



**Taller:**  
**El Rol de los Servicios Geológicos en la **Transición**  
Ecológica y Energética**

**Reflexión sobre **transiciones****

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Asociación de Servicios de Geología y Minería Iberoamericanos - XXIX Asamblea General

Hidalgo, Mexico – 10 abril 2024

# SERVICIO GEOLÓGICO DE EE.UU. (USGS)

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- Establecido en 1879
- La agencia científica para el Departamento del Interior
- Casa central en Reston, Virginia
- 7 regiones, 400+ oficinas
- 10,000+ empleados
- **MISIÓN:** *Monitorear, analizar y predecir las interacciones complejas entre sistemas humanos y naturales de la Tierra y entregar información accionable en escalas y períodos de tiempo relevantes a los tomadores de decisiones.*

# U.S. Geological Survey

## MISION

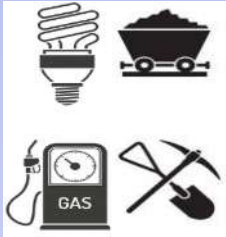
- Monitorear, analizar y predecir las interacciones actuales y en la evolución de las interacciones del sistema Terrestre
- Entregar información accionable a escalas y plazos relevantes para los tomadores de decisiones

# El Servicio Geológico de EE.UU. (USGS)



## Recursos Hídricos

- Agua superficial
- Agua subterránea
- Calidad del agua
- Represas y embalses



## Energía y Minerales

- Petróleo y gas
- Minerales críticos
- Residuos mineros
- Generación/almacenamiento de energía

## Peligros Naturales

- Volcanes
- Terremotos
- Deslizamientos
- Inundaciones
- Amenazas costeras



## Ecosistemas

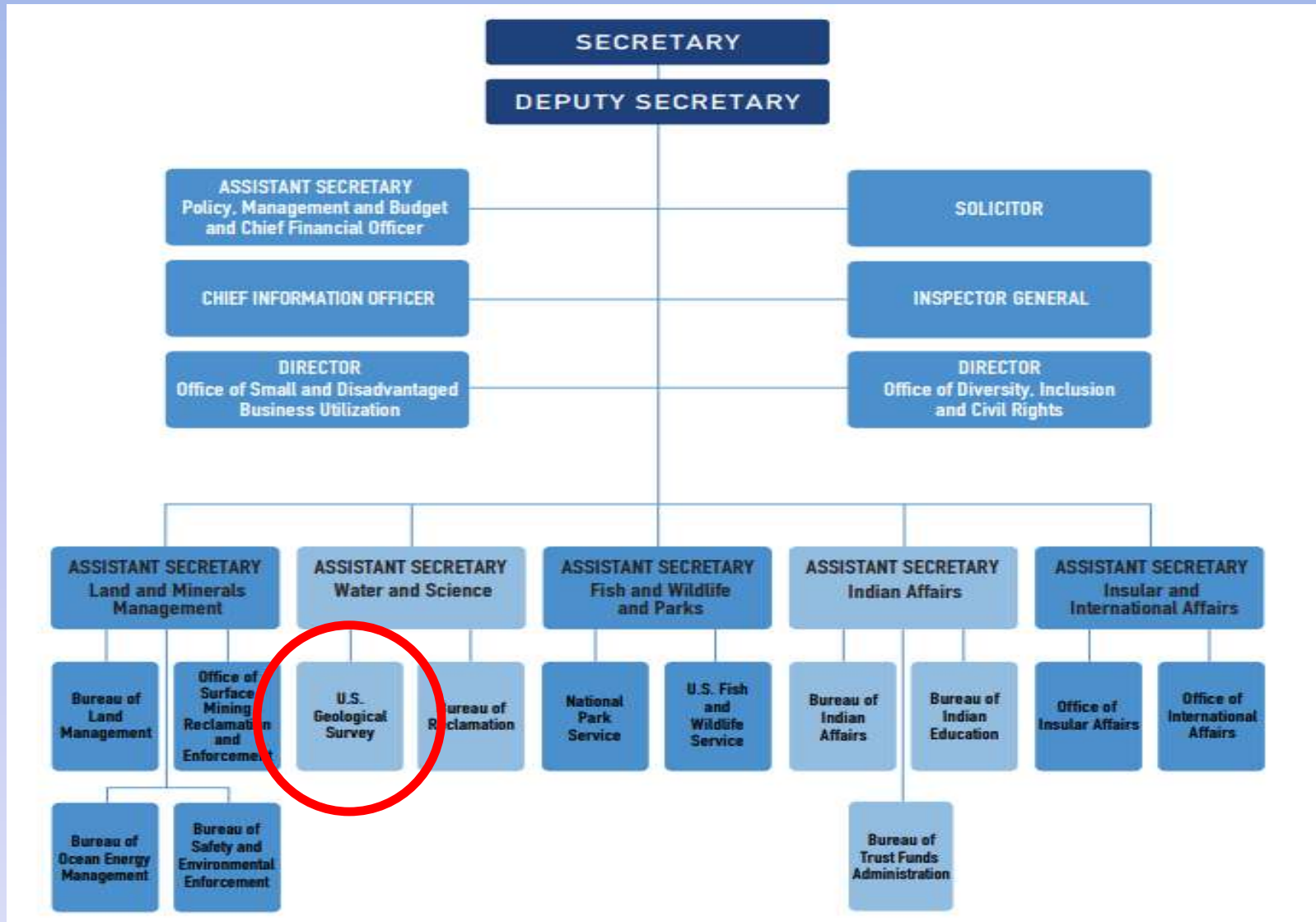
- Cambio climático
- Biodiversidad
- Hábitats y enfermedades de peces y vida silvestre
- Especies invasoras y zoonosis
- Incendios forestales



## Sistemas/Datos Geo-Espaciales

- Cartografía geográfica y geológica
- Programa Landsat
- Ciencia del cambio de la tierra
- Programa Geoespacial Nacional (Mapas 3DEP y LIDAR)
- Compilación, archivo y entrega de datos

# DEPARTAMENTO DEL INTERIOR DE EE.UU.





# DEPARTAMENTO DEL INTERIOR DE EE.UU.

480 million  
acres of public lands for access

532 million  
visitors to DOI lands and waters in 2021

17  
States in the west  
with managed and  
supplied water

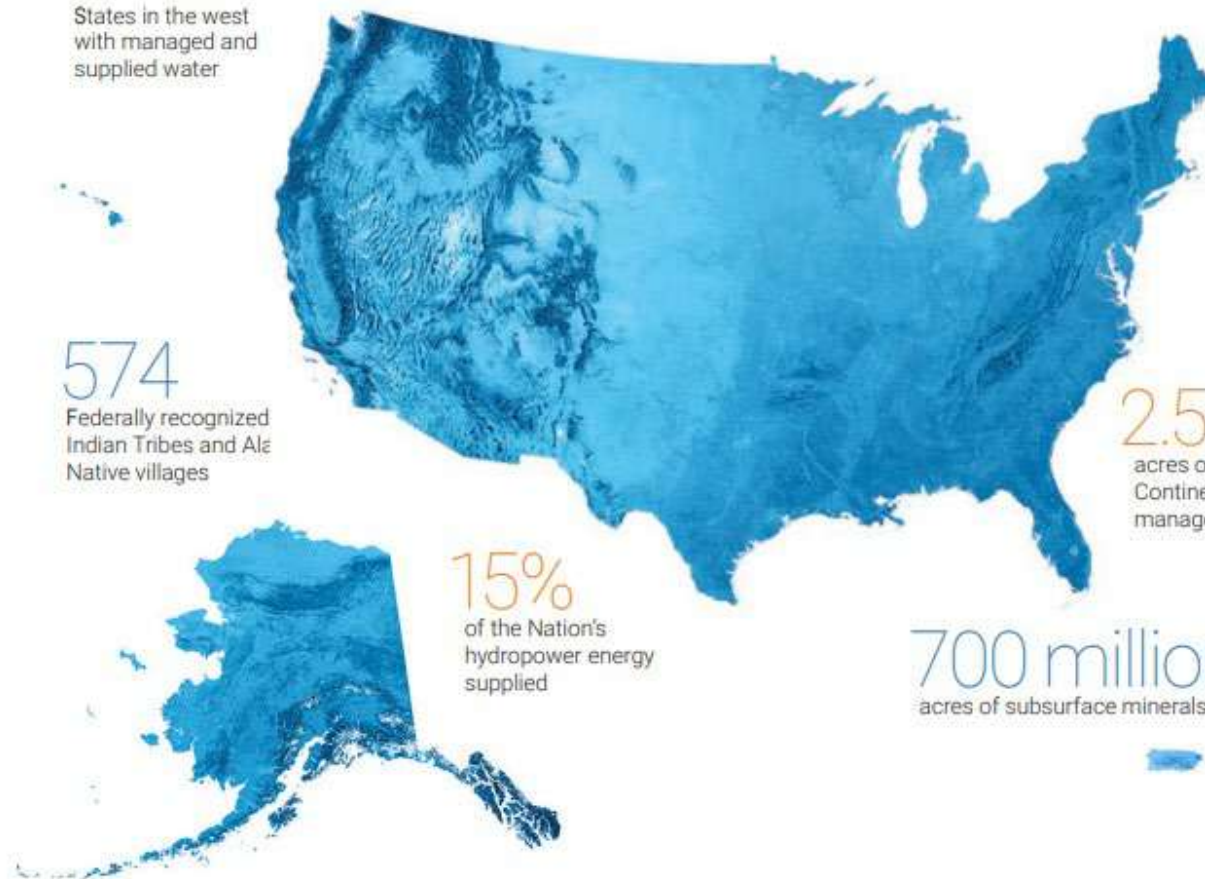
20%  
of the Nation's land stewarded

574  
Federally recognized  
Indian Tribes and Ale  
Native villages

2.5 billion  
acres of the Outer  
Continental Shelf  
managed

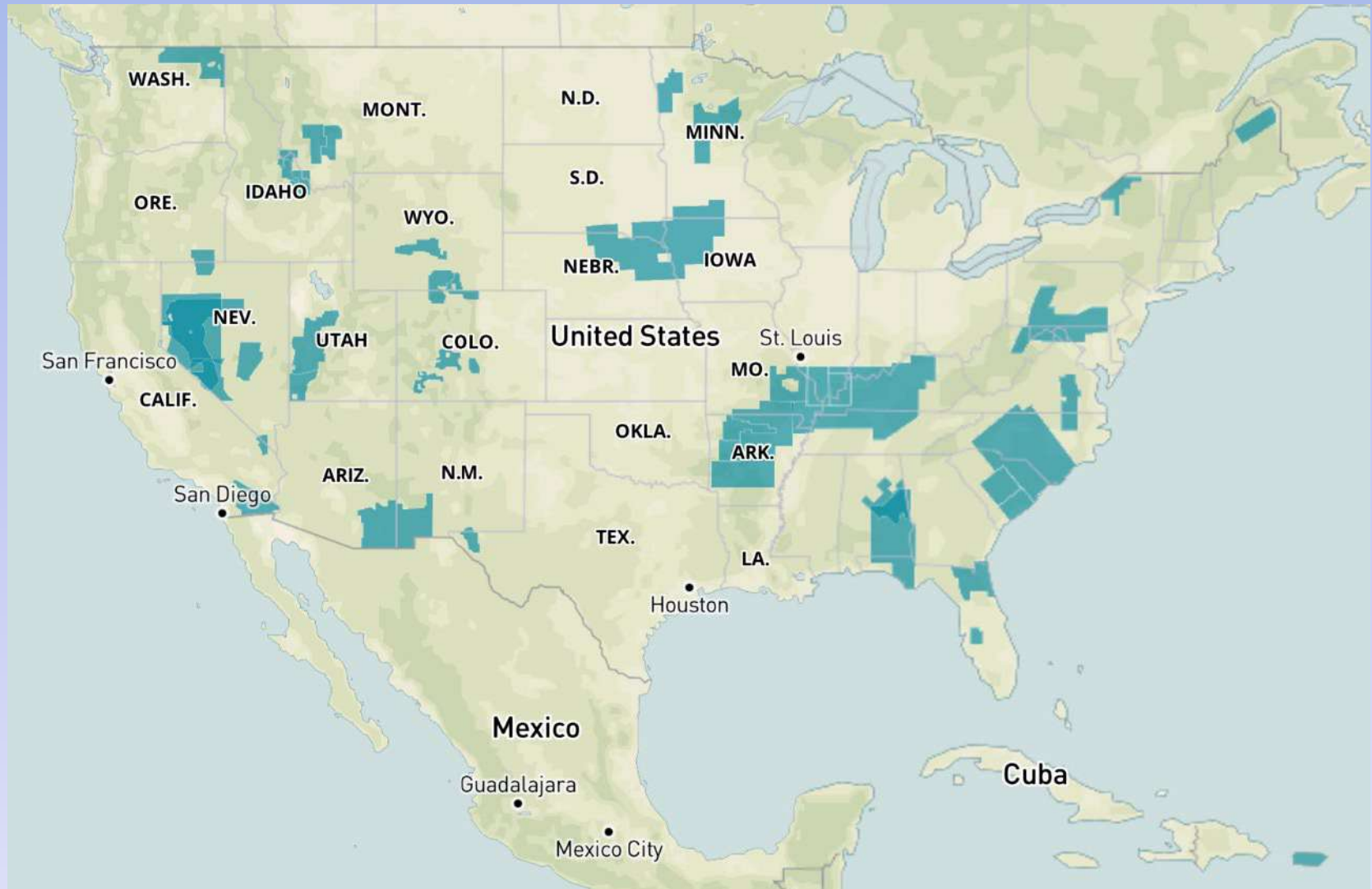
15%  
of the Nation's  
hydropower energy  
supplied

