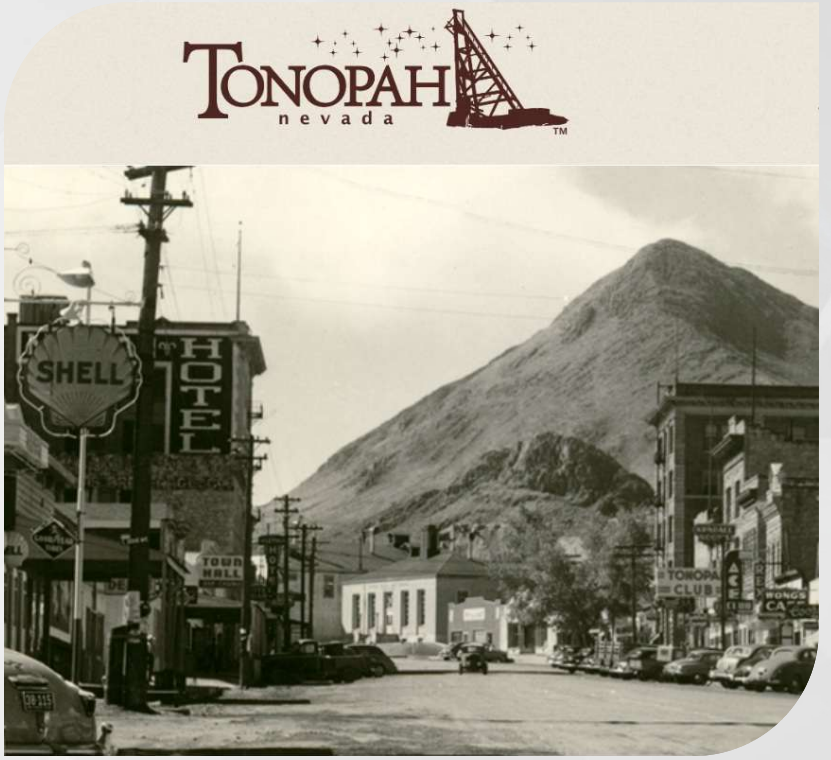
Tonopah, Nevada: Lithium Example

- Tonopah has been mined and intensely explored for over 100 years, and the town revolves around mining
- Despite this intense geological focus, lithium was not even on the map in Tonopah. In **2019, Li was discovered outcropping by a project generator**/prospector (not the government, not a mining company, not even a geologist!)
- Tonopah contains **a lot** of lithium mineralization hosted in claystones. Yet geologists had literally walked over it AND drilled through it (but not analyzed for Li) for 125 years!
- Since 2019, at least **5 new public lithium clay deposits have been discovered in Tonopah, defining >48 million tonnes of LCE** (Combined Resources: TLC, Tonopah Flats, Horizon Lithium, Lone Mountain, West Tonopah)
- **There are so many more critical minerals in the USA to be found that aren't known about because they have never been explored for!**



The USA has been massively under explored for most 'critical minerals' and continues to lack the expenditure required to stimulate this sector

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Had there been more lithium exploration, would these U.S. lithium projects be the ones getting developed?

Thacker Pass was accidentally discovered while exploring for **mercury & uranium**

The "First Movers"		
	Thacker Pass	**Rhyolite Ridge**
Company/Owner	Lithium Americas	Ioneer Ltd.
CapEx (USD)	$2.93B	$1.5B
Year Discovered	1975	1980s
Gov't Funding (USD)	$2.26B	$996M
Average Grade (Li ppm)	2,230	1,739

Rhyolite Ridge was accidentally discovered while exploring for **gold & boron**

Why are these two deposits being developed?

- They were the **first two large-scale lithium clay deposits** discovered, **found by accident** while exploring for other commodities (when discovered, they were of no lithium value because the lithium price was low)
- Both projects have access to **significant government funding** covering most of the development costs
- **How much exploration + R&D did the government invest in lithium, prior to making a >$3 billion commitment?**

Are they the best lithium clay deposits in the USA?

- During the recent lithium price boom (2021-2022), **additional US lithium projects** have been discovered
- Many offer **higher grades** than the initial "first movers," e.g., **Surge Battery Metals,** with an average grade of **3,843 ppm Li**
- **Grade matters**: Higher grade usually means a **smaller operational/disturbance footprint** and **lower operating costs,** assuming other factors are equal
- **Without regional systematic exploration,** deposits may be developed into mines, which would not otherwise be...

