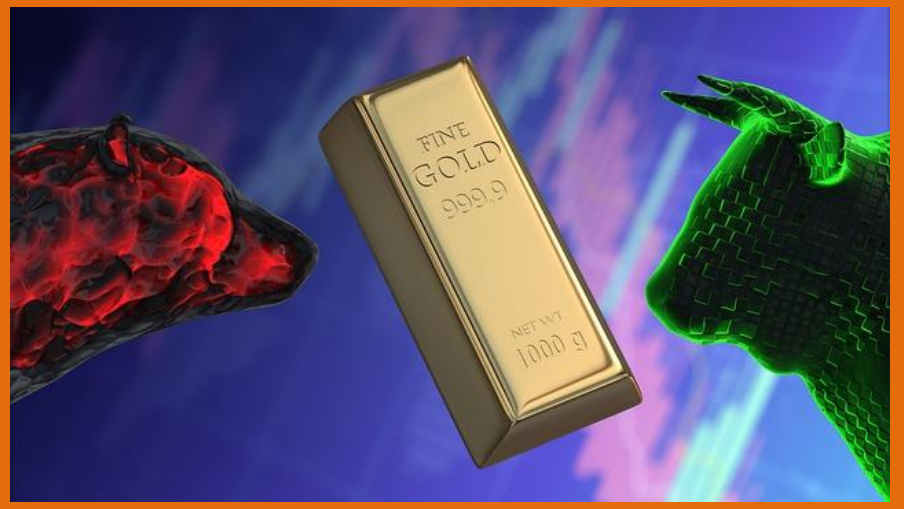
Princeton University LIBRARY

From the Rocks to the Stocks:

Library Research with a Geosciences Librarian and a Finance Librarian

January 14, 2021

Emily Wild and Bobbi Coffey, Princeton University Library



“If you can’t grow it, you mine it”

“Is it worth mining? What is my return on investment? ”

PRINCETON UNIVERSITY

Princeton University – GPO FDLP since 1884

Princeton University has a longstanding commitment to service, reflected in Princeton's informal motto — Princeton in the nation's service and the service of humanity — and exemplified by the extraordinary contributions that Princetonians make to society."
https://www.princeton.edu/meet-princeton/service-humanity

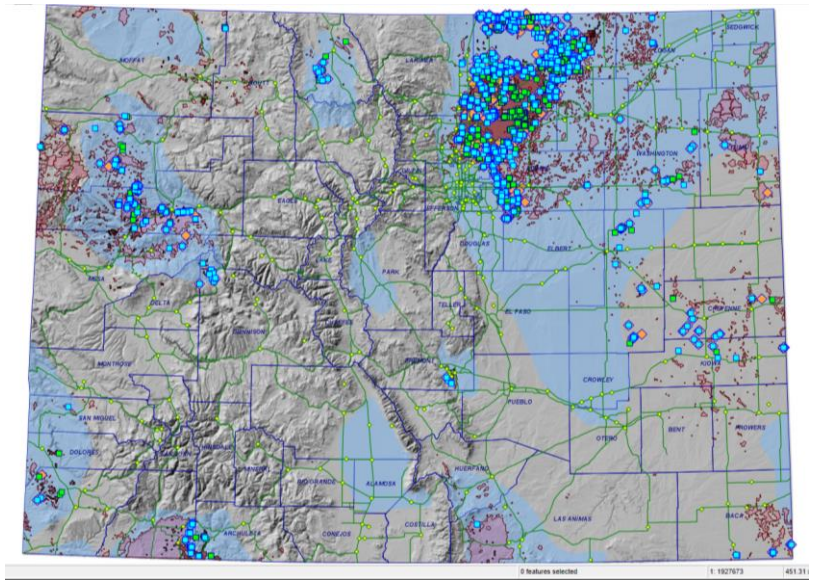
Firestone Library

Research Collections and Preservation Consortium (ReCAP)

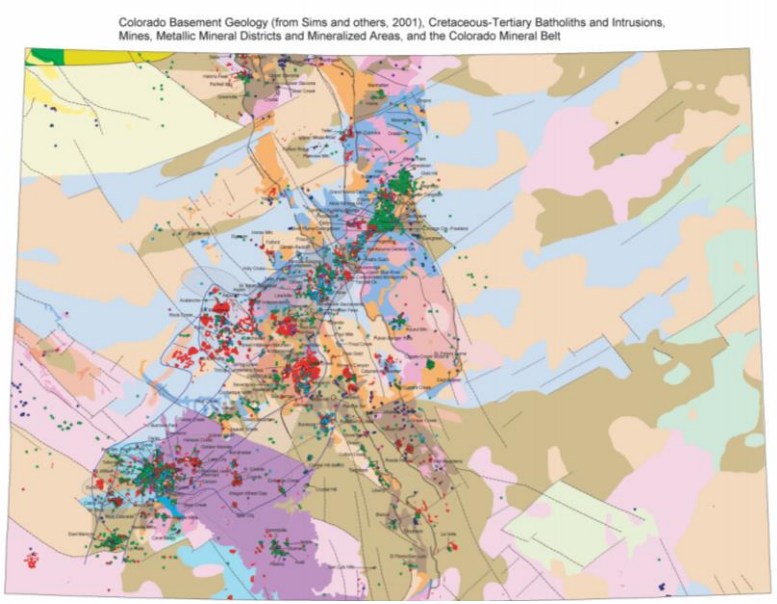
Lewis Science Library

Emily: “From the Rocks…

- **Energy Resources: Oil, Gas, Coal, Gas Hydrates**
- **Mineral Resources & Commodity Information**



https://cogccmap.state.co.us/cogcc_gis_online/



https://pubs.usgs.gov/of/2003/ofr-03-046/OFR-03-046-508.pdf

Quick Bio

Emily C. Wild

Princeton University Library

ewild@princeton.edu

Schedule a Research Consultation :
Monday – Friday
Meet Our Specialists – Emily Wild

ORCID: https://orcid.org/0000-0001-6157-7629

Princeton University Library, 2018-Present
Chemistry, Geosciences and Environmental Studies Librarian
https://library.princeton.edu/staff/ewild
Department of Chemistry https://chemistry.princeton.edu/
Department of Geosciences https://geosciences.princeton.edu/
High Meadows Environmental Institute (HMEI)
https://environment.princeton.edu/

U.S. Geological Survey: https://www.usgs.gov/staff-profiles/emily-wild
- Denver, Colorado : 2008-2018 - Librarian (Physical Scientist)
- NH-VT & MA-RI: 1996-2008 Hydrologist
Water: https://www.usgs.gov/mission-areas/water-resources
Energy: https://www.usgs.gov/energy-and-minerals/energy-resources-program/
Minerals: https://www.usgs.gov/energy-and-minerals/mineral-resources-program
Environmental Health: https://www.usgs.gov/mission-areas/environmental-health
Hazards: https://www.usgs.gov/mission-areas/natural-hazards

Previously also worked in libraries at the reference desk :
Providence College, University of Rhode Island, Hartwick College

Energy & Minerals in Rocks - a geosciences librarian – who do I help?

At the U.S. Geological Survey, 2008-2018

- General Public
- Teachers, K-12
- College/University Professors
- City, County, State Natural Resource Managers
- Undergraduate & Graduate Students
- New Employees to Geosciences or Post-Docs
- Federal Science Agencies, Scientists & Attorneys
- Private Sector: Scientists & Attorneys
- International Governments & Institutions
- Experienced Library Users that need a refresher

Colorado and World Geology

At Princeton University, 2018-present

- Undergraduate & Graduate Students
- College/University Professors
- Librarians
- Post-Docs
- Federal Science Agencies, Scientists & Attorneys
- Private Sector: Scientists & Attorneys
- Finance Industry
- International Governments & Institutions
- City, County, State Natural Resource Managers
- Experienced Library Users that need a refresher

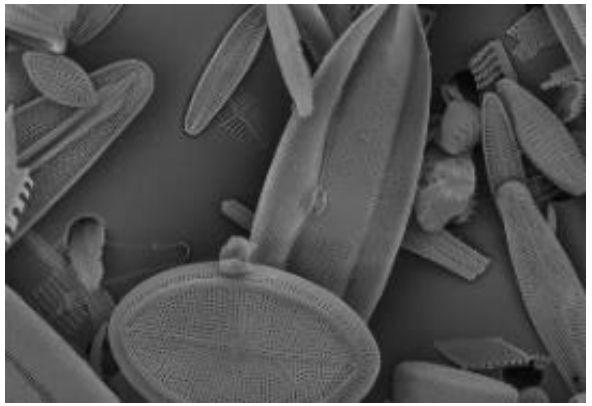
New York City Region & World Geology

What is geosciences?

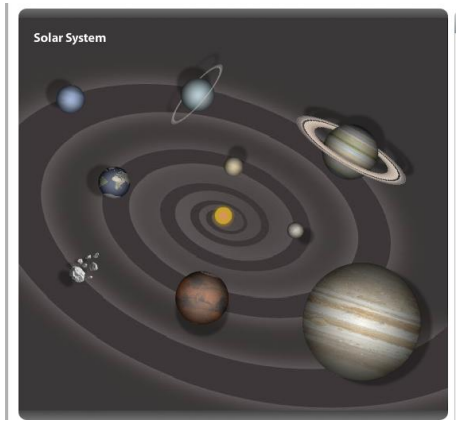
From American Geosciences Institute (AGI) :
https://www.americangeosciences.org/critical-issues/faq/what-is-geoscience

Geoscience is the study of the Earth - its oceans, atmosphere, rivers and lakes, ice sheets and glaciers, soils, its complex surface, rocky interior, and metallic core. This includes many aspects of how living things, including humans, interact with the Earth. Geoscience has many tools and practices of its own but is intimately linked with the biological, chemical, and physical sciences.

Geoscience investigates the past, measures the present, and models the future behavior of our planet. But it also involves the study of other planets, asteroids, and solar systems, both to better understand the Earth and to expand our knowledge of the universe.