700 million  
acres of subsurface minerals managed





# Earth MRI geophysical surveys



# Critical minerals for the green economy

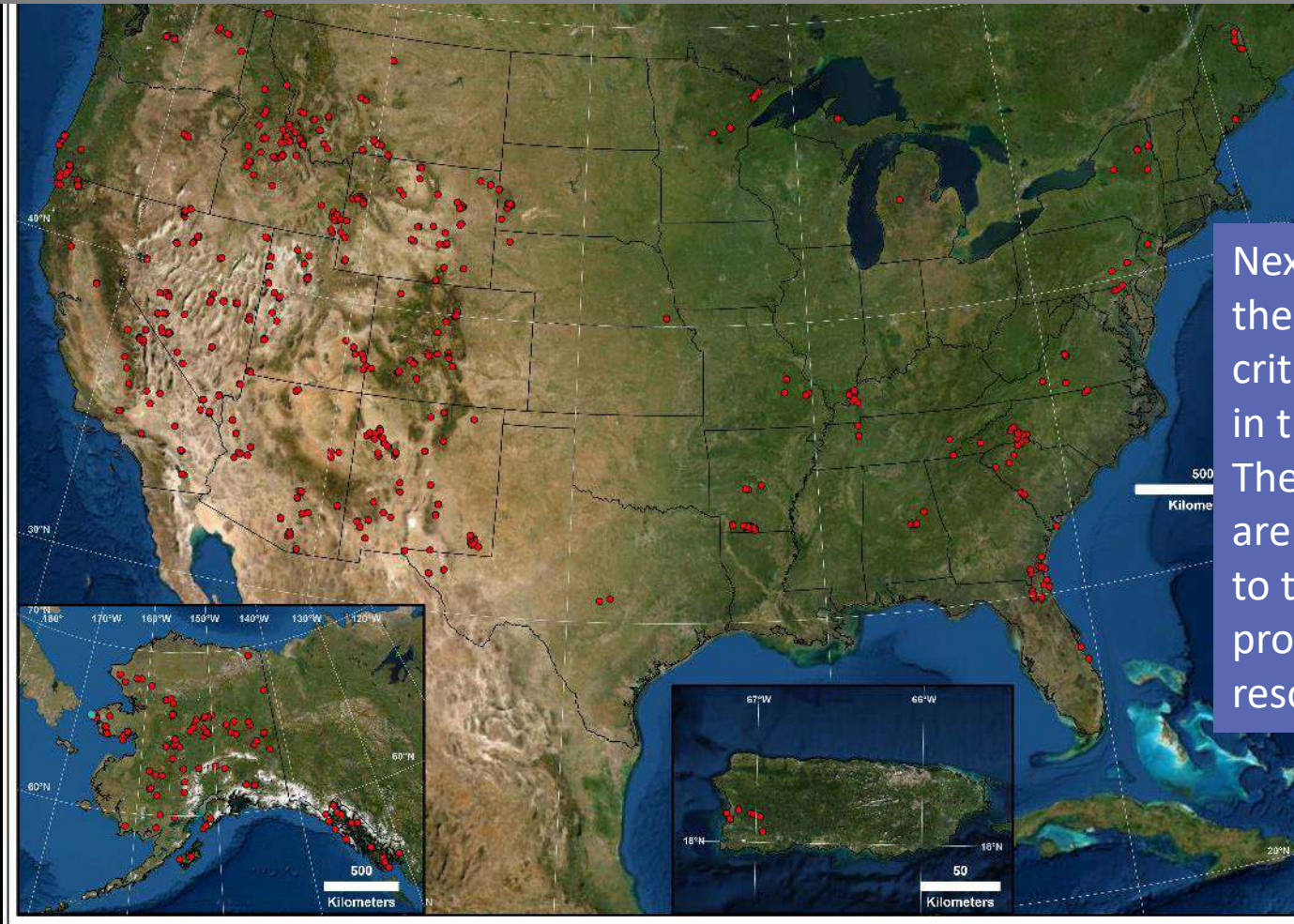
Products	Byproducts
Aluminum	Antimony
Graphite	Arsenic
Lithium	Cobalt
Manganese	Gallium
Nickel	Germánium
Rare earth elements	Indium
Uranium	Tellurium
Zinc	

Published
In Review
In Progress

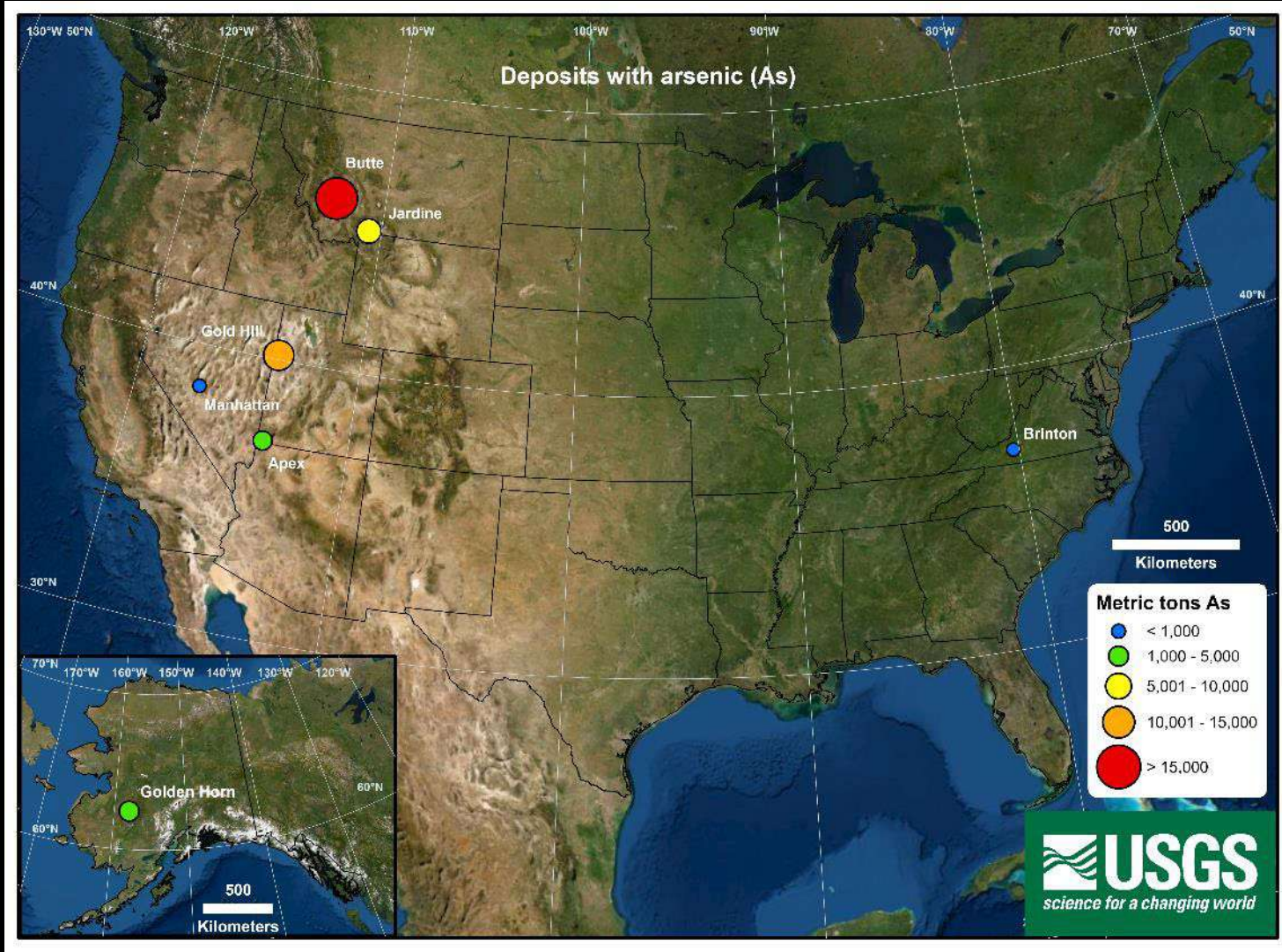


## Critical mineral sites (~650) added to the USMIN database since May 2017

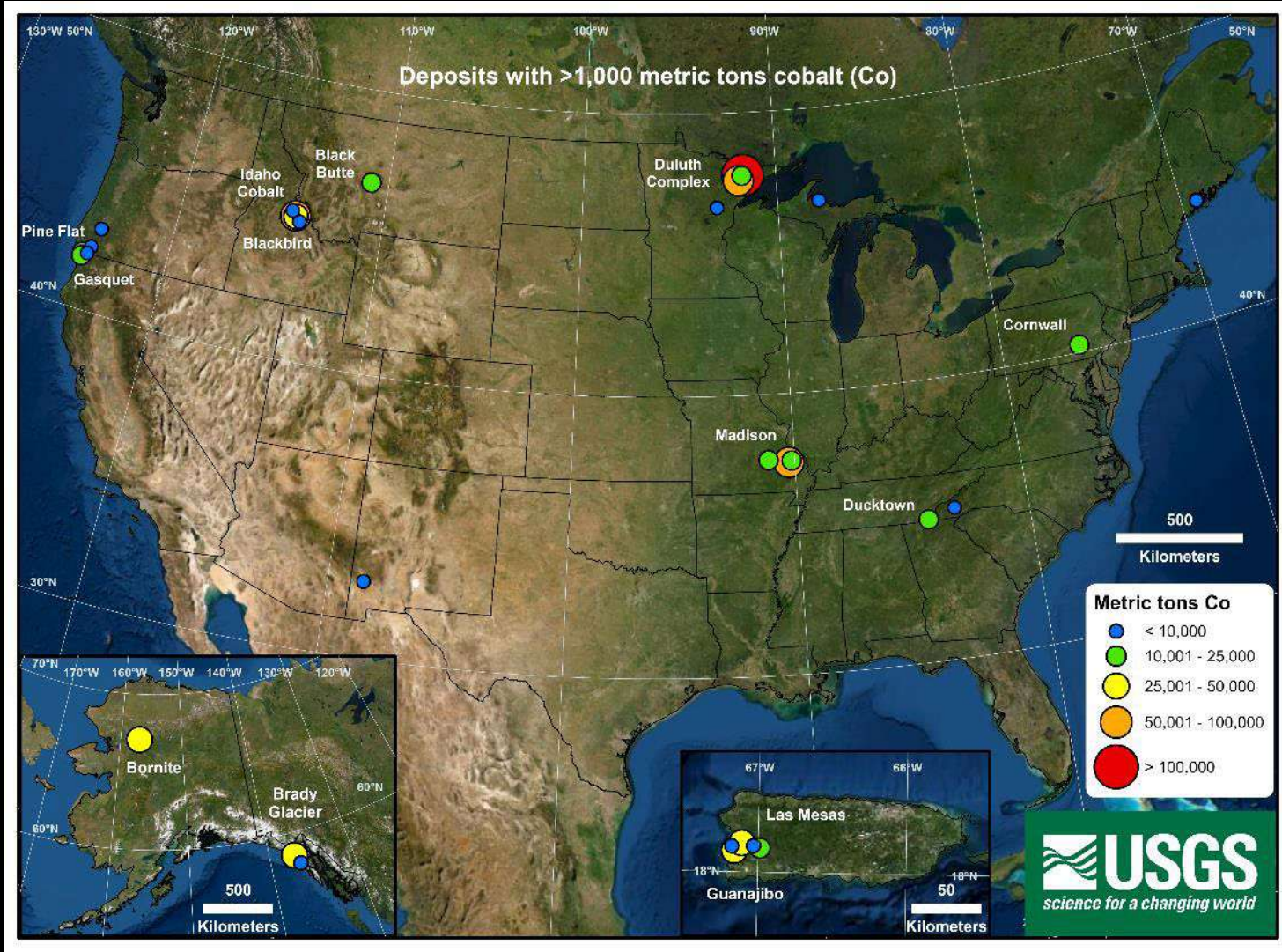


Next slides show the locations of critical minerals in the U.S. The bubble sizes are proportional to the total production + resources