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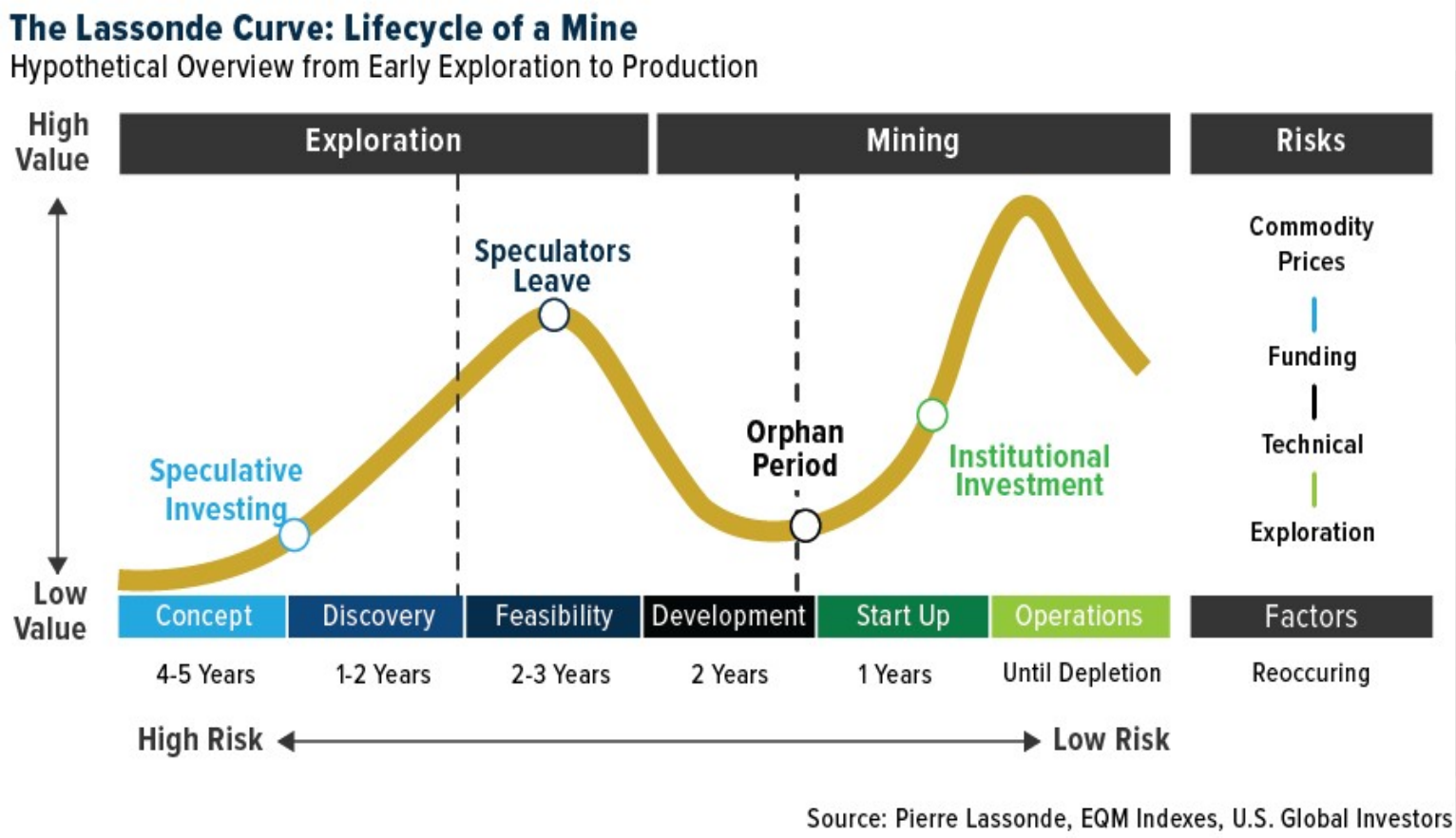
Life Cycle of a Mineral Discovery



- **99% of initial exploration drill programs** do not lead to an economic discovery (future mine)
- **For the 1% that does**, it takes **10-13 years** to move from discovery to production/mining
- **We can't simply "turn on" new mines**, because it begins with exploration which is currently barely happening in the USA!