What is a geosciences librarian?

https://libguides.princeton.edu/geo/librarianwebinars

http://www.geoinfo.org/geoscience-librarianship-101/

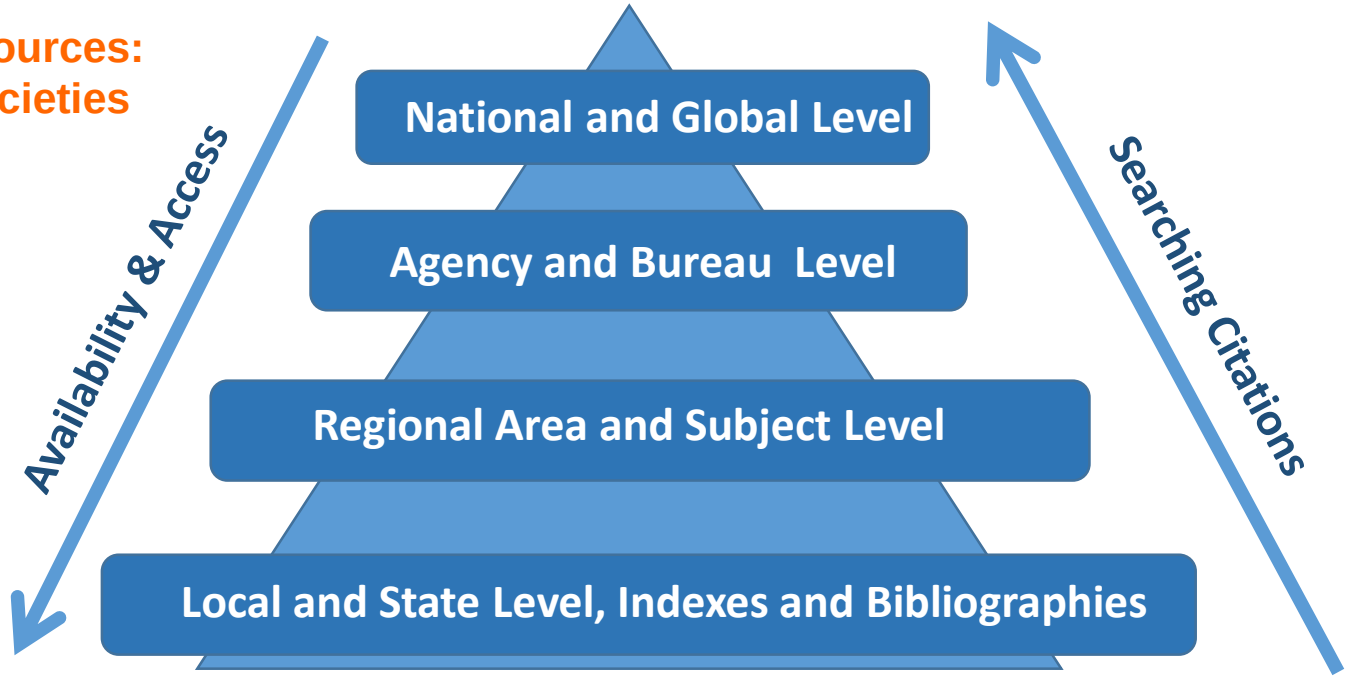
Scientist ↓

Raw Data: Real-Time, Continuous, Recent Partial Records, Historical
Calculated Data: Equations, Software Results, Lab Results, and Model Results
Map Data: Specific Location Information by Geosciences Topic
Citation Data: Bibliographic Information & Finding Publications

↑ Non-Scientist

Many Free Geosciences Information Sources:
Geological Surveys & Geosciences Societies
https://www.gsj.jp/en/gsj-link/directory/index.html

Modified from :
Wild and Havener, 2001
"Online bibliographic sources in hydrology"
https://pubs.er.usgs.gov/publication/70023512



USGS History: the Pre-USGS Map Area the Four Surveys, 1867-1879

[Catalogue and index of the publications of the Hayden, King, Powell, and Wheeler surveys]

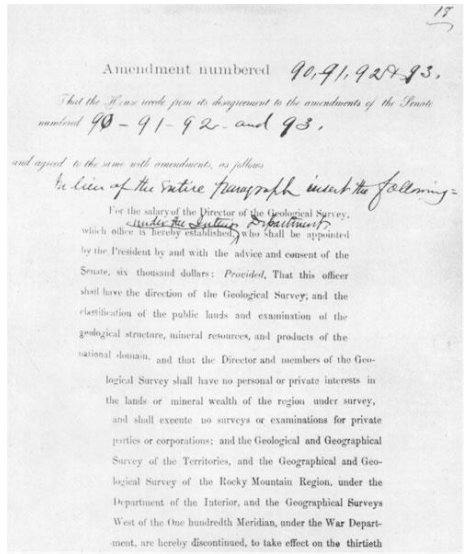
U.S. Geological and Geographical Survey of the Territories (Hayden)

U.S. Geological Exploration of the Fortieth Parallel (King)

U.S. Geographical and Geological Survey of the Rocky Mountain Region (Powell)

U.S. Geographical Surveys West of the One Hundredth Meridian (Wheeler)

[The Four Great Surveys of the West]



Amendment numbered 90, 91, 92 & 93.

That the House recede from its disagreement to the amendments of the Senate numbered 90 - 91 - 92 - and 93.

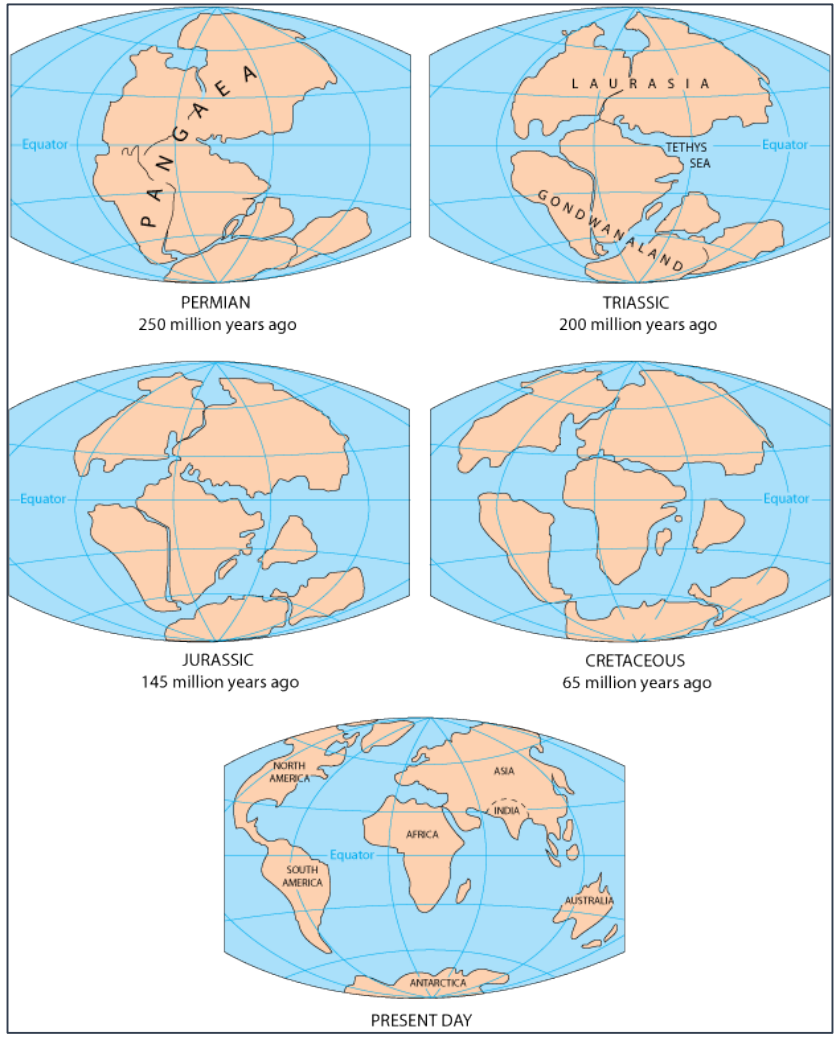
and agree to the same with amendment, as follows:

In lieu of the matter stricken out by said amendment insert the following:

For the salary of the Director of the Geological Survey, which office is hereby established, under the Interior Department, who shall be appointed by the President by and with the advice and consent of the Senate, six thousand dollars: *Provided*, That this officer shall have the direction of the Geological Survey, and the classification of the public lands and examination of the geological structure, mineral resources, and products of the national domain, and that the Director and members of the Geological Survey shall have no personal or private interests in the lands or mineral wealth of the region under survey, and shall execute no surveys or examinations for private parties or corporations; and the Geological and Geographical Survey of the Territories, and the Geographical and Geological Survey of the Rocky Mountain Region, under the Department of the Interior, and the Geographical Surveys West of the One hundredth Meridian, under the War Department, are hereby discontinued, to take effect on the thirtieth

March 3, 1879: Legislation to rename the Coast and Geodetic Survey and transfer it to the Department of the Interior and to establish the U.S. Geological Survey for "classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain"

Types of Questions for Energy & Mineral Resources



https://pubs.usgs.gov/gip/dynamic/historical.html

United States and Worldwide

- Earth processes that create oil, gas, coal, minerals, and uranium

- Location of natural resources

Geologic Time Scale – 2018
https://pubs.usgs.gov/fs/2018/3054/fs20183054.pdf

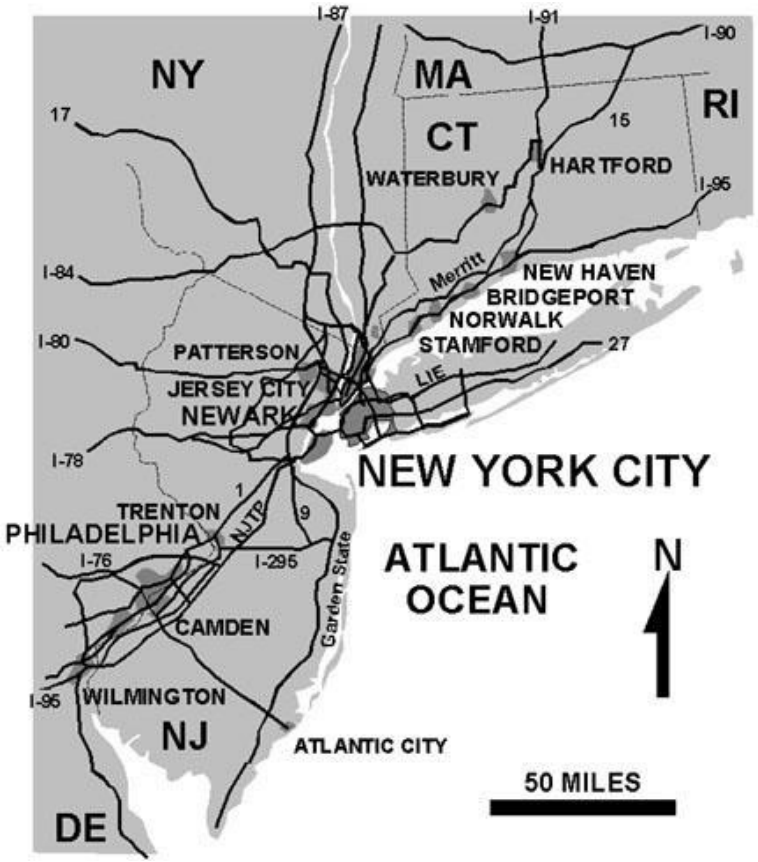
Geologic Units - USGS Lexicon :
https://ngmdb.usgs.gov/Geolex/search