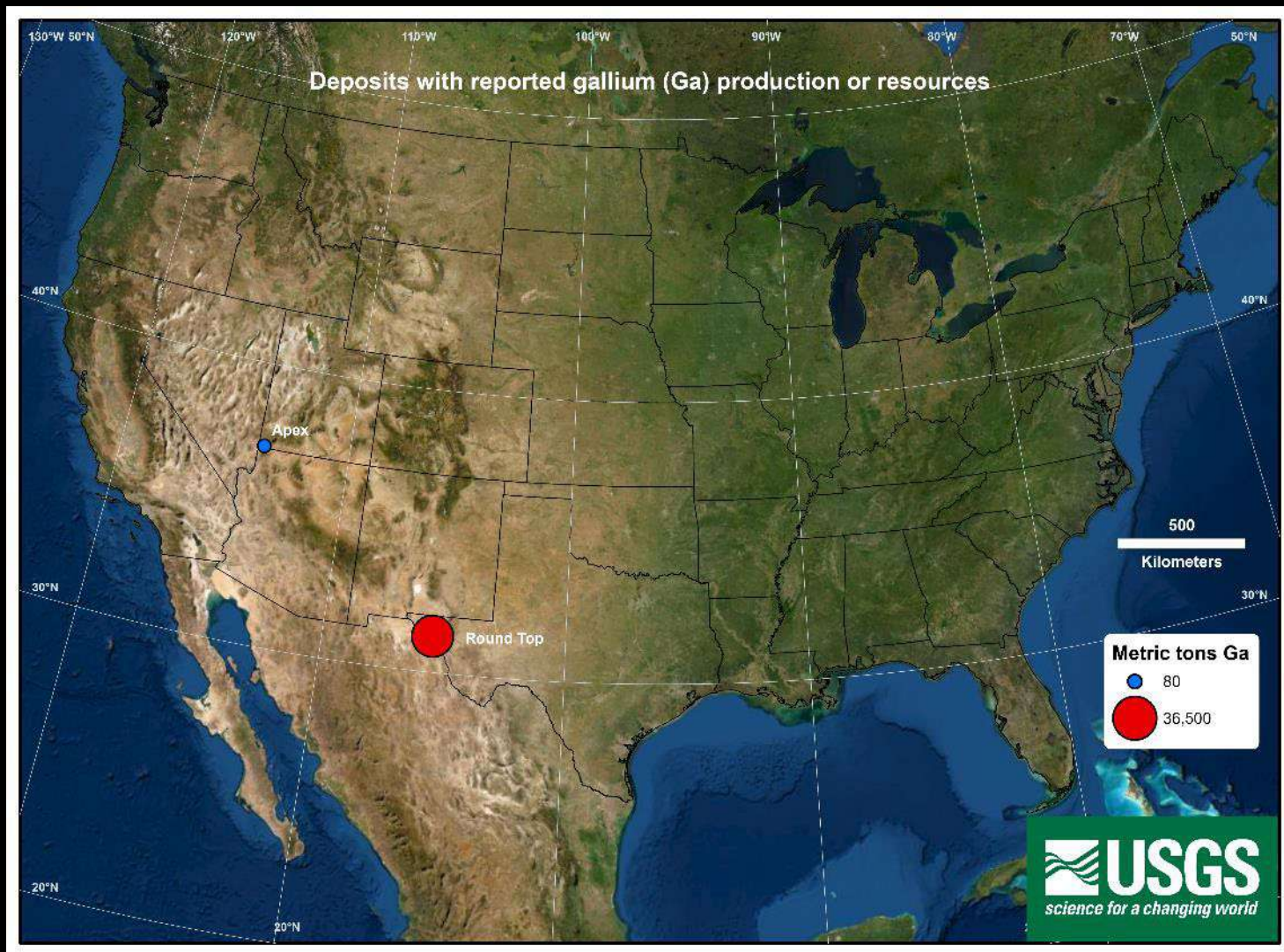




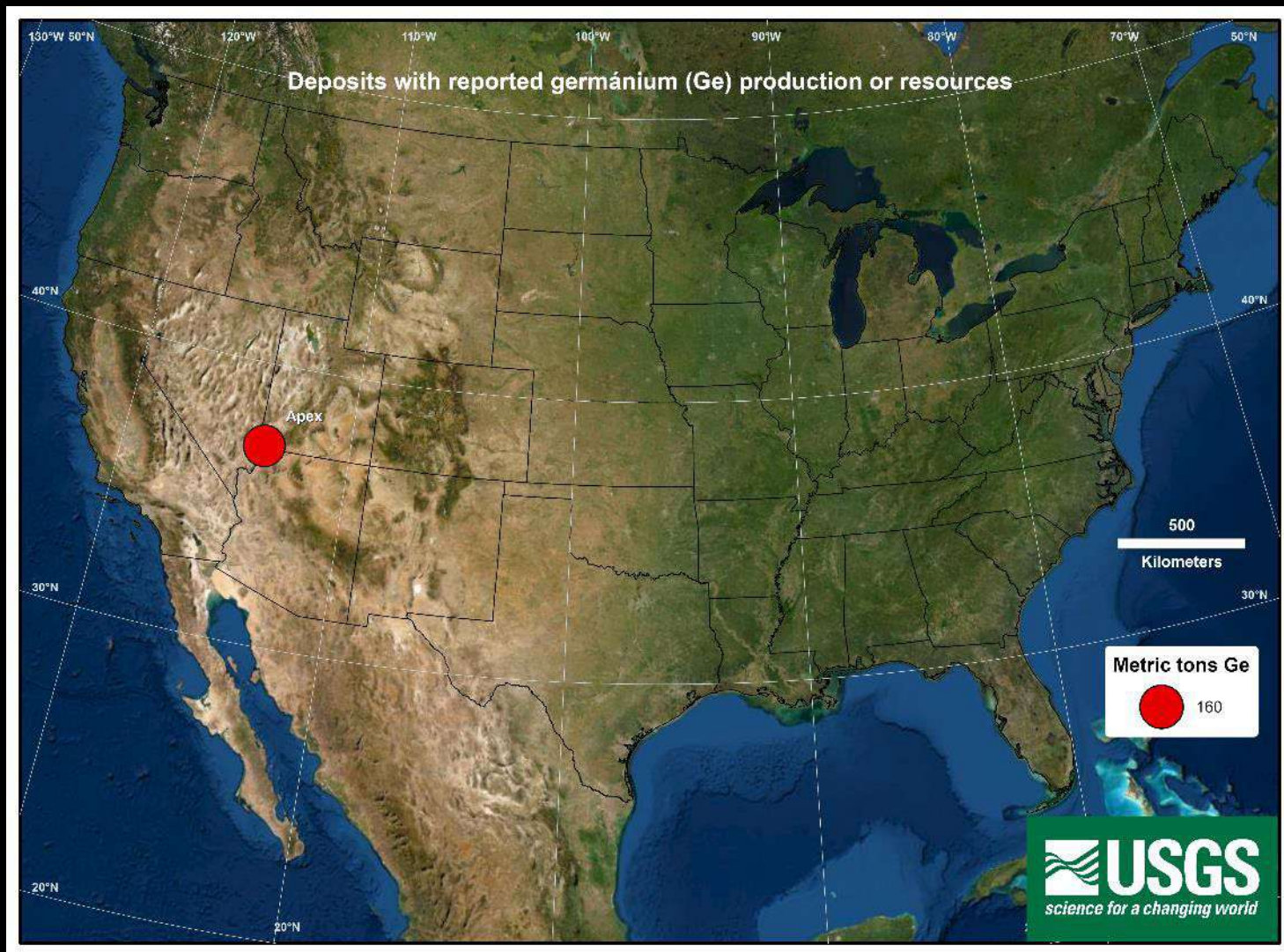




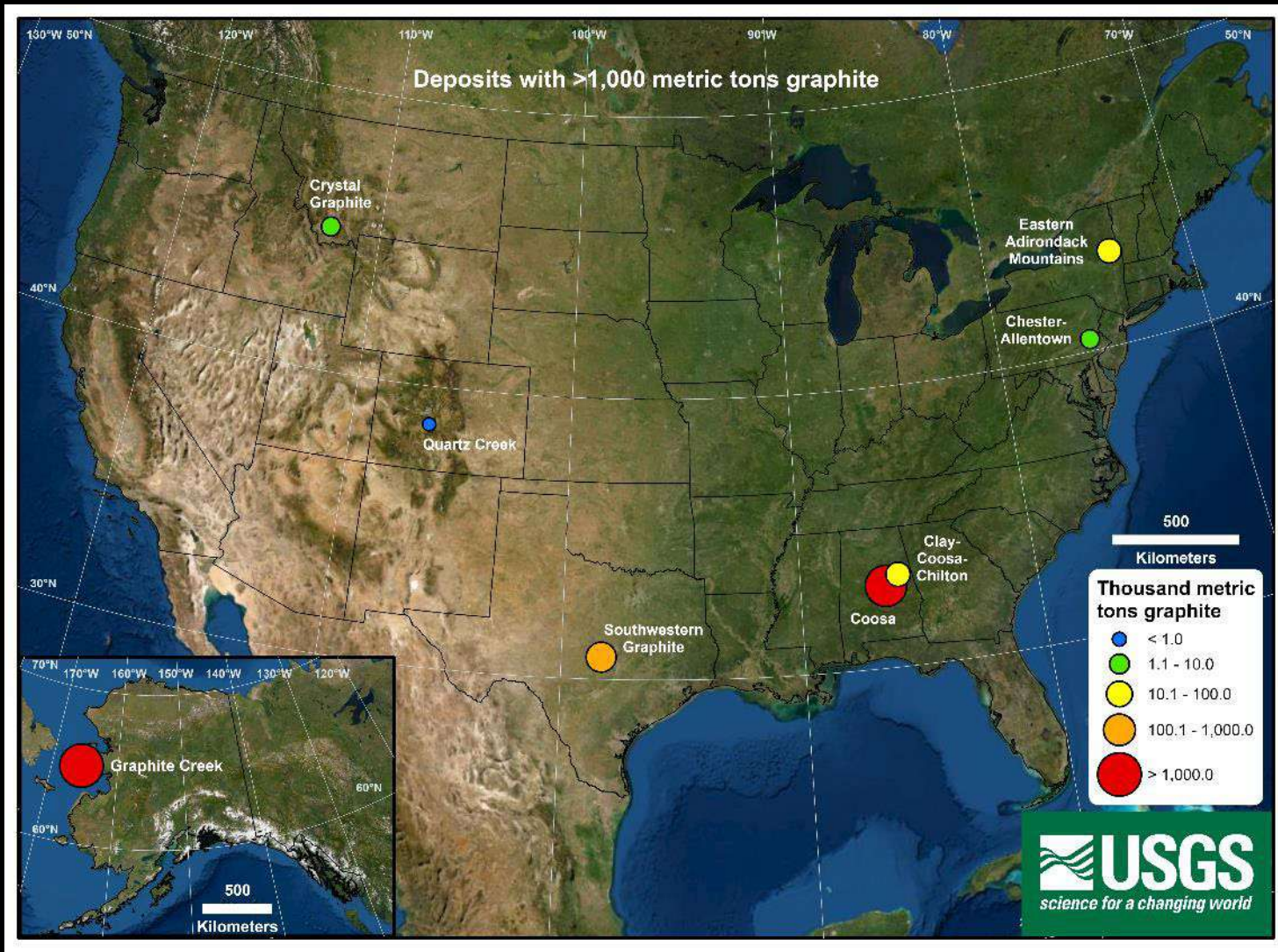




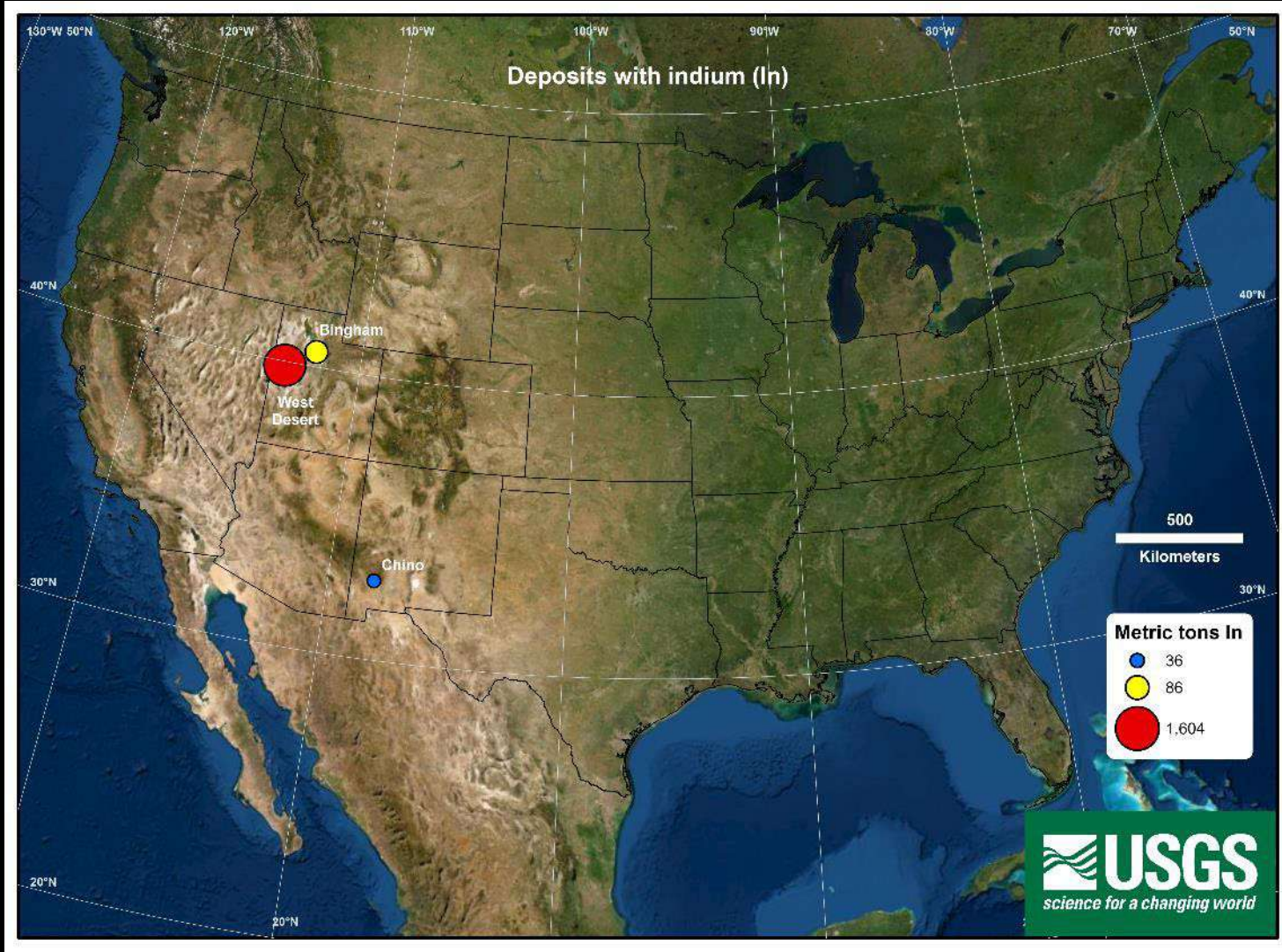


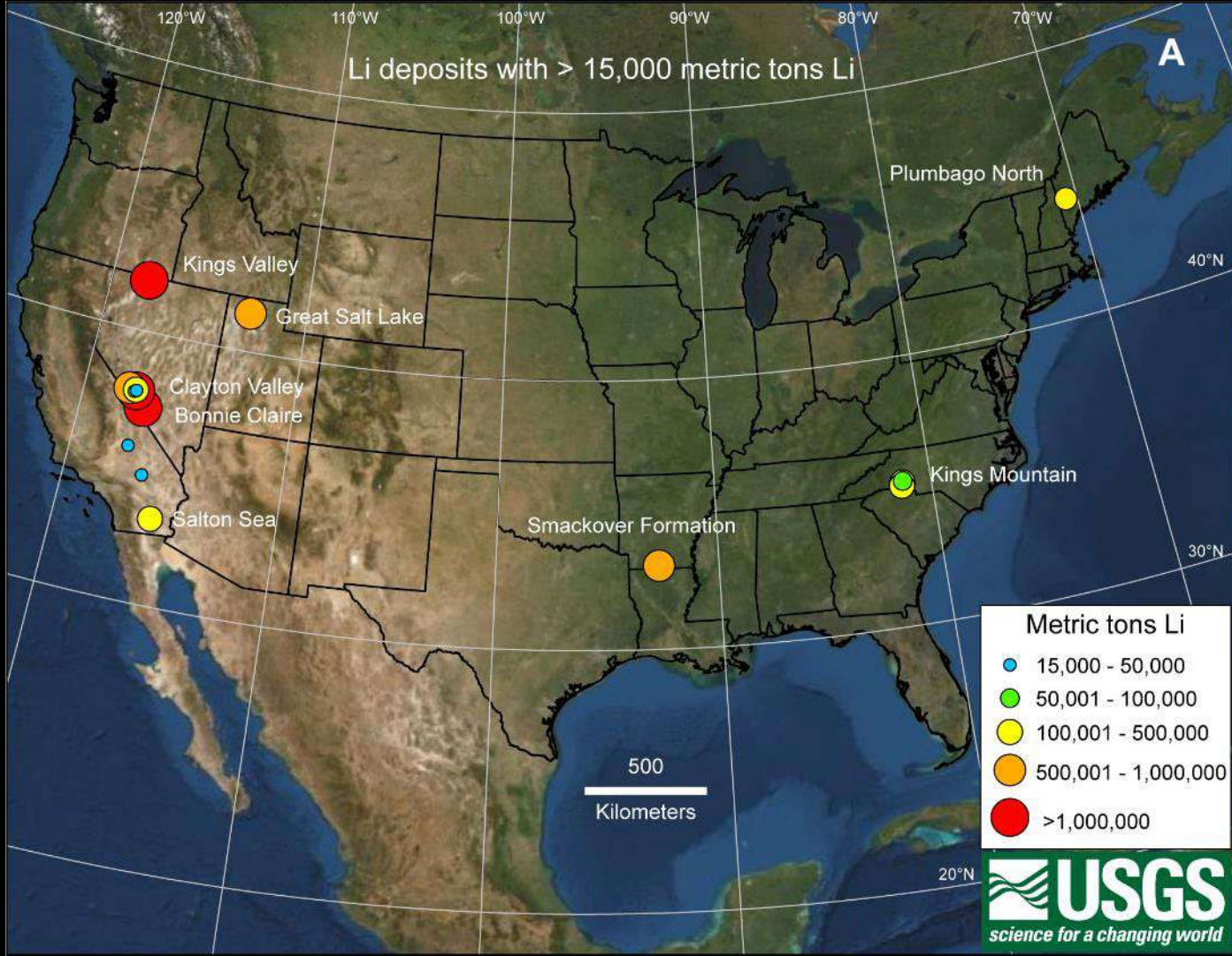




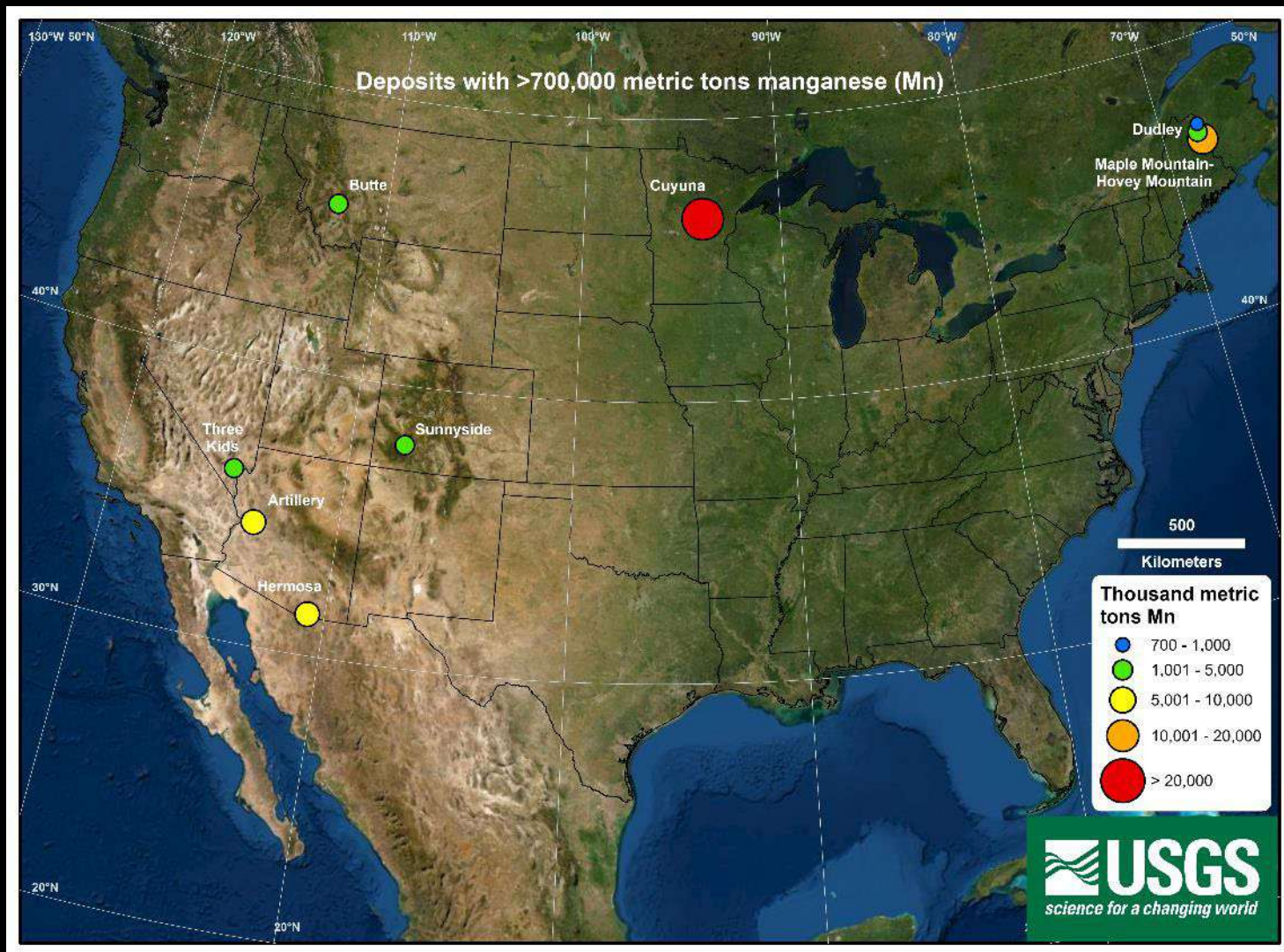