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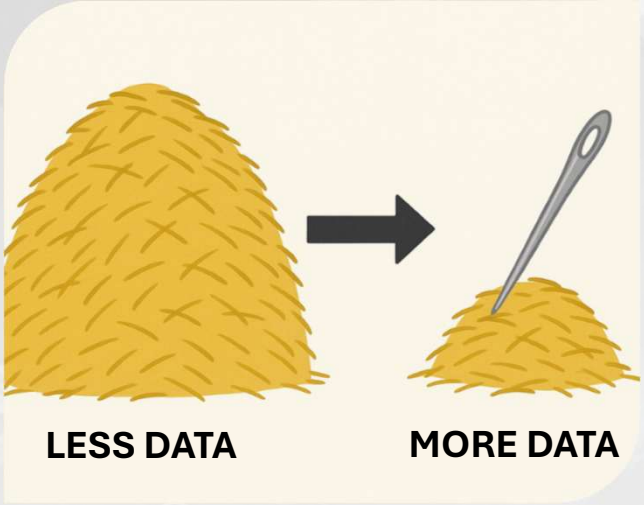
"Exploration doesn't just reveal new possibilities—it creates them."

The Future of Mineral Exploration is Under Cover



Exploration can be likened to searching for a 'needle in a haystack'

- With limited data, the challenge increases, leading to greater time, cost, and uncertainty
- With comprehensive data, the search becomes more efficient, and the needle is easier to find

Source: Visual Capitalist, *The Future of Gold Exploration is Under Cover*, June 2018.

- **>50% of the Earth's surface is under cover**
- **Most of that remains largely unexplored** or underexplored
- Huge potential lies in developing **innovative technologies** to explore these hidden areas
- **Recipe for success:**
  - Government-funded **Geophysics**
  - **Cost-effective methods** for testing targets
  - More drilling and R&D to create efficient drilling techniques to **directly sample covered bedrock**

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The Cost of Inaccessible Historical Data – Delker Project Example

Period	Company	Work Conducted	Estimated Cost to Re-Collect (US$)
1916-1917	-	Small-scale production/mining	-
1960s- early 1980s	Various small-scale exploration by individuals/juniors	Geochemical analysis and mapping	$400,000
1984-1993	Goldquest Inc	Geochemical analysis and mapping	$400,000
1988-1989	Pegasus Gold	21 RC (reverse circulation) drill holes	$800,000
1990-1991	Newmont (now Nevada Gold Mines)	Airborne magnetic & gravity surveys, 2 drill holes	$200,000
1996-1997	Battle Mountain Gold	Ground magnetics, IP (induced polarization), 4 RC drill holes	$500,000
2009-2018	Kinross Gold	29 drill holes	$1,000,000
2016-2018	Newmont (now Nevada Gold Mines)	Ground magnetics, gravity, IP, 5 core holes, baseline environmental studies	$ 4,000,000
		Total Estimated Re-Collection Cost	**$7,300,000**

Exploration work at Delker will cost > $7 million just to replicate what has already been done, due to the lack of accessible historical data

- Despite extensive historical work, **most of the previous data is inaccessible** today because the U.S. lacks a **government-mandated repository** for exploration data
- We now face the prospect of raising and **spending millions of dollars redoing work that has already been completed**
- We have actively engaged with **Newmont**, **Barrick,** and **NGM** to request access to the historical data, but with **no success to date**
- Delker clearly illustrates the **cost and inefficiency** caused by the absence of mandatory data submission
- This inefficiency is **costing the USA additional new mineral discoveries**

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Exploration Permitting 101 in the USA

In the USA, most exploration is conducted on BLM (Bureau of Land Management) lands:
Exploration consisting of **up to 5 acres of ground disturbance** may proceed under a **Notice of Intent (NOI)**. This is a relatively simple and rapid notification process that informs the agency of planned activities

All ground disturbances in the USA are bonded with the government (including those for exploration)

- Ground disturbance is required during exploration for the **creation of access roads and drill pads**
- **For disturbances over 5 acres on BLM land**, a **Plan of Operations** (PoO) is required
  This is a **comprehensive Environmental Assessment** that triggers additional baseline surveys and regulatory steps **(at a considerable cost and often taking several years):**
  - **Biological Surveys:** Assessments of local flora and fauna to understand potential impacts on ecosystems
  - **Cultural and archaeological resource surveys:** Evaluations of historical, indigenous, and archaeological resources to ensure awareness and preservation of cultural heritage
  - **Public consultation and environmental review** under NEPA (National Environmental Policy Act)

On U.S. Forest Service land (USFS):
A **Plan of Operations is typically required**, regardless of disturbance size.
USFS permitting processes is **more rigorous, expensive and time-consuming** than BLMs which **deters exploration** activities.