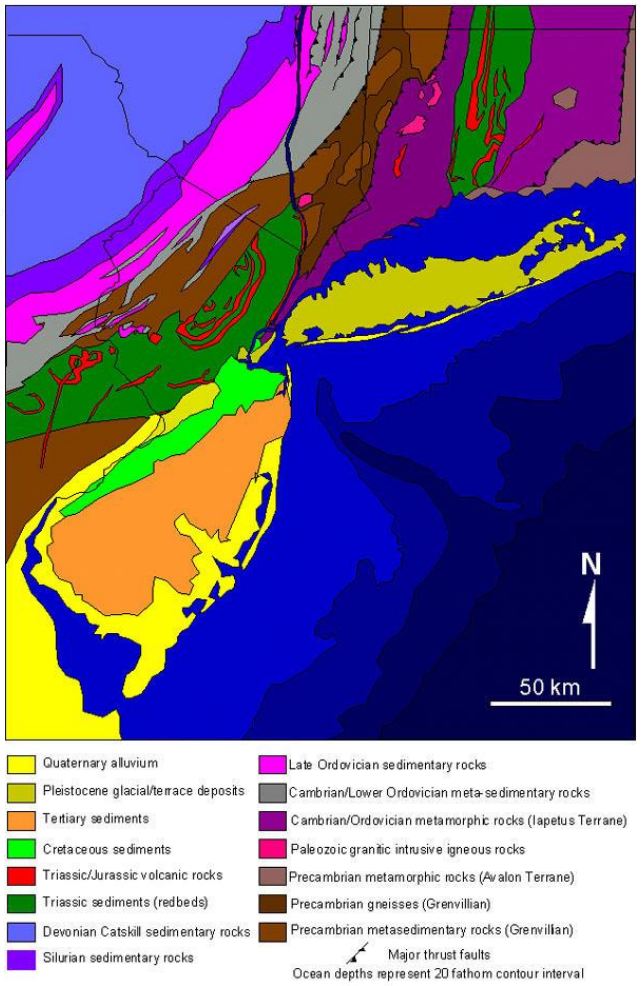
Geologic Units - Mexico Lexicon:
https://www.sgm.gob.mx/Lexico_Es/

Glossary of Geology
https://www.americangeosciences.org/pubs/glossary
Example:
Glossary of Geology –
Online at Princeton University
https://catalog.princeton.edu/catalog/8875615

Cretaceous Western Interior Seaway

New York City Region

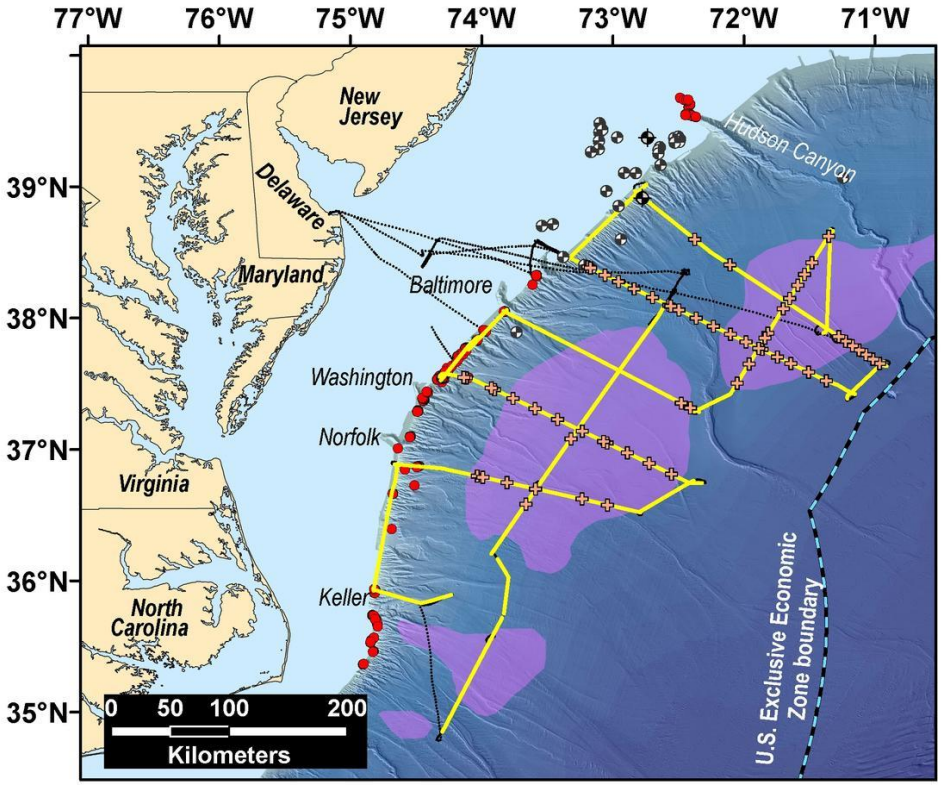




https://www.usgs.gov/science-support/osqi/yes/national-parks/geology-new-york-city-region/

USGS Estimates 214 trillion Cubic Feet of Natural Gas in Appalachian Basin Formations Release Date: OCTOBER 3, 2019

Seismic Research Cruise Provides New Data on U.S. Atlantic Margin Gas Hydrates Release Date: SEPTEMBER 20, 2018



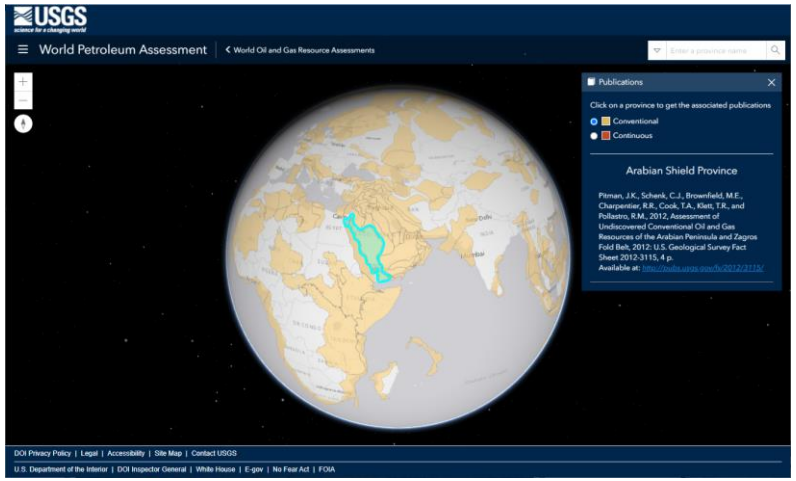
World Assessments: Oil & Minerals

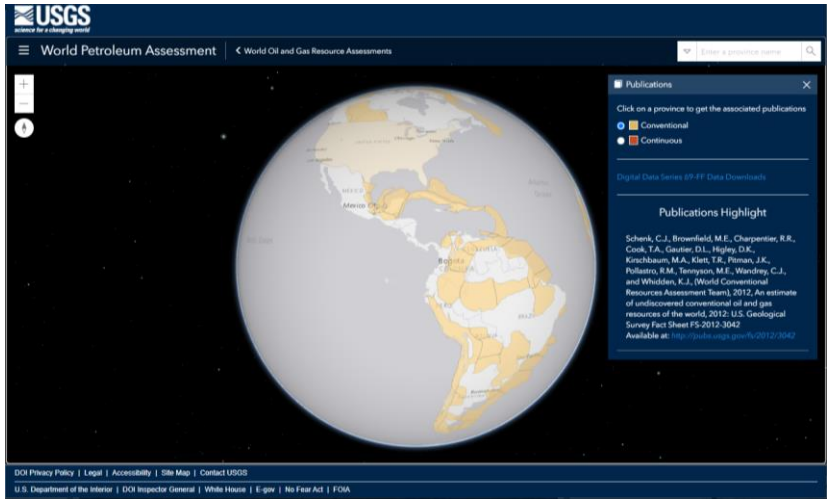
Search = Arabian Shield Province : https://pubs.er.usgs.gov/search?q=Arabian+Shield+Province+

Search = Arabian Peninsula : https://pubs.er.usgs.gov/search?q=Arabian+Peninsula

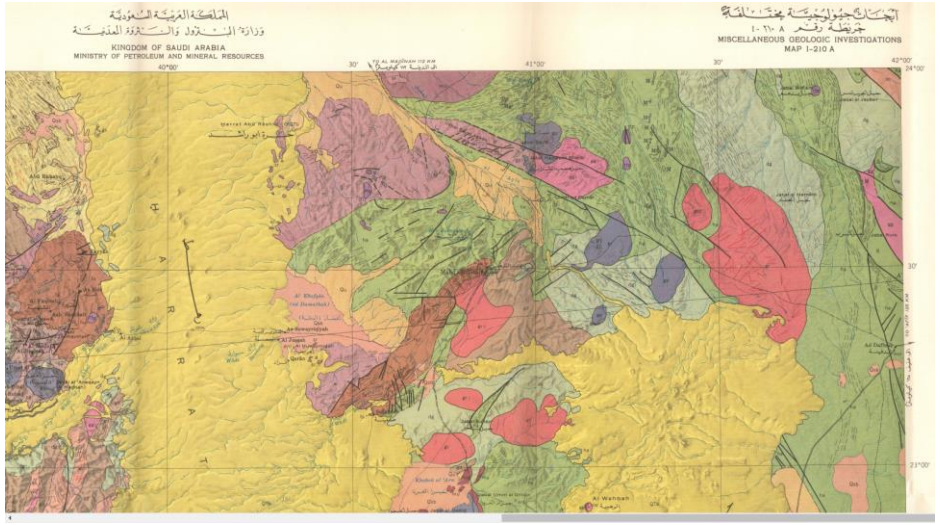
Search = Kingdom of Saudi Arabia : https://pubs.er.usgs.gov/search?q=Kingdom+of+Saudi+Arabia+