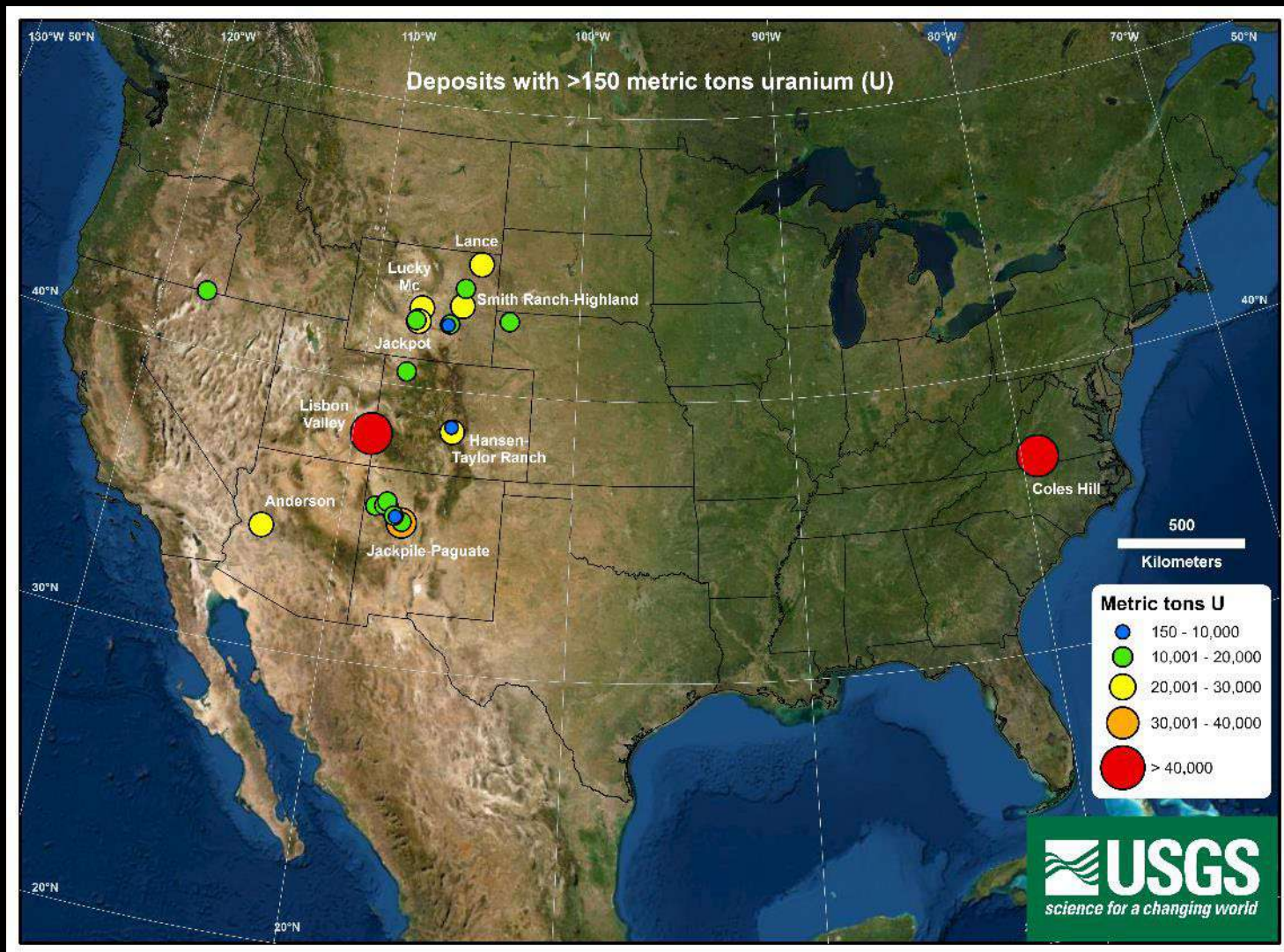
















# USGS decision support tools for hazard assessment, science coordination, and reclamation strategies on mined lands

Primary contact: Dan Jones ([dkjones@usgs.gov](mailto:dkjones@usgs.gov))