Most junior exploration companies can't raise funds to advance a PoO without first defining a mineral resource
(which often is not possible due to the 5 Acre NOI maximum)

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5-acre maximum disturbance restricts and impedes exploration

- The 5-acre limit restricts exploration **in the very areas that need it most**—remote sites without existing access
- This allowance is only practical **where roads and prior disturbance already exist**, not for **untouched terrain** where new discoveries are more likely

Can we increase the allowed 5 acre maximum to encourage more exploration?

- A full PoO is **unrealistic for Greenfields targets**, where funding rarely supports baseline studies before successful drilling results/resource definition
- Globally, PoO-level studies happen **after maiden resource definition**, not during early-stage exploration, where failure is common

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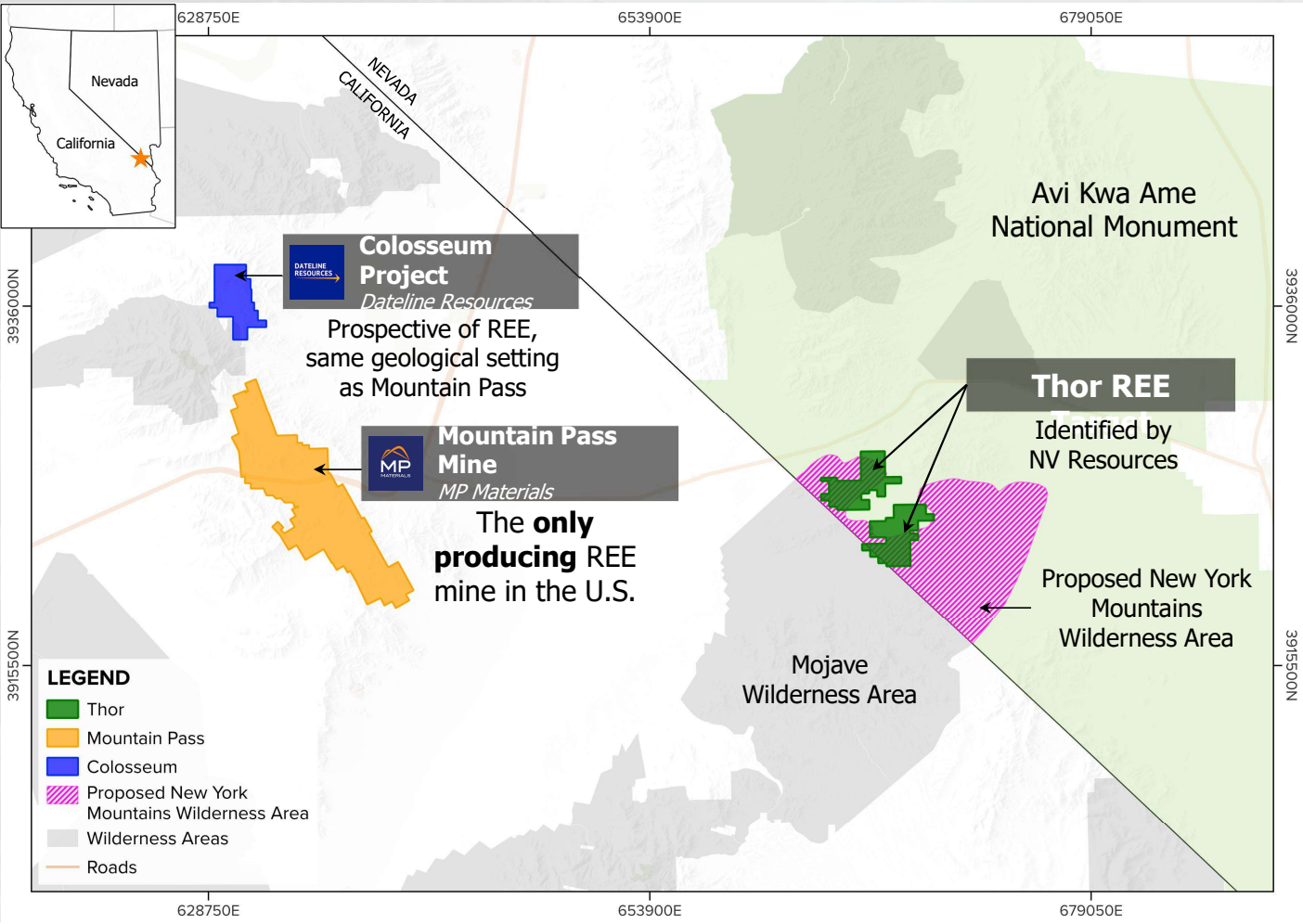
Access to Critical Mineral Projects - Blocked by Monument & Wilderness Designations