Search = Iraq : https://pubs.er.usgs.gov/search?q=Iraq

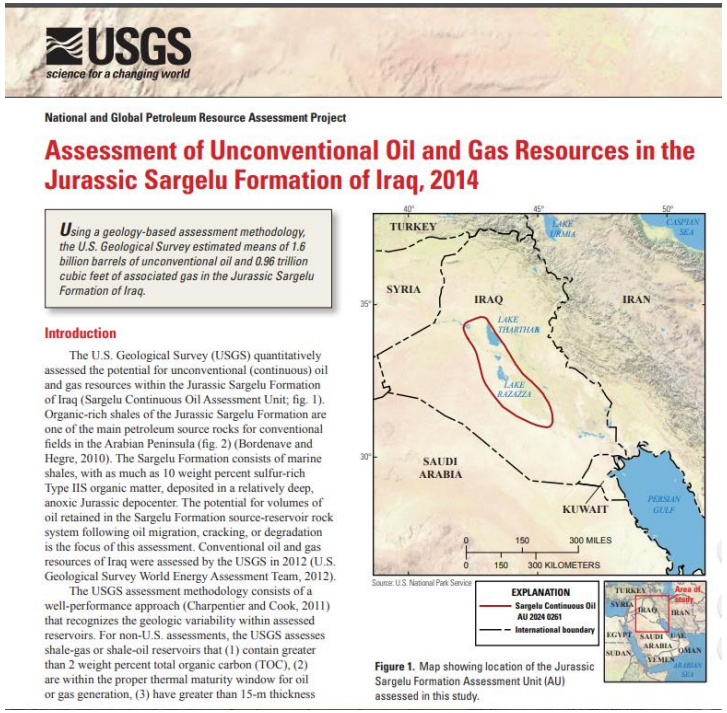




https://certmapper.cr.usgs.gov/data/apps/world-energy/?resource=conventional



https://pubs.usgs.gov/imap/0210a/plate-1.pdf


USGS
science for a changing world

National and Global Petroleum Resource Assessment Project

Assessment of Unconventional Oil and Gas Resources in the Jurassic Sargelu Formation of Iraq, 2014

Using a geology-based assessment methodology, the U.S. Geological Survey estimated means of 1.6 billion barrels of unconventional oil and 0.96 trillion cubic feet of associated gas in the Jurassic Sargelu Formation of Iraq.

Introduction

The U.S. Geological Survey (USGS) quantitatively assessed the potential for unconventional (continuous) oil and gas resources within the Jurassic Sargelu Formation of Iraq (Sargelu Continuous Oil Assessment Unit; fig. 1). Organic-rich shales of the Jurassic Sargelu Formation are one of the main petroleum source rocks for conventional fields in the Arabian Peninsula (fig. 2) (Bordenave and Hegre, 2010). The Sargelu Formation consists of marine shales, with as much as 10 weight percent sulfur-rich Type IIS organic matter, deposited in a relatively deep, anoxic Jurassic depocenter. The potential for volumes of oil retained in the Sargelu Formation source-reservoir rock system following oil migration, cracking, or degradation is the focus of this assessment. Conventional oil and gas resources of Iraq were assessed by the USGS in 2012 (U.S. Geological Survey World Energy Assessment Team, 2012).

The USGS assessment methodology consists of a well-performance approach (Charpentier and Cook, 2011) that recognizes the geologic variability within assessed reservoirs. For non-U.S. assessments, the USGS assesses shale-gas or shale-oil reservoirs that (1) contain greater than 2 weight percent total organic carbon (TOC), (2) are within the proper thermal maturity window for oil or gas generation, (3) have greater than 15-m thickness

Figure 1. Map showing location of the Jurassic Sargelu Formation Assessment Unit (AU) assessed in this study.

https://pubs.usgs.gov/fs/2015/3006/pdf/fs2015-3006.pdf

Afghanistan

https://afghanistan.cr.usgs.gov/

https://afghanistan.cr.usgs.gov/oil-and-natural-gas

https://afghanistan.cr.usgs.gov/oil-and-natural-gas-publications-maps

https://afghanistan.cr.usgs.gov/minerals

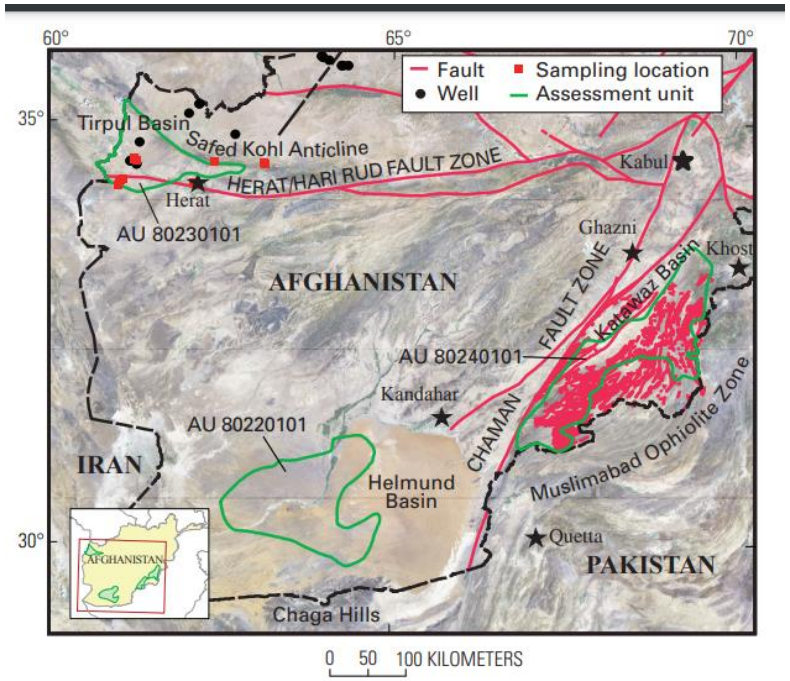


Figure 1. *Satellite image of southern and western Afghanistan showing prospective assessment units of the Tirpul Basin (AU 80230101), Helmund Basin (AU 80220101), and Katawaz Basin (AU 80240101); well and sample locations; and relevant faults. Image from National Geospatial Intelligence Agency, 12 July 2004, unclassified.*

Summaries and Data Packages of Important Areas for Mineral Investment and Production Opportunities in Afghanistan

https://afghanistan.cr.usgs.gov/minerals-publications-maps

A User-Friendly, Keyword-Searchable Database of Geoscientific References Through 2007 for Afghanistan

https://pubs.usgs.gov/ds/323/

The reference compilation is part of a larger joint study of Afghanistan's energy, mineral, and water resources, and geologic hazards currently underway by the U.S. Geological Survey, the British Geological Survey, and the Afghanistan Geological Survey.

Mineral research materials

GRAPHITE (NATURAL)

the largest natural graphite mine globally. The mine cut back production during 2019 in an effort to stabilize graphite prices. The mine is expected to operate for 50 years.

During the first half of 2019, crystalline flake graphite prices declined to levels similar to those of midyear 2017. The price decline was the result of oversupply, and some graphite mining companies cut back production in an effort to stabilize and increase graphite prices.

A U.S. automaker continued to build a large plant to manufacture lithium-ion electric vehicle batteries. The plant's completion was projected for 2020. A portion of the plant was operational and battery packs were being assembled in 2018 and 2019. When the plant is complete, it was expected to require 35,200 tons per year of spherical graphite for use as anode material for lithium-ion batteries.

New thermal technology and acid-leaching techniques have enabled the production of higher purity graphite powders that are likely to lead to development of new applications for graphite in high-technology fields. Innovative refining techniques have made the use of graphite possible in carbon-graphite composites, electronics, foils, friction materials, and specialty lubricant applications. Flexible graphite product lines are likely to be the fastest growing market. Large-scale fuel-cell applications are being developed that could consume as much graphite as all other uses combined.

World Mine Production and Reserves: Reserves for Mozambique and Tanzania were revised based on information reported by graphite-producing companies and the Governments of those countries.

	Mine production		Reserves[2]
	2018	2019[e]	
United States	—	—	(3)
Austria	1,000	1,000	(3)
Brazil	95,000	96,000	72,000,000
Canada	40,000	40,000	(3)
China	693,000	700,000	73,000,000
Germany	800	800	(3)
India	35,000	35,000	8,000,000
Korea, North	6,000	6,000	2,000,000
Madagascar	46,900	47,000	1,600,000
Mexico	9,000	9,000	3,100,000
Mozambique	104,000	100,000	25,000,000
Namibia	3,460	3,500	(3)
Norway	16,000	16,000	600,000
Pakistan	14,000	14,000	(3)
Russia	25,200	25,000	(3)
Sri Lanka	4,000	4,000	(3)
Tanzania	150	150	18,000,000
Turkey	2,000	2,000	90,000,000
Ukraine	20,000	20,000	(3)
Vietnam	5,000	5,000	7,600,000
Zimbabwe	2,000	2,000	(3)
Other	200	200	(3)
World total (rounded)	1,120,000	1,100,000	300,000,000

World Resources: Domestic resources of graphite are relatively small, but the rest of the world's inferred resources exceed 800 million tons of recoverable graphite.

Substitutes: Synthetic graphite powder, scrap from discarded machined shapes, and calcined petroleum coke compete for use in iron and steel production. Synthetic graphite powder and secondary synthetic graphite from machining graphite shapes compete for use in battery applications. Finely ground coke with olivine is a potential competitor in foundry-facing applications. Molybdenum disulfide competes as a dry lubricant but is more sensitive to oxidizing conditions.