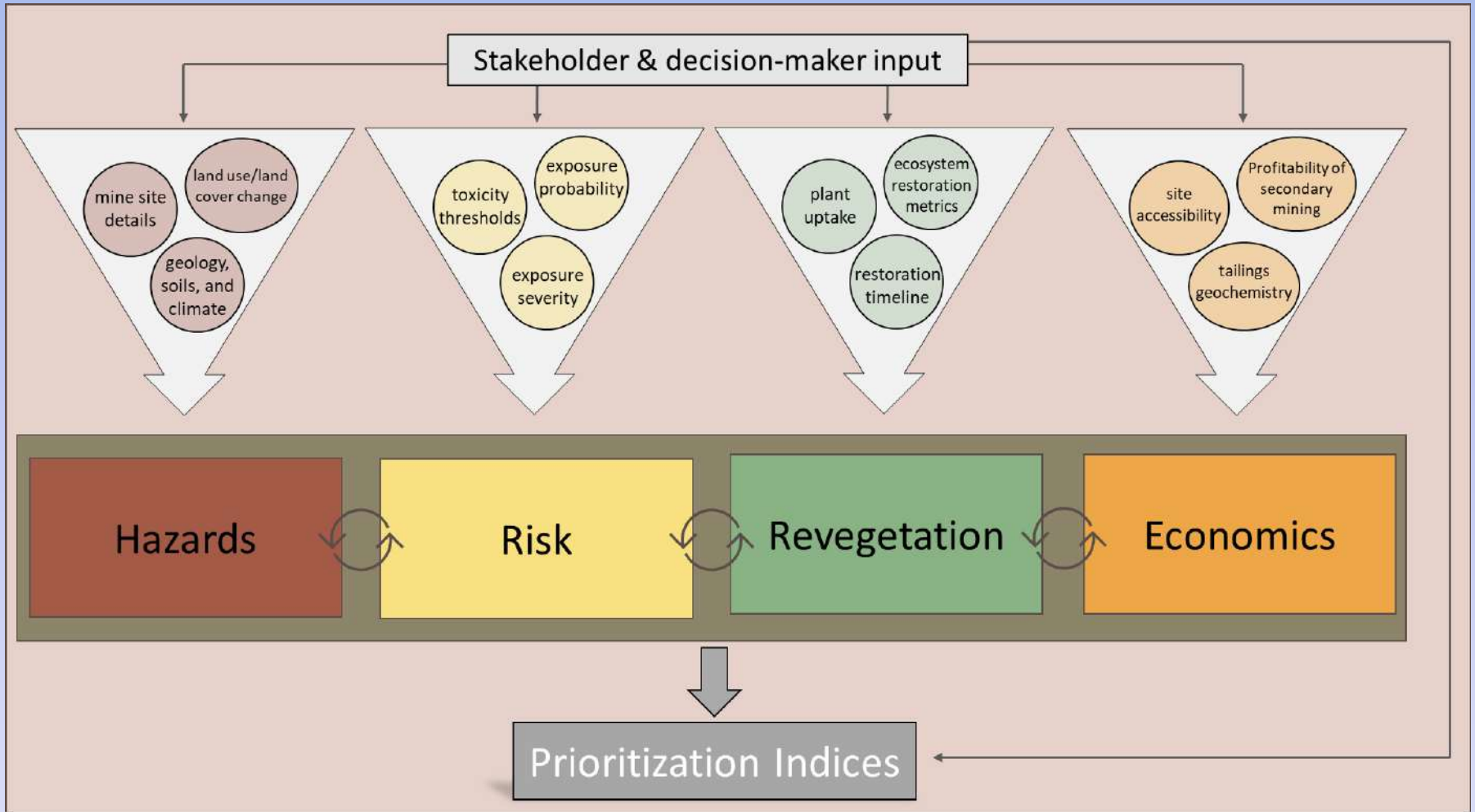


# Goals

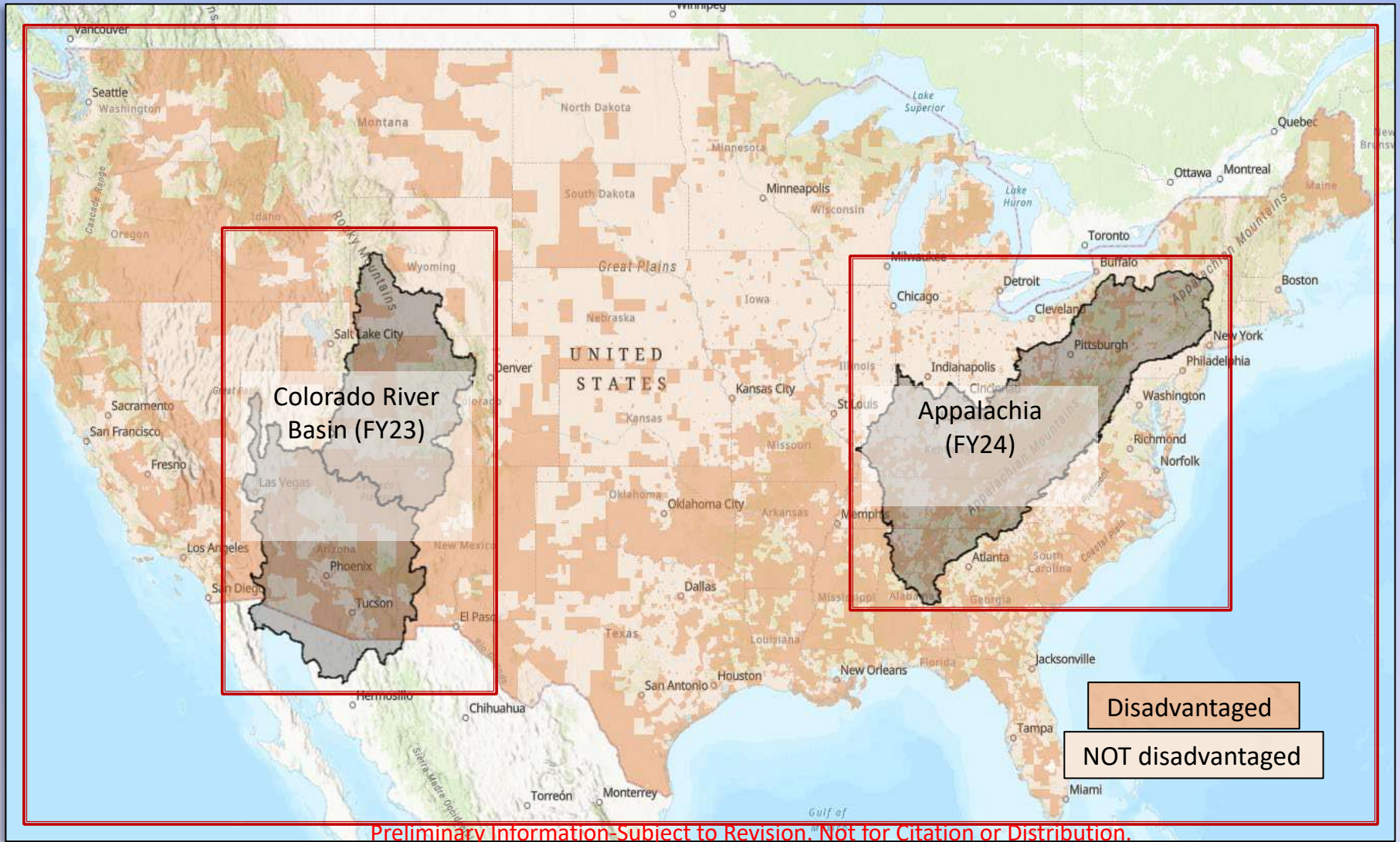
Crear una herramienta para uso de los tomadores de decisiones que permita el análisis de las tierras minadas definidas para:

- ▶ identificar peligros y riesgos potenciales para las comunidades vulnerables, y
- ▶ Priorizar y realizar un seguimiento de las actividades de remediación/restauración.
- ▶ Unir los datos nacionales en una aplicación geoespacial en línea, accesible y consultable impulsada por las necesidades de las partes interesadas que puede evaluar y priorizar de manera rápida y transparente los sitios de remediación, considerar los impactos del cambio climático y monitorear la efectividad de los proyectos

# Data, Science, Resource Inventory



# Project scope and timeline





# USGS science for a changing world

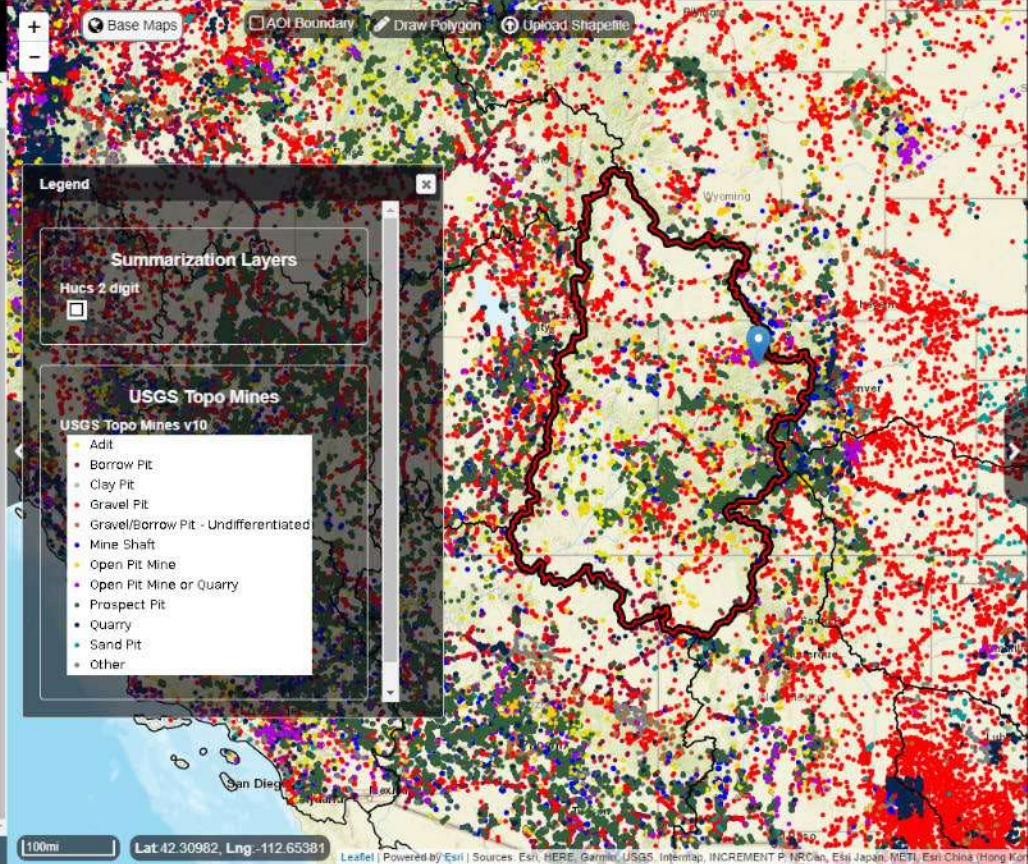
## Assessment and Restoration of Mined Lands: Decision Support Tool

The objective of the Science-based Hazard Assessment and Restoration of Mined Lands: Decision Support Tool is to provide relevant, scientifically robust, and accessible information to support mining and management decisions. This is a coordinated effort among Ecosystems, Core Science Systems, and Energy and Minerals Mission Areas to improve efficiency in analyses and identify areas of high resource potential and low environmental concern.

less...

**Legend** **Reset ALL Layers**

- Energy Resources
- Environmental Resources
- Synthesis and Interpretation
- Surface Land Management and Ownership
- Land Treatment and Fire History
- Soil and Topography
- Colorado River Basin Topography and Soils
- Climate and Weather
- Transportation
- Landcover and Vegetation
- Recreation and Visual Resource
- USGS Topo Mines



### Upper Colorado Region

Area: 72,480,412 acres

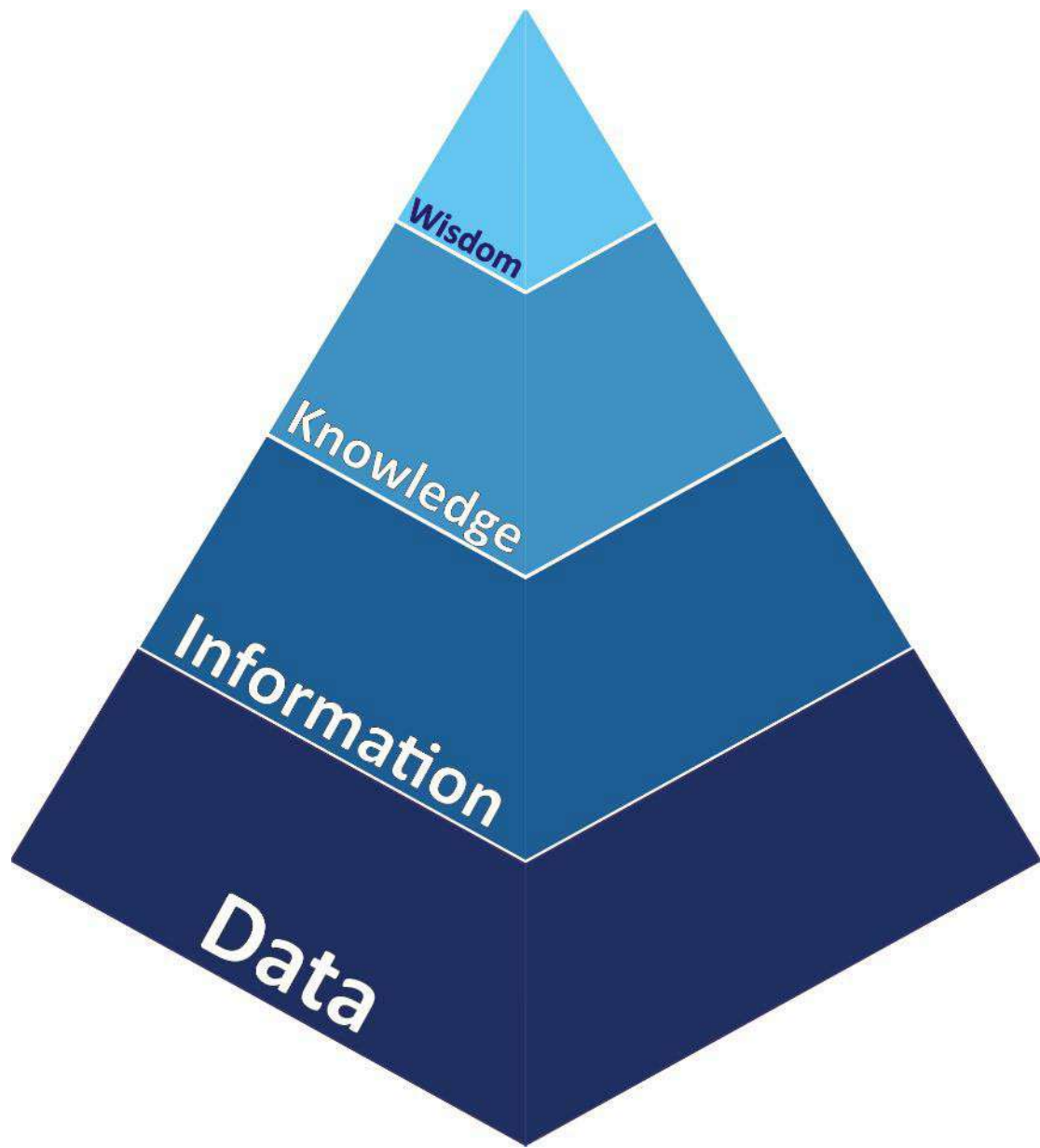
Submit Analysis IPAC Query ON Clear this selection

Share Map Download Report as PDF

#### Results from IPAC Query

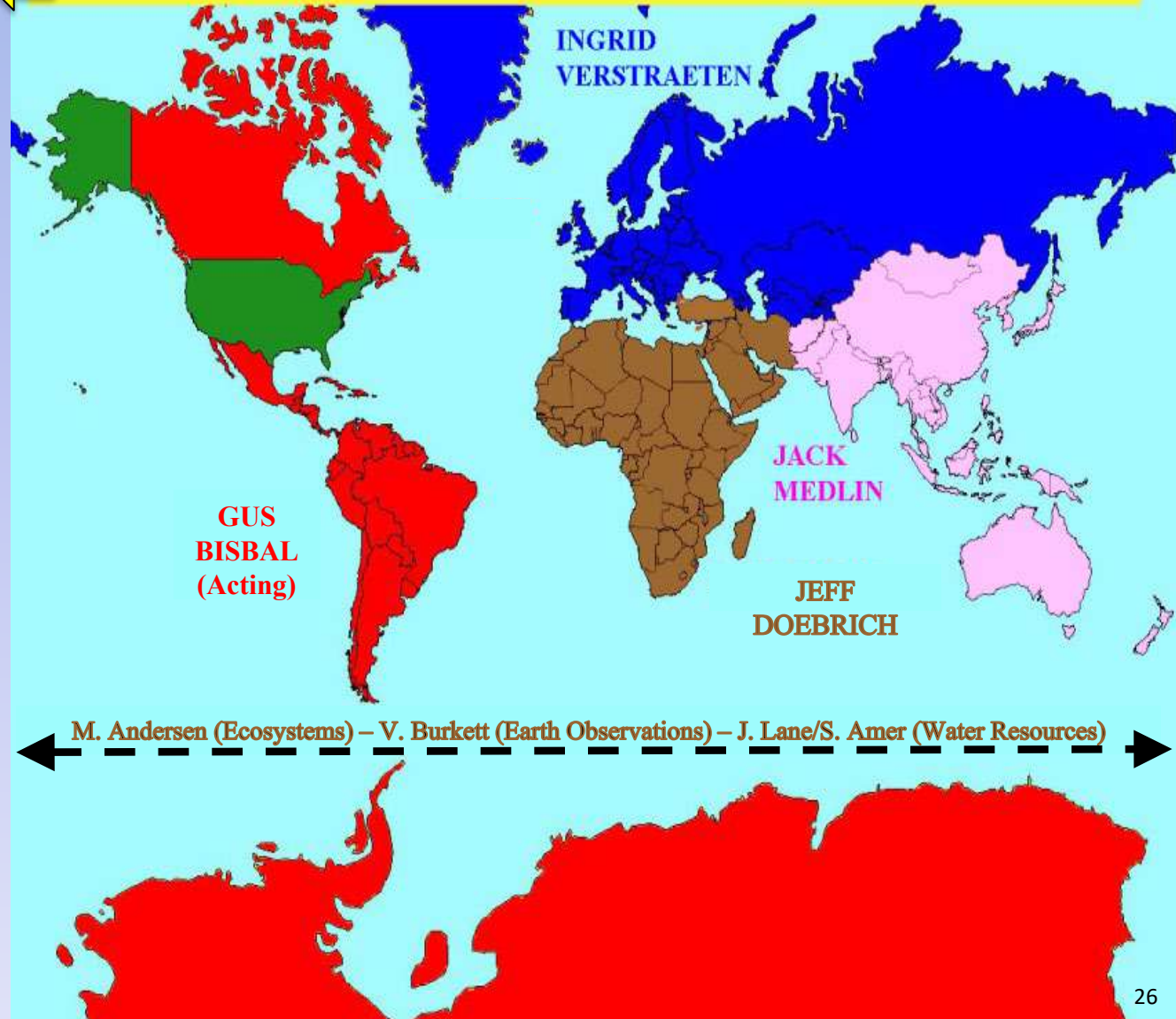
Class	Common Name	Status	Scientific Name
Birds	Mexican Spotted Owl	Threatened	<a href="#">Link to EDOS page</a> <i>Strix occidentalis lucida</i>
Birds	Yellow-billed Cuckoo	Threatened	<i>Coccyzus americanus</i>
Fishes	Bonytail	Endangered	<i>Gila elegans</i>
Fishes	Colorado Pikeminnow	Endangered	<i>Psychocheilus lucius</i>
Fishes	Humpback Chub	Threatened	<i>Gila cypha</i>
Fishes	Razorback Sucker	Endangered	<i>Xyrauchen texanus</i>
Flowering Plants	Clay Reed-mustard	Threatened	<i>Schoenocrambe argillacea</i>
Flowering Plants	Colorado Hookless Cactus	Threatened	<i>Sclerocactus glaucus</i>
Flowering Plants	Deboque Phacelia	Threatened	<i>Phacelia submutica</i>
Flowering Plants	Dudley Bluffs Bladderpod	Threatened	<i>Lesquerella congesta</i>
Flowering Plants	Dudley Bluffs Twinpod	Threatened	<i>Physaria eboradata</i>
Flowering Plants	Jones Cycladenia	Threatened	<i>Cycladenia humilis var. jonesi</i>
Flowering Plants	Parachute Beardtongue	Threatened	<i>Penstemon debilis</i>