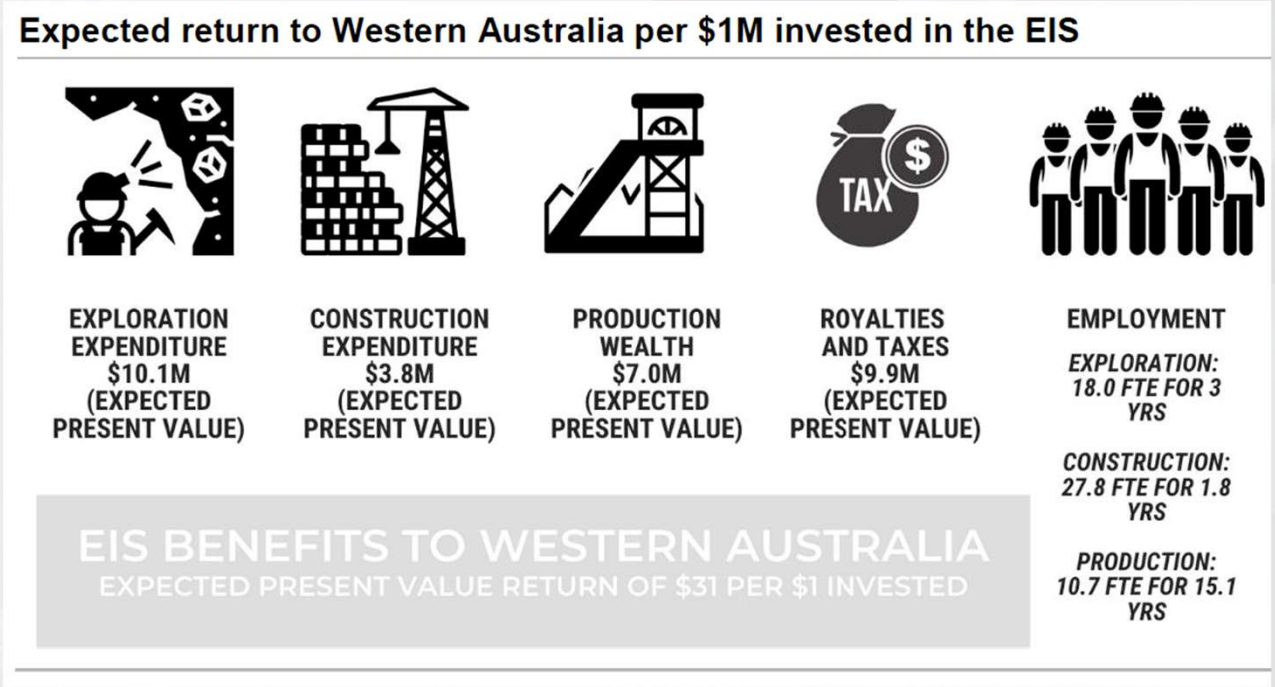
- **Thor Target** serves as a current, real-world example of a U.S. rare earth element (REE) target that may remain untested
- **2023 federal land withdrawals** have restricted access to highly prospective mineral targets
- **Avi Kwa Ame National Monument** was designated by President Biden, effectively closing the area to new mining claims
- The region also **overlaps with the proposed New York Mountain Wilderness** under the Southern Nevada Economic Development and Conservation Act (SNEDCA), which would introduce further land-use limitations
- These actions **block access to geologically favorable ground**, hindering the discovery of critical minerals and perpetuating the **under-exploration of U.S. resources**

