House Committee on Natural Resources
Subcommittee on Energy & Mineral Resources
"Beneath the Surface: Earth MRI and America's Resource Potential"

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Introduction

Chairman Stauber, Ranking Member Ansari, and members of the Subcommittee: Thank you for the opportunity to testify on the Earth Mapping Resources Initiative (Earth MRI), and for recognizing that any effective domestic resource strategy must begin by understanding what resources exist in the United States.

My name is Dr. Elizabeth Holley. I am a Professor in the Mining Engineering Department at the Colorado School of Mines, where I lead an interdisciplinary research team focused on the responsible production of critical minerals—including new mines, byproduct recovery, mine waste, recycling, imports, and demand reduction. Our work across the U.S. consistently shows that viable mineral projects are those grounded in a rigorous, foundational understanding of the geological deposit. These data are essential whether you are a developer, community member, investor, or policymaker.

As this subcommittee has established, the United States faces a massive surge in demand for critical minerals to power our energy infrastructure, advanced technologies, and national defense. Against a backdrop of intense international competition and growing supply chain vulnerabilities, we are trying to solve a 21st-century crisis with incomplete knowledge of our own subsurface.

Without modern geological data, the private sector is inefficient in project development and investment. Crucially, this data gap also impacts people. Public data provide the trusted baseline transparency necessary for local communities to plan, evaluate impacts, and build the collaboration required for responsible project development. When these data are incomplete or lacking, our nation is forced to make multi-billion-dollar energy, economic, and security decisions that may not be the most strategic.

Earth MRI is changing this dynamic. It is more than a mapping program; it is a critical piece of public data infrastructure. By reducing geologic uncertainty, Earth MRI lowers financial risks for private investment while simultaneously empowering community-led decision-making and securing America's economic future.

Unlocking and Optimizing Critical Mineral Potential

My research at Colorado School of Mines provides a case study on why Earth MRI is essential and must be expanded.

Derisking Mineral Exploration

Part of my work is in greenfields and brownfields mineral exploration, including precious metals, base metals, and energy minerals. Prior to Earth MRI, only 20% of the U.S. had been mapped geologically, and even less geophysically. Earth MRI has rapidly increased these percentages, but the program has still only mapped a fraction of the U.S., meaning that we make decisions with only a fraction of the possible information.

Only about 1% of early-stage discoveries become a mine, and it costs the private sector a quarter to half a billion dollars to make a discovery that has a chance at commercial viability. Earth MRI should be central to the federal government's strategy to derisk mineral exploration. Other countries such as Canada, Australia, and Ireland have data sharing frameworks that leverage broad-scale federal datasets for public use, like Earth MRI, and then require finer-scale private sector data such as drilling information to be open-access. In Ireland, the Tellus program is a prime example of how public-private data sharing lowers exploration cost, encourages investment, and enables sustainable land management.

My team recently examined the U.S. potential to produce the battery minerals nickel, cobalt, lithium, graphite and manganese. For all five of these minerals, we found that the U.S. likely has enough, geologically, to be self-sufficient for the foreseeable future. But many of these geological resources will not become available, due to technical, legal, political, environmental and social constraints.

A more detailed understanding of the Earth's crust enables more discoveries – which then gives us more choice about how, where, and when to mine. Responsible stewardship relies on the scientific information provided by Earth MRI.

Optimizing National Strategy

I also work on developing high-level strategy for critical mineral supply. For each mineral, the U.S. can import, develop new mines, recover value from waste through byproduct recovery, mine waste reprocessing, or recycling, or reduce demand. Our work examines the optimal ratios of each supply pathway for each mineral, across the 60 elements and minerals that comprise our critical minerals list. The U.S. makes and breaks strategic alliances with other countries based on our mineral needs, without understanding what we have under our own feet.

Data collected by programs affiliated with Earth MRI, such as the National Mine Waste Inventory, or the Critical Minerals Mapping Initiative (CMMI), illustrate the importance of federal funding, as well as several persistent gaps that must be filled.

Unlocking our Mineral Potential

A year and a half ago, I was quantifying production of the 10 metals recovered from U.S. hard-rock mines on federal land, and I started wondering about the rest of the periodic table. Most of the 60 U.S. critical minerals are not produced in our country today. There is no comprehensive

federal dataset on the geochemistry of U.S. mines, meaning that we had no quantitative understanding of how much of our critical minerals list we are actively mining and throwing away.