2019 U.S. NET IMPORT RELIANCE[1]

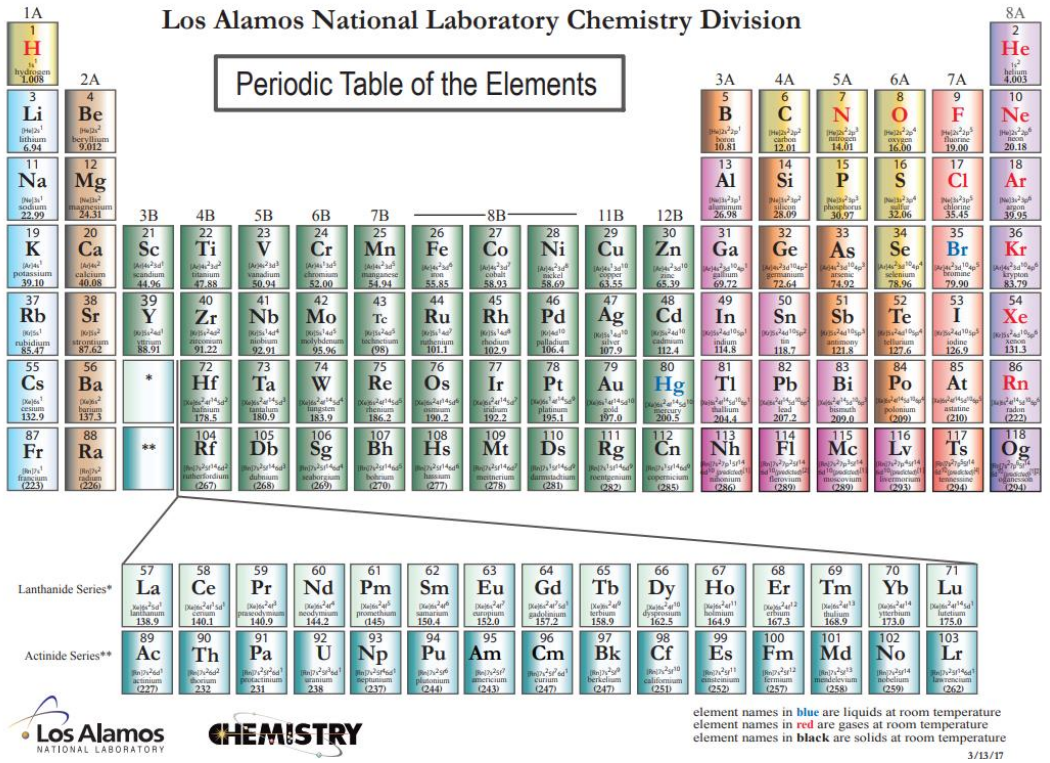
Commodity	Percent	Major import sources (2015–18)[2]
ARSENIC (all forms)	100	China, Morocco, Belgium
ASBESTOS	100	Brazil, Russia
CESIUM	100	Canada
FLUORSPAR	100	Mexico, Vietnam, South Africa, China
GALLIUM	100	China, United Kingdom, Germany, Ukraine
GRAPHITE (natural)	100	China, Mexico, Canada, India
INDIUM	100	China, Canada, Republic of Korea, Taiwan
MANGANESE	100	South Africa, Gabon, Australia, Georgia
MICA, sheet (natural)	100	China, Brazil, Belgium, Austria
NEPHELINE SYENITE	100	Canada
NIOBIUM (columbium)	100	Brazil, Canada, Russia, Germany
RARE EARTHS[3] (compounds and metal)	100	China, Estonia, Japan, Malaysia
RUBIDIUM	100	Canada
SCANDIUM	100	Europe, China, Japan, Russia
STRONTIUM	100	Mexico, Germany, China
TANTALUM	100	Rwanda, Brazil, Australia, Congo (Kinshasa)
YTTRIUM	100	China, Estonia, Republic of Korea, Japan
GEMSTONES	99	India, Israel, Belgium, South Africa
BISMUTH	96	China, Belgium, Mexico, Republic of Korea
TELLURIUM	>95	Canada, China, Germany
VANADIUM	94	Austria, Canada, Russia, Republic of Korea
TITANIUM MINERAL CONCENTRATES	93	South Africa, Australia, Canada, Mozambique
POTASH	91	Canada, Russia, Belarus, Israel
DIAMOND (industrial stones)	88	India, South Africa, Botswana, Australia
BARITE	87	China, India, Morocco, Mexico
ZINC (refined)	87	Canada, Mexico, Australia, Peru

https://pubs.usgs.gov/periodicals/mcs2020/mcs2020.pdf

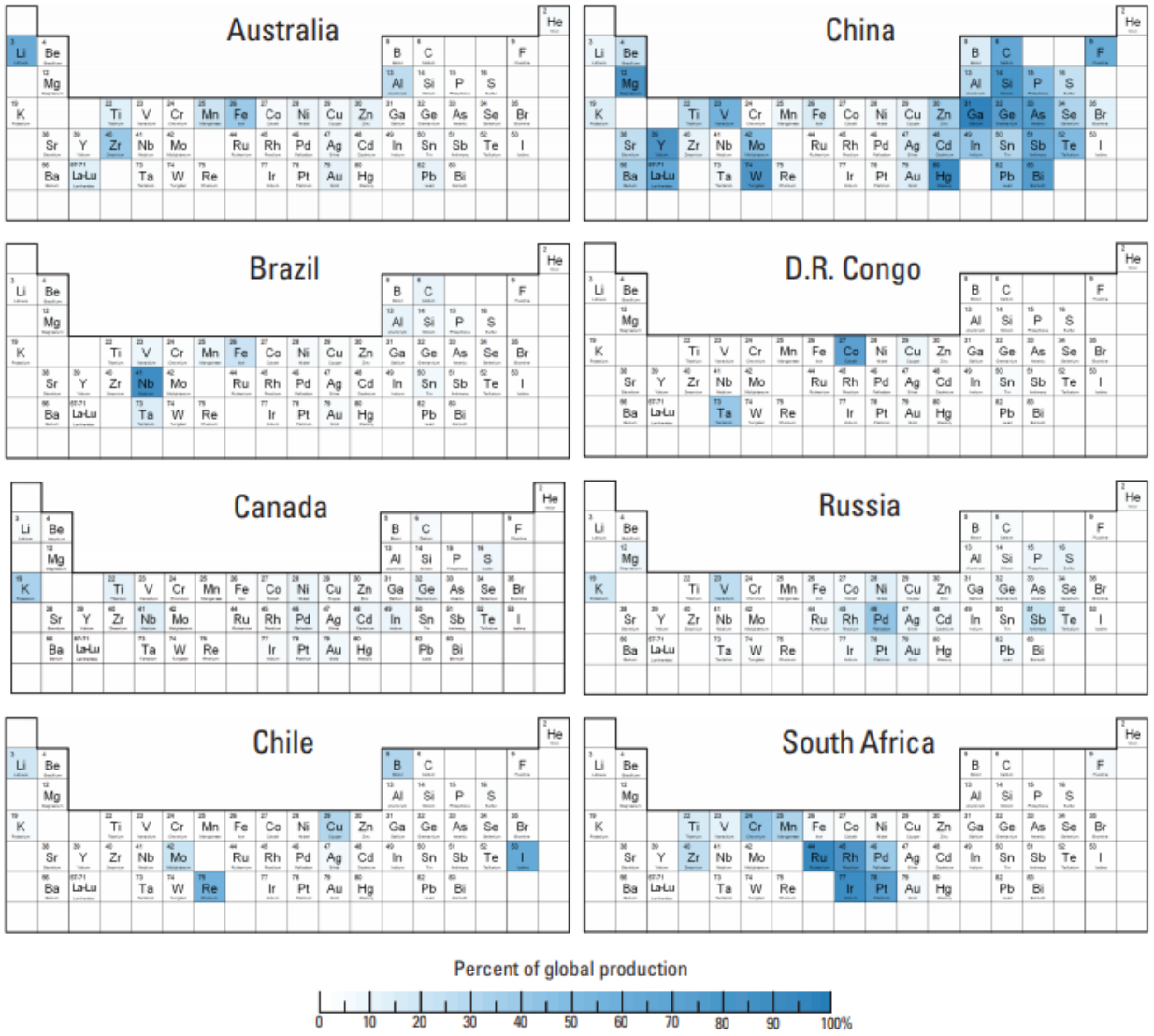
UW Researchers Turn Coal Powder into Graphite in Microwave Oven
http://www.uwyo.edu/uw/news/2021/01/uw-researchers-turn-coal-powder-into-graphite-in-microwave-oven.html

Critical Minerals

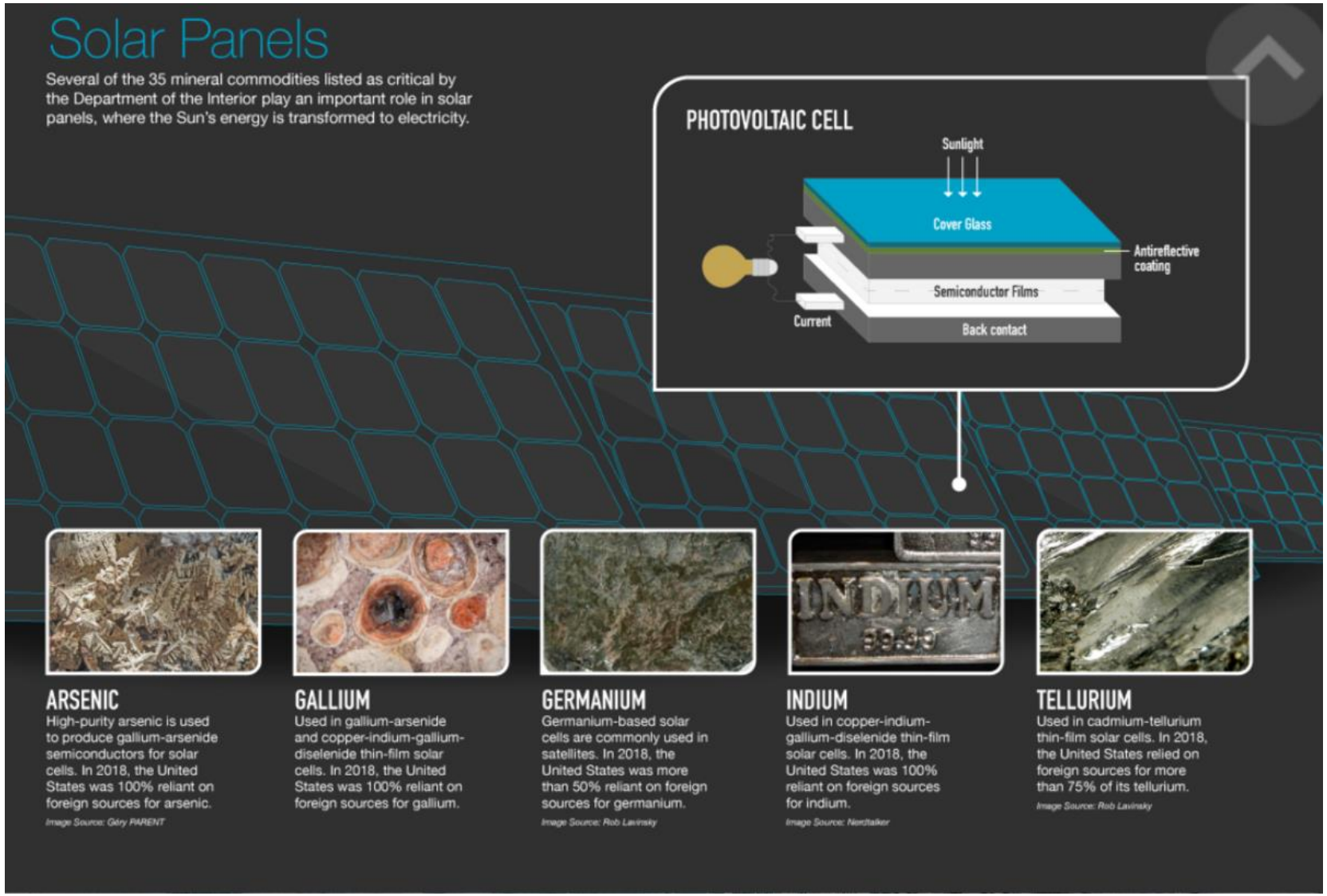
Investigation of U.S. Foreign Reliance on Critical Minerals—U.S. Geological Survey Technical Input Document in Response to Executive Order No. 13953 Signed September 30, 2020 December 2020



https://periodic.lanl.gov/index.shtml



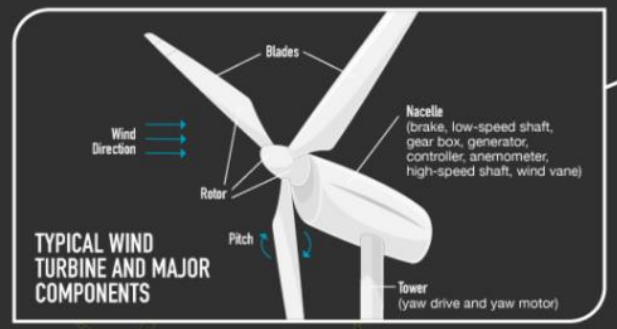
Critical Mineral Commodities in Renewable Energy