# The DIKW pyramid





THE INTERNATIONAL PROGRAMS OFFICE OF THE USGS

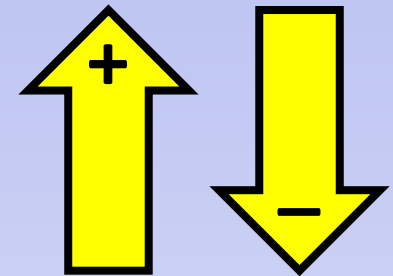




# Algunas realidades que dominan la producción y uso de la ciencia en LAC

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- Demandas políticas y sociales
- Urgencias ambientales y energéticas
- Capital científico capacitado
- Recursos tecnológicos
- Expansión industrial/comercial
- Intereses del sector privado
- Presupuestos...



# ¿Qué ciencia ofrecemos? (Mis ingredientes favoritos)

---

- **Objetiva:** pero NO regulatoria
- **Accionable:** informando decisiones explícitas
- **Prioritaria:** reconociendo lo más urgente
- **Integrada:** reconoce diferentes fuentes y niveles de integración
- **Participatoria:** distintos intereses, comunidades indígenas, etc.

# Ciencia ~~Accionable~~ Aplicada

Conocimiento científico que proporciona valor práctico para informar una decisión



# Ciencia accionable

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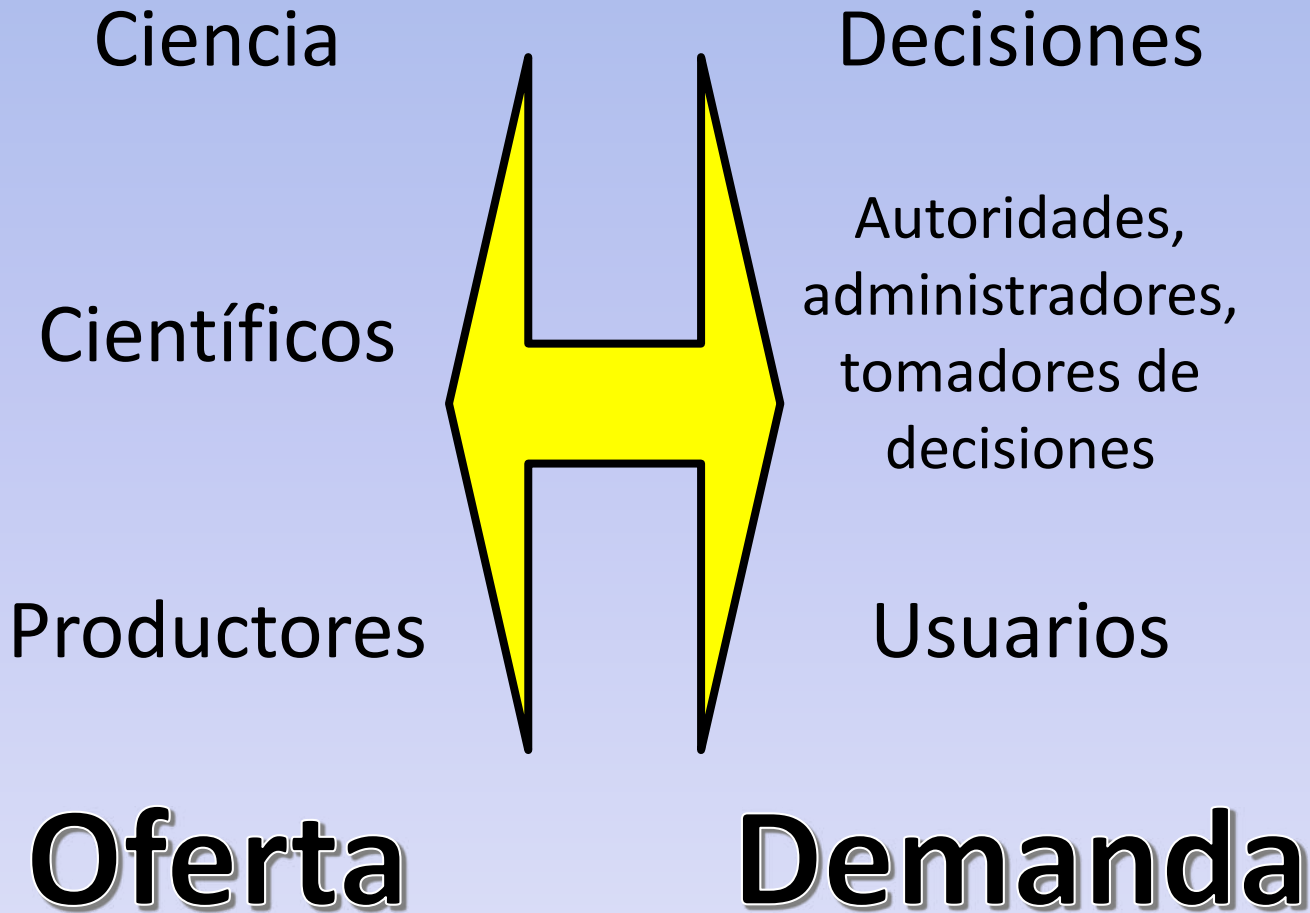
Conocimiento científico que proporciona valor práctico para informar una decisión

**PERO...**

Está explícitamente motivada por el contexto de esa decisión

# La **transición** más importante!

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# The researcher's lament: Why do they ignore my science?

Bisbal, G.A. 2022.  
*Ecosphere* 13(5): e4044.  
DOI: 10.1002/ecs2.4044

- Deficiencias de los funcionarios de selección
- Falta de apoyo a los responsables de la toma de decisiones
- Proceso de financiación falseado
- Requisitos absurdos
- El uso y el usuario son evidentes por sí mismos

Received: 27 December 2021 | Accepted: 12 January 2022  
DOI: 10.1002/ecs2.4044

INNOVATIVE VIEWPOINTS  
Eco-Education

ECOSPHERE  
AN OPEN ACCESS JOURNAL

## The researcher's lament: Why do they ignore my science?

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Climate Adaptation Science Center,  
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**Handling Editor:** Debra P. C. Peters

### Abstract

The researcher's lament is shared by many environmental and conservation scientists who complain about the little support they receive for their research proposals during the review and selection process. Understandably, any hopes of having their anticipated scientific findings applied toward the formulation of environmental management decisions or natural resource policy action are shattered. They attribute this lack of endorsement to shortcomings and limitations among decision makers and proposal selection officials when, in many cases, the rejection of project proposals is often a function of a handful of self-inflicted failures by applied scientists who anchor themselves stubbornly to doomed approaches. Familiar deficiencies in their research proposals perpetuate the disconnect between the enterprise of science and real-world resource management challenges. Researchers themselves can affect conditions that turn up the appetite for their scientific endeavors as a more meaningful component of the decision-making process, namely, to stage and deliver science that is more readily "actionable." Perhaps it is time for them to consider a course correction to improve the viability of their actionable science proposals. A few basic steps may help rejigger the science planning process in this direction and, consequently, help avoid the researcher's lament. The likelihood of gaining support during the proposal review and award adjudication process, and securing practical application of scientific products, increases when the products are (1) the result of active engagement of researchers with decision makers; (2) better connected to social and political priorities; (3) clearly designed to inform specific management decisions; and (4) tailored to fit the needs of targeted end users. These considerations and activities exist beyond the comfort zone of many environmental or conservation scientists. Yet, those who adopt them will spend less time lamenting rejection and become more influential in the production of actionable knowledge.

### KEYWORDS

actionable science, decision making, environmental management, policy-relevant research, usable knowledge

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*Ecosphere*. 2022, 13:e4044.  
<https://doi.org/10.1002/ecs2.4044>

<https://onlinelibrary.wiley.com/doi/10.1002/ecs2.4044> 1 of 8



# The decision maker's lament: If I only had some science!

Bisbal, G.A. 2024.

*AMBIO: A journal of Environment and Society*

DOI: 10.1007/s13280-024-01986-w

- Productos son de mala calidad
- Resultados poco informativos
- Comunicación deficiente
- Ciencia ausente

AMBIO  
https://doi.org/10.1007/s13280-024-01986-w

KUNGL. VETENSKAPS-  
AKADEMIEN  
THE ROYAL SWEDISH ACADEMY OF SCIENCES

Check for updates

1 PERSPECTIVE

2 The decision maker's lament: If I only had some science!

3 Gustavo A. Bisbal 

4 Received: 13 July 2023 / Revised: 24 October 2023 / Accepted: 17 January 2024

5 **Abstract** Environmental decision makers lament instances in which the lack of actionable science limits confident decision making. Their reaction when the needed scientific information is of poor quality, uninformative, unintelligible, or altogether absent is to criticize scientists, their work, or science in general. The considerations offered here encourage decision makers to explore alternative approaches to alleviate their disappointment. Ironically, many researchers lament the lack of support for the science they wish to deliver and science decision makers of failing to realize the value of the scientific studies they propose. Both communities would benefit by remembering that producing actionable science for a pending decision requires knowing the context for that decision beforehand. They may also look inward. Only then will they find answers to the question: What can I do within my own capacity to ensure that the necessary actionable science becomes available and facilitate its use to inform decisions?

6 political circumstances, budgetary realities, market pressures, and public demands among others (e.g., Morrison-Saunders and Bailey 2003; Kiker et al. 2005). These influences leave decision makers in an uncertain state where options may be constrained and offer little confidence in achieving the results they seek to satisfy priority goals within their environmental portfolios. This scenario is far from optimal because an unwise decision could render unacceptable consequences to those who make the decision as well as those affected by it.

7 Fortunately, many decision makers welcome the contributions that scientific information, tools, and services offer to help them mitigate risk, uncertainty, and speculation (Morrison-Saunders and Bailey 2003; White et al. 2010; Thomas Walters et al. 2021; Cooke et al. 2022). Their use of science to improve decision making is, in fact, consistent with the intended central role of science contemplated within the field of decision analysis (e.g., Murphy and Wetland 2014; Baker et al. 2022; Henning et al. 2022). Moreover, in the United States and many other countries, the legal, administrative, and institutional standard for the application of science to decision making instructs regulatory and resource agencies to include the best available science in the formulation of public policies and planning directives (Bisbal 2002; Sullivan et al. 2006; Ryder et al. 2010; Charney et al. 2017). Scientific information that not only provides practical value to inform a decision, but is explicitly motivated by the context of that decision, has been generically labeled "actionable science"; a concept abundantly examined in the professional literature (Palmer 2012; Beier et al. 2017; Bisbal 2019; Gerber et al. 2020; Mach et al. 2020).

8 The appetite for science as critical input to gain decision-making advantage, however, may end bitterly when the anticipated scientific information is of poor quality, uninformative, anecdotal, contradictory, obscurely communicated, or

9 **Keywords** Actionable science · Decision making · Environmental management · Usable knowledge

10 **INTRODUCTION**

11 Making informed and justifiable decisions is the most coveted goal that decision makers (this term will be used to collectively refer to public authorities, designated officials, agency administrators, and resource managers) responsible for addressing environmental concerns and managing natural resources strive to achieve. But the task is complex and risky. Their decision-making process is often influenced by an intricate assortment of factors including institutional jurisdiction and values, bureaucratic constraints, socio-