Most inaccessible critical mineral targets (like this one) go undocumented

Exploration Incentive Scheme (EIS)

Government co-funding example from Western Australia

- **Early exploration is the hardest to fund, because it is the highest risk**
- **Government funding initiatives greatly assist in stimulating this sector, making new discoveries**
- EIS is government co-funding for exploration expenditure, matching dollar for dollar on approved exploration programs. This funding is viewed as an investment by the Australian Government
- **"Modelling found that $1 million of government investment in the EIS generates $25 million in additional private sector exploration activity"**



Source: The Exploration Incentive Scheme: An economic assessment of the impact of the Exploration Incentive Scheme: 10 years from 2009 to 2020 by JJ Fogarty, *The University of Western Australia*, Geological Survey of Western Australia, March 2021.

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Key Takeaways

- **What is currently being done to stimulate U.S. critical mineral exploration?**
- The U.S. is not lacking in **favorable geology** or **critical mineral deposits**. It is lacking in the **exploration** required to find those deposits (*e.g., Tonopah Li*)
- Countries with the most critical mineral deposits have the right geology (as does the U.S.), but have generally invested significantly more in **acquiring geological data** and **exploring** for those deposits
- **Funding exploration** is difficult due to high risk. **Government stimulus** (e.g., **EIS**, **flow-through**) is often required to keep the sector alive during the 'down' times and to ensure the best deposits are discovered & developed!
- **Data mining (project generation)** is the first step in finding new deposits
- The U.S. does not have a **mandatory data repository** which impedes exploration for new discoveries. **Modern regional government datasets** are also lacking
- This is all **fixable** with increased **government funding** to acquire **new data** (faster and better than current efforts) and a **publicly available mandatory national data repository**
- A **dedicated government body**, such as the **Bureau of Mines**, is needed to drive **research and development** that supports **critical mineral discoveries**, beginning with improved **data collection/repository**
- Increasing the current **NOI allowable disturbance** would significantly help most exploration projects
- **Exploration, feasibility studies** and **mine permitting** take a lot of time **(>10 years)** and should be commenced long before there is a shortage of a commodity!

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What Can Be Done To Improve Mineral Exploration in the USA?

Attract exploration funding via **flow-through schemes and co-funded govt. programs** (e.g., Australia, Canada), Create a **US junior/penny stock exchange**

Reset the narrative - raise adult awareness about mining's vital role and illustrate it is no longer a 'dirty industry' (via TV, radio, and online ads)
– This is paid for by the government in numerous countries

Government-funded data acquisition like airborne surveys for explorers geared toward exploration

Invest in R&D
- Undercover exploration
- Low-grade ore extraction
- Low-impact mining methods

Educate youth on mining's importance in daily life through schools and gov't-funded apps

Reinstate the Bureau of Mines or establish a similar agency to stimulate and support the resources sector

Create a data repository: Require data submissions & centralize data for mining claims on BLM and National Forest lands

Permitting reform:
- Streamline permitting and add timelines/deadlines
- Expand 5-acre Notices of Intent
- Link permitting to project stages

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Questions?

"Every breakthrough begins with exploration."

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Western Australia - Key Legislative Instruments for reference

Below are links to key legislative instruments and guidelines governing mineral exploration reporting and data submission in Western Australia:

1. Mineral Exploration Reporting System
https://wamex.dmp.wa.gov.au/Wamex

2. Mining Act 1978 (WA):
https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_a517.html

3. Mining Regulations 1981:
https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_s4643.html

4. Exploration Incentive Scheme (EIS) Co-Funding Program Guidelines:
Drilling https://www.wa.gov.au/media/87748/download?inline
Geophysics https://www.wa.gov.au/media/87692/download?inline
Analysis https://www.wa.gov.au/media/87702/download?inline

5. Digital Data and Format Standards (GSWA publication):
https://www.wa.gov.au/organisation/geological-survey-of-western-australia/guidelines-publishing-gswa