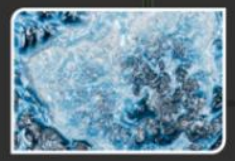
Critical Mineral Commodities in Renewable Energy

Wind Turbines

Wind turbines increasingly dot the American landscape, rising hundreds of feet in the air to capture electricity from the movement of the wind. Just like solar cells, wind turbines also rely on a few mineral commodities that have been designated as critical: aluminum and rare-earth elements.



TYPICAL WIND TURBINE AND MAJOR COMPONENTS



ALUMINUM

Aluminum plays a role in most parts of a wind turbine, particularly in the nacelle, where the transfer of wind power to electricity occurs. The United States was 50% reliant on foreign sources for aluminum in 2018.

RARE-EARTH ELEMENTS

Responsible for some of the most powerful and efficient magnets on the planet, rare-earth elements enable wind turbines to have smaller, lighter generators. Although the United States mined and exported rare-earth minerals in 2018, it relied on imports to meet its domestic demands for rare-earth compounds, metals, and manufactured products.

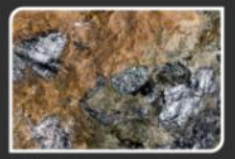
Batteries

Batteries play an important supporting role for renewable energy sources like wind and solar, allowing excess power to be stored for usage when direct solar or wind power are unavailable. Just like the energy sources they complement, modern batteries rely on critical mineral commodities, particularly cobalt, graphite, lithium, and manganese.

COBALT

On a global basis, the leading use of cobalt is in rechargeable battery electrodes. In 2018, the United States relied on foreign sources for 61% of the cobalt it consumed.

Image Source: James St. John

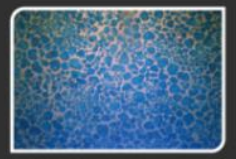


GRAPHITE

Graphite serves as an electrode in many lithium batteries. In 2018, the United States was 100% reliant on foreign sources for graphite.

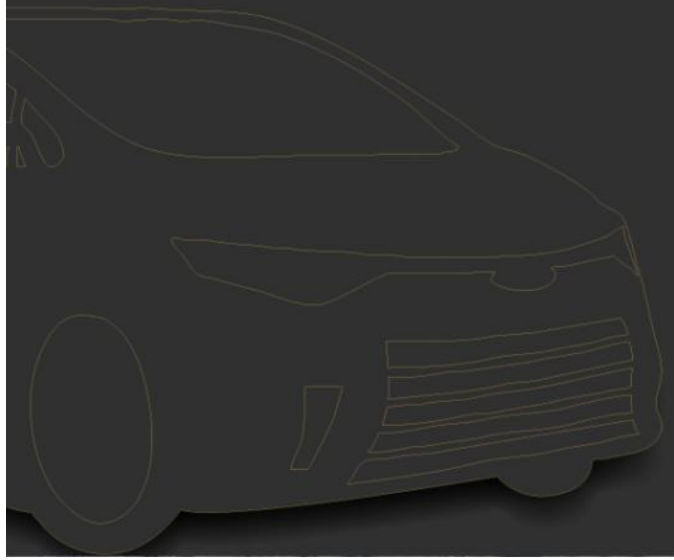
LITHIUM

Lithium has a long history in batteries and is a common material used in batteries today. In 2018, the United States was more than 50% reliant on foreign sources for lithium.



MANGANESE

Manganese serves as an electrode in many lithium batteries. The United States was 100% reliant on foreign sources for manganese in 2018.



The USGS delivers unbiased science and information to increase understanding of ore formation, undiscovered mineral resource potential, production, consumption, and how minerals interact with the environment. The USGS supports data collection and research on a wide variety of non-fuel mineral resources that are important to the Nation's economic and national security. The agency's mission is to provide reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life. For more information, please visit www.usgs.gov.

Rare Earths

https://pubs.usgs.gov/periodicals/mcs2020/mcs2020.pdf

RARE EARTHS[1]

[Data in metric tons of rare-earth-oxide (REO) equivalent content unless otherwise noted]

Domestic Production and Use: Rare earths were mined domestically in 2019. Bastnaesite (or bastnäsite), a rare-earth fluorocarbonate mineral, was mined as a primary product at a mine in Mountain Pass, CA, which was restarted in the first quarter of 2018 after being put on care-and-maintenance status in the fourth quarter of 2015. Monazite, a phosphate mineral, was produced as a separated concentrate or included as an accessory mineral in heavy-mineral concentrates. The estimated value of rare-earth compounds and metals imported by the United States in 2019 was $170 million, an increase from $160 million in 2018. The estimated distribution of rare earths by end use was as follows: catalysts, 75%; metallurgical applications and alloys, 5%; ceramics and glass, 5%; polishing, 5%; and other, 10%.

Salient Statistics—United States:	2015	2016	2017	2018	2019e
Production, bastnaesite concentrates[e]	5,900	—	—	18,000	26,000
Imports:[2]					
Compounds	9,160	11,500	11,000	10,800	14,000
Metals:					
Ferrocerium, alloys	356	268	309	301	310
Rare-earth metals, scandium, and yttrium	385	404	524	527	590
Exports:[2]					
Ores and compounds	4,980	590	1,740	16,800	26,000
Metals:					
Ferrocerium, alloys	1,220	943	982	1,210	1,400
Rare-earth metals, scandium, and yttrium	60	103	55	28	100
Consumption, apparent[3]	9,550	10,500	9,060	11,600	13,000
Price, dollars per kilogram, average:[4]					
Cerium oxide, 99.5% minimum	3	2	2	2	2
Dysprosium oxide, 99.5% minimum	279	198	187	179	240
Europium oxide, 99.99% minimum	344	74	77	53	35
Lanthanum oxide, 99.5% minimum	3	2	2	2	2
Mischmetal, 65% cerium, 35% lanthanum	7	5	6	6	6
Neodymium oxide, 99.5% minimum	48	40	50	50	45
Terbium oxide, 99.99% minimum	564	415	501	455	510
Employment, mine and mill, annual average	351	—	24	190	220
Net import reliance[5] as a percentage of apparent consumption:[6]					
Compounds and metals	38	100	100	100	100
Mineral concentrates	XX	XX	XX	E	E

Recycling: Limited quantities of rare earths from batteries, permanent magnets, and fluorescent lamps are recycled.

Import Sources (2015–18): Rare-earth compounds and metals: China, 80%; Estonia, 6%; Japan and Malaysia, 3% each; and other, 8%. Compounds and metals imported from Estonia, Japan, and Malaysia were derived from mineral concentrates and chemical intermediates produced in Australia, China, and elsewhere.

Tariff: Item	Number	Normal Trade Relations 12–31–19
Rare-earth metals, scandium, and yttrium, whether or not intermixed or interalloyed	2805.30.0000	5.0% ad val.
Cerium compounds:		
Oxides	2846.10.0010	5.5% ad val.
Other	2846.10.0050	5.5% ad val.
Other rare-earth compounds:		
Lanthanum oxides	2846.90.2005	Free.
Other oxides	2846.90.2040	Free.
Lanthanum carbonates	2846.90.8070	3.7% ad val.
Other carbonates	2846.90.8075	3.7% ad val.
Other rare-earth compounds	2846.90.8090	3.7% ad val.
Ferrocerium and other pyrophoric alloys	3606.90.3000	5.9% ad val.

Depletion Allowance: Monazite, 22% on thorium content and 14% on rare-earth content (Domestic), 14% (Foreign); bastnäsite and xenotime, 14% (Domestic and foreign).

Prepared by **Joseph Gambogi [(703) 648–7718, jgambogi@usgs.gov]**

RARE EARTHS

Government Stockpile:[7]

Material	Inventory As of 9–30–19	FY 2019 Potential Acquisitions	FY 2019 Potential Disposals	FY 2020 Potential Acquisitions	FY 2020 Potential Disposals
Cerium	—	—	—	900	—
Dysprosium	0.2	0.5	—	—	—
Europium	20.9	35	—	—	—
Ferrodysprosium, gross weight	0.5	—	—	—	—
Lanthanum, gross weight	—	—	—	4,100	—
Rare earths	—	416	—	—	—
Rare-earth-magnet feedstock	—	100	—	100	—
Yttrium oxide	25	10	—	—	—

Events, Trends, and Issues: Global mine production was estimated to have increased to 210,000 tons of rare-earth-oxide equivalent, an 11% increase compared with that of 2018. In the United States, domestic production of mineral concentrates, all of which were exported, increased to 26,000 tons, a 44% increase compared with that of 2018. China continued to dominate the global supply of rare earths. According to China's Ministry of Industry and Information Technology, the mine and separation production quotas for 2019 were 132,000 tons and 127,000 tons, respectively.

World Mine Production and Reserves: Reserves for Canada, Greenland, Tanzania, and South Africa were previously included with "Other countries."