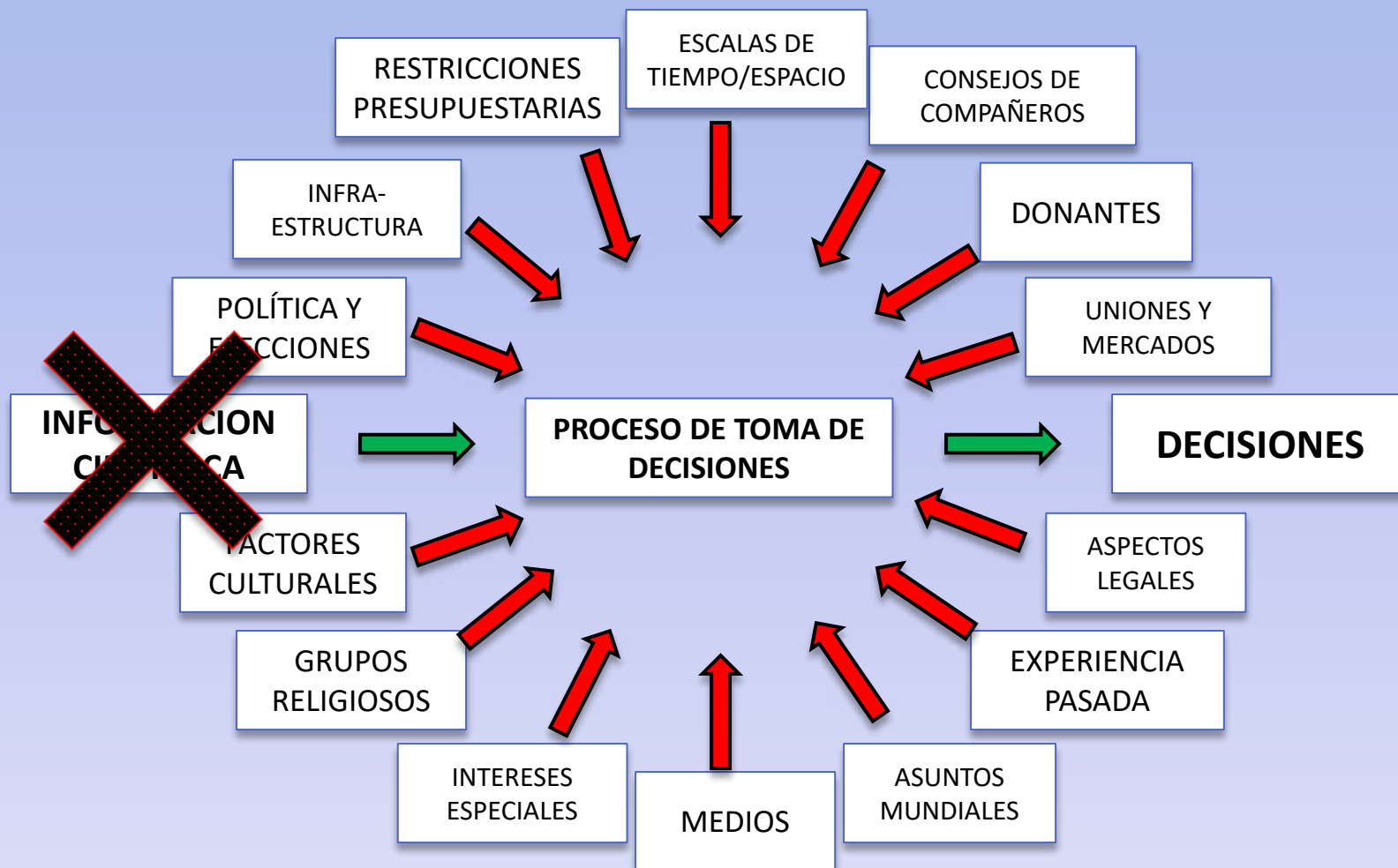
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Journal: Large 13280 Date: 13-2024 Page: 9  
Article No.: 1986  HTML  PDF  EPUB  
ISSN Code: AMBIO-13280-024  PDF  HTML

Springer

# ¿Por qué es importante el contexto de decisión?



**Preguntas?**

# Extra slides

# A puzzle

For critical minerals, how many years of resources exist in U.S. deposits?

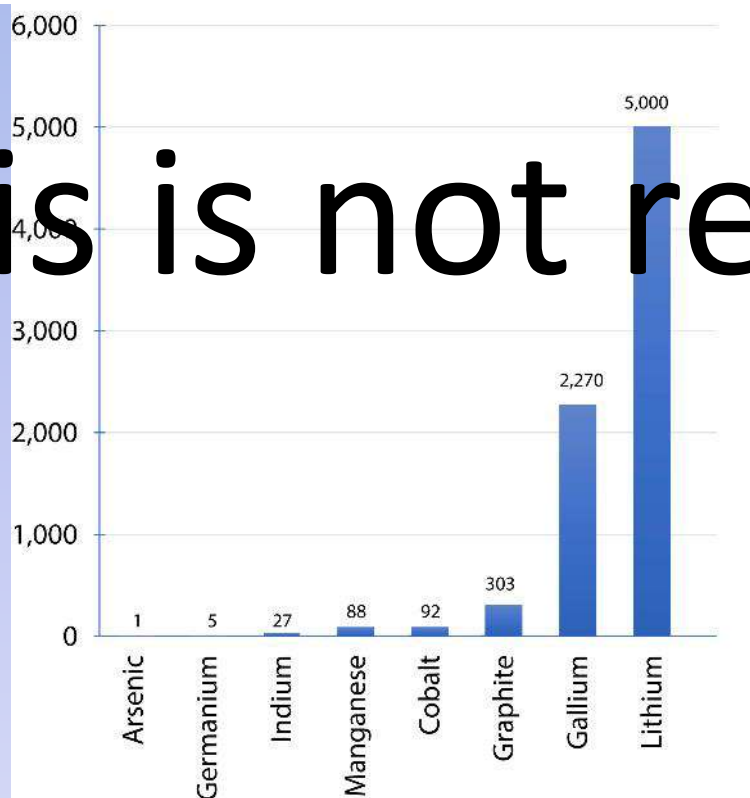
Mostly NI 43-101 (or similar) compliant resources

Particularly for each of As, Co, Ga, Ge, graphite, In, Li, Mn

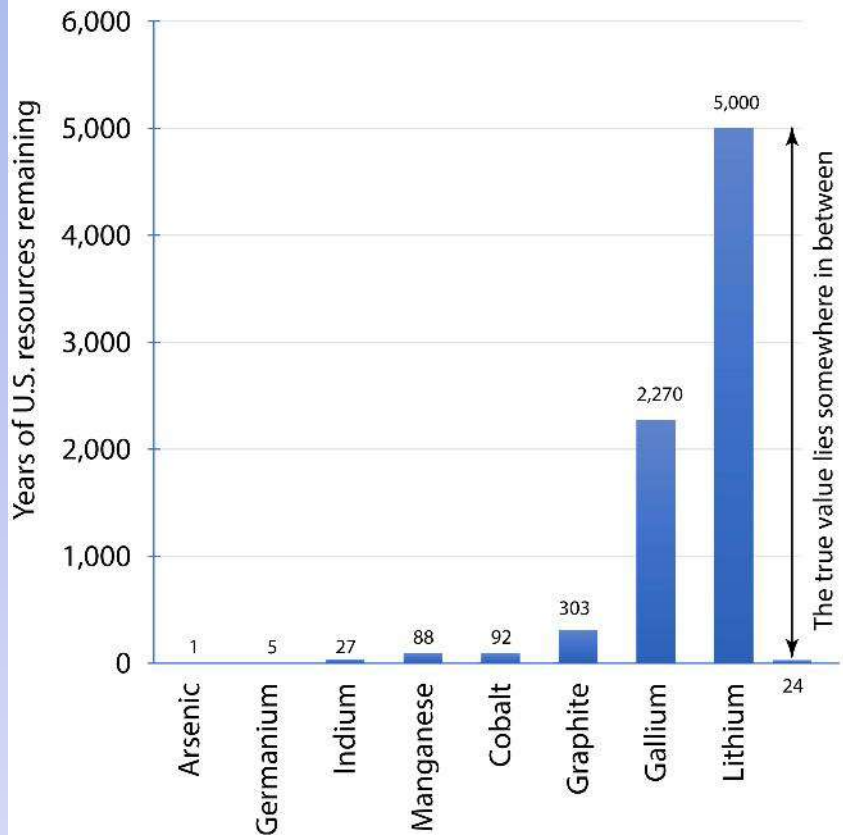
1 year? 10? 100? 1,000? 10,000? 100,000?

Years of U.S. resources remaining at current 5 year average apparent U.S. consumption of select battery and energy metals

This is not real!



Years of U.S. resources remaining at current  
5 year average apparent U.S. consumption  
of select battery and energy metals

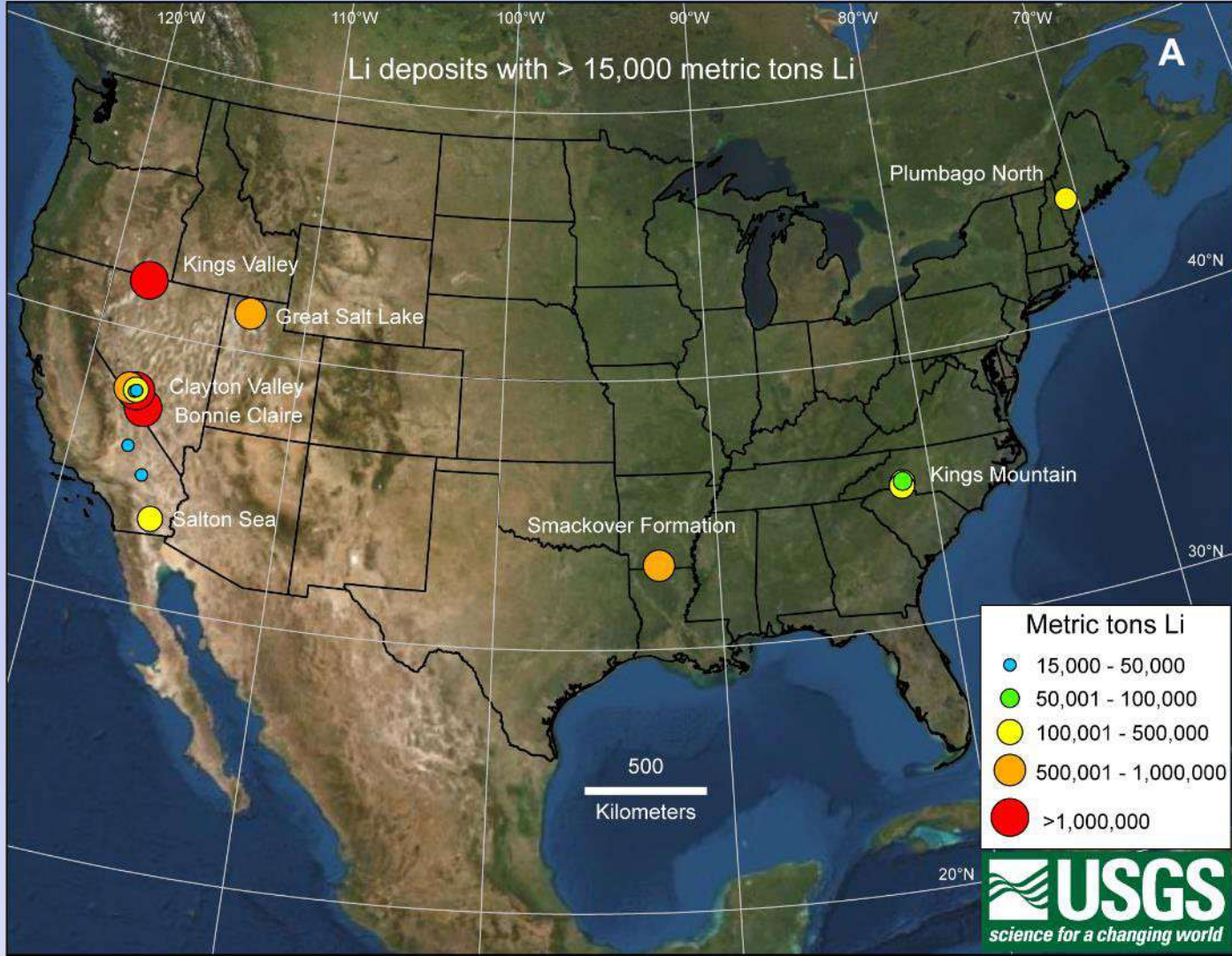


The true value lies somewhere in between

There are three kinds of lies:  
lies, damn lies, and statistics  
-Mark Twain

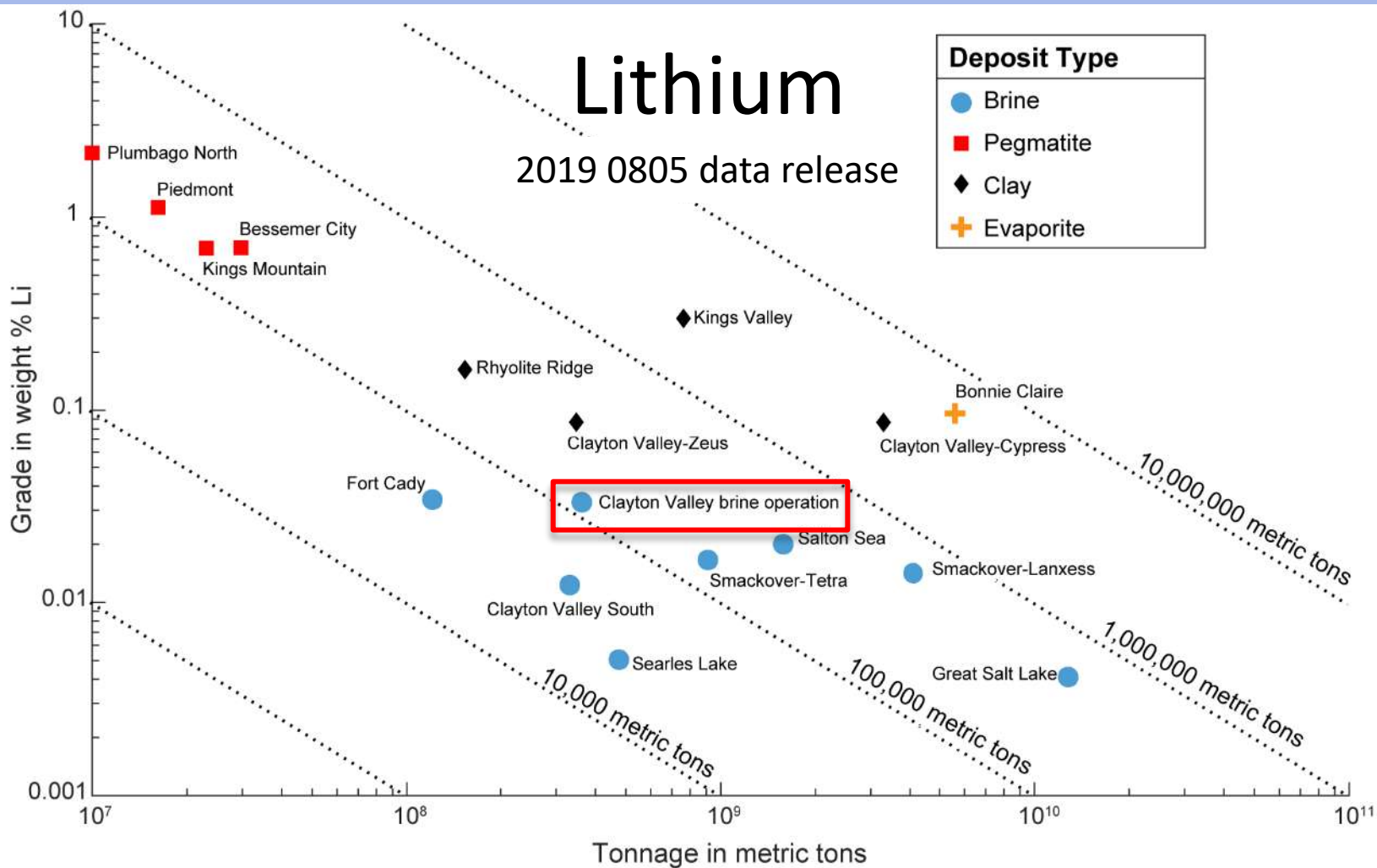
Bleiwas and Coffman (1986) Clayton Valley  
brine has a demonstrated in-situ mineral  
resource of 72,000 metric tons Li, which is  
a 24 year supply