There are some U.S. mines in the CMMI database that the U.S. shares with Canada and Australia. The database records the geochemistry of about 25,000 ore samples from all over the world. Representation of U.S. sites is very incomplete, meaning that for about half of our active mines, we do not even have geochemical data from a single rock. If we go back to all the 322 U.S. hard-rock mines that have produced metals since 1980, only 81 have multi-element geochemical data in CMMI, and for most of these sites the data are from just a handful of samples.

This is an egregious data sparsity problem that should be solved by expanding EarthMRI to include a National Ore Sampling Campaign to improve our understanding of what is already being mined, and a National Mill Sampling Campaign to determine what is being recovered and what is going into waste.

In the absence of this information, my team developed a statistical method that applies information from similar geological environments in the CMMI dataset to estimate what is being mined in the U.S. today. We determined that the U.S. could eliminate imports if we recovered everything that we mined, instead of allowing it to become waste that must be managed in perpetuity. If we recovered even 1% of all the elements that we mine, using byproduct recovery strategies, we would dramatically reduce our supply chain vulnerability.

We appreciate the House Natural Resources Committee's recognition of this potential and your bipartisan work to better understand the barriers to recovering critical minerals as byproducts during mining projects on public lands. One of these barriers is a lack of mineralogical information on how each element is hosted in the rock itself. If the U.S. systematically acquired these data as part of a National Mill Sampling Campaign, institutions like Colorado School of Mines and our industry partners could develop flowsheets to recover those elements, and we could direct federal investment into the infrastructure and sites that are the lowest risk pathways to secure our mineral supply.

We are nearing publication of research that expands our byproduct study to the 322 hard-rock sites where the U.S. has mined metals since 1980. Our data show that if the U.S. reprocessed even a small fraction of our accumulated mine wastes from the past, we could supply the world.

The National Mine Waste Inventory is a nascent effort by the USGS that will ultimately provide site-specific volumes and geochemistry on active and legacy mine waste, if the federal-state partnerships continue to be funded to provide the data. I hope that in ten years these data are in place, improving upon my statistical estimations. With robust data from Earth MRI and related programs, we can better identify and characterize these secondary resources with precision, develop new extraction and processing technologies, and transform environmental liabilities into domestic supply assets.

Collaboration

The success of Earth MRI relies on strong partnerships with state geological surveys, industry, academia, and local communities. These partnerships include institutions like Colorado School of Mines, where we have enjoyed a long-standing collaboration with the USGS.

Next year, our partnership will enter an exciting new chapter with the launch of the new USGS Energy and Minerals Research Facility (EMRF) on the Mines campus. Powered by collaboration—including a close relationship with Colorado's own State Geological Survey—and fueled by Earth MRI data, this facility provides a space where USGS scientists, Mines faculty and students, and industry leaders can work together in real time. Together, we will use Earth MRI data to drive innovation, as well as to develop and deploy advanced technologies.

A great example of this collaborative ecosystem in action is CASERM (the Center to Advance the Science of Exploration to Reclamation in Mining), led jointly by Colorado School of Mines and Virginia Tech. As an industry-university cooperative research center where the USGS is a core member, CASERM directly leverages Earth MRI. The program does not just provide foundational data; it actively empowers our students to transform raw datasets into predictive geological models. This advances exploration innovation while simultaneously training the next generation of the American minerals workforce.

Conclusion

I appreciate that this committee holds diverse perspectives on what constitutes an effective critical mineral strategy. Whether your priority is opening new domestic mines, recovering more from what we mine, reprocessing mine waste, or expanding recycling, each of these mineral sources are part of the solution. Developing and optimizing this strategy requires high-quality, modern data to succeed.

By investing in Earth MRI, Congress is funding the foundational public data infrastructure that reduces investment risks for industry, ensures transparency for local communities, and gives our nation strategic clarity.

With your continued support, a collaborative ecosystem, including Colorado School of Mines and the next generation of the American workforce, stands ready to translate these into practical solutions. Thank you, and I look forward to your questions.