	Mine production[e] 2018	Mine production[e] 2019	Reserves[8]
United States	18,000	26,000	1,400,000
Australia	21,000	21,000	[9]3,300,000
Brazil	1,100	1,000	22,000,000
Burma (Myanmar)	19,000	22,000	NA
Burundi	630	600	NA
Canada	—	—	830,000
China	[10]120,000	[10]132,000	44,000,000
Greenland	—	—	1,500,000
India	2,900	3,000	6,900,000
Madagascar	2,000	2,000	NA
Russia	2,700	2,700	12,000,000
South Africa	—	—	790,000
Tanzania	—	—	890,000
Thailand	1,000	1,800	NA
Vietnam	920	900	22,000,000
Other countries	60	—	310,000
World total (rounded)	190,000	210,000	120,000,000

[Rare Earth Processing Plant Opens in Colorado]

[USA Rare Earth's ambitious plans for domestic supply chain]

Keeping up with the News

First Action Every Morning, During Lunchtime, and Last Action of Day

The New York Times

Saudi Arabia Will Cut Its Oil Production, Allowing Russia's to Grow

Oil prices rose to levels not seen since February. The two major oil producers had been moving in lock step since an April agreement to cut output.

https://www.nytimes.com/2021/01/05/business/energy-environment/opec-plus-oil-prices.html

Example, Princeton University:
https://libguides.princeton.edu/NYT

https://www.eenews.net/

THE WALL STREET JOURNAL.

https://www.wsj.com/news/business/natural-resources

Example, Princeton University:
https://libguides.princeton.edu/WSJ

Geology Societies

Society for Mining, Metallurgy, and Exploration (SME)
https://www.smenet.org/

Publications:
Mining Engineering https://me.smenet.org/

Mining, Metallurgy & Exploration
https://www.smenet.org/Professional-Development/Publications/Mining-Metallurgy-Exploration

https://www.onemine.org/index.cfm

All About Mining:
https://allaboutmining.org/
Email me for past presentations (ewild@princeton.edu)

New York Section SME:
https://community.smenet.org/newyork/home

2020 events
Online presentations: Strengthening Critical Minerals Supply Chains in North America: The Key Role of Québec

SME's 8th Current Trends in Mining Finance (CTMF) Conference
Managing Risk and Identifying Opportunities in a Disruptive World

https://www.smeannualconference.com/

Colorado Mining Association : https://www.coloradomining.org/

United States Mint

Geology Makes Money

Denver Mint & Philadelphia Mint: Cent (Penny)

Composition	Weight	Diameter
Copper Plated Zinc 2.5% Cu Balance Zn	2.500 g	0.750 in. 19.05 mm

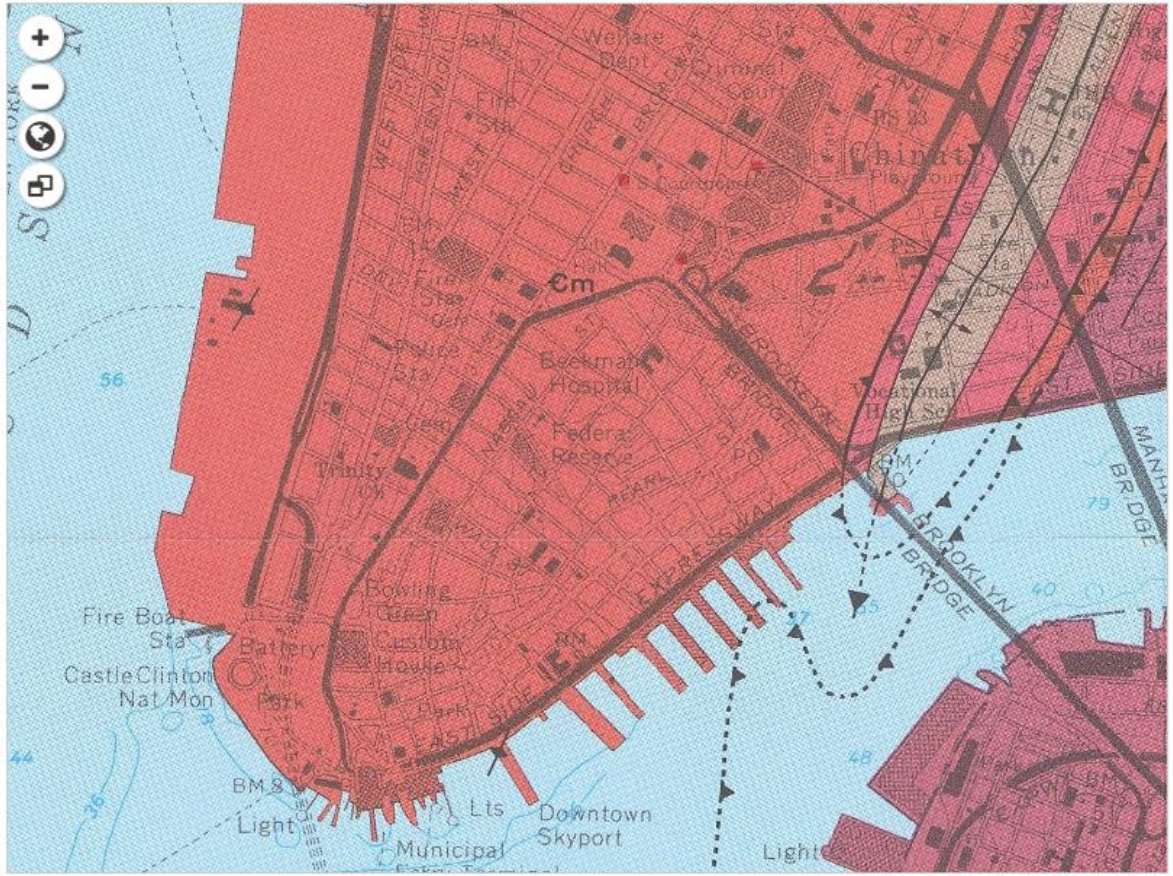
https://www.usmint.gov/coins/coin-medal-programs/circulating-coins/penny

https://www.usmint.gov/learn/coin-and-medal-programs/circulating-coins

Geology - New York City – Wall Street

https://ngmdb.usgs.gov/Prodesc/proddesc_10233.htm

Image 1 of 2 — Sheet 1 of 2: Bedrock geology

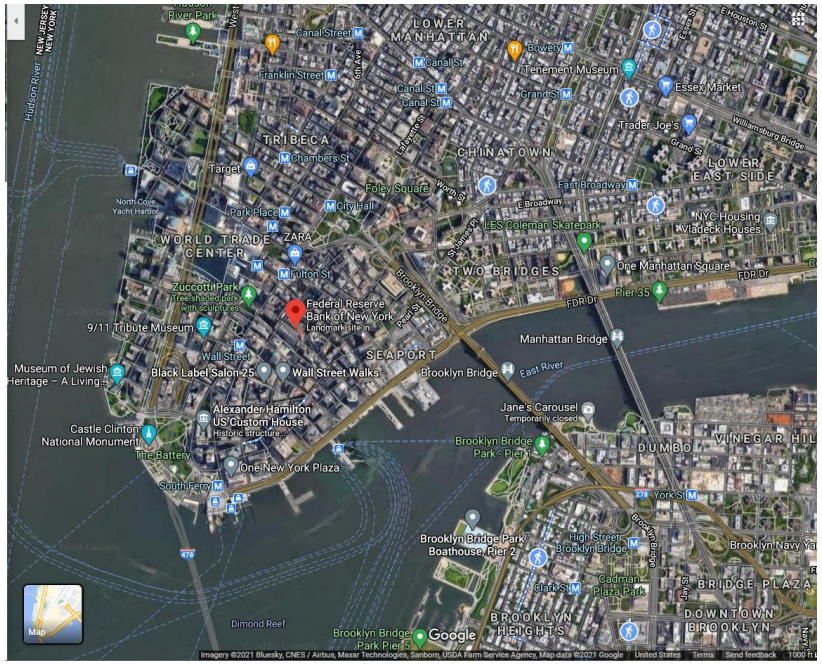


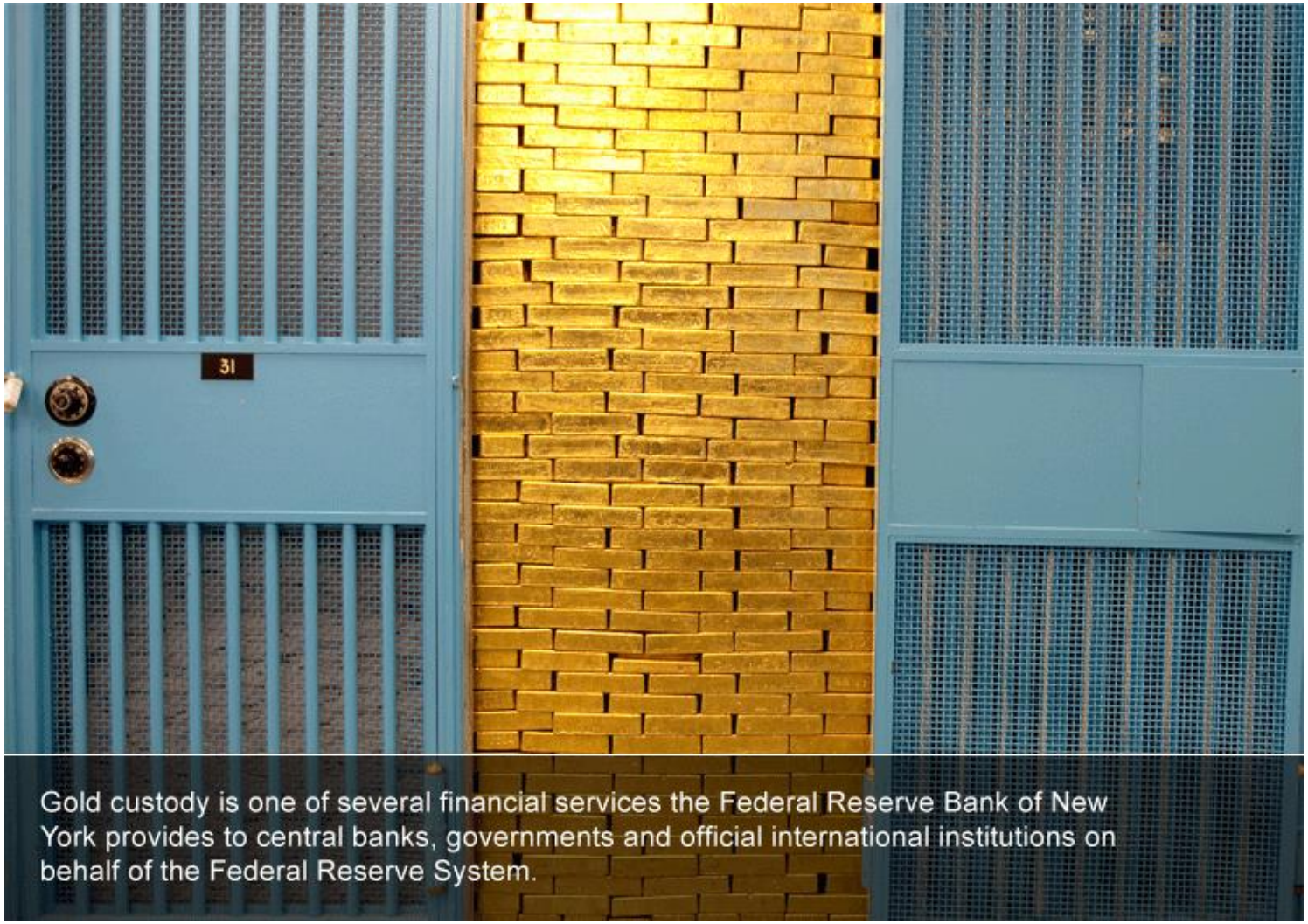
product is out of print and may be located at a Depository Library.