# Lithium

2019 0805 data release

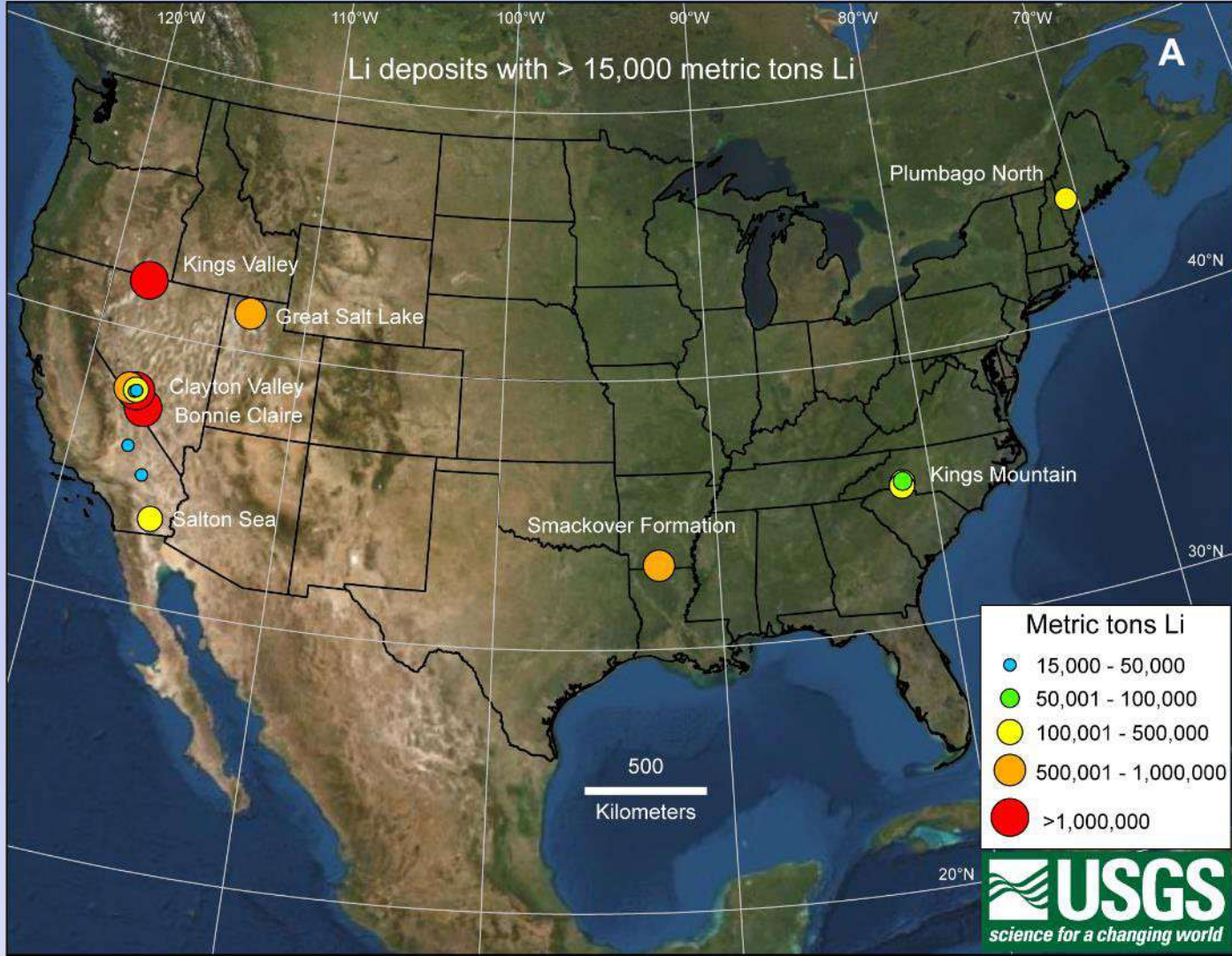


# Summary

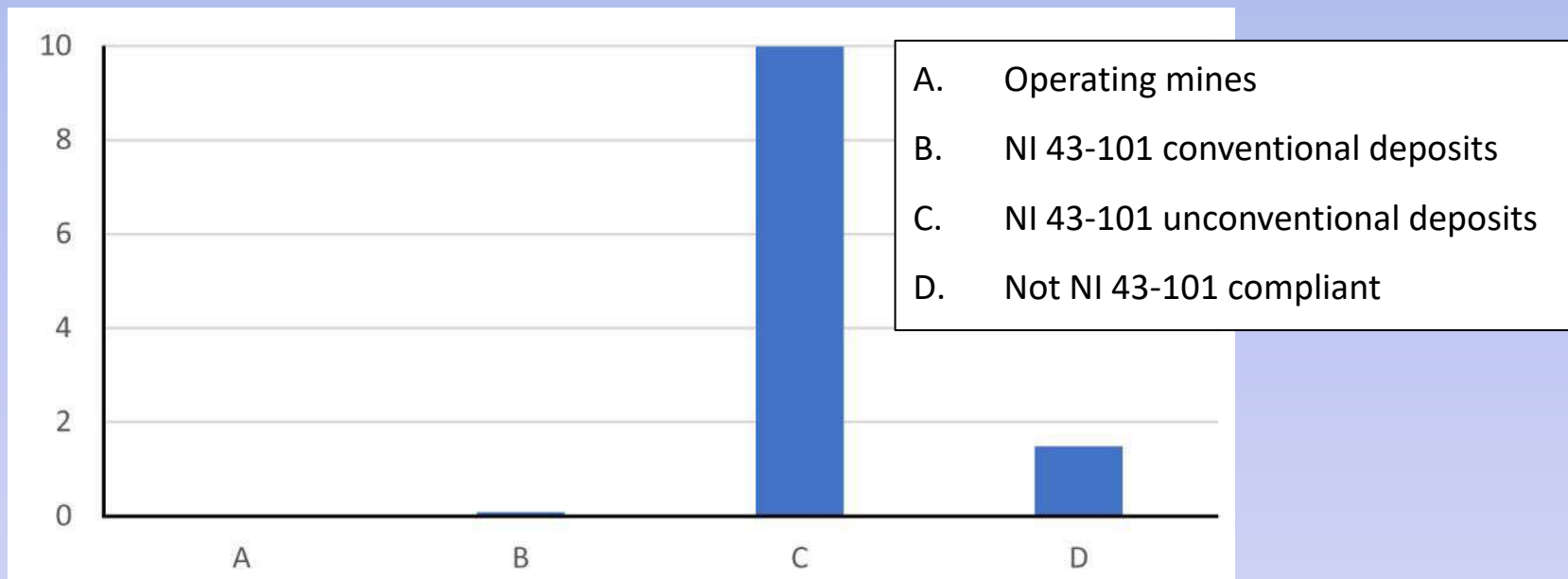
## Resource classification

- A. Resources and reserves at operating mines
- B. NI 43-101, or equivalent, resources and reserves for conventional deposits
- C. NI 43-101, or equivalent, resources and reserves for unconventional deposits
- D. Resources and reserves that are not NI 43-101 compliant



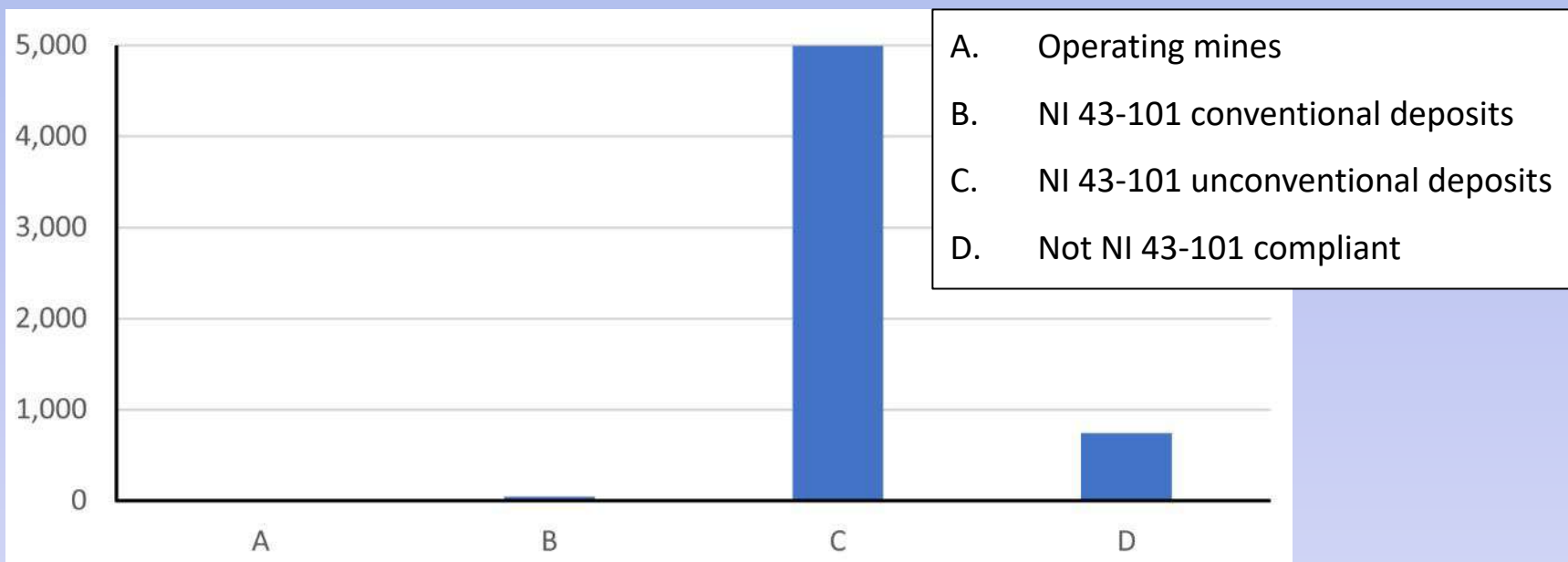


## Million metric tons Li in different resources

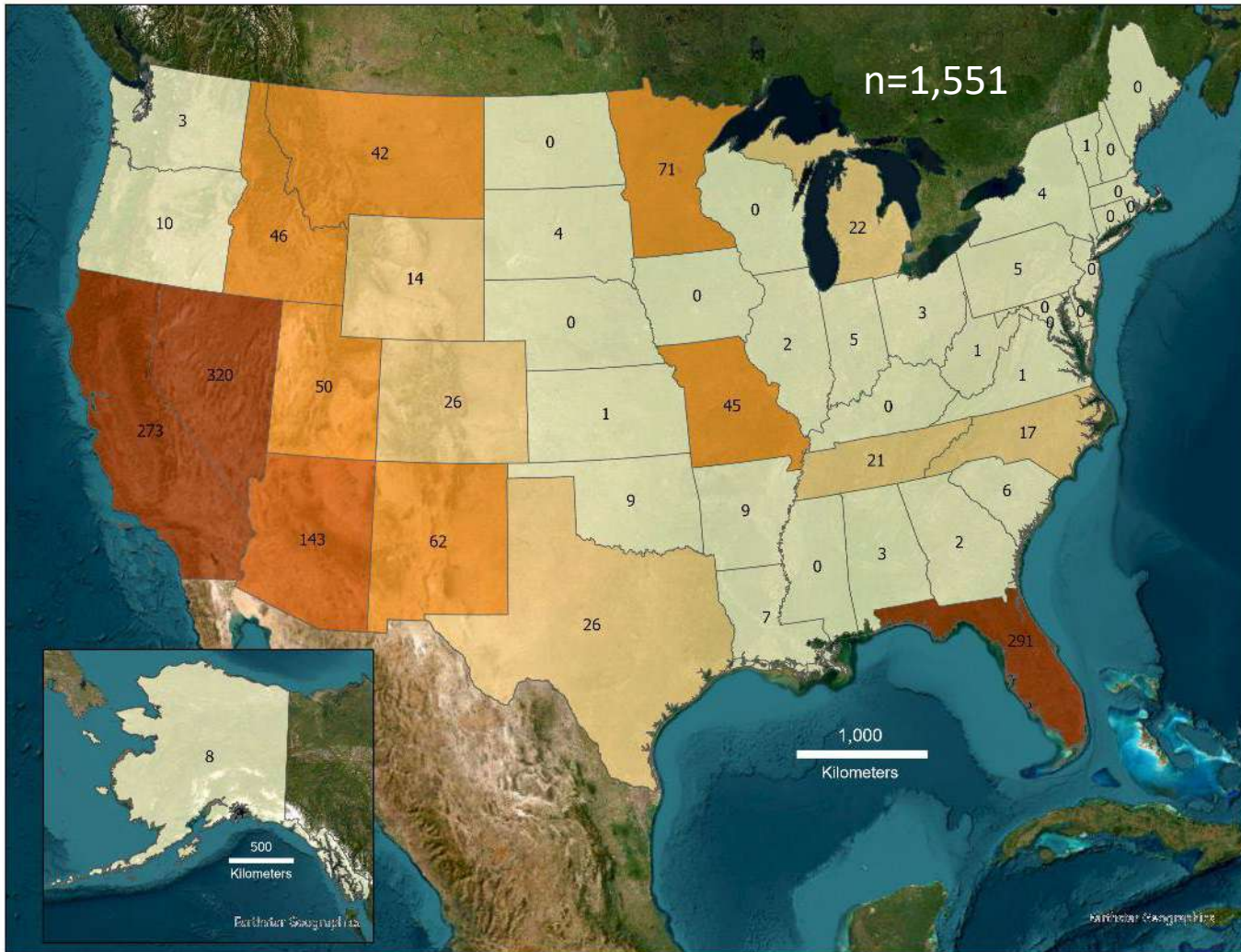




## Years of U.S. Li resources remaining at current 5 year average apparent U.S. consumption



# Mine Waste Features



We have digitized footprints, and are now working on completing geology and volume records

Number of non-coal mine waste features in the United States with areal extents greater than 200,000 m<sup>2</sup>

Starting work with State Geological Surveys from: Arizona, Illinois, Kentucky, Michigan, Missouri, Montana, Nevada, New Mexico, New York, North Carolina, Oklahoma, Virginia, Washington