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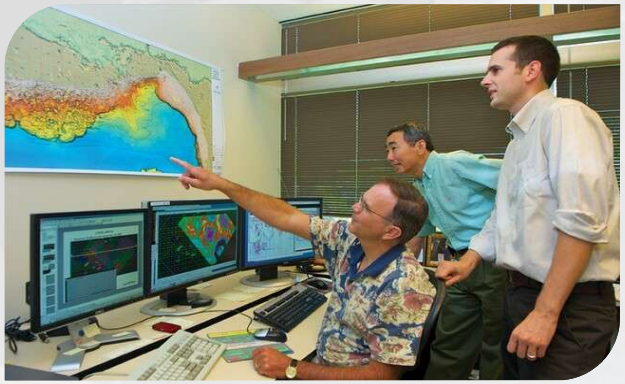
Mineral Exploration is High Risk & High Reward



Project Generation - Extreme Risk (>99% failure rate)

"Failure" presumes the project never becomes an operating mine

High Risk/
High Reward

Greenfields Exploration - High Risk (99% failure rate)

Resource Development – Medium Risk

Medium Risk/
Medium Reward

Brownfields Exploration – Lowest Risk

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Extraction Methods Influence Exploration

Open Pit Mining

Bingham Mine – Kennecott | Utah

Underground Mining

Lucky Friday Mine – Hecla Mining | Idaho

In-situ Leaching

Smith Ranch-Highland - Cameco Resources | Wyoming

Brine Mining

Silver Peak – Albermarle Corp | Nevada

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R&D Potential

Exploring innovative methods to enhance the efficiency, sustainability, and economic viability of mineral exploration, extraction and processing.

Opportunities For Regaining Mineral Dominance

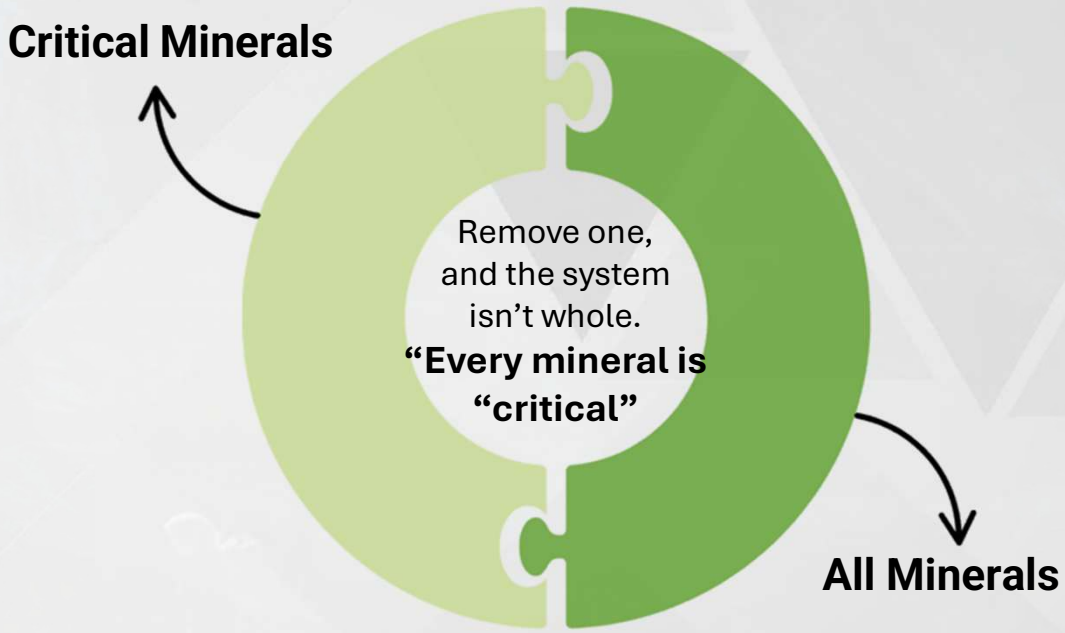
- Investing in new technologies and strategies to re-establish leadership in the global mineral supply

In-situ Leaching and Other Methods

- Low-impact mining techniques like in-situ leaching, offering a cleaner, more cost-effective solution

Beyond "Critical Minerals"

- I don't like the term *"critical minerals"* — all minerals are critical to our way of life.
- Current allies, may not always be



Most mineral metallurgical processes involve an interconnected web, for example, we don't have silicon chips or steel, without coal

Government-funded mineral R&D is an investment, one which has repeatedly paid off (e.g., modern Heap Leach technology)

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