USGS science for a changing world

€m **Manhattan Schist (Lower Cambrian)**—Gray, medium- to coarse-grained, layered sillimanite-muscovite-biotite-kyanite schist and gneiss interlayered with layered tourmaline-garnet-plagioclase-biotite-quartz schist and gneiss with black amphibolite layers 3 ft or more thick. Weathers gray, tan, rusty, and maroon. Sillimanite occurs in lenses and nodules, commonly with kyanite, and also with magnetite or quartz; sillimanite nodules average 0.8 in. in length. Unit locally contains interlayered thin quartz-mica-plagioclase-garnet granofels. Sparse garnet and (or) plagioclase porphyroblasts are present; the garnets average 0.4 in. across. In places the foliation surfaces bear lustrous white mica having a gray metallic sheen. A major thrust fault, the Inwood Hill, separates the Manhattan Schist from the underlying Walloomsac Formation (see cross section *A–A′*)

Federal Reserve Bank of New York





“As of 2019, the vault housed approximately 497,000 gold bars, with a combined weight of about 6,190 tons. The vault is able to support this weight because it rests on the bedrock of Manhattan Island, 80 feet below street level and 50 feet below sea level.”
https://www.newyorkfed.org/aboutthefed/goldvault.html

Session Overview

- Natural resources based traded commodities:
  - Industrial metal (copper, aluminum...),
  - Precious metals (gold, silver..),
  - Forest (pulp, lumber..),
  - Energy (Brent, WTI…)
- Alternative energy / Renewable energy - Wind, Solar, Geothermal
- Rare Earths – not yet a traded commodity.
- Commodity investing: Commodity trading, ETF/ETNs, stock trading.

Quick Bio

Bobbi: "…to the Stocks"

- Equity Research Analyst turned Finance Librarian
- 25+ years Wall Street analyst following technology
- Wrote extensively on changing industries and how industry evolution changed company valuation.
- Quoted as industry expert in New York Times and other print media and appeared on air for Bloomberg radio and TV as well as other venues.

What is finance? And other defintions

Finance is defined as the management of money and includes activities such as investing, borrowing, lending, budgeting, saving, and forecasting.
(From: Corporatefinanceinstitute.com)

The act of investing has the goal of generating income and /or increasing value over time.
(from Investopedia)

Ways to invest - stocks of companies whose fortunes depend on the resource, ETF & ETN - Exchange traded funds and notes which are designed to mirror returns of the underlying asset and commodity future contracts. Varying level of leverage and costs.

What is a finance librarian?

As Princeton's finance librarian, I help researchers find the resources they need for their independent research and related work. To help researchers, I curate pertinent resources in finance for Princeton University.

Accordingly, to know what the pertinent resources are I stay up to date on the trends in finance and in finance research.

Finance research users

At Princeton University, 2017-present

- Undergraduate & Graduate Students
- Alumni
- College/University Professors
- Librarians
- Post-Docs
- Finance Industry Professonals
- Experienced Library Users that need a refresher

New York Federal Reserve Bank

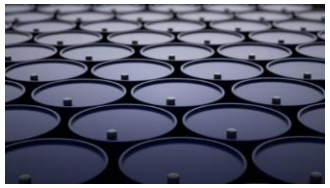
Over $260 billion in gold.

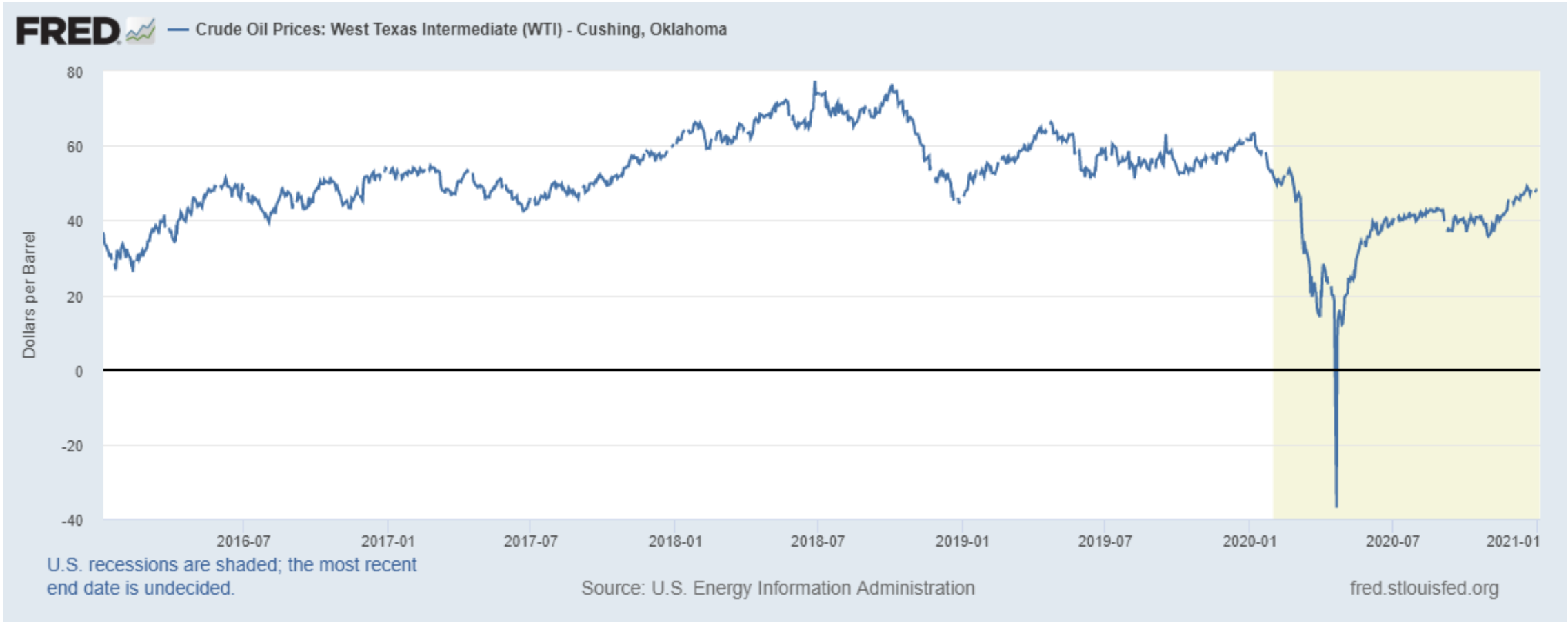
The vast majority of gold in the NY Fed is not domestic but owned by international entities.

https://www.newyorkfed.org/ - located in lower Manhattan
and pre-COVID offered tours. The tours discussed the operations of the Federal Reserve Banks as well as visited
the gold vaults in the basement.

There are 12 Federal Reserve Banks.

FRED - https://fred.stlouisfed.org/ Crude oil prices / barrel





FRED - https://fred.stlouisfed.org/ Gold price per Troy ounce

FRED - https://fred.stlouisfed.org/

For WTI

Source: U.S. Energy Information Administration

Release: Spot Prices

Units: Dollars per Barrel, Not Seasonally Adjusted

Frequency: Daily

Definitions, Sources and Explanatory Notes

Suggested Citation:
U.S. Energy Information Administration, Crude Oil Prices: West Texas Intermediate (WTI) - Cushing, Oklahoma [DCOILWTICO], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/DCOILWTICO, January 11, 2021.

For Gold

Source: ICE Benchmark Administration Limited (IBA)

Release: LBMA Gold Price: Daily Prices

Units: U.S. Dollars per Troy Ounce, Not Seasonally Adjusted

Frequency: Daily

The London Bullion Market Association (LBMA) Gold Price was launched on the 20th March 2015 to replace the historic London Gold Fix. ICE Benchmark Administration (IBA) provides the auction platform, methodology as well as overall independent administration and governance for the LBMA Gold Price, with the LBMA holding the intellectual property rights. The price continues to be set twice daily (at 10:30 and 15:00 London GMT) in US dollars. Sterling and Euro prices are available but they are indicative prices for settlement only. For further information contact the LBMA at Au.Consult@lbma.org.uk or the IBA at iba@theice.com.

Suggested Citation:
ICE Benchmark Administration Limited (IBA), Gold Fixing Price 10:30 A.M. (London time) in London Bullion Market, based in U.S. Dollars [GOLDAMGBD228NLBM], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/GOLDAMGBD228NLBM, January 10, 2021.

Finance research

EDGAR - https://www.sec.gov/edgar/search-and-access

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  - 10-Qs are the quarterly filings and will show the quarterly financial statements and will have notes on the financial statements.
  - 8-Ks are interim reports and often have significant events relevant to shareholders.
  - Proxies are reports that detail of the management compensation and materials for the annual meetings.

Finance research

Resources - Government:
https://www.investor.gov/ - solid information on investing. An SEC site.
https://tools.finra.org/fund_analyzer/ - fund specific information from the Financial Industry Regulatory Authority (FINRA)
https://www.sec.gov/edgar/searchedgar/companysearch.html - Securities and Exchange Commission(SEC) site. Has all SEC filings.
https://fred.stlouisfed.org/ - Current Economic Data from the St. Louis Federal Reserve Bank
https://fraser.stlouisfed.org/ - Historic Economic Data from the St. Louis Federal Reserve Bank

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Resources – Commercial :

https://www.bloomberg.com/ - Bloomberg
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Operations Research and Financial Engineering (ORFE) https://orfe.princeton.edu/home